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Original Article

Comparative Analysis of Efficacy of Mechanical Lateral Condensation Technique and Convention Lateral Condensation Technique for Obturation of Endodontic Canals

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ABSTRACT:

Background: Lateral condensation technique is one of the most common methods of root canal obturation. In conventional obturation methods, the tug-back in the gutta-percha master cone is recommended in order to create and maintain the apical seal. Tug-back is the slight back-pull or resistance to dislodgement of the gutta-percha master cone that is felt when it is removed from the canal. **Aim of the study:** To compare efficacy of Mechanical lateral condensation technique and Convention lateral condensation technique for obturation of endodontic canals. **Materials and methods:** The study was conducted in the department of Conservative dentistry and Endodontics of dental institution. For the study, we selected 50 extracted permanent maxillary central incisors with single canal and completed apex. Teeth with morphological and developmental anomalies were excluded from the study. The working length of all the teeth was standardized to 19mm. Biomechanical preparation (BMP) of the roots was done using hand K-files. The procedures on both the groups were performed by same operator to avoid any discrepancies. The obturation was done using size 30 gutta-percha master cone and size 15 gutta-percha accessory cones for both the groups. The weight of the obturated teeth was measured again. **Results:** A total of 50 extracted maxillary central incisors were used in the study. Teeth were randomly grouped into two groups with 25 teeth in each group. Teeth were weighed before and after the completion of obturation. The mean weight of gutta percha for Group LC was 8.11 ± 1.5 g and Group MLC was 12.31 ± 2.1 g. **Conclusion:** We conclude that Mechanical lateral condensation technique is superior to conventional lateral condensation technique in obturation of endodontic canals.

Keywords: Root canal, endodontic, lateral condensation, obturation.

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INTRODUCTION:

The goal of root canal filling is to completely obliterate the canal space with a stable, nontoxic material whilst at the same time creating a hermetic seal to prevent the movement of tissue fluids, bacteria or bacterial by-products through the filled canal.^{1, 2} To date the material most used in endodontics is gutta-percha in combination with a root canal sealer. The sealer provides the seal, not the gutta-percha, yet it has been reported that some sealers shrink upon setting whilst others are susceptible to breakdown. Obturation provides a seal that prevents reinfection of the canal and subsequent leakage into the peri-radicular tissues. It is suggested that the most common cause of endodontic failures is incomplete obturation of the root canal (60%).³

An important goal in filling the canal filling is to maximize the volume of root core material packed into the canal and to minimize the volume of root canal sealers. Currently, the two most popular gutta-percha obturation techniques are cold lateral condensation (LC) and warm vertical condensation (WVC).^{4, 5} Lateral condensation technique is one of the most common methods of root canal obturation. In conventional obturation methods, the tug-back in the gutta-percha master cone is recommended in order to create and maintain the apical seal. Tug-back is the slight back-pull or resistance to dislodgement of the gutta-percha master cone that is felt when it is removed from the canal.⁶ If coming from the apical third, this tug-back would be an indication of good fit.¹⁸ Although tug-back is necessary to

obturate the root canal, in some cases there are possibility of errors to fit the gutta-percha master cone into the 1 to 3 mm end of the root canal.⁷Hence, we planned the study to compare efficacy of Mechanical lateral condensation technique and Convention lateral condensation technique for obturation of endodontic canals.

MATERIALS AND METHODS:

The study was conducted in the department of Conservative dentistry and Endodontics of dental institution. The ethical approval for study was obtained from ethical committee of the institute before beginning the study. For the study, we selected 50 extracted permanent maxillary central incisors with single canal and completed apex. Teeth with morphological and developmental anomalies were excluded from the study. We kept the teeth immersed in normal saline from the day of extraction to the day commencing the study. The crowns of the teeth were cut off using a slow speed disc bur. The working length of all the teeth was standardized to 19mm. Biomechanical preparation (BMP) of the roots was done using hand K-files. The prepared teeth were randomly grouped into 2 groups with 25 teeth in each group, Group 1 and Group 2. In group 1, the obturation was performed using conventional lateral condensation technique (LC) employing finger spreaders and in group 2, the obturation was done using mechanical lateral condensation technique (MLC) employing a reciprocating handpiece for the same. The procedures on both the groups were performed by same operator to avoid any discrepancies.

