COMPARISON OF APEX SEALING ABILITY OF OBTURA II, GUTTA FLOW 2 AND LATERAL CONDENSATION TECHNIQUE

Ajit Hindlekar, Srinidhi Surya Raghavendra, Pratik Kotadia, Kinjal Gathani

ABSTRACT

This study compares the apical sealing efficacy of three obturation techniques. Lateral condensation is taken as the standard and Obtura II and Gutta Flow 2 is compared with it. Aims and Objectives: To compare the apical sealing ability of Thermoplasticized (Obtura II), Single cone (Gutta-Flow 2) and cold lateral condensation. Materials and Methods: Sixty mandibular premolars were randomly divided into three groups for three types of obturation techniques. Group I: Cold lateral condensation (n=20), Group II: Obtura II (n=20), Group III: Gutta-Flow 2 (n=20). Roots were placed in 2% methylene blue dye for 72 hours. All the roots were sectioned longitudinally with a diamond disc under continuous water-cooling. Both surfaces were then directly examined under a stereomicroscope at 20X magnification. The linear extent of dye penetration was measured in millimeter from the apical end of the preparation. Results: Group I showed the maximum dye penetration when compared with Group II and Group III and the difference was statistically significant. Conclusion: Gutta-Flow 2 when used in combination with Gutta-percha cone has the good apical sealing ability and shows promise as an obturation technique.

Keywords: Apical Sealing; Condensation Technique; Sealing Ability

Introduction

According to Ingle the most common causes of endodontic failure is incomplete obturation. He reported that 59% endodontic failure were due to leakage in the canal seal.12 Endodontic treatment includes three crucial steps, debridement, disinfection and obturation of the root canal system.3 Proper cleaning and shaping of the root canal system and complete filling with a biologically inert and dimensionally stable material is a major requirement of root canal treatment.4 Root canal filling is said to be ideal if it is dense, well-adapted and filled three-dimensionally with a homogeneous mass of core material.5 Several materials and techniques have been used to achieve three dimensional filling.6

Gutta-percha in combination with sealer is the most commonly used filling technique.7,8 Filling the root canal with gutta-percha and sealer using cold lateral condensation remains the standard with which newer techniques can be compared.9 The thermoplasticized injectable obturation techniques were introduced in 1967 by Schilder to improve the homogeneity and surface adaptation of the gutta-percha.10 The high-temperature technique, Obtura II system (Obtura Spartan, Fenton, Missouri, USA) consists of an apparatus for heating and injecting thermoplasticized gutta-percha for root canal obturation.11 Although a more homogeneous filling was produced, voids were still present and also, there is an issue of shrinkage in case of thermoplasticized gutta-percha.12

Gutta-Flow is a combination of gutta-percha and sealer which is flowable at room temperature. It can be used as a sealer as well as solid obturating paste without solid core. Gutta-Flow contains gutta-percha particles in powder form and sealer of polydimethylsiloxane.13

Gutta-Flow 2 is a further development of the silicone sealer Gutta-Flow, which has a stiffer consistency. They were developed to overcome possible problems regarding retention of the apical part of the root canal filling. Gutta-Flow 2 is delivered within a capsule or within an autumix syringe.14 According to the manufacturers, it has a better seal and good adaptability and expands (0.2%) on setting, thus enhancing the adaptation to root canal.15,16

Limited studies are reported comparing the apical sealing ability of cold lateral condensation, thermoplasticized (Obtura II) and Gutta-Flow 2. The aim of this study was to evaluate the apical sealing ability of three different obturation techniques – cold lateral condensation, thermoplasticized (Obtura II) and Single cone (Gutta-Flow 2). The null hypothesis taken was that all the techniques had similar apical sealing ability.

Materials and Method

Sixty-two human mandibular premolars indicated for orthodontic extraction were selected for the study. Teeth with straight single oval canals confirmed after bucco-lingual and mesio-distal radiographs were selected. Teeth with root fractures or cracks, resorptions, dilacerations or root caries were excluded. Teeth were cleaned of surface deposits using ultrasonic scaler and were stored in 3% Sodium hypochlorite (Prime Dental Products, Mumbai, India) for 1 week. After 1 week, teeth were removed, washed with water and stored in normal saline until use.

Specimen preparation: Teeth were decoronated at cemento-enamel junction using diamond discs under water spray. Patency was established and working length was determined by introducing No 10 K file (Mani, Japan) into the canal until the tip was seen at the apex. This length was measured, and working length was kept 1mm short of this length. Glide path was created for the use of the rotary file till No 20 K file. The roots were prepared using ProTaper NiTi files (Dentsply Maillefer, Ballaigues, Switzerland). Files were sequentially used and canals were enlarged upto F3 ProTaper file. Recapitulation was done with No 10 K file, and irrigation during preparation and between files were done with 1ml of 3% sodium hypochlo-
rite (Prime Dental Products, Mumbai, India). After root canal preparation, all specimens received a final flush of 17% EDTA (Dent Wash, Prime Dental Products, Mumbai, India) and normal saline to remove the smear layer. Canals were dried with paper points.

Sixty teeth were randomly divided into three groups, 20 teeth in each depending upon obturation technique and two were used as controls, one positive and one negative control.

Group I: Cold lateral condensation (n=20): A standardized gutta-percha (Sure Dent Corporation, Korea) master point corresponding to master apical file was fitted in the root canal at the working length. It was checked for tug-back and re-confirmed with radiograph. AH plus sealer (Dentsply DeTrey GmbH, Germany) was applied to the root canal wall using lentulospiral. The apical part of the master point was then coated with sealer and introduced slowly into the root canal until the working length was reached. Lateral condensation was done using standardized finger spreaders (Mani Inc, Japan).

