COMPARISON OF APICAL SEALING ABILITY OF GUTTA FLOW 2 WITH TRADITIONAL GUTTA PERCHA: AN IN-VITRO STUDY

[1]Dr. Reeti Rana, [2]Dr. Tamanpreet Kaur, [3]Dr. Anurag Aggarwal, [4]Dr. Sarita Bhardwaj, [5]Dr. Divyangana Thakur, [6]Dr. Mehak

Article History: **Received:** 12.02.2023 **Revised:**22.04.2023 **Accepted:** 24.04.2023

ABSTRACT

Aim: The purpose of this study is to compare the apical sealing ability of Gutta Flow 2 with traditional Gutta percha using Endoflas sealer in mandibular premolar- An In-Vitro study using lateral condensation.

Material & methodology: A total of 100 intact human single rooted mandibular pre molars were collected and decoronated. Biomechanical preparation was done using hand files uptill size 40. Then the samples were divided into three experimental groups of 25 samples each: Group 1 - Obturation done only with GuttaFlow 2, Group 2 - GuttaFlow2 + master cone gutta percha (40/02), Group 3 - Endo Flas Sealer + master cone (40/02), Group 4 - Endo Flas sealer +Master cone & Lateral condensation. After obturation teeth were sealed with temporary cement and were stored at 37^{o}C 24 hours. Nail varnish was applied on all surfaces of the tooth except apical 3mm of root. Specimens were immersed in 2% methylene blue dye for 24 hours and then were rinsed. Longitudinally sectioning of roots was done. Degree of microleakage was determined using stereomicroscope.

Results: Study showed statistically significant difference among the groups ($p<0.05$) with maximum dye penetration in Group 1, followed by Group 3, Group 4 and Group 2.

Keywords: Gutta Flow2, Sealer, Microleakage, Obturation, Master cone, Endoflas Sealer.

[1]Consultant Endodontist Private Practioner, Chandigarh, India
[2,6]Reader, [4]Professor & Head, [5]Senior Lecturer, Department of Conservative Dentistry & Endodontics, Swami Devi Dyal Hospital & Dental College, Golpura, Panchkula, India
[3]Professor, Department of Conservative Dentistry & Endodontics, Bhojia Dental College & Hospital, Baddi, India

Corresponding author: Dr. Tamanpreet Kaur

DOI: 10.48047/ecb/2023.12.5.496

INTRODUCTION

Successful endodontic treatment requires the removal of pathologic micro-organisms by thorough chemo-mechanical means followed by three dimensional obturation to prevent ingress and egress of fluids to prevent bacterial contamination or re-growth.1 Every single step of root canal treatment has its own important role, however obturation or the filling of the root canal is the key factor in obtaining success in root canal treatment.2

The gold standard material for canal space obturation is the gutta- percha cone with sealer. Gutta-percha does not bond with the wall of the root canal; hence the use of sealer with good adapted gutta- percha is essential in obtaining adequate endodontic treatment result.2,3

Sealers play an important role in sealing the root canal system with entombment of remaining microorganisms and filling of inaccessible areas of the prepared canal. Newer generation sealers are being engineered to improve their ability to penetrate into dentinal tubules or bond to both the dentin and core material surfaces.1,4

GuttaFlow is a modern expertise in silicone polymer technology, it is a mixture of guttapercha powder, poly-dimethylsiloxane and silver particles. It has a capacity to expand slightly when sets and also it has increased flowability allowing for good adaptation to the root canal walls and to the gutta-percha. It 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.5,6,7

GuttaFlow 2 is a further development of the silicone sealer GuttaFlow, which has a stiffer consistency. GuttaFlow 2 is available in a capsule or within an automix syringe.8

The physical properties of root canal sealers are inadequate therefore vertical or lateral compaction of Gutta Percha is required to ensure that the Gutta Percha occupies most of the space of the root canal, while the thin layer of sealer provides the seal. Although cold lateral condensation is an accepted method of root canal obturation its ability to create a perfect seal has been questioned.8

Microleakage continues to constitute a main reason for failure of root canal therapy and achieving an adequate seal is one of the most important goals in endodontics. Xu et al. discussed a non-destructive model that measures the leakage of glucose molecules quantitatively by using a spectrophotometer.12

Hence the purpose of this study is to compare the apical sealing ability of GuttaFlow 2 with traditional Gutta percha using Endoflas sealer in mandibular premolar using lateral condensation.

