In Vivo Evaluation of Lesion Sterilization and Tissue Repair in Primary Teeth Pulp Therapy Using Two Antibiotic Drug Combinations

Jaya AR*/Praveen P **/ Anantharaj A***/ Venkataraghavan K**** /Prathibha Rani S *****

Aim : *The purpose of this study is to evaluate and compare the clinical and radiographic effectiveness of Ciprofloxacin, Minocycline, Metronidazole combination with Ciprofloxacin, Minocycline and Tinidazole combination when used for Lesion Sterilization and Tissue Repair in primary teeth.* ***Method:*** *25 healthy children, visiting Dept. of Pediatric & Preventive Dentistry, D.A.P.M.R.V.Dental College, Bangalore, India, aged between 6 – 9 years who were having 30 infected primary teeth are selected and divided into 2 groups. In Group A, a mixture of 3mix-MP Ciprofloxacin, Metronidazole and Minocycline was placed on the floor of the pulp chamber covering the root canal orifices. In Group B a mixture of Ciprofloxacin, Tinidazole and Minocycline was placed as a layer on the floor of the pulp chamber. The procedure was completed in a single visit. Post operative clinical evaluation was done after 1,6,12 and 24 months. Postoperative radiographic evaluation was done at 6,12 and 24 months.* ***Results:*** *No statistically significant difference is observed between both the groups and a combination of Ciprofloxacin, Minocycline and Tinidazole antibacterial drugs can be used on teeth pulpally involved with physiologic root resorption.* ***Conclusion:*** *After a 24 Month follow up, we can conclude that primary teeth with the periradicular lesions, can be conserved by using combination of Ciprofloxacin, Minocycline and Tinidazole antibacterial drugs.*

Keywords: *Lesion Sterilization and Tissue repair, Primary tooth, pulp therapy, Antibiotics, Ciprofloxacin, Minocycline, Tinidazole.*

INTRODUCTION

Maintaining the integrity of the primary dentition until normal exfoliation is a major goal of modern dentistry. Early loss of primary teeth can cause a number of problems, such as ectopic eruption, disturbance of eruption sequence, drifting of adjacent teeth, and space loss for erupting succedaneous permanent teeth. Thus, it is important that the primary dentition is maintained in the dental arch, provided that it can be restored to function and remain free from disease.[1,2]

Pulpal infections are the most common problem in primary dentition. According to American Academy of Pediatric Dentistry treatment guidelines, when the infectious process cannot be arrested by the conventional treatment methods, when bony support cannot be regained, inadequate tooth structure remains for a restoration, or excessive pathologic root resorption exists, extraction should be considered.[3]

Lesion Sterilization and Tissue Repair (LSTR) therapy or Non-Instrumentation Endodontic Treatment (NIET) is used for teeth that show presence of external or internal root resorption and so are not amenable for conventional endodontic therapy.

In this technique a mixture of Ciprofloxacin, Metronidazole and Minocycline (3Mix-MP) in the ratio of 1:3:3 with Propylene glycol and Macrogol as a vehicle is used with or without entry into the root canals in order to control the infection.[4,5] Tinidazole a second generation synthetic nitroimidazole, is more effective than metronidazole and produces fewer and milder side effects and is recommended as drug of choice in single dose therapy and is preferred to metronidazole.[6,7]

The article evaluates the relative efficacy of Ciprofloxacin, Minocycline, Metronidazole combination with Ciprofloxacin, Minocycline and Tinidazole combination when used for Lesion Sterilization and Tissue Repair in primary teeth showing poor prognosis for conventional endodontic treatment.

MATERIALS AND METHOD

25 healthy children, visiting Dept. of Pediatric and preventive Dentistry, between the ages of 6 – 9 presenting 30 infected primary teeth are selected based on the inclusion criteria:

* Jaya A R,Lecturer, Department of Pedodontics, Rajarajeshwari Dental College, Bangalore.
** Praveen P, Professor, Department of Pediatric and Preventive Dentistry, D.A.P.M.R.V Dental College, Bangalore.
*** Anantharaj A, Professor and Head, Department of Pediatric and Preventive Dentistry, D.A.P.M.R.V Dental College, Bangalore
**** Karthik Venkataraghavan, Professor & HOD, Department of Pediatric and Preventive Dentistry, College of Dental Sciences & Research, Ahmedabad, Gujrat.
***** Prathibha Rani S, Reader, Department of Pediatric and Preventive Dentistry, D.A.P.M.R.V Dental College, Bangalore.

