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Effect of black tea (*Camellia sinensis*) toward tooth enamel hardness after being soaked in carbonated drinks

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ABSTRACT

Introduction: Demineralization is the loss of mineral ions on the tooth enamel surface which is generally caused by acid exposure**.** One of the most popular drinks is carbonated drinks which contain bicarbonic acid. Tooth enamel surfaced which is continuously exposed by acid will cause tooth erosion. Dental minerals that have been lost can be restored by the process of remineralization. Fluorine, calcium, phosphate and polyphenols in black tea can increase the surface hardness of the enamel. The aim of this study is to know the effect of teeth immersion with black tea on the enamel surface hardness.

Methods: This research is characterized as a true experimental laboratory study with a pre-test-post-test research design and a control group design. The study utilized a sample of 10 post-extraction premolars that met the inclusion criteria. The samples were divided into two groups, both of which were pre-soaked in carbonated drinks for 25 hours. Group I : 5 samples were immersed in black tea for 25 hours and group II : 5 samples were immersed in artificial saliva for 25 hours. Hardness measurement using Vickers hardness tester.

Results: Based on data analysis using paired t-test. The enamel surface hardness increased after being soaked in black tea (mean=237.06, SD=89.27) p=0.013. Enamel surface hardness also increased in group control with artificial saliva (mean=312.93, SD=33.21) p=0.007. Difference value in the control group 59.86 and after treatment group is 61.39.

Conclusions: There is an effect of black tea (Camellia Sinensis) on the surface hardness of the enamel after being soaked in carbonated drinks.

Keywords: Black tea, carbonated drinks, enamel hardness, vickers hardness tester.

INTRODUCTION

Taking care of dental and oral health is an integral part of overall well-being, and special attention needs to be given to dental and oral care. Individual consumption patterns, including preferences for carbonated beverages containing bicarbonate, require careful consideration. According to World Health Organization (WHO) data from 2012, it was found that Indonesians consume carbonated beverages at a rate of 16%.[1,2] Despite the continuous increase in carbonated beverage consumption, it is crucial to be aware that the content in these beverages, particularly the acidic substances, can lead to tooth erosion.[3] Carbonated beverages contain high-calorie carbohydrates, such as sucrose at around 7.8-10.3%, and other carbonating agents like phosphoric acid and citric acid.[4] The carbonic acid in these beverages, with its low pH, can lead to demineralization. This process occurs due to the continuous exposure over an extended period to acidic substances from food and beverages, causing changes in the mouth's pH and contributing to demineralization.[5]

The World Health Organization (WHO) states that 80% of the world's population relies on traditional medicine, typically derived from plants. Tea is recognized for its potential to enhance the tooth remineralization process. Both green and black tea are known to contain relatively high levels of polyphenols and fluoride. The proportion of polyphenol content reaches approximately 42%, and the fluoride content is around 95%.[6] Fluoride works by forming bonds with tooth enamel, creating fluorapatite, thus preventing tooth decay. Meanwhile, polyphenols in tea can inhibit the activity of pathogenic bacteria such as Streptococcus and Sobrinus, as demonstrated in oolong and green tea.[7]

Black tea accounts for 78% of the world's tea production, making it the most widely produced type of tea globally, while green tea comprises 20%, with white tea and oolong tea making up the remaining 2% each.[8] Black tea contains polyphenols in the range of 3-10%, inhibiting the enzyme glucosyltransferase produced by Streptococcus bacteria, thereby suppressing bacterial growth and acid production.[9] The objective of this study is to determine the effectiveness of black tea in enhancing the surface hardness of tooth enamel induced by carbonated beverages.

METHODS

This study is a true experimental laboratory study with a pre-test - post-test design and a control group. It was conducted in the Microbiology Laboratory of the Faculty of Medicine, Andalas University, and the Metallurgy Laboratory of the Faculty of Engineering, Andalas University, during February-March 2023. The samples used were premolar teeth that met the inclusion and exclusion criteria. In this research, there are 10 samples divided into 2 groups: the treatment group immersed in black tea for 25 hours and the control group

immersed in artificial saliva for 25 hours.

The sample preparation process began with cutting the teeth and embedding them in 2 cm diameter PVC pipes using clear resin (epoxy). The samples were then immersed in a carbonated beverage with a pH of 2.41 for 25 hours at a temperature of 37°C. Subsequently, the samples were measured for hardness using a Vickers hardness tester. The samples were then immersed for 25 hours in an incubator at 37°C in a solution of black tea with a pH of 6.57 and artificial saliva with a pH of 7. Hardness testing was conducted again to observe the differences before and after treatment. The obtained data were analyzed using paired t-test and independent t-test statistical analyses.

Table 1. The average surface hardness of tooth enamel before and after immersion in artificial saliva

Surface hardness of enamel	n	Mean ± SD	*P*
Before intervention	5	253.06 ± 14.74	0.007
After intervention	5	312.93 ± 33.21	

Table 2. The average surface hardness of tooth enamel before and after immersion in black tea

Surface hardness of enamel	n	Mean ± SD	*p*
Before intervention	5	175.66 ± 70.60	0.013
After intervention	5	237.06 ± 89.27	

Table 3. The results of the difference in the average delta values of tooth enamel surface hardness between the treatment group immersed in black tea and the control group immersed in artificial saliva

	n	Mean ± SD	*p*
Control group immersed in artificial saliva	5	59.86 ± 25.96	0.936
Treatment group immersed in black tea	5	61.39 ± 32.45	

RESULTS

Bivariate analysis in this study began with a normality test with a significance level (p>0.05) (Shapiro-Wilk). The research results in Table 1, after conducting a paired t-test in the control group, showed a p-value of 0.007 (p<0.05), indicating a significant difference in the surface hardness of tooth enamel before and after immersion in artificial saliva. The research results in Table 2, after conducting a paired t-test in the treatment group, showed a p-value of 0.013 (p<0.05), indicating a significant difference in the surface hardness of tooth enamel before and after immersion in black tea. The research results in Table 3 showed a p-value of 0.936 (p>0.05) (independent t-test), indicating no significant difference.

DISCUSSION

This study aims to evaluate changes in the surface hardness of tooth enamel after immersion in carbonated beverages intervened with black tea. All samples were demineralized using carbonated beverage (Coca-cola®) with a pH of 2.41, immersed for 25 hours. The 25-hour immersion period was chosen based on the exposure process to the teeth with a solution occurring approximately 20 seconds before the oral cavity is cleansed by saliva. When calculated for a year, this corresponds to 90,000 seconds (1,500 minutes) or approximately 25 hours per year.[10] In this study, there was a decrease in the hardness of tooth enamel after immersion in carbonated beverages for 25 hours, ranging from 119.33 to 266.67 VHN, with a slight variation in the surface hardness of tooth enamel generally ranging from 250 to 408 VHN. A study conducted by Erviana et al. on tooth immersion in carbonated beverages with durations of 35, 40, and 60 minutes showed that the decrease in tooth enamel hardness is influenced by the immersion duration. The longer the immersion, the higher the reduction in the level of tooth enamel hardness.[11]

The dissolution of tooth enamel is influenced by the acidity level (pH), acid concentration, and the duration of continuous exposure.[3] In this study, the pH of carbonated beverages was 2.41, indicating that the beverage had a pH below 5.5, which means it was in an acidic condition. Damage to tooth enamel is not only due to the low pH but also because the buffering capacity has erosive effects when in contact with the tooth enamel surface. The variation in enamel hardness values is influenced by several factors, including the chemical composition of the teeth, the duration of storing the teeth post-extraction for 3 to 6 months, during which the surface hardness of tooth enamel may decrease by 47-63%.[12] The study conducted by Khamverdi et al. showed that the hardness of tooth enamel was 304.26 VHN after induction with carbonated beverages for 20 minutes (7 days).[13]

Fluoride, calcium, phosphate, and polyphenols present in black tea can contribute to the increased surface hardness of tooth enamel. The remineralization mechanism occurs when calcium, phosphate, and fluoride ions from black tea diffuse into the microporosity of the enamel. The entering minerals are dispersed among the enamel crystals and absorbed by the enamel that has undergone demineralization, a condition referred to as hypomineralized enamel.[14,15] Dissolved hydroxyapatite ions will be replaced by fluoride ions present in black tea, forming calcium fluorapatite. The natural remineralization process can occur when the pH of black tea is not in a critical condition, allowing the buffering capacity to neutralize acid within the oral cavity. Calcium fluorapatite has more stable and resistant bonds compared to hydroxyapatite.[16]

Based on the independent t-test in Table 3, the results show the average difference between the treatment group with black tea and the control group with artificial saliva. The p-value is 0.936, meaning p>0.05, indicating no significant difference between immersion with black tea and artificial saliva. This suggests that artificial saliva has the same potential as black tea in enhancing tooth remineralization. Remineralization can occur through two processes: first, due to the fluoride content of black tea, and second, because of the calcium and phosphate content in artificial saliva.

The increase in surface hardness of tooth enamel is attributed to the crucial role of saliva as a buffer to neutralize acid. Saliva contains calcium and phosphate, which assist in enhancing the remineralization process of the dissolved enamel surface.[17] Artificial saliva contains minerals similar to the inorganic components of normal saliva, such as K+, Na+, Mg2+, Ca2+, Cl-, and HCO3-, as well as phosphate. Saliva contains fluoride at a concentration of 0.3 ppm, which falls into the low range.[15]

In this study, the pH of saliva was neutral, at a pH of 7. This means that the buffering capacity of saliva can work effectively. Saliva contains calcium and phosphate, which are capable of rebuilding demineralized hydroxyapatite crystals. Consequently, the natural remineralization process will occur. Conversely, when the pH of saliva is acidic, the buffering capacity is compromised, and the remineralization process cannot take place effectively.[16] Based on the research conducted by Farouk in 2021, after immersing teeth in black tea, green tea, moringa, and artificial saliva used as the control group, the results indicate that artificial saliva has the ability to remineralize enamel that has undergone demineralization.[18] The results of the study indicate that black tea can have a positive impact on tooth hardness. Research by Hardini et al., on tooth discoloration induced by tea, found that Manalagi apple can improve discoloration caused by tea. Based on this, tea can have both positive and negative effects when viewed from various perspectives.[19]

CONCLUSION

There is no significant difference between black tea and artificial saliva after immersion in carbonated beverages. Nevertheless, both of them influence the increase in the surface hardness of tooth enamel.

CONFLICT OF INTEREST

None.

ETHICAL CLEARANCE

This study has been approved by the Ethics Committee of Andalas University with No: 139/UN.16.2/KEP-FK/2023.

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AUTHORS CONTRIBUTION

This work was carried out in collaboration between authors. Authors conceived and developed the project with review, writing and approval of the final manuscript for publication.

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The effectiveness of 40% hydrogen peroxide for tooth bleaching after fixed orthodontic treatment: a case report

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ABSTRACT

Introduction: Tooth discoloration can reduce a person's aesthetics and appearance. One of the causes of tooth discoloration is the use of orthodontic fixed appliances. The use of these appliances is one of the factors that makes it difficult to maintain oral hygiene because they can be a good place for food debris and cause plaque accumulation under the appliances so that stains form on the surface of the teeth which can cause discoloration. One of the most conservative, safe and effective treatment procedures to treat discolored teeth due to the use of fixed orthodontic appliances is external bleaching. This case report describes an external bleaching procedure using 40% hydrogen peroxide (Opalescence Boost).

Case Illustration: A 22-year-old female patient came to RSGMP Hasanuddin University with complaints of yellowish teeth. The patient has a history of using fixed orthodontic appliances for approximately 7 years. The patient wants to restore the color of her teeth to become whiter. The bleaching procedure begins with cleaning the enamel surface with pumis and is followed by an assessment of the initial color of the teeth using an Opalescence Shade Guide. Dental optatragate is placed in the patient's mouth, astringent application, application of the gingival barrier, then light cured for 20 seconds, then application of 40% hydrogen peroxide bleaching material (Opalescence Boost, Ultradent Product, Inc., South Jordan, UT, USA) for 20 minutes for 2 cycles, then cleaning of the bleaching material, removal of gingival barrier ending with application of desensitizer agent. Shade score changed from 8 to 4 using Opalescence shade guide as the final result. The patient did not feel any sensitivity in the teeth after the application of the desensitizing agent. The control results after 1 week showed a stable tooth color

Conclusion: Tooth discoloration treatment after the use of orthodontic fixed appliance with external bleaching with 40% hydrogen peroxide gave satisfactory results.

Keywords: Bleaching, 40% hydrogen peroxide, fixed orthodontic treatment.

INTRODUCTION

Currently, tooth bleaching is the most popular procedure in dentistry and is the most conservative option because it preserves the intact tooth substance. There are two types of dental bleaching procedures: non-vital bleaching and vital bleaching.[1,2,3] For vital teeth, there are several dental bleaching procedures: in-office, at home, and combination treatment.[4]

In-office bleaching is one of the most popular techniques because it can brighten the color of teeth in a short time. This technique generally uses a high concentration of hydrogen peroxide (35%-40%) whose mechanism of action is to oxidize tooth color pigments. During hydrogen peroxide ionization, free oxygen ions are released and cause oxidation of organic pigments resulting in whiter tooth color.[5,6]

The purpose of this case report is to see the effectiveness of using 40% hydrogen peroxide in the treatment of in-office bleaching of teeth in patients who have used fixed orthodontic devices.

CASE ILLUSTRATION

A 22-year-old female patient came to RSGMP Hasanuddin University with complaints of yellowish teeth and wanted to make her teeth color more white. The patient has a history of using fixed orthodontic appliances for approximately 7 years. Intraoral examination obtained upper and lower anterior teeth appear yellowish, normal gingiva, no caries and restorations. The teeth were in vital condition and from the patient's history there was no history of tooth sensitivity.

The patient was diagnosed with tooth discoloration. The treatment plan for the patient's teeth was an external bleaching procedure with an in-office bleaching technique using hydrogen peroxide with a concentration of 40%. Patients are given DHE and informed consent before dental bleaching treatment procedures.

In the next step, the bleaching agent was removed from the entire tooth surface and the color was determined after the bleaching procedure (No. 4 Shade Guide Opalescent Boost, Ultradent) (Figure 4). A desentizing agent containing potassium nitrate and sodium fluoride (UltraEz) was then applied.

On the second visit, the patient came for control 7 days after the bleaching procedure was performed. From the anamnesis, the patient did not feel any complaints. Intraoral and extraoral examinations were within normal limits. The tooth color was stable after 7 days of bleaching procedure (No. 4 Shade Guide Opalescent Boost, Ultradent) Figure 5.

Figure 1. Initial color determination.

Figure 2. Application of gingival barrier.

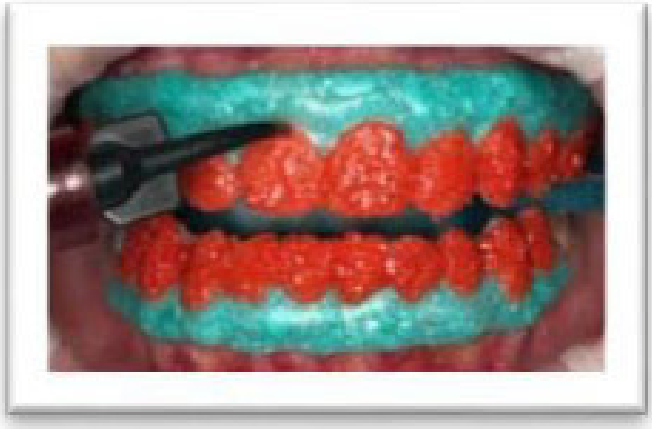

Figure 3. Application of tooth bleaching agent.

Figure 4. Color determination after bleaching procedure.

Figure 5. Clinical photo after 7 days of bleaching procedure.

DISCUSSION

The use of fixed orthodontics has grown rapidly in recent years. However, there are side effects of using these devices on tooth structure in the form of discoloration caused by irregular accumulation of chromogen and plaque around the bracket resulting in staining and white spot lesions. In addition, tooth discoloration around the bracket results in non-uniform tooth color after bracket debonding.[1,7] Sometimes, corrosion of the bracket metal also occurs due to prolonged orthodontic treatment and low oral pH in some patients, leading to enamel discoloration.[8,9]

In office bleaching generally uses hydrogen peroxide at a concentration of 35%-40%. According to the chemical theory explaining the hydrogen peroxide bleaching reaction, active hydrogen peroxide decomposes into water (H2O) and oxygen (O2) and perhydroxyl radicals (HO2). Peroxide is converted into unstable free radicals, which are formed as a result of the decomposition of hydrogen peroxide, and diffuse into the interprismatic region of the enamel and carry small molecules detached from large organic molecules to the surface due to their foaming properties. These free radicals react with organic molecules causing discoloration and producing simple molecules that reflect less light.[10]

In this case report, the results showed that the use of hydrogen peroxide as a tooth bleaching agent was very effective (shade guide no. 8 became no. 4). This is in accordance with the results of a study by Oliviera DS et al who found

that hydrogen peroxide is an effective whitening agent used both on teeth with or without orthodontic braces, due to the very low molecular weight of hydrogen peroxide peroxide (34 mg Mol) so that it has the highest penetration power in the tooth structure.[11] Based on the research of Consolaro et al, teeth whitening procedures should be performed after bracket removal to allow for balance in the oral environment after orthodontic treatment. In addition, it is not recommended to perform teeth whitening procedures during orthodontic treatment due to the limited penetration of whitening agents under the bracket surface.[12]

The most common side effect of using hydrogen peroxide in external bleaching is tooth sensitivity. The use of this material can change enamel morphology, increase micro-roughness and cause loss of hard tissue volume.[12] In addition, there is a decrease in enamel and dentin wear resistance and histomorphological changes.[13] To overcome these problems, in this case report, a desentizing agent containing potassium nitrate and sodium fluoride was applied. As a result, the patient did not complain of any tooth sensitivity after the tooth bleaching procedure.

CONCLUSION

Minimally invasive treatment with external bleaching of vital teeth using 40% hydrogen peroxide provides highly effective results in cases of discolored teeth after fixed orthodontic treatment.

CONFLICT OF INTEREST

Authors state no conflict of interest.

ETHICS CLEARANCE

The conducted research is not related to either human or animal use.

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AUTHOR CONTRIBUTIONS

All authors have accepted responsibility for the entire content of this manuscript and approved its submission.

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Endodontic broken file retrieval in curvature premolar tooth: A case report

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ABSTRACT

Introduction: The morphology of root canals is often more intricate than what can be observed on radiographs, presenting a difficulty for clinicians during endodontic treatment. The process of cleaning and shaping is a crucial aspect of clinical endodontics. The repeated application of traction and compression can induce cracks initiation in endodontic files, which commonly results in file breakage. The objective of this case report is to describe the clinical treatment steps for broken file removal in the curvature canal in the premolar maxillary.
Case Illustration: A 22-year-old female patient complained pain in maxillary premolar dan tooth was not unusual feeling while using for everyday activity, patient told that she has experienced uncomfortable to such an extent in the maxillary premolar and the tooth was treated before. The diagnosis of this case is pulpitis irreversible asymptomatic with normal periapical. The tooth was endodontically treated in 3 appointments.
Conclusion: Retrieval of broken files requires thorough analysis of root structure, methodology, magnification, and lighting conditions. A thorough plan and caution are crucial for optimal treatment outcomes.

Keywords: Broken instrument, curvature canal, file removals.

INTRODUCTION

The morphology of root canals is often more intricate than what can be observed on radiographs, presenting a difficulty for clinicians during endodontic treatment. The process of cleaning and shaping is a crucial aspect of clinical endodontics. Narrow and curved canal, quality of instrument, and fatigue factor of operator lead to the breakage of instruments and subsequently inadequate obturation of the root canal which can lead to failure of treatment and increase anxiety on patient, the repeated application of traction and compression can induce cracks initiation in endodontic files, which commonly results in file breakage.[1–3]

Managing dental anomalies poses a potential difficulty in endodontic procedures. However, the utilization of ultrasonic techniques in conjunction with the dental operating microscope has shown consistent success and safety in effectively extracting broken files from root canals.[4] The prevalences of the occurrence of fractured files is approximately 0.25% for manual instruments and ranges from 1.68% to 2.4% for rotary instruments.[5]

The most effective approach for addressing a broken file instrument is removal. Various methods and tools have been published to remove these broken file instruments. Nonetheless, the utilization of a dental microscope in conjunction with an ultrasonic device has consistently been identified as a method associated with a significant degree of success and safety in many reports.[4]

CASE ILLUSTRATION

A 22-year-old female patient complained pain in maxillary premolar dan tooth was not unusual feeling while using for everyday activity, patient told that she has experienced uncomfortable to such an extent in the maxillary premolar and the tooth was treated before. Radiographic evaluation of the involved tooth revealed a secondary caries and also curvature root canal anatomy. From the objective examination, there were secondary caries of 24, vitality (+), palpation (-), percussion (-) and normal gingiva. Thus, the diagnosis of this case was pulpitis irreversible asymptomatic with normal periapical.

For the first appointment was local infiltration to tooth 24 and isolation using a rubber dam. Removal of old restoration, the access was opened using endo access bur, canal negotiation was done using K File #8. Determination of working length of the canal using apex locator and K File #8 (buccal canal 18,5mm and palatal canal 15mm). Glide path was done by using rotary file Protaper glider (16.02). NaOCL 2,5% was used as the irrigant and ultrasonic irrigation was done. The file was broken when preparation took place, after the broken file was confirmed using radiograph the utilization of a dental microscope in conjunction with an ultrasonic device technique was used.

Dental operating microscope then used to view the broken file after that staging platform created using modified gates glidden. Ultrasonic used the broken file until it became loosen and continued until the broken file was successfully removed. The cleaning and shaping was done using protaper NEXT until file X2 (25.06). EDTA 17% was used as the final irrigant and ultrasonic irrigation was done. Intra canal medicament of Chlorophenol Kamfer Menthol was placed, as in the left upper first premolar and the patient was recalled after a week. The CHKM dressing was removed and the canal was dried. Obturation using single cone technique with thermoplasticized injection technique was performed and

SDR as liners. The endoresto treatment was finished using direct composite restoration.

DISCUSSION

Numerous professional organizations and experts propose that the severity of root canal curvature is among the factors that elevate the potential for errors during the preparation process. This heightened risk of errors can subsequently lead to complications in the subsequent stages of root canal treatment.[6]

The breakage of an endodontic instrument while performing root canal treatment impedes the continuation of cleaning and shaping within the root canal system. This incapability to proceed with further cleaning and shaping has the potential to undermine the treatment's overall effectiveness. Typically, the outlook for these teeth is less favorable compared to teeth undergoing standard endodontic procedures. Employing an ultrasonic instrument in conjunction with a microscope represents a conservative approach for addressing a broken file, especially when contrasted with alternative options. This technique facilitates a careful erosion of dentine structure and carries a lower risk of harming the root's integrity and the surrounding periodontal tissue.[5,7]

The successful extraction of broken files is influenced by various factors such as the instrument's position relative to the canal curvature, its depth within the canal, the specific type of broken file, and the size of the fragment. When the instrument is situated in the straight portion of the canal and a third of its total length is visible, retrieval becomes relatively straightforward. It is crucial to remove these fragments without causing additional harm to the dentin surrounding the root. Consequently, the recommended method for effectively addressing a broken file involves utilizing ultrasonic tips alongside a dental operating microscope, following the establishment of a staging platform. This technique ensures a favorable outcome in terms of fragment removal while minimizing potential damage to the dentin structure.[8]

The present case describes successful completion of endodontic treatment of a broken file removal in curvature maxillary second premolar. Success was mostly attributed to the use of magnification, which easily showed the location of broken instruments, ultrasonic irrigation and modified obturation techniques.

CONCLUSION

The process of retrieving a broken file can present difficulties, which can be attributed to several aspects such as the employed methodology, level of magnification, and the quality of lighting conditions. A comprehensive comprehension of dental root structure is important in order to optimize the extraction procedure and attain favorable treatment outcomes. The selection of an instrument retrieval method is a multifaceted process that requires a comprehensive analysis of various factors, including the specific circumstances, geometry of the root canal, existing dental restorations, availability of necessary tools, and the anticipated outcome of the case. It is imperative to conduct a thorough and individual assessment and develop a comprehensive plan for each instance. Moreover, caution should be exercised during the retrieval process to mitigate any potential harm to the canal.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

ETHICAL CLEARANCE

Written informed consent was obtained from the patient or legal guardian of the patient. The patient or the legal guardian has given their consent in the form of the images and other clinical information to be published in the journal. They understand that their names and initials will not be published.

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AUTHORS CONTRIBUTIONS

This work was carried out in collaboration between authors. Authors conceived and developed the project with review, writing and approval of the final manuscript for publication.

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Observation of unintentional extrusion of mineral trioxide aggregate in opex apex traumatic dental

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ABSTRACT

Introduction: In the Children population, dental traumatic injuries are highly prevalent typically occurring within the age range of 8 to 12 years. These injuries have the potential to induce pulpal necrosis, consequently halting the normal process of root formation and leading to an immature root apex. The presence of open apices and weakened dentinal walls poses significant challenges in managing such cases, requiring careful consideration from both restorative and endodontic perspectives. Moreover, this condition increases the susceptibility to root fractures, particularly in the cervical region.
Case illustration: A male of 25 years old came to the Teeth and Mouth Hospital of Sumatera Utara University with complaint of discolored tooth. Dental history revealed that he had trauma while playing football 15 years ago. Clinical examination revealed tooth discoloration. Radiographic evaluation of the teeth presented lesions with open apex. The diagnosis was necrosis pulp; asymptomatic apical periodontitis. After receiving informed consent from the patient, multiple visit to root canal treatment was done and obturation using MTA but extruded and direct veneer was selected for final restoration.
Conclusion: It is acknowledged that achieving favorable periapical healing outcomes with Mineral Trioxide Aggregate (MTA) is contingent upon three critical factors: the absence of a host response, the stimulation of bone deposition, and a robust sealing ability. Notably, these factors contribute to positive results even when MTA is inadvertently extruded.

Keywords: Traumatic dental injuries, open apex, mta, extruded.

INTRODUCTION

Dental traumatic injuries are particularly prevalent in the pediatric population, primarily occurring between the ages of 8 and 12 years. Dental health counselling is important and significantly increasing knowledge, thus increasing dental health including the risk of injury. These injuries pose the risk of pulpal necrosis, arresting root formation and resulting in an immature root apex. The management of such cases, both from a restorative and endodontic standpoint, becomes intricate due to open apices and weakened dentinal walls, often predisposing these teeth to root fractures, especially in the cervical region.[1,2]

The MTA apexification method has demonstrated efficacy in addressing the challenges associated with managing immature teeth with open apices. This approach involves promptly shaping and cleaning the root of the canal system, followed by substituting the apical seal with a substance that facilitates tissue healing and regeneration. Patients have experienced significant benefits from this method, which can be executed as a one- or two-visit procedure, eliminating the need for prolonged Ca(OH)2 dressings. Moreover, immediate restoration becomes feasible, reducing the risk of catastrophic vertical or oblique root fractures commonly observed in such cases.[3]

Nevertheless, achieving an optimal apical seal with immature apices remains a complex task due to the wide foramen on apical. This requires a considerable amount of filling material, which might unintentionally extrude into the periradicular tissue, potentially eliciting foreign-body reactions. The absence of an apical step or seat adds further complexity to this challenge. Various placement techniques, such as manual, ultrasonic, or ultrasonic-assisted hand delivery for MTA, have been suggested to reduce the risk of extrusion. Nevertheless, occurrences of apical material extrusion can still take place.[3]

CASE ILLUSTRATION

A male of 25 years old came to the Teeth and Mouth Hospital of Sumatera Utara University with complaint of discolored tooth. Dental history revealed that he had trauma while playing football 15 years ago. Clinical examination revealed tooth discoloration radiographic evaluation of the teeth presented lesion with open apex. From the objective examination, there was vitality (-), palpation (-), percussion (-), mobility (-) and normal gingiva. The diagnosis of this case was necrosis pulp; asymptomatic apical periodontitis.

For the first appointment was local infiltration to tooth 12 and isolation using a rubber dam. The access was opened using endo access bur. Canal negotiation was done using K File #10. Determination of working length of the canal using apex locator and K File #10 (18 mm) and irrigate root canals with NaOCl 1,5%. The cleaning and shaping was done by using a hand file until file 80. Sterile saline was used as the final irrigant and ultrasonic activation was performed. Intra canal medicament of calcium hydroxide was placed and the patient was recalled after 2 weeks. The calcium hydroxide dressing was removed and the canal was dried.

Obturation using MTA was performed but it was unintentionally extruded. The direct veneer was selected for final restoration.

DISCUSSION

Traumatic injuries to young permanent teeth are prevalent, often occurring before the completion of root formation in children. Such trauma can lead to the interruption of dentin formation and hinder root end development. Consequently, the affected teeth exhibit large root canals with thin walls and a wide apex.[4]

In instances of incompletely formed apices in non-vital teeth, the one- or two-step MTA technique as apical barrier stands as a viable substitute for apexification using calcium hydroxide. MTA presents a unique clinical advantage in the treatment of immature teeth, especially when there is exudation of tissue fluid into the canals. Notably, MTA can set in the presence of moisture, stimulating cell differentiation into hard tissue-forming cells and facilitating the production of a hard tissue matrix. Studies have reported that MTA has no adverse effects on microcirculation in connective tissues.[3]

The interaction with extruded MTA has been shown not to induce a foreign body reaction, emphasizing MTA's role in preventing irritation continuation of periapical tissues through its excellent ability to seal. Bone growth stimulation, absence of host response, and effective sealing are considered critical factors contributing the result of the healing of periapical with MTA, even in cases of unintentional material extrusion.

However, MTA has limitations, such as washout, where freshly made cement paste may break down upon contact fluids, especially with blood. To address this, research indicates that enhancing washout resistance can be achieved by incorporating substances such as gelatin or carboxymethyl chitosan into cement based on calcium silicates, which are the primary components of Portland cement in MTA.[5]

This case report highlights MTA extrusion in cases of open apices is an uncommon occurrence during the apexification. Importantly, the extruded and washed-out material does not adversely affect periapical healing, as evidenced by observations at 1, 3, and 6 months. Continued observations are necessary to further ascertain the success of the treatment.[6]

CONCLUSION

It is acknowledged that achieving favorable periapical healing outcomes with Mineral Trioxide Aggregate (MTA) is contingent upon three critical factors: the absence of a host response, the stimulation of bone deposition, and a robust sealing ability. Notably, these factors contribute to positive results even when MTA is inadvertently extruded.

CONFLICT OF INTEREST

None declared.

ETHICAL CLEARANCE

The patient or legal guardian of the patient provided written informed consent for the publication of images and other clinical information in the journal. They are aware that their names and initials will not be published.

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AUTHORS CONTRIBUTIONS

J.K conceptualized the study and contributed to the original draft preparation, while N.Y participated in writing, reviewing, and editing. All authors have read and agreed to the published version of the manuscript.

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Endodontic re-treatment of taurodontic mandibular right molar: a case report

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ABSTRACT

Introduction: Taurodontism is an uncommon dental anomaly distinguished by the enlargement of a molar's crown, resulting in elongated and shortened roots with a bifurcation near the apex. The anomaly is characterized by an elongated floor of the pulp chamber that is displaced apically. The endodontic management of taurodont teeth is considered complex and challenging, necessitating special handling due to the irregular tooth morphology. This irregularity can disrupt the location of root orifices, thereby complicating the processes of instrumentation and obturation. The objective of this case report is to describe the clinical treatment steps for taurodontic mandibular right molar endodontic retreatment.
Case Illustration: A 48-year-old male patient complained of pain from biting over in the lower right posterior tooth and the tooth was endodontically treated. Radiographic examination revealed an unusual, complex root canal anatomy, taurodontism could be identified and also underfilling obturation. The diagnosis of this case is previously treated teeth with symptomatic apical periodontitis. The tooth was endodontically retreated in 2 appointments.
Conclusion: A comprehensive understanding of the anatomy of the root canal system, coupled with extensive knowledge of the occurrence of atypical external and internal root canal morphologies, is imperative for the successful execution of endodontic treatment.

Keywords: Taurodontism, previously treated teeth, endodontic re-treatment.

INTRODUCTIONS

Taurodontism is a rare dental anomaly characterized by the enlargement of the molar crown. Thus, resulting in an elongation and short roots with a bifurcation, the pulp chamber also displaced apically. These teeth have a rectangular shape with reduced constriction in the cervical, resembling the of cud-chewing animals morphology of the molar teeth. The degree of taurodontism involvement is classified as mild (hypotaurodontism), moderate (mesotaurodontism), or severe (hypertaurodontism) based on the location of the bifurcation or trifurcation above the root apices. This anomaly is attributed to delay/failure in the Hertwig's epithelial root sheath invagination.[1,2]

Addressing dental anomalies, especially in the context of endodontics, presents unique challenges. Taurodont teeth, characterized by a variety of features such as wide variation in pulp chamber size and shape, varying degrees of obliteration, apically positioned canal orifices, and the potential presence of additional root canal systems, diverse canal configurations, pose a particular challenge in endodontic treatment. The irregularities in tooth anatomy associated with taurodontism require careful consideration and specialized approaches during endodontic procedures.[3]

CASE ILLUSTRATION

A 48-year-old male patient complained pain to biting over in the lower right posterior tooth and the tooth was endodontically treated. Radiographic examination of the affected tooth unveiled an atypical and intricate root canal anatomy, indicative of taurodontism, and also underfilling obturation. From the objective examination, there were profunda caries of 47, vitality (-), palpation (-), percussion (+) and normal gingiva. Thus, the diagnosis of this case was previously treated teeth with symptomatic apical periodontitis.

For the first appointment was local infiltration to tooth 47 and isolation using a rubber dam. Removal of old restoration, the access was opened using endo access bur, Gutta-percha was removed using rotary files and irrigate root canals with NaOCl 3%. Canal negotiation was done using K File #10. Determination of working length of the canal using apex locator and K File #10 (mesio buccal canal 21mm, mesio lingual canal 21mm and disto canal 20 mm). The cleaning and shaping was done by using rotary file Protaper Next until File X3 (30.07Sterile saline served as the ultimate irrigant, and ultrasonic irrigation was employed. An intracanal medicament of calcium hydroxide was applied, similar to the procedure performed in the right lower second molar. The patient was scheduled for a follow-up after a week, during which the calcium hydroxide dressing was extracted, and the canal was thoroughly dried. Obturation using single cone technique with thermoplasticized injection technique was performed and SDR as liners. The endoresto treatment was finished using direct composite restoration.

DISCUSSION

Taurodontism is often linked with other anomalies and syndromes. However, in this particular case, the patient was found to be healthy and free from any known diseases. The endodontic treatment of

taurodontism teeth is recognized as a complex and challenging procedure.[1,2]

Treatment failure and the need for retreatment can be influenced by various factors. While the overfilling of the canal space is deemed less problematic, incomplete or subpar obturation presents a more significant challenge. The issue of insufficient obturation is often associated with difficulties in instrumentation of the root canal system, as observed in the current case. The lack of proper canal shaping exacerbates the clinical complexities related to obturation procedures and subsequent cleaning. Studies have reported instances of treatment failure in individuals with taurodontism, even when utilizing advanced tools such as thorough initial radiographic assessment, a rotary system, cone-beam computed tomography (CBCT), and a well-prepared team. The endodontic treatment of a tooth with taurodontism undoubtedly poses a significant challenge.[4]

When performing endodontic treatment on a taurodont tooth, the operator should be aware of the complex anatomy of the root canal system. Judicious practice of endodontic principles such as identifying the canal orifices under magnification, thorough canal instrumentation and irrigation, and careful obturation of the entire root canal system is paramount for endodontic treatment success.[2] Invasive procedures like endodontic treatment can induce periodontal abscesses, necessitating irrigations or, in some cases, hemisection of the affected teeth.[5]

The current case report highlights the successful completion of endodontic treatment for a taurodont mandibular second molar. The achievement of success, in this case, is largely credited to the utilization of magnification, which facilitated the clear identification of the three canal orifices, as well as the application of ultrasonic irrigation and modified obturation techniques.

CONCLUSION

While Taurodontism poses a dental rarity and presents a challenge to dentists, a comprehensive understanding the anatomy, radiographically, and its potential association with other syndromes of the dental is essential. Successful endodontic outcomes in cases of Taurodontism rely on the combined utilization of modern diagnostic aids and treatment facilities, coupled with the skills and expertise of clinicians.

CONFLICT OF INTEREST

None declared.

ETHICAL CLEARANCE

The patient or their legal guardian has given written informed consent for the publication of images and other clinical information in the journal. It is understood that their names and initials will not be disclosed.

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AUTHORS CONTRIBUTIONS

This work was carried out in collaboration between authors. Authors conceived and developed the project with review, writing and approval of the final manuscript for publication.

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Endodontic treatment on mandibular molar with radix entomolaris: a case report

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ABSTRACT

Introduction: Understanding morphology, anatomy and variation of root canal is very important to achieve successful endodontic treatments. Mandibular molar may have additional root that located lingually (radix entomolaris) or buccally (radix paramolaris) which can often cause difficulties. The proper diagnosis of radix entomolaris before starting root canal treatment is critical to enhance success rate of endodontic treatment.
Case Illustration: A 31- years old male came to RSGM Universitas Sumatera Utara with chief complaint of pain and swelling in lower right posterior tooth. At clinical examination, tooth 46 had a deep carious lesion, swelling on gingival and was severely tender on percussion examination. Radiographic examination was found additional roots between mesial and distal root with diffuse radiolucency on periapical area. The diagnose of this case is pulp necrosis with acute abscess apical. The tooth was endodontically treated in 3 appointments with triple antibiotic paste and calcium hydroxide intracanal medicament. Obturation was done with single cone gutta percha and bioceramic sealer. Final restoration was completed with direct resin.
Conclusion: Comprehensive knowledge of both external and internal root canal morphologies is essential for successful endodontic treatment.

Keywords: Radix entomolaris, acute apical abscess, endodontic treatment.

INTRODUCTION

The successful prevention or resolution of endodontic pathologies hinges on thorough chemical and mechanical cleaning and shaping, coupled with the meticulous filling of the canals to achieve a tight, hermetic seal.[1] A comprehensive comprehension of atypical root canal structures can significantly augment the success of root canal therapy.[1,2] Carabelli, in 1844, documented the discovery of unique root canal configurations, specifically noting supernumerary roots in mandibular first molars.[1,2] Among these variations, the disto-lingual extra root is termed radix entomolaris (RE), while exceptionally rare instances may also exhibit an extra root on the mesio-buccal side, known as Radix Paramolaris.[2]

The prevalence rates of these root deviations vary based on ethnic background. Studies involving East Asian populations have revealed a significant occurrence of RE, whereas in other population groups, the prevalence of this conditions is comparatively lower.[3] A comprehensive systematic review and meta-analysis disclosed that Korea exhibits the highest radix entomolaris incidence (27.15%) among various Asian countries.[4] Accurate radiographic identification is crucial for effective endodontic treatment. Radiograph taken from various angles provide insights into potential additional canal or roots.[5] Successful treatment outcomes on tooth with RE demands a thorough understanding about its complexity, anatomical variation, radiographic and clinical diagnosis as well as prevalence.[2,3]

CASE ILLUSTRATION

A 31-years old male came to RSGM Universitas Sumatera Utara with pain and swelling in lower right posterior tooth. The pain was localized and aggravated while eating. At clinical examination, the 46th teeth had a deep carious lesion, swelling on gingival and was severely tender on percussion. Vitality test showed negative response. Radiographic examination revealed additional roots between mesial and distal root with diffuse radiolucency on periapical area. The diagnosis of this case was pulp necrosis with an acute apical abscess and the presence of radix entomolaris.

In the initial visit, the tooth was anesthetized using 4% articaine with epinephrine (1:100,000) and subsequently isolated with a rubber dam. After access opening with proper magnification and illumination, pus was allowed to drain and followed by copious irrigation with saline. Access was refined using endodontic ultrasonic tip. Working length was determined with K-file #10, apex locator and confirmation was done with periapical radiograph. Canals were shaped using Protaper Gold endodontic file until F2. The irrigation process involved the use of 5.25% sodium hypochlorite with ultrasonic device activation (Ultra-X, Eighteeth). 17% EDTA solutions was used as final irrigation for 1 minutes. After canal was dried, triple antibiotic paste was placed as intracanal medicament for 10 days. After the resolution of swelling, the canal was irrigated using the same method as the first visit, and calcium hydroxide was employed as an intracanal medicament for a period of 14 days. After sign and symptom free, obturation was done with gutta-percha cones and BC sealer using single cone technique. Direct composite restoration was used as final restoration.

DISCUSSION

The exact etiology behind the development of RE remains uncertain.[1] The prevalence rate of RE within 1st molar of mandibular has been documented at 0.68% in Caucasian populations, 3% in African populations, and remarkably high percentages, reaching up to 40% in Mongoloid populations.[5] Ribiero and Consolaro established a classification system categorizing RE based on its buccolingual orientation. The classification system proposed by Ribiero and Consolaro categorizes RE into three types: Type I: Characterized by a straight root canal; Type II: Features an curved entrance followed by a continuation as a straight root canal; Type III: Features an initial curve in the third portions of coronal of the root canal and a secondary buccally-orientated curve emerges, extending from the middle to the apical third.[1,3]

Thorough analysis of initial radiographs can offer indications of a concealed RE.[6,7] Radiographs at a 25-degree mesial horizontal angulation is crucial in identifying and assessing RE.[6] Magnification, illumination, and ultrasonic technology can amplify the visual clarity of the treatment area, improve the ability to locate canals, and adopt a conservative approach that preserves the healthy tooth structure, as stated by Taschieri et al. in 2010 and Agrawal et al. in 2019.[8-10] In a study by De Moor et al, radix entomolaris morphology was examined, leading to the conclusion that a majority of these canals exhibited curvature. It is imperative to emphasize the creation of a direct access path and the establishment of a glide path following the initial exploration of the root canal with small files (size #10 or smaller), alongside radiographic assessment of working length and curvature determination, to prevent procedural errors. Protaper gold, consisting of a higher proportion of the martensitic phase within the NiTi alloy, contributes to greater flexibility and heightened resistance to cyclic fatigue. This case can be well-managed with the initial diagnosis of radix entomolaris through radiographic examination and facilitated by employing magnification, illumination, a well-designed access cavity, appropriate instruments, and meticulous techniques.

CONCLUSION

A proper understanding of root canal system anatomy and extensive awareness regarding the presence of atypical external and internal root canal shapes are vital components for achieving effective outcomes in endodontic treatment. Precise diagnosis and a thorough understanding of the diversity in root canal structure, prevalence rates, and the specific configuration of radix entomolaris are fundamental prerequisites for achieving success in endodontics. The initial radiographic assessment, appropriate shaping of the access cavity, utilization of magnification, and selection of instruments designed for negotiating curved root canals on radix entomolaris can contribute significantly to the successful endodontic treatment.

CONFLICT OF INTEREST

None declared.

ETHICAL CLEARANCE

Written informed consent was obtained from the patient or legal guardian of the patient. The patient or the legal guardian has given their consent in the form of the images and other clinical information to be published in the journal, and the patient understand that their names and initials will not be published.

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AUTHORS CONTRIBUTIONS

This work was carried out in collaboration between authors. Authors conceived and developed the project with review, writing and approval of the final manuscript for publication.

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Multidisciplinary treatment approach for perforated internal root resorption in a maxillary central incisor: A case report

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ABSTRACT

Introduction: Internal root resorption (IRR) is characterized by the gradual deterioration of dentinal tubules dentin within the apical thirds of canal walls and the middle of canal wall due to odontoclastic activity. Employing Cone Beam Computerized Tomography (CBCT) for three-dimensional assessment of the resorptive zone is essential for gaining pivotal insights into early disease detection and devising appropriate treatment strategies. A multidisciplinary approach becomes imperative so that the long-term solution is achieved. Effective diagnosis and intervention of internal root resorption facilitate favorable healing of such lesions, ensuring prolonged functional preservation of the tooth.

Case Illustration: A male of 27 years old patient was referred to RSGMP FKG USU with discolouration of upper anterior teeth with a history of trauma about 7-years ago. It was found that the central incisor of left maxillary was diagnosed with pulp necrosis; asymptomatic apical periodontitis with inflammatory perforating internal resorption. The tooth is treated both conservatively via endodontic treatment and surgically which promotes distinct lesion progression 3 months post-op. In this present case, finishing irrigation with Chitosan Oligosaccharide 2% and intra canal medicament of nano chitosan 0,2% were performed. GTR surgery were performed one month after endodontic treatment to access the root perforation area. The infra bony defects were corrected using mineral trioxide aggregate / MTA, membrane, and bone graft. Obturation was performed two weeks later. The 35% hydrogen peroxide agent was used for internal bleaching and fiber post insertion was performed in this case.

Conclusion: Internal resorptions are rare and difficult to be treated in clinical cases with an uncertain prognosis. They require very specialized and technically-supported endodontic treatment. An multidisciplinary strategy is imperative to achieve a favorable long-term prognosis in intricate cases, such as the one presented.

Keywords: Endodontic, Cone-Beam Computed Tomography Mineral trioxide aggregate, Internal resorption, Perforating resorption.

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INTRODUCTION

Internal root resorption (IRR) is characterized by the progressive degradation of dentinal tubules and intraradicular dentin within the apical thirds and middle portions of canal walls, attributed to odontoclastic activity. This activity is predominantly associated with trauma and chronic pulp inflammation. Trauma, in particular, emerges as the most extensively supported etiological factor in the exploration of causative factors for predentin loss.[1] The sequence of events leading to IRR commences with rapid trauma to the tooth, initiating intrapulpal bleeding and subsequent hematoma formation. The hematoma is then replaced by the development of proliferating granulation tissue. The pressure exerted by this tissue on the dentin wall disrupts the ongoing formation of predentin. This series of events highlights the impact of sudden tooth trauma on the pulpal environment, where hemorrhagic and tissue responses contribute to the disturbance of normal dentin matrix formation. Consequently, the initiation of the resorption process involves the differentiation of odontoclasts from previously nondifferentiated storage cells within the connective tissue. Notably, internal root resorption (IRR) typically manifests without clinical symptoms, necessitating a reliance on radiographic examination for its incidental detection. In instances of complete coronary resorption, a distinctive phenomenon known as “pink spot disease” may manifest, observable as a pink spot on the coronary surface, signifying the presence of granulation tissue within the resorptive area.In the absence of symptoms, an asymptomatic process may lead to pathological consequences if the lesion fails to impact the surrounding periodontal tissues. The intricacy of IRR becomes more pronounced when complicated by perforation, distinguishing it from standard IRR by the substantial lesion size that results in the perforation of the root cement towards the periodontal ligaments. This often elicits patient complaints, triggering pathological changes within the periodontium.Visual inspection proves valuable in identifying IRR through tooth crown discoloration. Additionally, diagnostic insights can be gleaned through conventional radiographic examination, Cone Beam Computerized Tomography (CBCT), and light- and electron microscopy. In this context, the application of high-resolution CBCT is particularly recommended to precisely confirm the nature, position, and extent of IRR, as well as to ascertain the presence of perforation, providing a comprehensive

diagnostic approach to guide subsequent treatment decisions.[2-4]

Endodontic intervention is regarded as the preferred treatment for internal root resorption (IRR). Root canal treatment serves to eliminate granulation tissue and arrest the blood supply to clastic cells. The clinical management of IRR poses a challenge for practitioners due to the complexities associated with canal instrumentation and filling. In instances where access to the defect through the canal is unattainable, a surgical approach as a second intention should be contemplated. This approach facilitates direct access to the lesion, enabling mechanical cleaning of the resorption area.[2] In cases involving root canal perforation, Mineral Trioxide Aggregate (MTA) is the material of choice for sealing the perforation due to its biocompatibility, bioactivity, and well-tolerance by periradicular tissues. Alternatively, in perforation cases, the removal of resorptive inflammatory tissue through surgery and the subsequent filling of the root defect presents another viable treatment approach. A multidisciplinary approach is essential to attain a comprehensive and long-term solution. The accurate diagnosis and intervention of internal root resorption contribute to the successful of the lesions's healing, maintaining the tooth's functionality for an extended duration.[2,3]

CASE ILLUSTRATION

A male of 27 years old male patient was referred to RSGMP FKG USU with a discolouration of upper anterior teeth with a history of trauma 7-years ago. Intraoral examination revealed brownish discolouration, vitality test showed no response. Periodontal probing showed 6 mm periodontal pocket, percussion and mobility were within normal limits. Periapical radiograph showed radiolucency in the mesial and distal portion of the root canal. CBCT showed internal root resorption, root perforation in multiple areas, and infra bony defects. Left maxillary central incisor was diagnosed with pulp necrosis; asymptomatic apical periodontitis with inflammatory perforating internal resorption.

Proper isolation is achieved via a non-latex rubber dam sheet. After making straight-line endodontic access to the root canal, necrotic pulp remnants were found. A calcium hydroxide dressing combine with nonsurgical pulp therapy is recommended by Andreasen. Using it as intracanal medicament eliminates surviving bacteria placed between appointments. Calcium hydroxide is applied for 1 session of 2 weeks. In this present case, finishing irrigation with Chitosan Oligosaccharide 2% and intra canal medicament of nano chitosan 0,2% were performed. However, the total elimination of bacteria is difficult or almost impossible to accomplish. At the second appointment, a flap was made to visualize the granulation tissue and the bone destruction. Following the removal of granulation tissue, a precise planing of the irregular edges in the perforation area was conducted using a bur attached to a straight surgical handpiece. Mineral Trioxide Aggregate (MTA) material, prepared in accordance with the manufacturer's guidelines, was delicately placed using a plastic instrument. The MTA was then firmly condensed with a plugger, and its placement was secured using wet cotton pellets. Subsequently, the patient's own bone fragments were utilized to fill the cavity of the bony defect. The flap was sutured, and the patient was scheduled for a recall one week later for suture removal and the root canal obturation process. Obturation of the apical third with master gutta-percha cone calibrated to the apical diameter of the root canal. X-ray was taken to confirm the sufficient adaptation of the obturation in the apical third. Subsequent to these steps, a glass ionomer cement (GIC) barrier was meticulously applied, employing a ski slope configuration from the proximal direction and a bobsled tunnel from the labial direction until radiographic confirmation was obtained. The application of an internal bleaching agent, specifically 35% hydrogen peroxide, ensued. In the subsequent appointment, the assessment of tooth color revealed adherence to the patient's preferences and seamless integration with adjacent teeth. Following this, a rubber dam was placed, and the removal of the GIC filling was carried out with precision. Cavities were irrigated to remove the remaining bleaching material then dried and temporarized for 1 week. At the last visit, fiber post insertion and final restoration were performed. A three-month follow-up radiograph showed healing of the lesion. The tooth is totally asymptomatic and non-mobile.

DISCUSSION

The prognosis of endodontic treatment may be compromised in cases of perforating internal resorption, primarily attributed to the resultant weakening of the remaining dental structure and the associated inflammatory periodontal involvement. The proper diagnosis should form a proper treatment plan according to the extension of the resorption and the surrounding anatomical structures.[2] The effectiveness of CBCT for planning and treating IRR has been shown previously. Utilizing high-resolution Cone Beam Computerized Tomography (CBCT) is discretionary but recommended for confirming the precise characteristics, positioning, and extent of internal root resorption (IRR) and verifying the presence of a perforation.[2,4] A combined endodontic and surgical therapy should be the first method of choice as the most biological and success-proven treatment method. Critical to the endodontic process is the utilization of sodium hypochlorite for chemically dissolving pulp tissue. The utilization of ultrasonics plays a pivotal role in activating sodium hypochlorite, thereby improving its penetration across the entirety of the root canal. In consequence, this meticulous approach guarantees an exhaustive chemomechanical debridement of the root canal system, thereby promoting optimal cleanliness and removal of any potentially harmful debris. The comprehensive removal of pulpal and dentinal remnants is critical for the success of endodontic procedures, as it minimizes the risk of residual infection or further complications. Furthermore, the strategic incorporation of calcium hydroxide as a temporary dressing material serves to not only bolster the disinfection process but also contributes to creating an environment conducive to healing. Calcium hydroxide, being widely acknowledged for its antimicrobial properties, plays a crucial role in the prevention of bacterial proliferation

within the root canal. Its alkaline nature further aids in neutralizing residual acidic by-products, promoting an environment conducive to periapical healing. This dual-action approach, involving both thorough chemomechanical debridement and the application of calcium hydroxide, underscores the clinician's commitment to ensuring the long-term success and health of the treated tooth. Moreover, the consideration of the appropriate application time, concentration, and volume of the irrigation solution during the chemomechanical debridement phase is imperative. These factors significantly influence the efficiency of chelating agents, such as sodium hypochlorite, in dissolving organic tissue remnants and ensuring a pristine root canal environment. This attention to detail reflects a comprehensive understanding of advanced diagnostic and treatment modalities, showcasing the clinician's dedication to achieving optimal outcomes in addressing complex endodontic cases. Zubaidah et al., found that The application of bovine tooth grafts containing hydroxyapatite for dental socket preservation has been demonstrated to enhance the quantity of osteocyte cells in the alveolar bone of Wistar rats post-extraction. Notably, the use of bovine tooth grafts as dental socket preservation materials resulted in a peak increase in the number of osteocytes observed at 28 days.[5] Finishing irrigation with Chitosan Oligosaccharide 2% and intra canal medicament of nano chitosan 0.2% was placed in this case. Utilization of chitosan oligosaccharide 2% could act as chelating agent without causing collagen denaturation which subsequently ease the preparation towards the apical region. Chitosan oligosaccharides offer distinct advantages as irrigation materials, demonstrating enhanced capability to penetrate dentinal tubules in the apical third. This facilitates the dissolution of both smear layer and smear plug through the chelating effect exerted by chitosan oligosaccharides. It is noteworthy that the efficiency of chelating agents is subject to various factors, including application time, concentration, and volume of the irrigation solution.[6] For a permanent root canal filling, the selected material should effectively seal both the root canal system and the resorptive defect. In instances of root canal perforation, Mineral Trioxide Aggregate (MTA) is regarded as the preferred material for sealing due to its biocompatibility, bioactivity, and well-tolerance by periradicular tissues. Notably, the pH of MTA rises from 10 to 12.5 within 3 hours after mixing. It is postulated that in this elevated pH environment, the released calcium ions from MTA react with phosphates in the tissue fluid, forming hydroxyapatite. MTA has shown potential as a repair of root/furcal perforations sealing material. MTA application in cases of resorption nowadays can be clinically used because of its rapid resolution of symptoms and signs and repair of perforating internal resorption with a good long-term success rate. Because of the extensive internal lesion that perforates the mesial and distal wall of the root with multiple perforations and severe bone loss, surgical intervention was also performed to ensure a perfect external seal of the perforated area.[2,3] The defect is filled with synthetic resorbable bone with pronounced osteoinductive potential and high macro porosity, inducing growth of osteogenic cells and regeneration of vital bone tissue. On top of the defects, a resorbable collagen membrane is placed. The aim is to ensure effective barrier function for epithelium cells and a satisfactory matrix for the new proliferation of new blood vessels.[1,4]

CONCLUSION

Internal resorptions are rare and difficult to be treated in cases with uncertain prognoses. They require very specialized and technically-supported endodontic treatment. Furthermore, both radiographic examination and CBCT are essential for diagnosing root resorption. In complex scenarios such as this, adopting a multidisciplinary approach is crucial for securing a positive long-term prognosis. Furthermore, the clinician must demonstrate a profound understanding of advanced diagnostic and treatment modalities to proficiently manage root canals that have been perforated due to internal root resorption (IRR).

CONFLICT OF INTEREST

The author reports no conflicts of interest in this work.

ETHICAL CLEARANCE

Written informed consent was obtained from either the patient or the legal guardian. The patient or legal guardian has provided consent for the publication of images and other clinical information in the journal. They are aware that their names and initials will not be disclosed.

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AUTHORS CONTRIBUTIONS

S.T. conceptualized the study and prepared the original draft; W.P. and C.N. contributed to writing, reviewing, and editing. All authors have read and approved the final version of the manuscript for publication.

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Single-visit endodontic treatment of left mandibular second molar with constricted canals followed by indirect resin composite overlay: A case report

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ABSTRACT

Introduction: The endodontic treatment of posterior mandibular teeth poses challenges due to their diverse morphological variations. Endodontic therapy on single-visit is characterized by conservative and nonsurgical root canal treatment involving complete chemomechanical preparation and obturation, all accomplished within a single appointment. When carried out under appropriate case selection, accurate diagnosis, and proficient treatment technique, single-visit endodontic treatment can be successfully implemented for posterior mandibular teeth. This case report endeavors to elucidate the details of a single-visit endodontic treatment performed on the left mandibular second molar, which presented with constricted canals, followed by the application of an indirect resin composite overlay restoration.

Case Illustration: A female of 41 years old came with complaint of failing restoration on the lower left molars. Positive result was obtained on the cold test and negative result on percussion. Radiographic examination showed radiopaque restorative material that extends to the mesial pulp horn with radiolucency at the lower portion of the restoration. The diagnosis of tooth 37 was asymptomatic irreversible pulpitis. The tooth was isolated with a rubber dam and negotiation of the root canal. Negotiations were difficult to reach the apical portion of the mesial canals due to constricted canals. Irrigation NaOCl with a watch winding movement, #6 k-file can progressively reach the apical portion. Rotary files were utilized for root canals preparation and subsequently obturated using bioceramic sealer with a single cone technique. The final restoration was carried out using an indirect resin composite overlay restoration.

Conclusion: Single-visit endodontic treatment with constricted canals followed by indirect resin composite overlay was successfully carried out and able to restore the function of the teeth including mastication, esthetics, and protection of the supporting tissues of the teeth.

Keywords: Single visit endodontic treatment, constricted canals, indirect composite resin overlay.

INTRODUCTION

Root canal treatment, or endodontic treatment, is a routine procedure in dentistry.[1] The challenge intensifies when addressing the mandibular teeth due to the intricacies in their morphology. Molar teeth, in particular, exhibit a broad spectrum of anatomical variations concerning the number of roots and canals. The root canals may display various curvatures in different planes, and their diameter can be influenced by factors such as secondary dentine formation, the physiological aging process, and calcifications. The presence of constricted canals and curvatures introduces variables that elevate the risk of procedural errors during the root canal preparation process.[2]

Single-visit root canal treatment encompasses the integration of instrumentation, disinfection, and obturation of the root canal system within a single session. This approach presents distinct advantages compared to conventional multiple-visit treatments, including a reduction in the number of visits, elimination of the need for repeated applications of anesthetics or rubber dams, and the avoidance of intermediate restorations.[2,3] Restoration of root-filled teeth poses challenges due to structural disparities between vital and non-vital root-filled teeth. The utilization of an indirect resin composite overlay with cuspal coverage emerges as an effective solution. This method preserves the coronal structure, mitigates the risk of contaminating the root canal system, reinforces residual dental tissues, ensures optimal form, function, and aesthetics, and provides ergonomic and economic clinical benefits.[4] A study by Nagasiri and Chitmongkolsuk indicates that a greater remaining tooth structure correlates with increased longevity for the teeth, further emphasizing the clinical advantages associated with preserving and restoring tooth structure during the root canal treatment process.[5]

This case report aims to describe endodontic treatment on a single-visit of left mandibular second molar with constricted canals followed by indirect resin composite overlay restoration.

CASE ILLUSTRATION

A 41-year-old female came to RSGM USU with a chief complaint of broken

restoration on the lower left molars. On intraoral examination of tooth 37, there was failed MOD composite restoration. Positive result was obtained on the cold test and negative result on percussion. Radiographic examination showed radiopaque restorative material that extends to the mesial pulp horn with radiolucency at the lower portion of the restoration, widened periodontal space, and loss of lamina dura at the apical. The diagnosis of tooth 37 was asymptomatic irreversible pulpitis.

The tooth was anesthetized and isolated with a rubber dam. The composite restoration was removed using a round bur then opening the coronal access using an Endo-Access bur until it reaches the pulp chamber. Negotiations were difficult to reach the apical portion of the mesial canals, assisted by irrigation with NaOCl and a watch winding movement, #6 k-file can progressively reach the apical portion. Apex locator was used as reference and confirmed by radiography. The root canal preparation was carried out using the crown down technique using ProTaper Gold file until F2 (25/.08v).

The root canals were irrigated with 5.25% NaOCl and activated using endoactivator and then rinsed with saline solution. Final irrigation using 17% EDTA with saline solution. Root canals were dried using paper points and the gutta-percha master cone was confirmed by radiographic examination. The root canals were obturated using ProTaper gutta-percha points and bioceramic sealer using the single cone technique. A radiological examination was carried out and obtained hermetic obturation results in all four root canals.

On the second visit, indirect composite resin overlay preparation was performed followed impression was carried out using polyvinyl siloxane (PVS) material with a one-step technique. The next visit was cemented indirect composite overlay using self-adhesive resin cement. After six months, the patient underwent a follow-up appointment. During the clinical examination, the tooth exhibited no symptoms, and the radiographic assessment indicated normal periapical tissue. This favorable outcome suggests the successful resolution of the treated condition, reaffirming the efficacy of the root canal treatment.

DISCUSSION

The distinctive characteristic of composites is their relatively poor marginal strength. Consequently, it is recommended that the margins of the restoration be positioned away from the occlusal contact points. This precautionary measure is essential to mitigate the risk of microleakage, which could potentially lead to the formation of secondary caries if the restoration margins are left open.[6] Dental caries, if left untreated, can progress, allowing the infection to advance through the dentin, resulting in severe pulpal inflammation, commonly referred to as irreversible pulpitis, and eventual pulp death. In the present case, this progression has led to asymptomatic irreversible pulpitis. It underscores the importance of preventive measures and timely intervention to address carious lesions and preserve dental pulp health.

The principle underlying single-visit root canal treatment is grounded in the entombing theory. This theory posits that a significant number of microorganisms are eradicated during the cleaning and shaping phases of the procedure. The subsequent root canal obturation serves to entomb the remaining bacteria, depriving them of crucial elements essential for survival, such as nutrition and space. This strategy aims to create an environment within the root canal system that hinders the viability and sustenance of any residual bacteria, contributing to the overall success of the treatment.[7,8] Under controlled circumstances, which include proper case selection, accurate diagnosis, and skilled treatment technique, single-visit treatment can be effectively performed on mandibular teeth. Upon the removal of all composite restorations and identification of orifices in the pulp chamber, the negotiation of constricted root canals was conducted using small stainless steel (SS) k-files (size 06) in a watch-winding movement. This approach aimed to appreciate the canal's morphology, establish initial patency, and assess its resistance to file penetration. The remaining teeth with mesio-occlusal-distal cavities faced an elevated risk of fracture, making direct restoration unsuitable for endodontically treated posterior teeth that have lost both marginal ridges. Overlay preparation, involving the removal of approximately 50% less tooth structure compared to complete crown preparation and incorporating cusp coverage, was deemed essential to enhance fracture resistance. Cuspal coverage provided protection against biomechanical stress, effectively preventing vertical fractures. In the restoration process, indirect resin composite restoration was preferred as it allows for visual examination of proximal contacts, marginal adaptation, anatomic form, and results in less polymerization shrinkage when compared with the direct composite technique. Invasive procedures like endodontic treatment can induce periodontal abscesses.[9] This comprehensive approach underscores the importance of considering both endodontic and restorative aspects for successful long-term outcomes.[10,11]

CONCLUSION

Single-visit endodontic treatment with constricted canals followed by indirect resin composite overlay was successfully carried out and able to restore the function of the teeth including mastication, esthetics, and protection of the supporting tissues of the teeth.

CONFLICT OF INTEREST

None declared.

ETHICAL CLEARANCE

Prior to proceeding with any medical or dental procedures, written informed consent was diligently obtained from the patient or their legal guardian. In this consent, the patient or legal guardian explicitly granted permission for the publication of images and other pertinent clinical information in the journal. It was clearly communicated and understood that their names and initials would not be disclosed, ensuring the maintenance of confidentiality and privacy in the dissemination of medical information.

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AUTHORS CONTRIBUTION

This work was carried out in collaboration between authors. Authors conceived and developed the project with review, writing and approval of the final manuscript for publication.

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Root canal treatment on right mandibular molar with calcified canal: A case report

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ABSTRACT

Introduction: Pulp canal calcification is marked by the accumulation of calcified tissue along the walls of the canal. This phenomenon can lead to the partial or complete obliteration of the root canal space. Root canal calcification is linked to various factors such as dental trauma, caries, restorations, vital pulp therapy, and age-related physiological changes in elderly patients. The identification of calcified canals poses a considerable challenge, often resulting in procedural errors such as perforation, alterations in canal geometry, and the loss of dental hard tissue. The objective of this case report is to describe the clinical treatment steps for pulp canal calcification in molar tooth endodontic treatment.
Case Illustration: Patient S, female, 31 years old, came to RSGM FKG USU with chief complaints of pain in the lower right molars when used to chew. Treatment had been carried out with the previous dentist but the tooth was not successfully treated and it was suggested to be extracted only when the tooth was no longer painful. The tooth was only temporarily filled. Intra oral examination of tooth 46: D6, site 1, size 3, vitality test: thermal test negative, EPT negative, Percussion negative, Palpation negative, Mobility (-) tooth condition is vital. Radiograph of the tooth 46 showed temporary fillings, calcified canal and radiolucency on bifurcation. The patient had no history of systemic disease.
Conclusion: Management of Pulp canal calcification cases can be done with exploration starting with small file numbers. In this case report the canal was negotiated and the treatment was completed successfully.

Keywords: Access cavity, canal calcified, endodontic, root canal treatment.

INTRODUCTION

Pulp canal calcification (PCC), also known as pulp canal obliteration or calcific metamorphosis, manifests as the accumulation of calcified tissue along the canal walls, potentially leading to the partial or complete obliteration of the root canal space. Luxation injuries resulting from dental trauma commonly associate with PCC cases. Additional contributors to PCC include pulpal responses to injuries like invasive pulp therapy procedures, prolonged carious lesions, abfractions, and restorations. Furthermore, the imposition of orthodontic forces may induce PCC by disrupting the blood supply. Additionally, in elderly patients, the deposition of secondary dentin can significantly diminish the root canal space.[1]

Pulpal calcifications refer to calcified masses found within dental pulps, occurring in teeth whether they are healthy, diseased, or unerupted. The prevalence of these calcifications varies widely, spanning from 8% to 95% across different populations. Despite their frequent appearance, they usually do not lead to pulp-related issues or noticeable symptoms. There's an ongoing debate about whether they signify pathology or are simply natural variations. While the precise reasons behind pulpal calcification formation remain unclear, potential contributing factors include age, gender, systemic ailments, and long-term irritation such as deep caries or dental restorations. In a study involving the examination of 15,326 teeth, around 4.8% (747 teeth) displayed pulp chamber opacities indicating calcifications. Notably, first molars were the most commonly affected teeth, regardless of their location in either the upper or lower arches. Gender did not seem to influence the occurrence significantly. To sum up, pulpal calcifications are common but their significance is still under scrutiny. First molars appear especially prone to developing these calcifications, irrespective of tooth location or patient gender.[2]

Calcification of dental canals presents a complex challenge for dental practitioners, affecting not only healthy teeth but also those with various dental conditions, including disease, and even unerupted teeth. Negotiating calcified canals requires a combination of patience, effective magnification, illumination, and the use of appropriate armamentarium.[3] Calcification is a process characterized by the reduction in size of intra-dental cavities due to the formation of hard tissue by the cells of the vital pulp. This process may culminate in complete calcification, marked by dentin deposition within the tooth. The prevalence of calcifications varies widely. While the precise etiological factors for the development of pulpal calcifications remain not well understood, trauma, aging, and various systemic diseases such as cardiovascular conditions are considered potential contributors. Additionally, long-term irritation, as seen in cases of deep caries and restorations in close proximity to the pulp, has been suggested as possible implicated factors in the initiation of pulpal calcifications. Understanding and addressing the multifactorial nature of calcifications is crucial for effective management in clinical practice.[3,4]

CASE ILLUSTRATION

Patient S, female, 31 years old, came to RSGM FKG USU with chief complaints of pain in the lower right molars when used to chew. Treatment had been carried out with the previous dentist but the tooth was not successfully treated and it was suggested to be extracted only when the tooth was no longer painful. The tooth was only temporarily filled. Intra oral examination of tooth 46 D6, site 1, size 3, vitality test: thermal test negative, EPT negative, Percussion negative, Palpation negative, Mobility (-) tooth condition is vital. Radiograph of the tooth 46 showed temporary fillings, calcified canal and radiolucency on bifurcation. The patient had no history of systemic disease.

At the first visit, anamnesis, clinical examination, and radiographs examination (periapical) were performed to establish the diagnosis, and plan for treatment. The patient agreed to the treatment and signed an informed consent. After Scaling and root planning was done root canal treatment was planned. Local anesthesia was administrated appropriately and rubber dam was place to isolate the tooth. In this case tooth 46 was diagnosed with previously initiated endodontic therapy, symptomatic apical periodontitis, plan vital root canal treatment and composite resin onlay.

DISCUSSION

The prevention or resolution of endodontic pathology hinges upon a meticulous chemo-mechanical cleaning and shaping of the root canals followed by a dense root canal filling with a hermetic seal.[3] When undertaking endodontic treatment on a tooth with pulp canal calcification, it is imperative for the operator to be cognizant of the intricate anatomy of the root canal system. Adherence to sound endodontic principles is crucial, encompassing practices such as the identification of canal orifices under magnification, comprehensive canal instrumentation and irrigation, and meticulous obturation of the entire root canal system. These measures are fundamental for successful outcomes in the management of cases involving pulp canal calcification.[1,2,5] Other treatments, such as surgical hemisection treatment allows for the preservation of dental and periodontal tissues, thereby extending the longevity of the tooth without resorting to extraction. But, the evidence is unclear.[6]

Negotiating calcified canals demands a thorough exploration of the pulp chamber's anatomy, and the use of microscopic magnification and coaxial illumination proves indispensable in this process. Employing microscopic exploration through a well-designed access cavity allows for the revelation of all anatomical variations and limits within the pulp chamber. This approach aids in the identification of all canal orifices, discerning their topography, and determining the angle of entry. To facilitate this intricate procedure, specific equipment is essential. Long-shafted miniaturized burs, thin endodontic explorers, highly reflective mirrors, file holders, ultrasonic tips, and diagnostic dyes are among the specialized tools required for effective negotiation of calcified canals. Utilizing this advanced equipment under microscopic magnification ensures precision and enhances the operator's ability to navigate the complex root canal system, contributing to the success of endodontic procedures.[7,8]

In this case tooth 46 was diagnosed Previously Initiated Endodontic Therapy, Symptomatic Apical Periodontitis, Treatment plan was vital root canal treatment and composite resin onlay, the difficulty when performing treatment was that it was difficult to achieve full working length. Therefore, in this case, optimal magnification and illumination were used. In addition, EDTA 15% gel was used in combination with small files to achieve patency. The cleaning, shaping and obturation processes were all optimized. The treatment result was good.

CONCLUSION

Utilizing proper equipment is essential when undertaking a calcified root canal to ensure thorough elimination of bacteria from the canal. In the case management of tooth 46 with a calcified pulp canal, the approach involved an exploratory procedure starting with the smallest file (#8) and was facilitated by the use of a 15% EDTA lubricant. The procedure necessitated the application of magnification and optimal lighting to enhance visibility and precision. Through careful negotiation of the canal, the treatment was successfully completed, underscoring the importance of meticulous instrumentation and proper techniques in addressing calcified root canals.

CONFLICT OF INTEREST

None declared.

ETHICAL CLEARANCE

Written informed consent has been acquired from the patient or their legal guardian. In granting consent, the patient or legal guardian has explicitly authorized the publication of images and other pertinent clinical information in the journal. A clear understanding has been established that their names and initials will not be disclosed, ensuring confidentiality and privacy in the dissemination of medical information.

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AUTHORS CONTRIBUTION

This work was carried out in collaboration between authors. Authors conceived and developed the project with review, writing and approval of the final manuscript for publication.

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Non surgical root canal treatment of traumatized tooth with external inflammatory apical root resorption: A case report

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ABSTRACT

Introduction: Tooth trauma is a relatively frequent occurrence, and any delays in administering appropriate treatment can significantly impact the prognosis of the affected teeth. Inflammatory root resorption emerges as a serious complication following dental trauma, resulting in the gradual loss of root structure. Root resorption represents a noteworthy and common complication arising from traumatic dental injuries, including intrusion, avulsion, and luxation. While inflammation may exist, an intact tooth generally displays resilience against resorption. It is only when trauma compromises the protective pre-cementum layer that inflammation in the periodontium or pulp triggers root resorption. This study aims to illustrate the management of external apical root resorption through nonsurgical root canal treatment.

Case Illustration: A male of 22 years old came to RSGM Universitas Sumatera Utara with chief complaint of fractured anterior teeth which compromise her smile. Patient reported history of trauma because of motorbike accident around 1 year ago. Clinical examination showed fractured on teeth 11 and 21. No response in vitality test on teeth 12, 11 and 21. Tooth 12 revealed no response on percussion and palpation test. Periapical and CBCT radiograph revealed periapical radiolucency and external inflammatory apical root resorption on tooth 12. Root canal treatment was done in 2 visits with calcium hydroxide medicament. Obturation using bioceramic sealer with single cone technique. Direct composite restoration was used as final restoration.

Conclusion: Tooth resorption is a pathological condition that can often remain unnoticed over an extended period, given that most instances of resorption are asymptomatic. Utilizing bioceramic materials shows potential in fostering repair and arresting the pathological process, offering an effective treatment strategy for instances of external apical root resorption.

