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ORIGINAL ARTICLE

ASSESSMENT OF SEALING ABILITY OF THREE DIFFERENT OBTURATION TECHNIQUES: A COMPARATIVE STUDY

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ABSTRACT:

Background: Root canal therapy is one of the common dental procedures performed these days. The success of endodontic therapy is directly related to the sealing of the root canal system, by means of a three-dimensional hermetic endodontic filling. A variety of techniques have been developed to provide the proper adaptation of the gutta-percha root canal walls, aiming the complete filling of the root canal system. Hence; we planned the present study to evaluate and compare the efficacy and sealing ability of Lateral condensation, Obtura II, and GuttaFlow obturation techniques in patients undergoing root canal therapy. **Materials & methods:** The present study included assessment of 30 freshly extracted maxillary central incisors with intact crowns. All the teeth samples were divided broadly into three study groups; Group I: Teeth specimen obturated with Lateral condensation technique, Group II: Teeth specimen obturated with Obtura II technique and, Group III: Teeth specimen obturated with GuttaFlow technique The teeth were stored in distilled water during the entire study. Conventional access cavities to the pulp chamber were prepared. Obturation was done in all the three groups following techniques assigned to their respective groups. Sectioning of the root was done at different levels and following parameters were assessed: Area of voids (AV), Number of sections with voids and the area of voids was calculated as a percentage of the canal area in the sections. All the results were analyzed by SPSS software. **Results:** No. of sections observed in group I, II and III were 15, 9 and 25 respectively. The mean area of voids was found to be 1.6142, 1.0222 and 2.9325 respectively. Significant results were obtained while comparing the percentage frequency of voids in between the three study groups. **Conclusion:** in comparison to the other two study groups, the best adaptation with less number of voids was exhibited by Obtura II techniques.

Key words: Gutta Flow, Lateral, Obturation,

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INTRODUCTION

Root canal therapy is one of the common dental procedures performed these days. The success of endodontic therapy is directly related to the sealing of the root canal system, by means of a three-dimensional hermetic endodontic filling.[1] The primary objective of the endodontic obturation in root canal treatment is to prevent the ingress of microorganisms or fluids, from both oral cavity or periapical area, and also refrain the growth of any residual bacteria left in the canal system. An inadequate seal might result in contamination of the canal spaces, thus leading to periapical disease.[2, 3] The combination of gutta-percha with a layer of endodontic sealer is the most commonly used material for root canal obturations. A variety of techniques have been developed to provide the proper adaptation of the gutta-percha root canal walls, aiming the complete filling of the root canal system.[4, 5] Hence; we planned the present study to evaluate and compare the efficacy and sealing ability of Lateral condensation, Obtura II, and GuttaFlow obturation techniques in patients undergoing root canal therapy.

MATERIALS & METHODS

The present study was conducted in the department of conservative dentistry and included assessment of 30 freshly extracted maxillary central incisors with intact crowns. Ethical approval was taken from the institutional ethical committee and written consent was obtained after explaining in detail the entire research protocol. Teeth that were excluded from the study included those showing incompletely formed apex, evident root fracture, extreme calcifications, and extreme canal curvatures. All the teeth samples were divided broadly into three study groups;

Group I: Teeth specimen obturated with Lateral condensation technique

Group II: Teeth specimen obturated with Obtura II technique

Group III: Teeth specimen obturated with GuttaFlow technique

The teeth were stored in distilled water during the entire study.

Conventional access cavities to the pulp chamber were prepared. Gates Glidden drillswere used to flare the coronal third of each canal. The working length was defined to be 1 mm short of the apical foramen, determined by inserting a size #15 K-file into the canal until the tip of the file was just visible at the apical foramen. Patency of the canal was maintained throughout the procedure by passing a #10 K-file approximately 0.5 mm through the apex. Pro Taper files were used for doing the instrumentation of the canal. After preparation, the canals were then dried with paper points. Obturation was done in all the three groups

following techniques assigned to their respective groups. Sealing of the access cavities in all the three groups was done using temporary filling materials. These specimens after obturation were stored at 37°C for one week to allow adequate time for the obturated materials to set. Sectioning of the root was done at different levels and following parameters were assessed:

- Area of voids (AV)
- Number of sections with voids
- Location of the voids (either in the filling core or along the root canal wall)
- The area of voids was calculated as a percentage of the canal area in the sections

All the results were analyzed by SPSS software. Chi-square test and student t test were used for the assessment of level of significance. P-value of less than 0.056 was taken as significant.

RESULTS

Table 1 shows the mean of the area of voids in the three study groups. No. of sections observed in group I, II and III were 15, 9 and 25 respectively. The mean area of voids was found to be 1.6142, 1.0222 and 2.9325 respectively. **Table 2** highlights the P-value and Percentage frequency of voids in the three study groups. Percentage of voids observed in group I, II and III were 22, 14 and 53 percent respectively. Significant results were obtained while comparing the percentage frequency of voids in between the three study groups.

