

Symptomatic Root Canal Retreatment Approach in Five Patients: Case Reports

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ABSTRACT: In some teeth that have undergone root canal treatment, healing may not occur due to factors such as inadequate treatment, persistent or secondary microorganisms, extraradicular infections, foreign body reactions, or true cysts. In such cases, before considering tooth extraction or retrograde treatment, non-surgical root canal retreatment should be evaluated as a viable option. Root canal retreatment is generally time-consuming and requires effort; however, it represents a more conservative approach. Existing root canal fillings are removed using various techniques, and the canals are thoroughly cleaned, shaped, and refilled. This case series presents the root canal retreatment procedures and one-year follow-up outcomes of five symptomatic patients who previously underwent root canal treatment.

KEYWORDS: Retreatment, apical surgery, case reports.

INTRODUCTION

Ideal endodontic treatment involves disinfection of the root canal system, obturation with a biocompatible filling, and completion of a permanent, impermeable protective restoration (1). The success or failure of the treatment should be determined by evaluating the clinical findings, symptoms, and radiographic data of the treated tooth collectively. Symptoms and clinical signs defining success include the absence of pain, absence of pus drainage, resolution of fistulas, and functional preservation of the tooth (2). The primary cause of endodontic failure is microorganisms resistant to intraradicular or extraradicular infection and disinfection procedures (3). The American Academy of Dentistry (AAE) recommends nonsurgical retreatment when poor quality root canal obturation leads to failure. However, if nonsurgical retreatment is not possible or the risk of retreatment is considered too high, endodontic surgical treatment is preferred (4). Kök kanal tedavisinin başarısız olduğu durumlarda, ilk seçenek olarak kök kanal tedavisinin tekrarlanması düşünülmelidir. Bu tedavi, mevcut kök kanal dolgusunun endodontik el eğeleri, termal cihazlar, ultrasonik aletler, döner eğeler veya çözücüler kullanılarak çıkarılmasını içerir. Ardından, kök kanal sistemine tekrar erişim sağlanır ve ardından kanallar şekillendirilir, dezenfeksiyon yapılır ve tekrar doldurulur. If healing is not observed despite this treatment, retrograde surgery may be considered (2,3). This study presents the root canal re-treatment procedures and follow-up results of five patients who presented to the Pediatric Dentistry Clinic of Harran University Faculty of Dentistry due to inadequate root canal fillings, periradicular lesions, and/or persistent symptoms.

CASE REPORTS

Case-1:

A 15-year-old female patient presented to our clinic complaining of pain in tooth 11. Her history revealed a traumatic crown fracture 5 years prior, followed by root canal treatment and composite restoration. Radiographic examination revealed a periapical lesion and an open apex (Figure 1a). The composite was removed for retreatment, the root canal filling was manually removed, and the root canal length was measured radiographically. NaOCL (MICROVEM 5%, Altun Sterilization and Medical, Sakarya, TÜRKİYE) was used as the irrigant; two sessions of injectable Ca(OH)₂ (Best Iodoformed Calcium Hydroxide, Best Dental, Bursa, Türkiye); one session of CHX gel (CHX 2% Gel, Neo Dental, İstanbul, Türkiye); and glass ionomer cement (NOVA GLASS-F, IMICRYL, Konya, TÜRKİYE) were used as the temporary filling. An apical plug was created with MTA (Biofactor, IMICRYL, Konya, TÜRKİYE) at the final session (Figure 1b). Root canal treatment was then completed with gutta-percha and AH Plus root canal sealer (AH Plus Root Canal Sealer, Dentsply Sirona (Dentsply DeTrey GmbH), Konstanz, Germany). Composite veneer restoration was applied (Figure 1c). At 1-year follow-up, the tooth was asymptomatic, and the lesion was observed to be healing (Figure 1d).

Symptomatic Root Canal Retreatment Approach in Five Patients: Case Reports



Figure 1. First view of tooth number 11 of Case 1 (a), Implementation of MTA (b), after root canal repeat treatment (c) and radiographic view after one year follow-up (d)

CASE-2:

A 15-year-old male patient presented to our clinic complaining of pain and swelling in tooth 21. His history revealed a trauma with crown fracture 7 years prior, followed by root canal treatment and composite restoration applied. Radiographic examination revealed a periapical lesion and an open apex (Figure 2a). Grade 3 mobility was observed in the tooth. The composite was removed for retreatment, the root canal filling was removed with manual files, and drainage was established. The same procedures were then performed as in case 1 (Figure 2b, c). At the 1-year follow-up, the tooth was asymptomatic, and the lesion was observed to have healed (Figure 2d).



