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Ability of laser in removing gutta percha from root canal using chloroform and endosolv

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***Abstract*---**Background: Residual necrotic tissue or bacteria beneath gutta percha or sealer can be responsible for periapical inflammation or pain. The present study was conducted to the ability of laser in removing gutta percha from root canal using chloroform and Endosolv E. Materials & Methods: 60 freshly extracted permanent human maxillary central incisors with single and straight root canals were divided into 3 groups based on retreatment method used: group I- only diode laser; group II- diode laser along with chloroform as solvent and group III- diode laser along with Endosolv E as solvent. After completion of retreatment, roots were sectioned longitudinally and viewed under stereomicroscope at 10X magnification. The area of the remaining filling material in each half was measured. Results: The mean percentage area of remaining root canal filling material in group I was 18.2, in group II was 11.7 and in group III was 14.3. The

difference was significant (P< 0.05). Conclusion: Diode laser with chloroform and diode laser with Endosolv E were significantly more effective than only diode laser in the removal of gutta-percha from the root canal.

***Keywords*---**chloroform, diode laser, endosolv E.

Introduction

Retention of natural teeth in an asymptomatic clinical condition is one of the main goals of endodontic therapy. Endodontic treatment is a dental procedure in which the diseased or damaged pulp of a tooth is removed, and pulp space is filled with an inert material. In this procedure, before doing obturation tooth is biomechanically prepared and adequate irrigation is done to eliminate most of the irritants; as these irritants can cause damage, which may lead to failure of root canal treatment.[1] Residual necrotic tissue or bacteria beneath gutta percha or sealer can be responsible for periapical inflammation or pain. Thus, the main objective of nonsurgical retreatment is to remove all material filling from the root canal and to regain access to the apical foramen.[2] The techniques used to remove gutta-percha are varied and included the use of hand or rotary instruments with or without heat and solvents and/or ultrasound. According to various studies, failure rate is most commonly due to insufficient cleaning, untreated canals, inadequate filling or coronal leakage, postplacement errors, ledge formation, perforations, transportations, fractures and separated instruments.[3]

Laser is recommended for gutta-percha removal. Laser has been defined as a device which transmits light of various frequencies and is capable of generating immense heat and power when focused at close range. Studies have shown that laser can melt the gutta-percha material. Removal of root canal filling material by laser involves a combination of both photothermal and photoablation effects.[4,5] The present study was conducted to the ability of laser in removing gutta percha from root canal using chloroform and Endosolv E.

Materials & Methods

The present study comprised of 60 freshly extracted permanent human maxillary central incisors with single and straight root canals. Teeth were biomechanically prepared and then obturated. Teeth were then stored in 100% humidity at 37°C for 7 days. Teeth were divided into 3 groups based on retreatment method used: group I- only diode laser; group II- diode laser along with chloroform as solvent and group III- diode laser along with Endosolv E as solvent. After completion of retreatment, roots were sectioned longitudinally and viewed under stereomicroscope at 10X magnification. The area of the remaining filling material in each half was measured. Data thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

Results

Table I Distribution of patients

Groups	Group I	Group II	Group III
Method	Diode laser	Diode laser + Chloroform	Diode laser + Endosolv E
Number	20	20	20

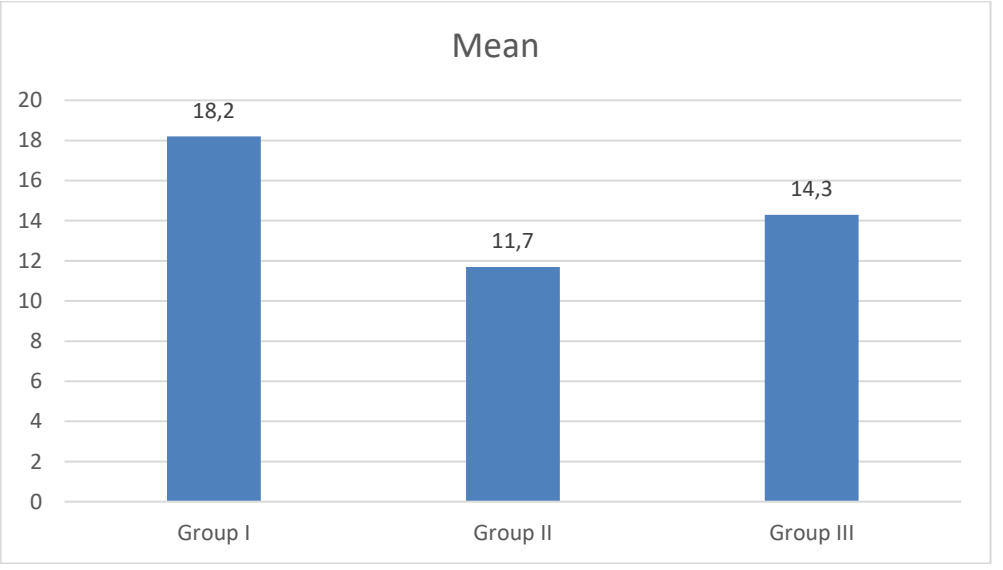
Table I shows that teeth were divided into 3 groups based on retreatment method used.

