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Clinical Use of Triple Antibiotic Paste in Dentistry

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Abstract: ***As intra canal medicament have shown very encouraging results the use of triple antibiotic paste (is a mixture of ciprofloxin ,metronidazole and minocycline)is widely used nowadays . Due to complex polymicrobial nature of infected root canal combination of antibacterial drug is required .Recent advances in lesion sterilization and repair using triple antibiotic paste has repress the root canal pathogen to allow healing of periapical lesion .This paper analysis the rationale of antibiotic mixture ,antibacterial efficiency, current application, advantages over calcium hydroxide and disadvantages.***

Keywords: Triple antibiotic paste, endodontics, revasularization, lesion sterilization

1. Introduction

A sound tooth structure is always resistance to microbial infection [1] .In case of infected pulp microbial flora of the infected root canal consists of both aerobic and anaerobic but predominantly anaerobic bacteria thus cleansing should eliminate both the bacteria .[2]Triple antibiotic paste (TAP), a mixture of metronidazole, ciprofloxacin, and minocycline, is the most widely used intracranial medicament in endodontic regeneration .[3]Since crown discolouration has been associated with triple antibiotic paste recent studies have suggested substituting minocycline with another antibiotic .[4]

Modified triple antibiotic paste (MTAP) composed of metronidazole, ciprofloxacin , and clindamycin was successfully used as an intracanal medicament to disinfect necrotic immature teeth during an endodontic regeneration.As triple antibiotic paste are placed directly on the infected site it plays a prominent role .

Traumatic injuries generally disrupt the pulpal blood supply causing pulp necrosis and leading to anaerobic conditions favourable for the growth of opportunistic microorganisms, which may subsequently result in the development of periapical lesions.

Certain kind of microbial species are resistant to normally used antimicrobials. Species such as Enterococcus group have shown to be viable when exposed to normally used root canal irrigants. Also, since the root canal infection is a mixture of aerobic and anaerobic flora; no single medicament can cause sterilization of the canal. Hence combinations of medicaments are required .[20]

2. Composition of Antibiotic Paste

Several composition of medicaments are tried over year some of the well-known combinations are:

According to Hoshino et al:Antibiotic (3Mix) – Ciprofloxacin 200mg, Metronidazole 500mg, Minocycline 100mg in the ratio 1:1:1Carrier (MP) – Macrogol ointment, Propylene glycol in ratio 1:1

According to Takushige T et al :The drugs are powdered and mixed in a ratio of 1:3:3 (3 Mix) and added either with macrogol- propylene glycol (3 Mix-MP) or a canal sealer (3 Mix-sealer). [5]

Combination of Antibiotic Paste :

- Metronidazole and ciprofloxacin plus minocycline
- Metronidazole and ciprofloxacin plus cefaclor
- Metronidazole and ciprofloxacin plus amoxicillin
- Metronidazole and ciprofloxacin plus cefroxadine
- Metronidazole and ciprofloxacin plus fosfomycin
- Grossman's polyantibiotic paste penicillin, bacitracin, chloramphenicol[6 ,7]

3. Action of Ingredients

Ciprofloxacin
Ciprofloxacin is a narrow spectrum antimicrobial agent it belongs to fluroquinolone group.Ciprofloxacin acts through the inhibition of DNA gyrase and as antibacterial effect present during both duplication stages and latent stages of bacterial growth phases .[8]

Metronidazole
Metronidazole is a narrow spectrum antimicrobial agent ,it is nitroimidazole compound and permeates into bacterial cell membrane and binds to DNA ,disrupting its helical structure and leads to call death .[9]

Minocycline
MINOCYCLINE is a broad spectrum antimicrobial agent it acts by inhibiting protein synthesis on surface of ribosomes ,it is effective against both gram – positive and gram negative micro-organism . Also augment the growth of host cells on dentin, via the exposure of embedded collagen fibres or growth factors allowing for successful revascularization and continued development of root to its normal length [10]

Propylene glycol
Acts as solvent enhancing better diffusion of the medicaments deep into the dentinal tubules thus enhancing the antimicrobial action. [11]

Healing of Large Peri-Radicular Lesion Using Triple Antibiotic Paste

The development of endodontically induced periapical lesion is clearly assosiated with the presence of microorganism in the root canal system .[12]

Calcium hydroxide is the most commonly used medicament for the asepsis of root canal because of its high alkalinity and antibacterial activity .The antimicrobial effects of calcium have also been evaluated by clinician where calcium hydroxide reduces 97% in one month dressing. [13]

Various combination of antibiotics have also been used among them a mixture of ciprofloxacin ,metronidazole and minocycline is effective in elimination of endodontic pathogens .It has been shown that this combination of drugs can can kill any bacteria in carious lesion, necrotic pulp,infected root dentin and periapical lesion .[14]

Endodontic Treatment Of Primary Teeth Using A Combination of Antibacterial Drugs

Teeth with infected root canals, particularly those in which the infection has reached the peri radicular tissues, are a common problem in the primary dentition. Early loss of primary teeth can cause a number of problems, including space loss for successor permanent teeth(Camp1994).Thus,itisimportantthattheprimary dentition is maintained in the dental arch.

A mixture of metronidazole, ciprofloxacin and minocycline (3Mix) in ointment (macrogol mixed with propylene glycol: MP) or in a root canal sealer was used to disinfect infected root canals. The root canals were not prepared before or after disinfection. 3Mix medicament (3Mix-MP/3Mix-sealer) was placed at orifices of root canals or on the bottom of pulp cham- bers, and then sealed with glass-ionomer cement and further reinforced by a composite resin inlay prepared using a direct method and cemented with resin. [15]

Antiseptics and Antibiotics Used in Regenerative Endodontics

Regenerative endodontic procedures can be defined as biologically based procedures designed to replace damaged structures, including dentin and root structures, as well as cells of the pulp-dentin complex. The objectives of regenerative endodontic procedures are to regenerate pulp-like tissue, ideally, the pulp-dentin complex; regenerate damaged coronal dentin, such as following a carious exposure; and regenerate resorbed root, cervical or apical dentin .[16]

Cephalosporins (cefaclor) has also been suggested as an alternative to minocycline in the triple antibiotic paste Arestin and amoxicilllin have also been recommended as alternatives to minocycline. However, no clinical trials exist on the efficacy of these alternative formulations on the success of revascularization treatment and hence this combination can neither be recommended nor refuted at the present moment. [17,18]

Disinfection should also be achieved by using intracanal adjuncts like triple antibiotic paste or chorhexidine. Long term clinical trials are needed to evaluate if chlorhexidine gel is as effective as the triple antibiotic paste in revascularization. New combinations of antibiotics should also be evaluated for successful revascularization therapy .[19,20]

4. Conclusion

- The combination of irrigation and disinfection with triple antibiotic paste protocol allow apical root closure in regenerative endodontic procedure and periapical lesion healing in nonsurgical endodontic therapy.
- The addition of triple antibiotic paste with propylene glycol allows efficient delivery deep into dentinal tubules and beyond cementum, thereby enhancing the healing of large peri-radicular lesion.
- 3Mix can be used as root canal filling material in primary endodontic teeth. Thus from the literature, it is clear that triple antibiotic paste is effective in disinfection of root canal and successful healing of large periradicular lesions.

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