British Journal of Medicine & Medical Research
17(10): 1-7, 2016, Article no.BJMMR.28166
ISSN: 2231-0614, NLM ID: 101570965

SCIENCEDOMAIN *international*
www.sciencedomain.org

Treatment of Permanent Teeth with Extensive Apical Periodontitis: 2 Case Reports

S. Körklü[1], Y. Candaner[1], E. Özçelik[2], E. Iriboz[1*] and H. Sazak Öveçoğlu[1]

[1]Deparment of Endodontics, Faculty of Dentistry, Marmara University, Turkey.
[2]Deparment of Oral Surgery, Faculty of Dentistry, Marmara University, Turkey.

Authors' contributions

This work was carried out in collaboration between all authors. Author SK performed the acquisition of data and endodontic surgery. Author YC performed the analysis, interpretation of data and literature searches. Author EI wrote the protocol and drafted the manuscript. Author EÖ performed the endodontic surgery. Author HSÖ performed the conception and design of the study. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/BJMMR/2016/28166
Editor(s):
(1) Ibrahim El-Sayed M. El-Hakim, Ain Shams University, Egypt and Riyadh College of Dentistry and Pharmacy, Riyadh, Saudi Arabia.
Reviewers:
(1) Rizwan Sanadi, Maharashtra University of Health Sciences, India.
(2) Dorina Lauritano, University of Milan-Bicocca, Italy.
(3) Anoop N. Das, Kerala University of Health Sciences and Research, India.
Complete Peer review History: http://www.sciencedomain.org/review-history/16197

Case Study

Received 4th July 2016
Accepted 27th August 2016
Published 15th September 2016

ABSTRACT

Aims: The purpose of the examination of these cases is to maintain the treatments and the managements of teeth with extensive apical periodontitis.
Case Presentation:
Case 1: A fifteen years old young male patient with apical periodontitis and an accompanying symptom of intraoral swelling on the maxiller left central incisor is presented. Radiographic examination showed an extensive radiolucent periradicular lesion and an open apex. Mineral Trioxide Aggregate was placed to obtain apical plug and seal, surgical curettage was performed and one week after the surgery the rest of the root canal was obturated with gutta percha.
Case 2: A thirty two years old male patient is presented with asymptomatic apical periodontitis. Radiographic examination revealed that the left mandibular first molar had an inadaquate root canal fiiling and an extensive radiolucent periradicular lesion on the distal root. In the first session the inadequate root canal filling was removed and calcium hydroxide was placed. The patient did

**Corresponding author: E-mail: eriboz@yahoo.com;*

not visit our faculty for a year. After one year the radiographic examination showed that the extensive periradicular lesion was disappeared. The root canal filling was completed with traditional gutta percha lateral condensation technique.
Discussion: Both of the patients' clinical follow-up appointments showed the absence of complaints and the radiological controls revealed that the extensive periradicular lesions were disappeared.
Conclusion: Treatment procedures for the therapies of teeth with large apical periodontitis may differ from one case to another. Selecting the correct treatment procedures and obtaining the follow-up appointments are the important steps to achieve and prolong the clinical success of such cases.

Keywords: Apical periodontitis; calcium hydroxide; MTA; periapical curettage.

1. INTRODUCTION

The role of bacteria in the development and persistence of apical periodontitis is well-established [1]. It is equally well-accepted that the prognosis for complete healing of endodontically treated teeth with the pretreatment diagnosis of apical periodontitis is approximately 10%–15% lower than for teeth without apical periodontitis [2]. Mechanical instrumentation, including adequate apical preparation size and chemical control through use of an antimicrobial irrigating solution are the 2 key elements that lead to effective reduction in intracanal microbial load [3].

Traditionally, mature permanent teeth with infected or noninfected necrotic pulps are treated with nonsurgical root canal therapy which includes chemomechanical debridement, intracanal mediation, and root filling. The outcome of nonsurgical root canal therapy is considered predictable [4].