Send all correspondence to: Dr. Praveen P, Department of Pediatric and Preventive dentistry, D.A.P.M.R.V Dental College, J.P.Nagar I Phase, Bangalore – 560078. India.

Tel: +91 80 22445754 (Extc34)
Fax: +91 80 26658411

Email: drppraveen@gmail.com

Table 1. Evaluation results

Study Group	Clinical Evaluation							Radiographic Evalutation			
	Presence of pain or Tenderness (%)	Presence of Abscess (%)	Presence of Mobility (%)					Presence of inter-radicular radiolucency (%)			
			Pre-Op	1M	6M	12M	24M	Pre-Op	6M	12M	24M
Group A	87 (preoperative)	27	60	60	62	62	62	73	69	69	69
Group B	100 (preoperative)	13	47	47	50	50	50	60	57	57	57

- Pulpally involved primary molars
- Teeth showing radiographic evidence of internal or external root resorption,
- Teeth with a root length of less than 50%,
- Teeth showing furcation radiolucency without involving the underlying tooth germ.

An informed consent was taken from patient's parents. The study was undertaken after the clearance of the Institutional ethical review Committee. A controlled double blind study was carried out by the evaluator who was aware of the participant of each group.

Preparation of the Antibacterial Mix

The commercially available chemotherapeutic agents Ciprofloxacin, Metronidazole, Minocycline and Tinidazole tablets in a proportion of 1:3:3 by weight were taken and their film coating was removed using a sterile knife or scissors. The drugs were ground into a fine powder and transferred to a sterile glass container, capped tightly and kept dry. On the day of treatment the 3 Mix – MP preparation was made. The powder was mixed with propylene glycol and macrogol just before placement into the tooth.

The selected 30 teeth were randomly divided into two groups Group A and Group B. Preoperative and one month, 6 months,12 Months and 24 months radiographs were taken using digital intraoral radiographs. 2% lignocaine hydrochloride with adrenalin 1:80,000 was used for anesthesia and teeth were then isolated with rubber dam.

The endodontic access cavity is prepared and both coronal pulp as well as radicular pulp was removed in both the groups. The canals were irrigated with normal saline and dried using paper points. In Group A, a mixture of 3mix-MP (Ciprofloxacin, Metronidazole and Minocycline was placed on the floor of the pulp chamber covering the root canal orifices. In Group B a mixture of Ciprofloxacin, Tinidazole and Minocycline were placed as a layer on the floor of the pulp chamber. The procedure was completed in a single visit.

Post operative clinical evaluation was done after one month, 6 months, 12 Months and 24 months. Post operatively the teeth were clinically evaluated for pain/tenderness, persistence of abscess, and presence of mobility.

The treated cases were considered as clinically successful if there was absence of above mentioned clinical signs and symptoms.

Post operatively the teeth were radiographically evaluated for status of interradicular radiolucency

The data so obtained is statistically analyzed using Chi-square test.

RESULTS

The Results were tabulated as follows: (Table 1)

1. Presence of pain/ Tenderness

Group A: Pre-operatively Pain/tenderness was observed in 13 teeth (87%). The 1month, 6 months, 12months and 24 months, post-operative evaluation revealed absence of pain/ tenderness in all the teeth.

Group B: Pre-operatively Pain/tenderness was observed in 15 teeth (100%). The 1month, 6 month and 12 months post-operative evaluation revealed absence of pain/tenderness in all the teeth.

2. Presence of Abscess

Group A: Preoperatively 4 teeth (26.67%) exhibited chronic dentoalveolar abscesses. There was complete resolution of abscess seen at 1month, 6 month and 1year interval.

Group B: Of the 15 teeth, 2 teeth (13.33%) exhibited chronic dentoalveolar abscesses. There was complete resolution of abscess seen at 1month, 6 month and 1year interval.

3. Presence of mobility

Group A: Preoperatively mobility was seen in 9 teeth (60%). At 1 month post operative evaluation mobility was continued in, 9 (60%) teeth. At 6, 12 and 24 months post operative evaluation mobility continued in 8 teeth (62%).

Group B: Preoperatively mobility was seen in 7 teeth (47%). At one month, mobility was continued in, 7(47%) teeth. At 6 month, 12 months and 24 months evaluation mobility was seen in 7 (50%) teeth

4. Presence of interradicular radiolucency

Group A: Pre-operatively presence of interradicular bone radiolucency was observed in 11 (73%) teeth. At the end of 6 months and 12 months, continuation of interradicular bone radiolucency was observed in 9 (69%) teeth.