MATERIALS AND METHODS

Freshly extracted 100 intact human single rooted mandibular pre molars with well intact roots and closed apices and oval canals without caries or root fractures were collected from the department of Oral and Maxillofacial Surgery of Swami Devi Dyal Hospital and Dental College, Panchkula. All the selected teeth were cleaned, washed, polished with pumice and were stored in distilled water.Teeth were decoronated using diamond disc. The working length was determined by no. 15 k file. Biomechanical preparation was done using hand files uptill size 40. Canals were irrigated with 2ml 17% EDTA for 3 minutes and 2ml 3% sodium hypochlorite for 1 minute followed by a final rinse of 2ml normal saline. After completion of the biomechanical preparation of root canals, samples were divided into three experimental groups of 25 samples each:

- Group 1 - Obturation done only with GuttaFlow 2(Coltene) (n=25): GuttaFlow 2 was provided in a double barrel automix system with delivery tip. Plastic delivery tip of GuttaFlow2 was inserted into the canal and material was injected. At the same time, tip

was retracted simultaneously till material was seen at coronal third. Material was allowed to set and excess material was removed.

- Group 2 - GuttaFlow2 + master gutta percha (40/02) (n=25): GuttaFlow2 was mixed as manufacturers instructions. After the root canals were dried with paper points, GuttaFlow2 was dispersed on mixing pad and embedded into the root canals with the master gutta percha cone and insertion to the working length. Overabundance gutta-percha was expelled with a hot plugger.
- Group 3 - Endo Flas Sealer + master cone (40/02)(n=25): Endo Flas sealer was mixed according to the manufacturer's instructions and placed into canal using a lentulospiral and master cone was selected to fit the canal snugly. Master gutta percha cone was coated with sealer and seated, and the coronal surplus of gutta-percha was removed with a heated instrument.
- Group 4 - Endo Flas sealer + Lateral condensation (n=25): A standardized GP master point was selected and introduced into the root canal to full working length and was checked for tugback criteria. Endoflas sealer was mixed according to the manufacturer's instructions and applied to the canal wall using lentulospiral. The master cone was then coated with a sealer and introduced slowly into the root canal until the working length was reached. Lateral condensation was performed using standardized finger spreaders. After obturation teeth were sealed with temporary cement (cavit) and were stored at 37ºC and 100% relative humidity for 24 hours. Nail varnish was applied on all surfaces of the tooth except apical 3mm of root and were immersed in 2% methylene blue dye for 24 hours. Teeth were thoroughly rinsed in water. Longitudinally sectioning of roots was done using diamond disc in a bucco-lingual direction to obtain two symmetrical halves. Degree of microleakage was determined using stereomicroscope. Statistical analysis was done.

Figure showing Gutta Flow 2 sealer

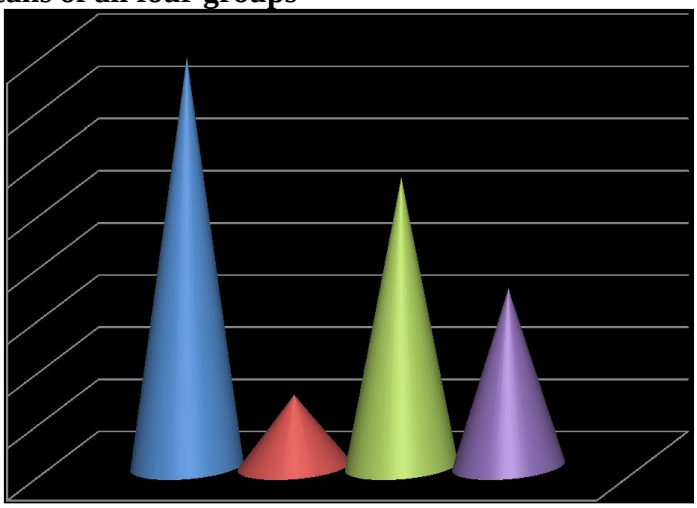
RESULT

Table: Showing mean and standard deviation of all four groups

	Group 1	Group 2	Group 3	Group 4	P value
MEAN	7.85	1.37	5.54	3.41	0.000
Std. deviation	0.67	0.53	0.66	0.56	

