

Role of Triple Antibiotic Paste in Treatment of Immature Necrotic Teeth

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ABSTRACT: *The development and progression of periapical lesions are associated with the presence of both aerobic and anaerobic bacteria. Immature teeth with apical periodontitis complicate this problem. A combination of antibiotic drugs (metronidazole, ciprofloxacin, and minocycline) is used to eliminate target bacteria, which are the possible sources of endodontic lesions.*

These case reports describe the treatment of immature teeth with large periradicular lesions using triple antibiotic paste. The follow-up radiograph of both cases showed progressive healing of periradicular lesions and root formation which confirmed the effectiveness of triple antibiotic paste in treatment of immature apical periodontitis.

Key words: *Triple antibiotic paste, immature teeth, apical periodontitis, apical barrier technique and apical revascularization*

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I. Introduction

The immature tooth with a necrotic pulp and apical periodontitis presents multiple challenges to successful treatment¹. The traditional technique of chemomechanical instrumentation and disinfection of the root canal system used in mature tooth are limited by the anatomy of the immature tooth, that are susceptible to fracture².

When treating nonvital teeth, a main issue is eliminating bacteria from the root canal system. As instruments cannot be used properly in teeth with open apices, cleaning and disinfection of the root canal system rely on the chemical action of NaOCl as an irrigant and an intracanal medicament.³ NaOCl is known to be toxic, especially in high concentrations. When rinsing immature teeth with open apices, there is an increased risk of pushing the irrigant beyond the apical foramen.⁴ Therefore we must rely on the placement of a medicament to achieve adequate reduction of intracanal bacteria. A triple antibiotic paste consisting of metronidazole, ciprofloxacin, and minocycline has been shown to be very effective against the pathogens commonly found inside the root canal system.⁵

Traditionally, the treatment of immature permanent teeth with necrotic pulps involves long-term application of Calcium hydroxide to induce apexification at the root apex.⁶ However, the technique has some disadvantages. It typically takes between 6 and 18 months for the body to form the hard tissue barrier and weakens the resistance of the dentin to fracture, emphasizing the need for an improved treatment technique.⁷

Mineral trioxide aggregate (MTA) which is a material with excellent sealing properties, was introduced by Torabinejad et al.⁸ In vivo studies have confirmed biocompatibility of this material and have shown a hard tissue inductive effect and can be used as an apical plug allowing for prompt obturation of the root canal.⁹

More recent reports, have demonstrated that it is possible in humans to restore a functional pulp-dentin complex in the necrotic immature permanent tooth.¹⁰

The purpose of these case reports are to show the possibility of using triple antibiotic paste for the disinfection protocols in treatment of immature teeth with necrotic pulps.

II. Case Reports

Case 1

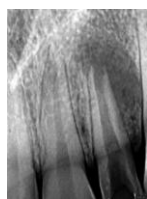


Fig 1a-Pre operative radiograph



Fig 1b-File in place



Fig 1c-Triple antibiotic paste



Fig 1d -MTA plug



Fig 1e- Obturation done with
Composite coronal restoration



Fig 1f-1 year follow up

A 19 year old male patient was referred to the Department of Conservative Dentistry for evaluation on the left maxillary lateral incisor (tooth #10). On clinical examination, the patient was slightly symptomatic to percussion, and sinus tract was present that traced to the apex of tooth #10. Periradicular radiographic examination revealed that tooth #10 had an incompletely developed root and periradicular radiolucency (Fig. 1a). The diagnosis of pulp necrosis and chronic apical abscess with a sinus tract was made for tooth #10. Rubber dam was placed and access cavity prepared. Working length with 25 size K file was made (fig 1b). The root canal was irrigated with 2.5% NaOCI for 10 minutes and dried with paper points, and a mixture of ciprofloxacin, metronidazole, and minocycline paste as described by Hoshino et al¹¹ was introduced into the canal with a lentulospiral (fig 1c). The access cavity was closed with cavit (3M, ESPE, Saint Paul, MN). No mechanical instrumentation was performed during the procedure. The patient returned 22 days later and the tooth was asymptomatic with resolution of sinus tract. After the canal debridement, a master gutta-percha point (Dentsply-Maillefer) was selected and adjusted to 3 mm short of the working length. An MTA plug (White MTA-Angelus, Angelus, Londrina, Brazil) was placed and adapted to the apical canal walls using the pre-adjusted gutta-percha point. The position of the MTA plug was checked radiographically (fig 1d) and a wet cotton pellet was placed on top of it before sealing the access cavity with Cavit. Lateral compaction of gutta-percha over the set apical MTA was followed by coronal composite restoration 1 week later.(fig 1e) One year follow up radiograph revealed complete healing of the lesion with hard tissue formation in the apex.(fig 1f).

