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EVALUATION OF THE ANTIBACTERIAL EFFECT OF THREE IRRIGANT SOLUTIONS IN TREATMENT OF ROOT CANALS OF PRIMARY ANTERIOR TEETH

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ABSTRACT

Purpose: To evaluate and compare the antibacterial effect of 0.5%Metronidazole, 2%Chlorhexidin e, and Normal saline irrigant solutions against *Enterococcus Faecalis* bacteria in treatment of root canals of primary anterior teeth. **Materials and methods:** This in-vivo study was carried out on Sixty, anterior, primary teeth of children ranging from three to five years of age. The teeth were equally divided into three groups (20 teeth each), based on the irrigant used during chemo mechanical preparation of the root canals. **Result:** There was no significance difference between the action of 2.0% Chlorhexidine and 0.5% Metronidazole against *Enterococcus faecalis* while there was a significant difference when they were compared with the action of normal saline. **Conclusion:** Both 0.5%Metronidazole and 2.0%Chlorhexidine appeared to be superior as final endodontic irrigants with higher antibacterial efficacy compared to saline.

INTRODUCTION

Early childhood caries (ECC) is defined as the presence of one or more decayed (noncavitated or cavitated lesions), missing (due to caries), or filled tooth surfaces in any primary tooth[1]. It associated with the consumption of foods or fluids sweetened with fermentable carbohydrates, usually from the bottle, over an extended period[2]. The role of microorganisms in infecting the oral flora become important, due to their presence in the oral samples of infants with ECC[3].

When dental caries invade the pulp tissues and it was necessary to treat the tooth endodontically, the essential for endodontic success is to eliminate or at least reduce the number of microorganisms and remove inflamed or necrotic pulpal tissue[4].

Irrigants should ideally have antimicrobial and tissue-dissolution actions as well as other advantageous properties, such as lubrication, demineralization, and the ability to remove debris and the smear layer[5].

The most common Irrigants used during root canal preparation is sodium hypochlorite (NaOCl). It is an effective tissue solvent and has excellent antimicrobial property,[6] however, its tissue toxicity, corrosive effect on endodontic instruments, and disagreeable odor have to be of concern[7]. Also Chlorhexidine digluconate (CHX) has been suggested as an irrigant in endodontic treatment because its antimicrobial activity however, its inability to dissolve organic matter is a drawback in its clinical use[8].

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In the recent years, a new concept has been developed, which employs the use of a combination of anti-bacterial drugs (metronidazole, ciprofloxacin and minocycline) for disinfection of pulpal and periradcular lesions. It has been reported that this mixture can sterilize root dentin[9]. In instances where anaerobic bacteria are acting as sole or major pathogens, metronidazole acts specifically without disturbing the commensal aerobic flora. The resistance to it develops very rarely[10] hence, it was been suggested for use as irrigant solution.

MATERIALS AND METHODS

This in-vivo study was carried out in Pedodontics and Oral Health Department, Faculty of Dentistry, Al-Azhar University, boys, Cairo.

Sixty, anterior, non vital primary teeth of children ranging from three to five years of age were selected for the study. Teeth were randomly divided into three groups (20 teeth each). Intra oral periapical radiographs were taken using a Long Cone technique and Kodak ultra-speed (22mm x 35mm) Film with a Film holder. After isolation with a rubber dam, Access cavity was gained on the palatal surface of each tooth using sterile round bur No 2 or No 4 and long tapering diamond point in a high speed hand piece with water coolant. The working length was then determined with # 15 K stainless steel file and confirmed with the radiograph.

The first microbiological sample (baseline) was collected by introducing a sterile paper point with a diameter compatible with that of the canal. The paper points were kept in place for 60 secs in the root canals and immediately transferred in a screw-capped test tube containing Amie's transport media stored at room temperature and the sample was immediately sent to microbiological laboratory for further evaluation. Sterile Universal K files were used for mechanical preparation of the canals. The prepared canals were flushed for 3 mins with 5 ml of one the following irrigant solutions: Group A: 0.5% Metronidazole, Group B: 0.2% chlorohexidine, and Group C: Normal saline.

The treated canals were sealed with a temporary sealing. After 48 hours the temporary sealing was removed and the second sample was collected as done previously and all samples were transferred to microbiology laboratory for quantification of *E. faecalis* colony forming units (CFUs). Obturation was performed with zinc oxide and eugenol in the later appointments followed by composite resin as a final restoration.

