

## TOPIC- TRIPLE ANTIBIOTIC PASTE AS INTRACANAL MEDICAMENT: A REVIEW

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### ABSTRACT:

The success of the endodontic treatment depends on microbial suppression in the root canal and periapical region. Endodontic instrumentation alone cannot achieve a sterile condition. With the advent of non-instrumentation endodontic treatment, lesion sterilization and tissue repair, local application of antibiotics has been investigated. As the nature of root canal system is not uniform and the presence of many inaccessible areas so the combination of mechanical instrumentation and irrigation with intracanal medicaments is necessary to decrease the amount of micro-organisms in the root canal system. These medicaments must be capable of destroying bacteria reducing further infection reducing inflammation and inducing hard tissue formation with no harm to the healthy tissue of host. So the Triple Antibiotic Paste can be effectively used for intermediate intracanal medication for canals and also in healing of periapical pathology. Thus Triple Antibiotic Paste seems to be promising medicament in the sterilization of canals.

**Key words:** Micro-organism (Bacteria), Intracanal Medicaments, Triple Antibiotic Paste.



### INTRODUCTION:

The success of the endodontic treatment depends on microbial suppression in the root canal and periapical region. Endodontic instrumentation alone cannot achieve a sterile condition. With the advent of non-instrumentation endodontic treatment, lesion sterilization and tissue repair, local application of antibiotics has been investigated. Microorganisms (bacteria) have been well known to play major

role in pulpal and periapical diseases. The bacteria associated with primary endodontic infections are mixed, but are predominantly gram-negative anaerobic rods, whereas the bacteria associated with secondary infection comprise only one or a few bacterial species – most important of which is *Enterococcus faecalis* <sup>[1]</sup>. Eradication of causative microorganisms during root canal treatment procedures helps attain

successful results. In order to achieve bacteria free root canal system especially in pulpless teeth it is very necessary to use intracanal medicaments. Because of the complex nature of the root canal system and the presence of many inaccessible areas, a combination of mechanical instrumentation and irrigation with intracanal medicaments is necessary to decrease the amount of micro-organisms in the root canal system. [2] These medicaments must be capable of destroying bacteria reducing further infection reducing inflammation and inducing hard tissue formation with no cause to the host healthy tissue.

#### **THE ROLE OF BACTERIA:**

Role of bacteria in pulpal and periapical diseases has been well researched in animal. Kakehashi and co workers demonstrated in two studies<sup>[3,4]</sup> that pulps which were exposed to the oral environment in germ free rats were capable of healing whereas bacterially-contaminated pulps displayed degeneration.

The recent studies confirmed<sup>[5,6,7,8]</sup> that the ability of pulp to heal if there was no contamination from microorganism. Many type of bacteria have been reported as being involved in pulpal and periapical diseases. A high incidence of anaerobic bacteria reports range from 80% to 93% of cultured bacteria. Bacteria can exist within root canal itself or within the dentinal tubules. Other areas of tooth that may harbour bacteria includes accessory canals, canal

ramifications, apical debris, fins and transverse anastomoses these entities were demonstrated by several investigator.

#### **INTRACANAL MEDICAMENTS-**

Intracanal medicaments in endodontics have been used for a number of reasons both in the past and currently. These include the elimination or reduction of microorganisms, rendering canal contents inert, prevention of post-treatment pain, and to enhance anesthesia. Abbott et al. (1990) discouraged the indiscriminate use of antibiotics.<sup>[9]</sup> He insisted on the importance of antibiotics in the form of intracanal medicaments in endodontics, and concluded that the systemic antibiotics should be restricted to patients who have local signs of infection, malaise and elevated body temperature. The chemical nature of medicaments employed are varied, they come from a number of different groups. Often, different chemicals or drugs are combined in a "cocktail" in an attempt to elicit a variety of effects with a single application.

#### ***Why to use intracanal medicaments***

1. Help to eliminate bacteria
2. Reduce inflammation (and thereby reduce pain)
3. Induce healing of calcified tissue
4. Help in eliminate apical exudates
5. Control inflammatory root resorption

6. Prevent contamination between appointments

Several studies shown that when intracanal medicaments were not used between appointments than number of bacteria increases. Several authors stressed the importance of intracanal medicaments in order to achieve bacteria free canal in predictable manner. Some medicaments can be used in root canal to prevent or reduce the incidence of pain following initial canal debridement. Thus they have ANODYN effect which can achieve largely by action of anti-inflammatory agents such as corticosteroids etc.

Periradicular and periapical tissue repair can be encourage by the use of intracanal medicaments. The intracanal medicaments were placed in the root canal and create an environment that is conducive to cemental tissue or bone. Intracanal medicaments can exert their influence on periradicular structure by diffusion of active components through root dentin and apical foramen. A suitable environment can be achieved by destroying bacteria with antibiotics or with the help of changing pH.

Thus these intracanal medicaments can help in improving the prognosis of endodontic treatment will will gradually improve the patient comfort.