Group B: Pre-operatively presence of interradicular bone radiolucency was observed in 9 (60%) teeth. At the end of 6 months, 12 months and 24 months, continuation of interradicular bone radiolucency was observed in 8 (57%) teeth.

At pre-operative evaluation there was no significant difference between group with respect to the presence of dentoalveolar abscesses, presence of pain/tenderness, mobility, interradicular

radiolucency). At 1 month, 6 months, 12 months and 24 months time intervals, it was noticed that all the samples in both the groups did not record the presence of pain/tenderness or presence of abscess. Further, statistically no significant difference is observed between mobility and interradicular radiolucency in both groups at 1 month and 6 months, 12 months and 24 months time interval.

DISCUSSION

Sterilization of the infected root canal and periradicular region resulted in good healing.[9,10] This can be achieved by using various antibacterial agents like irrigants, intracanal medicaments and broad spectrum antibiotic preparations.[1] Antibiotics can be used effectively as adjuncts to endodontic treatment by local application, systemic and prophylactic administration.[8]

As the bacterial composition of the infected root canal is complex, a single antibacterial drug may not be effective. Since the overwhelming majority of bacteria in the deep layers of infected dentin of the root canal wall consist of obligate anaerobes, metronidazole was selected as the first choice among the antibacterial drugs as it has a wide bactericidal spectrum against anaerobes, which are common in oral sites. However some bacteria in lesions were resistant to metronidazole and thus two other antibacterial drugs such as ciprofloxacin and minocycline were added to metronidazole in an effort to eliminate all the bacteria.[11]

One of the objectives of the study was to compare the relative efficacy of Metronidazole and Tinidazole in combination with Ciprofloxacin and Minocycline. Tinidazole appears to have several advantages over Metronidazole including greater *in vitro* potency against both sensitive and resistant strains of obligate anaerobes and more prolonged duration of action and improved patient tolerability.[7] This study did not show any statistically significant difference between the two drug combinations. Therefore, alternative drug combinations may be used on the basis of spectrum of antibacterial activity and availability.

In this study a 1:3:3 ratio of the three drugs has been used according to the recommendation of the original study. However, the basis for this ratio needs to be explored further and modified if required based on the evidence obtained.

One of the risks of installation of antibiotics is that of sensitization and/or hypersensitivity reaction. However, in our study none of the cases showed any evidence of such a reaction to the antibiotic combination.

In order to sterilize deep layers of infected root dentin, root canal medicaments should penetrate root canal dentin. The penetration ability of these drugs was improved by mixing these drugs with propylene glycol and macrogol to form the ointment base.[11] The penetration ability of propylene glycol has been clearly demonstrated.[5,12]

The overall success of LSTR technique using either combination was 90% for the period of evaluation. Another technique using calcium hydroxide dressing for traumatized teeth with internal and replacement root resorption showed a success rate of 64%.[13] Therefore, LSTR appears to have a better rate of success compared to the latter technique.

In patients showing internal/external root resorption, physiologic root resorption exceeding 2/3rd root length requiring short-term space management, Lesion Sterilization and Tissue Repair with 3Mix-MP may be considered as an alternative procedure. This technique may also find application in children with special needs in whom conventional endodontic treatment cannot be performed due to associated medical conditions. The procedure has also been used in controlling recurrent/persistent infections without prolonged systemic antibiotic therapy. It may also find application in managing pulpal infections in remote areas where access to dental care is poor. This application of LSTR technique has been researched and reported to be successful.[14]

Though LSTR technique has shown promising results, the study needs to be repeated with a larger sample size with a longer period of follow-up. Investigation is also required to understand the reaction of the periapical tissues to the drugs as well as the amount of drug absorption into the systemic circulation. Further LSTR technique needs to be compared to other treatment modalities that have been suggested, always keeping in mind the exfoliation schedule of the teeth and age of the child to conclusively predict the success of this procedure.

The present study shows considerable success of this procedure over a 2 year period. The procedure needs to be followed up for a longer period of time.

CONCLUSION

After a 24 Month follow up, we can conclude that primary teeth with the periradicular lesions, can be conserved with a combination of Ciprofloxacin, Minocycline and Tinidazole antibacterial drugs.

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