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Case Report

A retreatment of an endodontic tooth 25 with underfilled

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ABSTRACT

Background: *Cases of endodontic failure requiring retreatment are endodontic failure cases in which microorganisms in root canal are able to survive, causing inflammation and pain.* ***Purpose:*** *This research aims to carry out retreatment of teeth after endodontic treatment to maintain and improve its function.* ***Case:*** *Male patient (67 years) has suffered from pain when chewing and discolored upper left second premolar tooth since one year ago in 2022. Ten years ago in 2013, he got dental treatment for the tooth. The patient also has a history of controlled hypertension.* ***Case management:*** *Several stages were conducted in sequence, namely gutta percha removal from previous endodontic treatment, root canal re-preparation, irrigation sequence, dressing, and obturation with single cone technique.* ***Conclusion:*** *In this case, an indirect restoration in the form of a crown should have been conducted to obtain a good contact point. As a result, food retention occurred in the interdental area, and then microorganisms entered through the periodontal tissue, causing periodontal inflammation. The inflammation then spread apically until it entered one-third of the apical in root canal, resulting in periapical inflammation. Exposed dentinal tubules in the missing portion of cementum then cause bacterial invasion of the tubules and increase the possibility of damage to the pulp. Periodontal disease can progress apically and involve the apical foramen. In this case, an indirect crown restoration was used since the quality of the final restoration has an impact on the survival and success rate of the endodontically treated tooth. In conclusion, a well-sealed crown restoration will prevent the entry of microorganisms.*

Keywords: *Retreatment endodontic; Endodontic failure; Underfilling*

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INTRODUCTION

Pulp and periapical diseases based on the 2011 Indonesian Health Data Profile were considered as the 7th outpatient disease in Indonesia during 2010. Pulp and periapical diseases can be treated with several treatments, including root canal treatment.[6] The aim of this treatment is to prevent the spread of disease from the pulp to the periapical tissue, or if this has already happened, it aims to return the periapical tissue to its normal state. Root canal treatment is quite predictable with reported success rates of up to 86-98%. Although root canal treatment has a high success rate, failure can also occur in some cases.[10]

Moreover, there are some causes of root canal treatment failure, such as incomplete filling, root perforation, external resorption, periodontal-periradicular lesions, overfilling, retained root canals, periapical cysts, ledges due to broken instruments, foramen perforation, and coronal leakage. Crown leaks on teeth after obturation, leaving the root canal exposed to the oral cavity. As a result, microorganisms can enter the root canal and cause secondary infections. Apical periodontitis after root canal treatment is caused by persistent or secondary intraradicular infection. Persistent microbiological infection plays an important role in endodontic failure. Persistent infections are caused by microorganisms that survive from the intracanal disinfection procedure and successfully survive in the obturated root canal. Secondary infections are usually caused by microorganisms that enter the root canal through failure of asepsis during treatment or through crown leakage.[7]

In patients with failed root canal treatment, there are four treatment options that can be carried out. First, doing nothing is considered as a short-term treatment option if the etiology is unknown. Second, non-surgical retreatment is the most indicated solution for the treatment of endodontic failure. Third, surgical retreatment can be considered as the next option. And the last, tooth extraction is considered as an option if other treatment options cannot be achieved.[3]

Furthermore, non-surgical retreatment as the main option can be chosen for teeth that can still be restored well

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since it allows better disinfection of the root canal system. The quality of previous endodontic treatment is a big part of the success of endodontic retreatment. Hence, if the previous endodontic quality is poor, there will be a greater chance of retreatment.[3]

The main difference between endodontic therapy and retreatment is the importance of removing the root canal filling material from inside the root canal. Good retreatment then can be indicated with no debris remained in the instrument.[5] Root canal retreatment in this case aims to prevent infection due to loosening of restorations on teeth that have undergone previous endodontic treatment, with the ultimate aim of maintaining primary teeth in the oral cavity to maintain the jaw arch, aesthetics, and masticatory function.[3]

CASE

A 67-year-old male patient came to the dental hospital of Universitas Airlangga with complaints of pain in his upper left tooth when chewing. Ten years ago in 3 November 2013, he got dental treatment for the tooth. Unfortunately, one year ago the tooth started pain, especially when chewing, and change its color. Since two weeks ago (21 September 2023) the pain has been getting increased. The patient then went to the community health center one week ago and was given antibiotics and painkillers. Besides, it is also known that the patient has a history of controlled hypertension.