Keywords: Dental trauma, external inflammatory root resorption, root canal treatment, calcium hydroxide, bioceramic sealer.

INTRODUCTION

Tooth injuries resulting from trauma are not uncommon, and delays in providing accurate treatment can have adverse consequences on the future outlook of the affected teeth. The extended prognosis of teeth subjected to trauma is significantly influenced by the efficiency of emergency management and the swiftness with which it is administered.[1] Failure to address a traumatized tooth may result in potential tooth loss. Umniyati's study establishes a correlation between tooth loss and the quality of life experienced by the patient.[2] Inflammatory root resorption represents a grave complication arising from dental trauma, leading to the gradual erosion of the root structure. This form of root resorption is a pivotal and prevalent complication observed in traumatic dental injuries, including cases of intrusion, avulsion, and luxation.[3] Despite the potential presence of inflammation, typically, an intact tooth exhibits a degree of resistance to resorption. However, should the protective layer of pre-cementum sustain damage due to trauma, the ensuing inflammation in the periodontium or pulp may serve as a trigger for root resorption.[4,5]

The degree of harm to the supporting tissues relies on the nature and severity of dento-alveolar trauma, which may result in different types of resorption. In instances where the injured root's surface area is restricted, and there is a temporary or absent inflammatory stimulus, the healing process is expected to unfold without significant complications, involving reparative processes within the periodontal ligament and cementum.

However, when an infection in the root canal coincides with trauma-induced resorption, the deleterious process becomes accentuated, resulting in the rapid loss of tooth structure. This particular occurrence is denoted as "Infection-related root resorption" or "Inflammatory root resorption," and it can manifest as internal, external, or a combination of both internal and external lesions. This process occurs when the protective layer of pre-cementum is compromised due to trauma, allowing inflammation from the periodontium or pulp to initiate root resorption. This case report aims to showcase the management of external apical root resorption through nonsurgical root canal treatment, utilizing a bioceramic sealer as the obturation material, and includes a subsequent follow-up for comprehensive assessment.

CASE ILLUSTRATION

A 22 years old male came to RSGM University of North Sumatra with chief complaint of fractured anterior teeth

which compromise her smile. Patient reported history of trauma because of motorbike accident around 1 year ago. Clinical examination shows fractured on teeth 11 and 21. From Vitality test shows negative result on teeth 12, 11 and 21. Tooth 12 shows no response, percussion(-) palpation(-) and normal gingiva. Periapical and CBCT radiograph shows periapical radiolucency and external inflammatory apical root resorption on tooth 12.

For the first appointment was local infiltration to tooth 12 and isolation using a rubber dam. The access was opened using endo access bur. Canal negotiation was done using K File #10. Determination of working length of the canal using apex locator and K File #55 (18 mm) and irrigate root canals with NaOCl 2,5%. Mechanical preparation was commenced using rotary file (ProTaper File) until F3. Sterile saline was used as the final irrigant and ultrasonic activation was performed. Intra canal medicament of calcium hydroxide was placed and the patient was recalled after 2 weeks. The root canals were dried and Ca(OH)2 dressing was placed. Obturation using bioceramic sealer with single cone gutta percha. Direct composite restoration was used as final restoration. Follow up 1 year after treatment, the patient reported no symptom, periapical lesion had healed and a closed apical foramen was seen.

DISCUSSION

Dental trauma is recognized as a significant potential predisposing factor in cases of external inflammatory root resorption. External inflammatory resorption, which is recognized as a potential consequence arising from traumatic incidents affecting teeth, unfolds when there is a notable loss of cementum attributable to damage inflicted on the external surface of the tooth root during traumatic events. This scenario is further complicated by the intrusion of bacteria into the root canal system, initiating an inflammatory response within the affected tissues. When trauma impacts the periodontal ligament (PDL), as observed in instances of tooth displacement (luxation), an immediate inflammatory response ensues within the PDL and adjacent bone, triggered by the injury. In these situations, the compromised cementum facilitates the infiltration of intracanal bacteria and/or their endotoxins into the periodontal ligament, thereby creating favorable conditions for the initiation of the inflammatory resorptive process. The presence of bacteria or endotoxins from the infected root canal system amplifies the existing inflammation, activating clastic cells and prompting inflammatory resorption within the root and neighboring bone. Once initiated, the resorptive process persists as long as the root canal system remains infected, potentially leading to the complete resorption of the tooth root over time. External inflammatory resorption poses a significant risk of tooth loss if not promptly and effectively managed.[1]

In most instances, root resorption manifests without any discernible symptoms or signs. Typically, the affected tooth displays an unresponsive nature to pulp sensibility testing, and the manifestation of other symptoms or clinical signs varies, depending on the overall condition of the tooth and the surrounding tissues. Managing root resorption poses a challenge with an unpredictable prognosis, contingent upon factors such as the type, location, and size of the resorptive lesion.[3] The prognosis of resorption can be influenced positively through accurate diagnosis and meticulous treatment planning. For an accurate diagnosis of the lesion's site and extent, it is recommended to obtain periapical radiographs from various angles and consider the use of cone-beam computed tomography (CBCT) for improved identification.[6] The approach to treating root resorption is contingent upon its etiology. In cases where resorption is induced by pulpal necrosis and periodontal injury, nonsurgical root canal therapy becomes the preferred intervention. Comprehensive biomechanical preparation, coupled with thorough irrigation, plays a pivotal role in root canal disinfection. Additionally, intra-canal medicaments may be employed to eradicate any residual bacteria within the root canal system.[4]

The practice of using calcium hydroxide dressing as an intracanal medicament for root canal disinfection is highly recommended. Calcium hydroxide (Ca(OH)2) is utilized in endodontics as an intracanal medicament to eradicate any residual microorganisms after chemomechanical preparation. The antibacterial efficacy of calcium hydroxide in the root canal system is contingent upon maintaining a high pH. Consequently, calcium hydroxide continues to exert its antibacterial effects as long as the elevated pH level is sustained.[7]

Opting for Bioceramic sealer as the preferred material for treatment was a scientifically informed decision. The selection of Bioceramic sealer as the material of choice is supported by research that assessed the repair capacity of these materials and observed their bioactive potential. Furthermore, Bioceramic sealers are recognized for their biocompatibility (low cytotoxicity), excellent hermetic sealing capacity, and antibacterial properties. The applicability of Bioceramic in Endodontics, as highlighted in scientific discourse, underscores that its use as obturation material has evolved due to the enhanced characteristics already established and validated by Mineral Trioxide Aggregate (MTA). Recognizing that the healing of periapical lesions is contingent on various factors, one crucial element is the type and characteristics of the endodontic sealer employed. Bioceramic sealers, through mechanisms such as increasing pH and providing a tight seal, are anticipated to play a facilitating role in the healing process.[8]

CONCLUSION

Tooth resorption is a pathological condition that can often go unnoticed for an extended period, as most instances are asymptomatic. The treatment outcome in this case was deemed successful, as the resorption process had ceased and remained stable during the 12-month follow-up period. Additionally, there were no clinical symptoms observed, and the periapical tissues and periodontal space continued to regenerate. Based on both clinical and radiographic findings, it can be deduced that the utilization of bioceramic sealer as an obturation material proved to be a prudent choice. The application of bioceramic cements effectively fulfilled their role, promoting repair and halting the pathological process. This underscores the efficacy of bioceramic sealers as a viable

and efficient treatment modality for cases of inflammatory external root resorption.

CONFLICT OF INTEREST

None declared.

ETHICAL CLEARANCE

Express and written consent was acquired from either the patient or their legal guardian for the publication of images and other clinical information in the journal. The patient or their legal representative has provided this consent with the understanding that their names and initials will remain undisclosed.

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AUTHORS CONTRIBUTION

This work was carried out in collaboration between authors. Authors conceived and developed the project with review, writing and approval of the final manuscript for publication.

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Management of anterior tooth fracture with endodontic treatment and anatomical post with direct restoration: A case report

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ABSTRACT

Introduction: Dental trauma affecting the anterior maxillary teeth is a common occurrence among adolescents typically resulting in crown fractures. Complicated crown fracture leads to the need of post in order to strengthen the core and in adolescents mostly have a flared canal space. Additionally, the incorporation of anatomical posts has been found to enhance the resistance to fractures.

Case Illustration: A 14-year-old male patient came to the RSGM USU with a chief complaint of fractured. The patient provided a self-disclosed account of experiencing a traumatic event five years ago. However, the patient currently reports an absence of pain. There were no recorded instances of an underlying systemic illness. Following the acquisition of the patient's informed permission, endodontic therapy was performed, involving the administration of a resin based sealer for obturation of the tooth and placement of anatomical post. The final restoration involved the placement of composite resin.

Conclusion: The use of anatomical posts has the potential to enhance the adaption of glass fiber posts in situations when root canals are spacious. This approach allows for the formation of a thin layer of resin cement, reducing the possibility of adhesion failure.

Keywords: Anterior tooth fracture, dental trauma, anatomical post, direct composite resin.

INTRODUCTION

Anterior tooth crown fracture is a common dental trauma problem that frequently manifests in children and adolescents.[1] The primary etiologies of crown fractures in permanent dentition encompass incidents resulting from falls, sports-related trauma, due to traffic accident, and forceful contact with rigid objects 2,3. The global incidence of dental trauma injuries varies between 6% and 37%. According to available data, the incidence of crown fracture resulting from acute injury to permanent dentition is estimated to be 92%.[2–4]

The occurrence of dental trauma affecting the incisors and associated tissues is a complicated emergency situation requiring immediate evaluation and intervention, owing to its significant impact on both the physical and psychological well-being of the affected individual. The immediate and effective evaluation and intervention are of utmost significance, particularly in the case of young permanent teeth that are still in the developmental phase. This approach is crucial in order to mitigate the occurrence of undesired consequences.[5]

The restoration of crown fractures in the maxillary anterior teeth is a significant difficulty in the field of dentistry.[6] The significant reduction in tooth structure necessitates the placement of an intra-radicular post by the dentist in order to improve support and retention. The presence of flared root canal space in patients further complicates the available treatment options. It has been noted in the literature that young patients frequently exhibit wide canal space. The treatment alternatives for such cases, as reported in the literature, encompass the use of cast posts, posts with accessory posts, or anatomic posts.[7]

CASE ILLUSTRATION

A 14-year-old male patient came to the RSGM USU with a chief complaint of fractured anterior teeth. The patient provided a self-disclosed account of experiencing a traumatic event five years ago, the patient currently reports an absence of pain. The extraoral testing revealed facial symmetry, with no observable abnormalities in the lips and temporomandibular joints. The Chlor Ethyl and EPT vitality tests yielded negative results. During the examination, the supporting tissue was assessed using percussion and palpation, which yielded negative results, and there is no mobility of the teeth. The radiographic image reveals several significant findings: a cracked crown of the tooth, widening of the periodontal ligament space, a damaged lamina dura. Thus, the diagnosis of this case was pulp necrosis.

For the first appointment was local infiltration to tooth 21 and isolation using a rubber dam. The access was opened using round diamond bur no 2/4 (MANI, Japan) and widened the access cavity with non-cutting tip bur. Evaluation of orifices using endodontic explorer, root canal exploration and scouting with #8 and #10 files and irrigation with 5.25% NaOCl. Dry the root canal and determine the working length using the apex locator and fix the length of the root canal and confirm with X-ray (23,5 mm). Chemomechanical preparation using the crown-down technique with One Curve #45 taper 4% (Micro-Mega, Switzerland) using the crown-down technique then irrigation

with 5,25% NaOCL solution using a closed end side vented irrigation needle with a size of 30 Gauge with the tip of the irrigation needle placed 2 mm less than the working length then activated with ultrasonic, leave for 2 minutes and then rinse with saline, the protocol is repeated 3x. Irrigate with 17% EDTA solution with the tip of the irrigation needle placed 2 mm less than the working length, activate with ultrasonic, leave for 1 minute and then rinse with saline. Intra canal medicament of calcium hydroxide was placed, and the patient was recalled after two weeks. The calcium hydroxide dressing was removed, and the canal was dried. Obturation using warm vertical condensation with Fast Fill (Eighteeth, China). Patient was recalled after a week then the root canal was prepared for anatomical post and final restoration using composite resin.

DISCUSSION

Traumatic dental injuries represent a significant health concern due to their high occurrence and substantial impact on individuals' everyday functioning. The hard tissues present in the mouth cavity.[2] In the current research, the prevalence of fractures including both enamel and dentine (referred to as simple trauma) was found to range from 28% to 44%. Additionally, fractures comprising enamel, dentine, and pulp (referred to as complicated trauma) were observed to have a prevalence ranging from 11% to 15%.[2,5]The vast majority of these abnormalities (96%) were observed in the maxillary central incisors.

The application of direct composite resin restoration has emerged as a viable approach for the treatment of fractured teeth, offering a minimally invasive and cost-effective solution. When applied judiciously, this technique has demonstrated favourable outcomes, exhibiting commendable durability and resistance.[2,4,8] Composite resin is commonly selected as the primary material for treating anterior teeth that have mild to moderate damage. The use of composite resin below the cemento-enamel junction serves the dual purpose of establishing a favourable coronal seal and diminishing the risk of tooth fracture. Composite restorations are a highly favourable option for treating traumatized teeth, particularly in adolescents who typically have thin walls in the root canal.[9]

The rate of survival shown a decline to 70% in flaring canals that were solely rebuilt using prefabricated fiber posts. Direct and indirect anatomical posts facilitate a more direct interface between resin cement and the dentinal wall. This occurrence results in a reduction in the thickness of the cement layer and an enhancement in the uniformity and continuity of the resin cement layer. Consequently, this is expected to decrease the probability of experiencing stress concentration in a specific region, thereby mitigating the potential for root fracture. In addition, it has been observed that the application of composite resin around the anatomic post can enhance the long-term prognosis of the restoration. This is achieved by mitigating stress concentration at interfaces and promoting uniform force distribution, hence minimizing the likelihood of irreparable fractures.[7,10]

CONCLUSION

Direct composite restorations may serve as a viable treatment modality for addressing crown fractures in the anterior teeth. Anatomical posts relined with composite resin resulted in the highest fracture resistance. Anatomically customized posts demonstrated greater bond strength than non-customized posts and permitted a more uniform cement layer.

CONFLICT OF INTEREST

None declared.

ETHICAL CLEARANCE

Written informed consent was obtained from the patient or legal guardian of the patient. The patient or the legal guardian has given their consent in the form of the images and other clinical information to be published in the journal. They understand that their names and initials will not be published.

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AUTHORS CONTRIBUTION

SAT: Conceptualization, writing original draft preparation; WF, CN: writing, review and editing. All authors have read and agreed to the published version of the manuscript.

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Endodontic treatment of mandibular third molar with deep margin elevation in patient with gag reflex: A case report

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ABSTRACT

Introduction: The susceptibility of third molars to tooth decay is attributed to their posterior positioning in the dental arch and the presence of multiple additional grooves and ridges in their occlusal morphology. These factors contribute to the accumulation of plaque and hinder effective cleaning practices. Prior to initiating endodontic treatment on the third molar, it is crucial to possess a comprehension of the root canal anatomical features and the associated endodontic consequences. According to the AAE Endodontic Case Difficulty Assessment Form, this patient is classified as a high difficulty case. The objective of this case report is to describe the clinical treatment steps for mandibular third molar endodontic treatment with deep margin elevation in patient with gag reflex.

Case Illustration: A 43- year-old female patient with the chief complaint of pain to biting in the lower left back tooth region since a month ago. Clinically, the left mandibullary third molar had a deep carious lesion buccal-occlusally. There was gingival overgrowth between the tooth structure. A diagnosis of asymptomatic irreversible pulpitis was made. On further examination, it became apparent that the patient had a gag reflex. Gagging occurs during simple physical examination in high-risk areas such as the lingual aspect of lower molars. The tooth was endodontically treated in 2 appointments.

Conclusion: The clinical experience, knowledge and skills of operator regarding anatomy, diagnosis along with successful access cavity preparation relies on a knowledge of the internal and external morphology of teeth.

Keywords: Third molar, deep margin elevation, endodontic treatment, gag reflex.

INTRODUCTION

Despite heightened patient awareness, third molars are susceptible to tooth decay owing to their highly inaccessible location in the arch and the presence of numerous supplementary grooves and ridges in the occlusal anatomy, which can facilitate plaque accumulation and impede effective cleaning. Due to the presence of these physical constraints, the removal of impacted teeth continues to be the preferred treatment option for a significant number of dental professionals. Even though it is a common dental procedure, modern dentistry emphasizes minimal intervention and the preservation of every functional component of the dental arch. Prior to initiating endodontic treatment in third molar teeth, it is crucial to possess an in-depth understanding of the various anatomical variations in their roots and root canals, as well as the effects these variations may have on the endodontic procedure.[1,2]

Deep defects in teeth are associated with several clinical challenges, including difficulties in accessing, isolating, and controlling marginal. Treatment option to manage these defects is deep margin elevation (DME). Coronal relocation of subgingival margins, called DME, results in a more coronal margin by bonding several layers of direct resin composite to the deep margins. These attempts have been made to restore tooth structure by a hard tissue bond and to achieve its full function that unifies the tooth and its restoration and distributes the stresses throughout the tooth with nearnormal functional, biological, and esthetic features.[3]

The gag reflex is an automatic defense system that keeps foreign objects out of the pharynx and throat. Gag reflex is a prevalent issue encountered in the context of dental operations, making them uncomfortable and perhaps preventing their successful execution. Various interventions can be employed to address the gag reflex, encompassing the administration of anti-nausea medications, the application of behavioral therapies, the utilization of sedatives, local and general anesthetics, herbal remedies, acupressure, acupuncture techniques, laser treatments, and the use of prosthetic devices.[4] The objective of this case report is to describe the clinical treatment steps for mandibular third molar endodontic treatment with deep margin elevation in patient with gag reflex.

CASE ILLUSTRATION

A 43-year-old female patient presented to the RSGMP with the main complaint of pain upon biting in the lower left posterior tooth region persisting for the past month. Clinical examination revealed a deep carious lesion buccal-occlusally on the left mandibular third molar. Both the cold test and electric pulpal test elicited positive responses. Notably, there was gingival overgrowth between the tooth structures, and percussion yielded a negative response. Periodontal probing indicated a normal sulcular depth with

the absence of pockets and pathological mobility. The preoperative intraoral periapical radiograph displayed a buccal-occlusal radiolucency approaching the pulp space, accompanied by a widened periodontal space around the apex of tooth 38. Consequently, a diagnosis of asymptomatic irreversible pulpitis was established. On further examination, it became apparent that the patient had a gag reflex. Gagging occurs during simple physical examination in high-risk areas such as the lingual aspect of lower molars.

Following clinical and radiographic assessments, it was determined that nonsurgical endodontic treatment was the appropriate plan for tooth 38. The patient provided informed consent for the procedure. During the first appointment, given the caries extension below the CEJ, a deep margin elevation was planned. Local anesthesia was administered using 2% lidocaine with 1:80,000 epinephrine to ensure patient comfort. The majority of the enlarged gingival tissues were retracted during rubber dam isolation, which produced effective isolation. In this instance, a Greater Curve matrix band was employed. The next step was to elevate the margins coronally, at least 1mm above the gingival crevice. Flowable composite resin was placed for 3mm. Two increments of bulk fill composite were placed over the elevated margin and cured. High points were checked and the restoration was finished and polished. Subsequently, an access opening was created using an Endo Access Bur. Upon clinical examination of the pulp chamber, the three primary root canal orifices—MB, ML, and distal—were identified. Apical patency was established using a k-file #10, and the working length was determined with the aid of an apex locator (mesio buccal canal 20mm, mesio lingual canal 19mm, and distal canal 20 mm). The root canals were cleaned and shaped using crown-down technique with ProTaper Gold instrument. All canals enlarged till F2 and irrigated with saline, 5.25% sodium hypochlorite solution and 17% EDTA. Passive ultrasonic irrigation was performed to activate NaOCl. Following the drying of the root canals using paper points, the cavity was sealed with a temporary filling. The patient was scheduled for a follow-up appointment one week later. Management of the gag reflex was addressed through distraction techniques, including engaging in conversation with the patient and providing instructions to focus on breathing.

On the third visit, the tooth was isolated under rubber dam, then the temporary restoration was removed. The root canal was irrigated with 5,25% sodium hypochlorite and saline solution. Passive ultrasonic irrigation was performed to activate NaOCl. The root canal were dried with paper point. The root canals were filled with the master gutta-percha cones (F2) according to the working length then a periapical x-ray is taken. The canal was obturated with single-cone technique using AH plus (Dentsply Sirona; Germany) sealer. The gutta cutter was used to cut of gutta-percha on the pulp chamber, then condensed using an endodontic plugger. The excess sealer in the pulp chamber was cleaned with sterile cotton pellets then RM-GIC (Resin Modified Glass Ionomer Cement) was applied as orifice barrier continued with direct composite restoration.

DISCUSSION

Based from the guidelines using the AAE Endodontic Case Difficulty Assessment Form, this patient fall into high difficulty case. In 2012, Magne and Spreafico proposed the DME technique as a noninvasive alternative to crown lengthening. Using this technique, the deep cervical margin can be elevated with composite resin to facilitate isolation with a rubber dam, marginal preparation, impression-making, and easy removal of excess cement from an indirect restoration. Cases selected for DME must meet 3 criteria: the ability to establish complete isolation of the operative field; the ability to place a matrix band in a way that ensures a perfect seal; and the ability to position the matrix so that it does not violate the connective tissue space. Otherwise, crown lengthening or orthodontic exposure of the tooth should be considered.[5]

The endodontic treatment of a third molar tooth with deep margin elevation in patient with gag reflex is clearly a challenge.When performing endodontic treatment on a third molar tooth, the operator should be aware of the anatomy of the root canal system. Practicing endodontic principles such as identifying the canal orifices under magnification, thorough canal instrumentation and irrigation, and careful obturation of the entire root canal system is paramount for endodontic treatment success. The present case describes successful completion of endodontic treatment of a third molar tooth. Treatment success can was mostly attributed due to good deep margin elevation execution and management of the patient's gag reflex so the treatment can be carried out properly. Endodontic treatment has shown promise, especially when conducted in a single visit. A case study by Heptania demonstrated that a single-visit endodontic approach yielded favorable outcomes in cases of crown fractures, suggesting its applicability in similar situations. This method could be considered as a viable option for the current case.[6]

CONCLUSION

Although third molar is a challenge to the dentist because its inaccessible location with difficulties from the gagging patient and deep carious lesion that reach gingival margin, thorough knowledge of dental anatomy, radiographic examination and deep margin elevation so the isolation by rubber dam and the bonding of direct restorations with subgingival can be achieved for successful endodontic outcome.

CONFLICT OF INTEREST

None declared.

ETHICAL CLEARANCE

Written informed consent was duly obtained from the patient or the legal guardian, granting permission for the publication of images and other relevant clinical information in the journal. The understanding conveyed to the patient or legal guardian is that their names and initials will not be disclosed in the publication.

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AUTHORS CONTRIBUTION

H.N.T contributed to the conceptualization and preparation of the original draft, while T.A participated in the writing, reviewing, and editing processes. All authors have carefully reviewed and approved the final version of the manuscript for publication.

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Endodontic treatment of maxillary second premolar with Vertucci type-II: A case report

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ABSTRACT

Introduction: Successful endodontic therapy is heavily reliant on the thorough mechanical debridement of each root canal. Insufficient knowledge of the pulp cavity's anatomy is a primary factor contributing to the failure of root canal therapy. The occurrence of varied root canal morphology in permanent teeth is a commonly encountered phenomenon. A comprehensive grasp of the underlying anatomical intricacies of root canal morphology and its diverse presentations is crucial for achieving positive outcomes in root canal therapy. Understanding the intricate anatomical variations within the root canal system is crucial for the successful execution of endodontic treatments. Maxillary premolars, in particular, exhibit substantial anatomical diversity, encompassing variations in both root canal systems and the number of roots. Successfully addressing Vertucci type-II canal configurations in these teeth poses a distinctive challenge in the realm of clinical practice. Early identification is crucial in facilitating appropriate modifications to the treatment strategy. This case report aims to provide a comprehensive description of the clinical procedures involved in the endodontic treatment of the maxillary second premolar.
Case Illustration: A 35-year-old male patient reported pain from biting in the upper left tooth which was restored before. Radiographic examination revealed an unusual, complex root canal anatomy, old restoration could be identified and reached the pulp chamber. The diagnosis of this case is pulp necrosis with asymptomatic apical periodontitis. The tooth was endodontically treated in 2 appointments.
Conclusion: Each tooth exhibits intricate root and canal morphology. Attaining successful endodontic treatment necessitates a thorough understanding of the anatomical structure of the root canal system and a comprehensive awareness of the presence of both typical and atypical external and internal root canal morphologies.

Keywords: Vertucci type-II, maxillary premolar, endodontic treatment.

INTRODUCTION

Root canals display diverse shapes among different teeth, with each tooth containing a unique configuration. The dental pulp, constituting the soft tissue component, intricately forms the root canal system. The external boundary of the pulp space mirrors the distinct shape of the tooth's root.[1] The outer perimeter of the pulp cavity has a configuration that closely reflects the morphology of the tooth's root. Achieving success in root canal treatment is contingent upon a comprehensive understanding of root canal systems, encompassing their intricate three-dimensional cleaning and shaping processes, ultimately culminating in the creation of a hermetic seal. The identification and diagnosis of root canal variations are crucial aspects, and although various tools have been employed over the years to address this challenge, each comes with its set of limitations.[2]

Understanding the complex root canal system and its morphology is crucial in clinical practice to effectively achieve the intended treatment objectives. Numerous classification systems related to root and root canal morphology, along with many alterations and additional varieties, have been identified. Vertucci et al. (1984) identified a complex root canal system and reported 8 types of configurations based on the division pattern observed in the primary root canal, extending from the pulp chamber to the root apex. Type II denotes a dental condition characterized by two separate canals originating from the pulp chamber, which subsequently merge before reaching the apex, forming a single canal.[3] The root canal system and the number of roots in premolars undergo notable anatomical changes, and a comprehensive understanding of this diversity is crucial. Inadequate knowledge in recognizing and addressing these anatomical variations might result in untreated root canals, leading to potential challenges and reduced efficacy in root canal treatment.[2]

Treatment of variations of configurations of the root canal systems is a potential endodontic challenge. The application of a clearing technique in the evaluation of root canal systems provides a more thorough understanding compared to alternative techniques for investigating variances within the root canal system. Therefore, upon comparing the outcomes of cleating techniques with those of other investigations, it is evident that there is a greater prevalence of diversity in root canal morphology.[4]

CASE ILLUSTRATION

A 35-year-old male patient complained of pain from biting over in the upper left tooth and the tooth was restored before. From the objective examination, there were secondary caries of tooth 25, vitality (-), palpation (-), percussion (+), and normal gingiva. Radiographic

examination revealed an unusual, complex root canal anatomy, old restoration could be identified and reached the pulp chamber. Thus, the diagnosis of this case was pulp necrosis with asymptomatic apical periodontitis.

The first appointment was local infiltration to tooth 25 and isolation using a rubber dam. Removal of old restoration, the access was opened using endo access bur, and irrigated root canals with NaOCl 5,25%. Canal negotiation was done using K File #10 and found two orifices. Determination of the working length of the canal using the apex locator and K File #10 and confirmation with a periapical radiograph. From radiographic examination, reveal the files are fused apically on the apical foramen.

The cleaning and shaping were done by using the rotary file ProTaper gold until File F2 (25.08v). For the final irrigation, sterile saline was employed, and the procedure was enhanced with ultrasonic irrigation. Calcium hydroxide intracanal medicament was applied, similar to the left maxillary second premolar, and the patient was scheduled for a follow-up appointment after one week. The calcium hydroxide dressing was removed with irrigate and passive ultrasonic to activate NaOCl 5,25 % and flushing with saline solution. Final irrigation using EDTA 17 % and saline solution. After drying the canal with a paper point, the obturation procedure was carried out using the single cone technique, and AH Plus sealer was employed. The excess sealer is removed and RM-GIC was applied as a liner. The final restoration treatment was direct composite restoration. The patient was found to be asymptomatic on a one-month follow-up visit.

DISCUSSION

Recent advancements in diagnostic equipment within the field of dentistry have significantly contributed to the diagnosis of root canal variability. This progress enables more precise identification and understanding of the intricate anatomical variations in root canal morphology. The classification of root canals is necessary to establish standardized terminology for effective communication, accurate diagnosis, and appropriate treatment planning, given the variability in root canal configurations. A root canal categorization system's optimal criterion lies in its ability to precisely describe a tooth based on the number of roots, the count of canals within each root, and the pathway of the canal from the orifice to the apex. This comprehensive approach ensures a detailed and accurate representation of the tooth's anatomical structure.[1]

The clinical significance of this lies in the necessity for operators to treat all canals within a tooth, including those in various roots, rather than selectively treating canals in specific roots. Furthermore, conducting a comparative analysis of the intricacy of a canal system in a particular root with other roots inside the same tooth may prove beneficial. However, the classification of maxillary premolars based on the number of root canals has not been well established. Hence, maxillary premolars exhibiting comparable canal structure types are categorized in a separate code as using the Vertucci classification system.[5]

There are many factors associated with treatment failure and retreatment in endodontics. Successful root canal therapy hinges on the complete debridement of the canal system, emphasizing the need for a thorough understanding of the internal anatomy of teeth and potential anatomic variations to ensure effective treatment. This consideration holds significant clinical consequences for the interpretation of radiographs, access cavity preparation, and the identification of canal orifices.[5] A case study by Heptania demonstrated that a single-visit endodontic approach yielded favorable outcomes in cases of crown fractures, suggesting its applicability in similar situations. This method could be considered as a viable option for the current case.[6]

The current case report outlines the effective execution of endodontic therapy on a maxillary second premolar exhibiting a Vertucci type-II canal configuration. The achievement was primarily ascribed to the utilization of magnification, which facilitated the clear visualization of the precise positions of the two canal orifices, together with the implementation of ultrasonic irrigation and modified obturation techniques. In addition, the operator must have a good knowledge of the root canal layout to determine the appropriate diagnosis accurately.

CONCLUSION

Management of endodontic treatment with a Vertucci-type root canal configuration, including type II, is a challenge for the operator to achieve the proper outcomes. This detailed case report substantially contributes to broadening our comprehension of the intricate variations and configurations found in the anatomical structure of the root canals within maxillary premolar teeth. The success of a root canal treatment regimen critically hinges on the meticulousness of the clinical examination, coupled with the judicious utilization of diagnostic aids. This thorough process is subsequently followed by a comprehensive approach to cleaning, shaping, and precisely filling each of the individual canals.

CONFLICT OF INTEREST

None declared.

ETHICAL CLEARANCE

Written informed consent, obtained from either the patient or their legal guardian, explicitly allows for the publication of clinical information and images in the journal, with the understanding that names and initials will remain confidential.

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AUTHORS CONTRIBUTION

S: Conceptualization, responsible for drafting the original content; T.A, W.F: involved in writing, reviewing, and editing. All authors have thoroughly reviewed and approved the final version of the manuscript for publication.

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One visit endodontic on double curvature of a left maxillary lateral incisor: A case report

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ABSTRACT

Introduction: Clinicians have been engaged in discussions regarding the optimal number of visits for root canal treatment, deliberating between a single-visit or multiple-visit approach. Another important thing is understanding the root canal curvature before starting endodontic therapy to facilitate the use of appropriate and safe endodontic instruments. Root canal curvature increases the risk of procedural mishaps during endodontic treatment. The rarity of double curve canals presents a significant challenge in achieving comprehensive endodontic treatment, particularly in navigating these intricate canals and reaching the apex. This case report aims to elucidate the one-visit endodontic treatment of a maxillary left lateral incisor characterized by double curvatures.

Case Illustration: A 20- year-old female patient came to the RSGM Universitas Sumatera Utara complaining of pain in the upper left anterior tooth for several days. The patient wanted immediate treatment to relieve the pain. The final diagnosis was made based on both clinical and radiographic examinations, the involved tooth was diagnosed with symptomatic irreversible pulpitis with normal periapical. In the radiographic examination, double curvature was found in the apical third of tooth 22.

Conclusion: The success of endodontic treatment hinges on the effective mechanical and chemical debridement of root canals, ensuring the thorough removal of their contents and reduction of bacterial load. A comprehensive understanding of root canal system anatomy, coupled with knowledge of the diverse occurrences of both external and internal root canal morphologies, is imperative for the successful execution of endodontic procedures.

Keywords: Root curvature, root dilaceration, pulpitis irreversible, endodontic treatment.

INTRODUCTION

The essence of one or several visits to endodontic treatment has been vigorously challenged throughout this decade to ensure optimum endodontic results. Development in materials and technology as well as adequate techniques and equipment such as magnification, and rotary files driven using machines could shorten treatment time without compromising the results.[1] Indications for one-visit endodontic treatment are vital teeth with simple anatomy, symptomatic pulpitis without periapical abnormalities, and teeth requiring immediate treatment due to aesthetic involvement and demand as contained in this case report.[2] Contraindications for one-visit endodontic treatment include teeth with anomalous anatomy, cases of acute abscesses with exudate, patients with difficulty mouth opening, and location of the tooth involved.[3] Root canal treatment can be done according to the Oliets criteria such as a patient with a good/positive admission, sufficient time to complete the procedure, no acute signs requiring drainage, and no anatomic or procedural difficulties.[1,2]

The advantages of root canal treatment performed in a single visit include reduced number of visits, reduced possibility of microbial contamination in the period between visits, patient convenience, economics, and restorative consideration with no delay. The surge in technological advancements, the introduction of new tools, evidence-based dentistry, scientific discussions, and the principles of minimal intervention dentistry have collectively propelled a renewed focus on various protocols for the implementation of single-visit endodontics. This approach has shown promising outcomes with a reasonable level of success.[3]

Pineda, Kuttler, and Vertucci reported that maxillary incisors are single-canal in almost 100% of the cases. On the other hand, the shape of the crown is often normal, and the variation of the canal is sometimes detected by routine radiographic examination. The prevalence of root dilacerations amongst tooth types of Lateral Incisor is 13.6%.[4] Another important thing is understanding the root canal curvature before starting endodontic therapy to facilitate the use of appropriate and safe endodontic instruments.[5]

The presence of root canal curvature heightens the risk of encountering procedural challenges in endodontic treatment. Difficulties such as the inability to establish patency, uneven dentin removal leading to transportation, perforation, and instrument fracture within the curved pathways can compromise the effective management of intra-radicular infection, potentially leading to suboptimal treatment outcomes.[4] To achieve successful endodontic treatment, especially in cases of teeth with curved canals, the clinician must understand the basic principles required for the dynamic management of curved or narrowed canals and to increase understanding of future developments in this field of endodontics.[6]

CASE ILLUSTRATION

A 20-year-old female patient complained of pain in the upper left anterior tooth. The patient complained of spontaneous pains at night yesterday, throbbing pain to the point of not being able to sleep, and had been taking pain medication. Radiographic evaluation of the involved tooth revealed caries involvement that had reached the pulp with no abnormalities around the apical tissue. From the objective examination, there were profound caries of 22, ICDAS classification is D6, and Mount and Hume classification is site 2 size 2, vitality (+), palpation (-), percussion (+), mobility (-), and normal gingiva with OHI 1,4 (fair). Thus, the diagnosis of this case was symptomatic irreversible pulpitis with normal periapical condition. The patient had no allergies to food or drugs and no significant medical history was observed. After administering infiltration (2% Articaine 1:100000 Epinephrin), a rubber dam was immediately placed on tooth 22. Access was opened from the palatal aspect in a minimally invasive manner with size 2 round diamond burs. Two indentations were observed in the apical third of the root at the intraoral periapical radiograph, based on Schneider's the curvature was between 12° and 14° (slight curvature/ minimal difficulty). The patency of the root canals was determined using stainless steel K-files #8 and #10. Taking into account the curved nature of the canal, the working length was safely confirmed using an apex locator and intraoral periapical radiograph. Subsequent to meticulous canal preparation with NiTi rotary instruments until ProTaper F2 (#25.08v), the canal underwent copious irrigation with 5.25% sodium hypochlorite, followed by flushing with physiological saline and a final irrigation with 17% EDTA. Following these procedures, the canal was dried using a paper point, and a cone trial was conducted with an intraoral radiograph. The obturation process was then carried out using AH Plus sealer and the single cone technique, incorporating warm vertical compaction. Radiographs are retaken to ensure good and hermetic filling after root canal obturation. RM-GIC as liners and direct resin composite was used as the final restoration. The 1-month and 3-month follow-up examination of the patient revealed the tooth was completely asymptomatic and did not show any sign of edema or mobility.

DISCUSSION

The term "dilaceration" was first introduced by Tomes in 1848, where it is defined as the forcible separation of the cap of developing dentin from the pulp during the ongoing progress of dentin development. This phenomenon is subsequently described as an angulation, deviation, or sharp bend in the linear relationship between the crown and root of a tooth. The term "dilacero," derived from Latin, signifies tearing up, and in dental glossaries, dilaceration is characterized as a deformity resulting from a disturbance between the unmineralized and mineralized portions of the developing tooth germ.[7]

The term "dilaceration," initially coined by Tomes in 1848, refers to the forcible separation of the cap of developed dentin from the progressing pulp. It is characterized by an angulation or deviation in the linear relationship between the crown and root of a tooth. The etiology of dilaceration is not definitively understood, and two prevailing explanations exist. The term "dilaceration," coined by Tomes in 1848, refers to the forcible separation of the cap of developed dentin from the progressing pulp, resulting in an angulation or deviation in the linear relationship between the crown and root of a tooth. The intricate biomechanical preparation of curved canals can be adversely affected by improper instrumentation. Moreover, navigating calcified and curved canals introduces torsional and bending forces, creating uneven pressures that may lead to issues such as transportation, lodging, apical perforation, or instrument fracture. These challenges in curved canal instrumentation not only limit the ideal mechanical preparation of the root canals but may also contribute to the development of inappropriate instrumentation techniques. As a result, achieving thorough and effective biomechanical cleaning in curved canals becomes a complex task that requires careful consideration and precise techniques to avoid procedural mishaps.[7,8]

While these errors may not be direct causes of treatment failure, they can decrease the overall prognosis due to procedural challenges in eliminating intracanal infection. Managing root canal curvature involves various concepts developed to address these challenges and optimize the success of endodontic treatment. A comprehensive understanding of the degree of root canal curvature, assessed through diagnostic radiographs and determination of the correct working length, becomes essential in navigating the complexities of curved canals during endodontic procedures. These challenges underscore the importance of careful and precise techniques in navigating the intricate root canal system.[4,5] While these errors may not be the direct cause of treatment failure, they can diminish the prognosis due to the procedural difficulty in eliminating intracanal infection. Various concepts have been developed to address the challenge of managing root canal curvature, aiming to enhance the precision and effectiveness of endodontic procedures.[6]

The effectiveness of biomechanical preparation is adversely influenced by inadequate instrumentation in curved canals. Furthermore, when dealing with calcified and curved canals, the instrumentation process introduces torsional and bending forces. These forces, if not managed properly, can lead to complications such as transportation, lodging, apical perforation, or even instrument fracture. The challenge intensifies when addressing the intricacies of both calcification and curvature in root canals during endodontic procedures. Careful consideration and precise techniques are crucial to navigate these challenges and ensure a successful outcome in root canal treatments.[6,9] These curved canals may impose limitations on the ideal mechanical preparation of the root canals, potentially leading to inappropriate instrumentation.[4]

Root canal curvatures exhibit variations based on location and severity, with potential configurations such as apical gradual curves or S-shaped curves.[4,5] Instrumentation in curved root canals relies heavily on factors such as the flexibility of instruments, biomechanical preparation techniques, the position of the apical foramen, and the presence of calcifications in the root canal anatomy.[4,9]

Hence, assessing the degree of root canal curvature through diagnostic radiographs and determining the accurate working length plays a crucial role in ensuring the success of endodontic treatment.[10] A case study by Heptania demonstrated that a single-visit endodontic approach yielded favorable outcomes in cases of crown fractures, suggesting its applicability in similar situations. This method could be considered as a viable option for the current case.[11]

CONCLUSION

Effective endodontic treatment hinges on a comprehensive understanding and recognition of root canal anatomy, coupled with precise and meticulous cleaning and shaping procedures. Various factors, such as root dilacerations, can add complexity to the treatment process. Therefore, when undertaking endodontic procedures, clinicians must exercise great care to prevent mishaps in teeth exhibiting significant dilacerations. This case underscores the significance of possessing an in-depth understanding of root canal anatomy and morphology for accurate diagnosis. Biomechanical preparation in cases of root canal curvature demands the use of specially designed instruments, high-quality materials, and the support of radiographs and up-to-date tools.

CONFLICT OF INTEREST

None declared.

ETHICAL CLEARANCE

Written informed consent was obtained from the patient or the legal guardian for the publication of images and other clinical information in the journal. It is understood that the names and initials will not be disclosed.

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AUTHOR CONTRIBUTIONS

N: Conceptualization, writing original draft preparation; T.A, W.P: Reviewing, and editing. All authors have read and agreed to the published version of the manuscript.

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Management of complicated case on lateral incisor mandibular

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ABSTRACT

Introduction: Injuries to the oral and maxillofacial region are a common occurrence, constituting 5% of all cases that prompt individuals to seek dental treatment. Trauma to the teeth can lead to pulp injuries, with or without accompanying damage to the crown or root. These injuries can elicit various responses from the pulp, encompassing localized or generalized tertiary dentin formation, pulp canal calcification (PCC), internal root resorption, chronic pulp inflammation, and, pulp revascularization, in more severe cases, pulp necrosis followed by discoloration. The objective of this study is to describe how to manage endodontic treatment with several complications factors namely calcification, resorption and discoloration due to trauma.

Case Illustration: A 31-year-old male patient presented at RSGM Universitas Sumatera Utara with the primary concern of addressing the discoloration of the mandibular front tooth, specifically tooth #32, which appeared darker than the surrounding teeth. The patient had trauma about one year ago caused previous pain and mobility of teeth. No underlying systemic disease is reported. Radiographic evaluation of the involved tooth revealed external apical inflammatory resorption and calcified in the middle to apical root canal. From the objective examination, there was discoloration of tooth #32. The patient was diagnosed with pulp necrosis with asymptomatic apical periodontitis. The tooth was endodontically retreated in 4 appointments.

Conclusion: The efficacy of root canal treatment hinges on achieving thorough disinfection, extending to the minor apical constriction. In instances of calcified canals, successful attainment of the full working length requires negotiation using a combination of file systems, irrigants, a microscope, modified bur, and procedures conducted under a dental operating microscope. Dental professionals need to possess a thorough comprehension of both the etiology and clinical manifestation of tooth discoloration. This knowledge is crucial for accurate diagnosis and the selection of an optimal treatment approach.

Keywords: Dental injuries, pulp calcification, external apical inflammatory resorption, tooth discoloration.

INTRODUCTION

Injuries to the oral and maxillofacial region are a common occurrence, constituting 5% of all cases that prompt individuals to seek dental treatment. Among all facial injuries, dental injuries, specifically crown fractures and luxations, are the most prevalent. Trauma to the teeth can lead to various outcomes, including injury to the pulp, and also can damage to the crown or root or socket displacement of the teeth.[1] All traumatic injuries have a direct impact on the health of the pulp, potentially leading to a range of pulp responses. Traumatic dental injuries, constituting 5% of oral and maxillofacial injuries, are a common reason for seeking dental treatment. Among facial injuries, dental injuries, such as crown fractures and luxations, are the most frequent. The impact of trauma on teeth can lead to diverse responses from the pulp, ranging from localized or generalized tertiary dentin formation, pulp revascularization, pulp canal calcification (PCC), chronic pulp inflammation, internal root resorption, to, in severe cases, pulp necrosis and subsequent infection of the root canal system. These responses are complex and can vary based on the type and severity of injuries.[2] Trauma is more prevalent in maxillary central incisors, and the complications that ensue may compromise oral esthetics. Crown discoloration, despite the absence of clear evidence of pulp necrosis, is a clinical alteration that affects the patient and raises concerns for the clinician. The change in color suggests an alteration in pulpal tissue, this introduces uncertainties regarding the prognosis of the affected tooth, raising concerns about potential progression to necrosis.[3]

The incidence of traumatized permanent teeth ranges from 26.9% to 73.3%, with the extent of variability primarily influenced by the nature of dental trauma and the developmental stage of the root. Pulp necrosis in immature permanent teeth is observed within the range of 13.0% to 66.7%, while in mature permanent teeth, it ranges from 42.0% to 87.0%. Indications of trauma that imply the diagnosis of pulp necrosis might manifest in the following weeks, months, or even years post the initial injury.[3]

The responses of tissues to dental trauma can be either favorable or unfavorable, and these responses play a crucial role in determining the required treatment and the ultimate outcome or consequence for the affected teeth. Therefore, a comprehensive understanding of the biological aspects of potential tissue responses and the mechanisms involved in trauma is essential. This knowledge prepares clinicians to confidently assess the severity of dental trauma, enabling them to perform appropriate treatment

and minimize the consequences of the traumatic event.[2] The objective of this case report is to describe how to manage endodontic treatment with several complications factors namely calcification, resorption and discoloration due to trauma.

CASE ILLUSTRATION

A 31-year-old male patient presented to RSGM Universitas Sumatera Utara with the chief complaint of a mandibular front tooth appearing darker than the surrounding teeth.The patient reports a history of trauma about one year ago which caused previous pain and mobility of teeth. No underlying systemic disease is reported. Radiographic evaluation of the involved tooth revealed external apical inflammatory resorption and calcified root canal. From the objective examination, there was discoloration of tooth #32, vitality (-), palpation (-), percussion (-). The diagnosis for this tooth indicates pulp necrosis with asymptomatic apical periodontitis.

At the first appointment local infiltration anaesthesia was administered on tooth 32, followed by rubber dam isolation. The access cavity was done using endo access bur, root canal preparation using M-Access K-Files #6, #8, #10, #15 with the help of magnification and determination of working length of the canal using apex locater. The cleaning and shaping was done by using rotary file Protaper Gold until File F2 (#25.08) and irrigated with NaOCl 2,5% and activation with ultrasonic was done. Finishing irrigation with Chitosan Oligosaccharide 2% **a**nd intra canal medicament of nano chitosan 0,2% was placed, and the patient was recalled after two weeks. At the second appointment, obturation using single cone technique with bioceramic sealer and placement of RMGIC as an orifice barrier were accomplished. One week follow-up showed no symptoms, tooth color correction was carried out using the walking bleach technique to regain the color. Final restoration using class I direct composite restoration on palatal.

DISCUSSION

Traumatic dental injuries have the potential to cause varying degrees of damage to the pulp, periradicular tissues, and surrounding soft tissues. The responses of these tissues can be complex and depend on the types of injuries and their combinations.[2] Traumatic teeth also need immediate surgical repositioning, if there is an intrusion.[4] Traumatic injuries to a tooth can lead to the rupture of blood vessels in the pulp, causing blood to diffuse into the dentinal tubules. This results in the tooth acquiring a dark pinkish hue almost immediately after the accident, which later transforms into a pinkish-brown color. Even after the pulp is removed or recovers, the discoloration tends to persist. In young individuals, the breakdown of erythrocytes in the dentinal tubules generates pigment that contributes to crown discoloration. However, in many cases, the pulp succumbs to the trauma, resulting in the breakdown of hemoglobin and the creation of various colored compounds like hemin, hematoporphyrin, hematoidin, hematin, and hemosiderin. Occasionally, hydrogen sulfide produced by bacteria can also contribute to darkening the tooth.[1] Dental traumatic injuries can result in pulp canal obliteration, characterized by uncontrolled deposition of hard tissue along the pulp chamber and root canal walls. This process may gradually or completely obliterate the pulp canal space. Calcifications occur due to the failure of enzymes, particularly pyrophosphatase, coupled with diminished blood supply and reduced capillary permeability. This leads to the formation of calcific deposits that may obstruct access to the root canal. The pulp's responses to traumatic injuries are influenced by the extent of damage to the neurovascular supply, primarily entering through the apical foramen. Additionally, the presence of bacteria plays a significant role in determining the outcome of these injuries.[5]

The operating microscope is highly recommended for the treatment of calcified canals. Ultrasonic tips are employed to negotiate calcified root canals, and burs with long shanks are utilized for troughing and locating calcified canals. During deep access preparation, multiple angulated radiographs should be taken to ensure central alignment and prevent excessive dentin loss or perforation. Negotiating a calcified, narrow, and constricted canal poses a challenge for dentists. Typically, negotiation is performed using small-diameter files (#6, #8, #10), which serve as pathfinder files. However, excessive watch-winding force can lead to the fracture of these files due to their lack of rigidity. To prevent file fracture and further complications, alternate use of #6, #8, #10 files is advised. Dentists should employ a gentle watch-winding motion with a slight push-pull motion. Files should be inspected before insertion, and if any signs of distortion appear, they should be discarded.[6] Utilization of chitosan oligosaccharide 2% could act as chelating agent without causing collagen denaturation which subsequently ease the preparation towards the apical region.

The aesthetic impairment caused by discoloration resulting from traumatic injury necessitates dental treatment to enhance tooth color, aiming to restore the patient's smile. This intervention is crucial for positively impacting psychosocial interactions and overall development.[7] Therefore, it is crucial for dental practitioners to have a comprehensive understanding of the etiology and clinical presentation of tooth discoloration. This knowledge is essential for making accurate diagnoses and selecting the most appropriate treatment for each specific case.[8] In cases of discolored anterior teeth resulting from trauma, intracoronal bleaching is a commonly employed procedure for correction.[2]

CONCLUSION

The success of root canal treatment is contingent on achieving thorough disinfection up to the minor apical constriction. In situations involving calcified canals, successful negotiation to attain full working length involves the utilization of various file systems, irrigants, a microscope, modified bur, and performing the procedure under a dental

operating microscope. Dental practitioners must possess an understanding of the etiology and clinical presentation of tooth discoloration to accurately diagnose and select the most appropriate treatment.

CONFLICT OF INTEREST

None declared.

ETHICAL CLEARANCE

Written informed consent was acquired from the patient or legal guardian, indicating their approval for the publication of images and other clinical information in the journal. They are aware that their names and initials will not be disclosed.

FUNDING

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AUTHOR CONTRIBUTIONS

A.N.M.S : Conceptualization, writing original draft preparation; T.A, W.F: writing, review and editing. All authors have read and agreed to the published version of the manuscript.

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Pain management of symptomatic irreversible pulpitis on maxillary right first premolar and first molar: A case report

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ABSTRACT

Introduction: Dental pain is the chief complaint that needs emergency dental treatment. Dental pain can come from odontogenic and non-odontogenic sources, but most of it comes from pathology on pulp and periradicular which need emergency dental treatment. Symptomatic irreversible pulpitis was one of cases which needed emergency dental treatment. This condition is characterized with intermittent, continuous pain, lingering and sharp pain on thermal stimulation.
Case Illustration: A 38 years old female come with chief complaints of continuous pain on maxillary right first premolar and first molar for 2 days. Analgesic do not make pain disappear. Vital pulpectomy done after objective, subjective and radiographic examination. Local anesthetic, rubber dam isolation, access opening, removal of pulp tissue, cleaning and shaping with 2,5% NaOCl was done in first visit. Oral NSAID was given to patient. On second visit, patient showed no sign and symptoms and pain disappeared. Master apical cone confirmed with periapical radiograph. Obturation was done with continuous wave obturation techniques using epoxy resin based sealer and confirmed with periapical radiograph. Direct composite restoration was done as final restoration.
Conclusion: symptomatic irreversible pulpitis as an emergency endodontic case can be well managed with 3D strategy.

Keywords: Dental pain, pulpectomy, symptomatic irreversible pulpitis.

INTRODUCTION

Dental health counselling is important and significantly increasing knowledge, thus increasing dental health including the risk of injury.[1] Dental pain was patient main complain which need emergency dental treatment. Dental pain can come from odontogenic and non-odontogenic source. Endodontic treatment is typically recommended in cases related to alterations in the pulp and periapical tissues.[2] Symptomatic irreversible pulpitis was one of case which need emergency dental treatment. This condition characterized with intermittent, spontaneous, lingering and sharp pain on thermal stimulation.[2,3] Endodontic emergency is a condition of pain related to inflammation on pulp or periradicular tissue. Immediate, urgent, and non-urgent. Immediate endodontic emergencies require prompt intervention, urgent cases need attention within a short timeframe, and non-urgent situations can be addressed at a later, more convenient time. This classification helps prioritize and manage cases based on their severity and urgency:[4] The classification of endodontic emergencies includes those that occur prior to endodontic treatment, such as cases where no previous endodontic treatment has been performed. Emergencies can also happen during endodontic treatment, commonly referred to as a "flare-up," which occurs during multi-appointment procedures like root canal treatment or retreatment. Additionally, emergencies can occur after endodontic treatment, encompassing post-operative pain following the root canal filling stage or cases where previously treated teeth become reinfected, leading to acute apical periodontitis or an acute apical abscess. This classification aids in addressing emergencies based on their timing and association with endodontic procedures.

Purpose of emergency endodontic management was to manage pain and infection fast and effectively so can minimize development of persistent pain and periradicular pathology.[3] Effective Management of endodontic pain known as 3-D strategy : Diagnosis, Diagnosis, Definitive treatment), and Drugs.[4]

Dental practitioners can prescribe drugs with corresponding indications. Postoperative analgesic. Systematic review and meta analysis show post operative analgesic such as ibuprofen 600 mg or ibuprofen 600 mg and acetaminophen 1000 mg was most effective on decreasing postoperative endodontic pain on patient without contra indications.[3]

CASE ILLUSTRATION

A 38 years old female came with chief complaint of continuous pain on the maxillary right first premolar and first molar for 2 days. Analgesic drugs do not make pain disappear. Extra oral examinations show symmetric facial, and no abnormalities on lips, TMJ, and lymph nodes. Objective examination shows caries extended to pulp, pain on vitality test, and positive on percussion and palpation test. No mobility was seen. Radiographic examination shows caries extended to pulp. Teeth 14 and 16 were diagnosed as symptomatic irreversible pulpitis. The treatment plan was endodontic treatment with direct resin composite restoration. On first visit, Plexus and intraligamental

infiltration anesthesia was done using lidocaine 2% with 1:80.000 adrenaline. Pre endodontic build up and rubber dam placement was done. Caries removed using carbide bur and access opening was done using endo-access bur with combination using ultrasonic tip. The working length was established utilizing K-Files #8 and #10, aided by an apex locator, and further confirmed through a periapical radiograph. This comprehensive approach ensured accurate determination of the working length for the endodontic procedure.

Root canal preparation was done using Protaper gold file. Irrigation was done with 2,5 % NaOCl and activated using sonic activation (EDDY). 17% EDTA was used as final irrigation. Occlusal adjustment was done and patient was prescribed with Ibuprofen 400 mg and acetaminophen 500mg to reduce post operative pain. On the second visit, the patient showed no sign and symptoms and pain disappeared. Master apical cone was confirmed with periapical radiograph. Obturation was done with continuous wave obturation techniques using epoxy resin based sealer and confirmed with periapical radiograph. Direct composite restoration was done as final restoration.

DISCUSSION

Purpose of emergency endodontic management was to manage pain and infection fast and effectively so can minimize development of persistent pain and periradicular pathology.[3] Pulpectomy procedure interventions have become the first line of endodontic emergency care.[3] Additional definitive therapies after emergency pulpectomy should also be considered.[3] Rosenberg and et al stated occlusal reduction significantly reduced pain in patients with vital pulp, periradicular symptoms and pain preoperatively, 48 hours post instrumentation. Further post-treatment analgesic administration: he findings from a recent systematic review and meta-analysis revealed that the most effective approach for reducing post-treatment endodontic pain in patients without contraindications was the administration of ibuprofen 600mg or a combination of ibuprofen 600 mg with acetaminophen (APAP) 1000mg. This evidence suggests the efficacy of this pharmacological intervention in managing pain following endodontic procedures.

CONCLUSION

Dental pain management requires knowledge of tooth and root canal anatomy so that the entire root canal can be located and no pulp tissue remains. Pain in symptomatic irreversible pulpitis as an endodontic emergency case can be managed well with a 3D strategy of diagnosis, definitive treatment with pulpectomy and occlusal alignment and systemic administration of anesthetic and analgesic drugs.

CONFLICT OF INTEREST

None declared.

ETHICAL CLEARANCE

Informed consent was diligently obtained from the patient or legal guardian, who provided consent for the publication of images and other relevant clinical information in the journal. It was clearly communicated that their names and initials would be kept confidential and not disclosed in the published material.

FUNDING

None.

AUTHORS CONTRIBUTION

This work was carried out in collaboration between authors. Authors conceived and developed the project with review, writing and approval of the final manuscript for publication.

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Effect of application of calcium hydroxide and nanohydroxyapatite of duck eggshell on macrophages in reversible pulpitis (in vivo study)

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ABSTRACT

Introduction: Reversible pulpitis is a pulp disease that can change back to normal pulp by removing the irritant stimulus. Calcium hydroxide is one of the gold standard medicaments in pulp capping treatment but calcium hydroxide medications can cause superficial necrosis. Duck egg shells are a natural material that can be an alternative material. This study aims to determine the effect of calcium hydroxide and duck eggshell nanohydroxyapatite application on macrophage cell count in reversible pulpitis. This study examined the effect of calcium hydroxide and nanohydroxyapatite application on macrophage formation in vivo.

Methods: The samples used came from 3 groups consisting of a group of rats that were not given medicaments, a group of rats that were given calcium hydroxide medicaments, and a group of rats that were given duck eggshell nanohydroxyapatite medicaments. Macrophage observations were made using an Olympus CX23 Optilab microscope with a magnification of 400 times and calculated using image raster software.

Results: showed the effect of macrophage formation with an average of group 1 which is 29.11, group 2 which is 23.78 and group 3 which is 19.33. One Way Anova testing resulted in $p=0.002$ ($p<0.05$) which means there is a significant difference. The results of the LSD (Least Significant Different) Post Hoc test showed significant and insignificant differences.

Conclusion: Based on this study, it can be concluded that duck eggshell nanohydroxyapatite as a recycled pulp capping material has an effect on macrophage formation in reversible pulpitis

Keywords: Pulp capping, macrophages, reversible pulpitis.

INTRODUCTION

Reversible pulpitis is a condition where the pulp can still return to normal when the stimuli from the irritant have been removed. Inflammation in pulp tissue has increased blood flow, increased capillary permeability, recruitment of inflammatory cells to the site of foreign bodies, microorganisms, or damaged tissue.[1] Inflammatory cells that play a role in the inflammatory process one of them macrophages play an important role in the response to pulpitis to improve the formation of reparative dentin is the main goal of pulp capping treatment.[2]

The reversible pulpitis treatment used is pulp hooding, which aims to keep the pulp vital by reducing the inflammatory process characterized by a decrease in the number of macrophage cells.[3] There are several material options for pulp capping. The most commonly used material today is calcium hydroxide, which is one of the most commonly used medications for the treatment of reconstructed and indirect pulp cappings.[4] Calcium hydroxide has good biocompatibility with tissues and has a pH of around 12-13 so that it can cause the environment to become alkaline and easily form reparative dentin, but this medicament has several disadvantages and side effects including causing necrosis in the superficial layer of the pulp and can cause tunnel defects so that bacterial infections can occur.[2] Additionally, it less effective to eradicate alkaline resistant bacteria, such as Enterococcus faecalis.[5]

Nanohydroxyapatite is one of the uses of nanotechnology in dentistry.[6] Recent research has shown that nanohydroxyapatite can be used as a bone graft and implant. Previous research shows that nanohydroxyapatite can be recommended as a potential alternative material in the treatment of pulp capping due to iatrogenic factors. The development of nanohydroxyapatite as a medical material for pulp capping treatment is able to regenerate skeletal tissue that has molecules that look the same in dentin and enamel, then a dentin bridge will be formed. The initial inflammatory response and superficial coagulation necrosis in nanohydroxyapatite looks a lot but decreases over time, the superficial effect is needed in the repair of pulp inflammation because it will trigger the biological process of hard tissue formation, keep the pulp vital, and protect the pulp.[4] This study aims to see the effect of macrophage cell count in reversible pulpitis after application of calcium hydroxide and duck eggshell nanohydroxyapatite.

Natural sources of nanohydroxyapatite include duck eggshell waste, which is abundant and can be utilized as a source of making nanohydroxyapatite from organic materials. Duck eggshells have a very high calcium carbonate (CaCO3) content of around 94-97% which can be utilized for synthesis as a source of calcium in the manufacture of hydroxyapatite crystals. In addition, duck eggshells have calcination results in the form of a higher purity level

of calcium oxide (CaO) compared to the calcination results of chicken eggshells and quail eggshells.[7]

METHODS

This study used laboratory in vivo experimental research. Experimental research is basically a form of research in which individuals are manipulated to determine the causes and effects of treatments. The study population used Sprague Dawley rats. A total of 27 samples were divided into 3 groups, each of the 3 groups amounted to 9 Sprague Dawley rats, namely 1 negative control group, 1 positive group and 1 treatment group. The negative control group is a group of Sprague Dawley rats that are not given medication. The positive control group is a group of Sprague Dawley rats given calcium hydroxide Ca(OH) medicament,[2] while the treatment group is a group that will be given duck eggshell nanohydroxyapatite medicament.

This study was conducted by pretreating the first molar teeth of Sprague Dawley rats so as to cause reversible pulpitis, then given medicament material according to the control group, stacked using glass ionome cement, carried out the process of maintaining rats for 7 days, carried out the process of cutting the rat's jaw, taking n, making histology tissue preparations, observation of histopathology specimens by using a light microscope at 400x magnification.

Data analysis was conducted using SPSS software. Data is presented in the form of mean values and standard deviations. Based on the number of samples used to determine the normality of data distribution using the Shapiro Wilk Test, then the data homogeneity test was carried out using the Levene Test, then a parametric test with One Way Anova was carried out to test and determine whether there were differences in the number of odontoblast-like cells in all groups and continued with the LSD (Least Significant Different) test to test differences between groups.

RESULTS

The subject of this study was carried out on 27 left maxillary first molar teeth of Sprague Dawley rats which were divided into groups of rats with reversible pulpitis without being given medicaments and then filled with glass ionomer cement as a negative control group, groups of rats with reversible pulpitis given calcium hydroxide medicaments as a positive control group, groups of rats with reversible pulpitis given duck eggshell nanohydroxyapatite medicaments, then preparations were made and macrophages were observed using a 400 times magnification microscope. The average results and standard deviation can be seen in table 1.

Table 1. Macrophage average results

Group	Treatment	Results
1	No Medicines	29.11 ± 5.21
2	Calcium Hydroxide	23.78 ± 4.52
3	Nanohydroxyaptites	19.33 ± 5.48

Table 2. Shapiro wilk test results

Group	Treatment	Sig
1	Without medication	0,110
2	Calcium Hydroxide	0.693
3	Nanohydroxyapatite	0.694

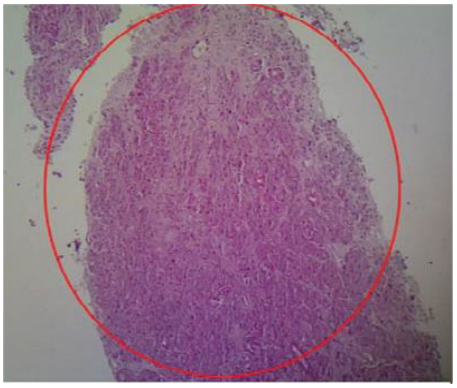

Figure 1. Without medicamen 200x magnification.

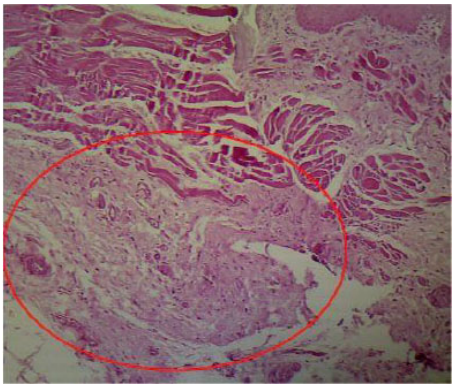

Figure 2. Calcium hydroxide 400x magnification.

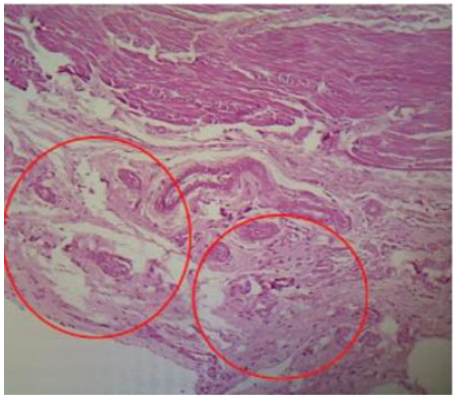

Figure 3. 400x magnification of nanohydroxyapatite

The results of data analysis indicate that the lowest average macrophage effect is located in group 3, namely the reversible pulpitis rat group given nanohydroxyapatite medicament, while the highest macrophage group effect is in group 1, namely the reversible pulpitis rat group without being given medicament.

The results of macrophage observation in tissue preparations can be seen in the picture below Figure 1, Figure 2, and Figure 3. The red circle is the macrophage cell referrer.

The total percentage of macrophage influence from each group is carried out The normality test used in this study is the *Shapiro Wilk test*. The results of the *Shapiro wilk test* was shown in table 2. It can be seen that groups 1,2,3 and show that significant P> 0.05 so that the data is normally distributed.

The data that has been tested for normality, then the homogeneity test is carried out. The homogeneity test used in this study is *Levene's test*. The results of *Levene's test* can be seen in table 3. It shows that the significant value obtained is 0.631, which means significant> 0.05, so the data has a homogeneous variant. Furthermore, *One-Way Anova* test was conducted (table 4). Based on table 4, it indicated

that the significance value obtained is 0.002, meaning that the significance <0.05 so that there is a significant difference. Furthermore, the LSD (Least Significant Different) test was carried out to test group differences. The results indicate that there is a significant difference in the effect of macrophages. Based on the results of the LSD (*Least Significane Different*) test, it was found that there was a significant effect of macrophage formation (p <0.05) in the group without medication against calcium hydroxide and nanohydroxyapatite group against the group without medication, other groups, namely the calcium hydroxide group against the group without medication, the nanohydroxyapatite group against the group without medication. The groups that were not significant were the calcium hydroxide group against nanohydroxyapatite, nanohydroxyapatite against calcium hydroxide (p>0.05).

DISCUSSION

The purpose of pulp capping treatment is to maintain pulp vitality by stimulating pulp cells to form reparative dentin which has the function of closing the cavities to protect the pulp from bacteria and external stimuli.[8] The effect of kaping pulpa medicament on macrophage formation is supported by the results of the One-Way Anova test. The results of the One-Way Anova parametric test showed p<0.05 so that there was a significant difference in the number of macrophages between the three research groups. This shows that the application of kaping pulp medicament has an effect on reducing macrophage formation in reversible pulpitis. The results of the analysis of the intergroup macrophage difference test (LSD) in the duck eggshell nanohydroxyapatite group rats and calcium hydroxide group rats showed significant differences between the two.

This is because duck eggshell nanohydroxyapatite and calcium hydroxide can both stimulate macrophage formation, but macrophage formation by calcium hydroxide has the disadvantage that the reparative dentin structure in calcium hydroxide is porous due to bacterial microleakage. This can stimulate pulp inflammation and can reduce the area of macrophage formation. The weakness of Calcium Hydroxide can result in tunnel defects, medicaments become easily dissolved in saliva, long-term degradation.[2] Calcium hydroxide has the ability to induce dentinal bridge formation through *undifferential mesenchymal cell differentiation*, but the dentinal bridge formed by calcium hydroxide is still imperfect. This is because calcium hydroxide dentinal bridges tend to be porous or called tunnel defects because calcium hydroxide has a weak bond with the dentin surface known as microleage.[9]

The choice of pulp capping medicament needs to be well considered. One of the factors that affect the success of pulp capping treatment is that the biomaterial must have high biocompatibility, can prevent microleakage by attaching to dentin, and can support the formation of dentin bridges. Based on research conducted by Hanafi, 2021, the use of nanoparticles has advantages, namely in the form of increased absorption and increased stability. Nanohydroxyapatite has excellent biocompatibility with human bone and tooth structures. Nanohydroxyapatite also contains molecules that have properties identical to dentin and human enamel.[4] Duck eggshell nanohydroxyapatite also contains calcium phosphate derived from duck eggshells. Calcium phosphate can play a role to stimulate the differentiation of *stem* cells into odontoblast cells and to increase dentin regeneration so as to produce reparative dentin to protect the pulp from the re-entry of irritants, so that pulp inflammation can subside, nanohydroxyapatite also contains calcium carbonate which can reduce inflammation.[10]

The difference in the number of macrophages that is not significant between Nanohydroxyapatite and Calcium Hydroxide can be caused by a lack of consistency in research procedures, one of which is the lack of consistency in the size of the cavities when the teeth are prepared. This can certainly affect the results, because the larger the exposed pulp area, the longer the pulp healing time required. The ability of duck eggshell nanohydroxyapatite which contains calcium phosphate, and has good biocompatibility makes this medicament able to reduce the number of macrophage cells.[11]

CONCLUSION

The research that has been done results in the conclusion that duck eggshell nanohydroxyapatite medicament reduces the number of macrophages in reversible pulpitis more than calcium hydroxide medicament. Based on the research that has been done, there are several suggestions, namely the need for further research related to the most effective dose of duck eggshell nanohydroxyapatite used as a pulp capping medicament on macrophage formation. Further research also needs to be done to determine the peak time of macrophage formation in

Table 3. ***Levene's Test*** **Results**

Leven Test	Sig
0.469	0.631

Table 4. ***One Way*** **Anova Test Results**

Group	Sig
No Medicines Calcium Hydroxide Nanohydroxyapatite	0.002

Table 5. **LSD test (*Least Significane Different*)**

	Without medication	Calcium Hydroxide	Nanohydroxyaptites
No Medicines	-	0.036*	0.001*
Calcium Hydroxide	0.036*	-	0.76
Nanohydroxyapatite	0.001*	0.076	-

the pulp that is applied with kaping pulp medication during the 7-day time span.

CONFLICT OF INTEREST

None declared.

ETHICAL CLEARANCE

Ethics from RS Dr. MOEWARDI File no: 440/III/HREC/2023.

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AUTHORS CONTRIBUTION

Study conception and design : Cahyani Cahyani. Data collection : Cahyani Cahyani, Marsela Valiadanti Nugraha. Analysis and interpretation of result: Marsela Valiadanti Nugraha. Draft manuscript preparation : Cahyani Cahyani, Marsela Valiadanti Nugraha.

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Effect calcium hydroxide on TGF-β expression in reversible pulpitis (in vivo)

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ABSTRACT

Introduction: Calcium hydroxide is the gold standard material for the treatment of pulp caps. Calcium hydroxide can overcome mild pulpal inflammation (reversible pulpitis) through a healing mechanism. TGF-β1 is a growth hormone that plays a role in it. This study aims to identify the effect of calcium hydroxide as a direct pulp capping medicament on TGF-β1 expression in reversible pulpitis.

Methods: This study was an experimental laboratory research, that 18 Sprague Dawley Rats involved three groups of samples, comprising healthy rats, rats with reversible pulpitis, and rats with reversible pulpitis treated with calcium hydroxide. Measurement of TGF-β1 expression using Enzyme linked immunosorbent assay (ELISA). Data was analyzed with statistical analysis using one-way ANOVA (SPSS IBM) with level of confidence $p<0.05$.

Results: The one-way ANOVA test obtained $p=0.011$ ($p<0.05$). This means that there is a significant difference. Calcium hydroxide can improve TGF-β1 expression.

Conclusion: Calcium hydroxide can improve TGF-β1 expression.

Keywords: Calcium hydroxide, TGF-β1 expression, pulpitis reversible.

INTRODUCTION

Taking care of dental and oral health is an integral part of overall well-being, and special attention needs to be given to dental and oral care.[1] Pulpitis is an inflammatory disease of the dental pulp that occurs due to an inflammatory response originating from iatrogenic factors, microorganisms, dental trauma, mechanical and chemical.[2] External stimulus is one of them, this stimulus is closely related to dentin permeability. Typically, enamel and cementum serve as an impermeable barrier, covering the dentinal tubules, but when an iatrogenic error breaks through the barrier, the dentinal tubules become permeable, and fluid moves from the exposed dentinal tubules to the pulp chamber, this will indirectly cause pain sensation in the pulp.[3] Therefore, an effort that can be made to prevent the occurrence of pulp inflammation due to iatrogenic errors is by direct pulp capping treatment. Direct pulp capping is a procedure conducted when the pulp is exposed due to iatrogenic factors, leading to perforation of the pulp tissue.[4] Pulp cap treatment is carried out by placing medicament material capable of being a barrier over the pulp tissue. This can suppress the inflammatory process and minimize the contact of the pulp tissue with external environmental stimuli as well as assist in the formation of reparative dentin which is the main goal in pulp treatment.[5] The medicament material that is often used in the treatment of pulp capping is Calcium Hydroxide $Ca(OH)_2$.[6] Calcium hydroxide is the gold standard material for the treatment of pulp caps. Calcium hydroxide can overcome mild pulpal inflammation (reversible pulpitis) through a healing mechanismTransforming Growth Factor β1 (TGF-β1) is a growth factor categorized among those influencing proliferation, migration, and differentiation in pulp cells.[7] This study aims to assess the impact of calcium hydroxide, used as a direct pulp-capping medicament, on the expression of TGF-β1 in reversible pulpitis.