Figure Error! No text of specified style in document.2. First view of tooth number 21 of Case 2 (a), Implementation of MTA (b), after root canal repeat treatment (c) and radiographic view after one year follow-up (d)

Case-3:

A 14-year-old male patient presented to our clinic complaining of swelling and severe pain in the lower right region. In the examination, deep decay was observed in tooth 44, a root canal filling in tooth 45, and a periapical lesion in both teeth (Figure 3a). Because the tooth causing the symptoms could not be identified, both teeth were treated in the first session. Root canal treatment was initiated in tooth 44, and the root canal filling in tooth 45 was removed with manual files and drainage established. The canal lengths were measured radiographically. NaOCL irrigation was performed, followed by two sessions of $\text{Ca}(\text{OH})_2$ (WOOCal, jefiX Dental, İstanbul, TÜRKİYE) as a powder-liquid mixture, and cavit (Coltosol F, Coltène/Whaledent AG, Altstätten, Switzerland) was used as temporary filling. The final session involved a root canal filling with gutta-percha and sealer (Figure 3b). A composite restoration was then applied, and due to the extensive material loss, the patient was referred for prosthetic treatment. Following the

Symptomatic Root Canal Retreatment Approach in Five Patients: Case Reports

control sessions, it was observed that prosthetic treatment was not performed and tooth 44 had fractured. After the prefabricated post core application and composite build-up, teeth 44 and 45 were crowned (Figure 3c). 1-year follow-up, the teeth were asymptomatic and the lesions were observed to have healed (Figure 3d).

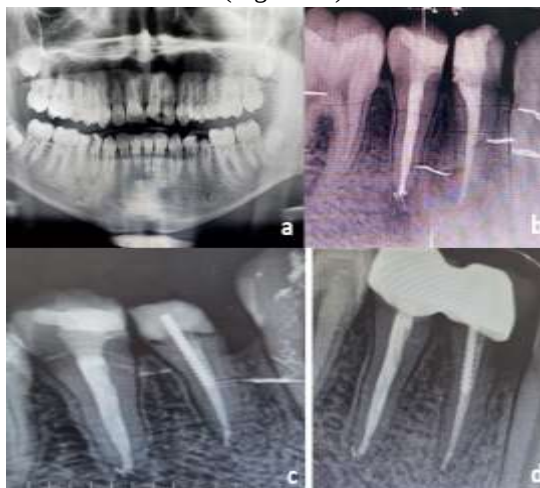


Figure 3. Pre-procedure radiographic view of Case 3 (a), after root canal repeat treatment (b), Post- cor application to tooth number 44 (c), and radiographic view after one year follow-up (d)

Case-4:

A 15-year-old female patient presented to our clinic with complaints of pain and crown discoloration in tooth 11. Her history revealed a traumatic injury 7-8 years prior and root canal treatment. Examination revealed hypersensitivity, mild mobility, a poorly fitting restoration, and a periapical lesion on radiographs (Figure 4a). The composite was removed, and the root canal filling was manually removed. The pin found in the crown was removed. NaOCL irrigation was performed; three sessions of injectable $\text{Ca}(\text{OH})_2$ and one session of CHX were administered as medication; and cavitation was temporary filling. The root canal filling was then completed, as in Case 3 (Figure 4b). For devital bleaching, carbamide peroxide at 37% based intracoronary bleaching agent (Whiteness Super-endo, FGM, DENTSCARE LTDA., BRAZIL) was applied for two sessions and four days to achieve the desired crown color. The gel was then rinsed off, and calcium hydroxide was left in the pulp chamber for two weeks. At the end of this period, the treatment was completed with a composite restoration (Figure 5a,b,c,d). At 1-year follow-up, the tooth was asymptomatic and the lesion was observed to have healed (Figure 6).