Next, extraoral examination was conducted. The results showed that there were no abnormalities. However, tooth 25 had intraorally discolored (Figure 1A). Yet, the results of percussion and bite tests on the tooth were responsive. There was also no tooth mobility. Although the surrounding tissue was normal, there was debris. Vitality examination then was performed, but had no reaction. But, the needle test using gutta percha showed that it had penetrated the orifice so that the pulp vitality was found to be non-vital.

Subsequently, radiographic examination was carried out. The radiographic image of tooth 25 showed underfilling from previous root canal treatment (Figure 1B). The radiographic image also indicated a diffusely bordered radiolucent image appeared at the apical of tooth 25. Afterwards, salivary examination was performed. The results of the salivary examination showed 35-second hydration (yellow), watery viscosity (green), pH 7 (green), 5 ml saliva (green), and 10 buffer capacity (green). Therefore, his tooth 25, according to AAE, was diagnosed with previously treated teeth for the pulp diagnosis, and symptomatic apical periodontitis for the apical diagnosis.

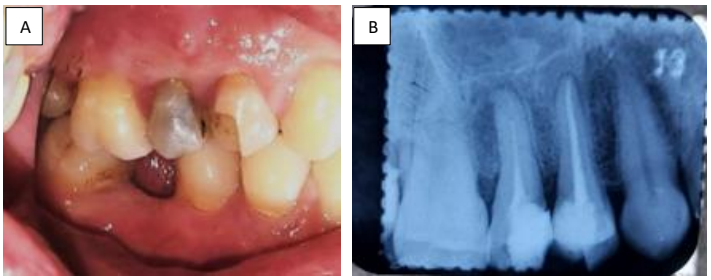

Figure 1. A. Clinical oral examination in tooth 25; B. Periapical radiograph of the last treatment in tooth 25.

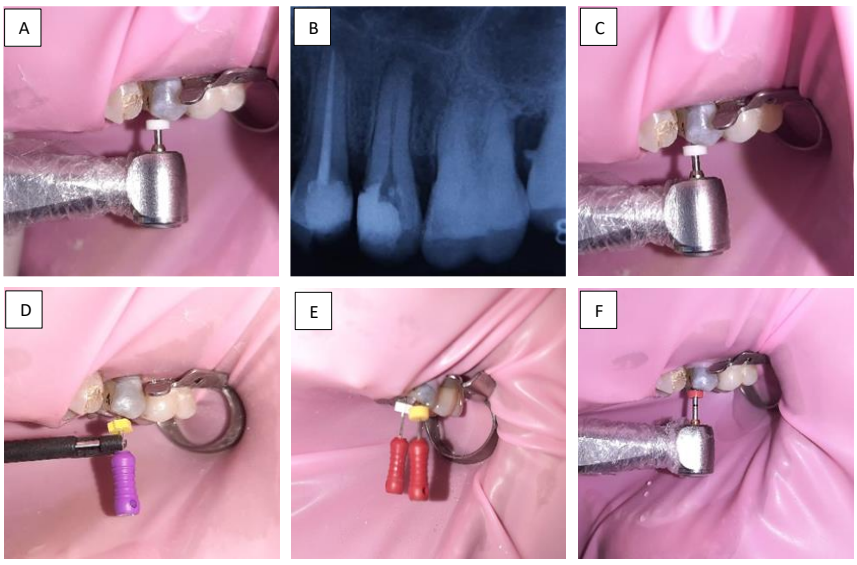

Figure 2. A. Gutta percha removal (treatment); B. Radiographic image after gutta percha removal; C. Glide path; D. Determination of working length; E. Apical gauging; F. Root canal preparation up to X2.

