

Original Article

New Self Curing Root Canal Filling Material: Gutta flow 2

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Abstract:

Aim: To evaluate the apical microleakage with Gutta Flow 2 as an obturating material with or without use of master gutta percha cone as compared to lateral compaction with gutta percha and zinc oxide eugenol sealer. **Methods:** A total of thirty extracted human mandibular molars were decoronated, sectioned and instrumented with rotary protapers size F1. Teeth were randomly divided into three experimental groups of 10 each labelled as Group G1 (lateral compaction), G2 (guttaflow 2 with master cone), and G3 (guttaflow 2 without master cone). All the teeth were given two coats of nail varnish leaving 2 mm at the apex. Teeth were immersed in India ink for 48 hrs, demineralized and cleared with methyl salicylate using Robertson's technique. The apical dye penetration was examined using a stereomicroscope. **Results:** The mean dye penetration was recorded to be maximum for guttaflow 2 without master cone i.e. 0.69 mm whereas the mean dye penetration value for all canals obturated with guttaflow 2 with master cone was found to be minimum i.e. 0.35 mm which was comparable to that of lateral compaction technique i.e. 0.36. On statistical analysis, no statistical significant differences were revealed in terms of sealing ability of guttaflow 2 with master cone and lateral compaction whereas it was statistical significant between guttaflow 2 without master cone and guttaflow 2 with master cone, and guttaflow 2 without master cone and lateral compaction. **Conclusion:** The apical sealing ability of Guttaflow 2 with master cone was comparable to the gold standard of lateral compaction.

Keywords: Gutta Flow 2, Obturation, Sealing Ability, Dye Leakage, Lateral Compaction.

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INTRODUCTION

Successful root canal treatment depends on proper diagnosis, adequate cleaning and shaping and finally three-dimensional obturation of the root canal system. It is generally accepted that incomplete root canal obturation which may permit penetration of microorganisms and their toxins is an important cause of endodontic failures. The Washington study of

endodontic success and failures has attributed nearly 60% of endodontic failures to incomplete obturation of root canal system.¹ Various materials have been advocated for obturation e.g. gutta percha, silver points etc. Gutta percha has universally been accepted as the gold standard for root canal filling materials.² However, formation of interfaces between sealer - gutta percha cones and sealer -

internal tooth structure which on setting cause shrinkage of sealer and thus voids are created resulting in the absence of complete seal.³ Gutta flow 2 is a first sealer/guttapercha combination which is flowable at room temperature that can be used as sealer as well as obturating paste without a solid master cone. Gutta-flow contains gutta-percha particles in powder form, with particle size of less than 30 μm , and sealer (polydimethylsiloxane).⁴ The manufacturer claims a better seal and good adaptability because of good flowability and the fact that this material expands slightly (0.2%) on setting, enhancing its adaptation to root dentin walls.^{5,6} The aim of present study was to evaluate the apical microleakage with Gutta Flow 2 as an obturating material with or without use of master gutta percha cone as compared to lateral compaction with gutta percha and zinc oxide eugenol sealer.

MATERIALS AND METHOD

Thirty freshly extracted human mandibular molars (n=10 for each group) with closed apices were collected. A single operator (duly trained) performed the whole procedure for standardization of technique.

The Criteria for Specimen Selection

- They should have Round canals
- They should have Completely formed apices
- Root curvature not exceeding 10 degrees.
- Should not have cracks, root caries or root resorption.
- Should have single apical foramen.

PREPARATION OF SAMPLE

All the selected teeth were immersed in 5.25% sodium hypochlorite solution for 24 hours to remove adhered tissues. Calculus and surface deposits if any were removed. Then selected teeth were sectioned into mesial and distal halves. The mesial roots thus obtained were decoronated using a high speed fissured

bur and water. Conventional access to the root canal system was performed using high-speed diamond burs. The working length was established. Root canals were prepared using a crown down pressureless technique with Rotary Protaper (Dentsply) up to size F1 with reduction handpiece (Anthrogyr, Sybron Endo) of 1:64 reduction.²⁶

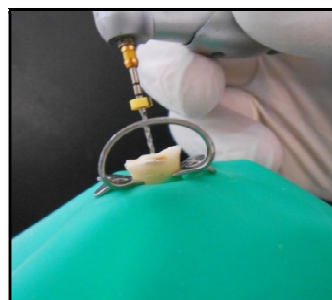


Figure 1: Access to the root canal system using high-speed diamond burs.