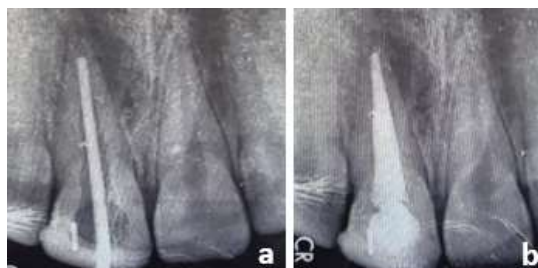


Figure 4. First view of tooth number 11 of Case 4 (a), after root canal repeat treatment (b)



Figure 5. Pre-treatment intraoral view of tooth number 11 in Case 4 (a, b), renewal of composite restoration (c) and appearance of the tooth after devital bleaching (d)



Figure 6. Radiographic view after one year follow-up

Case-5:

An 11-year-old female patient presented to our clinic with complaints of a hard swelling and pain in the lower left region, along with a history of fistulization. Upon examination, root canal treatment was performed on tooth 36, but a periapical lesion developed (Figure 7a). The restoration was removed for retreatment. Two distal canals were observed. The root canal filling was removed with rotary instruments. NaOCL irrigation was performed; three sessions of injectable $\text{Ca}(\text{OH})_2$ and one session of CHX were administered as medication. The cavity and GIS was used as temporary filling. On follow-up radiograph, $\text{Ca}(\text{OH})_2$ extrusion from the mesial canal was observed. However, the patient had no complaints, and the swelling had subsided. The patient was informed of this situation. The root canal filling was completed with gutta-percha and root canal sealer. A permanent restoration was placed with composite (Figure 7b). Due to excessive chron loss, the patient was referred for prosthetic treatment. At 1-year follow-up, the patient remained asymptomatic. In the radiography, it was observed that $\text{Ca}(\text{OH})_2$ was resorbed and the lesion was reduced in size (Figure 7c).

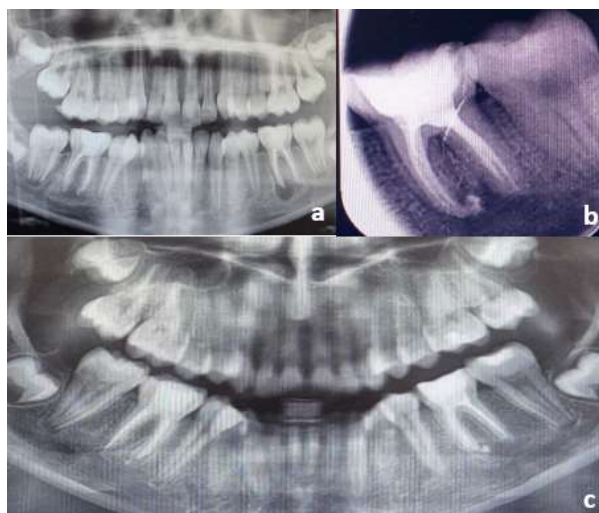


Figure 7. Pre-treatment radiographic view of Case 5 (a), after root canal repeat treatment (b) and Radiographic view after one year follow-up (c)

DISCUSSION

Many factors are considered when deciding whether to perform root canal retreatment or apical surgery in cases of unsuccessful root canal treatment. A study by Torabinejad and colleagues found that endodontic surgery provides better initial success, but root canal retreatment therapy yields better long-term results (5). Root canal retreatment generally requires time and effort but is a more conservative approach (6).

Root canal fillings can be removed using various methods (7,8). Solvents can cause more gutta-percha and sealer residues on the root canal walls and within the dentinal tubules (9). There was no significant difference between the solvents (10). In some cases, removal was reported to be easier with H-type hand files, but according to a study by Fariniuk LF et al., among mechanical methods, GT, ProFile, ProTaper, and K3 rotary files were more effective than manual and Hero instruments in removing gutta-percha (11). Furthermore, according to Wilcox LR et al., the absence of solvents prevents the formation of a thin gutta-percha film on the root canal walls (12), avoids the use of potentially carcinogenic products (13), and eliminates the risk of overdissolving gutta-percha and extrusion from the apices (11). In this case series, root canal fillings were removed using H-type hand files, and no problems were encountered.