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CASE MANAGEMENT

The main objective of this treatment was to carry out repeated root canal treatment. At the first visit, the patient came for subjective and objective examinations, as well as supporting examination in the form of radiographs. Before the treatment, the patient was given IEC and DHE regarding the treatment to be carried out and asked to fill in *inform to consent* as well as *informed consent*. Next, a rubber dam was installed and continued with access opening of tooth 25. After the orifice was open, gutta percha was removed from the buccal and palatal parts using a retreatment file (Figure 2A) followed by taking radiographs to confirm (Figure 2B). Afterwards, root canal negotiation (glide path management) was performed using Kfile #10, micro glidepath using Kfile #08 #10, and macro glide path using rotary file 17.02 (Figure 2C). Working length then was measured using Kfile #10 and apex locator confirmed with radiography (P: 19 mm; B: 20 mm) (Figure 2D). Subsequently, apical gauging of the root canal (P: #25; B: #25) (Figure 2E) was carried out before the root canal preparation stage (Figure 2F) was conducted using the CDP technique with the NEXT protaper file endomotor until 25.06. Irrigation then was performed using 2.5% NaOCl and 17% EDTA activated with sonic activation before dressing was carried out using Ca(OH)2 (Figure 3A and 3B). And the last, the cavity was closed with a temporary filling.

At the second visit, anamnesis control and extra oral examination was performed. The results revealed that there were no abnormalities. Next, intra oral examination was conducted. The results indicated a temporary filling with negative percussion and bite tests and normal surrounding tissue. Saliva test then was carried out before rubber dam installation as well as irrigation sequence of 2.5% NaOCl and 17% EDTA activated with sonic activation. Afterwards, trial gutta percha was confirmed with radiographs (Figure 4A and 4B). Final irrigation sequence then was performed using 2.5% NaOCl, 17% EDTA, and 2% CHX activated with sonic activation. Subsequently, the root canal was dried using a paper point before obturation preparation using a single cone technique with Bioceramic sealer. The cavity then was closed with a temporary filling, and radiographs were taken.

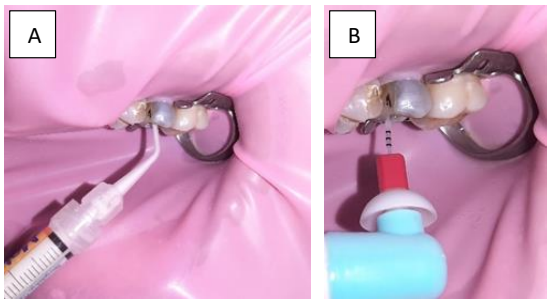

Figure 3. A. Dressing; B. Sonic activation.

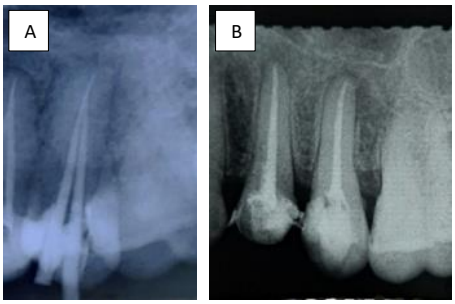

Figure 4. A. Trial gutta percha; B. Obturation radiograph.

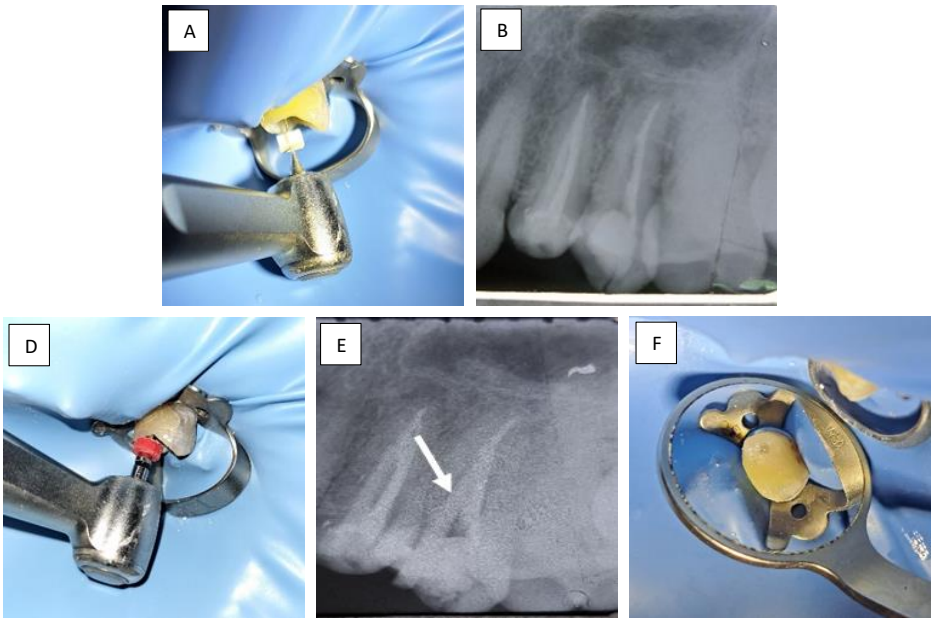

Figure 5. A. Gutta percha removal; B. Radiographic image of Gutta percha removal; C. Preparation with luxadrill; D. Radiographic image of fiber post installation; E. Core Making Process.

