wjpmr, 2020,6(2), 10-12

SJIF Impact Factor: 5.922

WORLD JOURNAL OF PHARMACEUTICAL AND MEDICAL RESEARCH

www.wjpmr.com

Research Article

ISSN 2455-3301

WJPMR

DISINFECTION OF THE ROOT CANAL USING TAP

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Article Received on 01/12/2019 **Article Revised on 22/12/2019** **Article Accepted on 12/01/2020**

ABSTRACT

The most important step in regenerative endodontics is the disinfection of the root canal system. Twenty non vital immature permanent incisors were included in this study. All the teeth included in blood clot technique as regenerative endodontics measure. **Aims:** The present study was carried out to demonstrate the using of triple antibiotic paste for disinfection of the infected root canals of immature non vital permanent incisors. **Materials and Methods:** Twenty non vital immature permanent incisors were included in this study. All the teeth included in blood clot technique as regenerative endodontics measure.

Antibiotics Preparation

Three mixed antibiotics paste or triple antibiotic paste was prepared on the day of treatment, and until that day, each drug was powdered and stocked in a desiccated and tight-capped ceramic device separately. The powdered drug would be used up within a month and till the time of using should keep under dehumidified conditions. When wet, it was discarded.

The antibiotics preparation would be better done by operation dentist to be sure when and how the preparation was done as following:

1. Take one tablet of antibiotic (metronidazole, minocycline and ciprofloxacin) (Figure 1), which may be sugar coated or have film-coating. When there was sugar coated tablet, using sand-paper for removing the sugar-coating layers (Figure 2). Meanwhile when there was film-coating tablet, surgical blade was used to remove the film coating (Figure 3). The core of the tablet was used.
2. Crash, smash and grind the tablet core to obtain fine powder, using ceramic mortar and pestle (Figure 4).
3. The weight of the fine powdered antibiotic measured using digital balance and (0.245g) of each antibiotic introduced in empty disposable drug capsules, separately.
4. Transfer the capsules to the ceramic container with tight caps to keep each drug separately from moisture and light. Put Silica gel inside the ceramic devices to desiccate (Figure 5).
5. Wash and dry the ceramic mortar and pestle used for powdering one type of drug before using them for powdering the other one.[1]

Figure (1): Metronidazole, minocycline and ciprofloxacin antibiotics used in this study.

Figure (2): Minocycline tablet before and after removing sugar-coating layers.

Figure (3): Metronidazole or ciprofloxacin tablet before and after remove the film coating.

Figure (4): Ceramic mortar and pestle.

Figure (5): Antibiotic capsules kept in ceramic container with tight caps. Put Silica gel inside the ceramic devices to desiccate.

Disinfection

The crowns of the teeth to be disinfected were isolated with rubber dam. The temporary restorations were removed using a sterile carbide bur in a high speed handpiece with water spray. Each experimental tooth was disinfected according to the following protocol.[2]

Each tooth underwent slow irrigation with 10 ml of 1 % NaOCl (sodium hypochlorite), and was flushed with 10 ml of sterile saline (0.9% sodium chloride) and dried with sterile paper points. This was followed by application of a triple antibiotic paste of metronidazole, ciprofloxacin and minocycline in equal portions of each antibiotic mixed with sterile saline (0.9% sodium chloride) to a paste like consistency. The triple antibiotic paste filled the root canal using a sterile K – file to the level of the canal orifice and completely removed from the access cavity. Then the access cavity adequately sealed with light cured glass ionomer cement.

RESULTS

After root canal disinfection, all involved samples showed crown color change ranging from light to dark yellow-green, meanwhile the gingiva returned to a normal state of pale pink in color and taper down to a knife edge where they meet the tooth.