The above table results shows the inter-group comparison among the groups using ANOVA test. The result shows statistically significant difference among the groups ($p<0.05$) with maximum dye penetration in Group 1, followed by Group 3, Group 4 and Group 2.

Graph showing means of all four groups



DISCUSSION

Lateral compaction of gutta-percha is the most commonly used method of obturating root canals and is also used as a control for comparing sealing ability of new obturation techniques. The merits of lateral compaction include predictability, relative ease of use, conservative preparation and controlled placement of materials. The problems associated are the lack of homogeneity of gutta-percha mass, more number of voids and sealer pools, and less adaptation to canal walls and irregularities.[14,17] The technique can be used in most clinical situations and provides for length control during compaction **(Gilhooly et al., 2001; Shahi et al., 2007)**.

A new established silicon-based root canal filling material, GuttaFlow (Coltene Whaledent) was recently introduced in endodontic clinical practice. The new material is a modification of the RSA (RoekoSeal Automix) which has been shown to provide a consistent seal over a period of 18 months. According to the manufacturer GuttaFlow contains very small Gutta Percha particles in powder form, with a particle size of less than 30μm, and sealer in its mass. Furthermore, the manufacturer claims a better seal and good adaptability because of the increased flowability and the fact that this material expands slightly on setting. Also it has been shown that this material has adequate adaptability to root canal walls. The properties of which has been improved by adding nano-silver particles and powdered GP to create guttaflow.[9]

In the present study, the mean dye penetration was found to be minimum for Group 2 (1.37 mm) [GuttaFlow 2+Master Gutta Percha (2%)].These findings can be explained on the basis of the setting expansion of the GuttaFlow 2 system combined with the close adaptation of the gutta-percha cone against the prepared root canal wall promoting the sealer flow and adaptation on the dentinal walls in the apical part of the root canal. The presence of the powdered gutta-percha in GuttaFlow 2 helps in the better bonding between the GuttaFlow 2 and the gutta-percha core material.[18]

Mean dye penetration was found to be maximum for Group 1[GuttaFlow 2](7.856 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.[14] The presence of silicone in the polydimethylsiloxane-based GuttaFlow 2 sealer, which possibly produces high surface tension, thus making its spreading on dentin difficult.1 A significant difference with GuttaFlow 2 ($P<0.05$) which is in agreement with a study conducted by Ozok et al.[19] In harmony with other studies GuttaFlow 2 exhibited maximum apical leakage.[20] The reason the authors speculated that this thixotropic sealer could flow under the pressure applied by the

inserted gutta-percha particles between the cone and the dentinal wall leading to inferior seal.[21]

Filling with a master cone with a larger taper may be advantageous in that a larger and more uniform mass of gutta-percha is introduced that potentially has less sealer entrapped in the filling mass. Because of the close proximity of the gutta-percha cone to the prepared canal walls, a potential detriment is the inability of a spreader or plugger tip to predictably penetrate to within 1 to 2 m of the working length. This could result in inadequate compaction of the master cone in the apical portion of the canal causing a potential deficiency in the seal of the canal. Using an in vitro apical leakage model, Allison et al. found that teeth in which a spreader tip could be inserted within 1 mm of the working length with the master cone in place had considerably less apical leakage than did teeth in which the distance between the spreader tip and working length was greater.

CONCLUSION

Within limitations of the study, it can be concluded that GuttaFlow 2 in combination with Gutta percha shows a good apical sealing ability with lateral compaction technique comparable to sealers when used alone. Further studies are required to come to a final analysis that which material is best to obturate the canals.

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