When $\text{Ca}(\text{OH})_2$ was administered as a medication by injection, protrusion occurred in teeth with wide apical openings, but no symptoms were observed. In the 1-year follow-up of Case 5, it was observed that the protrusion of $\text{Ca}(\text{OH})_2$ had resorbed. However, this protrusion is undesirable because it can cause a foreign body reaction. In this study, no problems were encountered in cases

Symptomatic Root Canal Retreatment Approach in Five Patients: Case Reports

where CHX was not used. However, according to a study by Tandon J et al., a significant difference in *E. faecalis* was observed between the groups when CHX was used in the final wash (14).

Temporary restorations are essential to prevent microleakage during and after endodontic treatment and to ensure treatment success. Conversely, lack of satisfactory temporary restorations can lead to bacterial infiltration and flare reactions (15). In this case series, either cavity or glass ionomer cement was used as temporary fillings; no significant difference was found between the two, and no adverse events were encountered. However, in cavities with low retention, using cavity cement can cause the temporary filling to fall out and the canals to open to the oral environment.

Especially immature upper central teeth have a high risk of being affected by trauma. Hermetic closure of the open apex with standard gutta-percha is difficult and the risk of leakage is high. This situation occurred in Cases 1 and 2, necessitating retreatment. MTA apexification was performed to ensure a hermetic apical seal during their treatment. MTA is a highly leak-resistant, antibacterial material with high marginal adaptation. Its pH is 12.5, compatible with biological tissues, and induces hard tissue formation (16). Finishing the root canal filling above the gum level can lead to internal discoloration of the crown. Furthermore, pulp residue and filling pastes remaining after root canal treatment are also major causes of internal discoloration. Currently, hydrogen peroxide, carbamide peroxide, and sodium perborate are used to bleach discolored teeth (17).

In a study in the literature, it was reported that intracoronary bleaching using 37% concentration carbamide peroxide achieved an aesthetically satisfactory level of color change after an average of five sessions without any toxic or side effects (18). In our study, carbamide peroxide was applied to the involved tooth for devital bleaching in Case 4. intracoronary bleaching, especially at high concentrations, should be performed with caution because oxidative agents can leak from the dentinal tubules, leading to an inflammatory response in periodontal tissues and cervical resorption. Therefore, a controlled procedure was performed under a rubber dam, ensuring absolute isolation during the procedure, and no complications were observed during follow-up.

Restorations applied after endodontic treatment play a decisive role in the long-term success of the treatment. The primary purpose of these restorations is to mechanically support the remaining tooth tissue, prevent coronal leakage, thereby preventing microbial recontamination of the root canal system, and maintain the functional and aesthetic integrity of the tooth. An appropriate restorative approach not only enhances the structural strength of the tooth but also directly impacts the prognosis of endodontic treatment (19,20).

Post-core restorations are a frequently used method for the restoration of endodontically treated teeth that have suffered excessive material loss (21). Prosthetic treatment should be applied to teeth with excessive material loss and a risk of fracture. In Case-3, when prosthetic treatment was not applied, crown fracture occurred, and the need for a post and crown became inevitable.

Clinical and radiographic follow-up of patients after root canal retreatment and monitoring the healing process of periapical lesions are important. If adequate healing is not achieved after root canal retreatment, apical surgery may be considered as an appropriate next step. In this case series, the patients were followed for 1 year and are continuing to be followed.

CONCLUSION

As a result, non-surgical treatment options are the primary treatment options in cases of endodontic failure. However, complications from previous treatment can complicate repeat root canal treatment and make the success rate uncertain. Therefore, patients should be thoroughly informed about the challenges and potential outcomes of the treatment process. Reaching the apex during the retreatment phase, performing appropriate preparation, and applying effective irrigation and medication are critical to treatment success. If healing fails despite all these efforts, apical surgery or tooth extraction may be considered. To avoid potential complications such as wasted time, increased costs, and the need for surgery for both the patient and the physician, it is crucial that the initial root canal treatment be performed in the most optimal way possible.

Conflicting Interest Statement

The authors declare that they have no conflicts of interest.

Investigator Contribution Statement

All authors contributed equally to the design, execution, and design of the study. Data collection, analysis, and interpretation were conducted collaboratively. The article was co-authored by all authors, and each made significant contributions. All authors critically reviewed and edited the article, ensuring equal distribution of intellectual contributions.

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Symptomatic Root Canal Retreatment Approach in Five Patients: Case Reports

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