Case 2

A 14-year-old girl was referred to the Department of Conservative Dentistry for evaluation on the left maxillary central incisor (tooth #9) (fig 1a). The patient gave history of trauma 7 years back. On clinical examination, the tooth was tender on percussion. Intra oral periapical radiograph revealed a periradicular radiolucency around the incompletely formed root of tooth #9(Fig 2b) .The diagnosis of pulp necrosis and chronic apical periodontitis was made in relation to tooth # 9



Fig 2 a-Pre operative



Fig 2 b - Pre operative radiograph



Fig 2c - Purulent discharge from the canal



Fig 2d-Access cavity



Fig 2e - file in canal



Fig 2f - Triple antibiotic paste Placed in canal



Fig 2g-MTA placed



Fig 2h-6month follow up

The tooth was isolated, and an access cavity was made (Fig 2c). Purulent discharge was observed. (Fig. 2d) When it stopped, a K-file was introduced into the canal until the patient felt some sensitivity, and a radiograph was taken (Fig.2e). No tactile resistance was met with the K-file until the patient reported sensitivity. Copious irrigation was performed with 2.5% NaOCl for 30 minutes, and dried with paper points. Later a mixture of ciprofloxacin, metronidazole, and minocycline paste as described by Hoshino et al.¹¹ was introduced into the canal with a lentulo spiral (fig -2f). The patient returned a month later and reported no postoperative pain. The root canal was slowly flushed with 10 ml of 2.5% NaOCl, and irrigation was maintained with same solution for 15 minutes. A size #30 K-file was used to irritate the tissue gently to create some bleeding into the canal. The bleeding was left for 15 minutes so that the blood would clot. MTA (Angelus, Londrina, Brazil) was carefully placed over the blood clot followed by a wet cotton pellet and Cavit (Fig. 2g). Two weeks later, the patient returned, asymptomatic, and Cavit and cotton pellet were replaced with a bonded resin restoration. At the 6-month recall, the patient was asymptomatic, and the radiograph showed signs of resolution of the radiolucency, and the canal space occupied by blood clot was narrowed (Fig.-2h).

III. Discussion

The infection of the root canal system is considered to be a polymicrobial infection, consisting of both aerobic and anaerobic bacteria.¹² 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.¹³ Hoshino et al¹¹ 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. In- vivo studies also confirmed this.¹⁴ We used the same combination to disinfect the root canal because it has been reported that the sterilization of the root canal and periradicular region results in good healing of periapical diseases.¹⁵

Caution should be taken in general when giving local or systemic drugs. Although the volumes of the drugs applied in this therapy were small and there were no reports of side effects, care should be taken if patients are sensitive to chemicals or antibiotics.

Case selection is important in open apex treatment protocol. Apical revascularization should be encouraged and promoted for clinicians faced with pulp necrosis with an immature apex that is open greater than 1 mm in a mesiodistal dimension radiographically. The size of opening must be sufficient to allow ingrowth of vital tissue.¹⁶ In case 1 the opening of the apex was minimal hence we decided to give MTA apical plug and for larger apex in case 2 we tried apical revascularization.

A 3-4 mm thick MTA plug was placed in the apical area of the root canal and conventional obturation was performed. Placement of the MTA plug facilitated obturation of the root canal without overextension of the filling material. Final obturation was carried out at a subsequent visit to avoid dislocation of the MTA plug beyond the apex. Studies have shown that intracoronary bonded restorations can internally strengthen

endodontically treated teeth and increase their resistance to fracture¹⁷ hence; we restored the tooth with composite restoration.

We created blood clot in the canal after disinfection in case 2. Induction of blood clot, with its constituent growth differentiation factors from periapical tissues, may act as a scaffold for the ingrowth of new tissue in the disinfected necrotic immature tooth. It serves as a pathway for the migration of cells including macrophages, fibroblasts, osteogenic cells and growth and differentiation factors important in wound healing process.²

Lastly the bacteria tight seal was coronally obtained by a double seal with MTA, to a level below the CEJ and bonded resin on it. Based on positive outcome of these cases we assume that this combination successfully sealed the tooth from bacterial leakage.

IV. Conclusion

Triple antibiotic paste is the choice, when large periradicular lesion in immature teeth is encountered. Such lesions in these cases were large but showed progressive healing after using a triple antibiotic paste in the canal and follow up radiographs confirmed the root development.

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