The obturation was done using size 30 gutta-percha master cone and size 15 gutta-percha accessory cones for both the groups. The weight of the obturated teeth was measured again. The difference between the weight of teeth before and after the obturation showed the weight of gutta percha mass.

The statistical analysis of the data was done using SPSS version 11.0 for windows. The Chi-square test and Student’s t-test were employed to verify the statistical significance of the data. A p-value<0.05 was predefined to be statistical significant.

RESULTS:

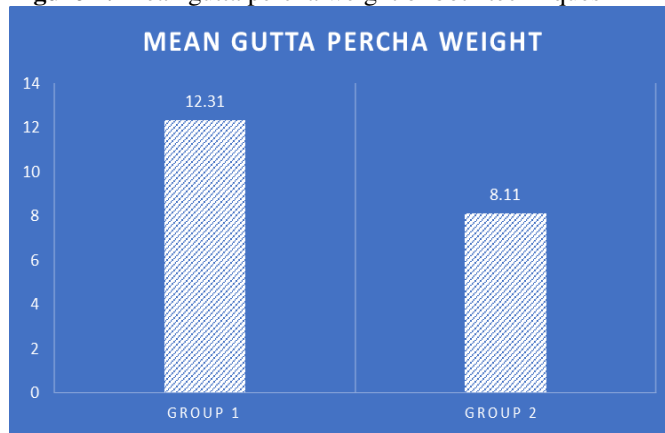
A total of 50 extracted maxillary central incisors were used in the study. Teeth were randomly grouped into two groups with 25 teeth in each group. Teeth were weighed before and after the completion of obturation.

Table 1: Comparative analysis of mean gutta percha weight between both techniques

Groups	Mean Gutta Percha weight	p-value
Group 1 (Mechanical lateral condensation technique)	12.31 ± 2.1 g	0.02
Group 2 (Conventional lateral condensation technique)	8.11 ± 1.5 g	

The difference between initial and final weight after obturation of teeth was calculated and a list was formulated for both the groups. The mean weight of gutta percha for Group LC was **8.11 ± 1.5 g** and Group MLC was **12.31 ± 2.1 g**. The difference in weight of both the groups was statistically significant with a p value of 0.02. [Table 1 and Figure 1]

Figure 1: Mean gutta percha weight of both techniques



DISCUSSION:

In previous studies, one method of evaluating the quality of root canal obturations has been the visual inspection of the obturation material, either with the aid of a microscope or by radiographs. Due to the subjective nature of these examinations, a more objective quantitative method was designed to compare different obturation techniques. In the present study, a few changes were made to refresh the method and to mimic a more sensible clinical circumstance. We observed that mean weight of Gutta-percha was significantly higher in Group MLC as compared to Group LC depicting that density of gutta-percha is more efficient with MLC technique. The results were statistically significant. The results were compared with previous studies and results were consistent with previous studies. Gilhooly RM et al evaluated and compare the radiographic quality and sealability of root fillings in extracted human teeth using lateral condensation of gutta-percha or multiphase gutta-percha obturation. A total of 108 freshly extracted human, mature single-rooted teeth were divided into two identical groups of 54 teeth on the basis of root canal shape. The canals were prepared to a minimum 0.055 taper and enlarged to size 35 at the apex. All root canals were flushed with 17% EDTA solution and 2.5% NaOCl to remove the dentinal smear layer. The canals of one group were obturated using cold lateral condensation of gutta-percha and the canals of the other group were filled using a warm multiphase gutta-percha obturation technique. The extrusion of sealer and/or gutta-percha through the apex of the teeth was recorded using a simple yes/no scheme. The sealability of each technique was assessed by a dye penetration method. The radiographic quality of obturation