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At the third visit, anamnesis control and extra oral examination were conducted. The results showed that there were no abnormalities. Afterwards, intra oral control was performed. The results indicated a temporary filling on tooth 25 with negative percussion and bite tests and normal surrounding tissue. Subsequently, gutta percha was removed as much as ⅔ of the root length (14 mm) confirmed with radiography (Figure 5A and 5B). The size of post then was determined with a post template. Next, post space preparation was carried out using a calibration drill (luxadrill) (Figure 5C). Trial post (luxapost) then was confirmed with radiograph before post insertion and core making using core build up material (Figure 5D and 5E). And the last, RA printing was conducted with irreversible hydrocolloid for making temporary crowns.

At the fourth visit, anamnesis control and extra oral examination were carried out. The results revealed that there were no abnormalities. Subsequently, intra oral control was conducted. The results showed a temporary filling on tooth 25 with negative percussion and bite tests and normal surrounding tissue. Next, 3M2 tooth color adjustment was performed before crown sheath preparation (Figure 6A) with 2 mm occlusal reduction, 1.5 mm axial wall reduction, and chamfer preparation (Figure 6B). RA printing then was carried out with a double impression of polyvinyl siloxane material, while RB with irreversible hydrocolloid. Later, a bite record was conducted with polyvinyl siloxane, and then a temporary crown was inserted before instructions were delivered to the laboratory for making the crown.

At the fifth visit, anamnesis control and extra oral examination were performed. The results showed that there were no abnormalities. Next, intra oral examination was conducted. The results indicated a temporary filling on tooth 25 with negative percussion and bite test results as well as normal surrounding tissue. Afterwards, the temporary sheath crown was removed, and then a permanent sheath crown (Zirconia) was inserted (Figure 7A and 7B). Subsequently, the suitability of occlusion and color, as well as adaptation to the surrounding tissue of the fixed sheath crown were checked. Installation of rubber dam then was carried out. Later, the tooth and zirconia crown were cleaned before GIC luting was applied and inserted on the tooth to remove excess cement. At the end, the rubber dam was removed, and then the occlusion was rechecked.

DISCUSSION

In the case above, an indirect restoration in the form of a crown should have been conducted to obtain a good contact point. As a result, food retention occurred in the interdental area, and then microorganisms entered through the periodontal tissue, causing periodontal inflammation. The inflammation then spread apically until it entered one-third of the apical in root canal, resulting in periapical inflammation.

The possible pathogenesis of perio-endo lesions was damage to the periodontium tissue affecting the root canal. Plaque and calculus are responsible for periodontal lesions. Inflammatory mediators then damaged gingival connective tissue, periodontal ligament, and alveolar bone. There was also loss of the outer layer of cementoblasts, resulting

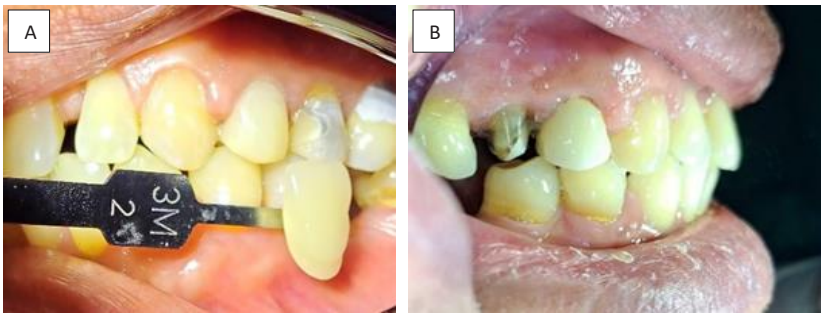

Figure 6. A. Color adjustment; B. Crown preparation results.

