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Original Article

Efficacy of Diode Laser in Root Canal Disinfection

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ABSTRACT

Background: Enterococcus faecalis tolerates chemomechanical preparation and intracanal medicaments and remains viable within the tubules of dentine. Irrigation of root canals plays an important role in debriding and disinfecting the root canal system. The most commonly used irrigants are sodium hypochlorite and hydrogen peroxide and combination of both. The present study was conducted to elucidate the efficacy of diode laser in disinfection of the root canal.**Materials and methods:** The present study was conducted for a period of 6 months the study included 30 extracted non carious premolar teeth. E. faecalis was incubated in brain heart infusion agar and the root canals were filled with this and incubated for 21 days at 37 degree. The first group was control group. In this group the teeth were cleaned and shaped and no irrigation was done. In group II, teeth were irrigated with endovac solution. 5.25% sodium hypochlorite solution was used for microirrigation. In group III, irrigation was done using diode laser. All the data was arranged in a tabulated form and analyzed statistically. SPSS software was used for analysis.**Results:** The mean colony forming units in Group I was 10^8 per ml, in group II it was 10^4 per ml and in Group III was 0 per ml. Group I demonstrated only 1% disinfection, Group II showed disinfection in 60% cases and Group III showed disinfection in 85% cases.**Conclusion**: In the present study, laser was efficacious in disinfection of the root canal compared to the standard techniques.

Keywords: disinfection, laser, microirrigation.

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INTRODUCTION

Root canal therapy includes removing vital and diseased pulp, necrotic dentin, and debris to remove microorganisms.[1-3] Enterococcus faecalis tolerates chemo-mechanical preparation and intracanal medicaments and remains viable within the tubules of dentine. [4,5]Therefore, effective delivery systems like Endovacm and Diode lasers.[4,6,7] have been introduced. Irrigation of root canals plays an important role indebriding and disinfecting the root canalsystem. The most commonly used irrigants are sodium hypochlorite and hydrogen peroxide and combination of both. Theirusefulness, good tissuessoftening and disinfectioncapacity, have beenseen indifferent researches. The amount of the irrigants to be used is still controversial and remains a topic of debate; various authors indorse a 5.25%concentration of sodium hypochlorite, while others use a lower concentration ofabout 3%or even less as 0.5%. [8] Sodium hypochloriteis an efficient agent against broad spectrum bacteria and for dissolution of vital as well as necrotic pulp tissue. However, Studies have also demonstrated that sodium hypochlorite has poisonous effects on vital tissues, that result in haemolysis, ulceration of skin and necrosis. The present study was conducted to elucidate the efficacy of diode laser in disinfection of the root canal.

MATERIALS AND METHODS

The present study was conducted for a period of 6 months in our clinic. The study included 30 extracted non carious premolar teeth. Radiographic confirmation at different angles was used to confirm the presence of single canal. Teeth with fractured roots, open apices, caries were excluded from the study. Disinfection of teeth was done according to OSHA regulations. Crowns of all teeth

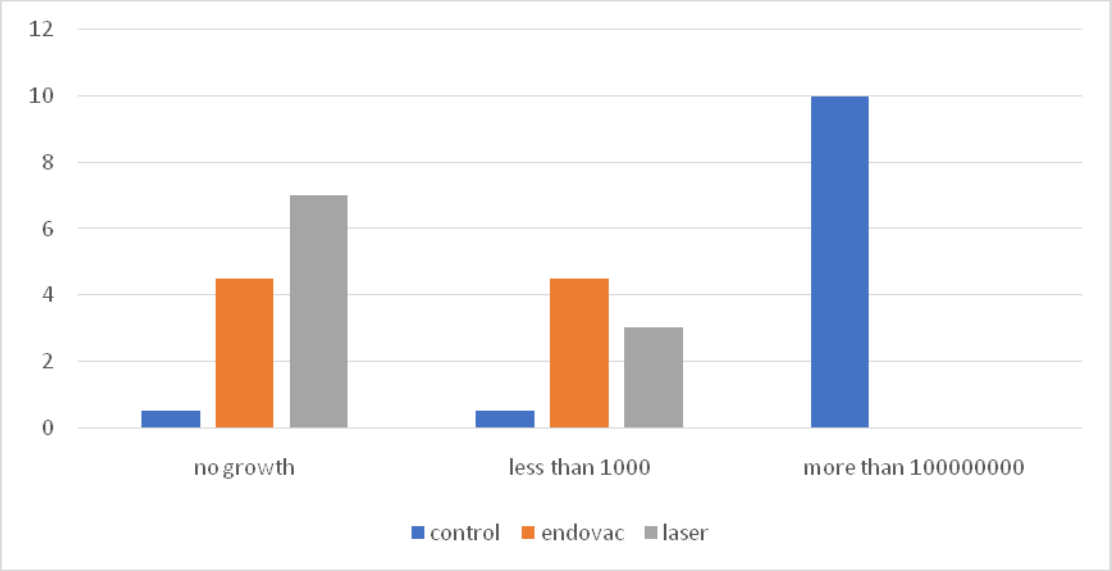
wereremoved. Determination of working length was done using digital radiograph and preparation was done upto 30K file for inoculation of bacteria. Nail varnish was used to seal the apices. Paper points was used to dry the canals and gamma radiation was used for sterilization of the canal. Inoculation with E.faecalis strains was done and incubation was done for 24 hours. E. faecalis was incubated in brain heart infusion agar and the root canals were filled with this and incubated for 21 days at 37 degree temperature. Positive growths were tested by using trypticase soy agar. The roots were randomly divided into three groups. Each group had 10 teeth each. The first group was control group. In this group the teeth were cleaned and shaped and no irrigation was done. In group II, teeth were irrigated with endovac solution. 5.25% sodium hypochlorite solution was used for microirrigation. In group III, irrigation was done using diode laser. Irrigant was placed in the canal using 27 gauge needle. 908nm diode laser was used in oscillating mode for disinfection. Paper points were used for collection of samples after disinfection and inoculated in brain heart infusion broth and incubated for 24 hours. The samples were transferred to petridishes and incubated for another 24 hours. All the data was arranged in a tabulated form and analyzed statistically. SPSS software was used for analysis.