was determined for each canal using a four-point scale. Root canals filled by multiphase obturation had significantly more extrusion of sealer and gutta-percha than canals filled by lateral condensation. Canals filled by multiphase gutta-percha obturation had significantly less apical dye leakage than those obturated by lateral condensation. Lateral condensation achieved significantly better scores for radiographic quality than multiphase obturation from the bucco-lingual view. They concluded that under laboratory conditions multiphase gutta-percha had better sealability but poorer radiographic quality than lateral condensation. Shahriari S et al compared apical dye penetration using lateral condensation technique (LC) and LC technique with a reciprocal handpiece (mechanical lateral condensation or MLC) as a new method. Forty-eight human extracted straight canine teeth were used. After crown amputation, the teeth were randomly divided into four experimental groups of 10 teeth each and two negative and positive control groups of 4 teeth each. The groups were as follows: IA, 10 obturations completed by operator A using the LC technique; Group IB, 10 obturations completed by operator B using the LC technique; Group IIA, 10 obturations completed by operator A using the MLC technique; and Group IIB, 10 obturations completed by operator B using the MLC technique. All roots were placed in 2% methylene blue dye and centrifuged at 3000 rpm for 3 minutes. Following centrifugation, the roots were cut along their long axis and evaluated under a stereomicroscope to measure the depth of dye penetration. A t-test showed that the teeth which were filled by the MLC technique had less dye penetration in comparison with LC technique. This in vitro study illustrates that canals obturated with the MLC technique had superior apical seal than canals filled with the LC technique.^{8,9}

Saatchi M et al compared the apical microleakage in a new obturation technique (true-tug-back) with two other obturation techniques (lateral condensation and chloroform dip technique). In this in vitro study 102 single canal teeth were selected. The crowns were removed, and the canals were prepared using step-back technique. The master apical file was K-file #40. The teeth were divided into 3 experimental groups of 32 teeth. First group were obturated with lateral condensation technique and second group with chloroform dip technique and the third group with true-tug-back technique. Six teeth were used as control group. The teeth were placed in incubator at 100% humidity and 37°C for three days. The roots of the teeth were coated with two layers of nail varnish except for the apical 2 millimeter. Teeth were placed in Methylene blue 2% for one week. The teeth were sectioned vertically and the depth of maximum dye penetration for each tooth was recorded by stereomicroscope. Data were analyzed using ANOVA and Duncan test. The mean liner dye penetration differences between lateral condensation group (6.88 ± 4.06 mm) and chloroform dip technique group (7.16 ± 3.37 mm) were not statistically significant. The differences between true-tug-

back group (3.15 ± 0.52 mm) and two other groups were statistically significant. The results of this study showed that the true-tug-back technique can improve apical seal. Further studies are needed for this purpose. Abedi H et al compared the weight of root canal filling material used in a new lateral condensation technique named mechanical lateral condensation (MLC) with that of conventional lateral condensation technique (LC). This new technique uses reciprocal handpiece. In this experimental study, 40 human extracted straight canine teeth were used. After crown amputation, root canals were prepared with 18 mm in length. The teeth were randomly divided into four experimental groups; each group was consisting of 10 teeth. The teeth in groups IA and IB were filled by LC technique. The teeth in groups IIA and IIB were filled by MLC technique and using a finger spreader that placed in a reciprocating-action handpiece to laterally condense cold gutta-percha, creating space for accessory cones. All of the roots were weighted before and after obturation and the difference demonstrated the weight of gutta-percha mass. The data were analyzed by t-test. The mean weight for MLC obturations was 10.82 ± 0.025 g compared with 7.37 ± 0.035 g for that of LC technique. The difference was statistically significant. This study showed that MLC technique requires more gutta-percha mass than LC technique.^{10,11}

CONCLUSION:

Within the limitations of the study we conclude that Mechanical lateral condensation technique is superior to conventional lateral condensation technique in obturation of endodontic canals.

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