Because of obvious ethical limitations, the repair process of apical periodontitis lesions and root resorption in humans after root canal treatment is by and large hypothetical. Knowledge is based mostly on observations of repair after tooth extraction or apical surgery, animal studies, and cross-sectional observations in humans with healed/healing teeth lesions that had to be extracted for reasons such as fracture or prosthetic planning [5].

The traumatic injury of an immature permanent tooth can lead to the loss of pulp vitality and suppressed root development. The consequences of interrupted development include a poor crown-root ratio, a root with very thin walls, an increased risk of fracture, and an open apex. The traditional endodontic management of such cases typically includes debriding the root canal, disinfecting the space, and final obturation of the system proceeded either by an apexification procedure or by developing an apical barrier by using materials such as mineral trioxide aggregate (MTA) [6].

An alternative way for traditional apexification is to place an artificial barrier at the apex to prevent the extrusion of filling materials during obturation. The chosen material is MTA for its sealing ability and its biocompatibility. This latest technique is convenient because it is faster than the traditional apexification. The case can be finalized by two more appointments and a hard tissue barrier eventually forms against the MTA [7]. However, this alternative approach has the same disadvantage of a tooth with thin dentinal walls and no further root development.

In the present case reports, we intend to report the radiographic and clinical findings of teeth exhibiting repair of extensive periapical lesion associated with apical periodontitis after successful root canal treatments.

2. CASE PRESENTATION

Two patients were treated in the endodontics clinic at the faculty of dentistry, University of Marmara. The patients' chief complaint and the dental and medical histories were obtained. Preoperative radiographs of all teeth were taken. Pulp tests using cold, heat, and an electric pulp tester were performed. Intraoral and extraoral examinations were conducted. Swelling, the presence of draining sinus tracts and tooth discoloration were recorded. A diagnosis of pulpal-periapical disease was based on the chief complaint, clinical signs/symptoms, pulp tests, and radiographic findings (Table 1).

2.1 Case 1

A fifteen years old young male patient with the chief complaint of spontaneous pain and intraoral

swelling in the anterior maxilla came to our clinic. He also mentioned that his maxillary left incisor had become mobile and tender to chewing. Grade 2 mobility was recorded for the maxillary left central incisor. This tooth was tender to percussion and palpation. Sensibility tests gave negative responses for the central incisor. No sinus tracts were present on the buccal or palatal gingiva. A periapical radiograph confirmed periodontal bone loss. Periapical radiolucency was present on tooth 21. The diagnosis of pulp necrosis with symptomatic apical periodontitis was made for tooth 21 which was considered to be caused by a trauma history, and the treatment plan included root canal treatment of this tooth.

Local anesthetic with 2% lidocaine containing 1:100,000 epinephrine was given as local infiltration, the tooth was isolated with a rubber dam, and the operative field was disinfected with 30% H_2O_2. Access preparation was completed, and the working length was established at approximately 1 mm short of the radiographic apex. The root canal was prepared by using just H-files with the circumferential filing motion as it was already wide. Irrigation was performed with copious amounts of 2.5% sodium hypochlorite with addition of 17% EDTA, which were frequently delivered by a small needle approximately 3 mm short of the working length. The canal was finally dried with sterile paper points, and filled with a calcium hydroxide paste. The paste was placed with a lentulo spiral and then condensed at the canal orifice with the blunted end of large paper points. The access cavity was closed with a sterile cotton pellet and temporary filling material.

One week later, at the second appointment, during the examination it was seen that the intraoral swelling was disappeared. However when the temporary filling was removed and the root canal was irrigated, it was realized that pus was still coming out from the root canal. Therefore following the irrigation procedures the canal was dried with sterile paper points, and filled with a calcium hydroxide paste once again. The access cavity was closed with a sterile cotton pellet and temporary filling material.