RESULTS

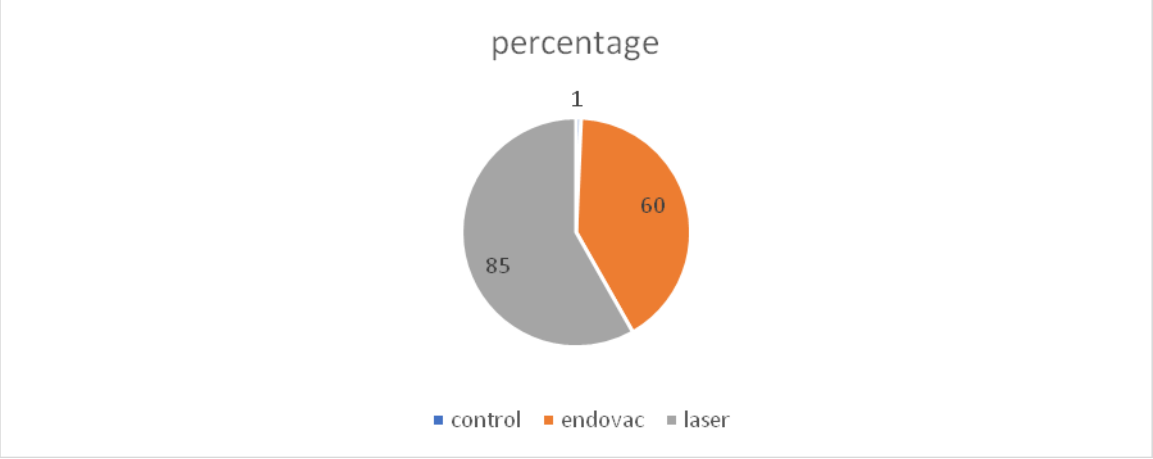
The study consisted of 30 premolar teeth. The mean colony forming units in Group I was 10^8 per ml, in group II it was 10^4 per ml and in Group III was 0 per ml. Statistical significant difference was observed in the three groups as the p value was less than 0.05. (Graph 1)

Graph 2 demonstrates the percentage overall disinfection. Group I demonstrated only 1% disinfection, Group II showed disinfection in 60% cases and Group III showed disinfection in 85% cases.

Graph 1: The colony forming units of bacteria formed using different irrigation techniques.



Graph 2: Overall decontamination



DISCUSSION

Microorganisms present in the root canal have been long identified as the primary reason in the occurrence of pulp and periapical diseases. [9] It is required to chemically remove the teeth with complex internal anatomy or other abnormalities that might get missed while instrumentation of the canals. Commonly used irrigants for root canal therapy include chlorhexidine with its broad-spectrum of antimicrobial action that has shown to illustrate action against vegetative bacteria, mycobacterium, has little action against fungi and viruses, and it also causes inhibition against spore germination. It is most efficient against gram-positive cocci, while less active against gram-positive and gram-negative bacteria. The antibacterial action of chlorhexidine is similar to that of sodium hypochlorite[10] and also exerts toxic actions on vital tissues. In the recent eras the use of lasers for endodontic procedures has been studied and proved to be efficacious in the root canal shaping and sterilization procedures; removing the smear layer and debris; and sealing of the tubules in the root canal walls. Combination therapy with irrigation solutions together or in series has been found to be more efficacious for disinfection of canal. [1]As per the study conducted by Manikandan et al., they concluded that E. faecalis shows formation of biofilm at pH between 7.3-12.3 and sodium hypochlorite has greater antimicrobial action than chlorhexidine on the biofilm. [11]As per the study by Moritz et al., he showed that an 890 nm diode laser showed disinfection of the root canal wall in an efficacious manner. [12]As per the present study, The mean colony forming units in Group I was 10^8 per ml, in group II it was 10^4 per ml and in Group III was 0 per ml. Statistical significant difference was observed in the three groups as the p value was less than 0.05. Group I demonstrated only 1% disinfection, Group II showed disinfection in 60% cases and Group III showed disinfection in 85% cases. The results of the present study were in accordance with the study conducted by Hockett et al., that concluded the Endovac and laser system had better ability to remove bacteria compared to the traditional irrigation system.[13] According to the Studies by Siu and Baumgartner, Mitchell et al., also showed that the Endovac System and laser are safer and is more efficacious in cleaning the root canal chiefly in the apical third region. [14,15]

CONCLUSION

Efficient and efficacious irrigating system is useful for appropriate endodontic treatment. In the present study, laser was efficacious in disinfection of the root canal compared to the standard techniques. Complete disinfection is mandatory for the success of root canal therapy and laser is an appropriate tool for root canal disinfection.

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