METHODS

This study was an experimental laboratory research and used 18 Sprague Dawley Rats. The first step in the treatment of the teeth of experimental animals is to model reversible pulpitis. The maxillary first molars were prepared using a high-speed handpiece equipped with a fissure diamond bur, starting at the occlusal position of the tooth, was drilled in a direction perpendicular to the axis of the tooth to a depth of 1 mm with a diameter of 2 mm to a thin layer above the roof of the pulp and a perforation was made using a probe. Check the depth of burial using a size 10 K file. The bleeding area of the cavity was cleaned using a cotton pellet and irrigated with saline solution, then dried with sterile dry cotton. Furthermore, the rats were given treatment according to each group. Where group1 (healthy rats), group2 (reversible pulpitis rats) Group3 (reversible pulpitis added with $(Ca(OH)_2)$. The expression of TGF-β1 was measured using Enzyme-linked immunosorbent assay (ELISA). Data was analyzed with statistical analysis using one-way ANOVA (SPSS IBM) with the level of confidence $p<0.05$.

RESULTS

Based on the result of the ELISA value, the average value of the TGF-β1 is in Figure 1. Figure 1 shows the mean and standard deviation in each group of mice. It showed that in group 3 there was the highest value of TGF-β1expression and in group 2 was the lowest value of TGF-β1expression.

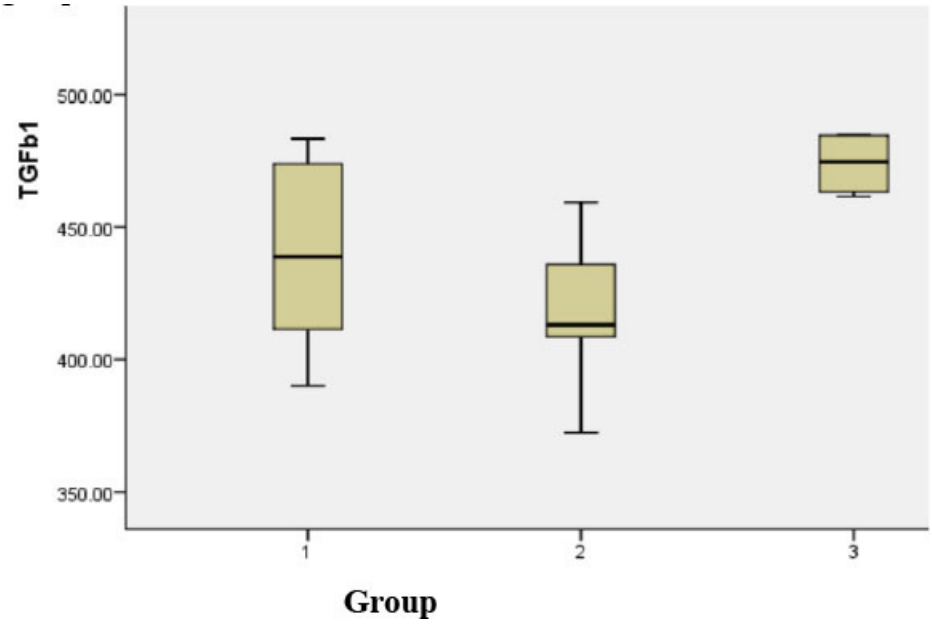

Figure 1. Boxplots mean and standard deviation for TGF-β1 expression.

Table 1. Post-hoc LSD for TGF-β1 expression

Group	Sig.
1-2	0.299
1-3	0.032*
2-3	0.004*

The data obtained by the Shapiro-Wilk test obtained each of the p >0.05 so it had normally distributed data. The Levene's test results with a p-value of 0.891 (>0.05) indicate that the data exhibits homogeneity of variances. Given this, a One-Way ANOVA parametric test can be performed on the data. The one-way ANOVA test obtained p=0.011 (p<0.05) that there were significant differences between the treatment groups. It was continued with the post-hoc Least Significant Difference that is shown in Table 1. Table 1 showed that the analysis revealed a significant difference between Group 1 and Group 3, as well as between Group 2 and Group 3. This suggests that there are notable distinctions in the measured parameter between these groups.

DISCUSSION

The effect of calcium hydroxide is that it has antiseptic properties because it has a high pH. The elevated pH of calcium hydroxide is documented to facilitate the release of proteins and growth factors, including TGF-β1, which serve as mediators in the formation of odontoblast-like cells. This mechanism underscores the potential impact of calcium hydroxide on cellular responses within the dental pulp.[8] Another chemical effect that calcium hydroxide has is that it can inhibit DNA replication by cleaving and killing infection-causing bacteria by hydrolyzing bacterial lipopolysaccharide (LPS).[9] The utilization of calcium hydroxide is anticipated to stimulate a rise in the population of progenitor cells. These progenitor cells play a crucial role in triggering an elevation in transforming growth factor beta 1 (TGF-β1), marking the initial phase of generating odontoblast-like cells derived from undifferentiated mesenchymal dental papillae cells.[10] TGF- can act as a building block for the formation of reparative dentin through a fibronectin matrix.[11]

CONCLUSION

Calcium hydroxide can improve TGF-β1 expression.

ETHICAL CLEARANCE

This research has received ethical approval from the Health Research Ethics Commission, Faculty of Medicine, Universitas Muhammadiyah Surakarta, under the reference number 3642/A.1/KEPK-FKUMS/VIII/.

CONFLICT OF INTEREST

None declared.

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AUTHORS CONTRIBUTION

Study conception and design conducted by Noor Hafida Widyastuti and Adi Prayitno. Data collection performed by Noor Hafida Widyastuti and Risya Cilmiaty. Analysis and interpretation of result done by Noor Hafida Widyastuti and Brian Wasita. Draft manuscript preparation by Noor Hafida Widyastuti, Adi Prayitno, Risya Cilmiaty, and Brian Wasita.

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Management of pulp stone in maxillary left molars with ultrasonic: A case report

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ABSTRACT

Introduction: Pulp stone is a calcified nodular mass that can be found in one or both parts or root canals. Pulp stones found at the bottom of the pulp chamber and root canals are a dentist's challenge. Root canal treatment using ultrasonic can be the treatment of choice in cases of pulp abnormalities with pulp stones.
Case Illustration: A female patient, aged 24, presented at the dental clinic. Conservation Specialist Clinic at RSKGM FKG UI. In tooth 26, there was an irregularly shaped attached pulp stone and patch to the floor of the pulp chamber and covering the orifice of the root canal.
Conclusion: The removal of pulp stones in endodontic treatment is a challenge for dentists. The use of an ultrasonic tip supported by a DOM magnifier can increase the success in the management of this case.

Keywords: pulp stone, root canal treatment, dental operating microscope, ultrasonic tip.

INTRODUCTION

A critical component for the achievement of successful endodontic therapy involves the implementation of key procedural steps facilitating entry to the pulp chamber and the root canal system involves the preparatory steps in endodontic procedures. Furthermore, a properly designed access cavity enables various procedures, including localization, measurement, chemo-mechanical preparation, and obturation to be performed successfully. Inadequate cavity preparation can hinder root canal treatment and can result in instrument fracture, anatomical deviations from the original root canal path and other iatrogenic issues can also occur. In such cases, infection may persist or treatment may fail. In carrying out the preparation tooth access with complex root anatomy, such as calcified root canals or calcified pulp, will be difficult to completely disinfect.[1]

A pulp stone is a calcified nodular mass that can be found in one or both parts or root canals. Pulp stones located at the base of the pulp chamber and within the root canals are a dentist's challenge. Root canal treatment using ultrasonic, in certain cases, it may be considered the preferred treatment option of pulp abnormalities with pulp stones.[1]

CASE ILLUSTRATION

A 24-year-old female patient came to the Dental Conservation Specialist Clinic at RSKGM FKG UI with complaints of discomfort in the left upper back tooth. The tooth was restored several years ago. The diagnosis of tooth 26 according to the American Association of Endodontists (AAE) is Chronic Apical Periodontitis caused by Pulp Necrosis with the treatment plan for tooth 26 is Non Vital Root Canal Treatment. In tooth 26, there was an irregularly shaped of attached pulp stone and patch to the floor of the pulp chamber and covering the orifice of the root canal, causing difficulty when exploring the root canal. Therefore, root canal treatment was carried out under a magnified Dental Operating Microscope (DOM) with a special ultrasonic tip (ET18D, Acteon® Satelec) to prepare pulp stones at the bottom of the pulp chamber.

DISCUSSION

A pulp stone is a calcified nodular mass that appears in one or both coronal portions or a root canal.[1] The dimensions of a pulp stone or denticle can exhibit variability, ranging from minuscule particles to more substantial masses and appearing on radiography as a dense radiopaque mass.[1,2] While the complete etiology of pulpal calcification remains not fully elucidated, potential contributing factors may include the patient's sex and age, systemic disorders, as well as prolonged irritants like deep caries and extensive restorations.[1–4]

Root canal therapy with pulp stone is a challenge when determining the location of the orifice. Extracting pulp stones from the pulp chamber is a challenging and time-intensive procedure, necessitating not only skill but also appropriate equipment and magnification.[3,5] Currently, the main method of treating root canal calcification is proper pre-operative dental radiography, fine magnification (DOM), instruments such as C+ files, and endodontically tipped ultrasonic equipment.[3,6] Pulp stone removal from the pulp chamber in this case reported with an endodontically tipped ultrasonic device.[3,4,7] Endosurgery serves as an alternative treatment in cases of failure with conventional endodontic approaches.[8]

CONCLUSION

The removal of pulp stones in endodontic treatment is a challenge for dentists. In addition, the use of magnification such as DOM helps the clinician in seeing into the pulp chamber. Complications such as Perforation or weakening of teeth can occur as a result of the excessive removal

of tooth structure when removing pulp stones with an ultrasonic scaler and DOM can be avoided. In essence, a comprehensive understanding of root canal morphology, utilization of a suitable armamentarium, and proficient operator skills are imperative for achieving success in the procedure of pulp stone extraction.

CONFLICT OF INTEREST

The authors assert the absence of any conflicts of interest.

ETHICAL CONSIDERATION

Approval from the ethics committee and informed consent from participants were obtained.

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AUTHORS CONTRIBUTION

All authors contributed to this paper; AF – performed the treatments and wrote the reports; DN – review and supervision.

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Identification of second mesiobuccal canal in maxillary first molar using dental microscope and ultrasonic

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ABSTRACT

Introduction: Successful endodontic intervention necessitates of pulp chamber and root canal anatomy variations. Maxillary first molars are known to have wide variations in the number of canals, especially the presence of the second mesiobuccal canal (MB2). This case report aims to present the identification of the utilizing a dental microscope to identify the MB2 canal in a maxillary 1st molar and ultrasonic.

Case Illustration: A 26-year-old male patient complained of discomfort while eating in his maxillary left first molar. Clinical and radiographic assessments led to a diagnosis of pulp necrosis with symptomatic apical periodontitis and endodontic therapy was planned. During access cavity preparation, 3 orifices were detected: mesiobuccal, distobuccal and palatal. The MB2 was identified using dental microscope and ultrasonic tip. It was located approximately 2-3 mm mesial and palatal to the MB1 orifice.

Conclusion: The use of dental microscope and ultrasonic tip demonstrates superior visualization and unhindered visual contact with the operative field, ensuring accurate procedural performance without instrument obstruction. This combination enables greater safety and control during dentin tissue removal.

Keywords: Maxillary first molar, second mesiobuccal canal, dental microscope, ultrasonic.

INTRODUCTION

A comprehensive understanding of both the pulp chamber and root canal structure constitutes a fundamental prerequisite for the successful implementation of endodontic treatment.[1,2] The root canal anatomy of the maxillary first molars is documented to exhibit elevated complexity and variations.[3,4] In general, these teeth have three roots: mesiobuccal, distobuccal, and palatal. The root canal situated in the mesiobuccal aspect of the maxillary first molar has a variety of configurations that can form a second root canal, called the second mesiobuccal canal (MB2).[5,6] Al-Habib et al. (2021) stated that anatomical studies reported the prevalence ofMB2 canals in maxillary first molars ranging from 69% to 95%.[7]

Determining the quantity and placement of orifices on the floors of pulp chambers poses challenges, particularly in cases where the treated tooth is extensively restored, malpositioned, or exhibits calcification.[8] The search for root canal orifices can be achieved following the Krasner and Rankow's Laws of Pulp Chamber Anatomy and utilize various strategies starting with a good understanding of anatomy, findings from radiographic or CBCT images, visualization with magnification and illumination, ultrasonics, and other testing methods that can be performed in the searching for root canal orifices.[8,9] Some clinical instruments can greatly improve visualization to locate the MB2 canal,in this case dental microscopes and ultrasonic tips are considered the most helpful tools to locate the additional canal.[10–12]

The presence of MB2 canals has been associated with the high failure rate of endodontic treatment in maxillary first molars due to the missed or untreated canal during treatment, with prevalence ranging from 46% to 78%.[7,13] Therefore, when treating the maxillary first molar, it is recommended to locate the MB2 canal orifice, especially if there are clinical or radiographic findings indicating its presence, and to perform the procedure with the appropriate tools. This case report aimed to report the identification of second mesiobuccal canal in maxillary first molar using dental microscope and ultrasonic.

CASE ILLUSTRATION

A 26-year-old male patient came with report of discomfort in the maxillary left 1st molar that had been filled, but felt uncomfortable when eating. Clinical examination showed a tooth-coloured filling in the occlusal part with inadequate condition, no response on the vitality test and tenderness on percussion. Radiographic examination showed a radiopaque image on the crown that extended to 1/3 of the pulp chamber, and there was widening of the periodontal ligament and disconnection of the lamina dura at the 1/3 apical of the root.

Upon consideration of these findings, a diagnosis of pulp necrosis accompanied by symptomatic apical periodontitis was rendered, leading to the formulation of a planned endodontic therapy. After access opening was obtained, 3 orifices were detected: mesiobuccal (MB1), distobuccal and palatal. Working length radiograph suggests an additional canal

in the mesiobuccal root, possibly the MB2 canal. MB2 orifices identified with ET BD ultrasonic tip (Satelec Acteon, France) and dental microscope magnification (Opmi PICO, Zeiss, Germany). Ultrasonic tips carefully explored the dentinal shelf using light and controlled movements along the pulp chamber floor towards the mesial and palatal direction of the MB1 orifice. The orifice of the MB2 was discovered, located approximately 2-3 mm mesial and palatal to the MB1 orifice. The MB2 orifice was then explored with K-File #10 (M-access, Dentsply), the working length confirmed using apex locator (Propex Pixy, Dentsply) and radiographic imaging. All of the canals were prepared with ProtaperGold rotary files (Dentsply-Maillefer) and were copiously irrigated with 2,5% sodium hypochlorite (NaOCl) and 17% ethylenediaminetetraacetic acid (EDTA). Calcium hydroxide paste was used as intracanal medicament and the tooth filled with temporary restoration. Later, all the canals were obturated with resin-based sealer (AH Plus) using warm vertical compaction technique. Patient was asymptomatic on recall after one week, and the final restoration was performed using fiber post and core with metal porcelain crown.

DISCUSSION

It is well-established that addressing furcation involvement in multirooted teeth constitutes a crucial aspect and a noteworthy challenge within the domain of periodontal therapy.[14] Maxillary first molar has a complex root anatomy, with a relatively high prevalence of the presence of an additional root canal, MB2, as reported in various literature sources.[1,6,15] Finding the MB2 orifices can be challenging as in this case, where dentin deposition occurs at the root canal orifice.[8,16] The use of a dental microscope helps in magnifying and illuminating the working area where dentin removal will be performed to find the hidden orifices.[10–12] The ultrasonic instrument tip is highly beneficial in the dentin removal process, as they provide good visualization where the handpiece head does not obstruct the view of the working area. Moreover, this instrument allows for controlled removal of dentin and calcifications, ensuring a more conservative preparation approach.[11,12,17]

It is crucial to preserve as much dentin as possible during the search for the MB2 orifice, as the mesial wall and pulp chamber floor are susceptible to perforation.[17] The use of a low-speed bur can also be used in orifice search, one drawback is that the operator's visualization may be hindered by the head of the handpiece.[11,12] According to the literature, using an ultrasonic instrument tip is highly effective because dentin removal occurs in a much less invasive manner compared to using burs.[11,12] With the discovery of the MB2 canal, debridement and disinfection procedure of the entire root canal system can be performed. This is done to prevent cases of retreatment due to untreated or missed canal in the future.[7,13]

CONCLUSION

The high prevalence of MB2 canals in maxillary first molars indicates the need to locate these additional canals in order to achieve the ultimate objective of endodontic therapy, which is successful treatment through elimination of the infection zone from the entire root canal. Dental microscope and ultrasonic technology have proven to be very helpful in locating the orifices of additional canals in maxillary first molar effectively. The amalgamation of these tools yields effective visualization through magnification, ensuring unobstructed visual access to the operative field throughout the procedure. This combination enhances safety and control in the removal of dentin tissue.

CONFLICT OF INTEREST

There is nothing to be declared.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Informed written consent was obtained from the patient for publication of this report.

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AUTHORS CONTRIBUTION

All authors contributed to this paper; AHM – performed the treatments and wrote the report; RM – review and supervision.

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CAD/CAM ceramic overlay with fiber-reinforced biobase for endodontic treated tooth: A case report

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ABSTRACT

Introduction: Cuspal coverage is often recommended for endodontic treated teeth to provide structural support and prevent fracture. CAD/CAM Ceramic with fiber-reinforced biobase for cuspal coverage restoration can maintain remaining tooth structure and increase fracture resistance. This study aims to evaluate indirect restoration with CAD/CAM ceramic with fiber- reinforced biobase in the upper right premolar tooth after root canal treatment at 6 months follow up

Case Illustration: Woman patient aged 35 years came to RSGM UGM Prof Soedomo due to pain on baiting in her upper right premolar tooth (15). The tooth has been endodontic treated about 1 year ago. Tooth are sensitive to percussion tests and mobility is normal. On the radiograph, there was a radiopaque filling to the pulp, non-hermetic obturation and apical radiolucency. From clinical examination obtained previously treated, symptomatic apical periodontitis. A one-session endodontic retreatment was conducted, subsequently strengthened with a biobase containing fibers. This was followed by intraoral scanning and the application of a CAD/CAM ceramic overlay to ensure coverage for the cusps.

Conclusion: Endodontic treated tooth that was restored with CAD/CAM ceramic overlay with fiber-reinforced biobase obtained good results at 6 months follow up.

Keywords: biobase, CAD/CAM, endodontic treated tooth, fiber-reinforced, overlay.

INTRODUCTION

Most endodontic treated teeth have been structurally compromised by caries, trauma, large restoration, access preparation and subsequent restorative procedures, leading to further weakening of tooth.[1,2] Cuspal coverage is often recommended for endodontic treated teeth to provide structural support and prevent fracture. The restorative procedures applied to endodontically treated teeth (ETT) aim to achieve three primary objectives: (1) safeguard the remaining tooth from fractures, (2) forestall the recurrence of infection within the root canal system, and (3) substitute the absent tooth structure.[3] While the success rate of root canal treatment remains high, inadequate coronal restoration can lead to the extraction of endodontically treated teeth (ETT). Notably, 59.4% of ETT failures are attributed to suboptimal coronal restoration, whereas only 8.6% result from inadequacies in the quality of the endodontic treatment itself.[4]

As an alternative of full crown restoration, the application of adhesively cemented ceramic overlay restorations has been employed to reduce the extent of removal of the existing tooth structure.[5] Cusp overlay can offer enhanced resistance to fracture in comparison to directly placed adhesive restorations, which increases the durability of the root-filled tooth after restoration.[3,5] There has been a transition from the conventional manual layering technique to the utilization of computer-aided design and computer-aided manufacturing (CAD/CAM Ceramic) technology.[5,6] Moreover, recent research indicates that employing ceramic blocks produced through a CAD/CAM system yields superior internal adaptation compared to the utilization of composite resin blocks.[5,6,7] This next generation ceramic is formulated from lithium disilicate crystals (IPS e.max CAD/CAM) is a chemical compound of glass ceramic, this material provides elevated strength, exceptional fracture toughness, and a notable degree of translucency. The physical characteristics of these materials have advanced to a degree where they can endure high-stress situations, such as posterior restorations in ETT.[7,8] Nevertheless, these restorations exhibit notable drawbacks, including the potential for brittle catastrophic tooth fractures and wear on opposing teeth.[2,7]

Endodontic access cavity need the removal of the dentin roof may contribute to an increased susceptibility to fractures under occlusal forces in premolar and molar teeth.[1,2] Therefore, the substitute for dentin in endodontically treated teeth (ETT) should possess mechanical properties comparable to natural dentin, and adhesive protocols need to be optimized to minimize the stress induced during the polymerization process known as Biobase.[9,10] One of these protocols incorporates polyethylene fibers, extensively investigated for their application in both vital and non-vital teeth, with a particular emphasis on in vitro studies.[9,10] Short fiber-reinforced composite (FRC) could serve as a suitable material for addressing the loss of dentin, given its ability to replicate dentin's stress absorption capacity, hinder crack initiation and propagation, and potentially mitigate the risk of fractures.[2,7,9] This study aims to evaluate indirect restoration with CAD/CAM ceramic with fiber-reinforced biobase in the upper right premolar tooth after root canal retreatment at 6 months follow up.

Figure 1. (A) Pre-operative clinical picture show old restoration leakage; (B) Radiographic showing periapical radiolucency; (C) Clinical view after obturation; (D) Application of ribbond fiber and Ever X posterior; (E) Clinial view of biobase; (F) Radiographic showing hermetic root canal filling and homogenous coronal seal biobase tooth 15.

Figure 2. (A) 3D overlay design tooth 15; (B) 3D-printed CAD/CAM IPS e.max ; (C) Clinical view cementation with pre-heated packable composite; (D) Clinical view post-op cementation from occlusal; (E) Clinical view post-op cementation from buccal; (F) Post-overlay cementation radiograph.

Figure 3. 6 months follow up tooth 15 (A) Clinical view from occlusal; (B) Clinical view from buccal; (C) Radiographic showing apical healing and no coronal lekeage.

CASE ILLUSTRATION

Woman patient aged 35 years came to RSGM UGM Prof Soedomo due to pain on baiting in her upper right premolar tooth (15). The tooth has been endodontic treated about 1 year ago. Tooth are sensitive to percussion tests and mobility is normal. On the radiograph, there was a radiopaque filling to the pulp, non-hermetic obturation and apical radiolucency. From clinical examination obtained previously treated, symptomatic apical periodontitis. A one-session endodontic retreatment was conducted, subsequently strengthened with a biobase containing fibers. This was followed by intraoral scanning and the application of a CAD/CAM ceramic overlay to ensure coverage for the cusps.

DISCUSSION

The CAD/CAM system employed in this study facilitated the completion of both endodontic and restorative treatments within a single session by minimizing the time needed for the fabrication of indirect restorations. Furthermore, CAD/CAM-based indirect restorations have demonstrated an enhanced initial marginal adaptation and a more secure coronal seal attributed to the low polymerization stress within the restoration and dental structure.[5] CAD/CAM ceramic overlay obtained good results at 6 months follow up in this study. The clinical evaluation indicated acceptability in terms of marginal discoloration, occurrence of secondary caries. The diseases implicated the roots or furcation, rendering conventional single-root canal treatment impractical.[11]

The clinical efficacy of all-ceramic restoration affixed with adhesive cementation restorations has predominantly been investigated within the context of short-term ceramic observations have been more prevalent, with only a limited number of studies extending beyond 7 years. The success rate followed a 10-year clinical monitoring of Cerec-1 CAD-CAM inlays and onlays. crafted from Vita MK I feldspathic ceramic revealed a 5% incidence of failure and a 90.4% rate of success.[12] In the meta-analysis study, the projected survival rate was 95% over a 5-year follow-up period, and it diminished to 91% after a 10-year follow-up (93% for glass-ceramics and 91% for feldspathic porcelain), although this disparity did not attain statistical significance. The probability of failure was 80% lower in vital teeth compared to endodontically treated teeth, underscoring the substantial influence of tooth vitality on restoration survival.[13] The primary clinical complications leading to failure in all-ceramic restorations include ceramic fractures and restoration decementation. In a study by Guess et al., a 100% survival rate was reported for IPS e.max Press, and a 97% survival rate was documented for CAD-CAM partial crown restorations during a specified duration of 7-year period.[13]

The restoration of the biomechanical behavior of endodontically treated teeth (ETT) through restorative procedures remains a multifaceted challenge within contemporary adhesive restorative dentistry. In this investigation, adhesively cemented ceramic overlay restoration was employed to mitigate the extent of removal of the residual tooth structure. Conserving intact tooth structure through contemporary adhesive partial restorations (extension preservation) is favored over the conventional approach of Reducing tooth structure for the placement of full crowns (extension for prevention) improve prognosis for ETT.[14,15] A biobase in this study was created with Leno weaved ultra-high-molecular-weight polyethylene (LWUHMWPE) ribbond fiber on the base in a palatal-buccal direction, Establishing a connection from the Palatal cusp connected to the pulpal chamber floor aims to diminish the stress induced by Polymerization shrinkage within the hybrid layer, thereby enhancing bond strength and increase in fracture strength of ETT, as related in some in vitro studies.[10,16-18] The substitution of dentin with a short fiber-reinforced composite (SFRC) has demonstrated notable enhancements in the load-bearing capacity, flexural strength, and fracture resistance of SFRC in comparison to conventional particulate filler composite resin.[7,9,19] The role of SRFC is predicated on biobase and acting as a crack stopping layer, superior load-bearing capacity and a favorable fracture pattern.[7] Opting for a preheated traditional light-polymerizing composite resin as a luting agent offers superior mechanical properties attributable to its increased filler content and a higher degree of conversion (ranging from 50% to 70%, in contrast to composite polymerization at room temperature).[20]

CONCLUSION

Advancements in methods of teeth restoration with a minimally invasive approach, preserving the residual tooth structure aiming to reinstate the tooth's original biomechanical behavior. The primary goal of such interventions is to delay the onset of the progressive dental deterioration. Given the introduction of novel materials and techniques, clinicians must exercise caution when adopting protocols without substantial high-level evidence. Consequently, there remains a need for clinical studies to substantiate the efficacy of these novel techniques and the biomimetic methodology tooth restoration. Nevertheless Endodontic treated tooth that was restored with CAD/CAM ceramic overlay with fiber-reinforced biobase obtained good results at 6 months follow up.

CONFLICT OF INTEREST

No conflicts of interest exist regarding the manuscript.

ETHICAL CLEARANCE

Written informed consent was obtained from the patient or legal guardian of the patient. The patient or the legal guardian has given their consent in the form of the images and other clinical information to be published in the journal. They understand that their names and initials will not be published.

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None.

AUTHORS CONTRIBUTION

The author contributed to the study by selecting relevant cases, determining the treatment administered to the patient, and evaluating and overseeing the outcomes following the endodontic and restorative procedures for the upper right premolar tooth.

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Management of traumatic intrusion of fractured maxillary right central incisor: A case report

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ABSTRACT

Introduction: Traumatic dental injuries of anterior teeth are commonly found in dental practice. One of them is traumatic intrusive luxation. It can be treated either by surgical or orthodontic approach. This case report aimed to evaluate whether the application of orthodontic extrusion effective treatment for this case.
Case Illustration: An 11-year-old girl came to restore her tooth due to trauma when playing with her sister a week ago. It was asymptomatic, but the patient was concerned about her fractured, intruded incisor. The diagnosis of maxillary right central incisor was fracture Ellis class III. The orthodontic intrusion was done since the incisor intruded below the adjacent cervical line, followed with root canal treatment. Apexification was done with an MTA plug and followed with fiber-reinforced composite post. Final restoration of this case was direct composite resin. A month's follow-up showed the maxillary right central incisor was asymptomatic and the degree of mobility was physiologically normal (1 mm).
Conclusion: Orthodontic extrusion was the appropriate treatment of choice in case of the intruded maxillary right central incisor. Orthodontic extrusion not only repositioned the fractured tooth but also facilitated an optimal outcome for restoration. Further long-term follow-ups (6 months, 1 year, and 5 years) are needed to evaluate long-term success and potential complications.

Keywords: Traumatic, orthodontic extrusion, fracture, incisor.

INTRODUCTION

Dental trauma (traumatic dental injury) is an impact injury to the teeth and/or other hard and soft tissues within and around the vicinity of the mouth and oral cavity.[1] One of them is traumatic intrusive luxation.[2] This case report aimed to evaluate whether the application of orthodontic extrusion effective treatment for this case.

Figure 1. Initial condition before treatment.

Figure 2. Initial fixed appliance with wire bending apically toward tooth 11.

Figure 3. Fixed appliance with wire that bends coronally away from tooth 11.

CASE ILLUSTRATION

An 11-year-old girl came to restore her tooth due to trauma when playing with her sister a week ago. It was asymptomatic, but the patient was concerned about her fractured, intruded incisor. Diagnosis of the maxillary right central incisor was fracture Ellis class III and uncomplicated crown-root fracture, intrusive luxation (Andreasen) (Figure 1). The treatment planning was orthodontic intrusion since the incisor intruded below adjacent cervical line (< 6 mm), followed by root canal treatment and apexification with MTA plug and followed with fiber reinforced composite post.

The patient was fitted with a fixed orthodontic appliance using the Roth method with a 0.22 slot (Shinye Orthodontics, China). Stainless steel rectangular wire size 016x022 (Dynaflex, Missouri) was used with apical bending to obtain traction with low force. Elastics were attached to the wire and bracket at the maxillary right central incisor (figure 2). Follow-up was done after 1 month.

The next treatment was performed by bending the wire in the coronal direction (figure 3). This was done to obtain a greater traction force to accelerate repositioning, as replacement resorption that had already occurred (figure 4). Follow-up was carried out again after 1 month.

At the next appointment, the position of tooth 11 was close to or almost the

Figure 4. Mild root resorption was begun on tooth 11 after 1 month follow-up.


Figure 5. MTA as apical barrier before gutta percha obturation.

Figure 6. Second attempt of orthodontic extrusion.

Figure 7. Clinical result after 3 months follow-up.

Figure 8. The width proportion of tooth 11.


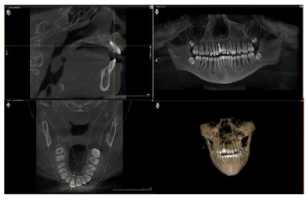

Figure 9. Root resorption in the apical area of tooth 11.

same as the CEJ position of tooth 21. Root canal treatment of tooth 11 was performed with apexification using MTA (BioMTA, Cerkamed) (Figure 5). Isolation of root canal treatment was done with a rubber dam. Root canal preparation using a crown-down technique with a Protaper Gold system (Dentsply, Maillefer). Obturation using Warm Vertical Compaction with AH Plus Bioceramic (Dentsply, Maillefer). Restoration treatment was not carried out because there was a degree of tooth mobility of 2 mm. The Planning of restoration would be carried out at the next follow-up.

Two weeks after the previous treatment showed that the position of tooth 11 relapsed apically (Figure 6). A second attempt of using fixed orthodontic extrusion was carried out again to get the same position as tooth 21.

The follow-up after 3 months indicated that tooth 11 was in the same position as tooth 21 (figure 7). The degree of mobility was normal at 1 mm and relatively the same compared to tooth 21. Treatment continued with fiber post treatment (Vivadent, GuangZhou) followed by direct resin composite restoration. The width proportion of tooth 11 was intentionally widened to prevent relapse of tooth 11 apically (figure 8).

The last follow-up after one month showed that the position of tooth 11 relapsed and CBCT results showed the position of tooth 11 was more labial than the normal tooth axis compared to tooth 21. Root resorption in the apical area of tooth 11 did not occur (figure 9). The patient did not continue treatment because the long treatment made the patient bored and was satisfied with the current tooth position.

DISCUSSION

The prognosis of traumatic intrusion cases is usually influenced by several variables, such as the severity of the intrusion, the stage of tooth root development, the type of fracture involved and the treatment method of choice. Intrusions of more than 8 mm are severe with an unfavorable prognosis for long-term evaluation. Treatment outcomes of pulp necrosis and external root resorption are common in severe cases. In severe cases, a surgical approach is recommended.[3] In this case, the severe degree is 8 mm intrusion with crown and root fracture. However, consideration of the patient's preference and still allowing the labial part of tooth 11 to be installed with an ortho appliance is a consideration for treatment with orthodontic extrusion.

The advantages of orthodontic extrusion are minimally invasive treatment, no bone and periodontal tissue loss, simple and predictable technique, and a better crown/root ratio than surgical crown lengthening. While the disadvantages of orthodontic extrusion are extended treatment time, poor oral hygiene due to appliance installation (requires high cooperation and motivation from the patient), aesthetic problems due to appliance installation, and frequent follow-up for fiberotomy of connective tissue.[4]

Recommended orthodontic extrusion is 1-2 mm movement per month. The recommended force for anterior teeth is 5 grams. Treatment is recommended to use a low force (0.2-0.3 N), and then use a larger force (>0.6 N).[5,6] In this case, traction was performed with a low force, but the force was increased after the first control there were signs of resorption on the roots of tooth 11.

Once the goal of repositioning with orthodontic extrusion has been achieved, stabilization is required for bone, periodontal ligament, and gingival maturation. This stabilization is necessary to prevent relapse. There is no consensus on the exact length of time stabilization is required, but some authors mention an average of 6-12 weeks. The longest stabilization phase is about 6 months.[7] In this case, no stabilization phase was performed, but rather modified the proportion of tooth 11 to resist relapse movement. This proved to be insufficient. Stabilization needs to be longer especially in cases with severe traumatic intrusion.

Replacement resorption will also be more common in incisors that have undergone intrusion of 6 mm and incisors that were repositioned with orthodontic extrusion. This is often associated with the incidence of ankylosis in teeth that result in infraocclusion as the jawbone growing.[3]

In this case, treatment was carried out with MTA apexification to prevent external resorption of the tooth root and no resorption has occurred so far. The patient refused to return for follow-up as there were no complaints of pain, but the author is still conducting periodic follow-up for long-term evaluation of this case.

CONCLUSION

Orthodontic extrusion is an appropriate treatment option for cases of intruded maxillary right central incisor. Orthodontic extrusion not only repositions the crown of the broken tooth but also facilitates optimal restoration results. A stabilization phase is required after orthodontic extrusion treatment is completed, to avoid possible relapse. Further long-term follow-up (6 months, 1 year and 5 years) is required to evaluate long-term success and potential complications.

CONFLICT OF INTEREST

There is no competing interest regarding manuscript.

ETHICAL CLEARANCE

Written informed consent was obtained from the patient or legal guardian of the patient. The patient or the legal guardian has given their consent in the form of the images and other clinical information to be published in the journal. They understand that their names and initials will not be published.

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None.

AUTHOR CONTRIBUTION

Pradika Danu Martha: Conceptualization, data collection, clinical management, and manuscript drafting. Yulita Kristanti: Supervision, review and editing final manuscript. Margareta Rinastiti: Review and editing final manuscript.

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Endocrown as restoration of choice for endodontically treated lower first molar with crossbite

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ABSTRACT

Introduction: The cleaning and shaping procedure performed at the beginning of the endodontic treatment procedure aims to eradicate all microorganisms in the root canal and shape the root canal in such a way that it is ready for filling. Coronal sealing also plays an important role in preventing re-contamination of the prepared root canals. The selection of the final restoration for teeth after endodontic treatment needs to consider the remaining hard tooth tissue and occlusal contacts.
Case Illustration: A 60-year-old female patient came to Universitas Gadjah Mada Dental Hospital complained pain in her lower right tooth when chewing hard food. The tooth had root canal treatment 2 weeks before, but the treatment had not been completed. Clinical findings showed that tooth 46 had a disto-occlusal cavity with re-walling on the distal side almost dislodged. Radiographic images show that the tooth has undergone initial therapy with a radiolucent area in the periapical area of both the mesial and distal roots.
Conclusion: The long-term success of root canal treatment is determined by optimal coronal sealing, adequate endodontic triad, and selection of the final restoration.

Keywords: Endocrown, endodontically treated teeth, indirect restoration.

INTRODUCTION

Tooth with previously initiated therapy can cause complaints in patients due to several factors. Postoperative pain can occur for a variety of reasons, including preparation beyond the apical end, incomplete removal of pulp tissue, overextension of root canal filling material, and extrusion of dentin and pulp remnants into the periapical area.[1,2] Several factors such as gender, pulpal and periapical status, preoperative pain, instruments, irrigation and obturation technique may affect postoperative pain.[3]

The likelihood of a good outcome from root canal treatment is much higher if the infection is effectively eradicated before the root canal system is obturated.[4] However, root canals can be at high risk of reinfection if the coronal area is poorly sealed during and after root canal obturation. An article suggests that apart from apical leakage causing endodontic treatment failure, coronal leakage is likely to be the main determinant of clinical success or failure.[5] Rewalling of the proximal walls of class II cavities using bioactive composite resin in the cervical area combined with packable composite resin can ensure adequate coronal seal to prevent re-contamination during root canal treatment procedures.

The final restoration after root canal treatment is as important as the restoration during the treatment. Cuspal coverage with indirect restoration have been reported to improve the outcome of the endodontically treated teeth especially when crossbite is exist.[6] Endocrown is a cuspal coverage restoration relatively more conservative approach to rehabilitate teeth after endodontic treatment. The wide variety of restorative materials available on the market with high physical and aesthetic properties makes it difficult to select a suitable restorative material depending on its biomechanical behaviour. Zirconia is the best material for restorations to maintain complex dental restorations because it can absorb stress and exhibit low displacement within and in the tooth tissue.[7] This article aims to report the success of endodontic treatment for failed therapy through a proximal rewalling procedure to ensure coronal sealing during therapy and zirconia endocrown as a final restoration in a patient with unilateral posterior crossbite.

CASE ILLUSTRATION

A 60-years old female patient came to Universitas Gadjah Mada Dental Hospital with complaints of a cavity in her lower right tooth. The patient admitted that the tooth had undergone root canal treatment outside the city 2-weeks before, but the treatment had not been completed. The patient admitted that the tooth hurt when chewing hard food, however. The patient is under the care of a cardiologist and is taking blood thinning, antihypertensive and antihyperlipidemic drugs. General condition was good. Her face was symmetrical, there were no enlarged lymph nodes. Blood pressure 135/89 mmHg, pulse 69 times/minute, respiration 18 times/minute, body temperature was afebrile. OHI-S were 0.5, occlusion relationship class I Angle malocclusion accompanied by crossbite in the right side. There was no sign of periodontal disease overall.

Figure 1. Right, front and left side occlusion relationship.

Figure 2. Clinical appearance and radiograph finding before treatment.

Figure 3. Clinical appearance of bioactive composite resin placement, packable composite resin placement, endocrown preparation respectively from left to right.

Figure 4. Clinical appearance of endocrown cementation from occlusal, during occlusion and post operative radiograph.

There appears to be a leakage in the proximal wall in 46 (left). The radiograph showed that the intracanal medicament material did not reach the apical area accompanied by lesions in the apical area of the distal root Treatment at the first visit begins with a rewalling procedure using bioactive composite in the 1/3 gingival area followed by placement of packable composite resin. The root canal preparation procedure was carried out with a Progold M3 rotary instrument, followed by placement of medicament with calcigel (Denpro) and a temporary filling. At the second visit, 1 week later, obturation was performed using a single cone technique using ceraceal bioceramic sealer (Metabiomed) and placing flowable composite resin as a base. Endocrown preparation and molding were performed at the same visit. third visit, endocrown cementation was carried out with RelyX U200(3M).

DISCUSSION

The use of bioactive composite resin for rewalling in the gingival 1/3 of the proximal wall can minimize the risk of leakage. Bioactive composite resin allows the release of fluor, calcium and phosphate ions when in contact with the biological environment. The addition of packable composite resin in the middle 1/3 allows good mechanical properties to withstand compressive forces from the occlusal direction.

Endocrown is a full cuspal coverage restoration that is relatively conservative in maintaining sound tooth structure. Endocrown is the recommended restoration for endodontically treated teeth. Retention is better with the presence of restoration parts in the intra-pulpal area.[8] The tooth's fracture resistance is also higher compared to crown restoration with post placement which reduces more sound radicular dentine. It also has no direct effect on the periodontal tissues as the margins are completely far supragingival.[6]

Zirconia is the material of choice for indirect restorations with full cusp coverage including endocrown. Zirconia has high fracture resistance so its use in endocrown restorations can minimize the risk of damage during functional activities.[9] Zirconia-based endocrown restorations might be the best material to preserve the tooth–restoration complex since it absorbs stresses and shows low displacement within it and in the dental tissues.[7]

CONCLUSION

The long-term success of root canal treatment is determined by optimal coronal sealing during treatment and adequate endodontic triad. Selection design and material of the final restoration become a more important factor for durability of post endodontically treated teeth. Zirconia endocrown can be the best choices for endodontically treated teeth with unilateral posterior crossbite.

CONFLICT OF INTEREST

The authors whose names are listed below certify that they have no conflict of interest regarding this article. The patient whose case is listed in this article has provided informed consent. All authors discussed the results and contributed to the final manuscript.

ETHICAL CLEARANCE

Written informed consent was obtained from the patient or legal guardian of the patient. The patient or the legal guardian has given their consent in the form of the images and other clinical information to be published in the journal. They understand that their names and initials will not be published.

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AUTHORS CONTRIBUTION

All authors contributed equally in the preparation of this manuscript.

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Overview of carbonate apatite-gelatin (Ca-Gel) handling property result as a novel scaffold material for endodontic regeneration

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ABSTRACT

Introduction: Endodontic regeneration has been developed to the level where it is possible to revitalize dental pulp, but the quest still revolves around the proper biomaterial that can enhance the process of regeneration. Carbonate Apatite–Gelatin (CA-GEL) is a novel scaffold material for endodontic regeneration, in which the Carbonate Apatite has been proven to be effective as a scaffold for bone regeneration. The addition of Gelatin will enhance collagen regeneration, as the important structure in dental pulp. The purpose of this study was to determine the range of Liquid/Powder (L/P) ratio of Carbonate Apatite–Gelatin (CA-GEL) material for good consistency as a scaffold for endodontic regeneration.
Methods: The type of research used in this study is descriptive quantitative with a cross-sectional approach. Glass ionomer cement (GIC) was used as a comparison for the proper consistency with easy handling result.
Results: The results show that 3 ratio variations mimic the GIC consistency and the closest handling property ratios to GIC are L/P 0.5, L/P 0.8, and L/P 1.0. The ratios that have the flow as close as GIC are L/P 0.8 and L/P 1.0, and were obtained by measurement using the Image-J application.
Conclusion: This study has outlined that CA-GEL has the possibility to be a proper biomaterial for dentistry purposes, and needs to be further studied to be acknowledged as a new novel material for endodontic regeneration.

Keywords: Carbonate apatite, gelatin, handling property, L/P ratio, endodontic regeneration, scaffold.

INTRODUCTION

Inflammation of the pulp tissue is known as pulpitis. Inflammation in pulpitis is usually caused by opportunistic infection of the pulp chamber.[1] Endodontic is the treatment option for pulpal diseases, which leads the pulp to be non vital.[2] Endodontic treatment has now been developed towards treatment with the aim of maintaining pulp vitality, which called endodontic regeneration therapy. Tissue engineering in endodontic regeneration requires three key elements, stem cell, growth factor and scaffold.[3,4] Biomaterials for scaffold can be divided based on their classification, namely natural scaffold, synthetic scaffold, and bioceramics. The biomaterial must be biocompatible, biodegradable, have high porosity and adequate pores.[5] Some biomaterials have been used in vital pulp therapy such as Mineral trioxide aggregate (MTA) and glass ionomer cement (GIC), but they do not have the biodegradable properties.[6]

Collagen as a natural polymer in endodontic regeneration has been shown to be a good material for the induction of new pulp tissues. Gelatin as one of the source for collagen has chemical similarity to the extracellular matrix (ECM) in native tissues, biocompatibility, biodegradability, low antigenicity, cost-effectiveness, and accessible functional groups that allow facile chemical modification with other biomaterials or biomolecules.[7,8] Carbonate Apatite(CA) is a material that is biocompatible and has high osteoconductivity.[9] CA has been shown to be biocompatible, bioactive to stimulate bone regeneration and to adapt well to existing bone structure, which in time degrades and is replaced by new bone formation.[10] CA has the same crystalline and composition as bone, and has been shown to be a substitute for artificial bone.[11] GIC as a dental cement that has been widely used, has been proven to have good mechanical properties. The consistency, strength, and speed of setting time of GIC can be a guidance in developing a new material with good handling properties.

CA and GEL with their promising properties have attracted the researcher to make a further study for their mixture as a new novel material for scaffold. Flowability in dental materials is a manipulative index that must be considered to obtain good consistency for various clinical applications.[12] Handling properties can also be measured using the Image-J application which can determine the particle size of the material. This tool can be accessed on a computer by entering an image of the material to be tested.[13] Based on this, the researcher is interested in conducting a study to overview if the mixture of Carbonate Apatite–Gelatin (CA-GEL) materials have a good consistency to be used as a scaffold for endodontic regeneration.

METHODS

The research method used in this study was descriptive quantitative with a cross-sectional approach. Image analysis stages using the image-j application were used to study CA-GEL mixture by tracing, scanning and measuring, then to be calculated in cm.[13] The data obtained

from the examination were analyzed descriptively, presented on a numerical scale. The results were presented as a data distribution of L/P ratios of consistency close to GIC and the distribution of property handling results.

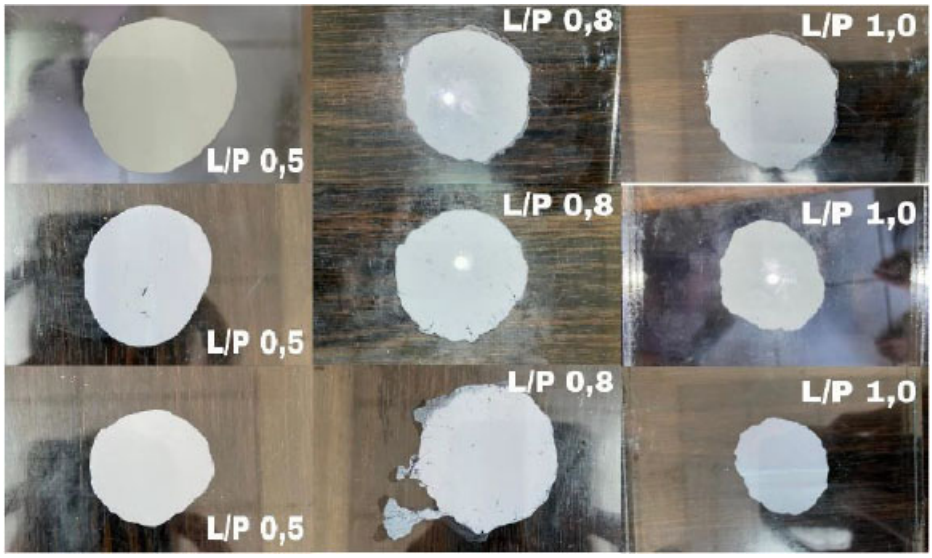
RESULTS

Prior to measuring the area distribution, the consistency of the CA-GEL must be close to the consistency of GIC and 3 L/P ratios were studied to have consistencies close to the GIC. The L/P ratios were L/P 0.5 (L: 0.20 P: 0.4), L/P 0.8 (L: 0.20 P: 0.25), L/P 1 (L: 0.20 P: 0.20) as shown in Table 1. The mixture in each ratio then were given 2 kg load and measured on tracing paper. The results of the traces on the tracing paper were photographed and inputted into the Image-J application, as shown in Figure 1. Based on the results of the study it was concluded that the group whose results were close to the control group was the group with L/P 0.8.

Table1. L/P ratio data distribution

NO	L/P ratio	P (gr)	l (ml)	L(microlite)
1	0.5	0.25	0.125	125
2	0.5	0.3	0.15	150
3	0.5*	0.4	0.20	200
4	0.8*	0.25	0.20	200
5	0.8	0.2	0.16	160
6	0.8	0.3	0.24	240
7	0.8	0.35	0.28	280
8	1*	0.2	0.2	200
9	1	0.25	0.25	250
10	1.5	0.25	0.37	370

(*) Ratio close to GIC consistency



a b c

Figure 1. The process of measuring the distribution of the CA-GEL area in 3 ratio variations *a. CA-GEL ratio withL/P 0.5, b. CA-GEL ratio withL/P 0.8, c. Ratio of CA-GEL to L/P 1.*

DISCUSSION

This research was conducted as a trial to find a concentration of CA-GEL that resembles the consistency of GIC. The consistency of GIC and the liquid that has gelling agent properties makes the GIC similar to the mixture of CA-GEL. Several studies suggest that the addition of materials such as GEL can make a better contribution such as synthetic polymers or bioceramics. So GEL was added to CA in this study. CA is a material that has an important role in the proper functioning of the human body, because CA is a natural inorganic component of human bone tissue.[5]

The results of this study are supported by Artilia, et al. In 2018 stating that handling property interpreted as a material handling procedure to produce consistency.[12] By testing the flowability, the cement paste will spread after being loaded according to the international standard ISO1566 which is used for zinc phosphate cement. Handling properties measured using the Image-J application can determine the particle size of the material. The results of the distribution area obtained showed that the group of L/P 0.8 has the closest to GIC.

Limitations in this study include limited references regarding CA-GEL materials to support the reason for the necessity in examining the handling properties of CA-GEL).

CONCLUSION

The L/P ratios for CA-GEL material that most closely resembles GIC (glass ionomer cement) are the ratio with L/P: 0.5, 0.8, and 1.0. The result of the handling property ratio for CA-GEL material by image analysis using the Image-J application being the closest to GIC is L/P: 0.8. This study has outlined that CA-GEL is a proper biomaterial, and need to be further studied to be acknowledged as a new novel material for endodontic regeneration.

CONFLICT OF INTEREST

None to declare.

FUNDING

None.

ETHICAL CLEARANCE

The ethical clearance is not needed due to the nature of this study. This study only used material for overviewing consistencies and no biological tissue involved.

AUTHORS CONTRIBUTION

All authors contributed equally in the preparation of this manuscript.

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Management of tooth discoloration with internal bleaching on post-traumatic anterior tooth

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ABSTRACT

Introduction: Tooth discoloration can be caused by various etiological factors and locations. Frequent intracoronary discoloration is usually due to trauma, either an accident or a fight. This condition causes the teeth to become non-vital and changes the color of the teeth to become darker. Internal bleaching treatment can provide a brighter tooth color after endodontic treatment is completed on the discolored tooth.

Case Illustration: A 48-year-old woman presented to the Department of Conservative Dentistry, Airlangga University Dental Hospital with a complaint of discoloration of upper anterior teeth compared to the rest of the teeth. The patient had a history of trauma to the anterior teeth about two years ago due to an accident. Intraoral examination revealed discolored maxillary left central incisor, percussion (+), bite test (+), and gingiva around the teeth was normal. An intraoral radiograph showed coronal radiopaque tooth 21 and normal periapical tissue. The diagnosis of tooth 21 was pulp necrosis with normal periapical tissues. Endodontic treatment and in-office bleaching were planned. The final restoration was filled with composite resin material.

Conclusion: The treatment of teeth with discolored cases can be carried out with internal bleaching procedures without having to make dental crowns to restore the original color of the teeth.

Keywords: Discoloration, Root canal treatment, Internal bleaching, Good health and well- being.

INTRODUCTION

Tooth discoloration can be caused by various etiological factors and locations. Frequent intracoronary discoloration is usually due to trauma, either an accident or a fight. This condition causes the teeth to become non-vital and changes the color of the teeth to become darker. Internal bleaching treatment can provide a brighter tooth color change through the application of chemicals to oxidize the pigmentation of organic matter in the tooth.[1] Internal bleaching is performed after endodontic treatment is completed on the discolored tooth. Sterility, accuracy, and the operator's ability are essential in endodontic treatment. This involves cleaning, shaping, and obturation to support the internal bleaching procedure.

Internal bleaching can be performed on teeth with a lot of tooth structure tissue, healthy gums, and periodontal tissue, it can be done quickly, produce good results, and is more conservative and affordable. Several things that must be considered for the effectiveness of internal bleaching materials are the patient's age, the etiology of the discoloration, and the degree of discoloration to provide good and satisfactory treatment results.

CASE ILLUSTRATION

A 48-year-old woman presented to the Department of Conservative Dentistry, RSGMP Airlangga University with a complaint of discoloration of upper anterior teeth compared to the rest of the teeth. The patient had a history of trauma to the anterior teeth about two years ago due to an accident. Intraoral examination revealed discolored maxillary left central incisor, percussion (+), bite test (+), gingiva around the teeth was normal. An intraoral radiograph showed coronal radiopaque tooth 21 and normal periapical tissue. The diagnosis of tooth 21 was pulp necrosis with normal periapical tissues. Endodontic treatment and in-office bleaching were planned. During the first visit, the patient was given an explanation of her teeth conditions, and signed the *informed consent* before dental treatment. The treatment started with shade taking with vita (A4), scaling and root planning, then isolation of the work area using a rubber dam. The access opening of tooth 21 used an endo access bur, then root canal negotiation using k-file#8 and continued with k-file #10 with canal lubricant. The management glide path was done and then the determination of working length using apex locator. On tooth 21, the working length was 20mm, and apical gauging was performed with k-file #30. The root canal was irrigated with 2.5% NaOCl solution and distilled water for every change of root canal files. Root canal treatment was conducted using the crown down pressureless technique with the rotary instrument. The cleaning and shaping were done by using a rotary protaper next until file X3 (30/07), following that the trial gutta percha using X3 gutta percha was performed, checked the tug back, and then confirmed with dental x-ray. The root canal was dried with endo suction and paper points, then application material *dressing* Ca(OH)2 and filled with a temporary material. The patient was instructed to return in a week. At the second visit, the patient did not complain of any pain, extraoral examination showed no abnormalities, percussion (-), bite test (-), temporary filling good, and normal gingiva. Isolated

rubber dam, then opened the temporary tooth 21. A recapitulation procedure was applied and finally irrigated with 2.5% NaOCl solution, EDTA 17% solution, and distilled water. The root canal was dried and obturated with gutta percha and sealed with continuous wave technique. The patient was instructed to return in a week. After the root canal treatment completed and there were no complaints, then an internal bleaching procedure was carried out using the walking bleach technique using 35% carbamide peroxide to obtain the appropriate results on this visit. Before applying the internal bleaching agent, the gutta percha must be reduced by 2mm below the cementoenamel junction (CEJ) and then confirmed with a dental x-ray. After that a barrier GIC material 2-3mm was applied in that area with bobsled tunnel appearance (labial aspect) and ski-slope appearance (proximal aspect), which was then confirmed by dental x-ray. The bleaching agent carbamide peroxide 35% was applied, and temporarily filled with GIC. The impression of the upper jaw was taken to make a mock-up or a working model to assist in the final direct restoration. Afterward, the patient was instructed to return three days later with a note that she is expected to pay attention to the color changes in her teeth every day. For the fourth visit, the patient did not complain of any pain, the extraoral and intraoral examination showed good condition, and the color of tooth 21 had the same color (shade guide Vita A2) as the rest of the teeth. Isolated area with a rubber dam, removed temporary tooth 21, and irrigated the cavity with aquadest to clean the remaining bleaching agent were performed. Then, the cavity was dried, and Ca(OH)2 was applied, followed by covering using cotton pellets and filling temporary material with GIC. Seven days later, the patient came for the last visit. The rubber dam was applied, removed temporary tooth 21, and irrigated with aquadest to remove the Ca(OH)2. The final restoration was filled on tooth 21 with direct resin composite using mock-up impressions that have been made before with layering technique, checked for occlusion and articulation, finished and polished.

DISCUSSION

Trauma to the teeth can be caused by a variety of things, most commonly accidents or fights. It can cause tooth cracks, pulp necrosis and even tooth avulsion. In traumatized teeth, it can cause discoloration, such teeth have a *dark pinkish hue* almost immediately after the accident and turn *pinkish brown* some days afterward.[2] Because of trauma, the blood vessels that fill the pulp chamber rupture and enter the dentinal tubules through a diffusion process. As a result, the hemoglobin breaks down, with the formation of various colored compounds, where at times, hydrogen sulfide produced by bacteria combines with the hemoglobin to darken the tooth[2] and the release of iron sulfide which enters the dentinal tubules changes the color around the tooth. In this situation, the tooth is usually pulp necrotized.

Endodontic treatment is the main procedure before internal bleaching procedures. This procedure eliminates the bacterial infection present in the root canal, in which sterility, accuracy and operator ability are crucial. This involves cleaning, shaping and obturation of the root canal system. Root canal cleaning with appropriate irrigation materials, such as 2.5% NaOCl solution, removes organic tissue solvent and 17% EDTA solution to remove the inorganic part of the smear layer. In this case, the root canal treatment used a crown down pressureless technique with the rotary instrument, which removes debris and microorganisms from the coronal to the apical and forms a tapered root canal while maintaining the narrowing of the apical area of the tooth. This technique minimizes the occurrence of blockage at the apical part of the tooth and distributes the course of irrigation fluid to the maximum. For the obturation with continuous wave technique, the advantage of this technique is that it can hermetically fill from the center to the coronal part of the tooth.

The main concern of this case is to eliminate the bacterial infection present in the root canal with endodontic treatment after that were no symptoms during the control and the result was good, an internal bleaching procedure was carried out on tooth 21 using the walking bleach technique using 35% carbamide peroxide, which involves the use of chemical agents within the coronal portion of an endodontically treated tooth to remove tooth discoloration.[1] It involves a reduction-oxidation reaction between tooth and bleaching product, where complex molecules degrade into simpler molecules, changes in wavelength occur, and increased light reflection, resulting in reduced discoloration and teeth appearing brighter. Before applying the internal bleaching agent, the gutta percha must be reduced by 2mm below the cementoenamel junction (CEJ). After that, a barrier GIC material 2-3mm was applied in that area to prevent leakage of bleaching material that diffuses into the pulp chamber and periodontal ligament which can cause external cervical resorption (ECR). The usage of carbamide peroxide for non-vital tooth office bleaching is a relatively fast method in whitening the discolored tooth and is equally effective as hydrogen peroxide with fewer complications of external cervical resorption.[3] The use of 35% carbamide peroxide has lower levels of extraradicular diffusion than comparable concentrations of hydrogen peroxide.[4]

Before planning all procedures, several considerations were made, such as the amount of the tooth structure present, the anatomic position of the tooth, the accuracy of root canal treatment and periodontal considerations such as shape and root color. The final restoration was filled with a composite resin material, before that filling the pulp chamber with calcium hydroxide for several days is useful for buffering acidity caused by bleaching material. Composite resin material can be applied on tooth 21 using a layering technique, which is a simple and conservative approach that minimizes damage to tooth structure.

CONCLUSION

The treatment of teeth with discolored cases can be carried out with internal bleaching procedures without having to make dental crowns to restore the original color of the teeth.

CONFLICT OF INTEREST

There are no conflicts of interest.

ETHICAL CLEARANCE

Informed consent was obtained from the patient in written form.

FUNDING

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AUTHOR CONTRIBUTION

Iin Indah Aris Wati: Conceptualization, Data Curation. Tamara Yuanita: Supervision, Validation, and Preparation. Tamara Yuanita and Grace Victoria Octavianus: Visualization, Writing – Original Draft Preparation, Writing – Review and Editing.

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The maintenance of oral hygiene and caries relationship in patients with diabetes mellitus

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ABSTRACT

Introduction: Tooth caries is a global oral problem which affects daily activities. Researchers have associated tooth caries with several contributing factors. One of them is how the patient keep their oral hygiene with mouthwash. The purpose of the study is to compare the caries of the patients with diabetes mellitus who visit Conservative Dental Clinic, Universitas Airlangga Dental Hospital Surabaya, Indonesia, during January-March 2023.
Methods: The study included 37 patients with caries and diabetes mellitus. Demographic data were collected from medical records and personal interview. Statistical analysis was conducted using chi-square analysis.
Results: Oral hygiene by using mouthwash has no significant difference ($p>0.05$) among the patients with caries and diabetes mellitus.
Conclusion: Oral hygiene maintenance using mouthwash does not influence the severity of caries in patients with diabetes mellitus.

Keywords: Caries, oral hygiene, mouthwash, oral health, diabetes mellitus.

INTRODUCTION

Diabetes mellitus can be suffered by the elderly, adult, and young patients.[1] Diabetes mellitus has great potential to lead to the formation and progression of dental caries and affecting the quality of life.[2] Insulin deficiency in diabetics causes hyposalivation and increased blood sugar in saliva which puts the patient at high risk of developing dental caries.[3] Diabetic patients can cause dry mouth which causes decreased salivary production, decreased buffer capacity, and increases the risk of dental caries and bacterial infections.[4] Dental caries can cause tooth structure destruction which require treatment. Based on the description above, it is necessary to conduct research on how the patients maintain oral health towards the posterior tooth caries in diabetic patients at the age level of young, middle age and the elderly, and by gender.

METHODS

This study was a cross-sectional analytic observational study from January to March 2023. Demographic data was collected from the medical records of 37 patients at the Conservative Dental Clinic, Airlangga University Dental Hospital with diabetes mellitus and dental caries in their posterior teeth. Diabetic conditions were discovered from interviews and from their medical records. While the habit of dental care using toothpaste and mouthwash was found from the interview results. The patients were grouped based on their age according to World Health Organization classification into young (25-44), middle age (44-60), and elderly (60-75).[5] Patient data were grouped into 2 variables, namely based on age and gender factors. The data obtained was then analyzed by chi-square test.

RESULTS

Twenty-two patients were male and fifteen patients were female. Based on age grouping, data showed the elderly group of 12 people (32.4%), followed by middle age group of 10 people (27.0%), and young group of 8 people (21.6%) maintain their OH with toothbrushing only. The elderly group of 4 people (10.8%), followed by the middle age group of 3 people (8.1%), and young group of 0 people (0.0%) maintain their OH with toothbrushing and mouthwash. Pearson Chi Square test based on age showed no significant difference in the incidence of posterior dental caries in DM patients (significance $p=0.301$).

Data based on gender grouping showed that 4 female patients (10.8%) and 3 male patients (8.1%) maintain their OH with toothbrushing only, while the data showed that 11 female patients (29.7%) and 19 male patients (51.4%) maintain their OH with toothbrushing and mouthwash. Pearson Chi Square test based on gender showed no significant difference in posterior dental caries among DM patients (significance $p=0.301$).

DISCUSSION

Diabetics can produce saliva with high glucose levels and experience complaints of dry mouth.[3,4] Poor metabolism in diabetics causes a significant decrease in saliva production and buffers. Diabetes mellitus (DM) is a common chronic disease that causes hyperglycemia.[1] It is classified into four general categories: type 1, in which the pancreatic β cells lose their capacity to produce insulin; type 2, in which defects in β-cells or decreased tissue sensitivity to insulin are required for

Tabel 1. Comparison of diabetes mellitus patients with posterior caries who maintain OH with toothbrushing only and maintain OH with toothbrushing and mouthwash based on age group

Comparison of Diabetes Mellitus Patients on Posterior Teeth Who Maintain OH with Toothbrush Only and Maintain OH with Toothbrush and Mouthwash Based on Age	Young (8 person)	Middle Age (13 person)	Elderly (16 person)
Patient Who Maintains OH with Toothbrush Only	21.6% (8)	27.0% (10)	32.4 % (12)
Patient Who Maintains OH with Toothbrush and Mouthwash	0% (0)	8.1% (3)	10.8% (4)

Table 2. Comparison of diabetes mellitus patients with posterior caries who maintain OH with toothbrush only and maintain OH with toothbrush and mouthwash based on gender

Comparison of Diabetes Mellitus Patients on Posterior Teeth Who Maintain OH with Toothbrush Only and Maintain OH with Toothbrush and Mouthwash Based on Gender	Male (22)	Female (15)
Patient Who Maintains OH with Toothbrush	8.1% (3)	10.8% (4)
Patient Who Maintains OH with Toothbrush and Mouthwash	51.4% (19)	29.7% (11)

disease manifestation.[3]

Diabetes mellitus has an impact on poor body metabolism in sufferers which is associated with the formation of dental caries. Diabetes mellitus can also cause complications in the oral cavity.[5,6] Insulin deficiency in diabetics is caused by an increase in salivary glucose levels, which promotes caries development. The occurrence of salivary dysfunction which causes a decrease in salivary flow rate, and a decrease in buffer capacity, also has an impact on the formation of dental caries and bacterial infections.[7] Oral bacterial activity is also stimulated by glucose contained in saliva which can lower the pH for the development of caries. Mechanical stimulation is also stimulated when rinsing the mouth due to the movement of the cheek muscles. The rinsing motion can also stimulate an increase in salivary production by increasing salivary pH.[7]

CONCLUSION

Maintenance of oral hygiene using mouthwash does not affect the severity of caries in patients with diabetes mellitus. However, dental care using other methods as a supplement to toothbrushing, such as flossing may help maintains oral health. It is necessary to understand other factors which contribute to caries development in order to provide optimal care for patients with diabetes mellitus.

MANDATORY

Conflict of Interest

None.

Ethical Clearance

Ethics from RSGMUA (Rumah Sakit Gigi dan Mulut Universitas Airlangga), File no: 17/UN3.93.

Funding

None.

Authors Contribution

Study conception and design : Wanda Oktaria, Eric Priyo Prasetyo. Data collection : Wanda Oktaria, Wilson Sukandar, Setyabudi Goenharto. Analysis and interpretation of result : Wilson Sukandar, Tamara Yuanita, Dian Agustin Wahjuningrum, Setyabudi Goenharto. Draft manuscript preparation: Wanda Oktaria, Eric Priyo Prasetyo, Tamara Yuanita, Dian Agustin Wahjuningrum.

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In-office extra-coronal bleaching technique on anterior teeth with discoloration: A case report

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ABSTRACT

Introduction: Extra-coronal bleaching using hydrogen peroxide has gained significant popularity as a conservative treatment option for dental discoloration.
Case Illustration: This case report emphasizes the efficacy of extra-coronal bleaching with 40% hydrogen peroxide on mild tooth discoloration, highlighting the importance of proper case selection, treatment planning, and follow-up care.
Conclusion: The patient demonstrated remarkable improvements in tooth color, with a visually pleasing outcome and no adverse effects. In-office extra-coronal bleaching using 40% Hydrogen Peroxide is a treatment option to improve discolored teeth in a short time.

Keywords: extra-coronal bleaching, hydrogen peroxide, discoloration.

INTRODUCTION

Amid increasing concerns regarding cosmetic aesthetics, particularly among young adults, a notable rise in tooth-whitening procedures has been observed in dental practice over the past decade, with a pronounced preference for minimally invasive techniques. Tooth whitening represents a swiftly expanding domain within cosmetic and restorative dentistry.[1,2] The identification of the primary etiological factor responsible for tooth discoloration is crucial, as it directly influences the choice of treatment plan and its subsequent outcomes.[1] Numerous factors can contribute to tooth discoloration, with one such factor being the persistent consumption of beverages capable of altering the color of teeth, such as tea, coffee, and smoking.[2] Additionally, acquired changes during tooth development stages, such as fluorosis, tetracycline staining, and amelogenesis imperfecta, constitute other causative factors for tooth discoloration.

Extra-coronal bleaching of vital teeth is regarded as a secure, efficacious, minimally invasive, non-destructive, and widely accepted procedure for addressing tooth discoloration. The predominant techniques employed for vital bleaching encompass "power bleaching" conducted in-office and "at-home bleaching." These techniques encompass various variables, including the type and concentration of the bleaching agent utilized, as well as the duration of its application.[3]

Bleaching agents can function as either oxidizing or reducing agents, with the majority being oxidizers and various preparations accessible. Commonly employed agents include solutions of hydrogen peroxide at varying strengths, sodium perborate, and carbamide peroxide. Sodium perborate and carbamide peroxide are chemical compounds that degrade gradually, releasing controlled levels of hydrogen peroxide. Primarily, hydrogen peroxide and carbamide peroxide find application in external bleaching, whereas sodium perborate is predominantly utilized for internal bleaching. All these agents have demonstrated efficacy.[4]

CASE ILLUSTRATION

A 27-year-old male patient came to RSKGMP Universitas Airlangga Dental Hospital the patient presented with concerns regarding the yellowish discoloration observed in the anterior teeth of both the upper and lower dental arches. The individual experiences diminished confidence due to the yellowish appearance of the teeth and expresses a desire to enhance the aesthetic presentation of the teeth. The patient disclosed a regular daily consumption of tea and coffee. The patient has no history of any systemic disorder and allergies. The bleaching procedure was performed using 40% hydrogen peroxide gel, applied in three sessions of 15 minutes each. Clinical findings showed a shade guide of A3 on both anterior upper and lower teeth.

DISCUSSION

Distinguishing the nature and origin of dental stains extends beyond purely academic curiosity. Understanding the causative factors of dental staining empowers the dentist to strategically plan whitening procedures and offer a more precise prognosis of the anticipated results. Dental staining and discoloration can result from a variety of factors, conventionally categorized into extrinsic and intrinsic classifications.[5]

Extrinsic discolorations manifest as a resilient film on the external tooth surface termed the pellicle, primarily composed of elongated polysaccharides and proteinaceous substances. This pellicle exhibits susceptibility to staining, with heightened discolorations observed particularly at the gingival margin and within interproximal regions, where accessibility to toothbrushing is diminished. The pellicle showcases a spectrum of hues, spanning from white to red, brown, and green, and may attain pronounced opacity contingent upon

the origin of pigmentation. Conversely, intrinsic discolorations emanate from alterations in the inherent tooth structures induced by systemic or locally derived factors.[5]

Addressing aesthetic concerns involves employing methods such as bleaching treatment and laminate veneers. Bleaching treatment stands out as a more conservative approach when contrasted with alternative discoloration treatment methods.[6-11] Two primary extra-coronal bleaching methods for vital teeth exist: the in-office type and the at-home bleaching type.[12] The in-office type is particularly popular, relying on the principle wherein hydrogen peroxide permeates the tooth, generating free radicals that oxidize organic stains. Numerous studies in the literature have documented the success of in-office whitening treatments.[6]

The inherent advantage associated with in-office bleaching agents lies in their capacity to assert a more rapid efficacy compared to at-home products. This assertion is generally substantiated. Additional potential advantages exist, with certain manufacturers purporting that the utilization of the utilization of an in-office gel bleach is associated with a reduction in the incidence of tooth sensitivity, attributed to its capacity to alleviate the commonly encountered tooth desiccation observed with liquid and liquid-powder products.[5] As indicated by several investigations, a one-week application of at-home bleaching using 10% or 16% carbamide peroxide gel typically yields a shift of two to four shade guide units. This alteration is approximately comparable to the change documented following a singular in-office bleaching session utilizing 35% hydrogen peroxide gel.[13]

In-office bleaching substances typically comprise oxygen-releasing compounds with higher concentrations, deemed safe for intra-oral application. The potent bleaching materials, either in liquid, liquid-powder, or gel forms, incorporate varying concentrations of hydrogen peroxide, which is a fluid thickened with stabilizers and/or coloring agents.[5] This process entails the administration of 25%–40% hydrogen peroxide or 16%–35% carbamide peroxide onto the external surface of the teeth. Notably, 35% carbamide peroxide exhibits a bleaching efficacy equivalent to that of a 10% to 12% hydrogen peroxide solution.[5]

In the context of in-office bleaching, the gels typically encompass 10% to 20% water content, serving the purpose of rehydrating the teeth during the bleaching procedure. The gel's viscous consistency facilitates sustained and more intimate contact with the tooth, ensuring predictability over extended periods. However, the inclusion of water in the gel diminishes its shelf-life, necessitating refrigeration during transportation and in the dental practice until utilization. The heightened viscosity of these gels minimizes inadvertent soft tissue contact by promoting localized adherence to tooth surfaces. Furthermore, the gel's viscous nature may enhance the penetration of oxidizing ions into enamel and dentin, functioning as a barrier to prevent the escape of liberated oxygen ions. For optimal efficacy, gels can be freshly prepared immediately before treatment, emphasizing the necessity for a new solution for each patient.[5]

Hydrogen peroxide serves as an oxidizing agent with the capability to generate highly reactive free radicals (H2O+O2). In its purely aqueous state, hydrogen peroxide exhibits slight acidity. Consequently, the formation of the particularly potent free radical perhydroxyl (HO2) ensues. To facilitate the production of perhydroxyl ions, hydrogen peroxide must undergo alkalization, with the optimal pH for this process ranging between 9.5 to 10. Within the ionization of hydrogen peroxide buffered by this pH range, a substantial quantity of H2O perhydroxyl free radicals is generated, enhancing the bleaching efficacy within a comparable time frame.[7] Additionally, owing to its low molecular weight, hydrogen peroxide can permeate dentin, releasing oxygen that disrupts the double bonds within organic and inorganic compounds situated within the dentinal tubule.[11]

Certain manufacturers assert that a hydrogen peroxide (HP) bleaching agent can yield accelerated outcomes when juxtaposed with a carbamide peroxide (CP) bleaching agent of analogous concentration. Such assertions stem from the premise that carbamide peroxide must undergo decomposition into hydrogen peroxide and urea to manifest its effectiveness.[10] The more basic difference between CP and HP is that HP liberates its entire peroxide content within a duration of 30–60 minutes, thereby necessitating wear and application times within this temporal span. In contrast, carbamide peroxide (CP) releases 50% of its peroxide during the initial two hours and may require an additional six hours to discharge the remaining peroxide for the bleaching process.[9]

In a study by Ganesh et al., statistical significance was observed between the control group and groups 1 (CP), 2 (HP), and 3 (SP) on days 7 and 14 post-treatment. Groups CP and SP demonstrated average enhancement of six Vita Lumin shade tabs was observed in one group, whereas the other group (HP) demonstrated an average improvement of eight Vita Lumin shade tabs. The research indicated a notably high level of statistical significance regarding the bleaching efficacy of hydrogen peroxide when compared to carbamide peroxide and sodium perborate at day 14.[11]

CONCLUSION

This case report highlights a successful application of extra-coronal bleaching with 40% hydrogen peroxide in a patient with mild tooth discoloration The patient demonstrated remarkable improvements in tooth color and a visually pleasing outcome, contributing to the patient's enhanced self-esteem and overall satisfaction.

