



## COMPARATIVE EVALUATION BETWEEN CHLORHEXIDINE AND LASER IN ROOT CANAL STERILIZATION IN PULPECTOMY OF PRIMARY TEETH

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### ABSTRACT

**Purpose:** The originality of the present study was to compare between chlorhexidine and laser in root canal sterilization in pulpectomy of primary teeth. **Methods:** The study sample was divided equally into two groups; **group A):** Thirty lower primary molars were disinfected using diode laser. **Group B):** Thirty lower primary molars were disinfected by chlorhexidine 2%. The samples were collected before sterilization and 2 day after its disinfection. **Results: A) laser group** The highest mean value of percentage of change was found in (Streptococcus mutants) (95.03%) followed by (Lactobacilli) (94.98%), (Porphyromonas gingivalis) (94.00%), (Fusobacterium) (93.99%), (Streptococcus salivarius) (93.98%) and (Actinomyces.sp) (93.32%), while the least percentage of change was found in (Enterococcus faecalis) (93.05). **B) Chlorhexidine group** The highest mean value of percentage of change was found in (Streptococcus mutants) (95.03%) followed by (Lactobacilli) (94.98%), (Porphyromonas gingivalis) (94.00%), (Fusobacterium) (93.99%), (Streptococcus salivarius) (93.98%) and (Actinomyces.sp) (93.32%), while the least percentage of change was found in (Enterococcus faecalis) (93.05%). **Conclusions:** Both technique of disinfection decrease bacterial count significantly while the 980 diode laser was more effective than 2% chlorhexidine.

### INTRODUCTION

Dental caries is a multi-factorial disease with a complex etiology. The primary objective of pulp therapy is to maintain the integrity and health of the teeth and their supporting tissues.<sup>(1,2)</sup> One of the most important aims of pulpectomy treatment is to eradicate or substantially reduce the microbial load in the root canal system. Approximately, 150 species of microorganisms are able to colonize in root canal. It has been reported that viable bacteria remain within the canal system even after mechanical preparation.<sup>(3)</sup> An ideal irrigation solution should be strongly antimicrobial but not toxic to the

periradicular tissues when extruded through the apical foramen. It should provide gross debridement, lubrication, the destruction of microbes, and the dissolution of tissues.<sup>(4)</sup> Chlorhexidine gluconate solutions in varying concentrations of (0.2-2%) have been recommended as an endodontic irrigants.<sup>(5)</sup> The laser is an effective for killing microorganisms because of the energy and wavelength characteristics. Laser irradiation has been introduced due to its potential to eliminate bacteria and thus improve Pulpectomy. Lasers have been found to be relatively effective in exerting antimicrobial action. The bacterial reduction has

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depended on radiation energy, bacterial species, time of radiation, and radiation frequency.<sup>(6)</sup> With the great progresses in the field of laser technology, semiconductor lasers such as diode laser are gaining increasing importance. The diode laser can be recommended for pulpectomy treatment because its wave length of 980nm which is within the infrared range, it also has thin, flexible light-conductor fiber.<sup>(7)</sup>

## MATERIALS AND METHODS

This study was designed as a cross-sectional a randomized clinical trial and it was carried out on thirty Egyptian children of both sex. The age of children was ranged from 4 to 8 years. The teeth included the study samples were divided equally into two groups according to the type of disinfectant agent:-

### **Group A):**

Thirty lower primary molars were disinfected using diode laser.

### **Group B):**

Thirty lower primary molars were disinfected by chlorohexidine 2%.