GROUPING:

30 teeth were randomly assigned to 3 groups, 10 teeth in each according to obturation technique.

Group I: Cold lateral compaction with ZOE sealer

ZOE sealer was mixed and applied into the canal, following which master cone coated with sealer was placed up to the working length, and tug back achieved. Compaction and accessory cone insertion continued with subsequent shorter accessory cone insertion, until the spreader reached no further than 2-3 mm into the canal.

Group II – Gutta-flow2 with master cone

The selected F1 Protaper gutta percha point was inserted to working length, before the guttaflow 2 was mixed according to manufacturer's instruction. Then, the material was gently dispensed into the apical one third of canal. After this, guttaflow 2 was placed directly onto the master cone which was then placed into the canal up to working length. Finally, the master point was seated into the canal.

Group III – Gutta-flow2 without master cone

The needle of Gutta flow2 was inserted into the root canal up to the level 2-3 mm short of working length . The trigger was pulled slowly and backfill was completed up to the root canal orifice. During obturation, the needle was pushed back simultaneously by gutta flow 2 paste being filled.

APICAL DYE LEAKAGE

After obturation of the root canals with the respective materials, the teeth were filled with Intermediate Restorative Material (IRM) (Caulk, Dentsply). Samples were then placed in an incubator for 48 hours at 37 C and 100% humidity to allow the sealer to set. Following obturation, the root surfaces of all samples were coated with two full layers of nail varnish except 2 mm apically. Teeth were then immersed in India ink for 2 days; in an upright position such that the apices of roots did not touch the floor of the container.²⁶The specimens were then washed under tap water for half an hour to remove any excess dye. The nail paint was

removed with acetone. The specimens were then cleared using Robertson’s technique.⁷ The extent of apical dye penetration in all the three groups was measured from apical constriction in millimeters using a Stereomicroscope (10x magnification)

RESULTS

The overall data (table 1) showed that the experimental groups exhibited different degrees of dye leakage. The highest leakage value was seen among samples of Group III which were the samples obturated using gutta flow 2 without master cone.This was followed by samples obturated by the lateral compaction.

ANOVA test and Tukey test ²⁶ was used to calculate ‘P’ value among different test groups (P<0.001 indicates a significant difference among different groups). Analysis showed there was significant difference between (group I vs group III) and (group II vs group III) whereas (group I vs group II) showed non significant difference between themselves.

Table 1: Descriptive analysis of Extent of Dye penetration in millimeters(mm)

Group	N	MEAN	SD	MINIMUM	MAXIMUM
I	10	0.36	0.22	0.1	0.7
II	10	0.35	0.27	0.0	0.8
III	10	0.69	0.21	0.4	1.0
Total	30	1.40	0.70	0.5	2.5

	Sum of squares	Degree of freedom	Mean square
Between groups	0.7487	2	0.3743
Within groups	1.558	27	0.05770
Total	2.307	29	

Table 2: Comparison of Lateral comp .vs Gutta flow with and without cone

Tukey's Multiple Comparison Test	Mean Diff.	q	Significance (p < 0.05)	Summary
Lateral comp .vs Gutta flow	0.01000	0.1316	No	Ns
Lateral comp. vs GF without cone	-0.3300	4.344	Yes	*
Gutta flow vs GF without cone	-0.3400	4.476	Yes	*

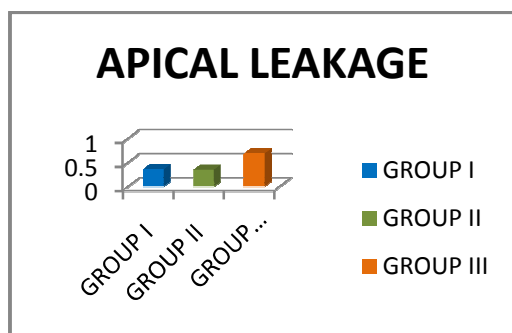


Figure 1: Bar graph showing apical leakage in three different groups.