**Properties of ideal intracanal medicaments-**

1. Antibacterial

2. Anti-inflammatory
3. Ability to stimulate hard tissue repair
4. Ability to reduce or prevent pain
5. Long lasting
6. Water soluble
7. Quick acting initially
8. Long shelf life
9. Inexpensive
10. Easy to use
11. Effective in presence of pus and debris

**Materials used as intracanal medicaments**

1. Anticeptic medication- paraformaldehyde, parachlorophenol, camphorated paramonochlorophenol (CMCP), formocresol, thymol etc.
2. Antibiotic medication- triple antibiotic paste, ledermix paste, septomixin forte paste,pulpomixine paste.
3. Combining medicaments- ledermix paste with calcium hydroxidein 50:50, ledermix paste with pulp dent paste. 50:50

**TRIPLE ANTIBIOTIC PASTE-**

Due to the polymicrobial nature of root canal infections, combination of drugs will be more effective mode to treat these infections. After reviewing various studies in literature, the recommended

protocol is the combination of metronidazole, ciprofloxacin, minocycline in an appropriate delivery system Triple Antibiotic Paste.<sup>[10]</sup> 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. The combination that appears to be most promising consists of metronidazole, ciprofloxacin, and minocycline. Majority of bacteria in the infected root canal dentin are obligate anaerobes. Hence, metronidazole was selected as the first choice among antibacterial drugs. Even at a high concentration, it cannot kill all the bacteria, indicating the necessity for combination of other drugs. Propylene glycol can be used as a vehicle for the delivery of this paste. The triple-antibiotics regimen was first tested by Sato *et al.* Teeth with immature root development, necrotic pulps, and apical periodontitis present multiple challenges for successful treatment.

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. Metronidazole is a nitroimidazole compound that exhibits a broad spectrum of activity against

protozoa and anaerobic bacteria. Minocycline is a semisynthetic derivative of tetracycline with a similar spectrum of activity. Ciprofloxacin, a synthetic fluoroquinolone, has a bactericidal mode of action.

Triple Antibiotic Paste was successful in promoting the healing and repair of the periapical tissue. The systemic administration of antibiotics relies on patient compliance with the dosing regimens followed by absorption through the gastrointestinal tract and distribution via the circulatory system to bring the drug to the infected site. Hence, the infected area requires a normal blood supply which is no longer the case for teeth with necrotic pulps and for teeth without pulp tissue. Therefore, local application of antibiotics within the root canal system may be a more effective mode for delivering the drug.

Microorganisms in dentinal tubules may constitute a reservoir from which root canal and surrounding tissue infection and re-infection may occur. Portenier *et al.* demonstrated that dentin itself can have an inhibitory effect on the bactericidal activity of intracanal medicaments.

Raison Bose compared Triple Antibiotic Paste, calcium hydroxide, and formocresol as intracanal medicaments in non-vital young permanent tooth. The triple antibiotic group showed the highest percentage increase in the dentin wall thickness compared with the

other two groups. TAP can help promote functional development of the pulp–dentin complex. Reynolds *et al.* achieved revascularization of a necrotic bicuspid using Triple Antibiotic Paste. Triple Antibiotic Paste contains both bactericidal (metronidazole, ciprofloxacin) and bacteriostatic (minocycline) agents to allow for successful revascularization.

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Apart from this advantages of TAP a study by Yadlapati *et al.* (2014) also showed the deleterious effect of the triple antibiotic paste on human periodontal ligament fibroblasts and minimal effect of Ca(OH)<sub>2</sub> on cell viability and production of cytokine. The TAP showed deleterious effects on HPDL viability and increased expression of the pro-inflammatory cytokine IL6.<sup>[11]</sup> TAP caused aesthetic problems leading to

tooth discoloration.<sup>[12]</sup> A study by Nagata JY. (2014) evaluated pulp revascularization using 2 different protocols on traumatized immature teeth. They found significant discoloration of the crown in TAP group.<sup>[13]</sup> Kirchhoff *et al.* (2014) observed the discolouration of teeth with closed and open apices after placement of TAP in the pulp chamber. TAP discoloured the tooth structure, but discolouration could be reversed with sodium perborate paste.<sup>[14]</sup> For the removal of TAP paste, a study by Arslan *et al.* (2014) concluded that passive ultrasonic irrigation (PUI) with 1% NaOCl effectively removes TAP from artificial grooves in the root canal.<sup>[15]</sup>

Regarding the effect of TAP on dentinal wall thickness.<sup>[16]</sup> Yassen *et al.* (2013) studied the use of medicaments in endodontic regeneration on root fracture and microhardness of radicular dentin.

He found the significance of duration and resistance to fracture. He concluded that three week application of TAP, double antibiotic paste DAP OR Ca(OH)<sub>2</sub> significantly reduced the resistance to fracture of extracted teeth as compared to 1 week application.

The concern of the antibiotic paste is that it may cause bacterial resistance. Additionally, minocycline may cause tooth discoloration. Thibodeau and Trope suggested cefaclor instead of minocycline in Triple Antibiotic Paste.

Reynolds *et al.* used dentin bonding agent and composite resin before placement of the triple antibiotic dressing to prevent discoloration, but the discoloration was only reduced. The discoloration by the tetracycline family is thought to be a photo-initiated reaction. Minocycline binds to calcium ions via chelation to form an insoluble complex. It should be limited to the root canal because of the potential risk of tooth discoloration.

Micro-organism are major cause for periapical and periradicular diseases. Microorganism can be eliminated through combination of mechanical instrument irrigating solution and intracanal medicaments of root canal system. Triple Antibiotic Paste can be effectively used for intermediate intracanal medication for canals and also in healing of periapical pathology. Thus Triple Antibiotic Paste seems to be promising medicament in the sterilization of canals.

## CONCLUSION

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