Academia Journal of Medicine

Review Paper	AJM	ISSN: 2663-8290 (Online)
Open Access	https://medjournal.co.in/index.php/ajm	Volume 6, Issue 2

Triple Antibiotic Paste: Boon to Dentistry

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Article History

Received: 12-11-2023
Revised: 16-11-2023
Accepted: 11-12-2023
Published: 15-12-2023

How to Cite

Ankita U, Bharati D, Sara S, Balasubramanyam V. Triple Antibiotic Paste: Boon to Dentistry. Acad J Med 2023; 6(2): 13-18.

Abstract

Microorganisms must be removed from the root canal (RC) and periapical region for endodontic success. A sterile state cannot be achieved with only endodontic instrumentation. Local administration of antibiotics has been studied in light of the development of non-instrumentation endodontic treatment, tissue healing and lesion sterilization. Triple antibiotic paste (TAP) with metronidazole, ciprofloxacin, and minocycline works well for non-vital young permanent teeth and the RC pathogen. Present review of literature aims to discuss role of TAP in endodontic treatment.

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Keywords

Endodontic treatment, TAP, Antibiotic

DOI https://doi.org/10.62245/ajm.v6.i2.3

1. INTRODUCTION

Clinical evidence has shown that the presence of bacteria causes the pulpal and periapical infection, and that the success of treatment is closely correlated with the reduction of bacterial colonisation in the pulp system and periapical region[1]. RC infection microbiome has been extensively studied. Necrotic pulp tissue from primary RC infections has been found to include a polymicrobial flora comprising gramme negative species of several types of obligate anaerobic bacteria, which account for 90% of all bacteria[2,3].

Polymicrobial RC infections may contain aerobic and anaerobic microorganisms.[4] Because sophisticated RC systems are common, bacteria are drug-resistant. Because one antibiotic cannot kill all polymicrobial flora, TAP (TAP) is used to disinfect. Most promising is ciprofloxacin, metronidazole and minocycline.[5]

2. RATIONALES IN USING ANTIBIOTICS IN COMBINATION

Single empirical antibiotics cannot eliminate bacteria in the canal due to polymicrobial tooth infection. Non-specific antibiotics may damage the canal's regular bacterial flora, allowing severe diseases to repopulate. Use a combination of antibiotics for all endodontic infections to prevent microbial resistance[6].

Second, systemic antibiotic therapy depends on the patient's compliance with a dose schedule, the gastrointestinal system's ability to absorb these antibiotics, and their bloodstream transport to the diseased area. Teeth with necrotic pulp, a pulpless and diseased canal, or a root cannot receive appropriate blood flow for medicine. Thus, local canal antibiotic administration may be more effective[7].

3. TAP

TAP is a "intra-canal medicament" with ciprofloxacin, metronidazole and minocycline. TAP can be created by combining ciprofloxacin, metronidazole, and minocycline in a 1:1:1 ratio with macrogol and propylene glycol paste at 0.1–1.0 mg/ml or in a 1:3:3 ratio.[8]

4. ANTIBIOTICS USED IN TAP

1.1 Minocycline: "Broad-spectrum antibiotics" like minocycline kill many germs. Being bacteriostatic has the benefit of preventing the release of antigenic compounds in the diseased area. In addition to being an effective antibacterial material, it also has the ability to promote regeneration since it limits the activity of

clastic cells and inhibits collagenases. By doing so, the formation of healthy, natural cells is encouraged, and the process of regeneration is aided[7,8,9,10].

1.2 Metronidazole: Metronidazole is a broad-spectrum anti-anaerobic and anti-protozoal nitroimidazole. It has been frequently used locally and systemically against several bacteria and anaerobic cocci due to its potent potency. It breaks the bacteria's DNA's helical helix, allowing it to perforate and bind to their membranes, killing the cell instantaneously. Metronidazole inhibits all obligatory anaerobes examined and outperforms calcium hydroxide against two strains[7,8,11].

1.3 Ciprofloxacin: Second-generation fluoroquinolone antibiotic ciprofloxacin treats urinary tract infections, diarrhoea, and stomach pain. Both oral and intravenous fluoroquinolones like ciprofloxacin are used for a number of ailments due to their strong tissue penetration[7,8,12,13].

5. CLINICAL APPLICATION OF TAP[14-15]

- To achieve RC disinfection in all endodontic diseases, Triple Antibiotic obturating Paste (TAOP) can be employed.
- It aids in repairing bone and PDL and removing harmful bacteria from the periodontal pocket for endo-perio diseases.
- In terms of regenerative endodontics, this discovery will open up new avenues for endodontic treatment options for both primary and permanent teeth.
- This material can achieve Lesion Sterilization and Tissue Repair (LSTR) in cases of calcified/obliterated RCs, premature pathological resorption in primary teeth, and uncooperative children with difficult RC instrumentation, preserving healthy oral function.
- It has the potential to be utilized as an intracanal agent for the management of flare-ups.
- As a medicated sealant (to protect against the possibility of re-infection).
- As a component of medicated gutta-percha points, which are used in the process of RC obturation.

6. DISCUSSION

Endodontic pathogens can be facultative or obligatory, aerobes or anaerobes, and taken from the carious teeth, oral cavity or pre-contaminated, unsterilized dentinal tubules. Damaged pulp degradation products promote multi-microbial colonization

and growth in the pulp area[11]. Few, independent of irrigation systems, generate biofilms in tortuous inaccessible sections that retain microbial residues after thorough chemo-mechanical preparation and irrigation, resulting in treatment failures and unknown prognoses[16].

The main success factor is the decrease of bacteria content in the RC. The microbial-free environment required for RC therapy cannot be created by endodontic instrumentation alone. In endodontics, combination chemical therapies, such as irrigation protocols and intracanal medications, are crucial. The use of medications is essential for creating an atmosphere free of microbes.[5]The trio of antibiotics ciprofloxacin, metronidazole, and minocycline is the most frequently suggested one. This is due to the fact that ciprofloxacin, a bactericidal broad-spectrum synthetic quinolone that works primarily against Gram-negative organisms, metronidazole, a bactericidal imidazole, and minocycline, a bacteriostatic broad-spectrum tetracycline, both work against Gram-positive organisms. Minocycline is one of the elements of TAP. Minocycline chelates with tooth calcium ions to form an insoluble molecule. Therefore, the discolouration is brought on by the minocycline integrated into the tooth matrix. Doxycycline, amoxicillin, cefaclor, and clindamycin are minocycline substitutes with comparable modes of action[17,18].

7. LIMITATION OF TAP

Patients who are allergic to any of the ingredients in TAP should not use it. Coronal tooth discolouration limits[8,18].

8. CONCLUSION

Microbe elimination from the RC system dramatically affects endodontic outcomes. TAP appears to be a useful tool for achieving this goal. It might be a promising drug for cutting-edge endodontics, but more studies are required to uncover its full potential.

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