Data were tabulated in Excel worksheets, and statistical analysis was performed with SPSS (Chi., IL, USA) software. Descriptive statistics were presented as mean ± standard deviation for each group of primary anterior teeth. The results were analyzed using Student's t-test, and significant differences were defined as $P < 0.05$.

RESULTS

For Metronidazole group there was a significant antibacterial effect against *E. faecalis* bacteria, the ratio of decreased colonial numbers of Metronidazole group was about 91.4%. Also, there was a significant antibacterial effect against *E. faecalis* bacteria for Chlorhexidine group, the ratio of decreased colonial numbers of Chlorhexidine group was about 96.1%. while there was no anti-bacterial action for normal saline group, the ratio of decreased colonial numbers of Saline group was about 49.1%.

There was no significance difference between the action of 2.0% Chlorhexidine and 0.5% Metronidazole against Enterococcus *faecalis* while there was a significant difference when they compared with the action of normal saline.

TABLE (1) Mean and standard deviation values of bacterial count for Enterococcus faecalis after irrigation with Metronidazole, Chlorhexidine and Normal saline.

Group	Time	Mean	SD	Effect	P-value
Metronidazole	**Before** **After**	2120 183	147 23	91.4%	0.02*
Chlorhexidine	**Before** **After**	1650 65	117 32	96.1%	0.01*
Normal saline	**Before** **After**	1213 609	126 16.6	49.1%	0.07^{ns}

**; significant (p<0.05) ns; non-significant (p>0.05)*

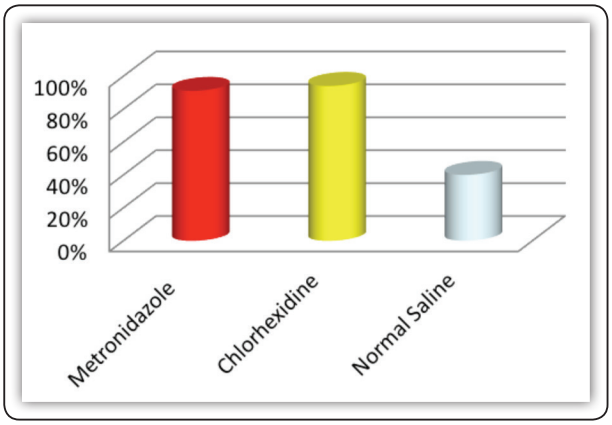

FIG (1) Column chart of mean values of reduction in bacterial count percentage.

DISCUSSION

Metronidazole and Chlorhexidine, had an antibacterial effect which appeared sufficient to significantly reduce the bacterial population of root canals, while Normal saline had no antibacterial effect. These findings may, therefore, enforce the need for a combination of mechanical instrumentation and chemical irrigation to effectively remove most root canal microorganisms.

Metronidazole acts preferentially on anaerobic germs; it prevents hydrogen production, exercising its toxic action by depriving anaerobic microorganisms of reducing equivalents essential for certain anabolic processes. In addition, the metabolite resulting from the reduction of the nitro group of metronidazole molecule damages the DNA chain this results in DNA damage in the form of loss of helical structure, probably acting as a nuclease, thus leading to bacterial cell death[11].

The antimicrobial effect of chlorhexidine is due to the attraction and adsorption of the chlorhexidine cationic molecules on the surface of the microorganism's cells[12]. this interaction promotes the alteration of the cell membrane permeability, resulting in the loss of intracellular components and the osmotic imbalance of the cell[13].

Normal saline has no antimicrobial action and will not decrease bacterial load considerably[14]. So, in this study, it was used as a control group to compare the effectiveness with that of the experimental irrigants used.

These results are in accordance with previous studies by Safavi et al. and Sassone et al [15]. That evaluated the efficacy of CHX against E. faecalis. They indicate CHX showed highly significant antibacterial activity. Also, Menezes et al [16] conducted an in vitro study to assess the efficacy of sodium hypochlorite and 2%chlorhexidine used as irrigation solution. Teeth had been contaminated by Enterococcus faecalis demonstrated that chemo mechanical prepared ion with 0.12% CHX solution significantly reduced the number of intracanal bacteria in teeth from patients with primary interradicular infections and chronic apical periodontitis.

