

Non-Surgical Management of Periapical Lesions Using Triple Antibiotic Mixture: Two Case Reports-

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Abstract : The infection of the root canal system is polymicrobial in nature, caused by both aerobic and anaerobic bacteria. Because of the persistent and recurrent feature 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 thus used to eliminate target bacteria, which are the possible sources of root canal infection. Two case reports describe the nonsurgical endodontic treatment of teeth with large periapical lesions. A triple antibiotic paste was used for 3 months. After 3 months, teeth were asymptomatic and were obturated. The follow up radiograph of the two cases showed progressive healing of periapical lesions. The results of these cases show that when most commonly used medicaments fail to eliminate the symptom, a triple antibiotic paste could be used clinically for the treatment of teeth with large periapical lesions.

Keywords -: Ciprofloxacin, metronidazole, minocycline, nonsurgical root canal treatment, periradicular lesion, triple antibiotic paste.

I. Introduction

Traumatic injuries generally disrupt the pulpal blood supply causing necrosis of pulp and leading to anaerobic conditions favourable for the growth of opportunistic microorganisms, which may subsequently result in the development of periapical lesions¹. Periapical lesions generally represent an inflammatory response to invasion of microorganisms and their byproducts in the root canal system. Such lesions grow via a variety of mechanisms, including osmotic fluid accumulation in the lumen, epithelial proliferation, and molecular mechanisms (Nair, 1998)². Thus, if the lesion is effectively evacuated of the inflammatory exudates, so as to reduce the hydrostatic pressure, and if the microbiological etiology is removed by nonsurgical root canal treatment, these lesions may regress by the mechanisms of apoptosis³.

Various techniques have been proposed for reducing hydrostatic pressure, such as, the decompression technique (Loushine *et al.*, 1991, Martin *et al.*, 2007)^{4,5} aspiration irrigation technique (Hoen *et al.*, 1990)⁶ and aspiration

through the root canal system⁷. Use of Calcium hydroxide and Apexum procedure may result in a shrinkage of the lesion. The ultimate goal of endodontic therapy is to return the involved teeth to a state of health and function without surgical intervention⁸. All inflammatory periapical lesions should be initially treated with conservative nonsurgical procedures⁹. Surgical intervention is recommended only after nonsurgical techniques have failed¹⁰. Besides, surgery has many drawbacks and thus have limited use in the management of periapical lesions^{11, 12}. Various studies have reported a success rate of up to 85% after endodontic treatment of teeth with periapical lesions^{13, 14, 15}. A high percentage of 94.4% of complete and partial healing of periapical lesions following nonsurgical endodontic therapy have also been reported¹⁶.

In recent years, the Cariology Research Unit of the Niigata University has developed the concept of "Lesion sterilization and tissue repair LSTR" therapy¹⁷. that employs the use of a combination of antibacterial drugs (metronidazole, ciprofloxacin, and minocycline) for the disinfection of oral infectious lesions, including dentinal, pulpal, and periradicular lesions. In some studies¹⁸ it is seen that oral lesions have been associated with strict anaerobic conditions and research was carried out to detect the target bacteria causing endodontic lesions. On this basis, antibacterial drugs have been formulated to eliminate the infection. Metronidazole has a wide spectrum of bactericidal action against oral obligate anaerobes¹⁹ and it was noted that more than 99% of bacteria found in carious lesions²⁰ and infected root dentin²¹ were not recovered in the presence of 10 µg per ml metronidazole in *in vitro* experiments. However, metronidazole, even at a concentration of 100 µg per ml,

could not kill all the bacteria²¹ indicating that other drugs may be needed to sterilize the infected root dentin. It has been reported that a mixture of antibacterial drugs, i.e., metronidazole, ciprofloxacin, and minocycline, can sterilize the root dentin effectively²².

The aim of this case series is to manage periapical lesions through non invasive endodontic therapy using triple antibiotic mixture.

II. Case Report I

A 26 year old male patient reported to the post graduate department of Conservative dentistry and Endodontics, Guru Nanak Institute of Dental Sciences and Research with the chief complaint of pain and swelling over three months in relation to his upper left anterior teeth region. Medical and Dental history were noncontributory. Patient gave a history of trauma to his anterior teeth when he was 9 years old. Intraoral examination revealed a firm palatal swelling, 1 cm in diameter and discoloration of teeth #21 and# 22 .These teeth failed to respond to thermal and electric pulp testing. Preoperative periapical radiographic examination revealed a well-circumscribed radiolucent lesion located around the apices of teeth # 21 and #22. Based on clinical and radiographic evidences a diagnosis of periapical cyst was established.



Fig1- Preoperative Radiographic examination of #21 and #22

Nonsurgical endodontic treatment was planned, to treat the involved teeth. Rubber dam was applied, and access cavities were prepared in # 21 and #22. Drainage of pus was noted . Teeth # 21were instrumented to ISO size 90 and #22 to ISO size 40 by using the stepback technique. During instrumentation, the canals were irrigated with 3% sodium hypochlorite and then dried and a calcium hydroxide intracanal dressing was given. The calcium hydroxide dressing was changed after 3 weeks and it was noted that the swelling had subsided, but the patient complained of constant dull pain and heaviness in the concerned region. The canals were wet and showed mild discharge. Then the treatment procedure was changed. The canals were irrigated and dried, a triple antibiotic paste was placed and the access cavity was temporarily sealed with Cavit G. 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 sealed apically with MTA .Then obturation was done with gutta-percha and AH plus. Post obturation restoration was done with composite resin. The patient returned to the department for the 1year followup examination and was found to be asymptomatic. Radiographic examination showed progressive healing of lesions.