This situation of pus running through the root canal continued for the next four visits. As a consequence we decided to curette the periapical of the tooth surgically. After the curettage the root canal was irrigated with sterile saline solution retrogradely and apical third of the root canal was obturated and sealed with MTA. One week later the temporary filling and cotton pellet were removed under rubber dam isolation. Setting of MTA was confirmed with an endodontic explorer. The root canal filling was completed with traditional gutta percha lateral condansation technique (Fig. 1). There was no symptom after 14 months follow up examination (Fig. 2).

2.2 Case 2

A thirty two years old young male patient with an asymptomatic apical periodontitis came to our clinic. Radiographic examination revealed that the left mandibular first molar had an inadaquate root canal fiiling and an extensive radiolucent periradicular lesion on the distal root. No mobility was recorded for the mandibular first molar. This tooth was tender to neither percussion nor palpation. No sinus tracts were present on the buccal or lingual gingiva. A periapical radiograph confirmed periodontal bone loss. Periapical radiolucency was present on tooth 36. The diagnosis of pulp necrosis with asymptomatic apical periodontitis was made for tooth 36, and the treatment plan included root canal retreatment of this tooth.

Following the identical access preparation procedures, the inadequate root canal filling was removed from the root canals with H-files and the working length was established at approximately 1 mm short of the radiographic apex. The root canal was prepared by using ProTaper Universal Rotary files. Irrigation was performed with copious amounts of 2.5% sodium hypochlorite, with addition of 17% EDTA, which were

Table 1. Demographics of patients, clinical signs/symptoms, diagnosis, and treatment outcomes of the teeth

Patient no.	Sex	Age	Tooth no.	Dental history	Clinical tests	Radiologic examination	Periapical status	Last control (months)
1	M	15	21	Trauma, pain, intraoral swelling	Ept (-)	PAP	Healed	12
2	M	32	36	Failure of root canal treatment	Ept (-)	PAP	Healed	12

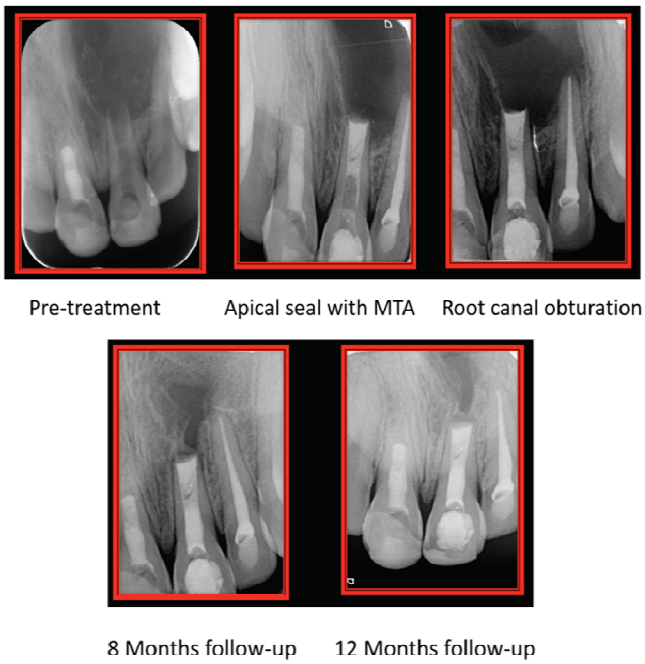

Fig. 1. Treatment stages and follow-up of the case 1

frequently delivered by a small needle approximately 3 mm short of the working length. The canal was finally dried with sterile paper points, and filled with a calcium hydroxide paste. The paste was placed with a lentulo spiral and then condensed at the canal orifice with the blunted end of large paper points. The access cavity was closed with a sterile cotton pellet and temporary filling material.