However according to Shen Y (2011) Bacteria in mature biofilms and nutrient-limited biofilms are more resistant to CHX killing than in young biofilms. The results emphasize the importance of standardization of factors such as biofilm age when studying the comparative effectiveness of disinfecting agents against biofilm bacteria [17].

CONCLUSION

Both 0.5% Metronidazole and 2.0% Chlorhexidine appeared to be superior as final endodontic irrigants with higher antibacterial efficacy compared to saline.

RECOMMENDATIONS

Further investigations & researches are required in the following folds:

1. Various risk factors of ECC in the form of longitudinal studies.
2. Frequently updated epidemiological surveys for assessing prevalence of caries in general and ECC in particular need to be conducted in Egypt to help in planning oral health promotion programs targeting populations with utmost needs.

REFRANCES

1. Drury TF, Horowitz AM, Ismail AI, Maertens MP, Rozier RG, Selwitz RH. Diagnosing and reporting early childhood caries for research purposes. J. of pub. health dent. 1999;59(3):192-7.
2. Marchant S, Brailsford S, Twomey A, Roberts G, Beighton D. The predominant microflora of nursing caries lesions. Clin. Micro. rev. 2001;35(6):397-406.
3. Starr J, White T, Leroux B, Luis H, Bernardo M, Leitao J, et al. Persistence of oral Candida albicans carriage in healthy Portuguese. Molecular Oral Microbiology. 2002;17(5):304-10.
4. Schilder H. Cleaning and shaping the root canal. Dent Clin North Am. 1974;18:269-96.
5. Gao Y, Fan B, Cheung GS, Gutmann JL, Fan M. C-shaped canal system in mandibular second molars part IV: 3-D morphological analysis and transverse measurement. J. of endo. 2006;32(11):1062-5.
6. Leonardo M, Tanomaru Filho M, Nelson Filho P, Bonifácio K, Ito I. In vivo antimicrobial activity of 2% chlorhexidine used as a root canal irrigating soln. J.of Endo. 1999;25(3):167-71.
7. Peters OA, Roehlike JO, Baumann MA. Effect of immersion in sodium hypochlorite on torque and fatigue resistance of nickel-titanium instruments. J.of Endo. 2007;33(5):589-93.
8. Hong S-T, Bae K-S, Baek S-H, Kum K-Y, Shon W-J, Lee W. Effects of root canal irrigants on the push-out strength and hydration behavior of accelerated mineral trioxide aggregate in its early setting phase. J. of endo. 2010;36(12):1995-9.
9. Mitchell D. Metronidazole: its use in clinical dentistry. J.of Clin. Perio. 1984;11(3):145-58.
10. Marsh P, Martin M. Oral Microbiology. 1999; 4th edn. Wright. Oxford; 1999.
11. Gardner TB, Hill DR. Treatment of giardiasis. Clin. Micro. rev. 2001;14(1):114-28.
12. Gaetti-Jardim EC, Marqueti AC, Faverani LP, Gaetti-Jardim Júnior E. Antimicrobial resistance of aerobes and facultative anaerobes isolated from the oral cavity. J. App. Oral Sci. 2010;18(6):551-9.
13. Karaolanoglu S & Akgul H. The association between the DMFs index and levels of salivary streptococcus mutans and lactobacilli of subjects living in ErzurumTurkey. J Dent Sci 2010;5(2):70–4.
14. Mohammadi Z, Abbott PV. Antimicrobial substantivity of root canal irrigants and medicaments: a review. Aust. Endo. J. 2009;35(3):131-9.
15. Sassone LM, Fidel RAS, Fidel SR, Dias M, Hirata Junior R. Antimicrobial activity of different concentrations of NaOCl and hlorhexidine using a contact test. Bra. Dent. J. 2003;14(2):99-102.
16. Menezes M, Valera M, Jorge A, Koga-Ito C, Camargo C, Mancini M. In vitro evaluation of the effectiveness of irrigants and intracanal medicaments on microorganisms within root canals. Inter. Endo. J. 2004;37(5):311-9.
17. Shen Y, Stojicic S, Haapasalo M. Antimicrobial efficacy of chlorhexidine against bacteria in biofilms at different stages of development. J. endo. 2011;37(5):657-61.