CONFLICT OF INTEREST

None to declare.

ETHICAL CLEARANCE

Written informed consent was obtained from the patient or legal guardian of the patient. The patient or the legal guardian has given their consent in the form of the images and other clinical information to be published in the journal. They understand that their names and initials will not be published.

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AUTHORS CONTRIBUTION

All authors contributed equally in the preparation of this manuscript"

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The regularity of patient's dental visits and caries relationship in patients with diabetes mellitus

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ABSTRACT

Introduction: Caries is one of dental health problem for both the young and elderly. Many factors have been studied in relation to the incidence of caries. Frequency of dental visit may play an important role in the prevention of caries. The study was aimed to compare the caries of the patients with diabetes mellitus who visit Conservative Dental Section, Universitas Airlangga Dental Hospital Surabaya, Indonesia, during January-March 2022.
Methods: The study included 37 patients with caries and diabetes mellitus. Demographic data were collected from medical records and personal interview. Statistical analysis was conducted using chi-square analysis.
Results: Patients' dental visit has no significant difference (p>0.05) among the patients with caries and diabetes mellitus.
Conclusion: The frequency of patients' dental visit does not influence the severity of caries in patients with diabetes mellitus.

Keywords: Caries, patient, dental visit, diabetes mellitus, oral health.

INTRODUCTION

Diabetes mellitus (DM) is a prevalent chronic condition characterized by elevated blood glucose levels.[1] Diabetes can impact the structural integrity of the oral cavity, potentially giving rise to various complications, including tooth caries.[2] Diminished salivary flow rates, attributed to hyperglycemia, are primarily indicative of phases characterized by inadequate metabolic control of diabetes. In such intervals, the potential for glucose seepage into the oral cavity exists, thereby fostering the proliferation of aciduric and acidogenic bacteria, ultimately contributing to the development of caries lesions.[3] Insufficient insulin levels in diabetes can result in reduced salivary flow and increased salivary glucose concentrations, potentially elevating the risk of caries development in diabetic patients.[1] Several studies Studies have documented a heightened incidence of caries among individuals with diabetes mellitus (DM), particularly in cases of inadequately managed DM.[4] The need for routine dental care as a caries prevention measure. Therefore this article was conducted to evaluate the relationship of regular dental check up and the occurrence of posterior dental caries in diabetic patients.

METHODS

The type of research used was an analytical observational study utilizing a cross-sectional methodology that was conducted during January-March 2020. This study uses data from 37 participants who suffer from diabetes mellitus. Caries measurements were carried out at the RSKGMP Airlangga University Dental Conservation Clinic on posterior teeth using a mouth mirror. All patients participating in the study were interviewed and consented to be conducted anonymously. Then the patients were grouped into 3 classifications according to WHO and the Indonesian Ministry of Health, Adolescents (12-25 years), adults (26-45 years), and elderly (> 46 years). Data analysis used the Pearson Chi Square statistical test.

RESULTS

Of the 37 patients, 22 patients were male and 15 patients were female. 2.7% (1) male patients who had routine dental check-ups and 56.8% (21) male patients who did not have regular dental check-ups. 0.0% (0) of female patients had routine dental check-ups and 40.5% (15) of female patients did not have routine dental check-ups. Pearson Chi Square test based on gender, routine dental check-up factors did not have a significant difference in the occurrence of posterior dental caries in diabetes. (Significance p=0.403).

Based on age, it is classified into adolescents (12-25 years), adults (26-45 years), and elderly (> 46 years). There were 8 adolescent patients 0.0% (0) patients who had routine dental check-ups and 21.6% (8) patients who did not routinely check their teeth. There were 13 adult patients, 2.7% (1) of patients who routinely checked their teeth and 32.4% (12) of patients who did not routinely check their teeth. There were 16 elderly patients, 0.0% (0) of patients who routinely checked their teeth and 43.2% (16) of patients who did not regularly check their teeth. Pearson Chi square test based on age, routine dental check-up factors did not have a significant difference in the occurrence of posterior dental caries in diabetes (significance p=0.387)

DISCUSSION

The incidence of dental caries and its impact on the overall population holds

Table 1. Comparison of DM patients with posterior dental caries with routine dental check-ups and non-routine dental check-ups, by gender

Comparison of caries in posterior teeth of DM patients with routine dental check-ups and non-routine dental check-ups by gender	Male (22)	Female (15)
Routine dental check-up	2.7% (1)	0% (0)
The patient does not have regular dental check-ups	56.8% (21)	40.5% (15)

Table 2. Comparison of DM patients with posterior dental caries who have routine dental check- ups and not routine dental check-ups by age

Comparison based on caries examination of posterior teeth of DM patients with routine and non-routine dental check-ups based on age	Adolescents (8)	Adults (13)	Elderly (16)
Patients who have regular dental check-ups	0.0% (0)	2.7% (1)	0% (0)
Patients who do not have regular dental check-ups	21.6% (8)	32.4% (12)	43.2% (16)

substantial public health significance. Therefore, it is crucial to recognize individuals who might be at an elevated risk of dental caries and oral ailments. Diabetes mellitus has been associated with an increased susceptibility to dental caries. Furthermore, individuals with diabetes exhibit a heightened vulnerability to infections, including dental abscesses stemming from advancing dental caries.[2]

An increase in blood sugar level has a high correlation with an increase in the prevalence of carries. High sugar levels and microangiopathy complications lead to reduced salivary production from the salivary glands. Reduced in unstimulated salivary flow rate could increase the pH and activated cariogenic bacteria thus increase carries risk.[5]

In this study, observed the level of routine dental examinations of patients with diabetes and those who did not routinely examine their teeth in patients with diabetes found no significant difference affecting the severity of dental caries. For future considerations so that it can be researched using more patient data related to routine dental examinations in patients with diabetes mellitus as prevention of dental caries.

CONCLUSION

Diabetes constitutes a risk factor for complications related to oral health. In this study it was found that the frequency of patients having routine dental check-ups did not affect the severity of dental caries in people with diabetes mellitus.

CONFLICT OF INTEREST

The authors decided there is no conflict of interest.

ETHICAL CLEARANCE

This study has been approved by the ethical committee of RSKGMP Airlangga University with number: 17/UN3.9.3/Etik/PT/2002.

FUNDING

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AUTHORS CONTRIBUTION

Study conception and design performed by Zellita Frestica Rosmaida Devi Hutapea, and Eric Priyo Prasetyo. Data collection by Zellita Frestica Rosmaida Devi Hutapea, and Eric Priyo Prasetyo. Analysis and interpretation of result by Eric Priyo Prasetyo, Febriastuti Cahyani, Setyabudi Goenharto, Devi Eka Juniarti, and Widya Saraswati. Draft manuscript preparation by Zellita Frestica Rosmaida Devi Hutapea, Eric Priyo Prasetyo, Febriastuti Cahyani, Setyabudi Goenharto, Devi Eka Juniarti, and Widya Saraswati.

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Single visit endodontic treatment for the upper left posterior tooth: A case report

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ABSTRACT

Introduction: *Single-visit endodontic treatment* versus *multiple-visit endodontic treatment* has long been a subject of debate among dental clinicians. Some issues that are still being debated incorporate variations in clinical outcomes and microbial control and flare-ups that may occur after treatment. On the other hand, there is also the issue of patients not having time for multiple visits. The objective of this case report to describe the clinical treatment steps for once-visit endodontic therapy for the upper left posterior tooth.

Case Illustration: A 22- year-old male patient complained of spontaneous pain in the upper left posterior tooth at night. The tooth has had a cavity for the past 2 years and had not done any previous treatment. The patient requested treatment as soon as possible due to time constraints for multiple visits.

Conclusion: Single-visit endodontic treatment offers numerous advantages in terms of time efficiency, patient comfort, and treatment outcomes. By understanding the principles and techniques of single-visit endodontic treatment, dentists can provide optimal care and deliver successful outcomes for their patients.

Keywords: single-visit endodontic treatment, irreversible pulpitis, direct restoration.

INTRODUCTION

The conclusion of endodontic therapy within a solitary session is not a recent concept, with literature reviews on single-visit endodontics dating back almost a century. Subsequently, as endodontic procedures evolved to become more precise, sophisticated, and intricate, the practice of multiple-visit endodontics garnered favor.[1] Single-visit endodontic treatment versus multiple-visit endodontic treatment has long been a subject of debate among dental clinicians. Some issues that are still being debated incorporate variations in clinical outcomes and microbial control and flare-ups that may occur after treatment. On the other hand, there is also the issue of patients not having time for multiple visits.[2]

In recent years, the widespread adoption of rotary nickel–titanium instruments has elevated single-visit endodontics to the preferred treatment modality for a majority of endodontic cases. Endodontic surgery encompasses surgical procedures aimed at eliminating factors contributing to periradicular abnormalities and restoring periodontal tissues to a biologically and functionally healthy state.[3] The pivotal determinant lies in the clinical expertise and proficiency of the practitioner. An experienced clinician in single-visit endodontics can effectively manage the majority of cases in a single session. However, for a practitioner transitioning from single-visit to multiple-visit endodontics, the delineation of indications and contraindications outlined below may serve as a valuable guide.

CASE ILLUSTRATION

A 22-year-old male patient complained of spontaneous pain in the upper left posterior tooth at night. The tooth has had a cavity for the past 2 years and had not done any previous treatment. Radiographically, there was radiolucency extending into the pulp space. From the objective examination, there was profunda caries of 25, vitality (+), bite test (-), percussion (-) and normal gingiva. Thus, the diagnosis of this case was symptomatic pulpitis irreversible with normal apical tissue. The patient had no other health problems. The patient requested treatment as soon as possible due to time constraints for multiple visits.

For the first appointment, the initial procedure was local infiltration to tooth 25 and Isolation utilizing a rubber dam. Access was initiated through the utilization of endo access bur. Canal negotiation was done using K File #10. Determination of working length of the canal using apex locator and K File #10 (buccal canal 22mm, palatal canal 21 mm). Instrumentation using proglider 16.02, apical gauging K File #25. Cleaning and shaping were accomplished employing rotary files. Protaper Next until File X2 (25.06). For the irrigation sequence using NaOCl 2.5% for each file changing and recapitulation using K File #10. NaOCl 2.5%, EDTA 17%, and aquadest being used for the final irrigation. For the irrigation was activated using ultrasonic. The two canals were filled using gutta-percha and a resin-based sealer employing the single cone method. A temporary filling was applied, and the successful obturation was confirmed through radiographic imaging. During the second appointment, the patient did not complain any pain, extraoral examination showed no abnormalities, percussion (-), bite test (-). The endodontic treatment was concluded through the application of a direct composite restoration.

DISCUSSION

In this instance, the patient presented a complaint a spontaneous pain, particularly at night and desired prompt dental treatment due to time limitation. The diagnosis of this case is symptomatic pulpitis irreversible with normal apical tissue. Treatment plans for this case was single visit endodontic treatment of 25, followed by composite restoration. The single visit endodontic treatment for this case, the procedure was performed utilizing the crown-down pressureless technique with *single cone* obturation, and for the final restoration (in the second appointment) was done with composite restoration. In this case, in the second appointment, the patient did not complain any pain, and there was no swelling observed during the extraoral examination, so a good prognosis was obtained.

Single-visit endodontics (SVE) is delineated as the conservative and non-surgical management of an endodontically compromised tooth, encompassing the processes of cleaning, shaping, and obturation of the root canal system within a singular appointment.[4] The principle underpinning once-visit techniques, posits that there exists no disparity in the treatment criteria essential for achieving a successful outcome between both interventions.[5,6] The criteria encompass precise diagnosis, appropriate case selection, and the utilization of modern endodontic models. Single-visit root canal treatment (RCT) is recommended when both practitioners and patients seek to optimize chair-side efficiency and prefer a singular administration of anesthesia.[4,6] While the treatment can be completed in a solitary session, essential procedures including Biomechanical instrumentation, thorough debridement, and disinfection, succeeded by thorough obturation of the prepared root canals, must not be compromised. In cases where the tooth is non vital and manifests acute inflammation, the recommendation of single-visit root canal treatment (RCT) is discouraged.[6]

A study done by Way Yee Wong in 2015 found that the success rates for single-visit and multiple-visit treatments were recorded as 88.9% and 87.4%, respectively. The mean chairside durations for single-visit and multiple-visit treatments were 62.0 and 92.9 minutes, respectively. There was no substantial difference in the incidence of postoperative pain within 7 days (21% and 12%, $p = 0.055$, effect size odds ratio = 2.061) and after at least 18 months (0.9% and 1.0%, $p > 0.999$, effect size odds ratio = 0.879) between single-visit and multiple-visit treatments.[5] In this case was using *crown down pressureless* as the preparation technique because less periapical extrusion of debris than manual preparation techniques using the stepback technique. Several studies have also shown the Crown Down Pressureless preparation technique has been observed to induce fewer flare-ups compared to the manual instrument preparation technique.[7,8]

Root canal irrigation plays a pivotal role in Endodontics, contributing to the facilitation of instrumentation through effective lubrication, eliminate detritus, microorganisms, smear layer, and hindrance of apical debris compaction need to be averted. The effectiveness of irrigants is attributed to their mechanical, chemical, and biological actions.[9] NaOCl 2.5% was chosen as irrigation because it serves as a potent antimicrobial and proteolytic agent, exhibiting outstanding organic tissue solvency and lubricating properties with rapid efficacy. Sodium hypochlorite (NaOCl) functions as both an oxidizing and hydrolyzing agent. EDTA 17% was used as irrigation solution due to its ability to chelate and eliminate the mineralized component of the smear layer.

In this instance, the irrigation solution underwent activation through ultrasonication. Activated irrigation may be defined as the utilization of a technique to agitate and augment the flow of irrigating solutions within the complexities of the Root canal structure via mechanical means or alternative energy forms. These activated systems for delivering irrigants assert enhancements in irrigant transfer, debridement, minimal periapical extrusion, and the removal of smear layer or biofilm. Clinical efficiency may be delineated as the capacity of a clinical procedure for attaining optimal results within the shortest timeframe.[9]

Obturation using esin-Based Sealers (RBS) are regarded as the gold standard in terms of physicochemical properties when compared to other available sealers for use with gutta-percha.[10] Several studies have indicated that RBS can deeply penetrate the dentinal tubules owing to their flowability, extended setting time, and long-term dimensional stability.[11,12]

Before planning restoration for endodontically treated, following factors should be taken into consideration, such: the quantity of existing tooth structure, occlusal forces, and the anatomical positioning of the tooth are factors to consider. In this case, based on the classification of Ingrid Peroz et al. (2005), was classified as Class I: four remaining walls around the access cavity preparation: If the thickness of all axial walls in the cavity remains above 1 mm, intracoronal restoration of the access cavity is deemed adequate, assuming the tooth is not exposed to excessive occlusal forces. So the restoration chosen was direct composite restoration.[4]

While suitable for specific cases, it is crucial for dental professionals to carefully evaluate each patient's individual condition and consider the limitations and challenges associated with the procedure. By understanding the principles and techniques of single visit endodontic treatment, dentists can provide optimal care and deliver successful outcomes for their patients.

CONCLUSION

Single visit endodontic treatment offers numerous advantages in terms of time-efficiency, patient comfort, and treatment outcomes. While suitable for specific cases, it is crucial for dental professionals to carefully evaluate each patient's individual condition and consider the limitations and challenges associated with the procedure. By understanding the principles and techniques of single visit endodontic treatment, dentists can provide optimal care and deliver successful outcomes for their patients.

CONFLICT OF INTEREST

None to declare.

ETHICAL CLEARANCE

Written informed consent was procured from the patient or their legal guardian.

The patient or guardian has provided approval for the publication of images and other clinical information in the journal, with the understanding that their names and initials will remain undisclosed.

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AUTHORS CONTRIBUTION

Each author made an equal contribution to the preparation of this manuscript.

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One visit endodontic with internal bleaching on tooth 21 post trauma: A case report

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ABSTRACT

Introduction: Post-traumatic non-vital (necrotic) teeth might cause discoloration that become an aesthetic problem. One visit endodontic with internal bleaching could be a choice in the absence of clinical symptoms or periapical lesions to restore the tooth color.

Case Illustration: A 26-year- old woman came with complaint of discoloration at the upper left incisor tooth due to history of fallen 13 years ago. Intraoral clinical examination showed fracture Ellis II at tooth 21, with negative percussion and bite test, grayish-colored, non-vital, and the gingiva was normal. A radiographic examination showed Lamina dura was cut off and widening the periodontal ligament apical to tooth 21. At the first visit, one visit endodontic treatment using the rotary instrument and obturation with a single cone technique. A week later, an internal bleaching procedure using the walking bleaching technique using 35% H2O2 paste. At the third until fifth visits, tooth color was not obtained, so 35% H2O2 was reapplied. The tooth color was obtained as desired from C4 to A1 (Vita Classic) at the sixth visit**.** After bleaching, calcium hydroxide was applied to neutralize that oxidizing agent. On the seventh visit color stability control and direct composite restoration.

Conclusion: One visit endodontic with optimal approach for reinstating both function and aesthetics in the traumatized tooth involved the implementation of an internal bleaching procedure and also provided benefits in terms of saving time, lower price, and maximum results.

Keywords: pulp necrosis, trauma, discoloration, internal bleaching.

INTRODUCTION

The crown anterior discoloration is one of the complications associated with traumatic dental injuries that might cause a significant aesthetic impairment.[1] The residual effects of blood staining resulting from trauma involving chromogenic blood degradation products are deposited within the dentinal tubules. The aggregation of these breakdown products gives rise to a discoloration in the teeth, manifesting as a grayish-yellow to brown hue.[2] The degree of discoloration is directly linked to how long the pulp has been necrotic.[1]

Various management of discoloration of non-essential anterior teeth is amenable to various therapeutic modalities, encompassing comprehensive crown restorations, veneer applications, and internal bleaching procedures. In instances involving anterior teeth characterized by relatively intact crown structures, without symptoms and apical lesion, one visit endodontic with internal bleaching is one of the best treatment choices.[3] Here we illustrated a case of post traumatic necrosis pulp with discoloration which successfully treated using one visit endodontic with internal bleaching.

CASE ILLUSTRATION

A 26-year-old woman came to RSGMP Universitas Airlangga and complained that the upper left incisor tooth looks darker than the adjacent teeth, thus disturbing her appearance. She had fallen from a motorcycle about 13 years ago and broke her tooth a little. The tooth in color become darker in the last 12 years. Intraoral examination, showed that tooth 21 fracture Ellis II, percussion (-), bite test (-) the tooth looks grayish, vitality test of tooth 21 showed no response, gingiva was normal. A radiographic examination showed Lamina dura was cut off and widening the periodontal ligament apical to tooth 21. The diagnosis is pulp necrosis with asymptomatic apical periodontitis.

During the initial consultation, the patient received an explanation of the procedural details. and had signed the informed consent. The patient gargle with Povidone Iodine 1% for 30 seconds, Scaling and root planing, Isolate the work area with a rubber dam and dental suction Access opening of tooth 21 with an endo access bur Glidepath procedure: Negotiation using K-file #8, then continued with K-file #10 and obtained patency. Then proceed with the use of Proglider (16.02) to get a smooth glidepath Apical gauging using K-file obtained number 40 on tooth 21 Determination of working length using apex locator on tooth 21 (23mm) confirmed by radiograph Root canal preparation of tooth 21 using Reciproc Blue R40. Sequential irrigation was employed for each alteration of root canal files, utilizing a solution sequence of EDTA 17%, distilled water (aquadest), and NaOCl 1.5%, administered through a 30 G side-vent needle. The placement of a trial gutta-percha point (size R40) in tooth 21 was validated via X-ray imaging. The ultimate irrigation sequence involved EDTA 17%, aquadest, and NaOCl 1.5%, administered through a 30 G needle with a single side vent, concurrently employing sonic agitation through an endoactivator.

The root canals were dried with endo suction and paper points. Obturate tooth 21 using the single cone technique and gutta point R40 using a resin based sealer Temporary placement X-rays confirm obturation.

On the second visit (a week later), she had no complaints with normal extraoral examinations. The intraoral examination showed a good condition of temporary fillings, negative percussion and bite test of tooth 21, gingiva around the tooth is normal. Subsequently, the initial shade taken with the shade guide vita classic was C4 color. We isolated the work area with a rubber dam and dental suction Open the temporary tooth 2. Gutta point retrieval up to 2 mm below the CEJ is then confirmed with radiographs. GIC cervical barrier application with bob sled tunnel appearance / ski design slope appearance then confirmed by radiographic photo Application of bleaching agent in the form of 35% H2O2 Temporarily filled with GIC. The patient was given the Internal post bleaching instructions and asked to control after 5-7 days post application of bleaching materials to see color changes to avoid over bleach.

On the third visit, both extraoral and intraoral examinations were in normal limit except the tooth color with a vita classic shade guide was A4 color. We then isolate the work area with a rubber dam and dental suction. Dismantling of GIC temporary fillings. Irrigation of the cavity with aquadest to clean the remaining bleaching agent. The cavity is dried with endosuction and cotton pellets. Second application of bleaching agent with H2O2 35% Temporarily filled with GIC. On the fourth and the fifth visit, both extraoral and intraoral examinations were in normal limits except the tooth color with vita classic shade guide was A3 and A2 color, respectively. We then performed the same procedure as in the last visit and applicating the bleaching agent for the third and the fourth time with H2O2 35% Temporarily filled with GIC. We then achieve the same tooth color as the adjacent teeth on the sixth visit with the shade guide vita classic show A1 color. We then performed the same procedure as in the last visit and applied Ca(OH)2 then covered with cotton pellets and filled with GIC.

On the seventh visit, the tooth color was stable in A1 color using the shade guide vita classic. We performed the same procedure as the last visit and removed the Ca(OH)2 using the cavity irrigation. We then underwent standard procedure of restoration using XWE enamel composite (3M ESPE) and A2 dentine composite (3M ESPE). Finishing and polishing using fine finishing burs and soflex discs (3M ESPE). Polishing paste application and polish with cotton wheel polishing.

DISCUSSION

Progressions in the field of dentistry have enabled patients to preserve the functional integrity of their teeth throughout their lifetime.[4] Single-visit endodontic treatment is delineated as a conservative and non-surgical approach to root canal therapy, encompassing comprehensive biomechanical preparation and root canal filling within a singular session. One of the indications for this treatment is necrosis tooth without clinical symptoms and periapical lesions.[5] The objective of this procedure is to expedite the treatment process while maintaining optimal treatment quality. The benefits encompass the minimization of the risk of microbial contamination within the root canal, avoiding compliance issues, mitigate potential errors or challenges in identifying root canal features in contrast to a multi-visit approach, reducing the patient's fear and anxiety due to single anesthesia administration, diminish the likelihood of fracture and pain during the treatment process, achieve a more cost-effective approach, and enable the prompt initiation of prosthetic interventions.[3,6,7]

In this particular instance, the teeth exhibited discoloration attributed to intrinsic factors.Trauma causes the pulp chamber capillaries to rupture and bleed. Its constituents subsequently permeate the dentinal tubules via a diffusion process, followed by a hemolytic process leading to the release of hemoglobin. The iron component (hydrogen sulfide) will form compounds of black ferric sulfate through its combination with bacterial products. This manifests as discoloration of the crown of the tooth.[8]

Internal bleaching was preferred in this case as the labial structure of the tooth remained intact and amenable to restoration with a composite material. The adoption of a full crown restoration was averted, as it would have necessitated the removal of the residual tooth structure and incurred additional expenses. Utilizing hydrogen peroxide (H_2O_2) for bleaching purposes will result in the oxidation of long-chain molecules of the pigmentation and transform them into carbon while releasing water and oxygen. We then performed restoration using a composite resin several days after internal bleaching, to allow hydrogen peroxide to influence the adhesive strength of composite bonding. Introduction of calcium hydroxide into the pulp chamber over an extended duration is helpful to neutralize the acidity induced by the bleaching agent.[9]

CONCLUSION

A single-session approach involving internal bleaching procedures emerged as the optimal choice for restoring both function and aesthetics, aligning with the tooth's initial coloration in cases of traumatized teeth.

CONFLICT OF INTEREST

None.

ETHICAL CONSIDERATION

The patient provided written informed consent for participation in the study or legal guardian of the patient. The patient or the legal guardian has given their consent in the form of the images and other clinical information to be published in the journal. They understand that their names and initials will not be published.

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AUTHORS CONTRIBUTION

Ira Widjiastuti - data collection, manuscript writing, critically revising article, reviewed final version of article.

Khadijah Fauzi Basalamah - study concept, patient contribution, revising article, reviewed final version of article, study oversight, creation of figures.

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External bleaching technique on anterior teeth discoloration: A case report

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ABSTRACT

Introduction: External bleaching offers solution for people with discolored teeth. The purpose of this case report is to provide an explanation of the clinical management involved in external bleaching using Hydrogen peroxide as the bleaching material. **Case Illustration:** A 40-year-old male patient complaint of yellowish teeth in the anterior tooth region, causing a lack of confidence. The patient had a history of Orthodontic, which finished 1.5 years ago. Clinical findings showed a shade guide of 3M2 for the anterior upper teeth and 3M2 for the anterior lower teeth. The tooth was diagnosed with Pulpitis Reversible. **Conclusion:** The utilization of 40% hydrogen peroxide in the treatment of vital tooth discoloration proves to be an efficient and expedient approach for managing discoloration concerns.

Keywords: external bleaching, hydrogen peroxide, discoloration.

INTRODUCTION

Having an attractive smile is considered a crucial aesthetic standard for everyone, and a major focus is on achieving bright and white teeth. The spectrum of treatment alternatives spans from invasive interventions such as crowns, veneers, and direct restoration placement to minimally invasive procedures including macroabrasion, microabrasion, and bleaching, extending to straightforward prophylactic measures. Tooth bleaching stands out as a cost-effective and conservative dental procedure that enhances an individual's smile. Teeth whitening, defined as a process involving active chemicals that enhance the perception of whiteness, leads to a brighter appearance. External bleaching, specifically, provides a valuable alternative for individuals with discolored teeth. Numerous studies have assessed the impact of hydrogen peroxide bleaching agents at varying concentrations, often coupled with heat acceleration.[1-3] In this case report, we aim to elucidate the clinical approach to external bleaching, utilizing a 40% hydrogen peroxide bleaching material without the use of heat acceleration.

CASE ILLUSTRATION

A male patient, aged 40, presented at the Department of Conservative Dentistry, Universitas Airlangga Dental Hospital with chief complaint of yellowish teeth in the anterior tooth region, causing a lack of confidence. The patient had a history of Orthodontic, which has completed 1.5 years ago. Clinical findings showed a shade guide of 3M2 for the anterior upper teeth and 3M2 for the anterior lower teeth. The Gingiva around teeth is normal. The tooth was diagnosed with Pulpitis Reversible. External bleaching was strategically arranged, involving the application of a 40% hydrogen peroxide bleaching agent (Opalescence Boost) on the tooth for a specified duration of 20 minutes, adhering to the manufacturer's instructions.

The treatment initiation involves cleansing the tooth surface using a brush. Subsequently, the operational field is isolated, with the tooth and gingiva subjected to drying through a three-way syringe. In preparation for the vital whitening treatment, a gum protector, 1-2 millimeters thick and 4-6 millimeters wide, was gradually applied over the entire anterior gingival margin, extending from the enamel-gum border to the gum. This protective barrier was polymerized using an LED light source to protect the gums. Afterward, the agent utilized for bleaching purposes, comprising 40% hydrogen peroxide. was uniformly applied to the teeth's labial surface, with a thickness ranging from 0.5 to 1 millimeter, and left in place for 20 minutes. Every 5 minutes during this period, the bleaching material was gently rotated using a microbrush. Upon completion of the bleaching session, any ineffective gel the removal of the substance was facilitated through an air-water spray, and the gingival barrier was carefully taken off. Post-whitening tooth color adjustments were made, resulting in a tooth color change to 1M2. Following these procedures, the tooth underwent a final cleaning, and a desensitizing agent was applied. The patient returned for a follow-up visit after 2 weeks, during which the patient reported no complaints. The bleaching results were found to be satisfactory, and the tooth color remained consistent. The patient was advised to use fluoride-containing toothpaste for ongoing dental care.

DISCUSSION

In-office bleaching is a technique for external tooth bleaching that utilizes a high- concentration oxidizing agent, specifically 40% hydrogen peroxide.[4,5] Research has indicated that hydrogen peroxide concentrations exceeding 35% do not carry any harmful effects and do not present a toxic or carcinogenic risk to humans. To prevent potential pulpal irritation and tooth sensitivity, which can occur with the application of light or heat in conjunction with whitening agents, we

deliberately avoided using any heat or light sources alongside hydrogen peroxide. Notably, OpalescenceBoost relies on chemically activated active ingredients, eliminating the need for light activation.

The reaction involves a reduction-oxidation process, where free radicals generated by H2O2 diffuse through enamel and dentin by dissociating, ultimately yielding unstable free radicals. These labile free radicals consist of Hydroxyl radicals (HO), perhydroxyl radicals (HOO), perhydroxyl anions (HOO–), and superoxide anions (OO–) are delineated. These radicals proceed to target molecules containing organic pigments situated in the interstitial interstices among the inorganic salts within tooth enamel. Specifically, they act upon the double bonds within chromophore molecules within the tooth tissues. This cascade of reactions results in an optical whitening effect as it reduces the absorption of light by the chromophores within the dentin, ultimately leading to whiter teeth. This optical transformation occurs as the free radicals interact with the pigmented molecules, causing a whitening effect.[6-9]

Tooth sensitivity represents a transient side effect commonly encountered subsequent to the bleaching process. This discomfort can be mitigated by the application of desensitizing agents following the bleaching procedure. Tooth discoloration can result from the consumption of tea, coffee, smoking, and colored beverages. Dentists commonly advise patients to abstain from smoking and the intake of tea, coffee, or red wine during tooth whitening interventions, often referred to as a 'white diet.[10]

CONCLUSION

In conclusion, this case underscores the viability of in-office dental bleaching as a treatment option for correcting discolored teeth. This procedure, in addition to being more conservative, offers the convenience of a single dental visit and carries no risk of pulp irritation during the process. The treatment of vital tooth discoloration using 40% H2O2 provides effective and significant management of discoloration within a short period of time. It is crucial for dentists to possess the requisite knowledge of these substances and their peroxide management. Light activation does not confer advantages, either in terms of the final bleaching results or in accelerating the peroxides' action mechanism.

CONFLICT OF INTEREST

The authors declare no conflicts of interest.

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ETHICS

Written informed consent has been obtained from the patient involved in this article.

AUTHORS CONTRIBUTION

Each author made equal contributions to the manuscript and endorsed the submitted version. The corresponding author supervised the article.

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Treatment of open apex due to trauma with apexification: A case report

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ABSTRACT

Introduction: The damage of Hertwig's root sheath as a result of trauma can lead to cessation of tooth root development. The management of a necrotic immature tooth with open apex can pose a great challenge during endodontic treatment. Apexification can promote root-end closure in a case of open apex nonvital immature tooth by using bioactive material such as MTA.

Case Illustration: This apexification was done in tooth 11. This procedure was carried out over multiple visits. At the first visit, access opening, establishing working length, and debridement was done. At the second visit, MTA plug was done by placing MTA 3 mm from the apical with MAP carrier. At the third visit, the rest of the root canal was filled by guttap percha by backfilled technique. The patient showed no sign and symptom of pain. The tooth was not tender to the percussion and bite test.

Conclusion: Apexification with biocompatible materials such as MTA can be considered an effective treatment option for teeth presenting with open apex

Keywords: Open apex, apexification, MTA.

INTRODUCTION

Trauma to immature teeth can cause necrotic pulp or even damage the Hertwig's root sheath (HERS). This condition leads to compromised conditions, namely disruption of the formation of tooth roots resulting in thin dentine walls, wide root canals, and failure to achieve maximum root length. Apexification is a method that induced calcified barrier at the root tip of a permanent tooth with open apex. An ideal filling material should be biocompatible, dimensionally stable, non-toxic, and insoluble. MTA can be used as material of choice to treat open apex.

CASE ILLUSTRATION

A 30-years old female patient come to dental specialty hospital Airlangga University with chief complain to repair her missing anterior filling with one of her anterior teeth blackened. The blackened tooth had a history of trauma 23 years ago. 12 month prior come to the hospital the tooth had intermittent pain so that the tooth was treated by another dentist. Clinically assessment show that the tooth is not tender to percussion and bite test. Pulp vitality test showed that the tooth was non vital. Inform consent was taken before the treatment started. Patient agree to take root canal treatment with apexification to close the apex by creating apical plug with MTA. Then, Access opening is performed at tooth 11. Apical gauging was determined with K-file #80. Working length was 20 mm. it was established by apex locator then confirmed with radiograph. Debridement using H-file #80 with circumferential filling motion. Irrigation sequence by NaCl 1,5% - Aquadest – EDTA 17% -aquadest was done in chronological order. After that, Calcium hydroxide dressing and temporary restoration was placed. At the second visit temporary restoration was removed, then root canal filled with MTA 3 mm from the apex using MAP carrier and then radiographically confirmed. At the third visit, bite test and percussion test showed no response of tenderness. After that the rest of the root canal chamber was filled with guttap percha by backfilled technic. Obturation then radiographically confirmed.

DISCUSSION

Pulpal involvement as a result of trauma or caries in immature permanent teeth can cause loss of pulp vitality and directly affect root development.[1] This phenomenon was associated to the damage of HERS cell. HERS cells plays important rule during root development to control the formation of tooth root formation by differentiating into cementoblasts and induction of odontoblastic differentiation.[2] Apexification was used as a therapy option for immature necrotic permanent teeth. Calcium hydroxide apexification requires long-term intracanal medication stimulates the formation of an apical calcified barrier that can takes time and increases the incidence of root fractures.[3] A number of dental materials have been introduced to overcome some of these disadvantages. One of those material is MTA. Mineral trioxide filling material (MTA) with good sealing ability and reparative periradicular cement tissue regeneration, can be packaged in a carrier, delivered to the apical third, sprayed in batches and compacted vertically with a hand plugger to form apical plug termination of immature roots with or without periapical lesions.[4] Compared calcium hydroxide and MTA for apexification of immature permanent teeth, reviewed studies concluded that MTA improved clinically and radiologically and apical barrier occurred in a shorter time compared to

calcium hydroxide.[5] Although MTA seems have better result than calcium hydroxide, long-term clinical trials are also needed to best evaluate the performance of MTA as obturating materials in immature teeth.

CONCLUSION

Apexification with biocompatible materials such as MTA can be considered an effective treatment option for teeth presenting with open apex. From the above case reports, it can be concluded, that MTA has good sealing ability in a case with open apex.

CONFLICT OF INTEREST

The author report no conflict of interest in this work.

ETHICAL CLEARANCE

Written informed consent was obtained from the patient or legal guardian of the patient. The patient or the legal guardian has given their consent in the form of the images and other clinical information to be published in the journal. They understand that their names and initials will not be published.

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AUTHORS CONTRIBUTION

All authors have accepted responsibility for the entire content of this manuscript and approved its submission. Author 1 As review and editing. Author 2 as writing-original draft preparation.

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Single visit endodontic followed by post crown restoration: A case report

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ABSTRACT

Introduction: Single Visit Endodontic (SVE) treatment which implies cleaning, shaping, and disinfecting a root canal system followed by obturating the root canal in the same appointment has been gaining popularity nowadays. As the quality of the permanent restoration holds a long-term success of the therapy, core build-up is recommended for compensating substantial loss of tooth structure. This case describes serial clinical steps of single visit endodontic treatment on multi-rooted tooth with post-crown final restoration.
Case Illustration: 55-year-old male patient complained of a carious tooth with spontaneous pain in the upper posterior tooth since two weeks ago. He already had the cavity two years ago; the restoration debonded one year ago and started to ache at night.
Conclusion: Aside from good case selections, clinician's skill and patient's positive acceptance promote higher success of the therapy for single visit endodontic treatment.

Keywords: Single visit endodontic treatment, endodontic treated tooth, post and crown.

INTRODUCTION

Root canal treatment (RCT) or Endodontic treatment is a common procedure in practical dentistry. With newer research, materials, and techniques which can help dental clinicians to perform RCT efficiently, Single Visit Endodontic (SVE) treatment which implies cleaning, shaping, and disinfecting a root canal system followed by obturating the root canal in the same appointment has been gaining popularity nowadays.[1] Compared with multiple visit therapy, SVE does not deviate from achieving the objectives of RCT itself; proper biomechanical preparation, shaping, disinfecting and 3-dimensional obturation of root canal system with proper case selection and strictly follows standard of endodontic protocols.[2]

As the quality of the permanent restoration holds a long-term success of the therapy, core build-up is recommended for compensating substantial loss of tooth structure. The major function of a post is to retain the core material. In fact, endodontically treated premolars with mesial occlusal distal cavity preparation and restored with full cusp coverage increased their fracture toughness, compared with premolars restored without any cusp protection.[3]

CASE ILLUSTRATION

A 55-year-old male patient complained of carious tooth with spontaneous pain in the upper posterior tooth since two weeks ago. He already had the cavity two years ago and seeked for treatment but the restoration debonded one year ago and started to ache at night. Wide radiolucency lesion had reached the pulp space from the radiography. Clinical examination revealed that tooth 14 had a deep carious lesion extending from mesial occlusal distal (MOD) with normal gingival tissue. Percussion and bite tests were negative with positive responses to the thermal test. A clinical diagnosis of asymptomatic irreversible pulpitis with normal apical tissue was made.

Local anesthesia and carious lesion removal were followed by pre-endodontic build- up and access opening with endo access bur. During the examination, the anatomy of the first right maxillary premolar was determined as follows: two canals in the buccal root and palatal root. Canal negotiation was done with #8 and #10 K Files. Working length was determined with an apex locator then confirming apical gauging #25 (21 mm buccal and palatal canals). Cleaning and shaping were done using *Protaper Gold* until F2 (25.08). Obturation with *single cone technique* was done with resin-based sealer.

The patient came back for obturation control and got satisfactory results. The patient then underwent fiber post preparation, installation, core build-up, and final restoration with a Zirconia crown with a *chamfer* finishing line. Try-in and insertion of the crown were done after adjustments.

DISCUSSION

Single visit root canal treatment has some advantages, including better cost-effectiveness and less time needed for both the patient and practitioner. Although some have reported less post-treatment pain in single visit therapy, a systematic review found that the incidence of post-obturation discomfort was similar in both. Thus made the clinician prefers single visit approach in addition to the limitation of time due to patient's favor these days.[4]

The irrigation solutions used in this case parted into two categories. NaOCl 2,5% is

a commonly employed concentration as it decreases the potential for toxicity while maintaining some tissue-dissolving and antimicrobial activity. Adding activation with a passive ultrasonic activator boosts the effectivity of NaOCl as well as to permit the irrigant to reach into the isthmuses of the root canal. EDTA 17%, is used as the final irrigant (remove the inorganic part of the smear layer) after using NaOCl (remove organic part of the smear layer).[5]

Final restoration for endodontically treated teeth (ETT) is structurally different from non-restored vital teeth. The differences comprise alteration of the tooth structure, properties of dentine, and proprioception. For these reasons, they require specific restorative treatments such as post and core. Application of fiber post inserted to root canal improves retention of the crown and transmits pressure alongside the root. As for the final restoration, a zirconia crown was chosen for this case. Zirconia was a chosen material for this case because of its superior mechanical and aesthetic properties compared to other ceramic materials.

CONCLUSION

A MOD (mesial-occlusal-distal) cavity diagnosed as asymptomatic irreversible pulpitis with normal apical tissue therapy carried out as single visit endodontic with post crown for final restoration. Suitable case, materials, technique, and approach may give a feasibly favorable prognosis if supported by clinician skills and the patient's positive acceptance.

CONFLICT OF INTEREST

There is no conflict of interest.

ETHICAL CLEARANCE

Informed consent was obtained from the patient in written form.

FUNDING

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AUTHORS CONTRIBUTION

Maria Febritania Wahyuni Huri: Visualization, writing-original draft preparation and editing. Nadia Liliani Soetjipta: Supervision, validation, and preparation. Dian Agustin Wahjuningrum: Conceptualization and reviewing.

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Endodontic retreatment of a mandibular second premolar's underfilled root canal: A case report

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ABSTRACT

Introduction: Bacterial elimination from the root canal system holds the key to a successful endodontic treatment. Factors that may result in endodontic failure are poor obturation quality, over and under-filling obturation and persistence of bacteria in the canals and apex. Endodontic retreatment is required to solve faults and achieve successful endodontic treatment results. This case report described the endodontic retreatment of a mandibular second premolar.

Case Illustration: Retreatment completed in multi visit. The previous gutta percha was removed by carefully using solvent and stainless-steel H-files and rotary protaper retreatment. The root canal was prepared with Crown Down Pressureless technique using Protaper Gold and sequence irrigation 2,5% NaOCl, 17% EDTA and distilled water. Obturation technique use the single cone obturation technique with calcium silicate based sealer. Final restoration with fiber post and lithium disilicate crown.

Conclusion: Non-surgical retreatment can be chosen as a management in previously treated tooth with chronic apical abscess, it requires maximal re-cleaning and reshaping. The reduction of the periapical lesion indicates a sign of healing so that the tooth can last as long as possible in the mouth.

Keywords: Underfilled obturation, retreatment, root canal treatment failure, dental health.

INTRODUCTION

The eradication of bacteria from the root canal system is paramount for the success of endodontic treatment. The effectiveness of endodontic treatment is gauged by both the clinical absence of symptoms and the prevention or resolution of periapical pathologies. Despite advancements in techniques and instruments facilitating treatment, instances of failure persist, necessitating retreatment of previously treated root canals.[1-3]

Elements that can contribute to endodontic failure include inaccuracies in length (such as overfill and underfill), errors in the cleaning and shaping process (such as ledge formation, apical transportation, perforations, and instrument fracture), and errors in the quality of obturation (such as voids, lack of uniform and continuous taper, and lack of homogeneity).[1]

CASE ILLUSTRATION

A 43-year-old female patient presented at RSKGMP FKG UNAIR with the chief complaint of pain during mastication in relation to her second mandibular premolar, persisting for the past two months. The patient had her teeth treated two years ago. The clinical examinations showed there was a resin composite on tooth 45, percussion (+), bite test (+) and sinus tract (+). The periapical radiograph revealed a root canal that was underfilled, approximately 5 mm short of the designated working length, accompanied by a minor periapical radiolucency of approximately 2 mmThe diagnosis was established in teeth that had been previously treated and exhibited a chronic apical abscess. The proposed treatment strategy involved undertaking endodontic retreatment, culminating in a final restoration comprising a fiber post and a lithium disilicate crown. The patient comprehended and consented to the outlined procedure, granting approval for treatment on tooth #45. The case was concluded over several sessions.

Tooth #45 was aseptically isolated using a rubber dam. The composite was removed and continued with a rewalling on the distal wall. Following the successful identification of orifices, the preceding gutta-percha was meticulously eliminated through the judicious application of solvent, H-files, and rotary ProTaper retreatment. Periapical radiographs were captured to assess the cleanliness of the root canal walls in relation to obturation material. The determination of the working length was achieved utilizing an electronic apex locator. A glide path using stainless steel K- files no #10 and #15, apical gauging until file no #25, cleaning and shaping using Protaper Gold up to F2 (25.08) with a sequence of irrigation with 2,5% NaOCl, 17% EDTA, and distilled water. The canals were desiccated using sterile paper points and subsequently applied with a dressing of calcium hydroxide paste.

On the next visit, there was no complaint from the patient. Percussion (-), bite test (-), and sinus tract (-). Isolate the tooth, open the temporary filling and calcium hydroxide paste were cleaned with aquades. Trial guttap and final sequence irrigation, followed by ultrasonic activation. The obturation methodology employs the single-cone technique in conjunction with a sealer based on calcium silicate and confirm with a periapical radiograph.

At the third visit, no complaints were noted. Removing gutta percha using

a peeso reamer, leaving a 4 mm gutta percha in the apical root, and a fiber post was placed. Subsequently, the core was constructed using a dual-cured composite material (Luxacore Z, DMG America). At the fourth visit, color assessment was conducted utilizing the Vita 3D Master shade guide, and the color of the teeth was 3M1. Crown preparation and dual impressions for the definitive restoration were executed. A lithium disilicate crown was selected as the final restorative material. During the conclusive appointment, crown placement was accomplished using resin cement (RelyX, 3M, US), and occlusion was verified. Subsequent follow-up assessments indicated the absence of pain recurrence post-retreatment, affirming the complete restoration of the tooth.

DISCUSSION

Historically, endodontic failure has been correlated with persistent infection within the canals and procedural errors arising from deviations in both technical and clinical biomechanical preparation protocols. The cause of root canal treatment failure in this case was obturation that did not reach the apex (less than 5 mm from the apex), possibly because the instrumentation did not reach the working length. The appropriate technique for cleaning and shaping, along with accurate measurement of the working length, is crucial. Research indicates that with each 1 mm reduction in working length, there is a corresponding 14% increase in the failure rate. Endodontic failure is frequently associated with insufficient obturation or the occurrence of overextended filling.[4,5]

A key objective in endodontic treatment involves achieving a hermetic preparation and obturation of the root canal. Inadequate obturation, if present, may lead to the development of a periapical lesion. The presence of sinus tracts is a manifestation of chronic dental infection and provides an avenue for the drainage of infection and pus.[6,7] Chronic abscesses may not cause pain or only cause mild pain, and sometimes the patient is unaware of the symptoms. Therefore, non-surgical endodontic treatment is needed to overcome the failure of the previous endodontic treatment.[5]

Numerous types of sealers have been used together with gutta-percha for root canal filling, resulting in the development of new sealers with enhanced properties. In this case, obturation using calcium-silicate-based sealers is recommended because sealers have a continuum of favorable biological characteristics, exemplified by prominent biocompatibility and an elevated pH level, antimicrobial properties, and bioactivity. Some studies showed calcium-silicate-based sealers had absence of volumetric contraction during the setting process, while others exhibited a marginal expansion. The development of a mineral layer during the setting process establishes a chemical bond with dentin walls within a biological milieu, thereby enhancing their sealing efficacy.[8,9]

A multitude of antimicrobial agents have been proposed for use as inter-appointment dressings. In this case, calcium hydroxide paste, recognized as one of the simplest and highly efficacious antimicrobial medicaments, was employed.[10] Calcium hydroxide (Ca(OH)2) serves as an efficacious root canal medicament due to its broad-spectrum antibacterial properties, biocompatibility with tissues, alleviation of periapical tissue inflammation, and its potential to stimulate hard tissue formation.[6]

The success of root treatment necessitates the restoration of compromised dental crowns. The restoration of the dental crown with secure retention is crucial for facilitating the prolonged functionality of root canal-treated teeth. The selection and fabrication of restorations for teeth undergoing root canal treatment are contingent upon the remaining dentition and the anticipated occlusal load borne by the tooth.[10,11] Prefabricated fiber posts were chosen in this case because there is still adequate tissue structure in the cervical region of the tooth, and the choice of a lithium disilicate crown as the final restoration is based on its aesthetically pleasing appearance, ability to mimic natural teeth, and high value of flexural strength, which is between 320 – 450 MPa. As a result, the prognosis for successful post-endodontic treatment restorations can be achieved.[12]

CONCLUSION

Non-surgical retreatment may be selected as a therapeutic approach for a previously treated tooth exhibiting a chronic apical abscess; it requires maximal re-cleaning and reshaping. The reduction of the periapical lesion indicates a sign of healing so that the tooth can last as long as possible in the mouth.

CONFLICT OF INTEREST

No conflicts of interest exist.

ETHICAL CONSIDERATION

Informed consent has been obtained from the patient.

FUNDING

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AUTHORS CONTRIBUTION

Meidi Kurnia Ariani: Conseptualization, Data curation; Dr. Nanik Zubaidah and Prof. Sri Kunarti: Supervision, Validation, and Preparation; Dr Nanik Zubaidah and Dian Dwi Pratiwi: Visualization, Writing-Original Draft Preparation, Writing – Review & Editing.

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Management of open apex on immature lateral incisive teeth using mineral trioxide aggregate with changes in inclination: A case report

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ABSTRACT

Introduction: Permanent teeth with an open apex with periapical lesion need appropriate treatment to close the apical and remove the periapical lesion. The success of treatment depends on the material used. The purpose of this case report is to describe the steps for apexification treatment of left lateral incisive by changing the inclination.

Case Illustration: A 20-year-old man complained because of pain in his left front upper tooth. The patient had a history of trauma when he was 9 years old and broke his tooth. The tooth had been previously treated, and the patient wanted to re-treat his tooth. The treatment procedure begins with debridement and irrigation sequences and is continued with apexification using MTA. The open apex in this case was caused by trauma to the anterior teeth, so the apexification treatment was chosen using MTA material. On the next visit, a cast post is made and the tooth was restored using a Lithium disilicate to change the inclination. Selection the right material is necessary before starting a treatment. After 3 months, the subjective and objective examination results showed no complaints about the tooth. The radiographic results showed that the periapical lesion had disappeared.

Conclusion: Apexification using MTA has high success for the treatment of open apices and removal of periapical lesions.

Keywords: Apexification, tooth fractures, periapical diseases, mineral trioxide aggregate, lithium disilicate.

INTRODUCTION

Young permanent teeth are permanent teeth whose root canals are not yet fully formed. Trauma that occurs in young permanent teeth can cause necrosis of the tooth and before the apical closed completely so the apical closure will stop and the apex will become open. If the apical is still open, conventional endodontic treatment become difficult because there is not normal apical constriction in the root canal and it cause the root canal filling material can be extruded so the successful of treatment cannot be predicted. To overcome this problem, apexification treatment can be carried out.[1]

Apexification is an endodontic treatment with the aim to close foramen apical with a barrier in young permanent teeth with incomplete roots. Treatment of non-vital teeth with open apex is not different from endodontic treatment of non-vital teeth, which includes cleaning, irrigation, and obturation of the root canals with filling materials. The calcific barrier at apexification can prevent cement and gutta percha extrusion towards the periapical direction during obturation.[2]

One of the materials that can be used is Mineral Trioxide Aggregate (MTA). Mineral Trioxide Aggregate (MTA) is an appropriate alternative material for open apex treatment because it can create an apical plug or apical barrier that can quickly close an open apex, so that the root canal can be immediately obturated. In addition, MTA has good sealing ability, biocompatible, antibacterial, radiopaque, appropriate setting time, good marginal adaptation and can be used as a root tip filling material and can induce hard tissue formation.[3] The aim of this case report is to demonstrate the use of MTA to form an apical plug at the open apex followed by obturation of the root canal using thermoplastic gutta percha.

CASE ILLUSTRATION

A 20 year old man came to the Airlangga University Dental Conservation Clinic with complaints of pain and swelling from his anterior upper tooth. The patient has falled down when he was 9 years old which caused fractured of his tooth. He went to the dentist for treatment and since 2 years ago the patient began to complain because of pain from his front upper tooth. On objective examination there is a temporary palatal filling, Percussion (+), Bite test (+), Gingiva around the teeth is normal and there is no mobility.

On radiographic examination, the root canal was seen with an open apex and there was a radiolucent appearance on the periapical tooth 21. The diagnosis of tooth 21 was pulpal necrosis accompanied by a chronic apical abscess. The treatment plan that will be carried out is apexification using MTA and followed by obturation using thermoplastic gutta percha and installation of cast post and lithium disilicate crown.

At the first visit, a complete anamnesis, objective and supporting examinations, diagnosis, establishment of a treatment plan, informed consent and inform to consent were done. Work isolation with rubber dam and removing temporary filling material. Working length measurements using the apex locator obtained a working length of 24 mm. K-file was used for apical gauging and obtained

#80. The root canal was debridement and sequence Irrigation using NaOCl 2.5% in 2/3 coronal - distilled water - 17% EDTA - sterile distilled water in 1/3 apical. The root canal was dressing with Ca(OH)2 paste and the cavity is closed with a temporary filling material.

On the second visit, application of 3-4 mm MTA in the 1/3 apical using MTA carrier, condensation using a plugger and X-ray confirmation of MTA filling. Moist cotton is applied to the cavity and temporary filling.

In the next visit, the root canal was obturated used *backfill* technique (*gutta percha thermoplastis*). A week later, the guttap was taken with peso reamer and preparation for fabricated post was done. The next step was try in fabricated post and cementation using GIC luting. Tooth color was determined using the Vita 3D shade guide. Double impression technique was applied for crown preparation, bite registration and insertion of a temporary crown. At the last visit, temporary crown removed, try in and insertion a *lithium disilicate* crown on tooth 21 with resin cement.

DISCUSSION

Trauma that occurs in anterior teeth causes necrosis before the development and growth of the root is complete, as a result the root growth stops and the root canal is not fully formed and it makes open apex in young permanent tooth. The open apex makes conventional root canal treatment difficult because gutta percha can extrude towards the periapical during obturation, so apexification treatment can form a calcific barrier at the apical so the root canal filling can be done.[1]

There are several materials that can be used for apexification, one the material is calcium hydroxide, but calcium hydroxide has several disadvantages, so MTA (Mineral trioxide aggregate) was developed for root ends filling material.[4] MTA has a high pH, which is 10.2 at the beginning and three hours later it increased to 12.5. This high pH condition acts as antibacterial and will induce the formation of hard tissue. MTA also has good sealability, biocompatibility and bacteriostatic properties when used as an apical plug. In addition, MTA has radiopaque properties, and can stimulate the release of cytokines from bone cells so that it can actively stimulate hard tissue.[5]

Obturation of apexification can be done using a *backfill* technique *(gutta percha thermoplastic)*.[5] The use of a post is also necessary in this case to increase restoration retention and continue the pressure received by the tooth so it can distributed along the root. Post can be divided into several types, namely based on how they are made. Post can be divided into two, namely prefabricated and custom-fabricated/custom-made post, while based on the material of manufacture, namely metal and non-metal post.[6]

In this case a metal fabricated dowel is used. This post was chosen because the tooth required inclination correction for the maxillary anterior teeth.[7] The final restoration of this case was a *lithium disilicate* crown. The crown was chosen because it has high fracture resistance, minimal reduction in restoration thickness, adhesive strength, good biocompatibility and has high esthetics.[8]

CONCLUSION

Permanent teeth with open apex require special care. Treatment that can be done is by apexification using MTA. MTA can speed up treatment time by forming an apical plug at the open apex so that root canal filling can be done immediately and radiographic results show periapical lesions which disappear after 3 months of control.

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CONFLICT OF INTEREST

The author declare no competing interest with regards to the authorship and/or publication of the article

ETHICAL CLEARANCE

Written informed consent was obtained from the patient or legal guardian of the patient. The patient or the legal guardian has given their consent in the form of the images and other clinical information to be published in the journal. They understand that their names and initials will not be published.

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AUTHORS CONTRIBUTION

All authors contributed equally in the preparation of this manuscript.

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External bleaching management on discolored teeth in one visit: A case report

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ABSTRACT

Introduction: Dental discoloration is a common issue among many people worldwide. An undesirable tooth color can impact an individual's appearance and decrease their self confidence. Dental bleaching is a prevalent and effective cosmetic procedure for treating discolored teeth. The objective of this case report is to present on the external bleaching with in-office dental bleaching for maxillary and mandibular anterior teeth.
Case Illustration: A 28-year-old female came in complaining of yellowish teeth and wanted her tooth color improved to a whiter shade.
Conclusion: External bleaching is an effective treatment for rapid improvement of tooth discoloration.

Keywords: Tooth discoloration, esthetics, external bleaching, in-office dental bleaching.

INTRODUCTION

Aesthetic concerns like tooth discoloration, particularly in anterior teeth, are common among many people, affecting their appearance and leading to decreased self confidence. Tooth discoloration can cause many effects, mainly lead to a decrease in self confidence, thus motivates patients to seek for dental treatment. One way to improve dental aesthetics against tooth discoloration is with dental bleaching procedure.[1]

In this case, external bleaching was employed. External bleaching itself consists of two methods, the first can be applied by dentists in clinical practice, called in-office bleaching, and the second can be performed by the patient at home under the dentist's supervision, known as home bleaching. These two bleaching approaches utilize distinct categories and concentrations of bleaching agents. In dentistry, the most commonly used bleaching agent is 5-35% H2O2.[2] In one visit, in-office bleaching can usually show noticeable result.[3]

CASE ILLUSTRATION

A female patient, aged 28, sought consultation at RSKGMP Airlangga University, presenting with concerns of yellowish teeth and a desire for a whiter shade. She reported being a frequent consumer of tea and coffee and had never previously sought dental treatment. For the first appointment, treatment begins with cleaning of 14, 13, 12, 11, 21, 22, 23, 24, 34, 33, 32, 31, 41, 42, 43, 44 tooth surface abrasion was performed using pumice and a brush. Subsequently, the baseline color assessment of the maxillary anterior teeth and mandibular teeth was conducted utilizing the Vita 3D Master shade guide, resulting in the determination of an initial color of 3M1. A cheek retractor is used, Subsequently, the working area is isolated, and both the teeth and gingiva are desiccated using an air spray. Subsequently, the gingival barrier was systematically applied along the entire surface of the anterior gingival margin to the premolars in both the upper and lower jaw, followed by light curing for screening motion technique. Prepare the bleaching agent in accordance with the manufacturer's instructions by mixing it 50 times. Subsequently, apply the 40% Hydrogen Peroxide bleaching agent uniformly to the labial surface of the teeth using a microbrush for a duration of 20 minutes. The bleaching material was subsequently cleansed using cotton pellets until devoid of any residue, followed by rinsing with water and removal of excess liquid using a suction tip.

After treatment, the color check with the color shade guide indicated 1M1 (Vita 3D Master), and the patient expressed satisfaction with the obtained color. Remove the gingival barrier. Final picture after treatment. Application of a desensitizing agent comprising 3% Potassium Nitrate and 0.11% Fluoride. The patient was instructed for a control after 2 weeks. Patients were given instructions to reduce their intake of acidic and highly colored foods and drinks for 2 weeks, use fluoride-containing toothpaste, and use the CPP-ACP paste. On her next visit, the patient had no reported concerns, and the outcomes of the bleaching procedure were deemed satisfactory.

DISCUSSION

Tooth discoloration is generally caused by two factors, extrinsic factors and intrinsic factors. Extrinsic factors can be caused by food consumption, certain drinks such as coffee and red wine, or smoking habits, and poor oral hygiene can also induce extrinsic staining. The alterations in the color of external teeth are induced by the low acidity (pH), in contrast to the effects observed with neutral and high acidity.[4] Meanwhile, factors can result from pulp hemorrhage, which causes blood to infiltrate into the dentinal tubules. The blood undergoes decomposition, resulting

in the deposition of chromogenic blood degradation products, such as hemosiderin and hemine. Other intrinsic factor can be caused by the systemic administration of tetracycline antibiotics and pulp necrosis.[5]

Dental bleaching constitutes a therapeutic intervention aimed at whiten teeth through a chemical process with H2O2 which is a potent oxidizing agent. In dentistry, there are two ways or techniques of dental bleaching, that are external bleaching applied to vital teeth and internal bleaching employed for non-vital teeth. This case pertains to external bleaching.[2] Hydrogen Peroxide and Carbamide Peroxide are chemical materials that are usually used for dental bleaching in various concentrations. External bleaching with in-office bleaching procedure is carried out under dentist supervision. To accomplish the desired tooth color, this procedure can be repeated for several sessions.[4]

In-office bleaching frequently produces a more rapid bleaching effect results from the elevated concentration of the bleach used. Several in-office bleaching systems available in the market include light activated to enhance the bleaching effect.[5] A study by Knezevic (2023) reported that the length of the discoloration period is an important factor for the success of bleaching treatments. A reduced duration of tooth discoloration is indicative of a more favorable prognosis for bleaching, whereas the outcome of a longer period discoloration bleaching is uncertain and often unsuccessful due to the more complex color integration in the dentin.[6]

After bleaching, tooth sensitivity may develop, as it is a common temporary side effect after procedure.[7] The application of fluoride and/or calcium can mitigate the loss of microhardness in the post-treatment phase. The incorporation of fluoride into the bleaching agent can positively influencing the re-hardening of bleached enamel, necessitating a reduced duration recovery time than without fluoride gels.[8]

CONCLUSION

It can be concluded that external bleaching with in-office dental bleaching can be an effective treatment for tooth discoloration. This dental bleaching procedure is a conservative way to improve aesthetics. Bleaching is an effective method to whiten teeth, and it can be done in one dental visit.

CONFLICT OF INTEREST

None to declare.

FUNDING

None.

ETHICAL CONSIDERATION

Written informed consent was secured from either the patient or the legal guardian. The patient or legal guardian has provided consent for the publication of images and other clinical information in the journal. They comprehend that their names and initials will not be disclosed.

AUTHORS CONTRIBUTION

All authors contributed equally in the preparation of this manuscript.

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Endodontic retreatment in underfilled root canal of maxillary second premolar : A case report

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ABSTRACT

Introduction: Endodontic retreatment is a procedure performed on a tooth that has undergone prior endodontic treatment, necessitating additional endodontic intervention to attain a successful outcome. These failures manifest as a result of factors including access-related issues, missed canals, access cavity perforations, instrumentation-related complications such as ledge formation and separated instruments, as well as the presence of foreign objects, and obturation-related challenges arising from coronal leakage. To mitigate failures and attain successful outcomes, nonsurgical endodontic retreatment can be implemented. This case report described the endodontic retreatment of a maxillary second premolar.

Case Illustration: Retreatment was carried out over multiple visits. Fillers were collected using a rotary protaper retreatment file and gutta solvent in the buccal root canal, opening the access and searching for the palatal root canal. The root canals were prepared using the Crown Down Pressureless technique using Proteper Gold with irrigation using 2.5% NaOCl, 17% EDTA, 2% chlorhexidine, and ice water. Ultrasonic activation. Obturation of the root canal using a single cone technique using a gutta point with a resin-based sealer paste, the provision of a fiber post, and the use of a dental crown made of zirconia as the final restoration.

Conclusion: Endodontic retreatment can eliminate inflammation, allowing the tooth to receive restorative treatment. Endodontic retreatment was done successfully on the underfilling obturation. Endodontic treatment is a highly predictable therapy with excellent prognosis. Correct evaluation of preoperative radiographs is essential for endodontic treatment to achieve successful results.

Keywords: Retreatment, underfilled obturation, maxillary second premolar.

INTRODUCTION

Endodontic retreatment is a therapeutic procedure conducted on a tooth that has undergone prior endodontic treatment, necessitating additional endodontic intervention to achieve a successful outcome in light of its present condition. The etiology of a failed root canal treatment can be caused by underfilling obturation or coronal restorations that experience microleakage. The efficacy of endodontic treatment is gauged by the thoroughness of the cleaning process within the complete root canal system and the meticulous filling of the root canals in three dimensions. Dentists must understand the anatomic variations of the root canal before performing treatment.[1,2]

Common factors that can be associated with endodontic failure include the persistence of bacteria (both intra-canal and extra-canal) and insufficient root canal filling (characterized by inadequately cleaned and poorly obturated root canals), root canal filling material that is too long, inadequate coronal sealing (leaks), unaddressed root canals, encompassing both primary and accessory ones, procedure errors of iatrogenic origin, such as suboptimal access cavity design, complications in instrumentation, including the occurrence of ledges, perforations, or separated instruments.[2,3] Radiographic examination also has an important role in identifying root canal configurations so that it can help establish a diagnosis and improve the quality of root canal treatment.

CASE ILLUSTRATION

A 36-year-old male patient came to RSKGMP UNAIR with a complaint that he wanted to treat his upper left tooth, which hurts when he eats. The patient said that the upper left tooth had been treated about a year ago at a private clinic. The patient also complained that his teeth felt painful when used to bite food since 2 months ago and had never swollen. On clinical examination, a large disto-oclusal cavity was found in tooth 25. Vitality examinations showed negative results or non-vital teeth, while percussion examinations and bite tests showed positive results. On supporting radiographic examination, there is a radiopaque appearance of the filling material in the root canal that does not reach the apical part of the tooth. The pulpal diagnosis of tooth 25 was Previously treated teeth on the periapical side had symptomatic apical periodontitis.

The treatment carried out in this case was first an anamnesis, an objective evaluation, supporting examinations, and a diagnosis of the case. Saliva, KIE, and DHE tests were carried out, followed by Informed consent and Informed Consent. After that, the stages of work were carried out, starting with isolation with a rubber dam and continuing with rewalling on the distal wall of tooth 25. Gutta points were retrieved using a rotary ProTaper retreatment file and gutta solvent within the buccal root canal, subsequently followed

by root canal irrigation. Radiographic confirmation for gutta-point retrieval. Two orifices are visible on the buccal and palatal sides. The buccal and palatal canal negotiations were continued with K-file #10. Measurement of working length with the apex locator obtained a working length of 24 mm buccal and 22 mm palatal. Apical gauging with the k-file got number #25. Followed by root canal preparation with Protaper Gold up to F2 (25.08). Sequence of irrigation: 2.5% NaOCl, 17% EDTA, 2% Chlorhexidine, and distilled water, subsequent to ultrasonic activation. Then the root canals were dried with endosuction and paper points. Administer intracanal medication with CaOH2 and temporarily fill the cavity. The patient was instructed to control it at the next visit.

On the next visit, isolate the work area with a rubber dam. Open the temporary filling, and Ca(OH)2 is cleaned with 2.5% NaOCl and activated by ultrasonic. Trial gutta point 25.08. Final sequence irrigation: 2.5% NaOCl, 17% EDTA, and distilled water, followed by ultrasonic activation of the irrigation fluid. The root canals were dried with endosuction and paper points. A gutta point trial was carried out, and then a radiographic photo was taken to see the results of the gutta point trial. Then followed by obturation with gutta point F2 with resin-based sealer paste.

Shade taking with the Vita 3D Master shade guide got 3M3 color. Followed by determining the size of the fiber post using a template. After that, gutta percha points were taken using a peeso reamer and continued with the adjustment of the root canal with an 18-mm long dowel drill, then the root canal was irrigated. After that, insertion of fiber post and manufacture of core buildup using dual-cured composite core material (Luxacore Z, DMG America) and light curing. After the post-installation was completed, the crown preparation was 1.5 mm occlusal, 1-1.5 mm lingual, buccal, proximal with chamfer endings, and convergent to occlusal using

round end fissure burs. Before printing the results of the preparation, gingival management was installed with a retraction cord. After that, impressions were made for the maxilla with a two-step technique with an elastomeric double impression impression material and for the mandible with an irreversible hydrocolloid impression material. Making bite registration using polyvinyl siloxane.

On the next visit, a try-on of a zirconia crown was carried out. Then proceed to check the occlusion and proximal adaptation of the restoration to the adjacent tissue. First isolate the working area with a rubber dam, then apply 37% phosphoric acid etching for 20 seconds on the tooth surface, rinse, and dry, followed by universal bonding and a light cure. Pretreatment of the inner surface of the zirconia crown with Zirconia primer Insertion and cementation of the crown utilizing dual-cure resin cement, then curing for a duration of 2 seconds, residual cement is removed, succeeded by a conclusive light-curing process lasting 20 seconds. The final stage is removing the rubber dam, checking for occlusion proximally, and adapting the restoration to the surrounding tissue after insertion.

DISCUSSION

Root canal treatment has the main goal of shaping, cleaning, and filling in three dimensions to prevent reinfection of the tooth. Besides that, to relieve pain, restore the function of the tooth and heal periapical lesions. If this goal cannot be achieved, there are several other treatment options, such as observation, non-surgical root canal re-treatment, surgical root canal re- treatment, extraction, or referral to a specialist. Certain experts adhere to the principle that preserving a portion of a tooth is preferable to complete extraction.[4] Non-surgical retreatment of the root canal is warranted in cases of failed initial root canal treatment, presence of inflammation or infection associated with the tooth, persistent symptoms, development of sinus tract swelling and pain, potential recoverability of the tooth, emergence of a periapical radiolucency, and the need for a new restoration for the tooth.[5,6]

The cause of the failure of root canal treatment in this case was that the obturation did not reach the apex, possibly because the instrumentation did not reach the working length. Failure of repeated root canal treatment to eliminate bacteria and prevent further contamination with hermetic obturation and good coronal closure Understanding the anatomy of the root canal system plays an important role in the success or failure of the treatment.[7,8] In this case, there was an underfilling obturation in the root canal of tooth 25, and there was a missed canal. So that in this case the operator performed repeated root canal treatment in multiple visits. The operator performs open access again at the base of the pulp. Because the operator looked for a previously treated orifice directed too buccally, it is likely that there is a root canal on the palatal side. According to Krasner & Rankow's laws of access opening theory, there are the Law of Centrali, the Law of Concentricity, the Law of the CEJ, the First Law of Symmetry, the Second Law of Symmetry, the Law of Color Change, the First Law of Orifice Location, the Second Law of Orifice Location, and the Third Law of Orifice Location, so that the operator can estimate the location of other orifices in the palatal area. Prefabricated fiber posts are the choice in this case because there is still adequate tissue structure in the cervical region of the tooth. A sufficient ferrule was obtained (height of the remaining structure ±2 mm and thickness ±1mm) so that the prognosis for successful post-endodontic treatment restorations could be achieved. In addition, the fiber post has elastic modulus properties similar to dentin, has good adaptability, is non-corrosive, and can distribute pressure both from the lateral and apical directions as a whole.[9]

The choice of a zirconia crown as the final restoration in this case was due to its better adaptation to the inner surface of the restoration and compressive strength than metal restorations. Another advantage of zirconia is that it does not cause discoloration and irritation of the gingiva around the restoration margin; besides that, it also has better functionality, retention, aesthetics, and durability.[10]

CONCLUSION

It can be concluded that re-root canal treatment requires maximum recleaning and reshaping. Clinicians need to be careful when performing root canal treatment of the maxillary second premolars regarding the configuration of the root canals to avoid root canals being left behind.

CONFLICT OF INTEREST

There are no conflicts of interest.

ETHICAL CONSIDERATION

Written informed consent was obtained from the patient or legal guardian of the patient. The patient or the legal guardian has given their consent in the form of images and other clinical information to be published in the journal. They understand that their names and initials will not be published.

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AUTHORS CONTRIBUTION

Yashinta Ramadintha: Conceptualization, Data Curation; Dr. Sukaton: Supervision, Validation, and Preparation; Dr. Sukaton and Daradhasih Bestari Santiaji: Visualization, Writing – Original Draft Preparation, Writing – Review & Editing.

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Open apex of upper central incissive apexification management with mineral trioxide aggregate – A case report

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ABSTRACT

Introduction: The maxillary anterior teeth are often damaged. As a result, the tooth become necrosis before the development and root growth is done, thus causing the root canal not fully formed and open apex. Open apex condition should be treated with apexification treatment to prevent the extrusion of root canal filling material. One of the best material choices for apexification is mineral trioxide aggregate (MTA).

Case Illustration: Diagnosis of open apex could be performed with radiography and clinical examination. The treatment of the open apex is apexification. Apexification could be done using application of MTA to achieve apical plug. The treatment of apexification starts with access opening of the teeth and canal was prepared using crown down pressureless. Root canal was irrigated at each file change and the root canal was given $Ca(OH)^2$ for a week. Apexification was performed with MTA carrier to the root canal and pushed down with plugger to make apical plug of the teeth. Obturation of the root canals using a thermoplastic with warm vertical compaction technique. The final restoration using direct resin composite restoration. Apexification with MTA gives us a favourable result, allowing the tooth to receive apical constriction. Apexification using MTA material is a highly predictable therapy with excellent prognosis. More than 90% of cases will recover if therapy is carried out carefully following proper protocols.

Conclusion: Apexification using MTA can reduce treatment time by forming an apical plug in the open apex, obturation can be done immediately.

Keywords: Trauma, open apex, apexification, MTA, composite resin.

INTRODUCTION

Trauma that occurs in young permanent teeth causes the teeth to become necrotic before apical development and growth is complete so that the apex closure will stop and the apex will become open. Because the apex is still open, conventional endodontic treatment becomes difficult because there is no normal constriction apical to the root canal so that the root canal filling material can extrude apically. To overcome this, apexification treatment can be carried out.[1,2]

Apexification is a method of root canal treatment with an open apex. Traditionally, this method uses calcium hydroxide. However, there are some disadvantages of calcium hydroxide, so a better alternative is needed. One of the choices of apexification materials is mineral.

trioxide aggregate (MTA). MTA is used as an apical barrier for teeth with incomplete apex, repairing root perforations, root end filling, pulp capping and pulpotomy procedures.[3]

Mineral Trioxide Aggregate (MTA) is a better alternative material for the treatment of open apices because it can create an apical plug, namely an artificial apical barrier that can quickly close the open apex, so that the root canal can be immediately obturated and fixed. In addition, MTA has good sealing ability, is biocompatible, antibacterial, radiopaque, and can serve as a material for filling root tips.[3]

CASE ILLUSTRATION

A 17-year-old male patient presented at Airlangga University Conservation Dentistry Clinic with complaints of maxillary right central incisor pain when chewing and discomfort. The patient said he had fallen about 5 years ago and was not treated. The patient is currently complaining of feeling uncomfortable with the condition of the teeth. Patients want their teeth preserved and cared for.

