Non Surgical Endodontic Management of Immature Root with a Large Periapical Lesion using Tri-Antibiotic Paste & MTA: A Case Series

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Abstract: The immature tooth with apical periodontitis presents numerous challenges that inhibit our ability to provide a predictable long-term treatment outcome. Past efforts have been aimed at eliminating the bacterial challenge and creating an environment conducive to the placement of a root canal filling. The infection of the root canal system is considered to be polymicrobial infection, consisting of both aerobic and anaerobic bacteria. Because of the complexity of the root canal infection, it is unlikely that any single antibiotic could result in effective sterilization of the canal. A combination of antibiotic drugs (metronidazole, ciprofloxacin and minocycline) is used to eliminate target bacteria, which are possible sources of endodontic lesions. Two case reports describe the nonsurgical endodontic treatment of teeth with large periradicular lesions. During treatment procedure, 2.5% sodium hypochlorite was used for irrigation and a combination of antibiotic drugs was used for the intracanal dressing. Periapical healing was observed 3-month after initial treatment and continued at the 7-month review. Apical closure was done with MTA plug.

Keywords: Tri-antibiotic paste, sodium hypochlorite, LSTR therapy, periapical healing, periapical lesion, MTA.

INTRODUCTION

Traumatic injuries of teeth are a frequent occurrence and usually involve the anterior teeth of young patients. Pulpal necrosis is a frequent sequel of trauma and if microbial infection occurs, this will result in the development of a periapical lesion(1). The immature tooth with apical periodontitis presents numerous challenges that inhibit our ability to provide a predictable long-term treatment outcome. Past efforts have been aimed at eliminating the bacterial challenge and creating an environment conducive to the placement of a root canal filling (2).

Treatment options to manage large periapical lesions range from non-surgical root canal treatment and/or apical surgery to extraction. Current philosophy in the treatment of teeth with large periapical lesions includes the initial use of non-surgical root canal treatment (1). When this treatment is not successful in resolving the periradicular pathosis, additional treatment options should be considered. Such treatment may include non-surgical retreatment to rule out morphological abnormalities or treatment inadequacies. Surgery may occasionally be required. Surgical treatment of persistent extensive periradicular lesions most often involves curettage and apical resection. Some clinical studies have confirmed that simple nonsurgical treatment with proper infection control can promote healing of large lesions(1,3). In recent years, The Cariology Research Unit of the Niigata University has developed the concept of ‘Lesion sterilization and tissue repair, LSTR therapy(5,6), that employs the use of a combination of antibacterial drugs for disinfection of oral infectious lesions, including
dentinal, pulpal, and periradicular lesions. Repair of damaged tissues can be expected if lesions are disinfected (7).

The infection of the root canal system is considered to be a polymicrobial infection, consisting of both aerobic and anerobic bacteria (8,9). Because of the complexity of the root canal infection it is unlikely that any single antibiotic could result in effective sterilization of the canal. More likely a combination would be needed to address the diverse flora encountered. A combination of antibiotics would also decrease the likelihood of the development of resistant bacterial strains. The combination that appears to be most promising consists of metronidazole, ciprofloxacin, and minocycline (2).

Though the goals of eliminating the bacterial challenge and creating an environment conductive to the placement of a root canal filling have been adequately met, but the problem of thin root walls and susceptibility to fracture still remain. The usual treatment procedure proposed for such cases is the repeated intracanal placement of calcium hydroxide in order to induce an apical hard tissue barrier. However, the calcium hydroxide apexification has some inherent disadvantages such as prolonged treatment time, unpredictability of apical closure, difficulty in patient follow up, susceptibility to coronal micro leakage, weakens the root structure by neutralizing the acidic components of dentin. To overcome all these limitations a single visit apexification technique using mineral trioxide aggregate (MTA) was adapted.

The following case report describes the endodontic treatment of a large cyst-like periradicular lesion using a combination of antibiotic drugs followed by apical closure with mineral trioxide aggregate (MTA).