DISCUSSION

The first phase of treatment is to disinfect the root canal system to ensure periapical healing.[3]

In this study, instrumentation of the root canal was avoided and agreed with Zhang and Yelick (2010)[4] and Nosrat *et al*. (2011)[5] who advocated no instrumentation procedure because using root canal instrument could not only increase fragility of dentin walls but also injure stem cells present in the apical area of these dentin walls. Growth factor and other cells essential for the regeneration process could also be eliminated by instrumentation. Two types of cells are required to achieve a normal root development: odontoblasts and epithelial cells of Hertwig's sheath. These two cell types are present in abundance in the apical area of immature teeth and are able to resist inflammation phenomena. These cells will be able to differentiate into secondary odontoblasts that will generate dentin on root canal walls and thus allow root maturation. No instrumentation procedure remains consistent with vital stem cells preservation and avoids weakening of already thin root canal walls.

Since the infection of the root canal system is considered to be polymicrobial, consisting of both aerobic and anaerobic bacteria. A combination of drugs would be needed to treat the diverse flora. In this study, triple antibiotic paste comprised metronidazole, ciprofloxacin, and minocycline in a saline was used. This medicament has been extensively studied by Hoshino *et al*.[6] Trope,[7] mentioned that the combination of antibiotics would also decrease the likelihood of the development of resistant bacterial strains. Also Sato *et al*.[8] mentioned that most of the revitalization regeneration procedures use a triple antibiotic paste, sometimes called Hoshino's paste. It has been shown to be effective in eliminating endodontic pathogens in vitro and in vivo.

After one month of disinfection procedure, results showed that all teeth that are disinfected with triple antibiotic paste showed crown color change ranging from light to dark yellow-green, even the paste application terminated to a level of the canal orifice, completely removed from the access cavity and the access cavity adequately sealed with adhesive restoration as mentioned by Reynolds *et al*.[9] for preventing contact between the antibiotic medicament and the dentin, but the discoloration of this study teeth disagreed with their results. Meanwhile, Kim *et al*.[10] identified minocycline as the cause for discoloration in vitro. They demonstrated that sealing the dentine wall with a bonding agent prior to application of the paste could reduce the overall color change, without being able to prevent it. Even though the triple antibiotic paste originally introduced by Hoshino *et al*.[6] reliably eradicates bacteria from infected root canals setting the conditions for subsequent re-vascularization in the field of regenerative endodontic procedures, it may cause severe aesthetic problems.[7]

Of the three antibiotics, minocycline is often reported to cause green-grey or blue-grey intrinsic tooth discoloration. Minocycline is a semi synthetic derivative of tetracycline and is a broad spectrum antibiotic,

effective against gram positive and negative bacteria. Discoloration may be due to minocycline binding to calcium ions via chelation to form an insoluble complex and is incorporated into tooth matrix causing discoloration.[11]

According to 'intrinsic theory' minocycline is bound only by those tissues with a high affinity for it such as dental pulp, dentin, and bone which are collagenous. Once in the tissues, the minocycline is oxidized and subsequently transformed to a colored product. Pigment deposits from discolored teeth when examined microscopically and histologically suggest the presence of iron and hemosiderin, a minocycline degradation product, chelates with iron to form an insoluble complex. The pigment contains a quinone –like structure which is the main contributor to its colour.[12]

In this study after one month of disinfection procedure, clinical symptoms such as gingival redness, bleeding, swelling, abscess and teeth mobility were disappeared. The gingival return to normal state of being pale rose in color and taper down to a knife edge where they meet the tooth. Recovering the clinical symptoms revealed the effectiveness of triple antibiotic paste to kill bacteria in the root canal dentine and periapical area that's agreed with Sato *et al*.[8] They found that alone, none of the drugs resulted in complete elimination of bacteria. However, in combination; these drugs were able to consistently sterilize all samples.

Triple antibiotic paste, contains both bactericidal (metronidazole, ciprofloxacin) and bacteriostatic (minocycline) components, allowing for successful revascularization and the continued development of the root to its normal length. A wide-spectrum bactericide, metronidazole has also been shown to be effective against oral obligate anaerobes, including those isolated from infected necrotic pulp.[13]

CONCLUSION

Disinfection is the most important step for revascularization of a necrotic immature tooth. The disinfection relies solely on irrigants and intracanal medications. A triple antibiotic paste used in disinfection of infected teeth result in discoloring teeth.

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