Table II Percentage area of remaining root canal filling material

Groups	Mean	P value
Group I	18.2	0.01
Group II	11.7	
Group III	14.3	

Table II, graph I shows that mean percentage area of remaining root canal filling material in group I was 18.2, in group II was 11.7 and in group III was 14.3. The difference was significant (P< 0.05).

Graph III Percentage area of remaining root canal filling material



Discussion

The major factors associated with endodontic failure are the persistence of microbial infection in the root canal system and/or the peri-radicular area.[6] Thus, root canal retreatment has largely replaced peri-radicular surgery for the management of persisting or emerging disease.[7] It is therefore important to

remove as much sealer and gutta-percha as possible during retreatment, to uncover remnants of necrotic tissue or bacteria that might set as the antigenic source.[8] Conventionally, the removal of gutta-percha using hand files with or without solvent can be a tedious, time-consuming process, especially when the root filling material is well condensed. Therefore, the use of rotary NiTi instruments in root canal retreatment may decrease patient and operator fatigue.[9] The present study was conducted to the ability of laser in removing gutta percha from root canal using chloroform and Endosolv E.

We found that mean percentage area of remaining root canal filling material in group I was 18.2, in group II was 11.7 and in group III was 14.3. Tasdemir et al[10] investigated the ability of three rotary nickel– titanium instruments and hand instrumentation to remove gutta-percha and sealer. Sixty freshly extracted human single-rooted teeth, each with one root canal, were instrumented with K-files and filled using cold lateral compaction of gutta-percha and AH Plus sealer. The teeth were randomly divided into four groups of 15 specimens each. Removal of gutta-percha was performed with the following devices and techniques: ProTaper, REndo, Mtwo and Hedstro¨m files. The specimens were rendered transparent and the area of remaining filling material on the root canal wall was measured using a computer image analysis program. The ProTaper group had less filling material inside the root canals than the other groups, but a significant difference was found between only the ProTaper and Mtwo groups ($P < 0.05$). The retreatment time for Mtwo and ProTaper was significantly shorter compared with R-Endo and manual instrumentation with Hedstrom files ($P < 0.001$). R-Endo was significantly faster than manual instrumentation ($P < 0.001$).

Devi et al[11] evaluated the gutta-percha removal from root canals with diode laser using chloroform and Endosolv E solvents. **T**eeth were randomly divided into three groups based on retreatment method used: Group 1-Only diode laser; Group 2-Diode laser along with chloroform as solvent; Group 3-Diode laser along with Endosolv E (Tetrachloroethylene) as solvent. After completion of retreatment, roots were sectioned longitudinally and viewed under stereomicroscope at 10x magnification. The results showed that all the laser groups left some filling material inside the root canal. However, the specimens retreated with diode laser along with chloroform (Group 2) left less filling material inside the root canals as compared to other groups.

Viducic et al[12] examined the use of an Nd:YAG laser in removing gutta-percha fillings from root canals when used in conjunction with eucalyptol, dimethylformamide (DMF) or no solvent. Root-canal fillings (sealer and gutta-percha) were removed with laser irradiation of 20 Hz/1.5 W from 30 roots randomly divided in three groups. In group 1, the solvent was eucalyptol; in group 2, the solvent was DMF; and in group 3, no solvent was used. Laser irradiation was performed until the temperature measured on the root surface increased by 4 degrees C over room temperature. The treatment was deemed complete when the apical foramen was reached with the optical fibre and a reamer. The samples were split longitudinally, and the area of remaining gutta-percha on the root-canal walls was determined with the aid of a computer program. The total number of laser pulses to achieve length and the highest temperature recorded was determined for each tooth. The average temperature increase in group 1 was 9.17

+/- 0.56 degrees C; in group 2, 9.56 +/- 0.28 degrees C; and in group 3, 8.29 +/- 0.41 degrees C. The shortest time to achieve length was in group 3 (6.4 +/- 0.49 min), then in group 1 (6.7 +/- 0.85 min) and group 2 (7.05 +/- 0.79 min). The area of remaining gutta-percha was the largest in group 2 (6.13 +/- 5.76%), whilst the smallest was for group 3 (4.69 +/- 4.03%), but the difference was not statistically significant. The number of pulses was not statistically significant between the groups.

Conclusion

Authors found that Diode laser with chloroform and diode laser with Endosolv E were significantly more effective than only diode laser in the removal of gutta-percha from the root canal.

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