On clinical examination, the crown of the tooth looked normal but there was a fistula in the gingival area. On objective examination the teeth did not respond when the vitality test was carried out using the EPT showing no reaction. The results of the percussion test found no response, on the bite test there was a pain response.

Radiographic examination shows the root canal was seen with an open apex and there was a radiolucent image on the periapical tooth 21. The diagnosis of tooth 11 was pulpal necrosis and a periapical diagnosis of chronic periapical abscess. The treatment plan that will be carried out is apexification followed by obturation using thermoplastic gutta percha followed by direct composite restoration.

During the initial visit, written informed consent was obtained, followed by isolation using a rubber dam. Open access was executed utilizing an endodontic access bur to the orifice then K-file #08 and apex locator were entered to obtain a working length of 25mm. Apical gauging using K-file #80 then

root canal preparation using brushing technique using K-file #80. The tooth underwent irrigation with 2.5% sodium hypochlorite (NaOCl) and sterile distilled water to remove all debris and necrotic tissue. The teeth were dried with a paper point then given a $Ca(OH)^2$ dressing and provisionally filled in.

The second visit was controlled after 1 week, the results of subjective and objective examinations showed no complaints on teeth 21 & 11. Then the temporary fillings and CaOH were cleaned and irrigated, the root canals were desiccated using paper points and MTA was prepared.

MTA is mixed with a powder:liquid ratio = 3:1 and fed into the MTA carrier MAP System. The stopper is attached to the MTA carrier with a working length of -2mm & the MTA is applied into the root canal. The MTA is condensed with an endo plugger with the stopper installed at -2mm working length. The next application stopper is installed at a working length of -3mm, condensation, the last application at a working length of -4mm then condensation. Application of moist cotton pellets on top of the orifice, temporary filling. Then confirm with X-rays.

During the third visit, both subjective and objective examinations revealed no reported issues, then temporary fillings and cotton were taken. The root canal was irrigated and the root canal was filled with thermoplastic gutta-percha, then a radiographic photograph was captured for verification purposes of the root canal filling, then a final restoration was carried out using composite resin.

DISCUSSION

Progress in the field of dentistry has enabled patients to preserve the functional integrity of their teeth for an extended duration, striving towards a lifetime.[4] Trauma that occurred to the maxillary right central incisor about 5 years ago, resulted in the tooth experiencing pulpal necrosis before root development and growth was complete, as a result root growth stopped and the root canal was not fully formed so that the apex remained open. The presence of an open apex makes conventional root canal treatment difficult because the gutta percha can extrude periapically during obturation. Therefore, in this case, apexification treatment was chosen first, which aims to obtain an apical calcific barrier so that root canal filling can be carried out normally.[5]

Apexification is conventionally carried out using calcium hydroxide. However, the application of calcium hydroxide has drawbacks, including requiring a relatively long time for apex closure of 5-20 months, length of treatment and apical closure is unpredictable, the risk of fracture of the teeth increases and the level of patient cooperation is poor. To overcome these deficiencies, better materials have been developed, one of these materials is MTA.[5]

Mineral Trioxide Aggregate (MTA) is the right alternative because it has the property of creating an apical plug, which is an artificial apical barrier that can quickly close the open apex so that the root canal can be immediately obturated and fixed, without waiting for the development of an apical calcific barrier. In addition, MTA has good sealing ability, biocompatibility to tissues, antibacterial, radiopaque, and can stimulate the release of cytokines from bone cells so that they can actively stimulate hard tissue.[6]

Restoration following the completion of root canal treatment is very diverse, according to the latest journal post endodontic restoration of anterior teeth can be accomplished using direct restorations using composite resin with or without using post. The type of restoration used after root canal treatment is based on the remaining healthy tissue in the tooth. While certain laboratory investigations have indicated that posts enhance the structural integrity of endodontically treated anterior teeth, the majority of studies have demonstrated that post placement does not influence or diminish the fracture resistance of these teeth.[7]

Therefore, when a full coverage restoration is unnecessary for aesthetic or functional purposes, such as serving as an abutment for a fixed or removable partial denture, the use of a post is not warranted. Nevertheless, in the event that a full coverage restoration is deemed necessary for an anterior tooth that is being treated endodontically for aesthetic or functional reasons, a post may be indicated. This holds particularly true for the maxillary lateral incisors and mandibular incisors. Composite direct restoration is one of the restorations that can be used on teeth after root canal treatment with teeth with adequate healthy tissue remaining.[8]

CONCLUSION

Proper analysis through anamnesis, clinical examination, and radiography must be carried out in detail in order to get the right diagnosis and treatment plan. Apexification treatment using MTA can speed up treatment time by forming an apical plug at the open apex so that root canal filling can be carried out immediately.

Restoration after root canal treatment is growing, direct composite restorations can be used as the final restoration after root canal treatment. The remaining tooth structure is a reference for the selection of the final restoration.

CONFLICT OF INTEREST

The author declares no competing interest with regard to the authorship and/or publication of this article

ETHICAL CONSIDERATION

Written informed consent was obtained from the patient or legal guardian of the patient. The patient or the legal guardian has given their consent in the form of images and other clinical information to be published in the journal. They understand that their names and initials will not be published.

FUNDING

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AUTHORS CONTRIBUTION

Rizky Ernawati: Conceptualization, Data Curation; Dr. Galih Sampoerno: Supervision, Validation, and Preparation; Dr. Galih Sampoerno and Daniyal Lazuardi Ramadhan: Visualization, Writing – Original Draft Preparation, Writing – Review & Editing

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Single visit endodontic on multiple canal tooth with post and overlay: A case report

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ABSTRACT

Introduction: Single-visit endodontic treatment involves the comprehensive execution of root canal system cleaning, shaping, and obturation within a single appointment. As endodontic procedures evolved to become more precise, sophisticated, and demanding, the adoption of multiple-visit endodontics increased in prevalence. In recent times, the emergence of rotary nickel–titanium instruments has led to a growing acceptance of single-visit endodontics as the preferred treatment modality for the majority of endodontic cases. A systematic review revealed that single-visit root canal treatment demonstrated a slightly higher efficacy compared to multiple-visit treatment, with a healing rate that was 6.3% greater. Nevertheless, the disparity between these two treatment approaches did not attain statistical significance. There are many advantages when clinician choose single visit endodontic to treat their patient such as Reduces the frequency of operative procedures, minimizes the need for additional anesthesia, mitigates gingival trauma, and eliminates the potential for inter-appointment leakage through temporary restoration. The objective of this case report is to describe clinical step by step of single visit endodontic treatment on multiple canal tooth with post and overlay.

Case Illustration: A 28 years female patient come to RSGM Airlangga University complaining there is a cavity and spontaneous pain on the lower left posterior tooth since 2 week ago. The pain comes and go and increase at night. Patient consumed analgetic to relieve pain. This tooth had filling 2 years ago, then 1 years ago the filling came out and patient did not came to dentist to treat her tooth. Patient want to treat her tooth as soon as possible.

Conclusion: Single visit endodontic offers more efficient time to clinicians and patient to treat tooth, also offers many advantage in terms of time- efficiency, patient comfort, and treatment outcomes. A competences of clinicians and good case selection by clinician, greatly supports the success of treatment.

Keywords: Single visit endodontic, multiple canal, pulpitis irreversible, post, overlay, good health, well being.

INTRODUCTION

Single-visit endodontic entails the conservative and nonsurgical management of an endodontically affected tooth, encompassing the thorough cleaning, shaping, and obturation of the root canal system within a singular appointment.[1] With the evolution of more precise, sophisticated, and intricate endodontic procedures, the preference for multiple-visit endodontics has grown. In recent times, the widespread acceptance of single-visit endodontics as the preferred approach for the majority of endodontic cases has increased, particularly with the introduction of rotary nickel–titanium instruments.[2] There is an ongoing debate concerning single visit endodontics. Some clinicians take an extreme approach and treat all cases in a single visit, regardless of the patient's symptoms or complexity of the case. Others believe that numerous cases involving vital teeth are well-suited for the application of a single-visit treatment approach. The factors to be considered include the number of roots, available time, and the proficiency of the clinician.[3]

Single-visit root canal therapy has some advantages, including better cost-effectiveness and less time needed for both the patient and practitioner.[4,5] A systematic review revealed comparable incidences of postobturation discomfort between the single and multi visit approaches. Another systematic review concluded that compelling evidence indicating a significantly different prevalence of post medication pain with single or multi visit root canal treatment was lacking. In the context of the healing rate cases, a systematic review indicated that there was no discernible distinction in the efficacy of root canal treatment concerning "radiographic success" between both approaches. A recent systematic review has also determined that the healing rate of root canal treatment, whether conducted in a single or multiple visits, is comparable for infected teeth. A systematic review indicated that single-visit root canal treatment exhibited a slightly higher efficacy compared to multivisit treatment, with a 6.3% higher healing rate. Nevertheless, there was no statistically significant distinction between the outcomes of these two treatment protocols.[3] The objective of this case report is to describe clinical step by step of single visit endodontic treatment on multiple canal tooth.

CASE ILLUSTRATIONS

A 28 years female patient come to RSGM Airlangga University complaining there is a cavity and spontaneous pain on the lower left posterior tooth since 2 week ago. The

pain comes and go and increase at night. Patient consumed analgetic to relieve pain. This tooth had filling 2 years ago, then 1 years ago the filling came out and patient did not came to dentist to treat her tooth. From the objective examination, there was profunda caries of 36, thermal test (+), EPT test on 36 score 7, EPT test on control tooth score 3. bite test (-), percussion (-) and normal gingiva. This case diagnosed as symptomatic pulpitis irreversible with normal apical tissue.

For the first appointment dentist take clinical picture and patient was instructed to take radiography of the tooth. Then dentist did shade taking with Vita 3D. Isolation using rubber dam. The access was opened using endo access bur. Intrapulpal anesthesia with pehacain 1 : 80.000 on tooth 36. Glide Path Management start with Canal negotiation that was done using K File #8 and #10 then rotary file (Proglider) with root canal lubricant. Determination of working length of the canal using apex locator and K File #10 (distal canal 19mm, mesibuccal canal 19 mm, and messiolingual canal 19mm). Apical gauging K File #25 on each canal. The cleaning and shaping was done by using rotary file Protaper Gold until File F2 (25.08). The three canals were obturated with gutta-percha and resin based sealer by single cone method.

For the second appointment patient did not complain any pain, extraoral examination showed no abnormalities, percussion (-), bite test (-), temporary filling good, and normal gingiva. Dentist started to do restoration post endodontic by matching the size of the fiber post with template. Removing 2/3 coronal gutapercha from distal canal of the tooth using peeso reamer then insertion of the fiber post. Overlay preparation of the tooth and do impression for overlay.

For the third appointment patient did not complain any pain, extraoral examination showed no abnormalities, percussion (-), bite test (-) and normal gingiva. Insertion overlay using dual cure resin base cement. For the fourth appointment patient did not complain any pain, overlay restoration is good, extraoral examination showed no abnormalities, percussion (-), bite test (-) and normal gingiva.

DISCUSSION

In this case, patient complained there is a cavity and spontaneous pain that increase at night and want to treat her tooth as soon as possible. This tooth diagnosed as asymptomatic pulpitis irreversible and normal apical tissue on tooth 36.

The objective is to conclude the treatment in the most expeditious manner while upholding treatment quality. The benefits of single-visit endodontic treatment encompass reduced susceptibility to microbial contamination of the root canal, heightened efficiency as the operator is not required to elaborate on the treatment, and avoidance of situations where patients may incompletely undergo endodontic treatment. The practitioner has the capability to execute access preparation, root canal negotiation, preparation, and filling concurrently, diminishing the likelihood of errors or complications in root canal identification, in contrast to the approach involving multiple visits for root canal treatment. Hence, there is no necessity for intracanal medication, and anesthesia is administered singularly, thereby mitigating the patient's apprehension and anxiety. Certain authorities adhere to the principle that retaining a portion of a tooth is preferable to complete extraction.[6] Consequently, immediate restoration of the tooth is feasible, thereby diminishing the risks of fracture and pain during treatment, optimizing cost-effectiveness, and facilitating prompt initiation of prosthetic work.[7]

NaOCl 5.25% was chosen as irrigation because it serves as an effective antimicrobial and proteolytic agent, displaying excellent organic tissue solvent properties, and acts as a lubricant with relatively rapid effects. A study show that 5.25% NaOCl was also associated with significantly lower postoperative pain compared to 2.5% NaOCl in Single-visit root canal therapy for mandibular molars afflicted with irreversible pulpitis.[5] NaOCl is both an oxidizing agent and a hydrolyzing agent. EDTA 17% was used as irrigation solution was chosen for its ability to chelate and eliminate the mineralized component of the smear layer.[1]

Before planning restoration for endodontically treated, following factors should be taken into consideration, such: the amount of the tooth structure present, occlusal forces and the anatomic position of the tooth. In this case, based on the classification of Ingrid Peroz et al. (2005), was classified as Class IV: one remaining walls around the access cavity preparation, provided the tooth is subjected to undue occlusal forces. So the restoration chosen was post and overlay.

CONCLUSION

Single visit endodontic offers more efficient time to clinicians and patient to treat tooth, also offers many advantage in terms of time-efficiency, patient comfort, and treatment outcomes. A competences of clinicians and good case selection by clinician, greatly supports the success of treatment.

CONFLICT OF INTEREST

There are no conflicts of interest.

ETHICAL CONSIDERATION

Informed consent was obtained from the patient in written form.

FUNDING

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AUTHORS CONTRIBUTION

Iin Indah Aris Wati: Conseptualization, Data Curation, Tamara Yuanita: Supervision, Validation, and Preparation; Tamara Yuanita and Ogie Wijayanto: Visualization, Writing – Original Draft Preparation, Writing – Review and Editing.

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Single visit root canal treatment of the right lower first molar with composite resin restoration: A case report

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ABSTRACT

Introduction: The longstanding discourse in the dental profession centers around the comparative analysis of single-visit and multiple-visit root canal treatments. The unresolved aspects encompass distinctions in clinical outcomes, challenges in microbial control, and considerations related to pain management. When clinicians are confronted with the decision of which treatment modality to recommend to patients, pivotal factors to weigh include effectiveness, potential complications, cost implications, and, notably, patient satisfaction.

Case Illustration: A 22-year-old woman came to RSKGMP outpatient clinic complaining of spontaneous pain in the lower right posterior teeth with cavities. The subjective investigation found cavities and a history of spontaneous pain. On objective assessment, 47 found deep caries, Tooth vitality was positive; the bite and percussion tests were negative, and normal gingiva was normal. On radiographic examination, it was found that the radiolucent image reached the pulp chamber on the crown of tooth 47. The patient's tooth 47 was diagnosed with symptomatic pulpitis Irreversible with normal apical tissue. The treatment plan is single visit root canal treatment on tooth 47 using the crown-down pressure less technique. The filling method uses a single cone. Permanent restorations using direct composite restorations.

Conclusion: The successful clinical and radiographic outcome was achieved in this case through the implementation of single-visit root canal treatment on the lower right first molar, coupled with composite resin restoration.

Keywords: Single-visit Root Canal Treatment, Irreversible Pulpitis, Composite Resin Restoration.

INTRODUCTION

Root canal treatment involves the removal of either vital or death pulp of the root canal, replacing the pulp with filling material to halt the spread of infection. The objective is to maintain the affected tooth in a biologically acceptable condition relative to the surrounding tissue.[1] Multiple-visit root canal treatment, a well-established endodontic procedure, presents certain drawbacks.[2] A crown-down pressureless technique was used to prepare the root canals, in comparison to a step-back technique to prevent periapical debris extrusion, challenges in timely provision of aesthetic restorations for traumatically damaged crowns, and instances of treatment failure.[3]

In recent years, single-visit root canal treatment has gained popularity as a preferred therapy for numerous endodontic cases. Irreversible pulpitis, marked by acute tooth pain, is a common reason for patients to seek emergency dental care.[4] Single-visit root canal treatment is a successful treatment modality compared to multiple-visit therapy. Root canals should be properly prepared biomechanically, debrided, shaped, disinfected, and closed three-dimensionally. It is favorable for the clinicians and patient to provide careful case preference and adhere to standard endodontic protocols. This case report aims to present single-visit root canal treatment for irreversible pulpitis.[5]

CASE ILLUSTRATION

A 22-year-old woman came to RSKGMP outpatient clinic complaining of spontaneous pain in the lower right posterior teeth with cavities. The patient has had niches since five years ago. She wanted her teeth to be treated. The general medical examination was within normal. The subjective investigation found cavities and a history of spontaneous pain. On objective assessment, 47 found deep caries, Tooth vitality was positive; the bite and percussion tests were negative, and normal gingiva was normal. Saliva examination, it was concluded that the risk of caries was low. On radiographic examination, it was found that the radiolucent image reached the pulp chamber on the crown of tooth 47. The patient's tooth 47 was diagnosed with Pulpitis Irreversible with normal apical tissue. The treatment plan is single visit root canal treatment on tooth 47 using the crown-down pressureless technique. The filling method uses a single cone. Permanent restorations using direct composite restorations.

The patient's first visit was conducted with a clinical examination and saliva test. Dental health education was performed, and got informed consent. The next step was local infiltration to tooth 47 and isolation using a rubber dam. The access was opened using endo access bur. Canal negotiation was done using K File #8. Then Irrigation sequence using 2.5% NaOCl for each file change and recapitulation

with K-file #10 activation of the irrigation material using ultrasonic activation. After completion, the root canals were dried using an endo suction tip and a paper point. Guttap trial was performed with gutta-percha X2 in the mesiolingual canal and X3 in the mesiobuccal and distal canal (Protaper Next). The three canals were obturated with gutta-percha and resin-based sealer by single cone method. After completion, a temporary filling is done, and a radiographic photo confirms obturation.

The patient wasn't complaining of any pain during the second appointment, and the extraoral examination, percussion test, and bite test showed no abnormalities. The direct resin composite restoration was used to complete the endo resto treatment. The teeth were performed once the procedure was over; this case showed clinical and radiological success. The patient was advised to uphold oral hygiene practices and scheduled for follow-up appointments every six months.

DISCUSSION

Single-visit root canal treatment changed the treatment method of endodontic therapy from an older era that consisted of hand-held files to a generation of rotary endodontics.[5] In this case, the choice was Single-visit root canal treatment due to its conservative, nonsurgical approach in addressing endodontic issues through the comprehensive cleaning, shaping, and obturation of the root canal system in a single session.[6] The advantages for the patient encompass a diminished risk of acquiring nosocomial endodontic infections, fewer instances of pain, and cost-effectiveness.[7] Indications of this method are vital teeth, anterior fractures, and teeth exposed to pulp accidentally. Another indication is patients with medical conditions who cannot frequently visit dental clinics.[6]

In this case, the patient's tooth was diagnosed as normal apical tissue with symptomatic irreversible pulpitis, included in the indications for a single-visit root canal treatment. Pain control for single-visit root canal treatment of irreversible pulpitis can relax the patient and save time. Using a long-acting local anesthetic agent is preferable. It also helps to control postoperative pain.[4] A rubber dam isolation is a procedure that offers several advantages during root canal treatment, including the ability to prevent the aspiration of instruments, tooth debris, and medicaments. Additionally, it minimizes the risk of cross-contamination within the root canal system, preventing the spread of infectious agents. The use of irrigants further enhances canal disinfection, contributing to improved treatment outcomes. NaOCl 2.5% was chosen for irrigation because it works quickly as a lubricant, excellent organic tissue solvent, antibacterial and proteolytic agent. EDTA 17% was employed as an irrigation solution due to its ability to chelate and eliminate the mineralized component of the smear layer.[6]

Root canal treatment with a rotary system can be done in a single visit. The decision to perform a single-visit root canal treatment was due to the absence of contraindications and the operator and the patient's ability to cooperate during the visit. At the same time, the rotary system is used because it shortens working time, causes few procedure errors, and reduces cross- contamination between patients.[3] The restoration chosen was resin composite restoration because all axial walls of the cavity remain with a thickness >1 mm. Only intracoronary restoration of the access cavity provided the tooth with undue occlusal forces.[6] The sustained success of endodontically treated teeth relies on the effective integration of both endodontic and restorative procedures. Post-endodontic restoration becomes imperative to safeguard against the fracture of the remaining tooth structure, prevent the re-infection of the root canal, and replace any missing tooth structure.[6]

CONCLUSION

The single-visit root canal treatment performed on the lower right first molar, coupled with composite resin restoration, demonstrated clinical and radiological success in this case. This approach provides benefits in terms of time efficiency and minimizes the risk of microbial contamination without compromising the quality of treatment outcomes.

CONFLICT OF INTEREST

None.

ETHICAL CLEARANCE

Patient has given permission and informed consent for the publication of this case report.

FUNDING

None.

AUTHORS CONTRIBUTION

All authors contributed equally in the preparation of this manuscript

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Indirect veneer using lithium disilicate as an alternative treatment for increasing aesthetic smile of teeth on diastema closure: A case report

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ABSTRACT

Introduction: In recent years, there has been an increase in patient demand for a procedure that results in an attractive smile to boost their self-confidence. Diastema is a gap of greater than 0.5 mm between the proximal surfaces of adjacent central incisors, resulting in a mismatch between the dimensions of the teeth and mandible. There are numerous treatment options for diastema, including indirect veneers. The indirect veneer technique offers several benefits, including the use of a durable material, the production of more aesthetically pleasing results, and the improvement of contours, contacts, and colour patterns. This case report describes an alternative indirect veneer therapy using lithium disilicate to enhance the aesthetic appearance of a smile.

Case Illustration: A 30-year-old female patient came to the Conservative Department of Dental Hospital Universitas Airlangga with the chief complaint of an unsightly space between her two upper front teeth. Approximately six months have passed since her most recent orthodontic appointment. She was found to have a central diastema on teeth 11 and 12. Lithium Disilicate Indirect veneers were used for the procedure.

Conclusion: In cases of central diastema, indirect veneers made from lithium disilicate are an alternative treatment option for enhancing the aesthetic value of patient teeth.

Keywords: Indirect veneer, Lithium disilicate, aesthetic smile, diastema closure.

INTRODUCTION

In recent years, there has been an increasing demand among patients for a procedure resulting in an attractive smile to boost their self-confidence.[1,2] In dentistry, gaps between teeth that result in a discrepancy between the teeth and jaw size are called diastemas. Diastema is a gap of greater than 0.5 mm between the proximal surfaces of adjacent central incisors, resulting in a mismatch between the dimensions of the teeth and mandible.[3,4] There are numerous treatment options for diastema, including indirect veneers.[4]

The indirect veneer technique offers several benefits, including the use of a durable material, the production of more aesthetically pleasing results, and the improvement of contours, contacts, and colour patterns.[4] Compared to direct veneers, indirect veneers were more aesthetic and last longer, particularly when it med by pressed ceramic or porcelain by laboratory technician.[5]

Ceramics emerge as a preferred material for enduring aesthetic indirect restorations, owing to their capacity for translucency and light transmission, closely simulating natural enamel. Among contemporary compositions, lithium disilicate stands out, showcasing notable attributes such as elevated strength, enhanced fracture resistance, and a superior level of translucency. The advancements in the physical properties of these materials have reached a stage where they demonstrate resilience even in high-stress-bearing.[6]

CASE ILLUSTRATION

A 30-year-old female patient came to the Conservative Department of Dental Hospital Universitas Airlangga with the chief complaint of an unsightly space between her two upper front teeth. Approximately six months have passed since her most recent orthodontic appointment. Clinical examinations show a central diastema on teeth 11 and 12. The patient had all of their molar teeth extracted last year, and she wished for a tooth treatment in which the result could last much longer. The patient's medical history was satisfactory. Upon examination of the patient's saliva, it has been classified as normal (green) category.

The treatment plan was explained to the patient during the first visit, and additional oral photographs were taken to determine the design for the closure of the diastema under the patient's consent. The initial stage of treatment begins with printing the study model and waxing it. Then the tooth colour was adjusted with Vita Master 3D, and the appropriate shade of 1M2 was chosen.

During the next visit, the isolation procedure was carried out using a rubber dam. The first step of preparation was carried out on a mock-up using a depth-cutting bur. The shading process was carried out using a pencil, followed by the second step of preparation. During this step, a round-end tapered fissure diamond bur was used that converges towards the incisal direction, creating a chamber-shaped space for the last step of preparation. A fine finishing bur was used to finish the preparation process.

After the gingival management was completed, it was followed by printing using a two-step technique using double impression material, bite registration, and the insertion of temporary veneers made of self-curing composite materials.

On the last visit, the temporary veneer was removed and the new veneer was tested. Anatomical conformity and colour similarity, occlusion, articulation, proximal contact, and adaptation of the restoration to the surrounding tissue were observed, and if it is appropriate, cementation can be carried out. A rubber dam was placed, and an all-porcelain veneer was etched with 9% buffered hydrofluoric acid for 10 seconds, then rinsed, dried, reviewed with silane, and left for 60 seconds. Etch teeth with 37% phosphoric acid for 20 seconds, irrigate, dry, and cover with bonding, then light for 20 seconds. Insert all porcelain veneers with adhesive resin cement, then light cure.

DISCUSSION

Dentists are encouraged to perform a conservative approach as it can maintain the natural tooth structure and achieve the dental aesthetic results desired by the patient.[7] Veneer treatments were used in several dental cases, including diastema. In numerous cases of diastema, the use of indirectly fabricated veneers is preferable to directly fabricated veneers due to their feasilibility.[8]

Diastema offers various therapeutic alternatives, encompassing orthodontic interventions, as well as restorative approaches utilizing direct composite resin, indirect composite resins, and ceramic veneers. Ceramic materials have a much more durable surface than composite restorations. Ceramics do not have a resin matrix to absorb liquid and are therefore more colour stable and show good physical strength.[7]

Lithium disilicate is the most recent ceramic composition, featuring high strength, high fracture durability, and a high degree of transparency.[6] The advantages of ceramic veneers are that they are minimally invasive, so they not only reduce tooth decay and minimize the risk to the gingiva but also mimic the natural translucency of tooth structure and provide promising dental aesthetic results.[9] Lithium disilicate veneers exhibit a thickness ranging from approximately 0.3 mm to 0.5 mm, allowing for elevated resistance while preserving their aesthetic attributes.[10] Comprising 70% by volume of needle-like crystals within a glassy matrix, lithium disilicate represents a ceramic material. The deliberate control over the size, shape, and density of this crystalline structure contributes to the development of restorations characterized by heightened flexural strength and enhanced fracture toughness.[10-12] In this case report, indirect veneer method using lithium disilicate were chosen as a treatment after considering their long-term aesthetic durability, promising results, and short procedures.

CONCLUSION

An appropriate selection of dental care materials is required to meet the high demand for aesthetic results in dentistry. In cases of central diastema, indirect veneers made from lithium disilicate are an alternative treatment option for enhancing the aesthetic value of patients' teeth. Due to its acid-resistant properties, lithium disilicate is expected to have high adhesion strength. In this care report, lithium disilicate was chosen due to its advantages, such as high biocompatibility and good mechanical properties, favourable bond strength to tooth tissue, and aesthetic appearance due to its higher translucency compared to other materials.

CONFLICT OF INTEREST

None.

ETHICAL CLEARANCE

Written informed consent was obtained from the patient or legal guardian of the patient. The patient or the legal guardian has given their consent in the form of the images and other clinical information to be published in the journal. They understand that their names and initials will not be published.

FUNDING

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AUTHOR CONTRIBUTION

All authors contributed equally in the preparation of this manuscript

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Single - visit apexification with mineral trioxide aggregates on the right maxillary central incisor: A case report of delayed care for traumatized young permanent teeth

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ABSTRACT

Introduction: Tooth root formation involves mediated interactions between Hertwig's epithelial root sheath (HERS), dental papilla, and follicle cells. Dental trauma and pulp inflammation will interrupt this process leads to an open apex and thin root canal walls. Open apices complicate endodontic treatment, because the tooth lack of apical stop for obturation so it is necessary to induced apical barrier with apexification procedures. This case reports gives details about diagnosis and management of maxillary right central incisor with pulpal necrosis, open apex and clinical crown discoloration.
Case Illustration: A 21-year-old female patient with broken central maxillary incisor, grayish discoloration, asymptomatic teeth, history of traffic accidents, and recurrent sinus tract. Radiography showed an opening foramen, wide root canal, and diffuse radiolucency. The 11 was diagnosed with pulp necrosis and chronic apical abscess. Treatment plans were apexification using Mineral Trioxide Aggregate (MTA) followed with custom fiber post and porcelain fused to zirconia (PFZ) crown.
Conclusion: MTA is capable of producing better apical artificial barriers, sealing capabilities, and biocompatible.

Keywords: Apexification, single visit, MTA, traffic accidents, open apical, crown discoloration.

INTRODUCTION

Tooth root formation occurs as a result of interactions between the cells of Hertwig's epithelial root sheath (HERS) and cells of dental papilla and dental follicle.[1] Dental trauma, inflamed or necrosed pulp occurs during this period will interrupt the root formation and leads to an open apex and thin root canal walls,[2] this condition complicate the endodontic treatment because lack of apical stop.[3] Treatment of immature necrotic teeth with open apices remains difficult for clinicians due to their anatomical complications.[4] To improve root filling and apical seal, it is necessary to induce closure of apical foramen with mineralized tissue or artificial barrier. This case report giving details on diagnosing and managing maxillary right central incisor pulpal necrosis, open apex, and crown discoloration using MTA apexification and custom fiber post restoration.

CASE ILLUSTRATION

A 21-year-old female patient with a history of traffic accidents reported broken central maxillary incisor, grayish discoloration, and recurrent sinus tract. Her teeth were asymptomatic, and she had 2/3 coronal crown fractures without pulp involvement. Radiographic examination showed an opening foramen apical, wide root canal, and diffuse radiolucency around tooth #11. Based on the findings, the diagnosis of necrosis of the pulp with chronic apical abscess was made. Apexification with MTA followed by custom fiber posts and PFZ were chosen for this case. Anesthesia and isolation were administered, and an access cavity was created on the palatal side using endo access bur. Canals were negotiated with #10 K-file (Dentsply Maillefer; Switzerland), working lengths obtained at 23 mm, and apical gauging was obtained at K- file #90, both were radiographically confirmed. The canal was instrumented 2 mm above the radiographic apex using H-file (Dentsply Maillefer; Switzerland), irrigated with sodium hypochlorite (NaOCl) 2,5 % (Biodinamica; Brazil), EDTA solution 17% (EDTA Trissodico, Biodinamica; Brazil), and saline, then activated using sonic system (EDDY, VDW, German). Calcium hydroxide ($CaOH_2$) paste (Ultracal XS; Ultradent, USA) used as an intracanal medicament and cavity was sealed with cotton pellets and temporized, patient recalled after two weeks.

The patient remained asymptomatic and had no abnormalities during the second visit. The temporary restoration was removed, and root canal irrigated to remove the CaOH2 paste. Filling of 3 mm of MTA (ProRoot MTA; Dentsply, USA) in apical 1/3 using MTA carrier, condensed using a plugger, and a confirmatory radiograph was performed. Moist cotton pellets placed into the cavity and sealed with temporary restoration, in order for MTA to setting. After 24–48 hours, the temporary restoration was removed, canals irrigated, and root canals filled with thermoplasticized gutta percha with calcium silicate-based sealer (CeraSeal; Meta Biomed, Korea). Next day, remaining 2/3 of gutta percha was removed with gates glidden drill, and root canal was prepped for the insertion of a custom fiber post (everStick POST, GC Europe). Custom fiber post cemented using adhesive resin cement (RelyX™ ARC; 3M ESPE). The

Figure 1. A. preoperative intraoral of #11 with crown fractured and grayish discoloration; B. preoperative radiograph showed #11open apex and periapical radiolucency; C. 3 mm of MTA placed on 1/3 apical third of #11; D. thermoplasticized obturation of #11; E. custom fiber post insertion on #11; F. crown preparation for PFZ; G. postoperative intraoral.

core for tooth 11 was made using resin core buildup material (Allcem Core, FGM dental group US), core is prepped for a PFZ crown. The impression technique used in this case was double impression technique, and bite registration was made using light body polyvinyl siloxane (Aquasil Ultra+; Dentsply Sirona).

During crown fabrication periods, patient was given a provisional crown made from *bis-acryl resin* (Luxatemp Fluorescence, DMG USA). After PFZ crown is done, it was tried on and cemented using adhesive resin cement; occlusion and articulation were also checked. Finishing and polishing at the end of the procedure also performed. Patient showed no symptoms 1 week after the procedures and she is satisfied with the final looks of her new appearance (Figure 1).

DISCUSSION

This type of case is frequently encountered in everyday clinical practice, especially in young adults. Pulpal necrosis is one of major complications of dental injury trauma.[5] In this case, pulpal necrosis occurred due to accidental trauma when she was 9 years old and manifested within a matter of years from the onset.

It is known that trauma prior to apical closure process restricts the development of roots. If the continuity of HERS is disturbed by trauma or inflammation process, dental papilla cells couldn't well differentiated into odontoblast, subsequently formation of dentin and cementum will be disrupted and result in open apices.[6] Open apices teeth have thin dentinal walls, undesired able crown – root ratio, inverted or parallel root canal shaped,[7] and lack of apical stop.[4,8] This abnormality may complicate disinfection, debridement, root canal obturation and outcomes of endodontic treatment.[7] In this report we did apexification with MTA because 11 tooth has open apex with 90 mm apical gauging.

Apexification is an approach to induce an artificial apical barrier in necrotic pulp teeth with open apex.[9] MTA is one of materials used for apexification and preferred over $CaOH_2$, because MTA produces a predictable apical artificial barrier significantly better than $CaOH_2$, with clinical success rate near 90%.[10,11] MTA also biocompatible, produce less pulpal inflammation responses, stimulates production of dental cementum and regenerates of periodontal tissue.[11,12] In this case periapical radiolucency resolved and artificial barrier induced by MTA was successfully formed, this confirmed by radiographic. Custom fiber post in this case is used to reinforce wide root canal, correct crown misalignment, and allowing better stress distribution.[13] Crown fractured and discoloration was treated using PFZ. Zirconia could effectively mask dark discoloration, then tooth-colored ceramics was used as veneered lamination over zirconia coping for higher esthetic.

CONCLUSION

MTA is capable of producing better physical apical barriers, has better sealing capabilities, and biocompatible. Thus makes MTA as an exquisite apexification materials.

CONFLICT OF INTEREST

None declared.

ETHICAL CLEARANCE

Written informed consent was obtained from the patients for publication of this case report and any accompanying images.

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AUTHORS CONTRIBUTION

concept – K.I., R.P., N.D.M; design – K.I., R.P; supervision – K.I.; funding materials – K.I., R.P; data collecting & processing – N.D.M., R.P., K.I; analysis & interpretation – N.D.M., K.I; literature research, writing, critical review – N.D.M., KI

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Aesthetic rehabilitation on anterior teeth: A case report

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ABSTRACT

Introduction: Dental trauma is among the causes of disharmonious relationships between teeth and their adjacent hard and soft tissues, all of which should improve the patient's general health and well-being. The patient complained about her unpleasant smile and want to repair her fractured and malpositioned teeth. All fractured and weakened teeth in this case restored with lithium disilicate crown and preceded by crown lengthening to correct the gum line symmetry.
Case Illustration: A 25 years old female complained about her disharmonious anterior teeth prior to trauma 2 months ago, that decreased her self-esteem. This case showed fractured teeth, rotation on tooth 22, asymmetrical margin gingival height, and edge to edge bite. Following procedures for rehabilitation of malpositioned tooth are elective endodontics, post-core and crown using lithium disilicate crown as the material to restore aesthetic and functional integrity, as well as minor endodontic surgery in this instance crown lengthening as tissue management.
Conclusion: Aesthetic rehabilitation of fractured and extreme angulation of the teeth with edge to edge bite requires a comprehensive management of tissue management, endodontic treatments, and indirect restoration to give better and promising results.

Keywords: Malposition teeth, fractured teeth, aesthetic rehabilitation, indirect restoration.

INTRODUCTION

Patients seek out clinical procedures in aesthetic dentistry primarily due to smile disharmony, which is frequently associated with asymmetry and/or disproportionality of the teeth. Anterior tooth fracture caused by motorcycle-related traffic accidents in modern developing-world nations are majority happened. The most frequently affected teeth are anterior teeth, particularly the central and lateral upper incisors. The traumatic injury could result in pain, discomfort, and damage to dental and periradicular structures, as well as physical and psychological distress, significantly lowering quality of life.[1,2]

The harmony and equilibrium of a smile are largely determined by the teeth's position and alignment in the arch. Teeth that are malposed or rotated disrupt the arch form and may alter the apparent proportions of teeth. The harmony and equilibrium of a smile are largely determined by the teeth's position and alignment in the arch. Teeth that are malposed or rotated disrupt the arch form and may alter the apparent proportions of teeth.[3]

Monolithic ceramic crowns could be used for correction of fractured and misaligned teeth, preceded by endodontic treatment and fiber post for severely rotated tooth. Monolithic ceramic crowns provide clinicians with excellent aesthetic outcomes while maintaining a conservative approach for creating full coverage crowns. Unfavorable aesthetic and angulation could also be corrected by using dental ceramic crown.[4]

CASE ILLUSTRATION

A 25 years old female came with a chief complaint of three broken anterior teeth D to a motorcycle accident 2 months ago that affected her appearance. No spontaneous pain was felt, but sometimes teeth become sensitive if patient eat or drink any cold beverages. Clinical examination revealed fracture of tooth #11, #21, and #22 up to half of the coronal portion of the tooth. The tooth responded well to an electric pulp test and was not sensitive to pressure or palpation. The tooth exhibited a positive response to an electric pulp test and did not elicit any reaction to pressure or palpation. A diagnosis of symptomatic reversible pulpitis was determined, with normal periapical tissue observed on pre-operative radiography.

In this case,the treatment for tooth #11 and #21 is crown lengthening with final restoration of lithium disilicate crown. Meanwhile for malpositioned tooth #22, endodontic treatment with restoration of fiber post followed by lithium disilicate crown is needed to correct the angulation.

DISCUSSION

According to the literature, the maxillary central incisors are most often affected by traumatic dental injuries, followed by the maxillary lateral incisors and mandibular incisors. The upper teeth are more prone to fractures than the lower teeth due to their open and conspicuous location in the face. Clinicians' decisions regarding the restorative treatment of fractured teeth significantly impact treatment prognosis. This choice necessitates a meticulous consideration of various factors, including the extent and pattern of the fracture, as well as the involvement of endodontic and periodontal components.[4]

On teeth 11 & 21 where the crowns were going to inserted, a gingival lift surgery was carried out to produce the correct gingival contours. In order to achieve

gingival health and aesthetics, gingival lift application is required because gingival labial margin position in the maxillary anterior region is a crucial factor in achieving the perfect smile. As a result, the relationship between the periodontium and the restoration is crucial.[4]

To achieve realignment and cosmetic enhancement of this tooth without orthodontic treatment, a restoration was deemed necessary, requiring the removal of sufficient tooth structure to accommodate both porcelain and realignment. Prophylactic endodontic therapy was deemed essential in this context, leading to the endodontic treatment of the maxillary anteriors to prevent pulpal exposure. Preserving color and translucency in the coronal third of the canal and pulp chamber is crucial for an endodontically treated tooth. Opting for esthetic posts, known for their increased translucency and compatible strength, was a logical choice.[5] Utilizing glass fiber posts enables the creation of aesthetically pleasing restorations devoid of a metal substructure. These reconstructed elements showcase exceptional depth in lifelike color vitality, avoiding unnatural opacity, shadows, grey discoloration, or artificial brightness attributed to underlying metal or masking agents.[6]

The compensation for the retention of the restored portion under masticatory stress involved the cementation of an intracanal post with fiber-reinforced resin posts. Suggestions have been made regarding resin posts as a category of materials providing stiffness equivalent to dentin, coupled with high durability, thereby presenting certain esthetic advantages over metal posts. The potential increase in strength for the remaining tooth structure and a reduction in the risk of tooth fractures may be attributed to a modulus of elasticity similar to that of dentin.[6]

All Ceramic as used in this case lithium disilicate crowns have advantages for having high mechanical and flexural strength, outstanding wear resistance, and superb aesthetics are a few of them. The aesthetic outcome of the restoration, its colour and translucency, the strength and fracture resistance of the material, the colour stability, the relationship with the soft tissue and remaining teeth, the stability of the cemented construction, the marginal closure and fitting, and the integrity of abutment teeth all play a significant role as restoration.[7]

CONCLUSION

This case study illustrates how aesthetic rehabilitation on fractured and malposition teeth could be restored with post-core and crown made of lithium disilicate may successfully manage the aesthetics of maxillary front teeth. The intricacy of the therapy may enhance aesthetics and provide patient-satisfying results.

CONFLICT OF INTEREST

None to declare.

ETHICAL CLEARANCE

Written informed consent was obtained from the patient or legal guardian of the patient. The patient or the legal guardian has given their consent in the form of the images and other clinical information to be published in the journal. They understand that their names and initials will not be published.

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AUTHORS CONTRIBUTION

All authors contributed equally in the preparation of this manuscript

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Single visit root canal treatment with *lithium disilicate* crown restoration on upper right first premolar: A case report

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ABSTRACT

Introduction: The quality of endodontic treatment directly influences its success rate. To achieve these goals, multiple visit for endodontic therapy was needed. Multiple visit endodontic has many disadvantages such as inter-appointment contamination and flare ups. In order to avoid these disadvantages, single visit endodontic have increased as the preferred treatment for the majority of endodontic cases.

Case Illustration: A 43-year-old female patient came to Department of Conservative Dentistry, Airlangga University Dental Hospital with complaints of spontaneous pain on her upper right tooth. Radiograph shows a cavity reaches the pulp and there was no periapical lesions. The 14 tooth was diagnosed with Symptomatic Irreversible Pulpitis with Normal Apical Tissue. Treatment plan was a single visit root canal treatment with post core and crown restoration.

Conclusion: One visit endodontic can be done in some cases, and it provides many advantages such as decreasing the number of appointments, patient convenience, and eliminating risk of inter-appointment contamination.

Keywords: Root canal treatment, single visit endodontic.

INTRODUCTION

The quality of endodontic treatment directly influences its success rate. To attain these objectives, endodontic therapy was traditionally conducted over multiple visits. Successful endodontic therapy requires debridement, shaping, disinfection, and three-dimensional obturation of the canal system. To accomplish this, endodontic therapy was previously carried out over multiple of visits to ensure complete canal cleanliness or improved endodontic therapy success.[1,2]

Multiple-visit endodontic procedures present several drawbacks, including risk of contamination each appointment and flare or hypersensitivity. These challenges may stem from factors such as temporary seal leakage or loss, prolonged treatment visits causing fatigue for both the patient and operator, difficulties in timely provision of cosmetic restorations for traumatized teeth, and treatment discontinuation, which may contribute to endodontic failures.[3]

To mitigate these disadvantages, single-visit endodontic procedures have gained popularity as the preferred treatment. Notable advancements in materials and equipment used in endodontic therapy, including essential tools like proper rubber dam isolation, magnifying instruments, sealants, obturating materials, electronic apex locators, and crown-down techniques with engine-driven rotary nickel-titanium files and ultrasonic instrumentation, have contributed to the preference for single-visit endodontic treatments. Although the materials and equipment differ significantly, the principles of the treatment in single visit endodontic are still relying on proper endodontic protocols, accurate diagnosis, and selecting the right cases.[3]

CASE ILLUSTRATION

A 43-year-old female patient came to the Department of Conservative Dentistry, Airlangga University Dental Hospital with complaints of sudden pain in the upper right back tooth, especially at night. The tooth has never been treated before and patient wants to treat the tooth. Objective examination showed that there was deep caries on the distal of tooth 14, percussion test (+), bite test (-), tooth was vital. Radiographic examination showed radiolucent appearance from distal surface reaching the pulp chamber tooth 14. Salivary examination results were: hydration in 30 seconds, bubble viscosity, pH: 7, quantity: 5ml, and buffer capacity is 10. From the examination results, tooth 14 was diagnosed Symptomatic Irreversible Pulpitis with Normal Apical Tissue and the treatment plan was single visit endodontic, fiber post core and *lithium disilicate* crown restoration.

At the first visit, informed consent were obtained before treatment. Isolation with rubber dam, rewalling with composite resin on the distal part of the tooth. The access opening using an endo access bur and then negotiated the root canal with K-File #10. Working length of the palatal root was 20mm, buccal root was 19mm and the apical gauging was found in K-File #25. Root canal preparation was performed using a Protaper Gold (Dentsply Sirona®) rotary file up to file F2 (25/08). Irrigation sequences were carried out using 2.5% NaOCL for each file change and recapitulation with K-File #10, then a gutta percha point F2 trial was performed (25/08) and radiographically confirmed. Final irrigation sequence were 2.5% NaOCL, 17% EDTA and distilled water, activation of the irrigation agent with sonic. Each change of irrigation

material is done by rinsing with distilled water. The root canals were dried and obturated with guttha percha point F2 and calcium silicate based sealer using the single cone technique. Temporary filling and obturation was confirmed with radiographic imaging.

On the second visit follow-up patient has no more pain, percussion (-), bite test (-), temporary fillings were in good condition, and gingiva around the teeth was normal. The restoration phase of treatment can be done immediately. Retrieval of 2/3 gutta percha point using peeso reamer and calibration drill on tooth 14 palatal root and root canal irrigated with distilled water. The root canal was drained and periapical radiographs were done to confirm gutta percha removal. Fiber post was cemented and core build up was done with dual cure composite core material, shade taking, then tooth were prepared for *lithium disilicate* crowns. Tissue management using a retraction cord, impressions were taken and temporary crown was cemented.

Third visit follow-up patient was asymptomatic and temporary crown were in good condition, gingiva around the teeth was normal. The temporary crown is removed, try in the lithium disilicate crown and check the occlusion, proximal and adaptation of the restoration. Isolate the work area with a rubber dam. Surface treatment of *lithium disilicate* crowns with application of 9% buffered hydrofluoric acid for 10 seconds then rinse, dry and cover with silane on the inner surface and leave for 60 seconds. Tooth surface treatment was done with etch with 37% phosphoric acid, rinse and dry. Cover with universal bonding then light curing. *Lithium disilicate* crown cemented the using adhesive resin cement and light cured for 2-5 seconds then clean the remaining cement. Light curing from all directions. Remove the rubber dam, then check occlusion, articulation, margin adaptation and proximal contact.

DISCUSSION

In this case, the tooth was diagnosed with symptomatic irreversible pulpitis with normal apical tissue. The treatment plan for single-visit endodontic procedures has proven to be an effective option in this case. An endodontic single-visit treatment can be appropriate when the vital teeth are uncomplicated, the pulp has been exposed due to caries or trauma, the patient is symptomatic of pulpitis, the patient is physically disabled, the patient is anxious and requires sedation during root canal treatment, fractured anterior teeth that are not periapical and have pulp involvement, traumatized teeth with aesthetic concerns, and nonvital teeth with sinus tracts. However, there are several contraindications for single-visit endodontic treatment such as anatomical abnormalities e.g. canal calcification and the curved shape of canals. In addition, symptomatic non-vital teeth without sinus tracts, symptomatic periapical abnormality of non-vital teeth, patients with hypersensitivity or flaring up, pus discharge in alveolar abscesses, patients unable to open their mouths for extended periods (TMJ disorder), patients with extreme percussion pain due to acute apical periodontitis, and those with lack of procedural access.[3]

Single-visit endodontic procedures present both advantages and disadvantages. The advantages include a reduction in the number of appointments, increased patient compliance, and minimized local anesthesia-related risk. In addition, it reduces iatrogenic errors that can occur from multiple appointments, reduces pain and anxiety episodes, prevents bacterial contamination through leakage beneath the provisional restoration, and reduces the likelihood of perforations, ledgings, stripping, and extrusion of antimicrobial irrigants. While single-visit endodontics may be more convenient for patients, one of the disadvantages is that the clinician and the patient may feel fatigued because of time constraints. Changing calcified canals, curving canals with a high degree of curvature, fitting weeping canals, etc., may require more time and may need to be done on successive visits. If a flare-up occurs, establishing drainage through an obturated tooth becomes difficult.[3]

Root canals were washed and formed using a *ProTaper Gold* rotary instrument (Dentsply Sirona®). The instrument has the advantage of being made of noble metal that has elasticity and flexibility thus it able to follow the form of the root canal and lower the risk of instrument fracture.[4] The preparation technique used in this case is crowndown pressureless. In several studies, it has been shown that crowndown pressureless technique reduces the risk of flare-ups due to the ability of this technique to cause less debris extrusion than other techniques, although there is still a possibility of flare-ups due to operator error in determining the working length.[5]

Calcium silicate based sealer, as known as bioceramic sealer was used in this case for root canal sealer obturation. It contains zirconium oxide, calcium hydroxide, single base calcium phosphate, calcium silicate, fillers, and thickener. Bioceramic sealer have a high pH, hydrophilic, insoluble, radiopaque, devoid of aluminum, and require humidity to set. Bioceramic sealants have the ability to stimulate the development of odontoblast-like cells from dental stem cells, which is supposed to aid in periapical healing. This sealer's nanoparticle size makes it easy for it to flow into the dentinal tubules, canals lateral, and ramifications. The bioactive qualities of this sealer will promote healing in the periapical region if extruded through the apex.[6] In the absence of intracanal dressing in single visit endodontic, administration of a sealer that has better biocompatible properties provides more optimal treatment results.

Premolars, characterized by reduced tooth material and smaller pulp chambers compared to molars, pose challenges in holding a core buildup following endodontic therapy. Furthermore, the risk of cusp fractures is heightened with the creation of an endodontic access canal, especially following cusp bending during function. Considering these factors, premolars may necessitate the utilization of fiber posts more frequently than molars.[7] Due to their remarkable flexural strength and transparency, lithium disilicate-based materials stand out among dental glass-ceramics and find extensive use in crown applications. These materials enable the fabrication of monolithic restorations characterized by complete anatomical integration and shape. Their exceptional strength renders them highly suitable for crafting inlays, onlays, thin veneers, as well as anterior, posterior, and partial crowns.[8]

In the case presented above, after a comprehensive examination of the tooth condition and if the operator can provide proper endodontic protocol, the patient can be advised to single visit endodontic procedure by being informed of its advantages and disadvantages. One of the benefits it can shorten the time to restore the function and aesthetic aspect of the tooth. As a clinician it is important to do a complete examination, strict case selection, and provide standard endodontic protocols that plays an important role in this treatment success rate.

CONCLUSION

One visit endodontic can be done in some cases, and it provides many advantages such as decreasing the number of appointments, patient convenience, and eliminating risk of inter-appointment contamination.

CONFLICT OF INTEREST

None to declare.

ETHICAL CLEARANCE

Written informed consent was obtained from the patient or legal guardian of the patient. The patient or the legal guardian has given their consent in the form of the images and other clinical information to be published in the journal. They understand that their names and initials will not be published.

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AUTHORS CONTRIBUTION

All authors contributed equally in the preparation of this manuscript.

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Management of traumatized non-vital tooth with intracoronal bleaching: A case report

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ABSTRACT

Introduction: Esthetic rehabilitation is important for a patient with traumatized dental injuries. Trauma to the teeth may cause pulp necrosis and intrinsic discoloration. Intracoronal bleaching is a minimally invasive treatment option for discolored non-vital teeth. This paper aims to describe the conservative management of discolored traumatized teeth through intracoronal bleaching techniques after endodontic treatment.

Case Illustration: An 18-year-old female came to Airlangga University Hospital with main complaints of broken upper front teeth and looks darker than the adjacent teeth after a motorcycle accident two months ago. The diagnosis of tooth 11 was pulp necrosis with asymptomatic apical periodontitis. The treatment was root canal treatment and intracoronal bleaching using 35% carbamide peroxide with final restoration of class VI direct composite.

Conclusion: Intracoronal bleaching is an option for treating discolored non-vital teeth, enhances esthetic rehabilitation, and is a minimally invasive alternative treatment.

Keywords: Intracoronal bleaching, tooth discoloration, carbamide peroxide.

INTRODUCTION

Restoring esthetics is crucial for patients experiencing dental injuries.[1,2] Maxillary central incisors are commonly affected by traumatic dental injuries, often leading to tooth discoloration and prompting patients to seek dental intervention. Traumatic dental injuries may result in pulp death, ankylosed root absorption, inflammatory root absorption, complete closure of the pulp canal, and change in tooth color.[2] The pulp's blood vessels may burst as a result of trauma to the tooth, allowing blood to diffuse into the dentinal tubules. The pigment from the erythrocytes' decomposition persists in the dentinal tubules, discoloring the crown. The hemoglobin and hydrogen sulfide produced by bacteria combine to discolor the tooth.[3]

Intracoronal bleaching is a minimally invasive cosmetic procedure that safeguards the existing structure of the tooth. The crowns of the teeth that will be bleached should relatively be undamaged. It is not recommended to bleach crowns that have been compromised by an access preparation, have multiple restorations, or have significant caries.[3]

However, there is a possible recurrence of a darkened color and whitening endodontically treated teeth may cause external erosion affecting the cervical root and crown, especially with high concentrations of H2O2 (30%) combined with heat.[4] The Walking bleach is one of the methods that can be used for bleaching non-vitalized teeth; it involves the placement of bleaching agents, such as 35% carbamide peroxide, into the pulp chamber and holding them there for a few days.[5]

CASE ILLUSTRATION

An 18-year-old female came to Airlangga University Hospital with complaining of broken upper front teeth and looks darker than the adjacent teeth after a motorcycle accident two months ago. The fracture was classified as class 2 Ellis Fracture Classification (not involving pulp), the vitality test and percussion test were negative, the bite test was positive, surrounding gingiva was normal. Radiograph showed a widening of the periodontal ligament at the apical tooth 11. The diagnosis of tooth 11 was Pulp Necrosis with Asymptomatic Apical Periodontitis. The management plan of this patient was root canal therapy and intra coronal bleaching with final restoration of class VI direct composite.

At the first visit, informed consent was obtained before treatment. The tooth was locally anesthetized, isolated with a rubber dam, access opening, glide path management, and working length was found in 20 mm, and apical gauging at K-File #30. The tooth was shaped and cleaned with rotary file X3 (30/07), irrigation with 2.5% NaOCL for each file change, and recapitulated with K-File to maintain the working length. After a trial of the gutta percha point (30/07), the root canal was dried with endo suction and sterile paper point, CaOH dressing, and temporary restoration was placed.

On the second visit, the tooth was asymptomatic, the percussion test was negative and the temporary restoration was in good condition. After isolation with a rubber dam was performed, the temporary restoration was removed and the root canal was irrigated with 2.5% NaOCl, 17% EDTA, and distilled water. The root canal was dried using paper point, obturated using resin- based sealer (AH Plus), and gutta-percha point (30/07) with continuous wave technique and backfilled with thermoplastic gutta-percha. Resin-based sealer has a good sealing ability and creates a "monoblock effect" that bond the canal wall and obturation material.

An obturation radiograph was taken and temporary restoration was placed.

After 1 week of follow-up, the tooth has no complaints. Shade taking was performed, and gutta- percha was removed 2mm below the CEJ level. GIC barrier was placed 2 mm so as to provide a Bobsled Tunnel appearance from the labial aspect and a Ski-slope appearance from the proximal aspect. 35% carbamide peroxide bleaching agent was placed, and the tooth was temporarily restored with GIC. Impression was taken to make wax-up models and the patient was instructed to notice the change of tooth color every day.

Three days follow-up, the patient had no complaints and the treated tooth showed a brighter color from 4M1 (Vita Toothguide 3D-Master) to 2M2. Application of Ca(OH)2 dressing for a week to neutralize the free radicals effect from the bleaching agent. At the following visit, the patient had no symptoms and final restoration of composite resin was performed. Shade taking with button try technique found that dentin shade was OA3 and email shade was A3. Composite restoration with layering technique, occlusion, and articulation checking were done, and restoration was finished and polished.

DISCUSSION

In this case, the cause of the discoloration originated intrinsically, to be more precise, diffusion of blood into the dentinal tubules. As the hemoglobin degrades, different colored molecules such as hemin, hematin, hematoidin, hematoporphyrin, and hemosiderin are produced. The tooth becomes discolored as a result of the combination of bacterial hydrogen sulfide and hemoglobin.[3] The most recommended treatment for discoloration with intrinsic causes is bleaching using intracoronal techniques. For an effective outcome in less time, the walking bleach technique was applied.[4]

Carbamide peroxide is the preferable material due to its effectiveness and exhibits reduced extraradicular diffusion compared to similar concentrations of hydrogen peroxide. Attin et al. demonstrate that patients who underwent whitening therapy at a young age frequently experience external resorption since young teeth have broad dentinal tubules, hydrogen peroxide may more readily enter the periodontium. Carbamide peroxide causes an alkaline pH in the tooth because it decomposes into ammonia, which has a lessened etching impact.[4] Hydrogen peroxide works more effectively in an alkaline environment (pH 8), which is maintained by urea.[3]

In a recent investigation conducted by Bersezio et al., internal bleaching demonstrated an association with inflammatory markers (RANK-L and IL-1), leading to bone loss in periodontal tissues and regulating root resorption. The utilization of the walking bleach technique with either 35% hydrogen peroxide or 37% carbamide peroxide resulted in an elevation of these markers, as revealed by the researchers.[3] Dental trauma can potentially harm the CEJ exposing underlying dentin. Collagen and hyaluronic acid can be broken down by free oxygen radicals produced during the bleaching process, which may be a pathological reason for resorption. Due to pH changes, these oxidizing substances can cause denaturation of the dentine protein. To avoid cervical resorption after the bleaching procedure, it is suggested to put calcium hydroxide in distilled water for 7 days to allow the medium to become alkaline and prevent potential injury to the periodontal ligament.[5]

This patient showed favorable results within 3 days. Higher bleaching agent concentrations accelerate tooth whitening compared to lesser bleaching agent concentrations, which take longer to bleach teeth.[6,7] A 3-mm protective barrier of glass ionomer cement was placed over the root filling to prevent the percolation of the bleaching agent into the periodontal tissues.[1] The final restoration in this case is using direct composite resin that preserves natural tooth structure.

CONCLUSION

Intracoronal bleaching is an option for treating discolored non-vital teeth, enhances esthetic rehabilitation, and is a minimally invasive alternative treatment.

CONFLICT OF INTEREST

There are no conflicts of interest.

ETHICAL CLEARANCE

Informed consent was obtained from the patient in written form.

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AUTHORS CONTRIBUTION

Brian Dwi Baskoro: Visualization, writing original draft preparation, and editing. Saindra Arsa Gumilang: Supervision, validation, and preparation. Widya Saraswati: Conceptualization and reviewing.

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A clinical approach to management of complicated crown fracture, peg shape tooth and multiple diastema of anterior maxillary teeth

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ABSTRACT

Introduction: Damage on anterior tooth requires prompt aesthetic repair. Treatment is dependent on the amount of tooth structure implicated. This case report aims to describe the practical steps and clinical treatment for complex aesthetic treatment for anterior maxillary teeth with fractured and peg shaped teeth with endodontic-restoration approach through smile design.
Case Illustration: A 23 year-old man with chief complaint of his smile with a fractured teeth, peg shaped tooth like, and rotate tooth, reported to RSGM FKG UNAIR. The patient wish to improve both function and the aesthetic of his smile.
Conclusion: Complex aesthetic rehabilitation on maxillary teeth were revealed successful to restore normal tooth shape, and function.

Keywords: Tooth fractures, tooth abnormalities, multiple diastema, aesthetic complex.

INTRODUCTION

Dental Trauma to the anterior teeth has a considerable effect on an individual, not only aesthetically but also has an effect on the mentality of the individual. Dental trauma cases are common due to various reasons, including 40% falling, 20% sports, and traffic accidents.[1] Cases involving enamel and dentin fractures occurring in permanent teeth were found to be 28% - 44%. While the involvement of enamel, dentin and pulp that occurs in permanent teeth due to trauma is 11% -15%. Treatment of teeth fractured by trauma can be done depending on how long the fracture line is, and how much hard tissue is involved.[1]

When developing a treatment plan for anterior teeth, aside from adequate anamnesis, examinations, and radiographs, it is necessary to capture patient profile and intraoral photographs. This is intended for the creation of a smile design, which includes a treatment plan to achieve the desired smile for the patient. With the smile design, practitioners will find it simpler to provide patients with information regarding their treatment plans.[2]

This case report presents a complex aesthetic treatment in traumatic, peg-shaped and rotational cases of maxillary anterior teeth. The treatment is performed through endodontic and restorative approaches.

CASE ILLUSTRATION

A 23 year old man came to the Endodontic and Conservative Department of the Dental Hospital of Universitas Airlangga, Surabaya. The patient expressed dissatisfaction with the fractured and undersized front tooth, and rotated tooth in his upper jaw. The patient wants his teeth fixed since they are unsightly. The patient had a traffic accident 5 months ago resulted in three broken upper left front teeth with three days of discomfort. According to radiographic examination results, tooth 21 and tooth 22 appears to have a fracture with pulp-reaching cavities classified to have a class IV Ellis fracture. tooth 23 was fractured without pulp involvement. An objective examination was performed in the oral cavity, it was obtained that tooth 13 was rotated, and tooth 12 had a peg shape. Whereas, negative percussion, negative palpation and negative mobility on teeth 13,12,11,21,22,23.

DISCUSSION

In order to plan an effective treatment, it is necessary to conduct a comprehensive analysis. Over time, this analysis can be aided by technology that can visualize the results of the analysis alongside the intended treatment plan design. Digital Smile Design is a valuable tool for interaction between doctors and patients to evaluate various treatment options. The analyzes carried out included Macroaesthetics (extra-oral facial analysis), Miniaesthetics (extra-oral mouth analysis) and Micro aesthetics (intra-oral analysis of teeth and gingiva).[3] The analysis is then entered into the program, which then develops a new smile design based on the golden proportion of the teeth and, according to the contours of the gingiva, produces a visual treatment plan for the patient's dental smile. This is done to achieve harmony between the shape and color of the teeth and the patient's face to achieve the desired aesthetic. Aesthetics in dentistry aims to obtain a better and natural contour, shape and surface texture of the tooth surface.[4]

The degree of tissue damage and the existing fracture line can both influence how fractured teeth are treated. Because of the fractures in teeth 21 and 22, which according to the Ellis Fracture classification rendered the teeth non-vital, endodontic treatment was chosen. Endodontic treatment is performed

to preserve the functionality of teeth. According to the endodontic Triad, the success of endodontic treatment can be accomplished through biomechanical preparation (cleaning and shaping), sterilization (irrigation and root canal disinfection), and obturation (root canal filling).[5]

This endodontic procedure employs a crown down pressureless root canal preparation technique. This technique is based on the principle of widening the corona area first, allowing dirt and debris to escape before the instrument is inserted in the apex region, thereby preventing the extrusion of debris into the periapical tissue.[6]

Endodontic procedure followed by application of post and core to increase the strength of the tooth. With the presence of posts and cores, the pressure force can be evenly distributed from coronal to apical to prevent fractures. Fiber post was chosen because it is more aesthetically pleasing than metal post, has a similar modulus of elasticity to dentin so that it can better distribute pressure, and has excellent adhesion with dentin (mono block dentine post core system).[7]

Crowns can completely or partially cover a tooth. Restoration with full coverage is needed to improve aesthetics because it can change the shape, size, contour, and greatly change the patient's self-image. The crown material used on the anterior teeth in this case is lithium disilicate. Lithium disilicate crown is a type of restoration derived from all ceramic-glass ceramic. This material has high flexural strength up to 440 MPa and has good biocompatibility in the oral cavity.[8]

Smile design can also give an overview of the patient as a whole. Not only cases of fracture due to trauma, but also cases of dental anomaly in this patient. Anomalies of the lateral incisors are quite common, can occur unilaterally or bilaterally. One form of dental anomaly is peg-shaped teeth, which are anomalies in the lateral incisors that change in size to become smaller/microdontia. Peg shaped is characterized by a reduction in mesiodistal incisal width so that the teeth appear slimmer. Peg shaped can cause diastema in anterior teeth, so masticatory and esthetic functions are disturbed.[9] The function of mastication is also disturbed due to the rotation of the teeth so that it interferes with the comfortable occlusion of the patient. Teeth require restoration on both a functional level and aesthetic cosmetic. It can be fixed by restoration approach by crown veneer indirect.

Veneers are layers of tooth-colored material that are applied to teeth to repair tooth decay and intrinsic discoloration. Veneers are a conservative treatment procedure because tooth preparation only involves removing tissue less than half the thickness of the enamel, leaving the remaining part intact by inserting the veneers. In this case indirect veneers can be performed because the patient's oral hygiene is good, the risk of caries is small, and it improves the shape of the peg-shaped teeth. The veneer material chosen in this case is lithium disilicate with the advantages of treatment techniques with porcelain laminate veneers, including good aesthetics, good strength, good marginal integrity, soft tissue biocompatibility, minimal reduction of tooth tissue, long wear resistance compared to composite resin materials.[9]

CONCLUSION

Complex rehabilitation of maxillary teeth can restore the normal form and function of teeth. To correct post-traumatic teeth and rotation, an endodontic approach and lithium disilicate crown restorations may be utilized. In addition to restoring teeth with peg-shaped and attrition issues with indirect veneers. Excellent results can be achieved with proper analysis and the help of a smile design.

CONFLICT OF INTEREST

There are no conflicts of interest.

ETHICAL CLEARANCE

Informed consent was obtained from the patient in written form.

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AUTHORS CONTRIBUTION

Ratih Mahanani: Conseptualization, Data Curation; Dr. Galih Sampoerno: Supervision, Validation, and Preparation; Dr. Galih Sampoerno and Karina Awanis Adla: Visualization, Writing – Original Draft Preparation, Writing – Review & Editing.

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An alternative approach to restoring endodontically treated tooth

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ABSTRACT

Introduction: Endodontically treated teeth must be restored using a procedure that takes into consideration the remaining tooth structure. Endocrown is an adhesive restoration that only passes through the pulp chamber to provide stability and retention with a supragingival butt joint while preserving as much enamel as possible to improve adhesion. The aim of this case report is to discuss endocrown restoration as an alternative approach to restoring endodontically treated tooth.
Case Illustration: A 31 years old female patient complained of large cavity on her tooth and frequent food impaction. She has often felt pain spontaneously since 2 years ago in his lower right back tooth. On clinical and radiographic examination, a diagnosis of symptomatic irreversible pulpitis with normal apical tissue was made and root canal therapy was initiated. Tooth received one-visit endodontic therapy. Based on the amount of remaining tooth structure and thickness of the walls, a post endodontic restoration of lithium disilicate ceramic endocrown was decided.
Conclusion: Endocrown as an indirect restoration can be used as an alternative to replacing a single crown with intraradicular retention in endodontically treated molar.

Keywords: Endocrown, endodontically treated tooth, lithium disilicate, ceramics.

INTRODUCTION

A successful root canal increases the likelihood that the tooth will continue to function ordinarily for an extended period of time. Restoration of endodontically treated teeth (ETT) is frequently regarded distinct from root canal therapy (RCT), despite the fact that the two are inextricably linked in planning, execution, and prognosis. The choice of restoration should be evaluated while taking into account the occlusion principles that continue to guide the clinician in the correct management of coronal restorations. Currently, a more conservative perspective is advocated. With the advent of adhesive systems, intraradicular anchorage and the post-core system are no longer necessary.[1-2]

Endocrown is a partial crown made from ceramic material or composite resin which is applied with resin cement to the postendodontic teeth. The pulp chamber's floor and walls provide macromechanical retention, while the adhesive cementation provides micromechanical retention, ushering in the notion of minimally invasive dentistry.[3]

CASE ILLUSTRATION

A 31-year-old female patient presented to the Endodontic and Conservative Department of the Dental Hospital of Universitas Airlangga, Surabaya, complaining of a large cavity and frequent food impaction. She wishes to treat her tooth because she has experienced spontaneous pain in his lower right back tooth since two years ago. Root canal therapy was instituted after a clinical and radiographic examination revealed symptomatic irreversible pulpitis with normal apical tissue.

Based on the quantity of remaining tooth structure and the wall thickness, a lithium disilicate ceramic endocrown was selected for the restoration. On the subsequent visit, treatment commences with the determination of the shade guide using Vita 3D Master. Using diamond burs to reduce the occlusal wall by 2mm and to prepare the dental pulp chamber. All preparation was accomplished with fine finishing burs. Then, the double impression two-step technique was done.

Cementation could be performed if the occlusion, margin, and proximal adaptation were satisfactory. The surface of lithium disilicate was treated with 9% buffered hydrofluoric acid for 10 minutes, followed by irrigation and drying. The inner surface was treated with Silane for sixty seconds. The tooth was incised using 37% phosphoric acid, followed by irrigation and curing. Then, bonding is applied, followed by curing. Cementation of a lithium disilicate endocrown with an adhesive resin cement and initial curing for 2–5 seconds, followed by removal of superfluous cement residue, after that curing from all angles.

DISCUSSION

This case report describes a one-visit root canal. Several studies found no difference between one-visit and multi-visit root canal therapy. One-visit root canal treatment is time-efficient. This case uses the crown-down technique. Coronal flaring allows more irrigants to reach canal abnormalities early in canal preparation, which improves tissue disintegration. Improper irrigation is detrimental to the cleansing process. Utilizing activation equipment like Sonic can facilitate irrigant penetration into the apical region of the root canal system.[4] Single cone obturation

technique has advantages over other obturation techniques due to the lower apical stress forces implied, thereby preventing excessive sealer extrusion.[5]

The clinical effectiveness of post-endodontic restoration of severely damaged tooth structure requires careful clinical planning and decision-making. Multiple considerations go into deciding which dental restoration to use after endodontic therapy. The selection guide for acceptable restorations should take into account the healthy tissue structure of the remaining teeth, the tooth's position in the mouth, and the esthetics that are vital. Tooth age, endodontic/periodontal prognosis, patient finances, and occlusal activity are other important considerations.[6]

It is generally agreed upon in the literature that endocrowns are an excellent restorative option for teeth.[7] Because endocrowns don't necessitate the removal of root dentine for retention, they eliminate the potential for recontamination throughout the disobturation process. It is also simpler to execute further procedures in the event of an endodontic failure. Preparing an endocrown restoration can be performed supragingivally. The supragingival margins are helpful for controlling plaque, allowing for a thorough clinical examination, and protecting the periodontium with minimum interference to the biological width.[8]

The endocrown restoration, which is a full coverage restoration, fabricated from reinforced ceramic or resin composite monoblocks. In terms of machinable materials, ceramics based on lithium disilicate have been shown to have desirable aesthetic and mechanical qualities in the literature.[9] In his studies, Zarone et al. (2019) highlighted the exceptional characteristics of lithium disilicate: unrivaled optical and esthetic properties, as well as high biocompatibility, high mechanical resistance, reduced thickness, and favorable wear behavior, have increasingly steered clinicians toward these ceramics.[10]

CONCLUSION

Endocrown as an indirect restoration can be used as an alternative to replacing a single crown with intraradicular retention in endodontically treated molar.

CONFLICT OF INTEREST

There are no conflicts of interest.

ETHICAL CLEARANCE

Informed consent was obtained from the patient in written form.

FUNDING

This case report was self-funded.

AUTHORS CONTRIBUTION

Putu Yuri Divina: Conseptualization, Data Curation; Dr. Galih Sampoerno: Supervision, Validation, and Preparation; Dr. Galih Sampoerno and Wulan Tri Maulinda: Visualization, Writing – Original Draft Preparation, Writing – Review & Editing.

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Endodontic retreatment of a maxillary first with crown zirconia restoration: A case report

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ABSTRACT

Introduction: The effectiveness of endodontic treatment is determined by the absence of clinical symptoms and the prevention or treatment of periapical pathologies. Treatment advancements have led to a success rate improvement, rising from 91.10% to 94.45%, reflecting a 3.35 percentage point increase. Despite these improvements, endodontic failure remains a challenge due to various factors. Endodontic retreatment is a solution to manage these failures, involving the removal of root canal filling materials from a previously treated tooth to achieve a successful outcome. This case report aims to provide a detailed clinical description of the step-by-step process of endodontic retreatment for a maxillary first molar with an onlay restoration.

Case Illustration: A 17 years female patient came to RSGM Airlangga University complaining there pain and percussion tenderness on the maxillary left first molar since 1 week ago. This tooth had been treated 4 years ago, Clinical examination showed the GIC filling. Patient doesn't have systemic disease and allergic. Patient want to treat her tooth as soon as possible.

Conclusion: The causes for the need for retreatment can be diverse. Precise identification of the reasons for failure is crucial in determining the appropriate course of retreatment. Initially, nonsurgical retreatment is the preferred option, unless a canal cannot be fully negotiated due to apical or coronal obstructions, or if a previous retreatment attempt has been unsuccessful. In order to improve the predictability and long-term success of root canal treatment as well as retreatment, it is important to understand endodontic anatomy and its variations, analyze periapical X-rays thoroughly, and magnify and illuminate using the Operating Microscope.

Keywords: Endodontic retreatment, previously treated tooth, molar.