DISCUSSION

Microorganisms present inside root canals may remain active in the dentinal tubules even after vigorous chemomechanical preparation. Thus, perfect apical sealing is desirable to prevent the remaining bacteria and their endotoxins from reaching the root apex.⁸ The microbial irritants and products of pulp tissue degeneration are the prime causes for pulpal demise and peri-radicular pathologies. Thus, the best possible cleaning and shaping coupled with an obturation technique that provides a 3-dimensional seal of the root canal system is recommended.⁹ Various endodontic materials have been advocated for obturation. Gutta-percha is by far the most universally used solid core obturation material. Although not the ideal filling material, it satisfies majority of Grossman's criteria. Gutta-percha, however, has few disadvantages like lack of rigidity and adhesiveness, ease of displacement under pressure, which are often overshadowed by its advantages.¹⁰ Lateral compaction of gutta-percha has remained the most widely used method of obturating root canals and is also often used as a control for evaluating sealing ability of new obturation techniques. Its advantages include predictability, relative ease of use, conservative preparation and controlled placement of materials. Disadvantages include lack of homogeneity of gutta-percha mass, increased number of voids and sealer pools, and less adaptation to canal walls

and irregularities.¹¹ Irrespective of different obturation materials and technique available, microleakage remains to be the most crucial cause of endodontic failure. Studies by Ingle indicated that 58% treatment failures were due to incomplete obturation.¹² In the present study, saline was used for the storage of freshly extracted teeth because it does not influence chemical and physical properties of human dentin.¹³ Mesial roots of human mandibular molars were selected, because a previous study had found that the rounded cross section of mesial root canals enabled rotary Protapers (Dentsply) to effectively clean and shape the root canal system without leaving any uninstrumented area, while maintaining the original canal shape at the same time.¹⁴ A New Self Curing Root Canal Filling Material i.e. Gutta Flow 2 was tested in the present study for its ability to provide three dimensional sealing for root canals. For the dye leakage evaluation, India ink was chosen over other dyes because its particles remain stable during the process of decalcification and clearing of teeth.¹⁵ Its small particle size (3 microns) further ensures that no bacteria may enter where this dye cannot, because most bacteria are much larger than its size.¹⁶ Pathomvanich and Edmunds recommended 48-72 hours of dye exposure to allow maximum dye penetration in root canals, which was duly incorporated in our methodology.¹⁷ The mean dye penetration was maximum for G3 [Gutta flow without master cone] (0.69 mm) whereas the mean dye penetration value for all canals obturated with Guttaflow (G2) was found to be minimum i.e. 0.35 mm, while being almost similar to G1 (Lateral compaction, 0.36 mm). Decreased leakage scores in G1 in this study could be greater spreader penetration. Since master cone used in this study was not in close approximation with the canal walls, it could have led to greater spreader penetration within 1-2

mm of working length, and adequate compaction of the master cone in the apical portion of the canal, thereby leading to less apical leakage.^{18,19} The most probable explanation for low mean leakage scores in G2 (0.35 mm, with range of 0.00-0.8 mm) would be the setting expansion and good adaptability with gutta percha cones. A high value of mean leakage score (0.69 mm) was observed in the Gutta Flow without master cone i.e. group (G3), with range of (0.4-1 mm). The cause for the high leakage scores would be poor condensation of the material because of absence of solid master cone upto apex of root. Guttaflow's biocompatibility and low tissue toxicity²⁰⁻²², low water sorption and solubility²³, antimicrobial resistance due to presence of silver particles²⁴, and adequate radiopacity²⁵ further recommend it as an acceptable alternative obturation material.

CONCLUSION

The apical sealing ability of Guttaflow 2 with master cone is comparable to the gold standard of lateral compaction. Apical sealing ability of Guttaflow 2 in the apical root region is acceptable, and in fact quite remarkable, in comparison Gutta Flow 2 without master cone. From the results of the present study it can be safely concluded that Gutta flow 2 with master cone is a good alternative to lateral compaction with sealer.

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