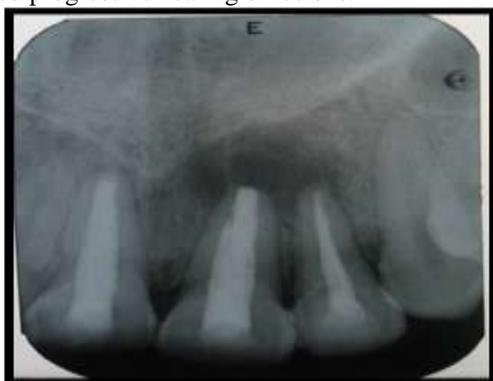


Fig2- Post Operative Radiograph



Fig 3- 6 Months follow up Radiograph

III. Case Report II

A 28 year old female patient reported to the Department of Conservative Dentistry and Endodontics of Guru Nanak Institute of Dental Sciences and Research, with a chief complain of pain and swelling in the upper anterior teeth region. The patient gave a history of trauma to the maxillary anterior teeth 10 years back. Medical and dental history were noncontributory. Intraoral examination revealed a painful swelling of the palatal mucosa, adjacent to teeth # 11 and # 21 and the teeth were tender on percussion. These teeth failed to respond to thermal and electric pulp testing. Preoperative periapical radiograph showed well-circumscribed large periapical radiolucency (> 4mm) in relation to # 11 and # 21. Based on clinical and radiographic evidences a diagnosis of periapical cyst was established. Nonsurgical endodontic retreatment was planned, to treat the involved teeth.



Fig1- Preoperative Radiographic examination of #11 and #21

Access cavities were prepared and working length were determined in teeth 11 and 21. Canals were cleaned and shaped using K-Files by conventional method. 3% sodium hypochlorite was used for irrigation. The canals were enlarged to an apical size of ISO #40, step back was done upto size #55. Calcium hydroxide dressing was placed in the canals as an intracanal medicament, and access cavities were closed with cavit . The calcium hydroxide dressing was changed after 3 weeks. As the discharge did not cease completely and the symptoms still persisted, the treatment procedure was changed. The canals were irrigated and dried and a triple antibiotic paste was placed and the access cavities were temporarily sealed with Cavit G. 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 obturated with gutta-percha and AH plus. Post obturation restoration was done with composite resin. The patient returned to the department for the 10month followup examination and was found to be asymptomatic. Radiographic examination showed progressive healing of lesions associated with each tooth.



Fig 2- 6 Months follow up Radiograph

IV. Discussion

The development and progression of endodontically induced periapical lesions is clearly associated with the presence of microorganisms in the root canal system. There are surgical and nonsurgical methods to treat such cases. Ideally, a nonsurgical method should initially be done especially in cases where lesions are in close proximity to important anatomical landmarks. The success of the nonsurgical endodontic treatment

method is based on appropriate cleaning, shaping, asepsis, and filling of the root canal system. The infection of the root canal is considered to be polymicrobial in nature. Due to this complexity it is unlikely that any single antibiotic could result in effective sterilization of the canal, so a combination is needed to combat the diverse microflora encountered.

Combination decreases the likelihood of development of resistant bacterial strains. Research with topical antibiotics has shown that a combination of metronidazole, ciprofloxacin, and minocycline is effective in killing common endodontic pathogens from necrotic/infected root canals *in vitro*²³. This antibiotic combination is also an effective disinfectant *in vivo*²⁴. Furthermore, the triple antibiotic paste has been successfully used in regenerative endodontics²⁵ and in healing of large periradicular lesions. Metronidazole has a wide spectrum of bactericidal action against oral obligate anaerobes. However, metronidazole, even at a concentration of 100 µg per ml, could not kill all the bacteria, indicating that other drugs may be needed to sterilize the infected root dentin. Tetracyclines which include doxycycline and minocycline, are a group of bacteriostatic antimicrobials mainly used in periodontal therapy. Ciprofloxacin which is a Fluoroquinolone antibiotic has been shown to provide a potent activity against gram negative pathogens with a limited action against gram positive bacteria. Most anaerobic bacteria are resistant to ciprofloxacin therefore it is often combined with Metronidazole. Minocycline may cause tooth discolouration leading to esthetic problems. The triple antibiotic paste was removed from the canals after every 1 month of placement for 3 months. The antibiotic paste contained 100 mg each of the three antibiotics in a total volume of 0.5 ml. The pharmaceutical carrier propylene glycol was used. These ingredients allow increased solubility and delivery of the paste into the canal. Aqueous solutions of antibiotics can often degrade and this degradation is increased by a rise in temperature and pH. Calcium hydroxide introduced in dentistry by Hermann in 1920 have been found to be very effective at eradicating intracanal bacteria. This is due to its alkaline pH which inhibits enzymatic activities that are essential for microbial life, that is their metabolism, growth, and cellular division. It is often used to promote periapical healing by its antimicrobial activity and by its ability to promote hard tissue formation and periodontal healing.

V. Conclusion

Non surgical endodontic treatment using combination of antibiotic drugs as an intracanal dressing was found to be successful in healing large periradicular lesions. A nonsurgical approach should always be adopted before resorting to surgery. The surgical approach can be adopted for cases refractory to nonsurgical treatment, in obstructed or nonnegotiable canals and for cases where longterm monitoring of periapical lesions is not possible.

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