INTRODUCTION

Retreatment is a frequently encountered scenario in endodontics. The heightened awareness among patients regarding the preservation of their teeth has spurred a growing interest in endodontic treatments in recent times.[1,2] The primary objectives of root canal treatment are to thoroughly cleanse and shape the root canal system and effectively seal it in three dimensions, thereby preventing the recurrence of tooth infection.[3,4] The causes of endodontic treatment failure are divided into 2 types. There are intraradicular infections and extraradicular infections. Intraradicular infection comprises enduring microorganisms and procedural errors, including overlooked canals, ledges, apical transportation, substandard obturation, and insufficient irrigation and debridement. Extraradicular infection encompasses actinomycosis, other extraradicular microbes, and non-microbial factors.[4]

The efficacy of an endodontic retreatment clinically appears to be influenced regardless the modifications in the natural trajectory of the root canals was induced by prior management of root canal. Some studies have correlated their findings with microbiological issues to distinguish retreatment of root canal results. For instance, Sundqvist et al. showed in 50 cases, the success rate of 74%, overall, after retreatment conducted. This study observed devoid of bacteria in canal was nearly 80% successfully removed, whereas in teeth harboring specific bacterial types, the success rate was only around 66%.[5]

Non-surgical endodontic retreatment involves two phases: removal of the filling material and re-instrumentation. It is important to consider both phases of canal cleaning after retreatment, because enlarging the canal during re-instrumentation facilitates the removal of the previous filling material. Some of the more recent retreatment methods use engine-driven nickel-titanium instruments that were developed specifically for retreatment. Complete cleaning of the prior filling material is crucial to expose areas where infection foci may exist. Despite technological advances, no technique has been proven to reliably achieve thorough filling removal, particularly in the apical canal region with curvatures and anatomical irregularities. Knowing the essential role of complete filling cleaning and the factors influencing it is crucial for clinicians to enhance treatment outcomes. This report aims to explore different aspects of the removal of root canal filling material undergoing retreatment.[1]

In endodontic retreatment, clinician competence and good case selection greatly supports the success of treatment. The objective of this case report is to describe clinical step by step of endodontic retreatment of a maxillary first molar with crown zirconia restoration.

CASE ILLUSTRATION

A 17 years female patient come to RSGM Airlangga University complaining there pain and percussion tenderness on the maxillary left first molar since 1 week ago. This tooth had been treated 4 years ago. Patient doesn't have systemic disease and allergic. From the objective examination, there was GIC filling on tooth 26. bite test (+), percussion (+). Intraoral periapical radiograph confirmed that the patient had a deficient previous root canal treatment on the maxillary left first molar, with incomplete root canal fillings and has presence of periapical pathology. This case diagnosed as previously treated tooth and acute apical abscess.

For the first appointment dentist take clinical picture and patient was instructed to take radiography of the tooth. Isolation using rubber dam. Remove GIC filling. The access was opened with 3 canals mesiobuccal, disto buccal and palatal. There was 2 guttaps in the mesiobuccal and palatal root canals. Guttap perca taken using dental sweezer. Glide Path Management start with Canal negotiation that was done using C-Pilot #10 then rotary file glide path M-Two 10.04 with root canal lubricant. Determination of working length of the canal using apex locator and K File #25 (palatal canal 21 mm, mesiobuccal canal 21 mm, and distobuccal canal 21.5 mm). Apical gauging K File #25 on each canal. Irrigation with NaOCL 5,25% - Aquades – Citric Acid 10%. CaOH was applied as dressing. One week after, the treatment was continued with canal preparation using M-Two. Started from file 15.05, 20.06 and 25.06 for the all canals. During preparation application irrigation NaOCL 2,5% - aquades – EDTA 17% – Chlorhexidine 2% for all canals using syringe and needle 1 side – vent 30G and endoactivator. The three canals were obturated with gutta-percha M-Two (25.06) and resin based sealer by single cone method.

For the next appointment the patient did not complain any pain, extraoral examination showed no abnormalities, percussion (-), bite test (-), temporary filling good, and normal gingiva. Dentist started to do restoration post endodontic by shade taking with shade guide ivoclar (2M1). Crown zirconia preparation of the tooth and do impression for crown.

For the next appointment patient did not complain any pain, extraoral examination showed no abnormalities, percussion (-), bite test (-) and normal gingiva. Insertion crown zirconia using dual cure resin base cement. For the last appointment patient did not complain any pain, overlay restoration is good, extraoral examination showed no abnormalities, percussion (-), bite test (-) and normal gingiva.

DISCUSSION

Treatment options after initial unsuccessful treatment include non-surgical retreatment, endodontic surgery and extraction. A 2.5% solution of sodium hypochlorite (NaOCl) was selected for irrigation due to its effectiveness as an antimicrobial and proteolytic agent, along with its excellent ability to dissolve organic tissues. Additionally, NaOCl serves as both an oxidizing and hydrolyzing agent. For irrigation purposes, a 17% solution of ethylenediaminetetraacetic acid (EDTA) was employed because it has the capacity to chelate and eliminate the mineralized component of the smear layer.[3]

Intraradicular infection can be effectively addressed through root canal retreatment. Successful retreatment relies on appropriate measures for infection control and prevention, such as strict asepsis, comprehensive chemomechanical preparation using antimicrobial irrigants, intracanal medication, thorough root canal filling, and proper coronal sealing. Swift placement of the permanent coronal restoration is crucial to enhance the overall success of the retreatment process.[6]

When planning the restoration for an endodontically treated tooth, several factors should be considered, including the occlusal forces, tooth structure remaining, and the tooth's anatomical position.

CONCLUSION

The causes for the need of retreatment can be diverse. Precise identification of the reasons for failure is crucial in determining the appropriate course of retreatment. Initially, nonsurgical retreatment is the preferred option, unless a canal cannot be fully negotiated due to apical or coronal obstructions, or if a previous retreatment attempt has been unsuccessful. In order to improve the predictability and long-term success of root canal treatment as well as retreatment, it is important to understand endodontic anatomy and its variations, analyze periapical X-rays thoroughly, and magnify and illuminate using the Operating Microscope.

CONFLICT OF INTEREST

None to declare.

ETHICAL CLEARANCE

Written informed consent was obtained from the patient or legal guardian of the patient. The patient or the legal guardian has given their consent in the form of the images and other clinical information to be published in the journal. They understand that their names and initials will not be published.

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AUTHORS CONTRIBUTION

All authors contributed equally in the preparation of this manuscript

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The aesthetic management of misaligned anterior maxillary teeth with indirect veneer restoration

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ABSTRACT

Introduction: Nowadays, due to high health standards and modern dentistry, patient's concern about dental aesthetics is as high as dental health. The needs of dental treatment is not only limited to dental pain or caries, but also on dental aesthetics. Fortunately, modern day dentistry provides a digital diagnostic tool as a guidance in smile makeover decision making to provide more predictable and satisfying result. DSD can evaluate the proportions and make correction of the shape and size that the teeth needed. The treatment planning of unaesthetic anterior teeth can be done by veneers. Veneers allow good aesthetical results by covering the entire tooth labial surface. It can be used to correct slightly rotated tooth and close the central diastema. Veneers enable individualized aesthetic criteria to be adjusted using distinctively colored materials. Indirect ceramic veneers have greater durability and color stability and do not suffer abrasion or discoloration.

Case Illustration: A 34 y.o. female patient came to RSGM UNAIR with a chief complain of diastema on her upper anterior tooth. The tooth has never been treated and never showed any symptoms. The objective examination showed central diastema on 11 and 21, with slight rotation on 11. Vitality test showed positive response on both 11 and 21, negative response on percussion and bite test, also normal gingiva. Indirect veneer restoration with lithium disilicate material is planned on 11 and 21.

Conclusion: The application of DSD analysis, completed with Indirect veneer restoration offers more predictable and aesthetic result for misaligned anterior maxillary teeth with central diastema.

Keywords: Misaligned teeth, central diastema, Digital Smile Design (DSD), indirect veneers, good health and well being.

INTRODUCTION

Modern dentistry is now happening. Nowadays, due to high health standards and modern dentistry, patient's concern about dental aesthetics is as high as dental health. The needs of dental treatment is not only limited to dental pain or caries, but also on dental aesthetics. In fact, these aesthetic dental needs is associated with the patient's oral health, quality of life, well being, and self esteem.[1] Misaligned teeth, malformed teeth, multiple diastema, discoloration, excessive gum exposure, reverse smile line, and missing teeth are factors that can lead to unpleasant an unsatisfied smile which might affected the patient's self-esteem.[2] Fortunately, modern day dentistry provides a digital diagnostic tool as a guidance in smile makeover decision making to provide more predictable and satisfying result. Digital Smile Design (DSD) is multi-disciplinary conceptual dental treatment planning tool that helps strengthen diagnostic vision, improve communication and patient education, and increase predictability of the rehabilitation procedures.[3] DSD can evaluate the proportions and make correction of the shape and size that the teeth needed.

Treatment of unaesthetic anterior teeth is various. The treatment selection is considered by the quantity of remaining tooth structure, the possibility for the restorative material, the level of tooth discoloration, and also the degree of rotated or inclined teeth. While complete crown preparations and other more intrusive treatments may result in periodontal and pulp involvement, veneers strive to preserve tooth structure as well as improve aesthetics. Veneers can be used to correct slightly rotated tooth and close the central diastema. The preparations of veneers is done under minimally invasive concepts and the combination of the adhesive technique to recover the tooth function and natural features. Veneers allow good aesthetical results because entire tooth labial surface is covered. With veneers, the teeth's colour and contour are harmonious. It also enable individualized aesthetic criteria to be adjusted using distinctively colored materials.[4] Indirect ceramic veneers have greater durability and color stability and do not suffer abrasion or discoloration.

CASE ILLUSTRATION

A 34 y.o. female patient came to RSGM UNAIR with a chief complain of diastema on her upper anterior tooth. The tooth has never been treated and never showed any symptoms. The objective examination showed central diastema on 11 and 21, with slight rotation on 11. Vitality test showed positive response on both 11 and 21, negative response on percussion and bite test, also normal gingiva. Indirect veneer restoration with lithium disilicate material is planned on 11 and 21.

On the first appointment, informed to consent and informed consent was made, followed by shade taking (Cervical A1, body and incisal A2). After shade taking, an alginate impression was took for model study and wax up. DSD analysis was done with the anterior teeth photo. The patient

then scheduled for the second visit. After DSD analysis and wax up of the model study, on the second appointment, the mock up is made. Under rubber dam isolation, the veneer preparation was done with round end tapered convergen fissure diamond bur on 11 and 21 with chamfer margin preparation, followed by finishing. Finishing was done with fine finishing bur. Before double impression with polyvinyl siloxane was made, gingival retraction cord was inserted for gingival management. Then, bite registration and provisional veneer was made. The third appointment then scheduled after the indirect veneer restoration finished. On the third visit, the provisional veneer was removed. Insertion of the all porcelain veneers was done using adhesive resin cement. The occlusion and restoration margin was checked and patient is scheduled for the next control. On the fourth appointment, the patient did not complain any discomfort, the veneer restoration showed no abnormalities, normal gingiva, and the patient is satisfied with the treatment outcome.

DISCUSSION

Digital Smile Design allows more effective treatment plan to design a better smiles. It improves the communication between doctors and the patients, also between the professionals. With DSD, operator can place specific sequence on the patient's extraoral and intraoral photos to guide and evaluate the aesthetic proportion based on "golden proportion" between teeth, gingiva, smile, and face. With the use of computerized technologies, each patient's treatment may be highly customized to provide an aesthetically pleasing outcome. Additionally, it enables the dentist and the patient to comprehend the issues better and develop the best solutions for each case.

The most popular kind of therapy for anterior teeth to enhance aesthetics is laminate veneer restoration. To choose the condition for which direct, indirect composite resin, and indirect ceramic laminate veneers are used and ensure the success of the treatment, proper diagnosis and treatment planning are crucial.[5] Indirect ceramic veneers have greater durability and color stability and do not suffer abrasion or discoloration. For direct resin composite veneers, the restoration's color stability is not determined just by the composite used, but also by patient's habits. Frequent consumption of coloured food and beverages, as well as smoking habit diminishes the veneer durability. Another disadvantage of the direct veneers is the need of the clinician's skills to create the aesthetic characteristics, such as shape, texture, contour, and shade. Thus, direct procedure takes more time and is less indicated when all anterior teeth need to be covered by a veneer. There is also the possibility of incorporation of air bubbles during the composite layer application, therefore creating areas even more susceptible to staining and degradation. Indirect veneers restoration can correct the slightly rotated teeth as well close the central diastema that the patient is needed with more predictable and aesthetic result.[6]

CONCLUSION

The application of DSD analysis, completed with Indirect veneer restoration offers more predictable and aesthetic results for misaligned anterior maxillary teeth with central diastema.

CONFLICT OF INTEREST

None declared.

ETHICAL CLEARANCE

Informed consent was obtained from the patient in written form.

FUNDING

This case report was self-funded.

AUTHORS CONTRIBUTION

Iin Indah Aris Wati, Safa Pramata Andriyanti: Conseptualization, Data Curation, Tamara Yuanita: Supervision, Validation, and Preparation; Tamara Yuanita and Safa Pramata Andriyanti: Visualization, Writing – Original Draft Preparation, Writing – Review and Editing.

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Retreatment on 44th tooth with underfilled obturation: A case report

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ABSTRACT

Introduction: Out of 100 patients, underfill were found in 46.9% of the root canals and for every 1 mm short of working length in teeth with apical periodontitis, the endodontic failure rates increased by 14%. This case report presents management to overcome the failure of previous endodontic treatment in underfilled root canal with a symptoms.

Case Illustration: A 44-year-old woman came to Department of Conservative Dentistry, Airlangga University Dental Hospital with a complaint of pain in the lower right back tooth. The patient wants to receive treatment for that tooth. The lower right back tooth has been treated approximately 2 years ago. The dental filling has frequently come off around 6 times. The tooth has been painful and the pain decreased after taking medication for the past 2 weeks. The radiography of 44th tooth showed an underfilled obturation in the root canal, radiopaque on the distal of the crown and there is an enlargement of the periodontal ligament. The 44th tooth was diagnose previously treated tooth with symptomatic apical periodontitis. The treatment plan of this tooth is retreatment endodontic, with crown down pressureless technique and single cone obturation. Continued with the restoration in this case we choose post and crown, a fiber post (prefabricated post) and *lithium disilicate* crown.

Conclusion: Based on the presented case, it can be concluded that the patient expressed satisfaction with the outcomes of the provided treatment. There were no subsequent complaints in terms of aesthetics, subjective experience, or functionality.

Keywords: Retreatment, fiber post, *lithium disilicate* crown.

INTRODUCTION

The growing awareness among patients regarding the importance of preserving their teeth has generated an increased interest in endodontic treatment. Root canal treatment aims to thoroughly clean and shape the root canal system, sealing it in three dimensions to prevent the tooth from reinfection. Endodontic treatment is deemed unsuccessful when it fails to meet acceptable standards.[1] It is common for endodontic instruments to fracture or overfill, underfill, create ledges, perforate, and fracture from the process of filling, that cause endodontic failure. A study involving 100 patients revealed that underfill occurred in 46.9% of root canals. Moreover, teeth with apical periodontitis have a 14% higher percentage of endodontic failure for every 1 mm short of the working length.[2]

The retreatment of an underfilled root canal is a crucial step in endodontic therapy, addressing the inadequate filling of the root canal system. Underfilling occurs when the root canal is incompletely sealed and filled, leaving voids or gaps within the dental pulp spaces. These gaps can harbor bacteria, leading to persistent infection and compromising the success of the initial root canal treatment. Persistent microbiological infection is a significant contributor to endodontic failure. Retreatment becomes necessary to thoroughly clean, shape, and fill the root canal system, effectively eliminating the infection and promoting the long-term health of the tooth.[3] Symptomatic root canal with underfilled endodontic treatment is presented in this case report, which details an approach to overcome symptomatic root canal with underfilled endodontic treatment.

CASE ILLUSTRATION

A 44-year-old woman came to Department of Conservative Dentistry, Airlangga University Dental Hospital with a complaint of pain in the lower right back tooth. Clinical findings showed a composite restoration class II disto-occlusal on 44th tooth, positive percussion, the bite test is negative for 44th tooth. The radiography of 44th tooth showed an underfilled obturation in the root canal, radiopaque on the distal of the crown and there is an enlargement of the periodontal ligament. This tooth is non vital and the diagnosis is previously treated tooth with symptomatic apical periodontitis. The treatment plan of this tooth is retreatment endodontic, with crown down pressureless technique and single cone obturation. Continued with the restoration in this case we choose post and crown, a fiber post (prefabricated post) and *lithium disilicate* crown.

The first visit start with taking dental health education and information, taking inform to consent and informed consent, *gutta percha* point removal with H-file and *gutta* solvent, and then followed with retreatment file and gutta solvent because the *gutta percha* is can't be removed, Root canal preparation using crown down pressureless technique with rotary file Protaper Gold until F2 (25.08) followed with irrigation of NaOCl 2.5% and recapitulation with K-file #10 every file rotary's changing. Irrigation sequence NaOCl 2,5%, aquades, EDTA 17%, aquades, CHX 2% and activation

with sonic. Intracanal medicament with Ca(OH)2 and followed with temporary restoration. Second visit continued with the obturation. *Gutta* point trial with Protaper Gold F2(25.08), followed with final irrigation. Obturation with *gutta* point Protaper Gold F2(25.08) using single cone obturation technique and *calcium silicate* based sealer followed with temporary restoration.

Third Visit treatment is core making using fiber post. *Gutta* point reduction with *peeso reamer* and calibration drill 16mm and followed with irrigation. Fiber core trial and radiograph confirmation. Bonding on the root canal and pulp chamber. Cementation of the fiber and core build up using dual cure composite core material and light cure 20s. Fourth visit starts with shade taking for crown restoration, using Shade Guide Vita 3D Master (3M2), crown preparation with round end tapered diamond bur 3-5° occlusal convergent, with chamfer end preparation continued with fine finishing bur on every surface of the preparation, followed with temporary crown making with *bys-acril* resin. Fifth visit, the treatment continued with crown insertion, starting with trial *lithium disilicate* crown. Surface treatment *lithium disilicate* crown with 9% buffered *hydrofluoric acid* 10s, apply *silane* on inner surface for 60s. Surface treatment on tooth surface with 37% *phosphoric acid*, apply universal bond and light curing. Cementation *lithium disilicate* crown with adhesive resin cement (Variolink esthetic LC) and light curing. Sixth visit for control only, with no symptoms, normal gingiva, percussion (-) and bite test (-).

DISCUSSION

In this case report, the patient presented with pain in the lower right back tooth (tooth 44). The chosen treatment involved the retreatment of the root canal on tooth 44, accompanied by the restoration using a fiber post and a lithium disilicate crown. The root canal treatment had previously failed due to underfilling of the obturation, as evident in the radiographic images, where the tooth exhibited signs of underfilling, creating an environment conducive to persistent microorganism colonization. This resulted in subjective complaints from the patient. Conventional retreatment aimed to address these failures by reshaping and recleaning the root canal, ensuring a hermetic seal based on the working length, and providing a durable restoration.[4] A crown-down pressureless technique was used to prepare the root canals, in comparison to a step-back technique to prevent periapical debris extrusion. Numerous studies have also highlighted fewer flare-ups associated with the Crown Down Pressureless preparation technique than with manual instrument preparation techniques.[5]

NaOCl serves as an irrigating agent capable of dissolving necrotic tissue and less vital pulp residues. The toxicity level increases with the concentration of NaOCl. However, a drawback is its cytotoxic nature, posing a risk of fatal injury if it reaches the periapical area. Upon contact with vital tissue, NaOCl swiftly oxidizes the surrounding tissue, leading to rapid hemolysis, ulceration, inhibition of neutrophil migration, and destruction of endothelial cells and fibroblasts.[5,6] On the other hand, 17% EDTA is relatively non-toxic and causes minimal irritation in solution.[7] Chlorhexidine gluconate, used in concentrations of 1-2%, exhibits a relatively broad spectrum of activity.[8]

Following the completion of endodontic retreatment on the 44th tooth, a fiber post was fitted to provide additional retention after the treatment.[8] Specialized tools, including a new Largo bur (Dentsply) and Gyrotip with a heat-generating tip, were utilized for fiber post removal, as neither the Gonon kit nor ultrasonic methods were suitable.[9,10] The primary aim of restoring the teeth that underwent endodontic treatment was to restore function and aesthetics, as well as to distribute the chewing load to prolong the longevity of both the teeth and the crown jacket within the oral cavity. Endodontically treated teeth are more prone to fracture due to organic and biological processes, such as pulp death and weakened dentin-enamel junction resulting from root canal preparation.[11] Subsequently, a lithium disilicate crown was chosen for its superior aesthetic qualities, including better color, anatomical features, and a more natural appearance, which is particularly crucial for anterior teeth requiring beautiful aesthetics.

CONCLUSION

Based on the presented case, it can be concluded that the patient expressed satisfaction with the outcomes of the provided treatment. There were no subsequent complaints in terms of aesthetics, subjective experience, or functionality.

CONFLICT OF INTEREST

None to declare.

ETHICAL CLEARANCE

Written informed consent was obtained from the patient or legal guardian of the patient. The patient or the legal guardian has given their consent in the form of the images and other clinical information to be published in the journal. They understand that their names and initials will not be published.

FUNDING

None.

AUTHORS CONTRIBUTION

All authors contributed equally in the preparation of this manuscript.

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Restoration direct veneer in microdontia tooth: A case report

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ABSTRACT

Introduction: The aesthetic appearance of teeth is important in dentistry. Patients with microdontia often feel insecure because one of these teeth is a different size than the other teeth than it influences the aesthetics of the teeth. This can be corrected with a restoration treatment, namely veneer direct restoration. Veneer direct is a layer in the same colour as the teeth to improve the morphology and shape of the teeth and is carried out directly in the patient's oral cavity.
Case Illustration: A 21 years-old woman came with a complaint of anterior one of these teeth is a different size than the other teeth. The patient wants to improve the size of the teeth and to have better aesthetic looks. The patient is being treated orthodonti. The tooth has never been treated, and there have never been complaints of pain before; it just looks smaller. The radiography of the 12nd tooth showed a smaller than 22 tooth. The 12 tooth was diagnosed with vital pulp with normal periapical tissue. The treatment plan of this tooth is direct veneer restoration with periodontal gingivectomy. Direct veneers using composite materials.
Conclusion: The utilization of direct resin-based composite veneers and adhesive bonding systems offers a cosmetic alternative to metal-ceramic or all-ceramic crowns when restoring front teeth.

Keywords: Veneer direct, aesthetics, composite.

INTRODUCTION

Aesthetics play a crucial role in dentistry, as everyone desires a beautiful smile with well- balanced teeth. Malformed maxillary anterior teeth, like peg lateral incisors, can create aesthetic concerns, often causing a gap in the teeth. Even though peg laterals are undersized, they can appear in an otherwise healthy dentition.[1,2] The conservative veneer technique, using advanced resin- based composites and adhesive systems, has transformed aesthetic dentistry. Direct resin-based composite laminate veneers and adhesive bonding systems provide a cosmetic alternative to traditional crowns for front teeth. These restorations offer outstanding adhesion, minimal tooth reduction, reinforcement of remaining teeth, and aesthetically pleasing results.[2,3]

CASE ILLUSTRATION

A 21-year-old woman came to the Department of Conservative Dentistry with a complaint that one of her anterior teeth was a different size than the other teeth. Clinical and radiographic findings on a 12th tooth have a different size from the 22nd tooth. This tooth is diagnosed with a vital pulp with normal periapical tissue. The treatment plan for this tooth is a direct veneer restoration with periodontal gingivectomy. Direct veneers using composite materials.

During the first visit, informed consent is obtained, and scaling and root planning are performed. An oral impression is taken for a wax-up model. On the second visit, a thorough examination reveals a 7.9 mm space between teeth 12 and 13, matching the wax-up model's 7 mm measurement. The working area is prepared aseptically with 10% Povidone Iodine. Local anesthesia is administered to the mucobuccal fold near tooth 12 using 2% mepivacaine with adrenaline (1:100,000). Gingivectomy is performed on the labial area of tooth 12 after probing the gingival pocket, bone sounding, and bleeding point assessment.Creating a palatal shell using the silicon key technique based on the wax-up model. Forming the proximal wall and incisal edge using A2 Tokuyama Palfique composite. Layering A3D Filtek Z350XT composite as dentin. Evenly applying A2 Tokuyama Palfique composite as enamel on the labial surface using an optrasculpt instrument. Curing the restoration from all directions using light. Application of glycerin gel followed by light curing. Checking the occlusion using articulating paper. Finishing and polishing using a fine finishing bur, enhanced pogo, and soflex disc. Applying polishing paste and polishing with a cotton wheel.

The third visit is a follow-up appointment (one week later) for a routine check-up. Patient has no complaints during the anamnesis. Afterward, the patient is referred back to the Department of Orthodontic, Universitas Airlangga Dental Hospital for further treatment.

DISCUSSION

In this case report, the patient complained about the size of her right upper lateral incision. Therefore, the treatment for this case was direct veneer composite restoration with gingivectomy on 12nd tooth and using adhesive bonding system.

It is important to ensure that crown margins do not encroach upon the biological width. The biological width refers to the combined attachment of epithelial and connective tissues coronal to the crestal bone. Placing restoration

margins within this zone can lead to gingival inflammation, pocket formation, and loss of alveolar bone. After subgingival restoration, it is essential to maintain a minimum apico-coronal height of keratinized gingival tissues of at least 3 mm. Gingivectomy, performed using techniques such as scalpels, electrosurgery, or lasers, can be an option. However, if gingivectomy may result in less than 3 mm of keratinized postoperative gingiva, an alternative treatment approach such as an apically positioned flap without osseous resection should be considered.[4,5]

Direct veneer are chosen because indirect veneers involve more reduction of healthy tooth structure compared to direct veneers. Resin-based composite restorations offer the advantage of minimal or even no tooth preparation, making them suitable for replacing decayed or missing tooth structures. This approach aligns with the emerging concept of "bio-aesthetics", which emphasizes non-restorative or additive procedures such as teeth bleaching, micro abrasion, enamel recontouring, and direct composite resins.

In the above case, the application of ferric sulfate 20% hemostatic agent and the use of retraction cord serve the purpose of hemostasis and protecting the gingival tissues during the treatment, as well as creating well-defined preparation margins for a successful restoration. Performing a composite button try allows for a visual assessment of the esthetic outcome before the final restoration. This technique involves placing a trial color of composite on the tooth to evaluate shade, translucency, and overall appearance. It facilitates open communication between the clinician and patient, ensuring a collaborative approach and patient satisfaction. The try-in helps in shade selection, minimizing surprises and achieving optimal esthetic outcomes in composite restorations.

In general, both self-etch and etch-and-rinse adhesive systems can be used successfully on root dentin, both systems having a well-documented proof of efficacy.[4] In the dental procedure described, the application of a 37% phosphoric acid etchant followed by rinsing and drying prepares the tooth surface for bonding. The etchant creates micropores on the enamel surface, enhancing the adhesion of the bonding agent. The subsequent application of bonding agent with a microbrush, followed by a gentle air blow with a 3-way syringe and light curing, promotes a strong bond between the tooth structure and the restorative material. This bonding process ensures reliable adhesion, prevents microleakage, and helps to achieve long-lasting and durable restorations.

The creation of a palatal shell using the silicon key technique offers several advantages in restorative dentistry. By basing the fabrication on a wax-up model, the dental professional can achieve a precise and accurate replication of the desired tooth morphology and contours. This technique allows for the customization of the proximal walls and incisal edges using A2 Tokuyama Palfique composite, which provides excellent aesthetic properties and blends seamlessly with the natural dentition. Layering the A3D Filtek Z350XT composite as dentin and the A2 Tokuyama Palfique composite as enamel on the labial surface helps to create a lifelike appearance, mimicking the natural tooth structure. The use of an optrasculpt instrument ensures even distribution and shaping of the composite materials, resulting in a harmonious and natural-looking restoration.

Effective light curing is vital for complete composite polymerization, ensuring strong bonding and long-lasting restorations while minimizing risks like microleakage and secondary caries. The palatal shell technique with WE Tokuyama Palfique composite combines tooth morphology, material science, and precise curing for reliable, aesthetically pleasing results in restorative dentistry. Checking occlusion with articulating paper is crucial for assessing bite and chewing force distribution, allowing adjustments to achieve balanced, harmonious occlusion, proper function, and prevention of issues with restored teeth.

Precise finishing tools like bur, pogo, and soflex discs shape the restoration, enhancing appearance and comfort. Polishing with paste and a cotton wheel adds shine, prevents plaque buildup, and ensures long-lasting, satisfying results. In summary, these steps are crucial for functional occlusion, aesthetics, and a smooth surface in restorative dentistry, enhancing durability and patient satisfaction.

CONCLUSION

The utilization of direct resin-based composite veneers and adhesive bonding systems offers a cosmetic alternative to metal-ceramic or all-ceramic crowns when restoring front teeth.

CONFLICT OF INTEREST

None.

ETHICAL CLEARANCE

Written informed consent was obtained from the patients for publication of this case report and any accompanying images.

FUNDING

None.

AUTHORS CONTRIBUTION

Ira Widjiastuti – data collection, manuscript writing, critically revising article, reviewed final version of article
Amelia Evita Puspita – study concept, patient contribution, revising article, reviewed final version of article, study oversight, creation of figures.

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Endodontic management of an open apex with mineral trioxide aggregate apexification: A case report

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ABSTRACT

Introduction: Managing a tooth with a necrotic pulp and an open apex has always presented challenges for clinicians. An open apex complicates efforts to achieve an apical seal and poses difficulties in ensuring sufficient disinfection, instrumentation, and obturation due to the thin radicular walls, which are prone to fracture. Apexification, involving the formation of a mineralized apical barrier, is considered the preferred treatment for such cases. While calcium hydroxide has traditionally been employed for apexification, its major drawback lies in the extended treatment time. This challenge has been overcome by using mineral trioxide aggregate (MTA). The objective of this case report is to present the outcomes of apexification using mineral trioxide aggregate for a necrotic upper anterior tooth with an open apex.
Case Illustration: A 26-year-old female patient came to the Department of Conservative Dentistry in RSKGM-P Universitas Airlangga with chief complaint of intermittent pain in the right maxillary central incisor. Past dental history revealed trauma to her upper front tooth, for which she did not undergo any treatment. Radiographically showed an open apex with periapical radiolucency on tooth #11.
Conclusion: Apexification with MTA as an apical barrier provided a good option for creating artificial root end barrier.

Keywords: Open apex, apexification, mineral trioxide aggregate.

INTRODUCTION

Dental injuries and bacterial infections affecting the dental pulp can trigger inflammation, potentially progressing to pulpal necrosis and apical periodontitis if untreated. The primary challenge arises when pulpal necrosis occurs in a permanent yet immature tooth, leading to incomplete root development or an open apex.[1] Managing the endodontic aspects of a tooth with a necrotic pulp and an open apex proves challenging due to difficulties in achieving mechanical preparation, canal disinfection, the absence of a tapered root canal apical seal, and the presence of thin radicular walls prone to fracture.[2] Additionally, obturating the root canal poses challenges due to the lack of an apical barrier to contain the root filling material. Consequently, the standard protocol for treating the infected root canal space of a tooth with an open apex is not applicable. In such cases, the preferred treatment is the apexification procedure to establish an apical barrier.[3]

Apexification is a treatment approach aimed at achieving apical repair by forming a barrier at the apex. Traditionally, calcium hydroxide has been commonly employed to induce the formation of a hard tissue barrier. However, this material has the drawback of requiring 5–20 months for the hard tissue barrier to develop. Prolonged use of calcium hydroxide has also been demonstrated to weaken the resistance of dentin to fracture.[4] On the other hand, mineral trioxide aggregate (MTA), recognized for its excellent biocompatibility and superior sealing ability even in the presence of moisture, can be utilized to establish a physical barrier. Additionally, MTA promotes inductivity or conductivity of hard tissue formation around its interface. The use of an MTA plug can be a viable treatment option for managing teeth with an open apex that requires immediate restoration.[5]

The objective of this case report is to assess the outcomes of apexification employing mineral trioxide aggregate for a necrotic upper anterior tooth with an open apex.

CASE ILLUSTRATION

A 26-year-old female patient came to the Department of Conservative Dentistry in RSKGM-P Universitas Airlangga with chief complaint of intermittent pain in the right maxillary central incisor. The patient has had the tooth cavity since childhood and past dental history revealed trauma to her upper front tooth, for which she did not undergo any treatment. Radiographically showed radiolucency extending into the pulp space and an open apex with periapical radiolucency on tooth #11. From the objective examination, the tooth #11 had vitality (-), discoloration (+), bite test (+), percussion (+), palpation (-), mobility (-), and normal gingiva. Thus, the diagnosis of this case was necrotic pulp with symptomatic apical periodontitis.

On the first visit, after isolated the tooth with rubber dam, an access opening was done using endo access bur, the tooth #11 showed one canal. The working length measurement was done and obtained the working length result of 15 mm. Apical diameter was found to be in a size of a #70

K-file. Debridement of the root canal was done with circumferential filing motion with H-file following the working length. The canal was irrigated with NaOCl 2.5% only on 2/3 coronal and saline until 1/3 apical with side-vent needle 30G and dried with endo suction and sterile paper point. Triple Antibiotic Paste (TAP) was chosen as an intracanal medicament then temporary filling was placed.

On the second visit, the patient did not complain any pain, extraoral examination showed no abnormalities, percussion (-), bite test (-), and mobility (-). The TAP was removed,and the canal was irrigated and dried with endo suction and sterile paper point. MTA cement and liquid was mixed according to the manufacturer's instruction. The mixture was applied inside the canal (3mm in the apical third) using MTA carrier, MTA was packed gently with hand plugger, and positioning of the material was checked with the periapical radiograph. A moistened cotton pellet was applied over the canal orifice and the tooth was temporarily restored.

On the third visit, the setting apical plug was checked with plugger through a gentle motion and the rest of the canal was obturated with gutta percha and resin-based sealer using thermoplastic technique.

On the fourth visit, gutta percha point was reduced 2/3 from the root canal length using peesi reamer, 5 mm of gutta percha and MTA point remained at the apex of the tooth, and the custom cast post preparation was done.

On the next visit, the shade guide was determined and 2M2 Vita 3D Master was chosen. Trial custom cast post was done using glass ionomer cement (GIC) type I, followed by full coverage crown preparation, two step double impression technique using elastomer, bite registration using polyvinyl siloxane, and insertion of a temporary crown using temporary cement.

On the final visit, trial of the porcelain fused to zirconia (PFZ) was done and checked. Application of a zirconia primer in the inner surface of the crown, pretreatment with etch and bonding application, and then insertion of a PFZ crown using dual cure resin cement was done. The occlusal evaluation was taken and showed no symptoms. The outcome of this treatment showed a present of a physical barrier and a healing of the lesion.

DISCUSSION

Calcium hydroxide has traditionally been employed successfully to induce the formation of an apical hard tissue barrier in immature teeth with open apices. The duration for calcium hydroxide apexification has been documented to vary, spanning from 5 to 20 months.[4] In this instance, the prompt creation of a barrier with MTA cement might serve as a treatment option for addressing teeth with open apices requiring immediate restoration.

MTA has been broadly used for the closure of open apices. MTA has the ability in obtaining an apical barrier, as in the goal of this apexification treatment, due to the superior sealing property even in the presence of moisture, excellent biocompatibility, and hard tissue formation.[5] Treatment outcome is an important part of evidence-based practice. In this case, MTA plug was present and confirmed, obturation of the canal and restoration was possible, the tooth became asymptomatic, and periapical healing occurred. MTA demonstrated an immediate apical closure and predictable healing outcome. The follow-up revealed clinical and radiographic indicators of recovery. However, MTA has disadvantage as the cement is difficult to handle because of its granular consistency, but to achieve a good seal and retention during orthograde placement of MTA in teeth with open apices, delivery technique could be improved.[6] Continuous monitoring over an extended period is essential to guarantee a successful outcome.

CONCLUSION

The use of MTA in apexification demonstrated clinical and radiographic success at follow-up control and showed a predictable outcome. Apexification with MTA as an apical barrier provided a good option for creating artificial root end barrier, particularly when in need of an immediate restoration.

CONFLICT OF INTEREST

There are no conflicts of interest.

ETHICAL CLEARANCE

Informed consent was obtained from the patient in written form.

FUNDING

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AUTHORS CONTRIBUTION

Amanda Andika Sari: Visualization, writing-original draft preparation, and editing. Nadia Liliani Soetjipta: Supervision, validation, and preparation. Dian Agustin Wahjuningrum Conseptualization and reviewing.

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Zirconia toughened alumina overlay restorations as a minimally invasive alternative for post endodontic treatment: A case report

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ABSTRACT

Introduction: Endodontically treated teeth are more prone to fractures due to irreversible changes caused by dehydration, decay, and dental procedures. Post endodontic restoration is essential to prevent fractures, root canal reinfection, and restore stomatognathic function. Overlay restorations offer a less invasive approach, preserving healthy tooth structure and providing cusp protection. Zirconia Toughened Alumina (ZTA) has introduced new restorative materials with excellent capabilities.
Case Illustration: A 21-year-old female patient sought treatment at the Conservative Dentistry clinic at RSKGM Universitas Airlangga for a crown on her lower left tooth with prior endodontic treatment. Objective examination revealed temporary restoration on 36 teeth, normal gingiva, and negative percussion and bite tests. Radiographic examination showed a radiopaque appearance of the pulp chamber and root canal, with a hermetically sealed filling. The chosen treatment was restoration with ZTA overlay. A follow-up after one week indicated no complaints, with the overlay in good condition and normal gingiva.
Conclusion: ZTA overlay restoration showed success in post endodontic treatment restoration with good tissue response.

Keywords: Root canal treatment, overlay, post endodontic restoration, human and health.

INTRODUCTION

The long-term success of endodontically treated teeth is dependent on the skillful combination of endodontic and restorative techniques. Postendodontic restoration is required to prevent the remaining tooth structure from fracture, reinfection of the root canal, replace the missing tooth structure and to restore stomatognatic function. Endodontically treated teeth are more brittle than unrestored vital teeth and lack a lifelike translucency, necessitating specific restorative treatment. The teeth are more brittle because the physical characteristics are irreversibly altered due to dehydration and loss of collagen intermolecular crosslinking.[1] Minimally invasive dentistry has recently gained popularity in the field of modern restorative dentistry. In most situations, the overlay restoration has proven to be a viable treatment for eliminating the symptoms of cracked tooth syndrome with or without the requirement for endodontic treatment. The necessity to conserve and reinforce the remaining tooth structure with cusp coverage while avoiding a conventional crown led to the decision to place an overlay restoration.[2] One of the new materials is Zirconia Toughened Alumina (ZTA), which has lower tensile strength compared with other ceramics and similar to tooth compressive strength.[3]

CASE ILLUSTRATION

A 21-years-old female patient came to the Dental Conservation Specialist clinic at the RSKGM Universitas Airlangga because she wanted to make a crown for her left lower teeth that had been treated at the previous dentist. History of the teeth (36) involved the tooth has caries since 1 year ago. Then the patient checked her teeth to the dentist and had root canal treatment. That treatment is finished and the patient wants to have a permanent crown constructed for the tooth immediately. Patient has no abnormalities medical history. Subjective symptom asymptomatic. Objective examination of tooth 36 showed a temporary occlusal occlusion. Percussion and bite test are negative. Gingiva around the teeth is normal. Radiographic examination revealed a radiopaque appearance in the pulp chamber and in the root canal.

Figure 1. preoperative clinical picture of lower left first molar (occlusal view).

Figure 2. Pre-operative periapical radiograph.

Figure 3. Shade taking.

Figure 4. Preparation of the cavity.

Figure 5. Final fitted restoration.

The root canal filling appeared hermetic. Pulp diagnosis is previously treated teeth and periapical diagnosis is normal apical tissue. The treatment plan in this case is a full cusp coverage overlay restoration with zirconia material. The prognosis of this case is favorable.

The first visit was carried out dental health education and communication of educational information to patients. A written informed consent, informed consent and saliva test was obtained before the treatment. Shade taking using Vita 3D (3M1.5). Removal of the temporary restoration under rubber dam isolation. Making a base with core build up materials, and light curing for 20 seconds. Preparation of zirconia toughened alumina (In-Ceram Zirconia; VITA) overlay starts with occlusal reduction 1.5 - 2 mm, the preparation margin is chamfer. Finishing and polishing the preparation. Taking 36 teeth impression with a two-step technique using an elastomeric impression material and bite registration was made using light body polyvinyl siloxane (Aquasil Ultra; Dentsply Sirona) and the antagonist with irreversible hydrocolloid impression material (Alginate; Hygedent). Application of temporary restorations (Cavit; 3M).

At the next appointment, temporary restoration removed. Try in ZTA overlay. Check the occlusion, proximal and restoration adaptation to surrounding tissue. Under the rubber dam isolation the teeth etched with 37% phosphoric acid (Any Etch; Mediclus) for 20 seconds, rinsed and dried, then covered with universal bonding (Single bond universal adhesive; 3M ESPE) and light cured for 20 seconds. Insertion of tooth 36 ZTA overlay using dual cure resin cement (RelyX™ ARC; 3M ESPE), curing for 2 seconds, excess cement is cleaned, followed by final light curing for 20 seconds. Remove the rubber dam. Check the occlusion, articulation, margin adaptation and proximal contact. The 3rd visit after 1 week found the patient had no complaints, extra oral normal, percussion and bite test negative. The condition of the ZTA overlay is in good condition and the gingiva around the teeth is normal.

DISCUSSION

Endodontically treated teeth are more brittle than unrestored vital teeth. Endodontic therapy does not make a tooth more brittle; rather, it is the loss of structural integrity that increases the likelihood of tooth fracture. Because of the loss of occlusion with its antagonist and adjacent teeth, the tooth's structural integrity is impaired. Endodontically treated teeth's physical characteristics are irreversibly altered due to dehydration and loss of collagen intermolecular crosslinking. Endodontically treated teeth have a 14% decrease in dentin strength and hardness. Endodontically treated teeth may be subjected to greater loads than vital teeth as a result of this. Before planning restoration for endodontically treated teeth, the following aspects should be considered such as the amount of tooth structure present, occlusal forces, the anatomic position of the tooth, restorative and esthetic requirements.[1]

In recent times, minimally invasive dentistry has become increasingly popular in modern restorative dental practices. The advancement of adhesive materials and procedures has altered the emphasis from mechanical retention-oriented practice to biological, adhesive, and biomimetic practice. Simultaneously with breakthroughs in ceramics, there have been advances in bonding and luting agents, as well as methods, which have allowed adhesive restorations to have long-term success equivalent to or greater than mechanical retention.[4]

Covering all posterior tooth cusps with direct or indirect restorative material is referred to as cusp coverage. The necessity to conserve and reinforce the remaining tooth structure with cusp coverage while avoiding a conventional crown led to the decision to place an overlay ceramic restoration. A cuspid covering is recommended if the important tooth's cusp thickness is greater than 2 mm. The thickness restriction for non-vital posterior teeth is 3 mm. Cuspid covering of endodontically treated teeth; wide cavities with thin cusps; management of teeth prone to fracture due to loss of tooth structure; restoration of a large occlusal surface damaged by wear and/or erosion are among its key applications.[2] Overlays are full cusp coverage indirect restorations. Overlay restorations have been suggested as an alternative to full crowns because they preserve a healthier tooth structure while providing cuspid protection. They are an excellent alternative to the peripheral crown for the restoration of severely damaged teeth.[4] In this study, we used a zirconia toughened alumina (ZTA).

Because of its outstanding mechanical qualities, such as excellent corrosion resistance and chemical stability, ZTA has been extensively researched. Alumina has a high hardness, and zirconia has a high toughness.[3] ZTA is a technique

that harnesses zirconia's stress-induced transformation potential by combining it with an alumina matrix, resulting in Zirconia- Toughened Alumina. One of the primary benefits of the slip-cast process is its minimal shrinkage and mechanical properties.[5] The tensile strength of ZTA is 425-430 MPa lower than others ceramic and more similar to tooth's compressive strength (400 MPa).[3]

CONCLUSION

The ZTA overlay restoration showed success in post endodontic treatment restoration with good tissue response.

CONFLICT OF INTEREST

None declared.

ETHICAL CLEARANCE

Written informed consent was obtained from the patients for publication of this case report and any accompanying images.

FUNDING

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AUTHORS CONTRIBUTION

concept – K.I., R.P., N.Q.A; design – K.I., R.P; supervision – K.I.; funding materials – K.I., R.P; data collecting & processing – N.Q.A., R.P., K.I; analysis & interpretation – N.Q.A., K.I; literature research, writing, critical review – N.Q.A., KI

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Apicoectomy as surgical management of chronic periapical lesion in endodontically treated maxillary central incisor: A case report

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ABSTRACT

Introduction: Periapical pathosis may occur as a result of nonsurgical endodontic treatment failure. Inability to clean apical root canal space due to anatomical complexity can lead to bacterial infection. This case report aims to explain clinical management for endodontically treated tooth that develop periapical lesion.
Case Illustration: An 18-year-old male patient came to Department of Conservative Dentistry, Universitas Airlangga Dental Hospital with chief complaint of swelling in the upper right front tooth region. The patient had a history of trauma 3 years ago and the tooth had been previously treated. Clinical findings showed fistula in relation to maxillary right first incisor. Radiographic examination revealed periapical radiolucency with 9 mm diameter and external resorption in the apical third. The tooth was diagnosed as previously treated tooth with suspected chronic apical abscess. Endodontic surgery was planned by performing apicoectomy followed by retrograde filling using Mineral Trioxide Aggregate (MTA).
Conclusion: Apicoectomy provides good result as a treatment for periapical lesion on endodontically treated tooth.

Keywords: Apicoectomy, periapical disease, endodontically treated tooth.

INTRODUCTION

Nonsurgical endodontic treatment has a fairly high success rate with the right diagnosis and procedure.[1] However, such treatment may fail due to several factors, such as improper mechanical debridement, persistent bacteria in the root canal and apex, poor obturation quality, over- or underfilling obturation, and coronal leakage.[2] The treatment of choice in most cases of conventional root canal treatment failure is nonsurgical endodontic retreatment. The presence of other factors such as a complex root canal system can interfere with the success of nonsurgical retreatment. Surgical endodontic treatment is an option in these cases so that the teeth can be preserved.[3]

Surgical endodontic treatment aims to remove the periapical pathology and restore complete tooth function.[4] One of the indications for surgical endodontic treatment is the presence of persistent abnormalities or arising from inadequate root canal treatment. In addition, surgical endodontic treatment is also indicated in cases of large periapical lesions which is classified based on the Periapical Index (PAI) with a score of 5, where there is severe periodontitis with exacerbations and the diameter of the periapical lesion is ≥8 mm.[5] The most common surgical endodontic procedure is periapical surgery which focuses on apex resection to partially remove roots with anatomic complexity and root canals that cannot be reached through nonsurgical approach. Periapical surgical treatment has been reported to have success rates ranging from 60% to 91%. This procedure is expected to optimize the condition of the periapical tissue to facilitate healing.[6]

This case report aims to describe the clinical management of periapical lesions after root canal treatment by performing surgical endodontic treatment involving apex resection procedures.

CASE ILLUSTRATION

An 18-year-old male patient came to Department of Conservative Dentistry, Universitas Airlangga Dental Hospital with chief complaint of swelling in the upper right front tooth region. The patient had a history of trauma 3 years ago. Root canal treatment had been carried out about 5 months ago, but sometimes the tooth still hurts, especially from chewing.

Clinical findings showed fistula in relation to maxillary right first incisor. The tooth was nonvital while showing no response to percussion test and positive to bite test. Radiographic examination revealed root canal filling in tooth 11 and well-defined periapical radiolucency with 9 mm diameter, also external resorption in the apical third. Tooth 11 was diagnosed as previously treated tooth with suspected chronic apical abscess. The treatment plan was endodontic surgery by apicoectomy followed by retrograde filling using Mineral Trioxide Aggregate (MTA).

On the first visit, saliva examination was carried out, informed consent and informed consent was taken, as well as referrals to the laboratory for blood tests and blood sugar levels.

On the second visit, surgery was performed. Preoperative preparation showed that the patient was in good condition, extraoral examination showed no abnormalities, and intraoral examination showed no response to percussion test. Surgical procedure began with extraoral and intraoral asepsis, followed by local anesthesia. Tooth length was measured using a K-file. Triangular flap incision was made in region 11

followed by bone reduction until the root tip was visible. Tissue curettage was done then irrigated with saline solution. The tissue was then sent to the laboratory for histopathological examination. The apex was resected about 3 mm using a retrotip ultrasonic at a 0° angle and irrigated with sterile saline. Root end preparation was done to take about 3 mm of gutta percha, then retrograde filling was performed with MTA. Bone graft and membrane were applied, then the flap was repositioned. Radiograph was taken after the apex resection procedure. The patient was given postoperative instructions and medication, then instructed for follow up 1 week later.

On the third visit, one week after surgery, the patient had no complaints. Extraoral examination showed no abnormalities, while on intraoral examination there was still slight swelling, slight pain on palpation, and the gingiva around the teeth was slightly erythematous. The results of histopathological examination of the periapical lesion of tooth 11 showed chronic inflammation which could be found in cysts. Irrigation was done afterwards with saline solution, continued by removal of sutures. The patient was instructed to come back 1 month later.

On the fourth visit, 5 weeks after surgery, the patient was asymptomatic. Extraoral examination showed no abnormalities and intraoral examination showed normal gingiva.

DISCUSSION

The diagnosis on tooth 11 was previously treated tooth with chronic apical abscess. This was based on clinical examination where tooth 11 was nonvital, while based on the periapical radiographic examination it appeared that there was root canal filling in tooth 11 and well-defined periapical radiolucency with about 9 mm in diameter. Based on the Periapical Index (PAI) score observed by cone beam computed tomography (CBCT-PAI), the lesion is included in a score of 5 (diameter of periapical radiolucency ≥8 mm, severe periodontitis with exacerbations) which indicates failure of endodontic treatment.[5]

The management of this case was surgical endodontic treatment by performing apicoectomy on tooth 11. Apicoectomy aims to remove infected ramifications, lateral root canals, and defected dentine. Root resection 3 mm apically was sufficient to remove most of the infected ramifications and lateral root canals. This procedure is performed at an angle of 0° with the aim of minimizing leakage that can occur through the resected dentinal tubules.[7]

Root end retrograde preparation was carried out with ultrasonic tip. This allows for more conservative and precise root end preparation, resulting in more predictable surgical results with a higher success rate.[6] Furthermore, retrograde filling was done using mineral trioxide aggregate (MTA). The cause of recurrent apical lesion is bacterial reinfection of the root canal system, so root end filling is an important step in periapical surgery. MTA has good sealing ability, good material stability, and excellent biocompatibility. In addition, histological analysis revealed deposition of new cementum at the resection plane and on the surface of the MTA. Several studies have reported high and constant success rates of teeth treated with MTA in periapical surgery procedures.[8]

CONCLUSION

Surgical endodontic treatment with apicoectomy provides satisfactory results for the treatment of periapical lesions in previously treated tooth. In this case, periapical lesions showed improvement in healing process after 5 months follow-up.

CONFLICT OF INTEREST

The authors declare no conflict of interest

ETHICAL CLEARANCE

Written informed consent was obtained from the patient or legal guardian of the patient. The patient or the legal guardian has given their consent in the form of the images and other clinical information to be published in the journal. They understand that their names and initials will not be published.

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AUTHORS CONTRIBUTION

All authors contributed equally in the preparation of this manuscript.

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Diastema closure treatment with indirect veneer using lithium disilicate: A case report

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ABSTRACT

Introduction: The presence of diastemas between anterior teeth is an aesthetic problem for some patients that may compromise the patient's aesthetic appearance. Maxillary anterior malformations, like diastemas, can pose aesthetic issues. Diastemas are one of common aesthetic problems. The causes of diastemas include teeth malformation, agenesis, macroglossia, bad habits, or genetics. For this case, diastema closure on anterior teeth can be achieved through various aesthetic treatments, one of which involves the application of indirect veneers made of lithium disilicate material.

Case Illustration: A-29 years old male patient came to Department of Conservative Dentistry, Universitas Airlangga Dental Hospital with a complaint of dissatisfaction with his smile because of a gap between teeth 22 and 23. The teeth are in vital condition with normal overjet and overbite. Based on this case, shade taking and impressions can be performed to create a wax-up model, followed by treatment using indirect veneers made of lithium disilicate material.

Conclusion: Indirect veneers is one of the alternative treatments for diastema closure cases. Lithium disilicate material not only provides aesthetic results and natural colour but also offers stability and an impressive natural appearance. The material's translucency and colour-matching properties blend seamlessly with surrounding teeth, creating a natural-looking smile and boosting the patient's self-confidence. Additionally, the high strength and durability of lithium disilicate ensure long-lasting restorations, contributing to the patient's dental health and satisfaction.

Keywords: Diastema closure, indirect veneer, lithium disilicate.

INTRODUCTION

Aesthetics are important in dentistry, as having a beautiful smile with well-balanced and harmonious teeth is a desire for everyone.[1,2] Maxillary anterior malformations, such as diastemas can present aesthetic problems. A diastema is characterized by a space exceeding 0.5 mm between the proximal surfaces of two adjacent teeth in the maxilla and/or mandible. The etiology of diastemas is associated with various factors, including abnormal formation of teeth, failed to develop, macroglossia, or undesirable behaviors like thumb-sucking, lip-sucking, incorrect tongue resting position, tongue thrusting, or genetic factors.[1] In adults, anterior diastema or multiple diastemas can influence the esthetic aspect of the smile and contribute to facial harmony.[3]

Dental veneers have emerged as a widely employed solution to address aesthetic concerns and protect teeth. Veneers are recommended for various conditions, such as tooth discoloration that does not respond to vital whitening, teeth requiring morphological changes in shape or contour, closure of diastemas with gaps exceeding 0.5 mm, minor alignment issues and localized enamel malformations, fluorosis featuring enamel spots, teeth with minimal cracks and fractures, and deformed teeth. However, cautious consideration is essential for veneer application in cases with limited interocclusal distances, extensive vertical overlap in the anterior region without sufficient horizontal overlap, inadequate management of bruxism, or the presence of parafunctional activities. Furthermore, significant dental misalignment, soft tissue disorders, and extensive dental restorations may also serve as contraindications for veneer placement.[4]

The composition of the lithium disilicate ceramic material includes a glass matrix infused with lithium silicate and micron-sized lithium disilicate crystals, providing it with a flexural strength comparable to that of natural enamel. The presence of a high concentration of crystals in this material does not compromise its transparency, allowing for a natural contour on the cervical portion of the restoration. This unique feature enhances the properties and aesthetics of lithium disilicate. Moreover, this characteristic simplifies adhesive techniques and allows for a more conservative approach to tooth preparation.[5,6]

CASE ILLUSTRATION

A 29-year-old male patient presented to the Department of Conservative Dentistry at Universitas Airlangga Dental Hospital with a concern about spaced anterior teeth. Intraoral examination revealed diastemas of approximately 2 mm between the left maxillary second incisor and canine. The affected tooth had been filled about 2 years ago, but the filling was now broken. The patient reported no systemic health problems or allergies. Posteriorly, the cusp and fossa were normal, and anteriorly, there was an overjet of 2mm and an overbite of 2mm. Salivary test results indicated normal quality and quantity of saliva, with no complaints during pressure and percussion tests. Clinical diagnosis indicated normal pulp and normal apical tissue for teeth 22 and 23. The proposed

treatment plan involved indirect veneer placement using lithium disilicate. Following comprehensive evaluation, the prognosis for this treatment was considered favorable.

The first visit starts with taking dental health education and information, taking informed consent and informed consent. The initial treatment performed during the first visit is scaling and root planning and an oral impression is taken to create a wax-up model. The suitable tooth colour was selected through Vita 3D Master Shade Guide 1M2

On the second visit, the patient attended a follow-up appointment for a comprehensive examination, which included anamnesis, intraoral, and extraoral assessments. The operator provided preparation guidance on the labial aspect of the tooth using a mock-up and a depth-cutting bur. The preparatory steps included employing a round-end tapered fissure diamond bur to craft a chamfer-shaped final preparation on the labial surface, ensuring parallelism to the gingival margin. The incisal edge underwent a reduction of approximately 1 mm, and the proximal preparation was extended to encompass the interproximal contact area. A fine finishing bur was then employed to achieve a smooth preparation. Tooth tissue reduction was carried out using a silicon guide, and gingival management was performed before capturing the preparation details. A two-step elastomeric impression technique, accompanied by a polyvinyl siloxane bite registration, was utilized. Subsequently, a temporary veneer made from bis-acryl material was inserted.

During the third visit, the temporary veneers were found to be in satisfactory condition, prompting a porcelain veneer trial to evaluate aspects such as color matching, occlusion, proximal contact, and adaptation. To facilitate the procedure, a rubber dam was applied to isolate the working area encompassing teeth 22 and 23. The inner porcelain veneers underwent a 10-second etching with 9% buffered hydrofluoric acid, followed by rinsing and drying. Subsequently, a 60-second application of silane was carried out. The prepared teeth were etched with 37% phosphoric acid for 20 seconds, followed by rinsing and drying, and the application of an 8th generation self-etch adhesive bonding. Finally, all porcelain veneers were positioned using light-cured resin cement, subjected to a 2-second curing process, and any excess cement meticulously removed with an explorer. The veneers were then subjected to an additional 20 seconds of curing on all surfaces.

During the fourth visit, the patient reported no complaints, and no abnormalities on extraoral were noted during examination. Intraorally, percussion and bite tests yielded negative (-) results, suggesting the absence of issues. The veneers were found to be in excellent condition, and the adjacent gingival tissue exhibited a normal appearance.

DISCUSSION

Closing a diastema can be achieved through various methods, including orthodontic therapy, restorative procedures, surgical treatment, or a combination of these, depending on the underlying cause. Both direct and indirect adhesive restorations are considered reliable and effective for closing diastemas.[7] Ceramic veneer restoration, in particular, is a preferred choice for addressing aesthetic concerns like diastema closure. This is attributed to its outstanding aesthetic properties, color stability, biocompatibility, and superior mechanical characteristics when compared to composite resins.[8]

Ceramic veneer is a highly favoured material for aesthetic treatments due to its ability to preserve almost all of the natural enamel before the placement of the veneer.[9] Lithium disilicate characterized as glass ceramic material with approximately 70% ceramic crystal concentration in the total substrate, possesses the remarkable capability to achieve a flexural strength nearly equivalent to enamel, ranging from 360-400 MPa.[10] Lithium disilicate ceramics are extensively employed for restorations that prioritize both aesthetics and minimal invasiveness. Laboratory studies have shown that when applied in a thin layer, this material demonstrates exceptional translucency. The lithium-silicate reinforced glass ceramics stand out for their low refractive index, enabling the material to achieve high translucency despite having a significant crystalline content.[11]

This case report details a diastema closure procedure with a specific focus on addressing substantial loss of tooth structure and severe defects affecting the dentin. To address these issues, the most suitable treatment option was deemed to be the use of porcelain veneer restorative material. As a result, we opted for a lithium disilicate veneer, considering its excellent aesthetic potential. Full veneers were prepared on teeth 22 and 23 to address diastema, tooth shape, sensitivity, and strength while enhancing aesthetics. The incisal lapping technique was used to accommodate the defect on the labial surfaces of teeth extending the preparation to the incisal edge. To achieve the best treatment outcome, successful cementation relies heavily on several factors: meticulous tooth preparation, proper conditioning of the ceramic veneers and tooth structure, and the selection of suitable materials for veneer cementation. In this instance of diastema closure, the restoration was meticulously performed using the indirect veneer technique, yielding highly gratifying results for the patient. To sum up, diastema closure employing the indirect veneer technique with lithium disilicate showcases outstanding aesthetic outcomes, providing a thin layer with remarkable translucency and minimal invasiveness. Following a month of treatment, a clinical evaluation of the veneer treatment was conducted, revealing that the veneers remained in excellent condition with no signs of discoloration. Most importantly, the patient expressed contentment and satisfaction with the final results.

CONCLUSION

Indirect veneers made from lithium disilicate offer an effective solution for diastema closure on anterior teeth, providing highly satisfactory results with remarkable aesthetics. The material's translucency and color-matching properties blend seamlessly with surrounding teeth, creating a natural-looking smile and boosting the patient's self-confidence. Additionally, the high strength and durability of lithium disilicate ensure long-lasting restorations

and contributing to the patient's dental health and satisfaction.

CONFLICT OF INTEREST

None to declare.

ETHICAL CLEARANCE

Written informed consent was obtained from the patient or legal guardian of the patient. The patient or the legal guardian has given their consent in the form of the images and other clinical information to be published in the journal. They understand that their names and initials will not be published.

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AUTHORS CONTRIBUTION

All authors contributed equally in the preparation of this manuscript

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Non-surgical endodontic retreatment of maxillary posterior teeth with inadequate root canal obturation: A case report

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ABSTRACT

Introduction: Every treatment performed by a clinician has a risk of treatment failure, including root canal treatment. Although root canal treatment has a high success rate, it does not mean that endodontic treatment cannot fail. The aim of this case is to demonstrate endodontic reappraisal.

Case Illustration: In this case, a 30 year old woman with a dental history who had been treated for root canal treatment about 10 years ago complained of pain. The planned treatment was re-treatment and endodontic restoration using a fiber post and metal crown fused to porcelain.

Conclusion: Based on correct endodontic and restorative diagnosis, teeth with endodontic failure can be preserved. In this case, endodontic re-treatment was successfully performed to overcome the endodontic failure. The patient is satisfied with the result.

Keywords: Endodontics, treatment, root canal treatment, treatment failure.

INTRODUCTION

Each procedure carried out by a healthcare provider carries an inherent risk of treatment failure, and root canal treatment is no exception. Root canal therapy, despite boasting a success rate ranging from 86% to 98%, is not immune to the possibility of failure.[1] The occurrence of endodontic failure is typically defined by the reappearance of clinical symptoms coupled with the presence of a radiographic periapical lesion.[2] To ascertain the success of root canal treatment, it is imperative to clinically and radiographically evaluate endodontically treated teeth. Follow-up appointments with patients should be scheduled to verify the treatment's success and ensure the proper functioning of the treated tooth. The primary objective of endodontic treatment is the comprehensive removal of infected pulpal tissue, facilitating the meticulous cleaning and shaping of the root canal system.[3] Subsequently, the root canal space is filled with an inert material to prevent or minimize the risk of reinfection. Despite these objectives, endodontic treatment is deemed unsuccessful when it deviates from established clinical principles.[4]

CASE ILLUSTRATION

A 30-year-old female patient came to the RSGM FKG Airlangga University Conservation clinic to treat painful upper left back teeth. The tooth was treated ±10 years ago. Tooth fillings is broken and started to feel uncomfortable about 1 year ago. Often the pain comes and goes, especially when used to eat. The results of objective examination showed that there was a base at the bottom of the cavity, gutta percha was seen in the root canal orifice, percussion test (+), and bite test (-). Radiographic examination showed widening of the periodontal ligament in the distal root of tooth 26 and a radiopaque appearance in the root canal which was the impression of a guttap point filling material. Based on the findings, the pulp diagnosis was previously treated and the apical diagnosis was symptomatic apical periodontitis.

The treatment plan that will be carried out includes: retreatment of the root canal, using the Balance Force technique, filling technique with a single cone, fixed restoration with fiber post and porcelain fused to metal crown. The prognosis in this case is good because the patient is cooperative, there is no bone loss, sufficient remaining healthy tooth tissue, no systemic factors.

Treatment was carried out by taking guttap points with a retreatment file. Glide path management using K-File #10 and #15 with root canal lubricant. Working length measurement using K-file #10 and apex locator (22 mm palatal, 20 mm mesiobuccal, and 20 mm distobuccal) and then X-ray confirmation. Apical gauging using K-file #25. Root canal preparation using reciproc file M (25/08). Irrigation sequence: 5.25% NaOCl, 17% EDTA, 2% CHX and interspersed with aquadest between changes of irrigation materials. Agitation with sonic activation. Trial guttap points. Irrigation sequences. Root canal dressing using Ca(OH)2 paste and temporary filling.

Irrigation sequence: 17% EDTA rinsed with distilled water and agitated with sonic activation. The root canals were dried using endodontic suction tips and sterile paper points. Filling of the root canal using the single cone technique using a gutta point reciproc #25 and a resin-based sealer. Temporary fillings and confirmation of obturation with X-rays. Impression of tooth 26 with PVS for provisional crown fabrication. Take 2/3 of the guttap point length and prepare for

the post by widening the root canal using a penetration and calibration drill. Fiber post trial and X-ray photo confirmation. Irrigate the root canal using distilled water and then dry it with a paper point. Fiber post insertion using self-adhesive resin cement. Core build up and Gingival management application. PFM crown preparation and continued impression of the maxilla using a double impression material and antagonist jaws with irreversible hydrocolloid. Making bite registration and adjusting tooth color (Vita 3D Master shade guide 3M3). Followed by insertion of a provisional crown and lab instructions. Try-in PFM crown and followed by adjustment of occlusion and proximal contact, adaptation of restoration margin to surrounding tissue, and color matching. Insert PFM crown with GIC luting cement and clean off any remaining cement.

DISCUSSION

The effectiveness of root canal re-treatment is contingent upon several factors, including the thorough removal of bacteria, necrotic tissue, and residual obturating material from the root canal. Additionally, the success relies on proper root canal preparation, ensuring a meticulous and hermetic filling of the root canal, and the implementation of a sound restoration. By removing necrotic tissue and bacteria in the root canals, irritants can be removed so that it will stimulate the healing process. Endodontic re-treatment has a success rate ranging from 80% to 88%, therefore it has a predictable prognosis if properly performed.[1]

Numerous factors contribute to the failure of endodontic treatment. Key elements linked to endodontic failure include the persistence of bacteria both within and outside the canal, insufficient root canal filling characterized by uncleaned and poorly obturated canals, excessively extensive root filling material, insufficient coronal closure leading to improper sealing, untreated canals including major and accessory ones, and iatrogenic procedural errors such as inadequate access cavity design and instrumentation complications such as fringes, perforations, or separated instruments.[2]

One of the most common ways to remove guttap percha obturation is to use rotary instrumentation.[4] The preparation technique uses the balance force technique because the technique employs a sequence of rotational movements, ensuring superior preservation of canal curvature and minimizing procedural errors. It offers effective apical control and ensures precise centering of the instrument within the root canal.[5] Obturation uses the single-cone technique because it provides the advantages of faster and more time-saving endodontic treatment during root canal filling.[6]

Irrigation was carried out using a sequence of 5.25% NaOCl, 17% EDTA, and 2% CHX. Sodium hypochlorite (NaOCl) is the most frequently used irrigant. NaOCl at the time of ionization produces hypochlorous acid and hypochlorite ions, this is what causes the antimicrobial properties of sodium hypochlorite.[4] Ethylenediaminetetraacetic Acid (EDTA) functions as a chelating agent and is used as an irrigation solution. Chlorhexidine digluconate (CHX) has broad-spectrum antimicrobial activity against the most common endodontic pathogens. CHX was highly effective against E. faecalis.[4] Calcium Hydroxide is selected for non-surgical treatment due to its inherent characteristics, making it advantageous. Its highly alkaline pH level, initially bactericidal (pH=12) and subsequently bacteriostatic (pH decreases to 9-10 after 4 weeks), along with its ability to stimulate fibroblasts, contributes to its effectiveness. Additionally, it exhibits excellent broad-spectrum antimicrobial activity, successfully eliminating 99.9% of bacteria within a short timeframe of 1 to 6 minutes.[7]

Restoration using fiber post because it has several advantages including less time-consuming clinical procedure, strong but lower stiffness and strength than ceramic and metal post, easy to take back, modulus of elasticity similar to dentin, biocompatible, good retention.[8] The crown uses porcelain fused to metal (PFM) material. These restorations combine the strength of cast metal and the aesthetics of porcelain. The underlying principle of this restoration is that the material is more cosmetically pleasing and enhances the brittle properties of porcelain through support derived from a strong metal substructure.[9]

CONCLUSION

Nonsurgical endodontic retreatment stands as a viable treatment option to address the shortcomings of prior endodontic procedures. By ensuring a precise endodontic and restorative diagnosis, a tooth that has encountered previous endodontic failure can be effectively preserved.

CONFLICT OF INTEREST

There are no conflicts of interest.

ETHICAL CLEARANCE

Written informed consent was obtained from the patient or legal guardian of the patient. The patient or the legal guardian has given their consent in the form of the images and other clinical information to be published in the journal. They understand that their names and initials will not be published.

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AUTHORS CONTRIBUTION

Rizky Ernawati: Conseptualization, Data Curation; Dr. Galih Sampoerno: Supervision, Validation, and Preparation; Dr. Galih Sampoerno and Muhammad Alviandi Hefni: Visualization, Writing – Original Draft Preparation, Writing – Review & Editing.

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Nonsurgical retreatment of a mandibular first molar with abscess periapical

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ABSTRACT

Introduction: One of the causes of endodontic failure is underfilled obturation. Underfilled obturation causes a cavity where microorganisms can grow and the potential for microorganisms to penetrate the periapical and progress to Chronic Periapical Abscess. Nonsurgical retreatment is medicine that can be done to treat reinfection.
Case Illustration: 37 years old female patient came with complaints of toothache and swelling 1 week ago. The patient had root canal treatment 4 years ago. The treatment plan in this case was retreatment using file Wave One Gold with calcium hydroxide as an intracanal medicament, and final restoration using fiber post and zirconia crown. After 1 week the patient was painless and no swelling.
Conclusion: Calcium hydroxide as an intracanal medicament in root canal retreatment has good outcome in chronic periapical abscess due to failure of endodontic treatment.

Keywords: Retreatment, nonsurgical medicine, abscess periapical.

INTRODUCTION

The etiology of endodontic failure is frequently multifaceted, with various contributing factors. Potential causes encompass incomplete obturation, root perforation, external root resorption, concurrent periodontal-periradicular lesions, excessive overfilling or overextension of canals, untreated canals, developing apical cysts, neighboring pulpless teeth, accidentally dislodged silver points, instruments breakage, neglected accessory canals, ongoing trauma, and perforation of the nasal floor are all potential contributors to endodontic complications.[1,2]

Most periapical lesions tend to recover following thorough non-surgical endodontic interventions. To evaluate the potential for healing, it is advisable to wait for a period of at least 6 to 12 months after root canal treatment. Yet, delaying the placement of a coronal restoration heightens the risk of tooth fracture. Preserving intact tooth structure and ensuring proper occlusion are crucial factors in this context. The placement of a robust coronal restoration enhances periapical healing.[3]

Root canal treatment failure can be treated in two ways, non-surgical treatment and surgical treatment. In well-restored teeth, non-surgical re-treatment is preferred because it allows better disinfection of the root canal system. The quality of previous endodontic treatment is a big part of the success of endodontic treatment (retreatment), with previous poor endodontic quality, there will be a greater chance of repeat treatment.[4]

CASE ILLUSTRATION

A 37 year old female patient came to the Dental Conservation Clinic FKG UNAIR RSGMP with complaints of sore and swollen teeth since 1 week ago and the teeth hurt more when used for chewing. The tooth had root canal treatment 4 years ago. Objective examination found a loose filling on tooth 36, bite test (+), percussion (+). Palpation (+), fistula (+). On radiographic examination, a radiolusent lesion was found with unclear boundaries in the periapical area, a radiopaque appearance resembling a filling material that did not reach the working length of the root canal. On examination of the saliva, the results of the hydration test were 50 seconds, watery viscosity, pH 6.8, quantity 4 ml, and buffer 10. The diagnosis of tooth 36 was previously treated and the treatment plan was retreatment with crown restoration.

At the first visit, a complete anamnesis, objective examination, supporting examinations, diagnosis and establishment of a treatment plan were final. After obtaining informed consent and obtaining patient consent for treatment. Work isolation was applied with rubber dam and continued with pre-endodontic build up with composite. Taking guttap percha using protaper retreatment, negotiating and measuring working length using k-file no#10 obtained mesiobuccal and mesiolingual lengths of 19.5 mm and distal lengths of 19 mm. The apical gauging stage uses k-file #25 for the mesiobuccal and mesiolingual roots and k-file #40 for the distal roots. Followed by making glide path using Wave One Gold Glider, distal root canal preparation using Wave One Gold Large, while mesiobuccal and mesiolingual root canals Wave One Gold Primary. Irrigation was carried out at each stage using 5% NaOcl, distilled water, 17% EDTA. Root canal activation using PUI. After all stages of root preparation have been carried out, the root canals are dried using paper points. Continue to apply the medicament using Caoh metapex and close cavity with cavit.

On the second visit, the patient had no complaints and objective examination found a fistula (-) and bite test (-), radiographic examination showed

reduced radiolucency in the periapical area. The temporary filling was opened by irrigation and activation, guttap photo trial, obturation with thermoplastic technique using bioceramic sealer filler. Cutting and condensation of the master cone of 25/07 mesial root and 45/05 distal root. Followed by filling using backfill. Temporary restorations and radiographic confirmation.

On the third visit, guttap was removed with a calibration drill in the distal root canal, then try in fiber post. Etching and bonding were applied to the pulp chamber and root canal. Post insertion and cementation using luxacore. Followed by cutting fiber post and preparing the crown. Double impression technique was applied for crown preparation, bite registration and color selection, the crown material chosen was zirconia. Next, insertion of a temporary crown.

Fourth visit, temporary crown removed, try in zirconia crown, gingival management using retraction cord, cementation using Luting GIC. Followed by checking occlusion using articulating paper, finally finishing and polishing.