An aseptic technique was used throughout the pulpectomy, the molars should first be anesthetized and isolated by rubber dam then the patient was allowed to wait for 10-15 minutes before cavity preparation and pulp surgery were undertaken. A sterile pulpectomy tray was always available. Caries were removed with sterile high-speed round shaped rotating at ultrahigh speed (200.000 r.p.m.), burs with coolant. The operative field including the tooth, clamp, and surroundings were cleaned. After completing the access the operative field were cleaned and the canal was filled with sterile saline solution with care to not overflow, and a sterile #15 K-file was introduced to a level approximately 1-mm short of the root apex, based on diagnostic radiographs, then three sterile paper points were

consecutively placed in the canal to the same level. Each paper point was left in the canal for one minute. After one minute, the paper points were removed from the canals under complete aseptic condition and kept in a tube containing 9 ml neutral broth medium as a transfer medium to keep the viability of the aerobic microorganisms and cooked meat media to keep viability of anaerobic microorganisms

Group A: The canals were prepared and lased with 980nm of diode laser (sirolase) for 15 sec for 4 times then rinsed with saline; final sampling was done using three sterile paper point of the same size and transferred to microbiological lab for culture. This procedure carried out by enlarging the root canal opening up to ISO 30. After measuring the canal depth, firstly patient and working team was worn protective eye glass. Then an optical fiber with 200µm diameter and 1mm shorter than the working length is placed inside the canal, the optic fiber is then led in slow, circular, spiral-forming movements from the apical to the coronal part, while the laser is activated. The procedure should be repeated four times for 15 seconds. The fiber optic tip always kept moving when the laser is activated to avoid producing micro cracks, excessive temperature rise on the tooth surface, which can be detrimental to the tissues surrounding the tooth. The power should be set in the range of 1.5w.<sup>(8)</sup>

Group B: The canals were depreid, prepared and irrigated with 2% of CHX solution which kept for ten minutes. Then rinsed with saline, final sampling was done using three sterile paper point of the same size and transferred to microbiological lab for culture.

After disinfection and sampling, Metapex which contains a combination of calcium hydroxide and iodoform, is supplied in a premixed syringe with disposable tips, tips are inserted into the canals, the material extruded and the endodontic plugger used to condense the material, material is soft to manipulate and easily condenses in the canal. Pulp

chamber can then be filled with layer of cement and the remaining part filled with glass ionomer as final restoration .In both groups the tooth was prepared for chrome steel crown. After sample were collected. All specimens were transported as soon as possible to microbiological lab at microbiology department, faculty of medicine, Assuite University for culture on selective media.

**RESULTS**

**Effect of different disinfectant systems on percentage of bacterial count change in each bacterial type:**

1. **Enterococcus faecalis:** There was a statistically significant difference between Laser and CHX groups where (p<0.001).The highest mean value was found in Laser (93.05% ± 0.24) while the least mean value was found in CHX (72.02% ± 1.18) Fig (1).
2. **Fusobacterium nucleatum:** There was a statistically significant difference between Laser and CHX groups where (p<0.001).The highest mean value was found in Laser (93.99% ± 0.75) while the least mean value was found in CHX (63.84% ± 1.74). Fig (1).
3. **Porphyromonas gingivalis:** There was a statistically significant difference between Laser and CHX groups where (p<0.001).The highest

mean value was found in Laser (94.00% ± 0.15) while the least mean value was found in CHX (61.04% ± 1.98) Fig (1).

4. **Lactobacilli:** There was a statistically significant difference between Laser and CHX. groups where (p<0.001).The highest mean value was found in Laser (94.98% ± 0.66) while the least mean value was found in CHX (77.87%±0.36) Fig (1) .
5. **Actinomyces.sp:** There was a statistically significant difference between (Laser) and (CHX) groups where (p<0.001).The highest mean value was found in Laser (93.32% ± 0.42) while the least mean value was found in CHX (80.05% ± 0.64) Fig (1).
6. **Streptococcus mutants:** There was no statistically significant difference between Laser and CHX groups where (p=0.101).The highest mean value was found in Laser (95.03% ± 0.33) while the least mean value was found in CHX (92.03% ± 0.29) Fig (1).
7. **Streptococcus salivarius:-**There was no statistically significant difference between Laser and CHXgroups where (p=0.054).The highest mean value was found in Laser (93.98% ± 0.70) while the least mean value was found in CHX (84.95% ± 1.04) Fig (1).