Fig. 2. 14 months clinical follow-up of the case 1

The patient did not come to his next appointment which was one week later. Eventually, he did not visit our faculty for a year. After one year on his first visit through that year, the intraoral examination revealed that the integrity of the temporary restoration was well protected. The radiographic examination showed that the extensive periradicular lesion was disappeared. Therefore the temporary filling and cotton pellet were removed under rubber dam isolation, following the irrigation procedures the canal was dried with sterile paper points and the root canal obturation was completed with traditional gutta percha lateral condansation technique (Fig. 3). There was no symptom after 14 months follow up examination but the crown oh the the tooth was broken so the patient was guided to the prosthodontics department for the restoration of the tooth (Fig. 4).

Follow-ups of the two cases were 12 months. Radiographic assessment of the change in periapical lesions of the teeth after treatment was evaluated based on the criteria of healed, healing, and disease used by Orstavik et al [8]. Healed is defined as no clinical signs/symptoms and normal periapical radiographic presentation. Healing is reduced periapical radiolucency and no clinical signs/ symptoms. Disease is new development or persistence of periapical radiolucency or the presence of clinical signs/symptoms [8]. Both of the teeth were considered healed. Both teeth were asymptomatic at their follow-up visits.

3. DISCUSSION

Proper control of root canal infection is the key to success of endodontic treatment in terms of elimination of clinical signs and/or symptoms and resolution of apical periodontitis. Contemporary root canal infection control protocols, including mechanical instrumentation, sodium hypochlorite irrigation, and intracanal medication with calcium hydroxide are not able to eliminate all bacteria in the root canal system because of its anatomic complexity [9]. Calcium hydroxide, the popular intracanal medication in root canal therapy has its shortcomings in eliminating intracanal bacteria because dentin and hydroxylapatite have an inhibitory effect on the antimicrobial activity of calcium hydroxide [10].

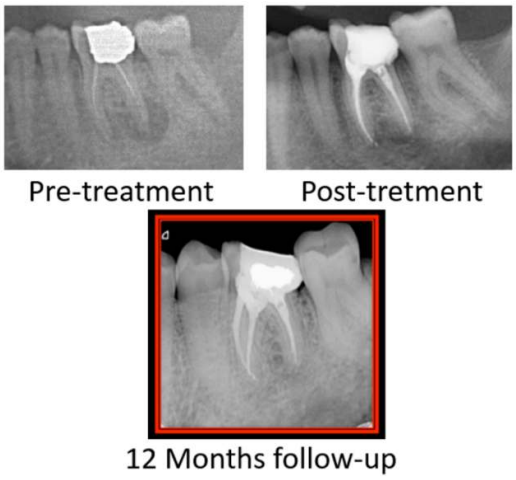

Fig. 3. Treatment stages and follow-up of the case 2

Fig. 4. 14 months clinical follow-up of the case 2

Apical periodontitis is a disease caused by intraradicular bacterial infection usually organized as biofilms adhering to the root canal walls [11]. Dentinal tubules underneath endodontic biofilm communities are usually penetrated by bacterial cells from the bottom of the biofilm structure [12]. If the cementum layer is lost for any reason (eg, superficial root resorption because of apical periodontitis lesion or trauma), dentinal tubule infection or bacterial mediators passing through tubules may stimulate or sustain inflammation in the PDL and lead to root resorption [13]. Effective antimicrobial endodontic treatment, including a strategy to disinfect dentinal tubules, halts the inflammatory resorptive process, allowing for periradicular healing. This is what was observed in the present cases.

In the presence of periradicular inflammation, resorption of the apical structure is a common histologic finding, even though the extent of the root tissue loss may not be sufficient for resorption to be detected on radiographs [5]. In apical periodontitis, some apical alveolar bone, PDL, cementum, and dentin are destroyed and replaced by inflammatory tissue. After the endodontic infection is effectively controlled by nonsurgical treatment, inflammation of the periradicular tissues gradually subsides, and the healing process is started [14].