Table 1: Mean of the area of voids in the three study groups

Groups	No. of sections	Mean
I	15	1.6142
II	9	1.0222
III	25	2.9325

Table 2: P-value and Percentage frequency of voids in the three study groups

Groups	Percentage of voids	95% confidence interval		p-value
		Upper bound	Lower bound	
I	22	17	31	0.02*
II	14	8	19	
III	53	47	57	

*: Significant

DISCUSSION

An ideal root canal filling should fill the entire root canal system in three dimensions and form a homogenous mass.[6, 7] Warm vertical (WV) compaction of gutta-percha was proposed in the 1960s, and this technique has been shown to lead to satisfactory results in terms of homogeneity and to fill a high percentage of the root canal area with gutta-percha material.[8] However, the armamentarium required for this technique is considerably more expensive than is required for cold lateral (CL) compaction.[9, 10] Another criticism of this thermoplasticized technique is that apical control of the filling material can be difficult at times, and some material may be extruded beyond the apical foramen.[11] Hence; we planned the present study to evaluate and compare the efficacy and sealing ability of Lateral condensation, Obtura II, and GuttaFlow obturation techniques in patients undergoing root canal therapy.

In the present study, we observed that best adaptation with less number of voids was exhibited by Obtura II technique in comparison with the other two techniques (**Table 1, Table 2**). Anantula K et al evaluated and compared the sealing ability between the conventional cold lateral condensation technique and two different obturating techniques — Obtura II and GuttaFlow under a stereomicroscope at 40× magnification. Sixty single-rooted teeth were selected and the canals were shaped with ProTaper rotary files. Irrigation was performed with 5% sodium hypochlorite and 17% EDTA. The teeth were then separated into three groups depending on the type of obturation technique. Group A (n = 20) — obturated using the Lateral condensation technique and AHplus sealer, Group B (n = 20) — obturated with Obtura II injection-molded thermoplasticized technique and AHplus sealer, and Group C (n = 20) obturated using GuttaFlow. After storing the teeth in 100% humidity for seven days at 37°C, the roots of the teeth were sectioned at five levels. The sections were then observed under a stereomicroscope at 40 × magnification and the images were analyzed for area of voids (AV) and frequency of voids. The 95% confidence intervals (CI) were calculated. The lowest mean of AV was recorded in the Obtura II group, 1.0%. This was statistically and significantly different from the GuttaFlow group, 3.0%. There was no significant difference between the Obtura II group and the lateral condensation group, 1.6% with regard to the area of voids, but there was a statistically significant difference between the Lateral condensation and GuttaFlow groups. The GuttaFlow group showed the maximum number of voids, 56%, which was significantly higher than those in the lateral condensation, 26%, and Obtura II, 15% groups. The Obtura II technique utilizing the injection-molded thermoplasticized gutta-percha had better adaptability to the canal walls when compared to the GuttaFlow obturation and lateral condensation techniques.[12] Cueva-Goig R assessed the sealing ability of different root canal filling techniques. Root canals from 30 teeth were shaped with Mtwo and divided in three groups; A, standard lateral condensation with size 35 and 20 gutta-percha points; B, standard lateral condensation and injected gutta-percha; C, single gutta-percha point (standardized 35 Mtwo), continuous wave technique and injected gutta-percha. Root surfaces were covered with nail varnish, except for the apical 2 mm, and submerged in a NO3Ag2 solution; apical stain penetration was measured in mm. A and B groups showed stain leakage in the 90% of the cases, whereas it was of 80% for group C. Stain leakage intervals were 1-5 mm for groups A and B and 1-3 mm for group C. There were no statistically significant differences between the three studied groups. All the analyzed root canal filling techniques showed

some apical stain leakage, without significant differences among them.[13]

Ho ESS et al compare the density of gutta-percha root fillings obturated with the following techniques: cold lateral (CL) compaction, ultrasonic lateral (UL) compaction, and warm vertical (WV) compaction. Thirty-three extracted mandibular first molars, with two separate mesial canals in each, were selected. After instrumentation, the canals were stratified into three groups based on canal length and curvature, and underwent obturation with one of the techniques. No sealer was used in order to avoid masking any voids. The teeth were imaged pre- and post-obturation using micro-computed tomography. The reconstructed three-dimensional images were analyzed volumetrically to determine the amount of gutta-percha present in every 2 mm segment of the canal. P values < 0.05 were considered to indicate statistical significance. The overall mean volume fraction of gutta-percha was 68.51 ± 6.75% for CL, 86.56 ± 5.00% for UL, and 88.91 ± 5.16% for WV. Significant differences were found between CL and UL and between CL and WV ($p < 0.05$), but not between UL and WV ($p = 0.526$). The gutta-percha density of the roots treated with WV and UL increased towards the coronal aspect, but this trend was not noted in the CL group. WV compaction and UL compaction produced a significantly denser gutta-percha root filling than CL compaction. The density of gutta-percha was observed to increase towards the coronal aspect when the former two techniques were used.[14]

CONCLUSION

From the above results, the authors concluded that in comparison to the other two study groups, the best adaptation with less number of voids was exhibited by Obtura II technique.

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