DISCUSSION

Microorganisms are the main cause of pulpal and periapical disease. Microorganisms invasion in the pulp chamber and root canals can cause pulpitis, pulp necrosis and even apical periodontitis. The main goal of root canal treatment is to eliminate bacteria that cause infection in the dental pulp and periapical tissue, and seal the root canal which has been thoroughly disinfected.[5]

In this case, treatment failure was felt 4 years after root canal treatment, this was due to inadequate cleaning and shaping resulting in non-hermetic root canal filling. Microorganisms are able to enter the root canal and further invade the periapical area.

In the case of this journal using reciprocating, this is because reciprocating instruments have proven to be more efficient in retreatment cases than rotary. WaveOne Gold is made from NiTi Gold-Alloy, capable of removing guttap percha, and has a shape memory that is useful in preventing stripping and ledge. wave one gold's parallelogram- shaped makes it more efficient in removing debris and the semi-active tip of Wave One Gold is safer when retreatment.[6]

In this case the final restoration used a fiber post and a zirconia crown. Tooth after root canal treatment will be more brittle due to reduced internal moisture and reduction of dentin during root canal treatment. The use of zirconia material was chosen because it has the advantages of good mechanical properties, good aesthetics, good biocompatibility, strong chemical resistance, abrasion resistance, corrosion resistance, does not conduct electricity, low thermal conductivity and better thermal strength than alumnia, has the same color as natural teeth, less abrasive to antagonist teeth.[7]

CONCLUSION

Endodontic retreatment is a good choice for maintenance management, maximally removing guttap and sealer left behind and achieving working length will facilitate hermetic obturation and selection of the right coronal restoration will prevent recurrence of infection in the root canal.

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CONFLICT OF INTEREST

The author declare no competing interest with regards to the authorship and/or publication of the article

ETHICAL CLEARANCE

Written informed consent was obtained from the patient or legal guardian of the patient. The patient or the legal guardian has given their consent in the form of the images and other clinical information to be published in the journal. They understand that their names and initials will not be published.

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AUTHORS CONTRIBUTION

All authors contributed equally in the preparation of this manuscript.

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Revascularization therapy in necrotic immature anterior permanent tooth due to dental caries: A case report

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ABSTRACT

Introduction: Cavities in a developing tooth can result in pulp necrosis, halt the progression of root canal development, and ultimately lead to an open apex and thin dentinal walls. Revascularization stands as an alternative method aimed at promoting the development of roots in an under develop permanent tooth that has experienced pulp necrosis. The aim of this case report is to assess the clinical and radiological results of revascularization therapy in a necrotic immature anterior permanent tooth caused by dental caries.

Case Illustration: Fourteen-year-old male come to hospital with major complaint of dull pain and frequent swelling on his upper anterior teeth. No significant medical history and history of trauma was confirmed by his mother. Clinical examination revealed deep caries on right maxillary central incisor, no evidence of sinus tract, did not respond to thermal or electric pulp tester, was positive to percussion and bite test. Radiographic examination showed immature tooth with open apex, thin dentinal walls and periapical radiolucency on right maxillary central incisor. Upon clinical and radiographic examination, the diagnosis indicated a necrotic pulp with a chronic apical abscess. The proposed treatment plan involved revascularization and subsequent direct composite restoration. At 1 week and 1 month follow up patient showed the absence of clinical signs and symptoms. After 3 months follow up the tooth showed continuation of root development, no sign of root resorption, incomplete resolution of periapical radiolucency and the patients was asymptomatic.

Conclusions: Revascularization is a good and promising treatment to continue the root development in immature permanent tooth with necrotic pulp. Proper disinfection protocol can control the infection and lead to tissue healing and regeneration. A long-term follow-up visits, including clinical and radiographic examination, are required to analyze the outcome of this therapy.

Keywords: Immature teeth, open apex, regenerative endodontic procedures, revascularization.

INTRODUCTION

Immature teeth necrosis affected by early dental caries or trauma may experience a loss of blood supply, ultimately resulting pulp decay and a halt in root development, accompanied by the formation of periapical lesions. Dental caries is a prevalent oral health issue resulting from the demineralization of enamel and dentin in the teeth.[1] Meta-analysis of adolescent and child, caries found 21% to have caries of under develop permanent teeth, alongside 7% with pulp necrosis.[2] Handling under develop permanent teeth with pulp necrosis poses a challenge due to the intricate root canal system that can be challenging to clean thoroughly, and the thin dentinal walls, which elevate the risk of subsequent cervical fractures.[3]

The present approach for treating necrotic of underdeveloped permanent teeth accompanied by periapical ulceration involves regenerative endodontics, a methodology rooted in tissue engineering that encompasses the triad of bioactive particle, scaffolds, and stem cell.[4] An important aspect of the procedure involves disinfecting or sterilizing the area followed by placing a scaffold that facilitates the proliferation, migration, and organization of cells which regenerate dental pulp-like tissue.[5] It has been demonstrated that there are few clinical signs and symptoms in under develop permanent teeth with pulpal necrosis following revascularization procedures, radiographic evidence suggesting periapical lesions have resolved, root development has continued, and canal wall thickness has increased.[3] Controlling infection in necrotic under develop teeth poses a significant challenge, as achieving elimination of all bacterial biofilm in the intricate root canal system is a complex task.[6] The aims of the current case report is to assess the outcome of the revascularization procedure in immature anterior permanent tooth.

CASE ILLUSTRATION

Male patient, fourteen-year-old. presented to Airlangga University Hospital with a major complaint of dull pain and frequent swelling on his upper anterior teeth. No significant medical history and history of trauma was confirmed by his mother. Clinical examination revealed deep caries on right maxillary central incisor, no evidence of sinus tract, did not respond to thermal or electric pulp tester, was positive to percussion and bite test. Radiographic examination showed an immature tooth with an open apex, thin dentinal walls, and periapical radiolucency on the right maxillary central incisor. Upon clinical

and radiographic evaluation, the diagnosis revealed a necrotic pulp with a chronic apical abscess. The proposed treatment plan involves revascularization and subsequent direct composite restoration. At the first visit, after placing rubber dam isolation, the cavity was accessed and purulent discharge was observed. The canal was copiously irrigated with saline and was dried using sterile paper points. Deep caries at proximal-labial aspect was restored with composite. Working length was established (19 mm) and minimal mechanical instrumentation was done (K-file #70). The canal was then irrigated, dried, and Double Antibiotic Paste (DAP) was applied as an inter-appointment medication.

Revascularization was started after two visits of DAP. Local anesthetic solution without adrenaline was infiltrated, and rubber dam was placed. DAP was rinsed and dried, then a sterile k-file was pushed into the periapical tissue (about 2 mm over the working length) to induce bleeding. Wait for several minutes to allow blood clot formation, then colla- plug was placed over the blood clot, and sealed with MTA. A moist cotton pellet then placed and covered with temporary restoration. On the next day, the temporary restoration was replaced with composite. The patient was instructed to come for postoperative follow up visit. At 1 week and 1 month follow up patient showed the absence of clinical signs and symptoms. At 3 months follow up, radiographic examination was performed and the tooth showed continuation of root development, no sign of root resorption, incomplete resolution of periradicular radiolucency and the patients was asymptomatic. Thereafter, the patient was instructed to come at 6 months and 1 year after treatment to observe the root formation.

DISCUSSION

The presence of dental caries in an immature tooth can lead to pulp infection, potentially causing a halt in root development. This condition indicates the suitability for revascularization therapy.[7] A three-part treatment plan has been established by the American Association of Endodontists: the removal of periapical periodontitis and associated clinical symptoms, the thickening of root walls, and the maturing of roots. A positive pulp sensitivity test should be achieved as well.[3] The success of this therapy hinges on the crucial interaction among stem cells, signaling transmitter, and scaffolds, collectively code-name the classic tissue engineering triad.[6]

While no correlation has been established linking the etiology of pulp decay and treatment outcomes, cases linked to dental trauma pose a higher risk. There is a possibility that trauma may damage the cells that make up the apical papilla and Hertwig's radicular sheet, thereby preventing their migration into the root canal and restricting the development of the radiculars.[8,9] According to Mittmann, teeth affected by trauma are less likely to undergo complete root development following revascularization compared to teeth with pulp necrosis caused by caries. The preservation of periodontal ligament or epithelial root sheath cells, which may remain undamaged in cases of severe dental trauma, could potentially benefit the overall outcome of the treatment procedure.[10]

Effective intracanal disinfection is considered a crucial step in regenerative dentistry. Using sodium hypochlorite and EDTA as irrigation procedures, calcium hydroxide fillings or triple antibiotic pastes as fillers are standard infection control protocols.[6] While calcium hydroxide has been suggested as a potential therapy, the majority of findings do not hold up its use. This is because it may lead to tissue necrosis, destroying the remaining vital cells essential for differentiation into odontoblast-like cells, and it could weaken dentinal walls.[4] Several studies have reported rapid tooth discoloration following the application of triple antibiotic paste (TAP). An in vitro study demonstrated that the original TAP formulation, containing minocycline, caused more pronounced discoloration compared to TAP formulations with amoxicillin, doxycycline, or cefaclor.[11,12] Ciprofloxacin and metronidazole, commonly referred to as Double Antibiotic Paste (DAP), are the preferred antibiotics in regenerative endodontics. Their low molecular weight allows for deeper penetration into the dentin, effectively reducing bacterial colonization without adversely affecting stem cells.[4]

This treatment necessitates long-term follow-up, involving both radiographic and clinical examinations. Periapical radiographs are essential for assessing the improve in root length, the increase of root panel, and the determination of any radiolucency in apical. During the pulse vitality test, there should be no pain felt while palpating or percussioning the pulse, and soft tissues should appear to be normal in appearance. While there are no standardized recall protocols, practical duration for follow-ups is typically set at 3, 6, 12, 18, and 24 months.[6]

Trevino *et al.* categorized tooth responses to Regenerative Endodontic Procedures (REPs) into five types: (1) Augmented density or width of the root canal panel with ongoing development of the root canal. (2) Absence of continued root formation, resulting in a blunt yet closed apex. (3) Ongoing root development with the apical foramen still open. (4) Manifestations of calcification in the canals of the roots. (5) Development of a hard tissue barrier within the canal, situated between the apex and mineral trioxide aggregate (MTA).[2] In this particular instance, it is apparent that during the 3-month follow-up, the tooth demonstrated ongoing root development without presenting any symptoms, despite the apical foramen remaining open.

CONCLUSIONS

Revascularization stands out as a favorable and promising treatment to promote ongoing root growth in immature permanent teeth with pulp necrosis. An appropriate disinfection protocol plays a crucial role in infection control, facilitating tissue healing and regeneration. A long-term follow-up visits, including clinical and radiographic examination, are required to analyzed the outcome of this therapy.

CONFLICT OF INTEREST

The authors declare no competing interest with regards to the authorship and/or publication of this article.

ETHICAL CLEARANCE

Written informed consent was obtained from the patient or legal guardian of the patient. The patient or the legal guardian has given their consent in the form of the images and other clinical information to be published in the journal. They understand that their names and initials will not be published.

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AUTHORS CONTRIBUTION

All authors contributed equally in the preparation of this manuscript,

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Management of a discolored non-vital anterior tooth with internal bleaching and aesthetic rehabilitation with direct veneer: A case report

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ABSTRACT

Introduction: Tooth discoloration is primarily caused by pulp tissue decomposition, particularly in necrotic pulps. This can result from blood breakdown, iron release, and the formation of ferric sulfide, which darkens the tooth. Internal bleaching is a cost-effective, minimally invasive, and conservative treatment for non-vital discolored teeth. Carbamide peroxide 35% offers safe and secure bleaching due to lower hydrogen peroxide diffusion and higher pH. This study reported the success of internal bleaching followed by direct veneer in restoring discolored teeth caused by pulp necrosis.

Case Illustration: A 20 year old male came to Conservative Dentistry Airlangga University with chief complaint of the upper right incisor tooth looks darker than the adjacent teeth. The tooth has been decayed for 10 years, causing pain for the patient. However, they have been pain-free ever since. The treatment involved root canal treatment, obturation, gutta-percha reduction, internal bleaching with carbamide peroxide 35%, a GIC barrier, and $CaOH^2$ alkalization. The final restoration was the direct veneer on #12, #11, #21 & #22.

Conclusion: The case highlights the successful application of internal bleaching as a conservative and cost-effective treatment for restoring discolored teeth resulting from pulp necrosis.

Keywords: Pulp necrose, discoloration, internal bleaching, neglected disease.

INTRODUCTION

Aesthetics is essential for self-perception and well-being, especially in relation to attractive smiles. Teeth discoloration is a common aesthetic issue, primarily caused by pulp tissue degradation in necrotic pulps. Iron release from blood breakdown, along with hydrogen sulphide, creates ferric sulphide, darkening the tooth.[1]

Internal bleaching is a cost-effective, minimally invasive treatment for non-vital discolored teeth. The walking-bleach technique uses oxidizing agents to break down pigments. Carbamide peroxide 35% is a safe bleaching agent with lower hydrogen peroxide diffusion and higher pH.[2,3]

CASE ILLUSTRATION

A 20-year-old man presented to Conservative Department RSKGMP Universitas Airlangga with a darker upper right incisor tooth, decaying for 10 years but currently pain-free. No systemic disorders or allergies reported. Clinical exam on #11 showed a darker tooth with deep caries, no response to percussion and bite tests. Vitality tests were negative and radiographs revealed diffuse radiolucency at the apical area. Whereas, on #12,#21,#22 showed a media caries, vitality test were positive. The patient was diagnosed with pulp necrosis and asymptomatic periodontitis apicalis on #11 and reversible pulpitis with normal apical tissue on #12, #21, #22.

The first visit involved IEC, DHE, informed consent, and a root canal treatment. The initial tooth shade was determined using a VITA classic shade guide, and the working area was isolated with a rubber dam. The canal was negotiated using K-File #8 and #10 (Dentsply, Sirona), and working length was determined using an apex locator. Glide path management was performed using pro glider, and apical gauging was found in #30 (Dentsply, Sirona). Crown down pressureless technique was used until F3 (30.09) (Dentsply, Sirona), and irrigation was performed using 5,25% NaOCl (Biodinamica, Ibipora) and sonic activator. Root canal dried, and calcium hydroxide was injected as dressing material. Temporary restoration was used for sealing.

On the second visit, extraoral and intraoral exams showed no abnormalities. Temporary filling and surrounding gingiva were normal. Rubber dam was set up, and the temporary filling was removed. Canal irrigated with 5.25% NaOCl to clean remaining $CaOH^2$ (Prevest Dentpro Calplus) followed by EDTA 17% (EDTA Trissodico, Biodinamica) and aquades with sonic activation. The canal was dried with paper point, and obturated with lateral condensation using gutta-percha #30/09 and #15. Obturation was confirmed using a radiograph.

On the third visit, intraoral and extraoral examinations showed no abnormalities and normal gingiva. Radiographic examinations showed apical lesion healing. A rubber dam was set up, and temporary filling was opened. Gutta percha was collected 2 mm below CEJ, and the GIC (GC Fuji VII) barrier was applied using ski slope and bobsled tunnel techniques. Carbamide peroxide 35% (Whiteness Super Endo, FGM) was used for internal bleaching, followed by temporary filling. The patient was

Figure 1. a. Before treatment, b. Radiograph before treatment, c. Radiograph after endodontic treatment, d. After internal bleaching #11, e. After direct veneer restoration #12 #11 #21 #22.

instructed to check tooth color changes daily and report via Teledentistry.

On the fourth visit, The colour of the teeth was examined using the Vita Classic (Dentsply, Sirona) shade guide, and it was in accordance with the patient's desire and was harmonious with adjacent teeth. Following that, a rubber dam was placed and the temporary filling was opened. The cavities were irrigated and dried in order to remove any residual bleaching material. The canal was then filled with $CaOH^2$ and sealed with temporary filling.

On the fifth visit, no discoloration was observed, the tooth color seemed harmonious with adjacent teeth, and the temporary filling was in good condition. A rubber dam was placed, and the temporary filling was removed. Preparation was done to remove caries on #12,#21,#22. Phosphoric acid 37% (etching was applied, bonding was applied, and light curing was done. The final restoration was direct composite veneer #12, #11, #21, #22. Patients were instructed to maintain oral hygiene and avoid food and drinks that can cause tooth discoloration.

DISCUSSION

Tooth discoloration stems from intrinsic, extrinsic, or combined factors. Intrinsic discoloration in pre-erupted teeth can result from tetracycline or fluoride exposure and hereditary conditions. Post-eruption discoloration may be due to pulp necrosis, blood component deposition after trauma or pulpectomy, and secondary dentin formation due to aging or iatrogenic factors. Extrinsic stains are caused by substances like coffee, tea, and tobacco.[4]

In this case, pulp necrosis can occur due to deep caries. When the pulp is inflamed, erythrocytes in pulp tissue and dentinal tubules degrade into haemosiderin, haemin, haematin, and haematoidin, releasing iron during haemolysis. This iron can be converted to black ferric sulphide by bacteria, causing grey tooth crown discoloration. When these teeth are treated appropriately with endodontic therapy, they generally keep their natural colour. Discoloration of the crown is more common if therapy is delayed.[5,6]

Internal bleaching is a cost-effective, minimally invasive, and conservative treatment for non-vital discolored teeth. The walking-bleach technique is commonly used in endodontically treated teeth because it is easy to perform, consumes the least time, and requires no special equipment.[7]

Nonvital bleaching can be effective, but there is a small chance of external cervical resorption due to chemicals diffused through dentine tubules and cementum defects. Bleaching material can cause denaturation of dentine protein with oxidizing agents and pH acid, causing foreign body reactions. A low pH of bleaching material can damage tissues, causing root resorption. In this case, carbamide peroxide 35% is used for safe and secure bleaching due to lower hydrogen peroxide diffusion and higher pH. Carbamide peroxide 35% when come in contact with water breaks into 23- 25% of urea and 10-12% of hydrogen peroxide.[7]

A cervical barrier is used to to prevent peroxide diffusion into the cementum and periodontal ligament which may cause inflammatory-related cervical root resorption. Glass ionomer cement, with a 2-3 mm coating, was used as a barrier material. The bobsled tunnel shape (labio-lingual) and skislope shape (mesio-distal) blocks dentinal tubules from pulp chamber to external tooth surface, preventing external root resorption.[8]

The final restoration is direct composite veneer on the teeth 12,11,21, and 22, as caries lesions are found on the proximal and labial surface. After internal bleaching with carbamide peroxide, composite resin restoration should be delayed for a few days to prevent the peroxide's negative impact on bonding strength. To neutralize acidity from the bleach, placing $CaOH^2$ in the pulp chamber temporarily proves advantageous.[8]

CONCLUSION

The presented case highlights the successful application of internal bleaching followed by as a conservative and cost-effective treatment for restoring discolored teeth resulting from pulp necrosis.

CONFLICT OF INTEREST

There are no conflicts of interest related to the publication.

ETHICAL CLEARANCE

Written informed consent was obtained from the patient or legal guardian of the patient. The patient or the legal guardian

has given their consent in the form of the images and other clinical information to be published in the journal. They understand that their names and initials will not be published.

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AUTHORS CONTRIBUTION

All authors contributed equally in the preparation of this manuscript.

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Regenerative endodontic procedure (REP) utilizing mineral trioxide aggregate (MTA) for mature teeth with open apex and periapical radiolucencies: A case report

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ABSTRACT

Introduction: Regenerative endodontic procedure (REP) has been established as a promising alternative for managing open apices in young permanent teeth. However, the use of REP in mature permanent teeth with pulp necrosis is gaining popularity and demonstrating success rates comparable to conventional endodontic treatments.

Case Illustration: This case report promotes the application of revascularization procedure on a 28-year-old female patient diagnosed with pulp necrosis in tooth 11, along with a chronic periapical abscess and an open apex. Prior to the revascularization procedure, the patient received two applications of triple antibiotic paste (TAP) over a two-week period. Mineral trioxide aggregate (MTA) and collaplug were subsequently applied over the formed blood clot. To prevent coronal leakage, a final direct composite with the basis of glass-ionomer cement (GIC) was placed. There were absence of pain, swelling, mobility, and no abnormalities in clinical examination.

Conclusion: The revascularization technique offers a viable treatment option for managing open apices in mature permanent teeth with pulp necrosis. Regular follow-up assessments are essential to evaluate the clinical, radiographic, and histopathological success of this treatment approach.

Keywords: Pulp revascularization, open apex, permanent mature teeth, periapical abscess, human and health.

INTRODUCTION

Dental trauma is frequently encountered in 7% to 58% of trauma cases among children aged 8 to 11 years. Dental trauma can lead to arrested root development in immature permanent teeth, resulting in thin dentin walls and increased susceptibility to fractures. Additionally, dentin structure is weaker due to incomplete mineralization in peritubular dentin and intertubular dentin.[1] Trauma during root development can disrupt the interaction between epithelial cells of Hertwig's epithelial root sheath (HERS) and mesenchymal cells from the dental papilla. Failure to unite can inhibit odontoblast differentiation that can lead to incomplete root formation and leading to open apices in immature permanent teeth.[2]

The management of open apices in non-vital teeth can be classified based on the stage of root development. When the root length is less than two-thirds of its total length, regenerative endodontic procedures (REP) are employed, utilizing its capacity to release various growth factors that stimulate physiological root growth.[3] The revascularization technique utilizes the blood clot formed after overinstrumentation of the root canal into the periapical area. The ensuing bleeding brings mesenchymal stem cells (MSCs) from the apical region into the pulp space, and the blood clot acts as a scaffold while carrying various growth factors.[4]

Revascularization treatment success relies on various considerations. Studies suggest the age range of 6 to 17 years is ideal due to enhanced regenerative capacity.[5] Although the closure of apices generally occurs in permanent teeth, open apices can be found in some cases, with dental trauma in early age being one of the contributing factors.[1] This case report will present a revascularization procedure performed on an upper anterior permanent tooth with a chronic periapical abscess lesion and an open apex.

CASE ILLUSTRATION

A 28-year-old female patient presented to the Specialist Dental Conservation Clinic at RSGM UNAIR with complaints of swelling and pain in the upper right gum area. The patient had been experiencing pain for the past week and already taking pain relievers. The tooth was broken because of trauma at the age of 9 years-old and was not treated since then. The patient had no systemic health issues and want to preserve the affected tooth. Clinical examination revealed extensive caries extending to the dentin on the incisal surface, and vitality tests showed a negative response, percussion sensitivity, and a positive bite test. Radiographic examination revealed an open apex with a diffuse radiolucent periapical lesion. The diagnosis for this case was pulp necrosis in tooth 11, with a periapical abscess and an open apex. The treatment offered to the patient was pulp revascularization with a direct composite restoration.

During the first visit, after obtaining the patient's informed consent, an access opening was created, and working length was determined using an apex locator. The root canals were then irrigated with 2.5%

sodium hypochlorite (NaOCl) solution in two-thirds of the root canals, followed by saline and 17% ethylenediaminetetraacetic acid (EDTA) irrigation. After drying the root canals, TAP was applied as root canal medication below the cementoenamel junction and sealed with a temporary filling. TAP medication was repeated in subsequent visits until there were no complaints and abnormalities on clinical examination.

On the third visit, revascularization was initiated by over-instrumentation using a no. 15 K-file, extending 2mm beyond the initial working length. The resulting bleeding was allowed to rise up to the orifice for approximately 15 minutes. Once a blood clot formed, a collaplug was applied over the blood clot, followed by MTA application and a GIC base. A direct composite restoration was performed using an incremental technique as the final restoration. The absence of pain and no abnormalities in clinical examination were found during the subsequent follow-up.

DISCUSSION

Revascularization is one of the REP techniques that can mediate the presence of bleeding into the root canal without requiring exogenous stem cell implantation or synthetic scaffolds.[1] Initially, revascularization was commonly performed on young permanent teeth. However, with its regenerative potential, revascularization is now being applied more frequently in mature permanent teeth. One of the main indicators of REP success is the resolution of clinical symptoms and bone healing. It has been reported that 92.4% of REP cases showed lesion healing and new bone growth compared to 85% in conventional endodontic treatment for mature permanent teeth with periapical lesions >5 mm.[6] Long- term evaluation is necessary to assess cell regeneration, and a follow-up period of 12 months is recommended to determine REP success.[7]

Chemical disinfection can be carried out using NaOCl at concentrations of 1%, 1.5%, 2.5%, or 6%, along with EDTA as the final irrigant.[7] However, some other literature recommends the use of low-concentration NaOCl (1 – 2.5%) due to its lower toxicity, which helps preserve stem cell vitality in the apical papilla for revascularization protocol. EDTA has the ability to stimulate migration, proliferation, and differentiation of stem cells into odontoblasts.[8] This effect is attributed to its capacity to induce the release of transforming growth factor (TGF- β) in adult permanent teeth.[7] Moreover, EDTA is utilized to neutralize the adverse effects of NaOCl, making it suitable for application before inducing bleeding and the formation of blood clots.[8]

The use of root canal medications can enhance root canal disinfection, especially in cases with periapical lesions. One of the commonly used root canal medications is TAP, which contains metronidazole, ciprofloxacin, and minocycline. However, TAP has the disadvantage of potential discoloration due to the minocycline content.[1] While some literature suggests using other drugs such as Cefaclor to replace minocycline or using double antibiotic paste, these may lead to bacterial resistance and allergic reactions.[1,9] An alternative to antibiotic paste is the use of calcium hydroxide, which also has antimicrobial effects and can stimulate the release of TGF- β 1 from dentin and enhance stem cell vitality in the apical region.[1]

MTA has advantages when placed directly above the blood clot, as it is biocompatible, hydrophilic, exhibits good bioactivity, and can effectively seal the root canal. The contact of MTA with blood can also stimulate inflammatory cytokines such as interleukin (IL) – 1α, IL-1β, IL-4, IL-6, IL-8, and other biomarkers.[10] However, the use of MTA may cause coronal discoloration if placed above the cementoenamel junction (CEJ). To prevent this potential discoloration, other materials like bioceramic cement or tri-calcium silicate cement can be used instead of MTA.[11] The use of collagen matrix before MTA placement is advantageous in preventing MTA intrusion into the root canal.[10]

CONCLUSION

Revascularization in cases of pulp necrosis in mature permanent teeth with periapical lesions has shown promising success potential. Long-term periodic evaluation is essential to assess lesion healing, new bone growth, dentin deposition, root growth, and pulp vitality. Furthermore, alternative biomaterials other than MTA can be considered to prevent potential crown discoloration in teeth that require good aesthetics.

CONFLICT OF INTEREST

There is no conflict of interest.

ETHICAL CLEARANCE

Informed consent was obtained from the patient in written form.

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AUTHORS CONTRIBUTION

Ramadhinta Y: conceptualization, data curation; Sukaton: supervision, validation, and preparation. Kurniantari AM: visualization, writing – original draft preparation, writing – review & editing.

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The relationship between cigarette smoking habit and caries in patients with diabetes mellitus

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ABSTRACT

Introduction: Diabetes mellitus (DM) is a major health problem. Tooth decay or caries is a major dental problem which needs conservative treatment. There are many factors that influence the severity of caries, one of them is smoking habits. The aim of the study is to compare tooth decay of patients with diabetes mellitus who visited Conservative Dental Clinic, Universitas Airlangga Dental Hospital Surabaya, Indonesia, during January-March 2023.
Methods: The study included 37 patients with caries and diabetes mellitus. Demographic data were collected from medical records and personal interviews. Statistical analysis was conducted using chi-square analysis.
Results: Smoking habit has a significant difference ($p<0.05$) among the patients with caries and diabetes mellitus.
Discussion: Smoking increases the risk of caries by promoting cariogenic bacterial growth and decrease saliva quality. Smoking is also one of risk factors that worsen diabetes condition through biochemicals pathways on systemic and molecular level. Higher blood sugar level in DM patients correlated with lower salivary flow thus increase caries risk on patients.
Conclusion: Smoking habits influence the severity of caries in patients with diabetes mellitus.

Keywords: Smoking habit, caries, diabetes mellitus, oral health, cigarette.

INTRODUCTION

Diabetes mellitus (DM) is one of the prominent public health problems, affecting the quality of life.[1] DM is affecting the young, adult, and elderly.[2] DM can cause many complications in the oral cavity.[3] Smoking habits are one of major issues related to oral health and one of major risk factors determining severity of diabetes mellitus progress. Prevalence of smoking in young adults, adults, and people that already suffer from diabetes is high despite the negative effect that it may leads. Understanding the effect of smoking habit on diabetes patients and its effect on caries prevalence may emphasis on prevention and smoking abstinence.[4]

Smoking could also increase caries prevalence by decreasing saliva quality, increase pH level, and increase cariogenic bacterial activity. Moreover, smoking also gave negative outcomes to diabetes patient's blood sugar levels. High blood sugar level could lead to lower salivary rate that increase caries prevalence.[5] This study tries to look at the correlation between smoking and incidence of posterior caries in patients with diabetes mellitus.

METHODS

This is an observational analytic cross-sectional study during January until March 2023. Demographic data were collected from medical records of 37 patients of Conservative Dental Clinics Universitas Airlangga Dental Hospital with diabetes mellitus and suffering from dental caries on their posterior tooth.

Diabetes conditions are found from interviews and from their medical records. Meanwhile their smoking habits were found from an interview. All patients who smoke consume more than 1 cigarette daily. All patients agreed to participate in this study anonymously. Researchers also conduct personal interviews related to their smoking habits. Patients then group based on their gender and their age categories. Their age group classification according to World Health Organization are young (age 25-44), middle age (age 44-60), and elderly (age 60-75).[6] Statistical analysis was conducted using SPSS chi-square analysis.

RESULTS

From 37 patients 22 patients are males, and 15 patients are females. As much as 48.6% male patients are smoking more than 1 cigarettes per day and 10.8% (4) male patients are nonsmokers. All female patients as much as 40.5% (15) are nonsmokers. Chi Square Pearson test from gender and smoking habit have significant result on

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incident of posterior caries (significance p=0.000).

From their age, the patients were divided into 3 categories: young age 25-44, middle age 44-60, and elderly 60-75. There are 8 young patients, 8.1% (3) of them are active smokers and 13.5% (5) are nonsmokers. There are 13 middle age patients, 18.9% (7) of them are active smokers and 16.2% (6) are nonsmokers. At length, there are 16 elderly patients, 21.6% (8) of them are smokers and 21.6% (8) are nonsmokers. Chi Square Pearson test based on age group on smoking habits have significant result on incident of posterior caries (p=0.759).

To conclude, smoking habit is a significant factor on the incidence of posterior caries (p<0.05) among patients with diabetes mellitus.

Table 1. Comparison of posterior caries on patients with DM who are smokers and non-smokers based on their gender

Presence of Posterior Caries on DM Patients	Male (22)	Female (15)
Smokers	48.6% (18)	0.0% (0)
Non-smokers	10.8% (4)	40.5% (15)

Table 2. Comparison of posterior caries on patients with DM who are smokers and non-smokers based on their age groups

Presence of Posterior Caries on DM Patients	Young	Middle Age	Elderly
Smokers	8.1% (3)	18.9% (7)	21.6% (8)
Non-Smokers	13.5% (5)	16.2% (6)	21.6% (8)

DISCUSSION

CO (Carbon Monoxide), ROS (Reactive Oxygen Species), Cadmium, Arsenic, lead and others free radical and proinflammatory factors through biochemical pathways on systemic and molecular level could affect in increase insulin retention and decrease insulin secretion thus worsen diabetes progress and increase blood sugar levels.[4] Pancreatic cells islet that produces insulin have neuronal nicotinic acetylcholine receptors on its surface, due to nicotine from cigarettes that bonds with these receptors, pancreatic cell produce less insulin. Thus, smoking could lead to reduced insulin secretion and leads to higher blood sugar level.[4]

Increase in blood sugar level has a high correlation with increase prevalence of caries. High sugar levels and microangiopathy complications lead to reduced salivary production from the salivary gland. Reduced in unstimulated salivary flow rate could increase the pH and activated cariogenic bacteria thus increase caries risk.[7]

The presence of nicotine inside mouth cavity has indirect link to cariogenic bacterial activity. Cariogenic bacteria such as streptococcus mutants use nicotine to help its metabolism and significantly enhance its capability to adhere on tooth surfaces.[8] Cariogenic bacteria that adhere to tooth surface created thick biofilm that made it harder for saliva to clean. High pathogenic activity, biofilm presence, low salivary rate, and acidic pH on mouth cavity from nicotine could increase demineralization of enamel thus caries occur.[9]

Future considerations from our study are we expected that more data could be presented related to patients who suffer diabetes mellitus that also happened to be an active smoker. We hope that from our findings and better understanding of the effect of smoking on diabetes patients could stress the importance of smoking abstinence.

CONCLUSION

Smoking could increase prevalence of posterior caries among diabetes patients significantly. On account of that smoking cause insulin retention, increases insulin resistance, and has microvascular complication on diabetes patient that leads to less salivary production. Furthermore, nicotine inside mouth cavity could increase cariogenic bacteria pathogeny thus increase the risk of caries among diabetes patients who smoke.

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CONFLICT OF INTEREST

The author reports no conflicts of interest in this study.

ETHICAL CLEARANCE

Clearance from RSKGMP UA (Rumah Sakit Khusus Gigi dan Mulut Pendidikan Universitas Airlangga), Certificate No. 17/UN3.93.

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AUTHORS CONTRIBUTION

Study conception and design: Aditya Arinta Putra and Eric Priyo Prasetyo. Data collection: Shafy Shariz, Nurfahira Paidal, Dimas Prasetianto Wicaksono. Analysis and interpretation of result : Shafy Shariz, Nurfahira Paidal, Eric Priyo Prasetyo, Galih Sampoerno, and Setyabudi Goenharto. Draft manuscript preparation: Aditya Arinta Putra, Shafy Shariz, Nurfahira Paidal, Eric Priyo Prasetyo, Galih Sampoerno, Dimas Prasetianto Wicaksono and Setyabudi Goenharto.

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Periapical abscess endodontic procedure in coronary artery disease patient using combined anticoagulant and antiplatelete therapy: A case report (hospital intensive cardiology care unit inpatient)

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ABSTRACT

Introduction: One of treatment for patients with a diagnosis of Coronary Artery Disease is the administration of anticoagulant and antiplatelet drug therapy with the aim of preventing thrombosis. These therapies also carry consequences in the form of a risk of bleeding. Of course, medical action plans with the risk bleeding need to be carefully considered for their indication and contraindication. Acute periapical abscess is a dental emergency that must be treated immediately. Delay in handling cases of acute periapical abscess can cause dangerous systemic complications, especially in cardiac patient who are being treated in intensive care unit.

Case Illustration: A 50 years old male patient was admitted to the ICCU with complaint of chest pain. Patient with angina pectoris and medical history of hypertension and diabetes mellitus. On the angiography examination, the results of Coronary Artery Disease 3VDs were obtained. The patient was given Heparin (anticoagulant) therapy, Clopidogrel and ASA (antiplatelet) and was indicated for Coronary Artery Bypass Graft (CABG). During treatment in the intensive care unit, the patient complained of pain in the lower right molar (#48). On Dental examination, the #48 had deep caries with partially exposed pulp. Percussion and palpation hurt so much. The patient experienced a toothache since 4 days ago and felt headache and feverish. The diagnosis of the tooth was an acute periapical abscess with cephalgia and febris complication.

Conclusion: Cardiac intensive care patient with complaints of toothaches can be treated endodontically. Endodontic treatment with manipulation of the pulp chamber can be considered as an emergency medical measure. The ability to recognize emergency situation from all health workers involved during the patient intensive treatment, also an understanding of the need for emergency endodontic treatment are very needed. Giving emergency treatment, antibiotics and painkillers can help improve the patient's condition in the intensive care unit.

Keywords: Periapical abscess, CAD patient, emergency endodontic, anticoagulant, antiplatelet.

INTRODUCTION

There are several cardiovascular intervention that need special consideration in the provision of treatments within the scope of endodontics. If these measures are not accurately identified, diagnosed, and taken into account in the patient's comprehensive treatment plan, they could lead to life-threatening situations. These may include high blood pressure that can lead to serious heart conditions like angina, blocked blood vessels, heart attacks, infections in the heart lining, issues with the heart valves, and the need for pacemakers. Doctors often prescribe antiplatelet and anticoagulant medications to patients who have had a stroke.[1]

Coronary heart disease is a cardiovascular disease caused by narrowing the coronary arteries due to atherosclerosis.[2] Some patients with CAD have indications for intense antiplatelet and anticoagulant therapy with the aim of preventing thrombosis. The use of three antithrombotic agents reduces the risk of cardiac ischemic events but also increases the risk of bleeding.[3] There is no anticoagulant that reduces thrombotic risk without simultaneously increasing the risk of bleeding.[4]

Moreover, individuals with cardiovascular disease (CVD) often have other health conditions that enhance the severity and risk of each disease. It is crucial for CVD patients to maintain excellent oral health in order to minimize the chance of experiencing pain, which can trigger the release of natural stress hormones like epinephrine and further burden the cardiovascular system.[5]

Acute periapical abscess is a dental emergency that must be treated immediately. Delay in handling cases of periapical abscess can cause dangerous systemic complications. Head and neck infections often occur due to problems originating from the teeth or gums. If these infections are not treated or do not respond well to treatment, they can have serious consequences such as abscesses in a specific area, infections deep in the neck, and mediastinitis. In extreme cases, emergency procedures like tracheostomy or cervicotomy may be necessary.[5] These situations can pose significant challenges for providing care to patients in the

Intensive Care Unit.

Of course, medical treatments plans with the risk of bleeding need to be carefully considered for their indications and contraindications. While deep neck infections are not commonly encountered, they can be a serious and life-threatening complication that arises from an abscess in the tooth's pulp. It is crucial for dentists to be able to identify the warning signs and accurately assess which patients may be at risk. This is important because in some cases, an infection can rapidly escalate from a simple toothache to a potentially life-threatening situation.[6] The present case report describes the endodontic emergency treatment of cardiac patient that are being treated in the Intensive Cardiac Care Unit (ICCU).

CASE ILLUSTRATION

A 50 years old male patient was admitted to the ICCU with complaint of chest pain. Patient with angina pectoris and medical history of hypertension and diabetes mellitus. On the Angiography examination, the result of Coronary Artery Disease 3VDs were obtained. The patient was given Heparin (anticoagulant) therapy, Clopidogrel and ASA (antiplatelet), and patient was indicated for Coronary Artery Bypass Graft (CABG). During treatment in the intensive care unit, the patient complained of pain in the lower right molar (#48). On dental examination, #48 had deep caries with partially exposed pulp chamber. Positive result from percussion and palpation test.

The patient experienced dental pain since 4 days ago and felt headache and feverish. The diagnosis of the tooth was acute periapical abscess with cephalgia and febris complication. The patient's temperature had increased on day 2 until it reached 38^0 Celsius. As in all infected cases, debridement of the canal(s), and irrigation followed by placement of calcium hydroxide, is the basic treatment for a patient presenting with diffuse facial swelling (cellulitis) resulting from an acute apical abscess. Systemic involvement in the form of fever or malaise may also be noted[7]. The patient also complained of pain during swallowing. Following an infection in the lateral pharyngeal space, individuals may experience difficulty swallowing (dysphagia) and swelling in the larynx. Infections in both the submandibular and sublingual spaces, known as Ludwig's angina, can cause muscle stiffness (trismus), swelling, and a raised tongue, potentially leading to blockage of the airway and respiratory distress. By examining clinical symptoms and the patient's medical history, we can determine that apical abscesses have the potential to spread and develop into either a mandibular abscess or a deep neck abscess. Endodontic emergency treatment was taken for this case by debridement of the canal(s), and irrigation. Then left the pulp chamber in an open condition to maximize the drainage process.

DISCUSSION

Treatment of tooth pain in Coronary Artery Disease patient under anticoagulant antiplatelet therapy must understand not only the risks of the treatment, but also have to prioritize the principles of managing the risks emergencies experienced by patient.[3] Bleeding is the major complication of heparin therapy and treatment with other anticoagulants.[7]

Serious dental infections in endodontics can be a potentially life-threatening condition that, in many cases, can be effectively treated with appropriate care. However, if treatment is delayed or not done properly, it can lead to sepsis or difficulty in breathing, which may require a surgical procedure called a tracheostomy, along with additional medical support and close monitoring in an Intensive Care Unit.[8]

In this case, the patient treated in intensive care unit, so that the treatment was carried out in bed. Relief of pain could only be done with cavity access and root canal preparation to drainage intrapulp abscess. Consider leaving the canal open until the next day if there is continuous drainage.[8] Some patients develop more serious post-obturation complications characterized by severe pain and/or swelling.[9]

If an infection from the inner part of a tooth spreads, it can cause pain due to the buildup of pressure in the surrounding tissues. To alleviate the pain and reduce inflammation, there are effective interventions available. These interventions include removing the bacteria causing the infection from the root canal system through a process called chemomechanical preparation, performing an incision and drainage procedure, or extracting a tooth that cannot be restored. By targeting the source of inflammation, these interventions can successfully reduce pain.[7] Direct elimination of the microbial irritants within the root canal system (chemomechanical preparation), was chosen to minimizing the risk of bleeding, reducing infection and being able to control the source of infection. Patients at risk of cardiac complications exceeding the benefits of dental treatment should be identified and only the most urgent conditions should be treated. Endodontic treatment, conservative treatment, non-surgical periodontal treatment, or prophylactic treatment are considered procedures entailing a low risk of complications.[10]

Furthermore, as part of the treatment for this situation, metronidazole and dexketoprofen were administered intravenously. The reasons for using additional antibiotics include symptoms such as fever (above 100°F or 37°C), general discomfort, swollen lymph nodes, difficulty in opening the mouth (trismus), increasing swelling, and cellulitis. It is suggested to combine either penicillin (amoxicillin) or an antibiotic that is resistant to β-lactamase (flucloxacillin) with a drug that effectively targets most Gram-negative anaerobes (such as clindamycin or metronidazole) for optimal coverage. In the dental office, the initial approach for treating infections typically involves prescribing oral antibiotics. However, if the infection doesn't improve or if there's a risk of airway obstruction, it may be necessary to administer antibiotics intravenously.[8]

Combination of endodontic emergency treatment (chemomechanical preparation) and drug therapy, can reduces pain and cephalgia of the patient. Endodontic emergency treatment for all cardiovascular patients is preferable to be performed at a hospital where cardiologist and special facilities are easily accessed.[5] Most authors recommend a cautions 4-6 week period after myocardial infarction to stabilize the disease. During this period,

the most indispensable procedures, such as extractions, the drainage of abscesses or pulpotomies can be performed in a hospital setting[11]. All endodontist must have a complete tool to treat the patient in intensive care unit.

CONCLUSION

Cardiac intensive care patient with complaints of dental pain can be treated endodontically in intensive care unit, Endodontic treatment with manipulation of the pulp chamber can be considered as an endodontic emergency measure. The ability to understand emergency situation from all health workers who treat patient, an understanding of endodontic emergency treatment for CAD patient from endodontist are very needed. Giving endodontic treatment procedure combined with antibiotics and analgesics can help improve the patient's condition in intensive care unit.

CONFLICT INTEREST

The author reports no conflicts of interest in this study.

ETHICAL CLEARANCE

The patient/participant provided their written informed consent to participate in this study. The patient/participant has also agreed if the results of this study are published.

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AUTHORS CONTRIBUTION

DCF. Conceptualization, writing-original draft preparation, TA. writing-review and editing. All authors have read and agreed to the published version of the manuscript.

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Post-endodontic restoration with minimally invasive approach using direct fiber-reinforced composite

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ABSTRACT

Introduction: The endodontic treatment procedure requires adequate final coronal restoration. The choice of treatment for each case is heavily influenced by the quantity and arrangement of the remaining upper part of the tooth. The advent of fiber-reinforced composites (FRC) has offered a significant chance to alter performance and improve the effectiveness of conventional materials already in use. This article presents the treatment of the endodontically treated maxillary canine using fiber-reinforced composite which might improve the fracture strength of teeth.

Case Illustration: A 31-year male patient reported spontaneous and throbbing pain in his upper left tooth which lasted for days. An oral examination revealed a disto-incisal cavity on the left maxillary canine. The periapical radiograph revealed a caries lesion extending from the coronal aspect of the crown to the roof of the pulp chamber. Therefore, it requires root canal treatment and post-endodontic restoration. Anesthesia was performed before the removal of all the infected dentin and an access opening was established into the pulp chamber. Pulp extirpation was performed using barbed broach instrument. Root canal treatment was performed according to the previously determined working length. Obturation was performed seven days after the calcium hydroxide placement. The final post-endodontic restoration was performed using fiber-reinforced composite with consideration of preserving the remaining hard tissue. After the root canal treatment procedure was done, the patient showed no symptoms of pain or discomfort. Follow up period 3 months after the treatment was made, the tooth shows no pathological symptoms and functions normally.

Conclusion: Post-endodontic restoration using fiber-reinforced composite that contains fibers improve the physical properties of restoration.

Keywords: Endodontically treated teeth, fiber reinforced composite, post endodontic restoration, minimal invasive restoration.

INTRODUCTION

The success of endodontic treatment is influenced by the effectiveness of root canal treatment. The endodontic procedure requires adequate final restoration. Post-endodontic teeth have differences in their physical structure and mechanical properties to resist fracture from masticatory load. Final restoration of endodontically treated teeth depends on the amount of the residual coronal structure. Preservation of hard tissue is considered more important to prevent overuse in final restoration preference, especially in cases with sufficient coronary structure remnant. The invention of fiber-reinforced composites (FRC) enhance the mechanical properties of existing direct restoration material. Moreover, fibers could provide aesthetics for the anterior teeth besides the physical reinforcement properties.[1,2] This article presents the treatment of the endodontically treated maxillary canine using fiber-reinforced composite which might improve the fracture strength of teeth.

CASE ILLUSTRATION

A 31-year male patient reported spontaneous and throbbing pain in his upper left tooth which lasted for days. An oral examination revealed a disto-incisal cavity on the left maxillary canine. The periapical radiograph revealed a caries lesion extending from the coronal aspect of the crown to the roof of the pulp chamber. Therefore, it requires root canal treatment and post-endodontic restoration. Anesthesia was performed before the removal of all the infected dentin and an access opening was established into the pulp chamber. Pulp extirpation was performed using barbed broach instrument. Root canal treatment was performed according to the previously determined working length. Obturation was performed seven days after the calcium hydroxide placement. The final post-endodontic restoration was performed using fiber-reinforced composite with consideration of preserving the remaining hard tissue. After the root canal treatment procedure was done, the patient showed no symptoms of pain or discomfort. Follow up period 3 months after the treatment was made, the tooth shows no pathological symptoms and functions normally.

DISCUSSION

Final restoration of endodontically treated teeth need to consider the reduced elasticity and remnant morphology of the tooth. In cases of anterior teeth with minimum structure loss, a more- minimal invasive approach will preserve more remnants of hard tissue, thereby will improve the

Figure 1. Pre-operative.

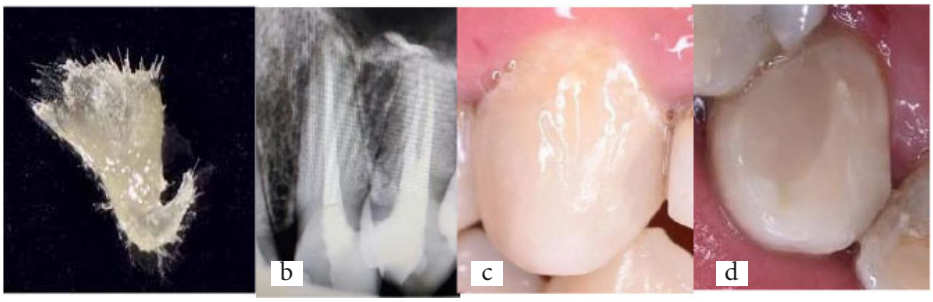

Figure 2. (a) fiber-reinforced composite, (b) post-obturation radiograph, (c-d) post-endodontic restoration.

longevity of the tooth. Cuspal coverage or full coverage restoration in anterior treated teeth needs to be reconsidered if one of the marginal ridges is still intact. Fibers contained in the composite could modify mechanical load by forming monoblock effect, thereby have the ability to dissipate the stress evenly along the axis of tooth. Distribution of stress from the polymer matrix to the fibers which have a similar elastic modulus to dentin could prevent the crack formation. Fibers characteristic of high tensile strength, density, and percentage elongation similar to dentin elastic modulus (18 GPa), thereby having the ability to endure stress load and crack propagation.[3,4]

The toughening mechanisms attributed to microfibers stem from their capacity to divert the spread of cracks, thanks to the unpredictable arrangement of microfibers within the resin matrix. As per the Krenchel factor, the combination of E-glass fibers and the resin matrix establishes an isotropic strengthening effect in various directions, thereby improving the material's ability to withstand fracture propagation. An additional investigation demonstrated that incorporating glass fibers beneath the composite layer at the base of restoration yielded fracture toughness comparable to that of intact teeth. In a study by Basaran and Gokce (2019), it was found that endodontically treated teeth with a remaining cavity wall thickness of 1.5 mm, restored with fiber-reinforced composite, exhibited increased resistance to fracture.[4,5]

CONCLUSION

Post-endodontic restoration using fiber-reinforced composite that contains fibers improve the physical properties of restoration and also effective in reinforcing the weakened cusp in root canal- treated teeth.

CONFLICT OF INTEREST

There are no conflicts of interest.

ETHICAL CLEARANCE

Written informed consent was obtained from the patient involved in this case report.

FUNDING

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AUTHORS CONTRIBUTION

Joshua Darma: Writing-original draft preparation. Meiny Faudah Amin: Supervision, reviewing, and editing. Elline Elline: Supervision, reviewing, and editing.

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Management strategies of calcified and curved canal on maxillary molar

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ABSTRACT

Introduction: Root canal curvature and calcification were contributing factors to the occurrence of iatrogenic errors. The inability to achieve glide path and apical patency frequently leads to iatrogenic errors such as canal transportation, perforation, and instrument fracture. The objective of this case report was to explain the endodontic management strategies of a curved and calcified canal on the maxillary first molar.

Case Illustration: A 26-year-old male patient presented to the Department of Conservative Dentistry, Universitas Trisakti, Indonesia, complaining of a cavity on his upper right back tooth that was painful when drinking cold drinks one year ago and it is now no longer painful. The tooth has never been treated before. Tooth #16 was diagnosed with pulp necrosis and asymptomatic apical periodontitis. The endodontic procedure was performed at 4.5x magnification. During exploration and negotiation, obstructions were found in the mesiobuccal and distobuccal canals. Periapical radiograph showed curved and calcified canals in the mesiobuccal and distobuccal canals. The glide path was determined using C+, D Finder, #6, #8, and #10 stainless steel files. Every modification in the file was paired with irrigation using 5.25% sodium hypochlorite (NaOCl). Once the glide path and working length were established, biomechanical preparation followed the crown-down technique up to F3, coupled with irrigation using 5.25% NaOCl, saline, and 17% EDTA with sonic activation. Obturation was performed using a warm vertical compaction technique and resin sealer. Flowable composite was placed as an orifice barrier, and the tooth was restored using composite resin.

Conclusion: Curved and calcified canals required unobstructed patency of the canal before the initiation of the mechanical preparation. In this case, C+, D Finder, #6, #8, and #10 stainless steel files proved successful in establishing and securing the glide path in calcified and curved canals.

Keywords: Root canal anatomy variation, calcified canal, curved canal, instrumentation technique.

INTRODUCTION

Progress in the field of dentistry has enabled individuals to preserve the functionality of their teeth for an extended period, potentially spanning a lifetime.[1] Root canals in humans frequently exhibit curvature in various dimensions, and the diameter of the root canal can be influenced by natural aging processes. Continuous formation of secondary dentin results in the gradual tapering of root canals, and there is potential for calcification. The presence of root canal curvature and calcification are factors that contribute to the occurrence of iatrogenic errors. The inability to achieve glide path and apical patency frequently leads to iatrogenic errors such as canal transportation, perforation, and instrument fracture.[2,3] The objective of this case report was to explain the endodontic management strategies of a curved and calcified canal on the maxillary first molar.

CASE ILLUSTRATION

A male patient, 26 years old, presented to the Department of Conservative Dentistry, Universitas Trisakti, Indonesia, complaining of a cavity on his upper right back tooth that was painful when drinking cold drinks one year ago but no longer painful. The patient said that the tooth had never been treated before. Clinical examination showed dark shadows on the underlying dentin with destruction of enamel on distal of the right maxillary first molar (Tooth #16). Periapical radiology showed radiolucency on the middle third of the tooth crown which is suspected to be caries involving the pulp. Radiographic examination also showed that there was radiolucency with diffuse borders on the palatal root (Figure 1). Tooth #16 was determined to have a necrotic pulp and asymptomatic apical periodontitis. Following the approval of informed consent, root canal treatment was carried out on tooth #16 at a magnification of 4.5x, under local anesthesia and rubber dam isolation. The process involved removing caries, preparing the access cavity using an endo access bur, and subsequently exploring and negotiating the root canal with k-files #8 and #10. Obstructions were found in the mesiobuccal and distobuccal canals, this means the glide path and working length cannot be determined. The glide path was then determined using C+, D Finder, #6, #8, and #10 stainless steel files (Figure 2a). Each file change was accompanied by 5.25% NaOCl irrigation. Following the establishment of the glide path, the working length was ascertained using an apex locator and verified through periapical radiography. Biomechanical preparation followed the crown-down technique up to F3, and then irrigation was conducted with 5.25% NaOCl, saline, and 17% EDTA using sonic activation (Figure 2b). The obturation process involved employing a warm vertical compaction

technique with a resin sealer. A flowable composite was applied as an orifice barrier, and the tooth was subsequently restored using composite resin (Figure 3).

Figure 1. Pre-operative.

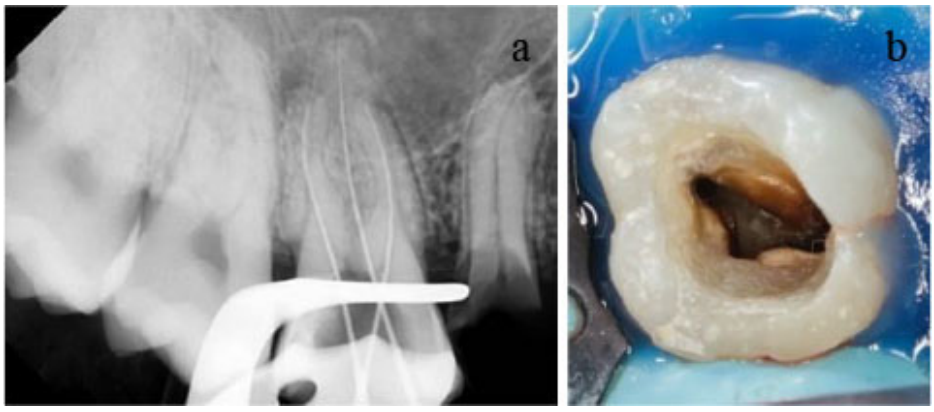

Figure 2. (a) Glide path. (b) Biomechanical preparation.

Figure 3. Post-operative.

DISCUSSION

The structure of the root canal is frequently complex and not consistently straight; it often presents various curves along its length. This complexity makes the preparation of curved root canals quite challenging.[2,4] The curvature of the root canal system should be known before treatment to avoid procedural errors and help determine the instruments required[4]. In this case, preoperative periapical radiology showed curved in mesiobuccal and distobuccal root canals. During exploration and negotiation, obstructions were also found in the mesiobuccal and distobuccal canals. C+, D Finder, #6, #8, and #10 stainless steel files were used to achieve the glidepath (Figure 4). C+ Files have a cutting tip that engages the dentin, making them ideal for the initial instrumentation of calcified root canals.[5] This case also used stainless steel k-file and D Finder to make the glide path because provide better tactile sensation, and less potential for separation. Compact stainless steel files commonly preserve an imprint of the canal, and the rigidity of stainless steel hand files facilitates navigation through blockages and calcifications. The utilization of nickel-titanium files is discouraged due to insufficient torsional strength.[5,6]

CONCLUSION

The pivotal phases of root canal treatment are considered to be the instrumentation and preparation of the root canal system. Prior to commencing mechanical preparation, it is essential to ensure unobstructed patency of curved and calcified canals. In this instance, the glide path was established and secured using C+, D Finder, #6, #8, and #10 stainless

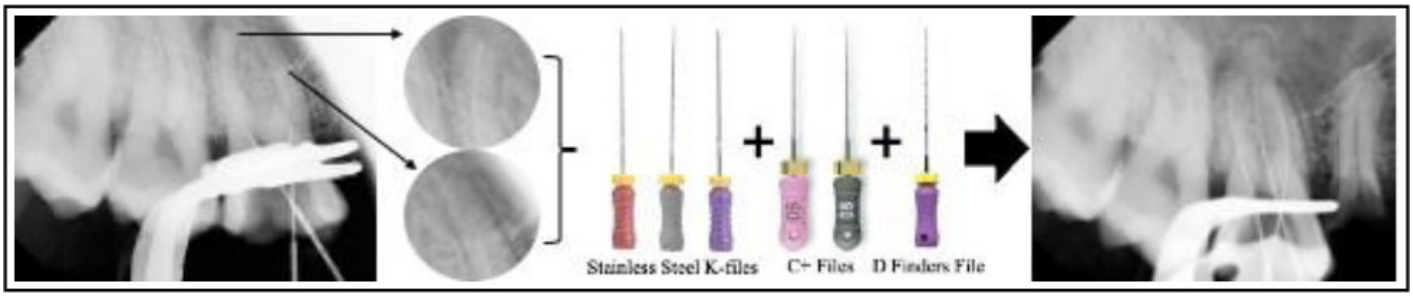

Figure 4. C+, D Finder, #6, #8, and #10 stainless steel files were used to achieve the glidepath.

steel files. These files have demonstrated their efficacy as a method for establishing and securing glide paths in calcified and curved canals.

CONFLICT OF INTEREST

There are no conflicts of interest.

ETHICAL CLEARANCE

Written informed consent was obtained from the patient involved in this case report.

FUNDING

This case report received no external funding.

AUTHORS CONTRIBUTION

Theodorus Aldo Fernando: Writing-original draft preparation. Meiny Faudah Amin: Supervision, reviewing, and editing. Taufiq Ariwibowo: Supervision, reviewing, and editing.

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Endodontic treatment on maxillary first molar with severely curved canal

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ABSTRACT

Introduction: The understanding of anatomical variations is essential towards the success of an endodontic treatment, one of which is the curved canal. Normally, a tooth possesses a curvature in its canal. The extent of the curvature is one of the most vital variables that could lead to instrument fracture. The usage of radiographic imaging is crucial in order to respect the curvature of the root canals before commencing an endodontic treatment procedure to minimize the possibility of iatrogenic errors. Apical constriction (AC) is considered the narrowest part of the root canal. An optimal prognosis is attained when an endodontic treatment concludes at the cementodentinal junction (CDJ). While pinpointing the precise location of the CDJ is challenging, the apical constriction (AC) proves to be a suitable and dependable landmark, serving as the endpoint for root canal procedures. Typically, the apical foramen is not positioned at the anatomical apex; instead, it is laterally offset 0.5–2.0 mm coronally from the anatomical apex.

Case Illustration: A female patient, aged 35, visited the Conservative Dentistry Department at Trisakti University Dental Hospital in Indonesia, reporting a substantial cavity in her upper right molar. She had experienced spontaneous pain approximately one month prior. Clinical findings showed a carious lesion on the proximal side of maxillary molar and premolar. Radiographic imaging showed radiolucency on the periapical area. Root canal treatment using the gold-treated rotary files was done on the maxillary right first molar. The canals were filled using a warm vertical compaction technique with a resin sealer, and afterward, a restoration with a lithium disilicate overlay was performed. Overall, the treatment yielded satisfactory results after 1 month post treatment, with the tooth having no symptoms and its functionality restored back to normal.

Conclusion: Curved canals can be managed with proper glidepath to negotiate the canals.

Keywords: Anatomical variation, curved canal, overlay, lithium disilicate, apical constriction, anatomical apex.

INTRODUCTION

Effective endodontic treatment requires clinicians to possess appropriate knowledge.[1] The understanding of anatomical variations is essential towards the success of an endodontic treatment, one of which is the curved canal. Normally, a tooth possesses a curvature in its canal. The degree of curvature is a crucial factor that has the potential to result in the breakage of instruments.[2] Clinicians have long struggled to shape and clean curved canals. The ideal biomechanical root canal preparation is to maintain the original canal morphology.[3] The usage of radiographic imaging is crucial in order to respect the curvature of the root canals before commencing an endodontic treatment procedure to minimize the possibility of iatrogenic errors. Apical constriction (AC) is considered the narrowest part of the root canal.[3]

The best possible outcome in endodontic treatment is achieved when the procedure concludes at the cementodentinal junction (CDJ). While pinpointing the exact location of the CDJ is challenging, the apical constriction (AC) serves as a suitable and reliable landmark, marking the endpoint for root canal procedures. Typically, the apical foramen is not situated at the anatomical apex; instead, its location is laterally offset by 0.5–2.0 mm coronally from the anatomical apex.[3,4]

CASE ILLUSTRATION

A female patient, 35 years old, presented at the Department of Conservative Dentistry, Trisakti University Dental Hospital, Indonesia, reporting a substantial cavity in her upper right molar and experiencing spontaneous pain for approximately one month. Clinical findings showed a carious lesion on the proximal side of maxillary molar and premolar. Radiographic examination revealed radiolucency in the periapical region. A 4.3x magnification was utilized to enhance visibility during the root canal treatment procedure, and the tooth was isolated using a rubber dam.

Glide path preparation using the 16.02 Ni-Ti files, followed by shaping the root canal using the gold-treated rotary files up to 25.08 on the maxillary right first molar. A root canal irrigation protocol consisting of 5,25% sodium hypochlorite, 17% EDTA, 2% chlorhexidine, and sonic activation was used for canal disinfection. The warm vertical compaction technique, accompanied by a sealer based on resin, was employed to fill the canals, followed by the application of a restoration with a lithium disilicate overlay. Overall, the treatment yielded satisfactory results after 1 month post treatment, with the tooth having no symptoms and its functionality restored back to normal.

Figure 1. (A) pre-operative condition, (B) post-obturation, (C) post-operative restoration with lithium disilicate overlay.

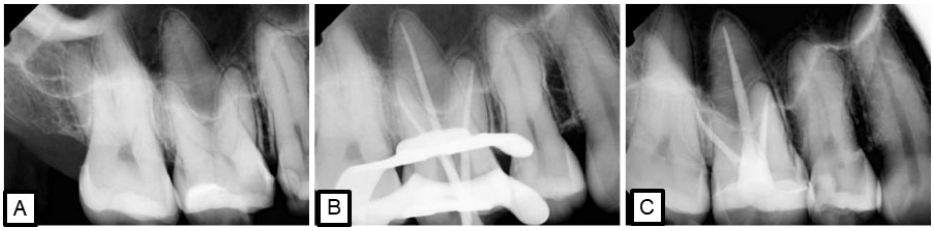

Figure 2. (A) pre-operative radiograph, (B) masterpoint gutta-percha trial, (C) post-operative overlay restoration radiograph.

DISCUSSION

Curved canal is one of the most challenging root canal anatomies to work on, operator's knowledge plays an important role towards the success of the treatment.[5,6] Periapical radiograph can only show a two-dimensional view of the tooth, which is the mesio-distal curvature of the root, whereas buco-lingual root curvature can be present on many cases.[7] The effectiveness of root canal treatment is largely contingent on the thorough cleaning and removal of microorganisms from the root canal system.[7] Factors influencing the outcomes of the final instrumentation include the flexibility of the instrument and the technique employed during preparation.[7] In accordance with Schneider's method for assessing canal curvature, periapical radiographs were used to measure the degree of curvature in the distal root. The results indicated a curvature of 41 degrees, signifying a severe curvature in the distal canal, particularly in the apical third, thereby intensifying the complexity of the treatment.

Preparing a glide path is advisable for narrow and curved canals to prevent procedural errors like canal transportation, ledging, and instrument fracture. In this particular case, a pathway for easier instrument insertion was created by employing slender Ni-Ti files adjusted to the working length, ensuring the retention of the initial apical shape and position. The use of such files may help retain more peri-cervical dentin and decrease the likelihood of instrument separation.[8] Following the glide path preparation, the root canals were cleaned, shaped, and obturated seamlessly. Gold-treated Nickel Titanium rotary files were employed for shaping all the canals. Research indicates that gold-treated instruments exhibit significantly improved flexibility and cyclic fatigue resistance compared to conventional NiTi instruments.[9]

CONCLUSION

Proper knowledge and technique are important for the success in endodontic treatment of curved canal cases. Curved canals can be managed with a proper glidepath to negotiate the canals. The usage of flexible Ni-Ti Files can help to shape and maintain the original anatomy of a curved canal and may retain more peri cervical dentine.

CONFLICT OF INTEREST

There are no conflicts of interest.

ETHICAL CLEARANCE

Written informed consent was obtained from the patient involved in this case report.

FUNDING

This case report received no external funding.

AUTHORS CONTRIBUTION

Indra Kanujaya: Writing original draft preparation. Wiena Widyastuti: Supervision, reviewing, and editing. Anastasia Elsa Prahasti: Supervision, reviewing, and editing. All authors have read and approved this version of manuscript.

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Endodontic treatment of bull–like shaped pulp chamber

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ABSTRACT

Introduction: Taurodontia is a dental condition where the growth of the tooth body occurs at the cost of root development. The alteration in the tooth's morphology occurs due to Hertwig's epithelial sheath diaphragm being incapable of invaginating at the appropriate horizontal level. This dental irregularity is rare, marked by a larger and lengthened tooth body, an enlarged pulp chamber, and a shift of the pulpal floor toward the apex.

Case Illustration: A 39-year-old male patient presented with the chief complaint of a large cavity on his left lower tooth which had throbbing pain about a year ago. Clinical examination showed an occlusal caries extending to the buccal part of the tooth. Deep caries had impacted the pulp, as indicated by the periapical radiograph. The radiograph also showed the absence of constriction at the cementoenamel junction (CEJ) level and periapical radiolucency. Additionally, an abnormal distance between the lowest and highest points in the pulp chamber floor was observed. The notable aspect of this dental anomaly lies in the challenges faced during the execution of endodontic treatment. Achieving comprehensive filling of the root canal system in taurodontia poses a challenge due to the complex nature of the root canal architecture. Gold-treated rotary files was used to prepare all root canals. Single cone technique with bioceramic sealer was used to obturate the canals. The access cavities were cementation using a zirconia material with endocrown technique on the next visit.

Conclusion: A successful endodontic treatment requires a thorough clinical examination, aided by magnification devices such as microscopes, along with meticulous examination of radiographs and a comprehensive understanding of the internal anatomy of teeth.

Keywords: Endodontic treatment, pulp chamber anomaly, taurodontia, access opening.

INTRODUCTION

A rare morphologic variant known as taurodontism (Bull-like tooth) results in the chamber's occluso-apical lengthening and the root's shrinking. This variation leads to a tooth with short roots, an elongated body, an expanded pulp chamber, and regular dentin. It seems that this variation arises from Hertwig's epithelial sheath diaphragm being unable to invaginate at the appropriate horizontal level. This defect has been linked in preliminary research to an unnamed ectodermal deformity. Amelogenesis imperfecta or other genetic disorders may be related to it. It is currently considered to be an anatomical variation that can happen in the general population. Taurodontism may appear as an unique condition or as part of a syndrome. A first diagnosis of this sickness can therefore be made by a dentist because of the existence of a taurodont tooth. A taurodont tooth's clinical size tends to be normal, but molars are more frequently affected in the permanent dentition. This disease is bilateral in almost half of situations and is very common among skimoo and Middle Eastern regions. In addition to its distinctive appearance—which includes a pulp chamber that is occluso-apically expanded, short roots, and no cervical constriction—radiographic examination helps identify the condition. Taurodontism, however uncommon, is an important occurrence that may affect how patients are managed in terms of their dental care. An endodontic procedure was used to treat a maxillary second molar with taurodontism in the current case. The success of endodontic treatment is influenced by the effectiveness of the root canal treatment.[1,2]

CASE ILLUSTRATION

A 39-year-old male patient came to the Department of Conservative Dentistry, Trisakti University Dental Hospital, Indonesia with a complaint of a sizable cavity on his lower left molar, and had spontaneous pain about a year ago. Clinical findings showed to be occlusal caries extending to the buccal part. Tooth #37 was diagnosed with necrosis pulp. Radiographic examination revealed radiolucency in the periapical area. A 4.3x magnification was employed to enhance visibility during the root canal treatment procedure, and the tooth was isolated using a rubber dam. Glide path preparation using the 16.02 NiTi files, followed by shaping the root canal using the gold-treated rotary files up to 25.08 on the maxillary right first molar. A root canal irrigation procedure employing 5.25% sodium hypochlorite, 17% EDTA, 2% chlorhexidine, and sonic activation was utilized for canal disinfection. Warm vertical compaction technique with resin-based sealer was used to obturate the canals, followed by lithium disilicate overlay restoration. Overall, the treatment yielded satisfactory results after 1 month post treatment, with the tooth having no symptoms and its functionality restored back to normal.

Figure 1. (A) pre-operative condition, (B) post-obturation, (C) post-operative restoration with zirconia.

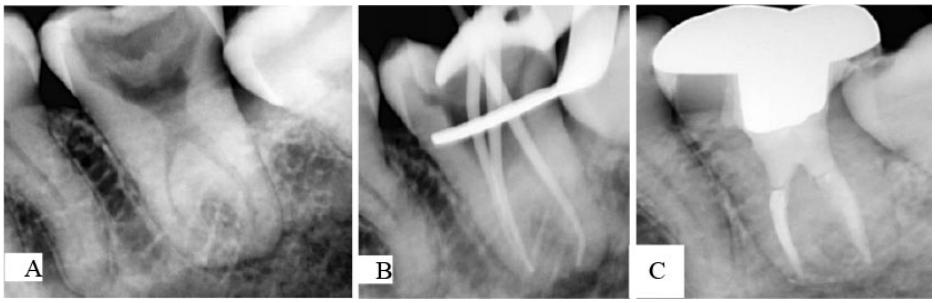

Figure 2. (A) pre-operative radiography, (B) trial master point radiography, (C) post-operative radiography with zirconia endocrown.

DISCUSSION

Managing the endodontic treatment of a taurodontic tooth poses a challenge due to variations in the size of the pulp chamber, root canal orifices positioned apically, and the presence of short roots. Clinically, the crown of a taurodontic tooth appears normal in structure, form, color, and texture, making diagnosis reliant on radiographic examination. The identification of taurodontism involves a specific index, where the ratio of the distance from the lowest point of the pulp chamber's roof to the highest point of the pulp floor (V1) to the distance from the lowest point of the roof to the root apex (V2) multiplied by 100 equals 20 or higher. Hypotaurodontism is recognized when the taurodontic index falls within the range of 20 to 30.[3-5]

The challenging aspect of taurodontic teeth lies in their elongated rectangular pulp chamber, which complicates the location of canal orifices and subsequent canal preparation and obturation. Hence, the effectiveness of endodontic treatment in taurodontic teeth depends significantly on the application of a dental microscope. Utilizing magnification improves the view of the pulpal floor by illuminating the depths of the cavity, facilitating the identification of root canal orifices. Because of the intricate characteristics of the root canals, integrating additional techniques like ultrasonic irrigation during chemomechanical debridement is beneficial for thoroughly cleaning and disinfecting the root canal system.[6,7]

One study proposed that using both the lateral compaction technique and the warm vertical compaction technique is a suitable method for obturating a taurodontic tooth. Ensuring three-dimensional canal obturation and preventing the extrusion of material at the apex can be accomplished by sealing the apical portion of the canal in sections and backfilling with thermoplasticized gutta-percha. In the described scenario, the canals were obturated with lateral compaction in the apical region and vertical compaction at the canal orifices.[7,8]

The post-endodontic restoration of a taurodontic tooth plays a crucial role in ensuring long-term clinical success. The lack of cervical constriction eliminates the supportive effect that shields the tooth from excessive crown loading. Moreover, the diminished thickness of remaining dentin in these roots substantially heightens the likelihood of root fracture in such situations.[8]

CONCLUSION

It underscores the importance for clinicians to possess comprehensive knowledge of uncommon anatomical variations and canal configurations. Successful endodontic treatment necessitates a thorough clinical examination, aided by magnification devices such as microscopes, along with careful analysis of radiographs and a profound understanding of the internal anatomy of teeth.

CONFLICT OF INTEREST

None to declare.

ETHICAL CLEARANCE

The patient or legal guardian provided written informed consent, granting permission for the publication of images and other clinical information in the journal. They are aware that their names and initials will remain undisclosed.

FUNDING

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AUTHORS CONTRIBUTION

All authors contributed equally in the preparation of this manuscript.

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Inclination change of endodontically treated teeth with post core crown

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ABSTRACT

Introduction: Endodontically treated teeth (ETT) are structurally and aesthetically compromised. Most tooth structure loss is caused by caries and also access cavity when the tooth undergoes endodontic treatment or preparation for the final restoration. Full coverage crowns are used to improve fracture resistance and ensure long-term success rates of endodontically treated teeth. Tooth inclination correction is also performed on malocclude teeth to eliminate trauma occlusion and distribute bite force to all teeth. The proximal anatomy of the restoration and the contact area should be designed to maximize arch continuity and to minimize food impaction. Post-core was used to compensate for the loss of structure due to preparation for the intentional inclination change with zirconia crown.