Teeth with persistent apical periodontitis after root canal therapy are primarily caused by persistent root canal infection or root canal reinfection [15]. Systematic reviews of primary and secondary root canal treatments indicate that the outcome of secondary treatment is poorer than the primary treatment [16]. Therefore, secondary root canal treatment is more difficult than primary root canal treatment. The microbial flora in teeth undergoing secondary root canal treatment is single species of the predominantly gram-positive organism Enterococcus faecalis, which is resistant to intracanal medication (ie, calcium hydroxide) [17].

The fate of bacteria remaining in the root dentinal tubules after proper chemomechanical debridement is not known. In nonsurgical root canal therapy, residual bacteria in the root dentinal tubules do not appear to be the primary cause of post-treatment apical periodontitis [18]. In fact, an inflammatory periapical lesion is able to heal even without root filling if root canal infection is properly controlled and the coronal seal is able to prevent root canal reinfection. There are no convincing studies to show that bacteria in the root dentinal tubules are capable of sustaining or inducing apical periodontitis of

endodontically involved teeth after proper root canal therapy. However, it must be emphasized that effective control of root canal infection is always pivotal to endodontic therapy including nonsurgical root canal treatment [19].

Calcium hydroxide is commonly used for intracanal medication as it has no adverse periapical reactions, predictable results, antibacterial effects and can be mixed with a number of different substances (camphorated mono chlorophenol, distilled water, saline, anesthetic solutions, chlorhexidine, and cresatin) to induce apical healing. MTA is used as an apical barrier for teeth with immature apices, repair of root perforations, root-end filling, pulp capping, and pulpotomy procedures. MTA has a number of favorable characteristics including biocompatibility, antimicrobial activity and prevention of bacterial leakage, no cytotoxicity, and can stimulate cytokine release from bone cells to promote hard tissue formation. It also has a more predictable time to apical closure. As a consequence we chose to used these two materials in our study [20].

Biodentine (Septodont, Saint-Maur, France) was introduced as a tricalcium silicate cementum and is being used recently. Biodentine is a novel root-end filling material, which is a powder consisting mainly of tricalcium silicate (Ca3SiO5), zirconium oxide, and calcium carbonate and the mixing liquid is composed of water, calcium chloride, and a hydrosoluble polymer. Similar to MTA, Biodentine has been shown to release calcium hydroxide, induce reparative dentin synthesis, and have antibacterial activity. Biodentine offers an additional advantage over MTA in that it can be used as a temporary enamel substitute and permanent dentin substitute [21]. We would like to use this newer material but because of the lack of availability in our faculty we were not able to use. We are planning to supply the material to our faculty for further studies.

The outcome of endodontic treatment could be influenced by the severity of the root infection and the quality of the root filling [22]. According to the results of this study, we concluded that the volumes of post-treatment periapical radiolucencies showed significant decreases in size during 12 months, actually we maintained complete resolution of the radiolucency. Thus, the healing of apical periodontitis is a dynamic process that takes time.

4. CONCLUSION

This case reports emphasize that proper control of root canal infection is essential for healing of the periradicular tissues after endodontic treatment. Treatment procedures for the therapies of teeth with large apical periodontitis may differ from one case to another. Selecting the correct treatment procedures and obtaining the follow-up appointments are the important steps to achieve and prolong the clinical success of such cases.

CONSENT

All authors declare that written informed consent was obtained from the patient (or other approved parties) for publication of this case report and accompanying images.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Siqueira JF Jr. Endodontic infections: Concepts, paradigms, and perspectives. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2002;94:281–93.
2. Doyle SL, Hodges JS, Pesun IJ, Baisden MK, Bowles WR. Factors affecting outcomes for single-tooth implants and endodontic restorations. J Endod. 2007; 33:399–402.
3. Card SJ, Sigurdsson A, Orstavik D, Trope M. The effectiveness of increased apical enlargement in reducing intracanal bacteria. J Endod. 2002;28:779–83.
4. Saoud TM, Martin G, Chen YHM, Chen KL, Chen CA, Songtrakul K, Malek M, Sigurdsson A, Lin LM. Treatment of mature permanent teeth with necrotic pulps and apical periodontitis using regenerative endodontic procedures: A Case series. J Endod. 2016;42(1):57-65.
5. Ricucci D, Siqueira Jr. JF, Loghin S, Lin LM. Repair of extensive apical root resorption associated with apical periodontitis: Radiographic and histologic observations after 25 years. J Endod. 2014;40(8):1268-74.
6. Shabahang S, Torabinejad M. Treatment of teeth with open apices using mineral