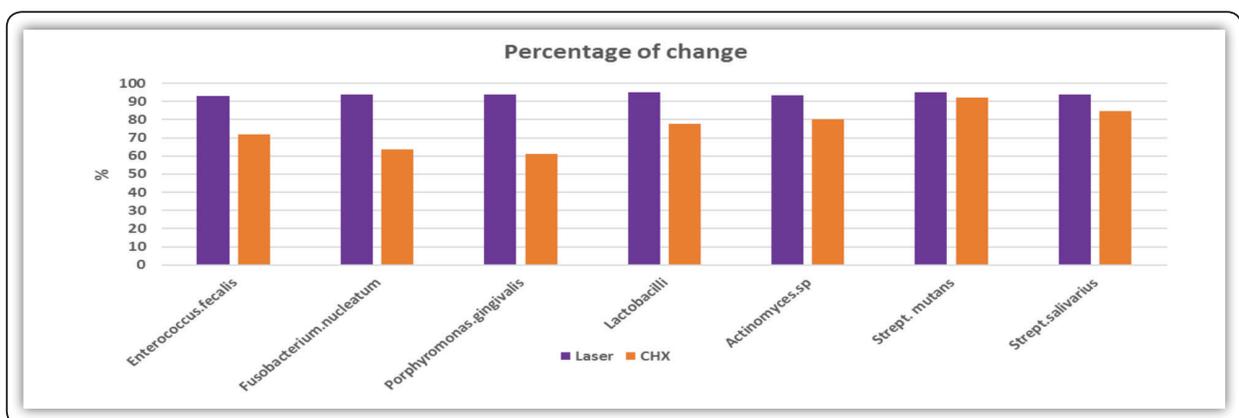


FIG (1) Column chart of mean values of percentage of change of different experimental group

## DISCUSSION

The main objective of pulp therapy is to retain primary tooth as a fully functional component in the dental arch to allow for proper mastication, phonation, swallowing, preservation of the space required for eruption of permanent teeth. The primary objective of pulpectomy is the disinfection of the root canal. <sup>(9)</sup>

In this study we compare the effect of CHX 2% and diode laser on disinfection of the root canal and their effect on bacterial population present in root canal<sup>(10,11)</sup> Diode laser with 980nm (sirolase advance) with a 200 µm fiber optic tip and set at a power of 1.5 W. Using an oscillatory technique. <sup>(12)</sup> The results of the present study have shown that although a significant decrease in bacterial count was obtained with two groups, Laser is more significantly effective when compared to 2% CHX. The superior bactericidal effect of diode laser irradiation could be attributed to its greater depth of penetration (up to 1000 µm into dentinal tubules) when compared to the penetration power of chemical disinfectants, which is limited to 100µm. <sup>(13)</sup>

The result of the present study was about; in group (A) LASER group; the percentage of change was nearly 93, 9%. No statistically significant difference was found between the different types of bacteria. In group (B) CHX group; The percentage of change was nearly 71.7%. Statistically significant difference was found between *P.gingivalis* & *F.nucleatum* and the remain bacteria. The results of the present study are in accordance with the studies done by Mohan PU et al 2016, <sup>(14)</sup> they tested APF gel, Propolis, Diode Laser, and 2% CHX against *S.mutants* and *Lactobacilli* bacteria. The disinfection with Diode Laser was found to be superior when compared to the other groups. The results of the present study also in accordance with the studies done by Naik RG et al 2017, <sup>(15)</sup> they compare the efficacy of 810 diode laser-assisted disinfection in comparison to conventional sodium hypochlorite

(NaOCl) in deciduous root canal disinfection. The result of this study show that total viable bacterial count was reduced to 97.46% after disinfection by 3% NaOCl and 100% after laser irradiation.

One of the studies which showed disagreement of the present findings result was conducted in Vivo by Kazem A et al, <sup>(16)</sup> who disinfect the canal by diode laser and three intracanal irrigants and find that the highest bacterial reduction in the canals was done by Naocl followed by %2 CHX% and the least bacterial reduction was for laser and MTAD respectively

## CONCLUSIONS

1. Both technique of disinfection decrease bacterial count significantly while the 980 diode laser was more effective than 2% chlorhexidine
2. Diode laser can be considered as an alternative technique for root canal disinfection.

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