Case Illustration: A 35-year-old male patient came to the Department of Conservative Dentistry, Universitas Trisakti Dental Hospital. He was referred for endodontic treatment. Clinical examination showed a right maxillary first molar with extensive caries on distal with an inclination more towards the palatal direction. The soft tissues around the tooth appeared normal. Periapical radiography showed normal apical tissues. The endodontic treatment procedure was done under 4.3x magnification. Biomechanical preparation was carried out using heat treated rotary files followed by 5.25% NaOCl, saline, and 17% EDTA irrigation with sonic activation for 1 minute. Obturation was performed using a single cone technique and bioceramic sealer. Fiber post was placed on palatal canal followed by core build up with dual cure core material. Preparations for palatal reduction of between 3 - 4 mm to change the inclination more towards the buccal direction. Zirconia was the material of choice for the crown in this particular case. Cementation of the crown was done using self-etch self-adhesive dual cure resin cement. At 3 months follow-up, the tooth showed favorable results clinically and radiographically with absence of symptoms.

Conclusion: Post core crown can be used to change the inclination of maxillary first molar.

Keywords: Endodontic treatment, inclination change, zirconia crown, maxillary first molar, post core crown, contact area.

INTRODUCTION

Advancements in the field of dentistry have allowed individuals to maintain the functionality of their teeth for a prolonged duration, possibly throughout their lifetime.[1] Fractures in teeth that have undergone endodontic treatment are frequently encountered in clinical practice and can stem from various causes. Relevant predisposing variables include the access cavity prior to endodontic therapy and the loss of coronary structure brought on by caries cavities. Endodontically treated teeth (ETT) are structurally and aesthetically compromised. Most tooth structure loss is caused by caries and also access cavity when the tooth undergoes endodontic treatment or preparation for the final restoration. Biomechanical characteristics of teeth with ETT differ greatly from those of vital teeth. Configuration, isthmus width, and cavity depth are important variables that influence fracture risk.[2,3]

ETT that exhibit significant restorations and coronal structure destruction are typically rebuilt using post and core, and then prosthetic crown restoration. Expanding the coronal third of the root canal space is considered as a crucial step in the application of fiber posts and endodontic therapy.[2,4,5] In order to increase fracture resistance and guarantee the long-term success rates of ETT , full coverage crowns are utilized.[6] Tooth inclination correction is also performed on malocclude teeth to eliminate trauma occlusion and distribute bite force to all teeth.[7] Arch continuity should be maximize and food impaction should be minimized by designing the contact area and the proximal anatomy of the restoration.[8] Post-core was used to compensate for the loss of structure due to preparation for the intentional inclination change with zirconia crown. Restorations should enable practitioners to more accurately recreate the natural contours of damaged and tilted teeth. Proper preparation plays a crucial role in influencing the load-bearing capacity of the restoration. With increased restoration thickness, sufficient preparation can reduce stress within the restoration.[6,7,9]

CASE ILLUSTRATION

A 35-year-old male patient came to the Department of Conservative Dentistry, Universitas Trisakti Dental Hospital. He was referred for endodontic treatment. Clinical examination showed a right maxillary first molar with extensive caries on distal with an inclination more towards the palatal direction. The soft tissues around the tooth appeared normal. No tenderness on percussion and no mobility was observed. Periapical

Figure 1. (a) and (b) **Pre-Operative** clinical image of right maxillary first molar (c) **Pre-operative** periapical radiograph showing radiolucency that extends disto-occlusal and has reached the pulp (d) and (e) **Post-Operative** clinical image endodontic treatment continued intentional inclination change with post-core crown restoration and (f) **Post-operative** periapical radiograph showing radiopaque images along the mesiobuccal and distobuccal canals and the apical 1/3 of the palatal root canal filled with gutta perca, 2/3 of the palatal root length was filled with fiberpost material. There was a radiopaque image on the crown showing a zirconia crown restoration.

radiography showed normal apical tissues. Diagnosis of previously initiated therapy on tooth 16 was made. The endodontic treatment procedure was done under 4.3x magnification. Root canal treatment was done under rubber dam isolation. Biomechanical preparation was carried out using heat treated rotary files followed by 5.25% NaOCl, saline, and 17% EDTA irrigation with sonic activation for 1 minute. The obturation was carried out employing a single cone technique along with a bioceramic sealer. Subsequently, a fiber post was positioned in the palatal canal, and a core build-up was performed using dual-cure core material. Preparations for palatal reduction of between 3 - 4 mm to change the inclination more towards the buccal direction. Zirconia was the material of choice for the crown in this particular case. Cementation of the crown was done using self-etch self-adhesive dual cure resin cement. At 3 months follow-up, the tooth showed favorable result clinically and radiographically with absence of symptoms.

DISCUSSION

Endodontic treatment (ET) failure and tooth fracture are frequent outcomes in teeth with extensive tissue destruction. Regardless of the level of quality of the root canal procedure, combining it with a proper coronal restoration increases the probability that the treatment will be successful. Success rates of 83.33% were achieved when sufficient root canal treatment was combined with proper coronal restoration. However, 58.33% of cases were the outcome of inadequate coronal restoration and adequate root canal treatment. Therefore, inadequate restorative treatment or periodontal issues are typically the cause of clinical failures rather than the effects of root canal treatment.[3] Indirect restorations are used to obtain a tight, well-positioned contact area and anatomically contoured proximal surface. Interproximal food impaction can result in periodontal disease, recurrent caries, and discomfort during mastication. Furthermore, inadequate contact can result in tooth movement and dental arch instability.[6,7,9]

For a molar to change inclination, the full-crown restorative material selection is essential. Zirconia and lithium disilicate glass-ceramic, high-strength ceramic materials, have become increasingly popular in the development of various all-ceramic systems. This trend aligns with the growing preference for restorations that are both aesthetically pleasing and biocompatible. Zirconia has a greater flexural strength (>1000 MPa) than lithium disilicate (approximately 400 MPa), so monolithic zirconia crowns' fracture resistance might be suitable for molar restoration.[7] Given the restoration of the tilted occlusal surface, it is inevitable to encounter excessive load correction; therefore, a force of 100 N was chosen for the current study.[7] The interproximal contact in the natural dentition is recommended to be a bean area of 1.5–2 mm rather than a point. The contact area is located at the proximal plane's transitions between the middle and buccal third in a bucco-lingual direction and between the middle and occlusal third in a cervico-occlusal direction. Furthermore, it is important to replicate the proximal surface's contour in both directions while maintaining the natural gingival embrasure, occlusal, buccal, and lingual.[7,8]

CONCLUSION

Post core crown can be used to change the inclination of maxillary first molar. When considering post-core crown restoration, it is advisable to take into account tooth roots with an inclination of less than 30°, occlusal preparation parallel to the bite plane, and minimal oblique force loading.

CONFLICT OF INTEREST

There is no conflict of interest.

ETHICAL CLEARANCE

Written informed consent was obtained from the patient involved in this case report.

FUNDINGS

This case report received no external funding.

AUTHORS CONTRIBUTION

Riesta Paluvi Kusuma Dewi: Writing-original draft preparation. Tien Suwartini: Supervision, reviewing, and editing. Dina Ratnasari: Supervision, reviewing, and editting. All authors have read and approved this version of manuscript.

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Endodontic treatment of type c entomolaris on mandibular second molar

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ABSTRACT

Introduction: The primary objective of endodontic treatment is to eradicate microorganisms from the root canal system and mitigate the potential for reinfection. This is achieved by thoroughly cleaning the pulp structure biomechanically and then sealing it meticulously to create a hermetic seal. Anatomical root variations always exist in dental anatomy. Achieving successful endodontic treatment necessitates a comprehensive comprehension of the root canal system's anatomy. In mandibular molars, extra roots may be positioned either laterally, known as radix entomolaris, or buccally, referred to as radix paramolaris. Radix entomolaris (RE) is identified in the first, second, and third mandibular molars, with the second molar displaying it less frequently. Several techniques have been used to locate radix entomolaris, such as conventional radiographs, and cone-beam computed tomography (CBCT). Recognizing the distinctive external and internal root canal morphology plays a crucial role in achieving success in root canal treatment. The objective of this case report is to provide a comprehensive account of the materials and techniques utilized in the endodontic treatment of entomolaris in the root canals of the mandibular second molar.

Case Illustration: A 19-year-old female patient visited the Department of Conservative Dentistry at Trisakti University Dental Hospital in Indonesia, complaining of persistent pain in her left mandibular tooth. Clinical examination revealed caries on the occlusal surface of the left mandibular second molar. Radiographic imaging using the SLOB technique showed the third root located lingually from the mesio-buccal root. After access opening, three roots with three canals were found. The mandibular left second molar underwent root canal treatment utilizing rotary files treated with gold. A warm vertical compaction technique with resin sealer was used to obturate the canals, followed by short fiber reinforced resin composite restoration.

Conclusion: After the treatment, the patient is asymptomatic and satisfied, which can directly impact her quality of life.

Keywords: Anatomical variation, endodontic treatment, radix entomolaris, mandibular second molar, Protaper Gold, short fiber reinforced composite.

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INTRODUCTION

The main cause behind the ineffectiveness of root canal treatment is the reoccurrence of bacterial infection.[1] The main goal of the endodontic treatment procedure is to eliminate microorganisms from the root canal system and safeguard against the potential for reinfection. This is achieved by meticulously cleaning the pulp structure biomechanically and ensuring a thorough and airtight seal. Anatomical root variations always exist in dental anatomy. A thorough understanding of root canal anatomy is essential for the successful execution of endodontic treatment.[2] A clinician must possess a comprehensive comprehension of root canal anatomy, including variations like extra roots, fins, webs, and isthmuses, as these factors contribute to the complexity of the treatment process. Insufficient awareness of the root canal configuration and incorrect shaping and cleaning techniques can result in flare-ups.[3]

Mandibular molars may have extra roots situated either laterally, referred to as radix entomolaris, or buccally, known as radix paramolaris. The presence of radix entomolaris (RE) is observed in the first, second, and third mandibular molars, with the second molar being the least common location.[4] As per Manning's findings, the mandibular second molar exhibited morphological variations, with 22% having a single root, 76% having two roots, and 2% having three roots. They observed that alterations in the anatomy of the second molar were directly correlated with the age, gender, and ethnicity of the patients.[3]

Several techniques have been used to locate radix entomolaris, such as conventional radiographs, and cone-beam computed tomography (CBCT). Acknowledging the presence of unique external and internal root canal configurations enhances the positive outcomes of root canal treatment.[5] The objective of this case report is to provide a comprehensive account of the materials and techniques utilized in the endodontic treatment of entomolaris in the root canals of the mandibular second molar.

CASE ILLUSTRATION

A female patient, aged 19, sought treatment at the Department of Conservative Dentistry at Trisakti University Dental Hospital in Indonesia. The patient complained about continuous pain on her left mandibular tooth. Clinical examination showed caries on the occlusal of the mandibular second left molar (tooth 37). The patient refused to do CBCT

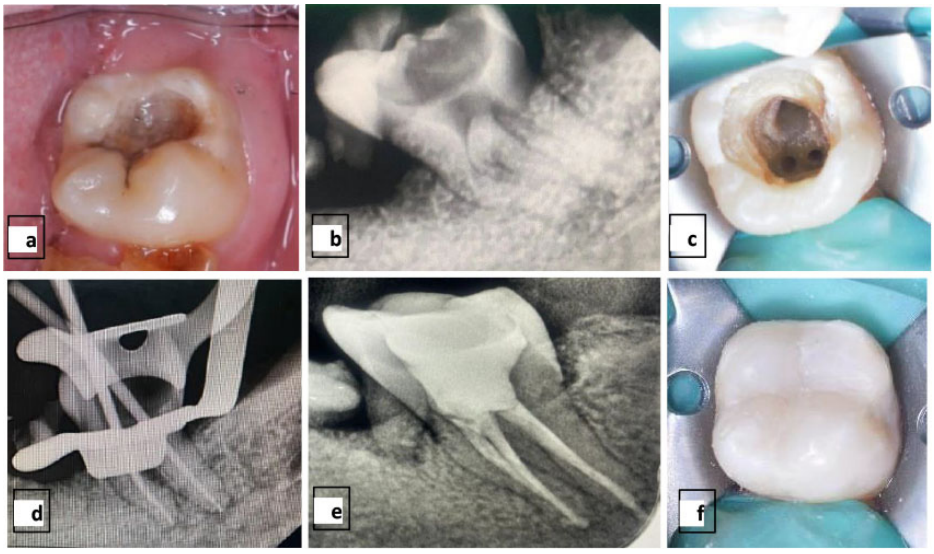

Figure 1. (a) and (b) Pre-operative. (c) Biochemical preparation. (d) Gutta-percha master point radiograph. (e) and (f) Post-operative.

examination, so conventional radiograph was used. Radiographic imaging using the SLOB technique showed the third root located lingually from the mesio-buccal root. With radiographic confirmation, this case comes under type C RE. After access opening, three canals were found and explored with small files (size #8 and #10). Root canal treatment using gold-treated rotary files was done on the mandibular left second molarTo irrigate the canals, a solution comprising 5.25% sodium hypochlorite and a 17% EDTA solution was used. Canals were cleaned and shaped, and calcium hydroxide was used to disinfect the canals. A warm vertical compaction technique, coupled with a resin sealer, was employed to fill the canals. Following this, a restoration was carried out using a short-fiber reinforced resin composite.

DISCUSSION

One of the most important stages in endodontic is a correct diagnosis. Accurate diagnosis of supernumerary roots such as RE is important to produce a successful result of endodontic treatment. Radiographs were captured from diverse angles to minimize the risk of overlooking canals. To prevent iatrogenic errors, it is essential to obtain a minimum of two diagnostic radiographs from varying perspectives, coupled with careful clinical examination.

Carlsen and Alexandersen classified radix entomolaris (RE) into four types (Types A, B, C, and AC) based on the location of the cervical part of the RE to distinguish between separated and non-separated instances. Type A is characterized by three conical macrostructures in the distal part of the root, situated lingually, medially, and facially. The lingual component may be separate, with the medial and facial components connected, or conversely, all 3 macrostructures may be interlinked. In Type B, the distal portion of the root exhibits two conical macrostructures, one on the lingual side and one on the facial side, with both structures being approximately equal in size. These structures may either be interconnected or separate. Type C is distinguished by the mesial positioning of the cervical portion, while In Type AC, the cervical segment is positioned at the center between the mesial and distal root components.[6]

De Moor et al. examined the development of radix entomolaris and noted that in a majority of instances, these canals exhibit curvature. Commencing root canal exploration involves using a small file (size 10 or smaller) in conjunction with radiographic determination of working length and curvature. Following exploration, emphasis should be placed on establishing a straight-line access and preparing a glide path to prevent procedural errors.[7]

CONCLUSION

Accurate diagnosis, multiple radiographs, straight-line access, and glide-path preparation of supernumerary roots such as RE is important to produce a successful outcome of endodontic treatment. After the treatment, the patient is asymptomatic and satisfied, which can directly impact her quality of life.

CONFLICT OF INTEREST

The authors declare the absence of any conflicts of interest.

ETHICAL CLEARANCE

The patient involved in this case report provided written informed consent.

FUNDINGS

This case report received no external funding.

AUTHORS CONTRIBUTION

Calvin Reinnaldi contributed to writing, reviewing, and editing. Wiena Widyastuti provided supervision, reviewed, and edited the manuscript. Taufiq Ariwibowo oversaw, examined, and revised the manuscript. All authors have assessed and endorsed this revised version of the manuscript.

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Post core monoblock system in endodontically treated tooth- Case report

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ABSTRACT

Introduction: The primary objective in endodontics is to eradicate the cause of pulpal and periradicular disease by thoroughly disinfecting and sealing the root canal system. Endodontically treated teeth exhibiting damage to the coronal structure and extensive prior restoration are typically reconstructed using a post-core crown approach to enhance retention and resistance. Lithium disilicate crown showed good esthetic features. The "monoblock" technique, relying on a core-and-post system, has the capability to eliminate potential incompatibilities among diverse materials and fully leverage the strengths of each system. Practitioners can streamline the process of cementing fiber posts and building up cores, opting for a system that simplifies the procedure by minimizing steps and materials while ensuring consistent success.

Case Illustration: A 72-year-old male patient referred from another dentist with chief complaint of pain on biting on upper left anterior region. Intraoral examination showed temporary filling on palatal and tenderness on percussion. No gingival swelling was observed around the tooth. Radiograph examination showed radiopaque filling on the coronal and widening of periodontal ligament on apical third. Root canal treatment was performed on maxillary first incisor tooth. Intracanal medicament using calcium hydroxide was done for one week. Canal were obturated with warm vertical compaction technique using gutta percha and resin sealer. The self-adhesive dual cure resin cement was used to cement fiber post and to build core, forming post-core monoblock interphase. The tooth was then restored with lithium disilicate crown.

Conclusions: The monoblock system that uses a single material protocol minimizes the material interfaces. After 3 months the tooth showed no symptoms and no periapical lesion observed radiographically.

Keywords: Core build-up, monoblock system, lithium disilicate, post-endodontic.

INTRODUCTION

The likelihood of treatment failure rises when microorganisms proliferate.[1] The primary objective in endodontics is to eradicate the cause of pulpal and periradicular disease by disinfecting and sealing the root canal system.[2] Teeth that have undergone endodontic treatment, displaying damage to the coronal structure and having received substantial restoration, are typically reconstructed with a post-core crown to enhance retention and resistance. A lithium disilicate crown demonstrated favorable aesthetic qualities. The "monoblock" method, utilizing a core-and-post system, has the capacity to eliminate potential conflicts among various materials and unlock the complete potential of each system.[2] Practitioners can reduce the time spent in the chair for fiber post cementation and core build-up by selecting a system that streamlines steps and materials, ensuring consistent and predictable success.[3,4]

CASE ILLUSTRATION

A 72-year-old male patient, referred by another dentist, presented with the primary concern of experiencing pain while biting in the upper left anterior region. Intraoral examination showed temporary filling on palatal and tenderness on percussion. No gingival swelling was observed around the tooth. Radiograph examination showed radiopaque filling on the coronal and widening of periodontal ligament on apical third. Root canal therapy was conducted on the maxillary first incisor tooth, and a calcium hydroxide intracanal medicament was applied for a duration of one week. The canals were filled using the warm vertical compaction technique, incorporating gutta-percha and resin sealer. A self-adhesive dual-cure resin cement was employed for cementing the fiber post and building the core, creating a post-core monoblock interface. Subsequently, the tooth was restored with a lithium disilicate crown, which was cemented using a dual-cure resin.

DISCUSSION

Due to the fragility induced by endodontic and restorative procedures on the root, the effectiveness of the sealing and the overall potential of endodontic replacement monoblocks have emerged as significant areas of concern. Therefore, endodontic rehabilitation poses a challenging task as the distribution of stress is influenced by the direction and magnitude of applied force, resulting in a multiaxial and non-uniform scenario. Hence, it is essential to include in the treatment plan the need to reinforce and restore the weakened tooth structure.

Monoblock means "single unit" in the literal sense. Asic requirements for proper functioning of monoblocks that must work as a single unit at the same time are materials should be able to bond efficiently with one other and to the substrate, and materials utilized should have similar elastic moduli to the substrate.[5]

Primary monoblock has two drawbacks: insufficient strength and

Figure 1. (a) and (b) pre-operative, (c) and (d) after fiber post placement and crown preparation, (e) and (f) after cemented lithium disilicate crown.

stiffness. Secondary monoblocks exhibit two peripheral interfaces: one between the cement and the dentin, and the other between the cement and the core material. Monoblock assemblies formed by adhesive root canal sealers, either in conjunction with bondable root filling material or through the application of adhesive post systems during root canal treatment, possess a modulus of elasticity comparable to dentin.[5]

CONCLUSION

The monoblock system, employing a unified material protocol, reduces the number of material interfaces. After 3 months the tooth showed no symptoms and no periapical lesion observed radiographically.

CONFLICT OF INTEREST

The Authors declare that there are no competing interests.

ETHICAL CLEARANCE

The patient and parent provided written informed consent for the publication of clinical details and images.

FUNDING

This case report received no external funding.

AUTHORS CONTRIBUTION

Stanley: Writing- Original draft preparation. Aryadi Subrata: Supervision, Writing- Reviewing and Editing. Selviana Wulansari: Supervision, Writing- Reviewing and Editing.
All authors read and approved the final manuscript.

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A 3-month follow-up of fiber post placement after MTA plug in apexification

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ABSTRACT

Introduction: The use of fiber posts and self-adhesive resin cement for intraradicular reinforcement has been suggested to improve the outlook for teeth with structural compromises. While the modulus elasticity of gutta-percha is lower 175-230 times than dentin, fiber post has a similar modulus elasticity to dentin. It is also known that conventional root canal sealers do not adhere well to dentin and gutta-percha. Since MTA exhibits superior sealing capacity compared to gutta-percha as an apical seal for teeth indicated for post and core, it should be considered to put fiber post directly after the MTA plug.

Case Illustration: 14-year-old female patient came with a chief complaint of unaesthetic upper front teeth. The accurate diagnosis was achieved through the assistance of radiological examinations. The potential treatment alternatives were deliberated with the parents of the patient. The upper left front teeth underwent root canal therapy, with the use of MTA as an apical plug. The canal was delicately cleaned using a #60 H-file along with irrigation using 1.5% NaOCl and 17% EDTA. An MTA plug was positioned in the apical region of the root canal, and a glass fiber post was inserted for reinforcing the root, followed by the placement of a crown.

Conclusion: The findings in this case report indicate that utilizing a fiber post after MTA plug insertion offers a practical option for achieving root end closure. This approach proves to be a straightforward and effective procedure, yielding excellent aesthetic and functional results. Despite the limitations of this case, the described technique permitted satisfactory results in teeth requiring apexification with post core restoration.

Keywords: Apexification, mineral trioxide aggregate, fiber post, post core technique.

INTRODUCTION

The suggestion of intraradicular reinforcement involving a fiber post and self-adhesive resin cement aims to improve the overall prognosis for teeth that are structurally compromised. While the modulus elasticity of gutta-percha is lower 175-230 times than dentin, fiber post has a similar modulus elasticity to dentin. It is acknowledged that traditional root canal sealers do not bond effectively to dentin and gutta-percha. MTA has been recommended for establishing an apical plug at the root end, contributing to the prevention of filling material extrusion. MTA is composed of small hydrophilic particles, including tricalcium silicate, silicate oxide, and tricalcium oxide. When MTA is combined with sterile water, it transforms into a colloidal gel, with a setting time of 3-4 hours in the presence of moisture. Due to its superior sealing ability compared to gutta-percha for apical sealing in teeth designated for post and core, it is advisable to directly place a fiber post after the MTA plug.

CASE ILLUSTRATION

14-year-old female patient came with a chief complaint of unaesthetic upper front teeth. The proper diagnosis was made with the help of radiological investigation (Figure 1A). The potential treatment alternatives were deliberated with the parents of the patient. Subsequently, root canal therapy was performed on the upper left front teeth, employing MTA as an apical plug. The canal was carefully cleaned using a #60 H-file, along with irrigation using 1.5% NaOCl and 17% EDTA. To achieve canal disinfection before MTA placement, the canal was dried with paper points, and then calcium hydroxide was inserted into the root canal, followed by the placement of a sterile cotton pellet. After the initial appointment, the access cavity was sealed with a temporary restoration material. The patient was scheduled for a follow-

Figure 1. (A) Preoperative radiograph of maxillary left central incisor with an open apex, (B) Radiographic evaluation of MTA in the apical area, (C) Fiber post placement with dual-cure resin cement, (D) Radiograph after three months.

up one week later. During the subsequent appointment, the tooth was re-accessed, and calcium hydroxide was removed using 1.5% NaOCl irrigation and 17% EDTA. The canal was then dried with paper points. MTA, prepared according to the manufacturer's instructions, was placed with a carrier and adapted using hand pluggers in the 4 mm apical portion of the canal, confirmed radiographically. An MTA plug was positioned in the apical area of the root canal (Figure 1B), followed by the placement of a glass fiber post using dual-cure resin cement (Figure 1C). The procedure continued with crown placement, and a follow-up was conducted after three months (Figure 1D). At the three-month clinical follow-up, satisfactory clinical function was observed, and there were no clinical symptoms.

DISCUSSION

The use of a fiber post reduces the likelihood of restorative failure and provides more effective support against tensile stress. Additionally, fiber posts may contribute to a more uniform distribution of forces along the root, minimizing stress concentrations.[1] In this case, the fiber post was placed over the MTA apical plug without backfilling with gutta-percha. Fiber post was cemented with dual-cure resin cement. The literature shows that composite resin can be placed directly over MTA with no adverse reactions.[2,3] Zhabuawala et al. assessed the fracture resistance of simulated immature teeth by utilizing a biodentine apical plug and backfilling with gutta-percha, dual-cure resin, and Biodentine.[4] During immediate testing, the dual-cure resin group exhibited a higher mean fracture resistance, followed by the Biodentine and gutta-percha groups, respectively.[4] Directly inserting a fiber post into MTA could prove to be an efficient procedure, reducing treatment time and material usage. However, a drawback of this technique is the limited availability of clinical data concerning the adhesion between resin cement and MTA, as fiber posts are typically placed in root canals using resin cement adhesive.[5]

CONCLUSION

The outcome in this case report suggests that fiber post placement after MTA plug provides a viable alternative to achieve root end closure and can be a simple and efficient procedure with excellent functional results. Despite the limitations of this case, the described technique permitted satisfactory results in teeth requiring apexification with post core restoration. Additional clinical studies are advised to validate the efficacy of this approach.

CONFLICT OF INTEREST

The authors affirm that they have no conflicts of interest.

ETHICAL CLEARANCE

Written informed consent was obtained from the patient and parent.

FUNDINGS

This case report received no external funding.

AUTHORS CONTRIBUTION

Caecilia Caroline Aliwarga: Writing-Original draft preparation. Eko Fibryanto: Supervision, Writing- Reviewing and Editing. Selviana Wulansari: Supervision, Writing- Reviewing and Editing.

A,ll authors reviewed and endorsed the final manuscript.

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Healing process of rarefying osteitis after nonsurgical endodontic treatment

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ABSTRACT

Introduction: Referred to as a radiolucent or radiopaque abnormality in periapical X-rays, apical periodontitis is the immune system's inflammatory reaction to the presence of infection in or around the root canal system. It is linked to continuing changes in the periapical bone. A radiolucent lesion of endodontic origin is referred to as rarefying osteitis. A sizable periapical abnormality might be directly connected to the root canal system and show positive response to non-surgical intervention. Endodontic treatment, coupled with effective infection control measures, can facilitate the healing of substantial periapical lesions by eradicating the infection within the root canal space.

Case Illustration: A 48- year-old female patient came with a coronal fracture with pulp exposures on the maxillary right central incisor, along with discolorations. On radiographic examination, 11 showed a well- demarcated radiolucent lesion of endodontic origin at the apex with a size of 6 mm x 7 mm on the apical area. Under rubber dam isolation, the patient received standardized treatment consisting of instrumentation to an apical diameter of #40 with endodontic rotary files, sufficient irrigations with a sonic activation procedure and warm vertical obturation with gutta percha and resin-based sealer, followed by internal bleaching and composite build-up. Clinical indicators and radiographic evaluations were examined four months later to gauge the progress of healing.

Conclusion: Nonsurgical endodontic procedures are effective in addressing root canal infections, facilitating the reduction of associated inflammatory processes and promoting healing of periapical lesions. Treating significant periapical lesions with nonsurgical endodontics demonstrated a successful outcome, as evaluated four months later, with success defined as either healing or complete healing.

Keywords: Apical periodontitis, periapical lesion, radiolucent lesion, root canal treatment.

INTRODUCTION

Referred to as a radiolucent or radiopaque abnormality in periapical X-rays, apical periodontitis is the immune system's inflammatory reaction to the presence of infection in or around the root canal system. It is linked to continuing changes in the periapical bone. A radiolucent lesion of endodontic origin is referred to as rarefying osteitis. A sizable periapical abnormality may be directly connected to the root canal system and exhibit a positive response to nonsurgical intervention. Endodontic treatment, combined with effective infection control, can foster the healing of substantial periapical lesions by eradicating the infection within the root canal space.

In alignment with various research findings, the resolution of apical periodontitis reaches its highest point during the initial year following treatment. By the end of the first year, nearly 90% of treated teeth exhibit signs of healing, with only half of them achieving complete healing.

CASE ILLUSTRATION

A 48-year-old female patient came with a coronal fracture with pulp exposures on the maxillary right central incisor, along with discolorations. On radiographic examination, 11 showed a well-demarcated radiolucent lesion of endodontic origin at the apex with a size of 6 mm x 7 mm on the apical area. Under rubber dam isolation, the patient received standardised treatment consisting of instrumentation to an apical diameter of #40 with endodontic rotary files, sufficient irrigations with 5.25% NaOCl, saline, and 17% EDTA, followed by a sonic activation procedure. A paste containing calcium hydroxide served as the intracanal medicament, and the warm vertical compaction technique was employed for obturation, utilizing gutta-percha and a resin-based sealer. This was followed by internal bleaching and composite build-up. The evaluation of clinical signs and radiographic assessments at the 4-month mark was conducted to assess the progress of healing.

DISCUSSION

The primary goals of endodontic treatment for teeth with infected pulp chambers and periapical lesions are to eradicate the infection from the intricate root canal system and to safeguard against the introduction or reintroduction of microorganisms into the root and adjacent tissues.[1] The first course of treatment for periapical lesions should focus solely on eliminating the causative factors because the periapical tissues have the capacity for healing.[2]

Additionally, the precise method by which periapical lesions heal is unclear.[3] A 'bay' or 'pocket' cyst has an open lumen connected to the root canal, so undergoing standard root canal treatment is likely

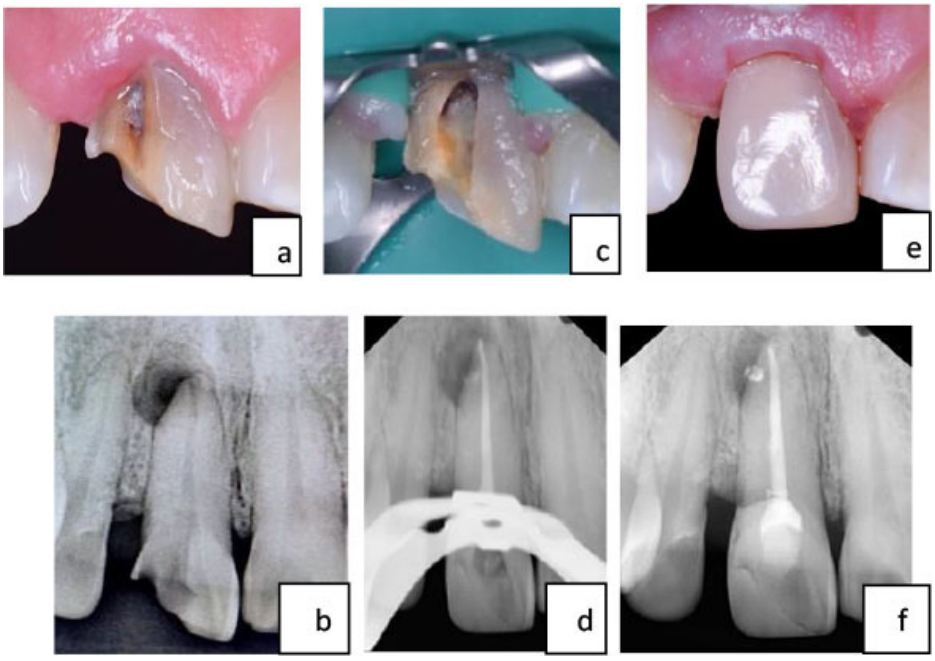

Figure 1. (a) and (c) pre-operative clinical image of the right maxillary first incisor; (b) pre-operative periapical radiograph showing a well-demarcated radiolucent lesion of endodontic origin at the apex; (d) post-operative periapical radiograph after obturation; (e) Post-operative clinical image of the right maxillary first incisor; (f) Post- operative periapical radiograph at 4 months of evaluation.

to result in the cyst healing due to the removal of intra-canal irritants.[3]

Lesion healing is a dynamic process since it depends on the host's reaction to any biofilm or remaining debris that usually remains after conventional root canal therapy, in addition to the effectiveness of the disinfection procedure. While each of these treatments presents unique challenges, it is probable that the cleaning, debridement, and disinfection of the root canal system contribute to the healing of the periapical lesion and the regrowth of alveolar bone. The efficacy of cleaning has been enhanced to some degree through procedures that involve irrigants containing potent antibacterial agents.[4,5]

Moreover, the notable success in this instance can be attributed to the effectiveness of the sonic activation technique in dissolving biofilm and smear layers, even in challenging canal spaces. As part of the treatment, an antibacterial dressing comprising a calcium hydroxide-based paste was applied. Calcium hydroxide, when used beyond the apex, is believed to have four potential effects: (i) anti-inflammatory activity; (ii) neutralization of acid products; (iii) activation of alkaline phosphatase; and (iv) antibacterial action.[4]

In a clinical context, the successful management of apical periodontitis is indicated by the absence of symptoms and signs, along with complete or partial resolution of the periapical radiolucency.[3,6] The outcome of endodontic treatment is influenced by the severity of the root infection and the effectiveness of the root canal filling. The risk of treatment failure rises when there is microbial growth.[3]

CONCLUSION

Nonsurgical endodontic procedures are effective in addressing root canal infections, leading to a reduction in associated inflammatory processes and the subsequent healing of periapical lesions. The treatment of substantial periapical lesions through nonsurgical endodontics demonstrated a success rate during a 4-month re-evaluation, with success defined as either healing or complete healing.

CONFLICT OF INTEREST

There is no conflicting interest.

ETHICAL CLEARANCE

The patient provided written informed consent for the publication of clinical details and images.

FUNDINGS

This case report received no external funding.

AUTHORS CONTRIBUTION

Talisa Claudiary Sinatra contributed to the original draft preparation. Ade Dwisaptarini supervised, reviewed, and edited the manuscript. Rosita Stefani also provided supervision, reviewing, and editing. All authors have read and approved this version of the manuscript.

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Endodontic management of previously initiated therapy on first maxillary molar: A case report

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ABSTRACT

Introduction: Previously Initiated Therapy refers to a clinical diagnosis indicating that the tooth has undergone prior treatment through partial endodontic procedures like pulpotomy or pulpectomy. After concluding endodontic treatment, certain patients may experience pain, including sharp discomfort when exposed to temperature changes, prolonged discomfort, spontaneous (unprovoked) pain, and pain referred to other areas. The tooth's responsiveness to pulp testing methods may vary depending on the extent of the treatment received. Success in completing endodontic treatment depended on factors such as having a broad crown access, ample illumination, and the utilization of exploring files.
Case Illustration: A 58-year-old female patient reported to the Conservative Department. He complained of a proximal cavity, pain that occurs spontaneously, and the tooth previously has been treated. An oral examination revealed a proximal cavity that was covered with temporary filling. Based on the clinical presenting features and radiographic image, a clinical diagnosis of previously initiated therapy on tooth 26 was made. Root canal treatments, canal disinfection was performed followed with the warm vertical condensation and restoration was done using short fiber reinforced composites.
Conclusion: Managing molars with previously initiated therapy proved achievable through effective root canal treatment, leading to the resolution of patient complaints. This case still needs recalls and regular controls.

Keywords: Endodontic treatment, maxillary first molar, short fiber reinforced composites.

INTRODUCTION

The term "Previously Initiated Therapy" categorically denotes that the tooth underwent prior treatment involving partial endodontic procedures like pulpotomy or pulpectomy. Following the cessation of endodontic treatment, certain individuals may experience pain, characterized by sharp sensations when exposed to temperature changes, persistent discomfort, spontaneous (unprovoked) pain, and pain referred to other areas.[1]

Teeth containing untreated canals host bacterial causes and frequently contribute to the failure of root canal treatment. Comprehending and foreseeing unusual tooth structures empowers clinicians to navigate and thoroughly cleanse the entire root canal system, playing a crucial role in enhancing the success of endodontic treatment. The tooth's responsiveness to pulp testing methods may vary depending on the extent of the therapy. Successful completion of endodontic treatment relies on factors such as having broad crown access, ample illumination, and utilizing exploring files.[2]

CASE ILLUSTRATION

A 58-year-old female patient reported to the Conservative Department. He complained of a proximal cavity, pain that occurs spontaneously, and the tooth previously has been treated. An oral examination revealed a proximal cavity that covered with temporary filling. Based on the clinical presenting features and

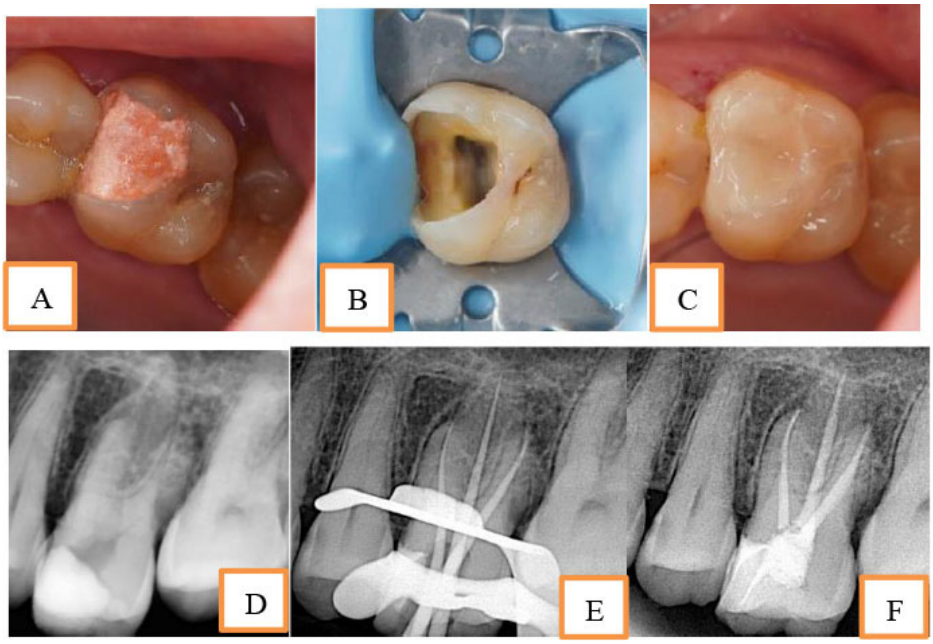

Figure 1. A. Preoperative condition, B. Removing caries, C. Final restoration, D. Preoperative radiograph, E. Trial master gutta percha radiograph, F. Final obturation radiograph.

radiographic image, a clinical diagnosis of previously initiated therapy on tooth 26 with asymptomatic apical periodontitis was made. Root canal treatments, canal disinfection was performed followed with the warm vertical condensation and restoration was done using short fiber reinforced composites.

DISCUSSION

The primary objective of root canal treatment is to prevent or address apical periodontitis, thereby preserving natural teeth. The presence of bacteria in the root canal system can lead to the formation of periapical lesions. In the conventional approach, root canal treatment is performed over several sessions, incorporating additional disinfecting agents (intracanal dressing) alongside irrigants employed during the cleaning and shaping procedures. The primary goal is to minimize or eliminate microorganisms and their byproducts from the root canal system before its completion.[3-4]

CONCLUSION

Molars that have undergone prior therapy were successfully addressed through appropriate root canal treatment, resulting in the resolution of patient complaints. This case still needs recalls and regular controls.

CONFLICT OF INTEREST

No conflicts of interest exist.

ETHICAL CLEARANCE

The patient involved in this case report provided written informed consent.

FUNDING

This case report received no external funding.

AUTHORS CONTRIBUTION

Joseph: Writing-original draft preparation. Ade Dwisaptarini: Supervision, reviewing and editing. Melaniwati:

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MTA apical plug as treatment on fracture necrotic immature tooth

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ABSTRACT

Introduction: In children and adolescents, traumatic dental injuries (TDIs) frequently occur in permanent teeth. The occurrence of pulp necrosis in immature permanent teeth suggests a disruption in both root development and apical closure. Apexification using Mineral Trioxide Aggregate (MTA) is preferred because it generates a calcific barrier at the apex, accompanied by fiber post placement to reinforce the weakened root structure may increase favorable outcomes. The purpose of this case report is to describe the treatment of a fractured immature tooth which is non vital with open apex caused by traumatic dental injury.

Case Illustration: A 10-year-old male patient presented to the department of conservative dentistry at RSGM-P Trisakti University with a fracture in his upper front tooth, the tooth had already been treated by another dentist a month ago. A complicated crown fracture on the maxillary left central incisor was discovered clinically. Radiograph examination showed a crown fracture involving enamel, dentin and pulp exposure with an open apex and radiolucency on the apical area. The maxillary left central incisor was instrumented minimally using an H-file and irrigated with 1,5% sodium hypochlorite. Apexification of the maxillary left central incisor with an MTA plug was performed, followed by fiber post core and resin crown restoration.

Conclusion: Opting for MTA (Mineral Trioxide Aggregate) continues to be the preferred material for creating an immediate apical barrier due to its excellent clinical properties and high success rate. Three months post-treatment follow-up revealed the absence of any abnormal symptoms in the tooth.

Keywords: Apexification, calcific barrier, open apex, traumatic dental injuries.

INTRODUCTION

In children and adolescents, traumatic dental injuries (TDIs) are prevalent in permanent teeth, with an average incidence of 97.3% for fractures in anterior teeth. The right maxillary central incisor is the least frequently fractured anterior tooth, contributing to 43.2% of all fractures. The occurrence of pulp necrosis in immature permanent teeth suggests that there has been a disturbance in both root development and apical closure. Apexification using Mineral Trioxide Aggregate (MTA) is preferred because it generates a calcific barrier at the apex, accompanied by fiber post placement to reinforce the weakened root structure may increase favorable outcomes. This case report aims to detail the treatment of a fractured immature tooth with a non-vital open apex resulting from traumatic dental injury.

CASE ILLUSTRATION

A Male patient, 10 years old patient, presented to the department of conservative dentistry at RSGM-P Trisakti University with a fracture in his upper front tooth, the tooth had already been treated by another dentist a month ago. A clinically identified complicated crown fracture was observed on the maxillary left central incisor. Radiographic examination revealed a crown fracture involving enamel, dentin, and pulp exposure, with an open apex and radiolucency in the apical area. Minimally invasive instrumentation of the maxillary left central incisor was performed using an H-file #80 (Mani, Tochigi, Japan) and irrigated with 1.5% sodium hypochlorite. Ca(OH)2 was applied as intracanal medication. After one week, apexification of the maxillary left central incisor was carried out using an MTA plug with an MTA carrier (Nexton, Pakistan), followed by the placement of a fiber post core and resin crown restoration.

DISCUSSION

Immature teeth with necrotic pulp present several difficulties because of their tendency to fracture due to their big open apices with thin dentinals. Complete cleaning and debridement of the root canal is also challenging, as is obturation.[1] Various therapeutic techniques for such immature nonvital teeth have been proposed. For such clinical circumstances, the apexification method has been routinely adopted. Frank (1966) popularized the apical closure procedure using Ca (OH)2.[2] In apexification, no vital pulp tissue is maintained because, regardless of the size of the apical opening, root canal obturation will take place to the root's highest apical extent. In teeth that have undergone apexification, no further development of roots is predicted. Apexification's major goal is apical closure, which can be achieved either by using Ca(OH)2 as an intracanal medicament or by directly placing MTA

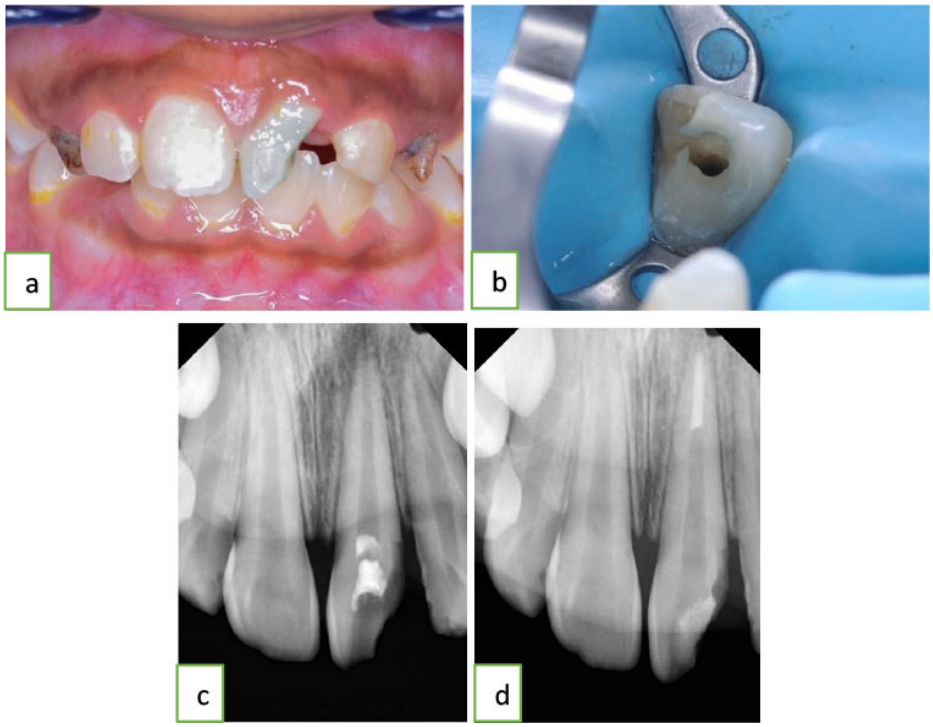

Figure 1. (a) and (b) Pre-operative #21, (c) Radiograph pre-operative, (d) MTA plug.

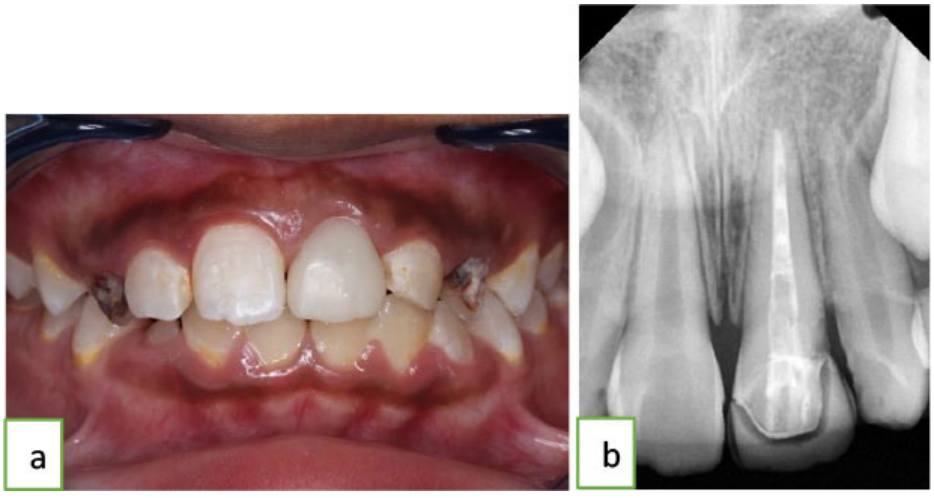

Figure 2. (a) Post operative, (b) Radiograph post operative.

or other hydraulic silicate cement to the apical extent of the root canal space. Apexification using Ca(OH)2 does have some drawbacks. Among these is that the treatment takes a long time, ranging from 3 to 9 months.[3] Over time, the root canal may be reinfected because of the leaking of the temporary coronal filling. In teeth with poor coronal filling, the success rate drops by 10%.[4] Before using the MTA plug procedure, the root canals must be disinfected with a temporary calcium hydroxide coating. This is due to the fact that chemomechanical pretreatment alone is insufficient for completely eliminating microorganisms.[4] MTA has demonstrated the ability to induce osteogenesis and cementogenesis. Additionally, it may have the potential to prompt the release of various growth factors, including fibroblast growth factor (FGF), epidermal growth factor (EGF), transforming growth factor-1 (TGF-1), insulin-like growth factor-1 (IGF-1), platelet-derived growth factor (PDGF), cementum-derived growth factor (CGF), as well as insulin-like growth factors (IGFs), transforming growth factor-beta (TGF-B), bone morphogenetic proteins (BMPs), and fibroblast growth factor (FGF) from the alveolar bone matrix. This process could lead to the differentiation of cells into cementoblast-like cells and osteoblasts.[5] The benefits of MTA as a substance used for open-apex therapy include the ability to reduce treatment time, hydrophilicity, excellent biocompatibility, and bacteriostatic action.[1] By increasing the fracture resistance of developing teeth, MTA is the most viable replacement for the drawback of calcium hydroxide. Apexification with MTA resulted in a high rate of healing and apical closure.[6]

CONCLUSION

MTA continues to be the preferred material for creating an immediate apical barrier due to its excellent clinical properties and a high rate of success. After a follow-up of three months, the tooth showed no abnormal symptoms.

CONFLICT OF INTEREST

The authors affirm that they do not have any competing interests.

ETHICAL CLEARANCE

The patient and parent provided written informed consent for the publication of clinical details and images.

FUNDING

External funding was not obtained for this case report.

AUTHORS CONTRIBUTION

Winny Moniaga: Writing-original draft preparation. Elline: Supervision, reviewing, and editing. Anastasia Elsa Prahasti: Supervision, reviewing, and editing. All author have read and approved this version of manuscript.

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Post-endodontic restoration on mandibular first molar with endocrown

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ABSTRACT

Introduction: Endodontic therapy on extensively decayed molars can lead to a reduction in mechanical strength. Subsequent restoration after endodontic treatment aims to safeguard the original tooth structure while enhancing its appearance, shape, and functionality. Balancing the need for minimal invasive tooth preparation, preservation, and long-lasting restoration poses a notable challenge for clinicians. The endocrown stands out as a viable restorative choice for teeth that have undergone endodontic treatment.

Case Illustration: A 19-year-old male patient was referred to the Department of Conservative Dentistry and Endodontics, Trisakti University to continue endodontic treatment. The patient's main complaint was pain in the lower right back tooth when biting down. Clinical examination showed tooth #46 with temporary filling and extensive coronal tooth loss. Radiographic examination showed pulpal involvement with periapical radiolucency. Endodontic treatment was indicated for this case. The temporary filling was taken out, and upon identifying the orifices, an artificial barrier was created. The root canals underwent biomechanical preparation, followed by the application of calcium hydroxide as an intracanal medicament. In the second appointment, the patient reported no symptoms therefore, treatment was followed by obturation, and the tooth was prepared for endocrown restoration. Before teeth were prepared, the shade was chosen using the VITA master shade. The preparation involved using a wheel bur to reduce the buccal and lingual walls, aiming for an interocclusal clearance of 2 mm, a butt joint margin, and a central retentive cavity with a depth of 4 mm from the pulp chamber roof to the intracoronal cavosurface margin. Upon receiving the prosthesis, a zirconia endocrown try-in was performed, followed by cementation using resin cement.

Conclusion: Endocrowns epitomize a minimally invasive dental approach, offering improved aesthetics, mechanical effectiveness, and a shorter clinical timeframe for teeth that have undergone endodontic treatment.

Keywords: Post-endodontic restoration, Endocrown, endodontically treated tooth, minimally invasive dentistry.

INTRODUCTION

Severely decayed molars undergoing endodontic treatment may experience a decline in mechanical properties. Post-endodontic restorations play a crucial role in mechanically stabilizing the complex formed by the tooth and its restoration in endodontically treated teeth. The restoration following endodontic treatment serves to preserve and safeguard the existing tooth structure while enhancing its aesthetics, form, and functionality. There are diverse treatment options for restoring teeth that have undergone endodontic treatment, such as direct composite restorations, onlays, overlays for cuspal coverage, full-coverage crowns, crowns supported by post and core, and endocrowns. The success of root canal treatment is heavily influenced by the final restoration, as coronal leaks can diminish the success rate by up to 40%. Addressing concerns about minimal invasive tooth preparation, preservation, and the durability of the restoration, the process of restoring a tooth after endodontic treatment poses a considerable challenge for clinicians. The evolution of adhesive techniques, initially outlined by Pissis in 1995, led to the introduction of the monoblock technique, paving the way for the development of the endocrown. The endocrown stands as a viable restorative choice for teeth that have undergone endodontic treatment.

CASE ILLUSTRATION

A 19-year-old male patient was referred to the Department of Conservative Dentistry and Endodontics at Trisakti University to continue endodontic treatment. The patient's main complaint was pain in the lower right back tooth when biting. Clinical examination showed tooth #46 with temporary filling and extensive coronal tooth loss. Radiographic examination showed pulpal involvement with periapical radiolucency. Endodontic treatment was indicated for this case. Temporary filling was removed and followed by locating the orifices. After all the orifices were found, an artificial wall was made. The root canals underwent biomechanical preparation, and calcium hydroxide was administered as an intracanal medicament. In the second appointment, the patient reported no symptoms therefore, treatment was followed by obturation, and the tooth was prepared for endocrown restoration. Before teeth were prepared, the shade was chosen using the VITA master shade. The preparation involved using a wheel bur to reduce the buccal and lingual walls, aiming for an interocclusal clearance of 2 mm, a butt joint margin, and a central retentive cavity with a depth of 4 mm from

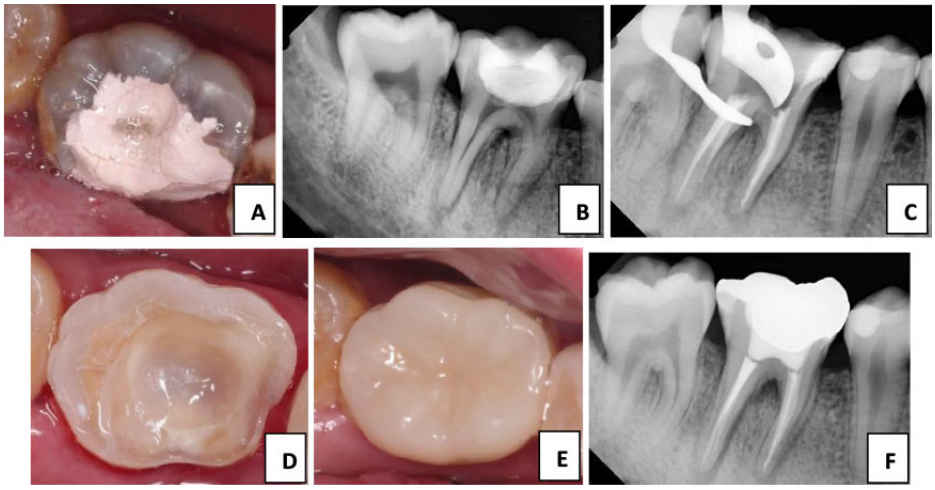

Figure 1. (A) Clinical condition of tooth #46, (B) Pre-operative radiograph, (C) Obturation of the root canals, (D) Endocrown preparation, (E) Cementation of endocrown, (F) Radiographic examination after crown cementation.

the pulp chamber roof to the intracoronal cavosurface margin. Following the completion of the preparation, a polyvinyl siloxane impression material was utilized to take an impression of the tooth. The impression was then forwarded to the laboratory for the construction of the endocrown. On receiving the prosthesis, the zirconia endocrown try-in was done to evaluate any occlusal interference and marginal adaptation. Before the final cementation, the inner surface of the zirconia restoration underwent air abrasion using 27-µm aluminum oxide for a duration of 5 seconds to ensure proper conditioning. Self-adhesive resin cement was dispensed directly into the treated restoration, and the endocrown was placed on the tooth. Any surplus cement was eliminated, the occlusion was verified, and the final step involved polishing to conclude the procedure.

DISCUSSION

The choice to restore nonvital teeth should consider aspects such as planning and the selection of the restorative design carefully.[1] Post-endodontic restoration is determined by the tooth and the amount of remaining tooth structure. However, if the remaining tooth structure is not sufficient, an extra retentive mechanism is needed. An endocrown restoration fully covers the tooth and extends into the pulp chamber. The preparation for an endocrown involves creating a butt-joint margin and a central retention cavity.[2] The inner part of the cavity offers macromechanical retention, while adhesive cementation is utilized to achieve micromechanical retention. Endocrown follows the rationale of minimally invasive treatments. Nowadays, minimally invasive preparations are regarded as the preferred method for restoring teeth that have undergone endodontic treatment. The long-term restoration necessitates the preservation of the remaining healthy dental tissues. The endocrown offers a practical and cost-effective restoration with aesthetic and adhesive dentistry.[3]

CONCLUSION

Endocrowns represent minimally invasive dentistry with better esthetics and mechanical efficiency and a shorter clinical time for endodontically treated teeth. Endocrowns can be a choice for restoring endodontically treated molars with structural loss.

CONFLICT OF INTEREST

No conflicts of interest exist.

ETHICAL CLEARANCE

The patient involved in this case report provided written informed consent.

FUNDING

No external funding was received for this case report.

AUTHORS CONTRIBUTION

Josephine Amanda Karnady: Writing-Original draft preparation. Bernard Ongki Iskandar: Supervision, Writing-Reviewing and Editing. Anastasia Elsa Prahasti: Supervision, Writing- Reviewing and Editing.

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Bulk-fill composite as intraradicular retention in post-endodontic restoration

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ABSTRACT

Introduction: The success of endodontic treatment requires not only good-quality root canal treatment but also coronal restoration. The Nayyar core technique used amalgam placement 2-4 mm into the root canal and pulp chamber acting as post and core. Recently there was a development of bulk-fill resin composite for dentin replacement (Smart Dentin Replacement (SDR)) that can be cured up to 4 mm depth with less polymerization shrinkage compared to conventional resin composites. It was discovered that SDR has fracture toughness very similar to sound teeth. The retention of adhesive restoration is micromechanical and does not require macro-retentive feature, leading to less invasive preparation and maximal tooth structure preservation. In addition, it was proven that the use of adhesive material into the canal orifice reduces coronal leakage and increases fracture resistance. Therefore SDR, an adhesive material, will be used in this case report as intraradicular retention.

Case Illustration: A 23-year-old female patient came with complaint of spontaneous pain since a month ago on the lower right posterior region. No tenderness on percussion and no mobility observed. Intraoral examination showed a large disto-occlusal caries on tooth 47. Radiographic examination revealed deep caries without periapical radiolucency. Diagnosis of irreversible pulpitis on tooth 47 was made. Root canal treatment was done under rubber dam isolation. SDR was placed 3 mm below the orifice as intraradicular retention. The core was constructed using the same material. The tooth was restored with zirconia crown. At 3 months follow-up, the tooth demonstrated good clinical performance. The patient reported no pain or discomfort during mastication and the tooth can function normally.

Conclusion: The post- endodontic restoration successfully returns the form and function of the endodontically treated tooth. The SDR can be considered as a material for intraradicular retention.

Keywords: Post-endodontic restoration, minimal invasive, Nayyar core, adhesive restoration.

INTRODUCTION

Endodontically treated teeth are at risk of coronal leakage and fracture, which can cause failure of root canal therapy. According to clinical studies, around 11-13% endodontically treated teeth were extracted due to vertical root fracture.[1] This is due to removal of tooth structure during endodontic treatment and loss of dentin moisture. Therefore, the success of endodontic treatment requires both good quality root canal treatment and also coronal restoration that can reinforce residual tooth structure.

The Nayyar core technique involves amalgam placement 2-4 mm into the root canal and pulp chamber that act as post and core. This technique proved to be effective in endodontically treated tooth.[2] With the development of adhesive restoration material, the retention is now based on micromechanical retention, leading to minimal invasive preparation and maximal tooth structure conservation. Smart dentin replacement (SDR) is a bulk-fill composite for dentin replacement that can be cured up to 4 mm depth with less polymerization shrinkage compared to conventional resin composites.[3] It was discovered that SDR has fracture toughness very similar to sound teeth. The use of adhesive material into the canal orifice was proved to reduce coronal leakage and increase fracture resistance.[1] In this case report, SDR intraradicular retention in post- endodontic restoration on endodontically treated molar with extensive cavity.

CASE ILLUSTRATION

A 23-year-old female patient came with complaint of spontaneous pain since a month ago on the lower right posterior region. Intraoral examination showed a large disto-occlusal caries on tooth 47. No tenderness on percussion and no mobility was observed. Radiographic examination revealed deep caries without periapical radiolucency. Diagnosis of irreversible pulpitis on tooth 47 was made. Root canal treatment was done under rubber dam isolation. All three root canals were prepared biomechanically with copious irrigation using sodium hypochlorite. Final irrigation with activation using sodium hypochlorite and EDTA were done. The root canals were obturated using warm vertical compaction technique using resin sealer. The gutta percha was removed 3 mm below the orifice. The SDR was then placed 3 mm below the orifice as intraradicular retention. The core was constructed using the same material, forming monoblock interphase. The SDR was applied incrementally with the thickness of 3 mm per layer and light cured. The tooth was restored using zirconia crown.

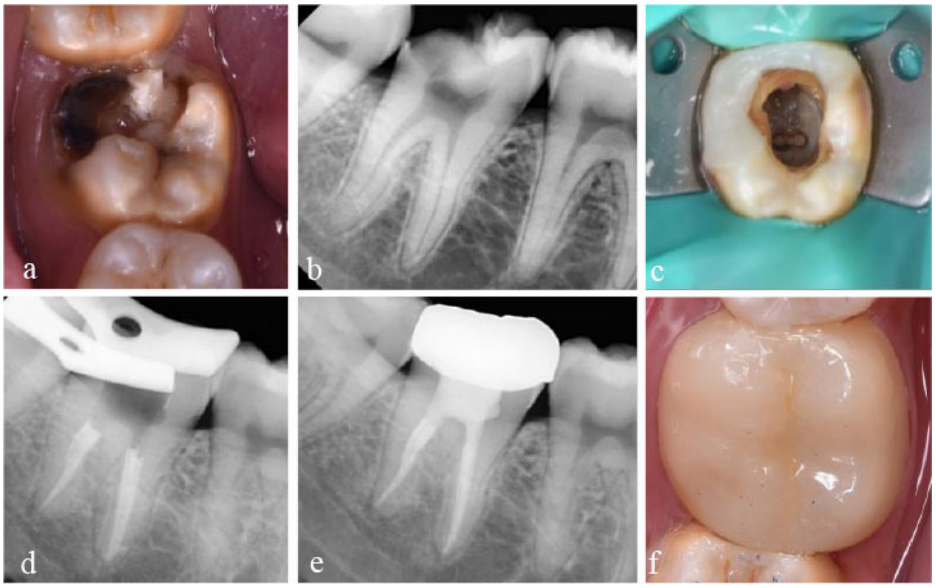

Figure 1. (a) and (b) pre-operative, (c) and (d) After obturation, the gutta-percha was removed 3 mm below the orifice, (e) and (f) After placement of SDR for post and core and zirconia crown.

DISCUSSION

Endodontically treated tooth showed significant reduction in mechanical properties due to caries lesion and endodontic procedure. There is a correlation between amount of remaining tooth structure and its ability to withstand occlusal force. Thus, providing an adequate restoration on endodontically treated teeth is very important to prevent fracture and failure. Nayyar *et al* used amalgam post and core technique which was effective in endodontically treated posterior teeth.[2] In this case report, SDR was used to fill 3 mm into the root canal spaces and pulp chamber to act as a post and core. SDR is non-fiber dentin replacement bulk-fill flowable composite base material with lower polymerization shrinkage and greater depth of cure up to 4 mm. SDR® has good adhesive properties and self-leveling properties which improve marginal integrity and adaptation of restorative materials to tooth structure.[4] In addition, SDR is an adhesive material that doesn't require macromechanical retention like amalgam, leading to minimal invasive procedure. It has been demonstrated that the use of adhesive material into the orifice and root canal, improved the fracture resistance and provide coronal sealing of endodontically treated tooth which is crucial for the success of the endodontically treated teeth.[1] One study showed that the SDR has superior result of pushout bond strength compared to other group that used fiber post with composite flowable and biological post as intraradicular restoration. This might be due to less interphases as it utilizes single material for post and core, forming "monoblock" restoration with mechanical properties similar to tooth structure.[5] Another study showed that SDR showed fracture toughness very close to sound teeth in endodontically treated molar.[3] At three months follow-up, the tooth exhibited good clinical function. SDR can be taken into consideration to be used as material for intraradicular retention in endodontically treated teeth.

CONCLUSION

The quality of post-endodontic restoration is essential for the success of endodontically treated tooth. The SDR can be used as intraradicular retention in endodontically treated molar to improved the fracture resistance and provide coronal sealing.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

ETHICAL CLEARANCE

Written informed consent was obtained from the patient involved in this case report.

FUNDINGS

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AUTHORS CONTRIBUTION

Yohanna Feter: Writing, reviewing, and editing. Tien Suwartini: Supervision, reviewing, and editing. Aryadi Subrata: Supervision, reviewing, and editing. All authors have read and approved this version of manuscript.

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Management of severely curved canal on second maxillary premolar

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ABSTRACT

Introduction: Root canal of the tooth often shows complex configurations that complicate the root canal treatment. Curved root canals cause difficulty in cleaning, shaping, and obturation. Complications that can occur include ledges, fractured instruments, canal blockages, zips, and perforations. This case report aims to provide a procedure for completing endodontic treatment of severely curved root canals.

Case Illustration: A 18-years old male patient came to Dental Hospital Faculty of Dentistry, Universitas Trisakti with a major complaint of spontaneous pain on the right maxillary second premolar. The clinical examination revealed a caries lesion on the mesial aspect with an exposed to pulp chamber. The tooth responded to thermal test and showed sign of tenderness. After measurements using Schneider's method, it was found that the curvature was in the severe category (34 degrees). The root canals were negotiated using pre-curved stainless steel #6 and #8 K-files, followed by glide path preparation using 13/.02 and 16/.02 rotary files. Biomechanical preparation was done using blue heat-treated files until size 25/.06. Continuous irrigation using 5.25% sodium hypochlorite was performed at every file change. Sonic activation at the final irrigation was performed to create an acoustic streaming effect and optimize the flushing of debris from the apical third. The root canal was obturated with warm vertical compaction technique, and the tooth was restored using fiber-reinforced composite resin. At 3 months follow-up, the tooth shows no symptoms and functions normally.

Conclusion: A proper and appropriate approach is needed in the treatment of severely curved root canals to achieve a successful endodontic treatment.

Keywords: Blue-heat treated, pre-curved files, severely curved root canals.

INTRODUCTION

It is not always easy to see how a root canal should be configured. In the event of iatrogenic errors, the dentist must select the appropriate devices for the management of curved canals based on precise knowledge of the tooth structure and degree of curvature. The tooth's root canal frequently has complicated configurations that make the root canal therapy more difficult. Cleaning, shaping, and obturation are challenging procedures for teeth with curved root canals. The following complications can happen are perforations, canal obstructions, ledges, broken tools, and zips. The purpose of this case study is to present a method for finishing endodontic therapy on root canals with extreme curvature.

CASE ILLUSTRATION

An 18-year-old male patient came to Dental Hospital Faculty of Dentistry, Universitas Trisakti with a major complaint of spontaneous pain on the right maxillary second premolar. A caries lesion on the mesial aspect with an exposed pulp chamber was discovered during the clinical examination. The tooth responded to a thermal test and showed signs of tenderness. Schneider's technique measurements revealed that the curvature fell into the severe category (34 degrees). An isolation cavity was set up after the use of rubber dams and anesthesia. Pre-curved stainless steel #6 and #8 K-files with the degree of curvature visible on the radiograph were used to traverse the root canals. Determined the 6# K file up to the radiographic working length. Estimated length until the instrument's curvature was marked, at which point coronal flaring was completed. An apex locator was then used in each canal to establish the working length. In cases where the coronal flaring and canal straightening caused a decrease in the working length as estimated by the radiography, the 6# K file continued to be used until the radiographic working length was reached, and then the 10# K file was introduced. To maintain the canal's original shape and stop the instruments from traveling to the apical side of the apical foramen, precurve the file before putting them. Glide path preparation using 13/.02 and 16/.02 rotary files came next. Blue heat-treated files were used for biomechanical preparation up to size 25/.06. Every file change was accompanied by continuous irrigation with 5.25% sodium hypochlorite. To maximize the removal of material from the apical third and provide a streaming effect, sonic activation was carried out during the last irrigation. A heated vertical compaction technique was used to obturate the root canal, and fiber-reinforced composite resin was used to the tooth. After three months, there are no symptoms and the tooth is functioning normally.

DISCUSSION

Accessing curved canals in a straight path is crucial. Endodontic files are not required to bend before entering the

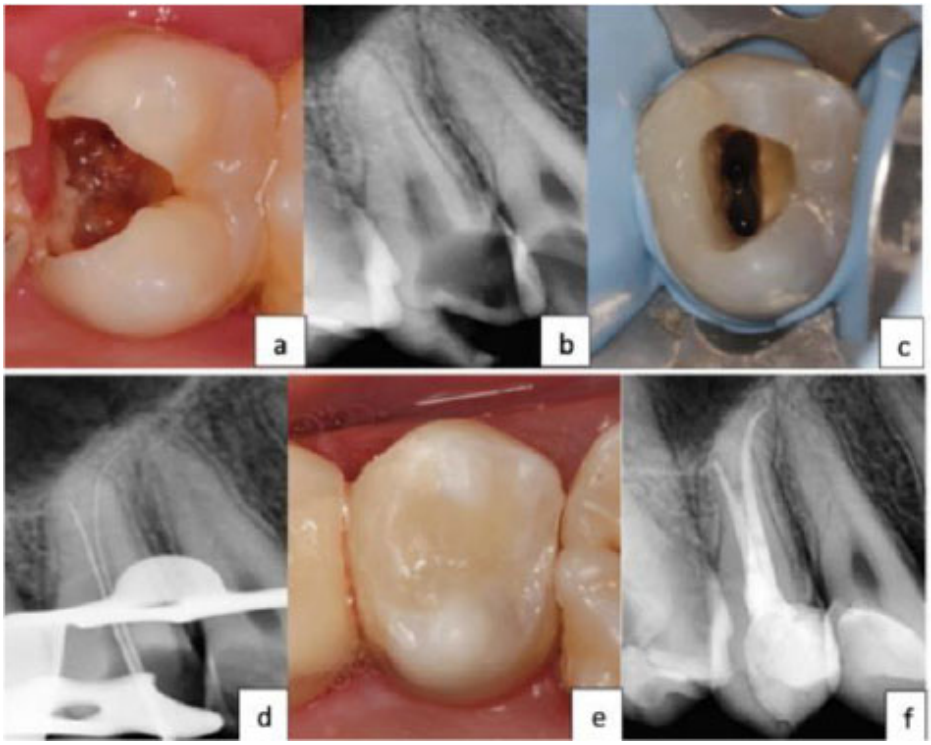

Figure 1. (a) and (b) Pre-operative, (c) Access opening, (d) Working length confirmation using a radiograph. (e) and (f) After obturation and direct restoration using fiber-reinforced resin composite.

canal, which lessens the strain on them. During the procedure, ultrasonics is used to conservatively improve the form of the access cavity. To prevent instrument fracture, it is imperative to establish a clear glide path using hand files prior to utilizing rotary files. Start with safe-ended, tiny hand files. Before inserting any hand files into the canal, give them a pre-curve. Pre-curved files are more effective at navigating curves than straight files. To precurve, a progressive curve is placed along the whole length of the file, and near the apical end of the instrument, a sharp curve measuring almost 45° is placed.[1] Instead of following the canal's curvature, a straight file's point is more likely to leave a ledge behind. It might be necessary to approach a highly curved canal in phases. Before attempting to maneuver around the bend, prepare the canal using hand and rotary files. This marginally expands the hand file's footprint and improves the tactile feedback the tip provides. When preparing curved canals, a flexible rotary file system that respects the architecture of the canal is used for cleaning and shaping. Sodium hypochlorite irrigation on a regular basis helps keep debris out of the canal. Using small hand files (sizes 6–10) to maintain patency and recapitulate regularly is crucial. Blockages can occur as a result of debris building up quickly. This may result in iatrogenic mistakes.[2] Recent developments in dentistry have led to the use of rotary devices with heat-treated nickel-titanium (NiTi) files to tackle the intricate anatomy of root canals. The high rigidity of the NiTi instruments helps to provide strong lateral forces in curved canals and gets better with increasing instrument size. The flexibility, effectiveness, and cutting capacity of NiTi rotary files have made them a preferred tool for shaping root canals.[3] For the preparation of root canals, nickel-titanium (NiTi) devices have been and remain frequently utilized. These tools' flexibility is a huge advantage since it makes the process of creating curved canals more predictable. However, the prognosis of the endodontic therapy is compromised in these circumstances due to the possibility of torsional fracture and/or cyclical fatigue. Various alloys and instrument components have been suggested to improve fatigue resistance and flexibility. A significant advancement in the mechanical qualities of the instrument that has led to a safer and more precise root canal preparation is the thermal treatment of NiTi alloys. In addition to increasing predictability and efficiency and reducing procedural errors— particularly in curved canals— the use of NiTi rotary files for root canal preparation made it possible to create consistently tapered preparations.[4]

CONCLUSION

A successful endodontic treatment for severely curved root canals requires a proper and appropriate approach.

CONFLICT OF INTEREST

The authors declare that there are no competing interests.

ETHICAL CLEARANCE

Written informed consent for publication of clinical details and clinical images was obtained from the patient and parent.

FUNDING

This case report received no external funding.

AUTHORS CONTRIBUTION

Levina Amelia: Writing- Original draft preparation. Eko Fibryanto: Supervision, Writing- Reviewing and Editing. Dina Ratnasari: Supervision, Writing- Reviewing and Editing. All authors read and approved the final manuscript.

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