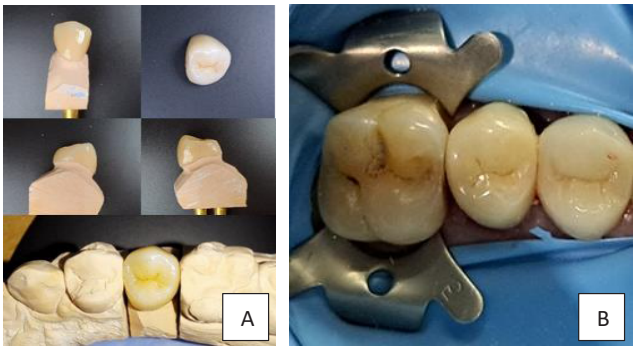

Figure 7. A. Sheath crown in working model; B. Zirconia sheath crown insertion.

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in shallow resorptive lesions in the cementum. Exposed dentinal tubules in the missing cementum lead to bacterial invasion of the tubules and increase the likelihood of damage to the pulp, causing retrograde pulpitis. Periodontal disease can progress apically and involve the apical foramen.[2]

The similarity between endodontic and periodontal microbes indicates the possibility of the spread of infection between the root canal and periodontal pocket.[9] Periodontal disease is an inflammatory disease of the tooth supporting structures that is initiated by bacteria forming a biofilm on the tooth/root surface. Root canal infections (such as apical periodontitis) are diseases involving multi-microbials and biofilms. Apical ramifications, lateral canals, and isthmus connecting root canals may contain microbial structures such as biofilms. The 'interaction' between the pulp and the periodontium occurs mainly through exposed dentinal tubules, small exits (e.g. accessory canals and lateral canals - and through the apical foramen). Therefore, it is not surprising that the pathogens infecting the periodontium and the root canal system are very similar, indicating an inseparable relationship between the root canal system and the periodontium.[5]

In this case, non-surgical retreatment was performed because conventional root canal treatment was failed. There were signs of inflammation or infection related to the filled tooth root. There were also persistent symptoms due to the filled tooth root, swelling or pain, as well as the tooth root filling failed for technical reasons. There will actually be systemic risks if no intervention is carried out. Therefore, tooth should be restored since the filling of the existing roots is technically inadequate, thus, a new restoration is required.[4] The retreatment stages carried out in this case were removing the gutta percha, then taking radiographs, performing glide path, determining the working length, conducting apical gauging, re-preparing the root canal up to X2, dressing, performing activation using sonic activation, removing trial gutta-percha, conducting obturation, and taking radiography photos after obturation.

In this case, an indirect crown restoration was used because the quality of the final restoration has an impact on the survival and success rate of the endodontically treated tooth. A well-sealed crown restoration will prevent the entry of microorganisms. Swanson and Madison highlight that coronal leakage is a major factor leading to endodontic treatment failure. A meta-analysis published in 2008 even stated that endodontically treated teeth with adequate restorations have a higher success rate compared with teeth restored with poor quality.[1]

Furthermore, Vire argues that crowned RCT teeth showed increased longevity compared to uncrowned RCT teeth. In a retrospective study conducted by Aquilino and Caplan (2002), it was found that placing crowns on endodontically treated teeth would increase the longevity of posterior teeth.[1]

Full coverage restoration shows a higher survival rate than direct restoration. Definitive restoration should be performed immediately after completion of the RCT.[1] since it has been proven that the timing of dental crown placement after endodontic treatment affects the survival rate of endodontically treated teeth.

The choice of zirconia as a crown restoration material was because zirconia is a ceramic material that has mechanical properties similar to metal. The use of zirconia is increasingly in demand by patients because this material has better aesthetic aspects compared to metal. Zirconia is a mineral and crystalline dioxide derived from zirconium. Zirconium was originally used as a material for making artificial bones or artificial hips, so the strength of zirconium itself has been proven.[8] In other words, zirconia was chosen as material for crown restoration because of its advantages, such as: aesthetics, stable color and shape, strength to withstand chewing loads, biocompatibility, no toxic effect, low plaque retention.[8]

Cases of endodontic failure requiring retreatment are cases in which microorganisms in root canal are able to survive, causing inflammation and then resulting in pain. Hence, tooth retreatment after endodontic treatment is required to maintain and improve its function. The quality of the final restoration affects the survival and success rate of endodontically treated tooth. Finally, it can be concluded that a well-sealed crown restoration will prevent the entry of microorganisms.

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