**Case 1:** A 16 year old male presented to the department of conservative dentistry and Endodontics in the college for treatment of maxillary left lateral incisor tooth. On clinical examination of soft tissue an intra oral sinus tract was present. No discoloration and caries were clinically detected. The tooth was slightly tender to percussion with probing and exhibited normal mobility. Periapical radiograph demonstrated a large radiolucent lesion with a well-defined margin around the apex of the maxillary left lateral incisor (Fig. 1). The lesion was approximately 3.5 cm in maximum diameter. This tooth gave negative response to electric pulp and cold tests. The access cavity was prepared, and a rubber dam was applied. A clear, straw-colored fluid was exuded from the canals. Necrotic pulp tissue was extirpated from the canal. The canal was instrumented with size 80 K-file.

**Fig. 1:** Preoperative radiograph showing maxillary left lateral incisor with large periapical lesion

**Fig. 2:** Radiograph showing placement of MTA
Fig. 3: Follow-up 7 months after completion of endodontic treatment. Periapical radiograph shows healing of the periapical lesion.

During the instrumentation, the canal was irrigated copiously with 2.5% sodium hypochlorite solution using a 27-gauge endodontic needle after each instrument. Drainage was performed until discharge through the canal ceased. When the drainage ceased, the root canal were finally instrumented and copious irrigation with 2.5% sodium hypochlorite solution under rubber dam isolation was done. After drying with sterile paper points, and a mixture of ciprofloxacin, metronidazole, and minocycline paste as described by Takushige et al. (7) was prepared into a creamy consistency and spun down the canal with a lentulo spiral instrument into the canal. The paste was further condensed using sterile cotton pellets before sealing the coronal access. The compounding of antibiotic paste was standardized for all two cases. The patient was recalled after 3 months when radiographic examination revealed significant healing (Fig. 2). The antibiotic paste removed after irrigation with 3% sodium hypochlorite, the white MTA was mixed to a paste consistency with saline and delivered to the canal using plugger in about 4 mm thickness and remainder of canal was obturated next day using a lateral condensation technique. Access cavity was sealed with composite. The patient returned to the department for 7 month follow-up examination and was asymptomatic. Radiographs showed that the radiolucent area was absent and that trabecular bone was forming (Fig 3). Clinical examination showed no sensitivity to percussion or palpation and the soft tissues were healthy.

Case 2: A 19 year old female reported to the department of conservative dentistry and Endodontics with a chief complaint of pain and swelling in maxillary anterior region. There was a history of trauma to maxillary left central incisor 1 year back due to fall while playing. But the patient did not seek any treatment for the same at that time. Extraoral examination revealed no swelling. Intraoral examination revealed fracture of maxillary left central incisor involving enamel and dentin. Two periapical radiographs at different vertical angulations were made but showed no root fracture. Periapical radiographic examination revealed a well defined radiolucent area involving maxillary left central and lateral incisors, measuring around 3cm in diameter (Fig 4). Electric pulp and cold tests elicit negative response with maxillary left central incisor and lateral incisor. The clinical and radiographic findings were suggestive of periapical pathology in relation to central and lateral incisor. Hence endodontic treatment was proposed with patient’s consent. A rubber dam was applied, and the access cavities were prepared. The drainage of pus was noted from both teeth. Both teeth were instrumented to ISO size 60 by using the step-back technique. During instrumentation, the canals were irrigated with 2.5% sodium hypochlorite and dried, triple antibiotic paste was placed, and the teeth were temporized. The paste was changed every month for a period of 3 months until the teeth displayed no symptoms. After 3 months the canals were irrigated with 2.5% sodium hypochlorite and apical closure was done with MTA plug in the same appointment (Fig 5). Next day rest of the canal was obturated with gutta-percha and the restoration was accomplished with composite resin (Fig 6). The patient returned to the department for the 7 month follow-up examination and was asymptomatic. Radiographic examination showed progressive healing of lesion.
DISCUSSION

The response to trauma can be varied. Some pulps remain apparently normal with no adverse effects, whereas others became necrotic. Necrotic pulps provide a good nutritional supply for pathogenic bacteria, which must be present for the development of a periapical lesion. The treatment options available to manage large cysts range from nonsurgical root canal treatment and/or apical surgery to extraction. In some instances, nonsurgical treatment may be ineffective or difficult; those cases may be treated by surgery. In the present study, radiographs revealed that the involved teeth had large periradicular lesion with uniformly dense radiolucency and well-defined margins around the apices.