Group II: Obtura II (n=20): Apical stop was confirmed with a greater taper master cone corresponding to the last file used. The canal was coated with AH plus sealer using a lentulospiral. The gutta percha pellets were loaded into the syringe of Obtura II thermoplasticized system and the temperature control of the unit was adjusted to 180 degree. A 23 gauge injection needle was placed within 3.5-5 mm of the apical plug. The canal was filled with the thermoplasticized gutta percha in increments. Preselected pluggers were used to compact the softened gutta percha before the addition of next increment till the canal is completely filled.

Group III: Gutta-Flow 2 (n=20): Gutta-Flow 2 (Coltene Whaledent GmbH, Germany) was provided in a double barrel auto-mix system with delivery tip. Master point was selected based on master apical file. Plastic delivery tip of Gutta-Flow 2 was inserted into the canal passively till 3mm short of working length. Now the tip was introduced into the canal and material injected. At the same time, tip was retracted simultaneously till material is seen at coronal third. Master point was coated with Gutta Flow 2 material and placed inside the canal till desired length with to and fro movement. Material was allowed to set and excess of the gutta-percha cone was removed. After obturation of the root canal with respective materials, the teeth were filled with conventional Glass Ionomer Cement (GC Corporation, Japan). Specimens were stored at 37oc and 100% humidity for 24 hrs to allow the sealer to set.

Apical Dye Leakage: Each root was coated with two layers of nail paint except the apical 3 mm and allowed to dry. Roots were placed in 2% methylene blue dye (Triveni Interchem Pvt Ltd) for 72 hours. In the negative control teeth, the tooth was fully coated with nail varnish and positive controls were left as it is. Samples were suspended by dental floss in a test tube such that, the apical 2-3 mm remained immersed in 2% aqueous solution of methylene blue for 24 hours at 370 C. After 24 hours, the teeth were removed from the dye and rinsed with tap water.

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<th>Group (I)</th>
<th>Groups (J)</th>
<th>Mean Difference (i-j)</th>
<th>SD error</th>
<th>Sig.</th>
<th>95% Confidence Interval</th>
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Table 1: Descriptive Statistics for Apical Micro-leakage for each group

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Table 2: Comparison between the groups (Post Hoc test)
Comparison of apical sealing ability of Obtura II, Gutta Flow 2 and lateral condensation technique

All the roots were sectioned longitudinally with a diamond disc under continuous water cooling, taking care to include the apical foramen in the fracture line. Both surfaces were then directly examined under a stereomicroscope (Wuzhou New Found Instrument Co. Ltd, China) at 20X magnification. The linear extent of dye penetration was measured in millimetre from the apical end of the preparation.

Results

ANOVA and post hoc Tukey’s test was used to calculate ‘P’ value among different test groups. Dye penetration was seen in positive control, whereas dye penetration was absent in negative control, suggesting the model was appropriate for the present study.

The results (Table 1) showed that Group I showed the maximum dye penetration when compared with Group II and Group III.

Inter group evaluation (Table 2) of leakage showed statistically significant difference between Group I and Group II. The difference was also statistically significant when Group I and Group III were compared. The results were not statistically significant when Group II and Group III were compared (p<0.005).

Discussion

Chemomechanical preparation fails to eliminate the bacteria present deep inside the dentinal tubules. These bacteria may remain active and the toxins secreted by them may reach the periapical tissues if the apical seal is not adequate. Thus, creating the proper apical seal helps to prevent the micro-organism and its toxins to cause periapical pathology.

Gutta-percha is most commonly used as a solid core obturating material, as it satisfies majority of Grossman’s criteria. However, it has got some disadvantages like lack of rigidity and adhesiveness, and it is easily displaced under pressure.

AH+ plus sealer is an epoxy resin–based sealer, which has long setting time, better adhesion and penetration to root dentin.

Lateral condensation technique, even though a commonly used technique, has some limitations like lack of homogeneity of obturation, increased number of voids and poor adaptation which possibly explains the highest mean apical dye infiltration with this technique.

Teeth obturated with thermoplasticized gutta-percha presented the lowest mean apical infiltration. This can possibly be due to better adaptation to the canal walls and no voids. The observations of the present study are similar to the results of a previous study by Brosco VH et al.

The results of the present study is however, not in agreement with those obtained by Gencoglu N, Garip Y, Bas M et al in 2002. In their study, no statistically significant difference in the dye penetration was noted after 48 hours between the lateral condensation group and the continuous wave of condensation group.

Statistically significant difference was seen between Group I and Group III. This finding of our study can be justified on the basis of the setting expansion of the Gutta-Flow 2 system combined with the close adaptation of the gutta-percha cone against the instrumented canal wall enhancing the sealer flow and adaptation against the dentinal walls in the apical part of the root canal. The presence of the powdered gutta-percha in Gutta-Flow 2 may have helped in the better bonding between the Gutta-Flow 2 and the gutta-percha core material.

The results of the present study are, however not in agreement with those obtained by E Pitout and TG Oberholzer in 2009.22 No statistically significant difference in the dye penetration results was noted between the lateral condensation group and GuttaFlow group in their study.

There was no statistically significant difference between the teeth obturated by thermoplasticized obturation technique using AH Plus sealer (Group II) and the teeth obturated by single cone technique using Gutta-Flow system II (Group III). This finding was in accordance with a study by Monticelli F et al in 200723 stating that Gutta-Flow obturation system employing the single cone technique was as effective in sealing the apex as the continuous wave of condensation technique.

Conclusion

Gutta-Flow 2 in combination with Guttapercha cone shows a good apical sealing ability comparable to thermoplasticized obturation technique and better than Lateral Condensation technique.

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