trioxide aggregate. Pract Periodont Aesthet Dent. 2000;12:315–20.
7. Cotti E, Mereu M, Lusso D. Regenerative treatment of an ımmature, traumatized tooth with apical periodontitis: Report of a case. J Endod. 2008;34(5):611-6.
8. Orstavik D. Time-course and risk analysis of the development and healing of chronic apical periodontitis in man. Int Endod J. 1996;29:150–5.
9. Siqueira JF, Rocas IN. Clinical implications and microbiology of bacterial persistence after treatment procedures. J Endod. 2008; 34:1291–301.
10. Portenier I, Haapasalo H, Rye A, et al. Inactivation of root canal medicaments by dentine, hydroxylapatite, and bovine serum albumin. Int Endod J. 2001;34:184–8.
11. Siqueira JF, Roças IN, Ricucci D. Biofilms in endodontic infection. Endod Top. 2010; 22:33–49.
12. Ricucci D, Siqueira JF Jr. Biofilms and apical periodontitis: Study of prevalence and association with clinical and histopathologic findings. J Endod. 2010; 36:1277–88.
13. Siqueira JF Jr, Roças IN, Lopes HP. Patterns of microbial colonization in primary root canal infections. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2002;93:174–8.
14. Liao J, Al Shahrani M, Al-Habib M, et al. Cells isolated from inflamed periapical tissue express mesenchymal stem cell markers and are highly osteogenic. J Endod. 2011;37:1217–24.
15. Lin LM, Pascon EA, Skribner J, et al. Clinical, radiographic, and histological study of endodontic treatment failures. Oral Surg Oral Med Oral Pathol. 1991;71:603–11.
16. Ng YL, Mann V, Gulabivala K. Outcome of secondary root canal treatment: A systemic review of the literature. Int Endod J. 2008;41:1026-46.
17. Evans M, Davies JK, Sundqvist G, Figdor D. Mechanisms involved in the resistance of *Enterococcus faecalis* to calcium hydroxide. Int Endod J. 2002;35:221–8.
18. Peters LB, Wesselink PR, Moorer WR. The fate and role of bacteria in root dentinal tubules. Int Endod J. 1995;28:95–9.
19. Sabeti MA, Nekofar M, Motahhary P, et al. Healing of apical periodontitis after endodontic treatment with and without obturation in dogs. J Endod. 2006;32: 6128–33.
20. Lin JC, Lu JX, Zeng Q, Zhao W, Li WQ, Ling JQ. Comparison of mineral trioxide aggregate and calcium hydroxide for apexification of ımmature permanent teeth: A systematic review and meta-analysis. J Formos Med Assoc. 2016;115(7):523-30.
21. Daltoé MO, Paula-Silva FWG, Faccioli LH, Gaton-Hernandez PM, De Rossi A, Silva LAB. Expression of mineralization markers during pulp response to biodentine and mineral trioxide aggregate. J Endod. 2016; 42(4):596-603.
22. Zhang MM, Liang YH, Gao XJ, Jiang L, van der Sluis L, Wu MK. Management of apical periodontitis: Healing of post-treatment periapical lesions present 1 year after endodontic treatment. J Endod. 2014; 41(7):1020-5.

Peer-review history:
The peer review history for this paper can be accessed here:
http://sciencedomain.org/review-history/16197