The infection of the root canal system is considered to be a polymicrobial infection, consisting of both aerobic and anaerobic bacteria (8,9). Because of the complexity of the root canal infection it is unlikely that any single antibiotic could result in effective sterilization of the canal. More likely a combination would be needed to address the diverse flora encountered. A combination of antibiotics would also decrease the likelihood of the development of resistant bacterial strains. The combination that appears to be most promising consists of metronidazole, ciprofloxacin, and minocycline. Sato et al. investigated this drug combination in vitro and found it to be very effective in the sterilization of carious lesions, necrotic pulps, and infected root dentin of deciduous teeth (10). Hoshino et al. performed an in vitro study testing the antibacterial efficacy of these drugs alone and in combination against the bacteria of infected dentin, infected pulps, and periapical lesions. Alone, none of the drugs resulted in complete elimination of bacteria. However, in combination, these drugs were able to consistently sterilize all samples (11). Metronidazole is a nitroimidazole compound that exhibits a broad spectrum of activity against protozoa and anaerobic bacteria. Known for its strong antibacterial activity against anaerobic cocci, as well as gram-negative and gram-positive bacilli it has been used both systemically and topically in the treatment of periodontal disease. Tetracyclines, which include doxycycline and minocycline, are a group of bacteriostatic antimicrobials. They have a broad spectrum of activity against both gram-positive and gram-negative microorganisms. Tetracyclines are
effective against most spirochaetes, and many anaerobic and facultative bacteria. Minocycline is a semisynthetic derivative of tetracycline with a similar spectrum of activity. It is available in many topical forms ranging from gel mixtures to sustained release microspheres, and has also been used extensively in periodontal therapy. Ciprofloxacin has very potent activity against gram-negative pathogens but very limited activity against gram-positive bacteria. Most anaerobic bacteria are resistant to ciprofloxacin, therefore, it is often combined with metronidazole in the treatment of mixed infections (2). Side effects of ciprofloxacin have been reported, however, Black et al. found the drug to be clinically safe when applied in low doses (12). When applied as an intra-canal medicament in low doses, adverse systemic side effects should be minimized. It was further suggested that no single antimicrobial agent can be used appropriately for the treatment of mixed infections. Thus a combination of medicaments must be considered. Knowing the concern over the potential for the development of resistant flora when using certain topical antibiotics, Slots advocated the use of metronidazole because of the unlikelyhood of inducing bacterial resistance (13). It was demonstrated in this case report that the use of a combination of antibiotic drugs in tooth with large cyst like periradicular lesion gave excellent clinical results. Previous studies (8,9,2,14) have clearly demonstrated that this combination is capable of eliminating bacteria from infected dental tissues.

The ideal treatment for open apex teeth involves the use of material capable of forming an immediate apical barrier. Such a treatment is superior to the conventional apexification treatment and can be achieved in a single appointment. Various materials have been used for this purpose including dentine chips, calcium hydroxide, tricalcium phosphate, hydroxyapatite and MTA (15). Calcium hydroxide has been used with great success to affect an apical hard tissue barrier in immature open apices. The barrier produced by calcium hydroxide apexification has been reported to be incomplete having swiss cheese appearance and can allow micro leakage. With the MTA apical plug technique, a one-step obturation after short canal disinfection with calcium hydroxide could be performed. In agreement with other studies, MTA appeared to show good sealing ability, good marginal adaptation, a high degree of biocompatibility and a reasonable setting time (about 4 h). From a practical point of view, MTA can be used in the presence of moisture in the root canal. This property is important in teeth with necrotic pulps and inflamed periapical lesions because one of the problems found in these cases is the presence of exudate at the apex of the root (16).

The clinical case reported here demonstrates that when MTA is used as an apical plug in necrotic teeth with immature apices, the canal can be effectively sealed.

CONCLUSION

Root canal treatment using a combination of antibiotic drugs as an antibacterial dressing was successful in healing large cyst-like periradicular lesions. The use of MTA apical plug after calcium hydroxide disinfection showed a positive initial clinical outcome for the immature tooth.

REFERENCES


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