

EVALUATION OF SEALING ABILITY OF DIFFERENT OBTURATION TECHNIQUES BY CONFOCAL MICROSCOPE: AN IN- VITRO STUDY

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ABSTRACT

Aims: The aim of this study is to evaluate the sealing ability of three root canal filling materials using a confocal microscope.

Methods and Materials: Thirty human first premolars with intact roots, extracted for orthodontic purpose, were selected for the study. Root canal treatment was done in all the specimens and randomly divided into three groups (ten teeth in each group) and obturated with three different obturating materials (i.e. Thermafil, Pro-Points and Gutta Flow). All the specimens were subjected to thermocycling and then stored in 100% humidity at 37°C for 48 hours. Sealing ability was checked using Confocal Microscope Thermafil.

Statistic analysis: Done by using tukey test and ANOVA.

Result: The sealing penetration into dentinal tubules were observed more in Thermafil as compared to Pro-Point and Gutta Flow. Conclusion: Study concluded that Thermafil is the better material for obturation as it exhibits higher depth of sealing penetration than Pro-Points and Gutta Flow.

KEYWORD: Sealing, Gutta Flow, Pro-Points, Thermafil, Confocal Microscope.

INTRODUCTION: The clinical success of endodontic treatment dependent on proper access, cleaning, shaping, disinfection and sealing of root canals. Three dimensional sealing ability of obturating material leads to decrease the risk of apical microleakage & hence increases the success rate of endodontic treatment.[1] Johnson (1978) introduced concept of carrier based thermoplasticized gutta-percha obturation technique involving the obturation of the root canal with heated alpha phase gutta-percha on a carrier. The root canal filling paste called Gutta Flow (Coltène/Whaledent, Altstätten, Switzerland) is a mixture of gutta-percha powder, poly dimethylsiloxane and silver particles with a particle size of less than 30 micron, and sealer in its mass. Its capacity to expand slightly on setting and its increased flow ability

allow for good adaptation to the root canal walls and to the gutta-percha. Pro-Points have a two component design, with a central core to provide good handling characteristics and a hydrophilic polymer coating, which radially expands to seal the canal when hydrated in the root canal. This gentle expansion occurs within the first 4 hours after placing the point into the canal.[2] **METHODS** The selected samples were de-coronated at twelve millimeter from the apex for standardization with a low-speed diamond disc under continuous water spray. Chemo- mechanical debridement of the root canal was done by removal of pulp and canal patency was maintained by passing with an ISO size 15 K-file. The working length was established by reducing 0.5 mm from the radiographic apex. Instrumentation was performed with a crown down technique using Hyflex EDM rotary instrument system. All canals were prepared to ISO size 30. The canal is irrigated between each instrument with 2 ml 5% NaOCl for 1 minute and final flush of 2 ml 17% EDTA (pH7.7) was done for 3 minute. Finally, the canals were washed with 2 ml of normal saline with 27 gauge leur-lock syringe. After completion of instrumentation, the root canals were dried with ISO size 30 paper points and checked for patency. The prepared teeth were randomly divided into 3 groups of 10 samples each i.e. Group

I:	Thermafil	with	AH	Plus	Sealer	Group
II:	Pro-Points	with	AH	Plus	Sealer	Group
III:	Gutta	Flow	with	AH	Plus	Sealer

The canals were dried with paper points and coated with AH Plus sealer using lentulo spiral. Master cone was selected, checked for tug back and coated with sealer which was mixed with Rhodamine B fluorescent dye to an approximate concentration of 0.1%, and placed in the canal. All the specimens were obturated with conventional gutta-percha, Thermafil obturators and Gutta Flow and Pro-Point syringe according to manufacturer instructions. After the completion of obturation all the teeth were wrapped with moist gauze to maintain the relative humidity at 37°C for 48 hrs for the proper setting of the sealer.

The specimens were transversely sectioned at the mid-point of the coronal, middle and apical third of each root. Samples were examined with a Confocal Laser Scanning Microscopy (CLSM) (Carl Zeiss, Germany) at magnification of 10X. The depth and penetration of sealer into dentinal tubules measured and evaluated.

Statistics Data were summarized as Mean ± SD (standard deviation). Groups were compared by oneway analysis of variance (ANOVA) and the significance of mean difference between the groups was done by Tukey's post hoc test. Mean microleakage of three groups were compared which wasp

RESULTS

The amount of microleakage was minimum with Thermafil (0.01-0.12 mm) as compared to ProPoint (0.17-0.30 mm) and Gutta Flow (0.11-0.23 mm).

Table 1: Comparison of Microleakage.

THERMAFI L	PROPOINT	GUTTA FLOW	F value	P value
0.050±0.029 (0.01-0.12)	0.230±0.035 (0.17-0.30)	0.173±0.039 (0.11-0.23)	212.60	<0.001

Numbers in parenthesis indicates the range(min-max)

On comparison of mean microleakage between the groups Thermafil has got minimum microleakage (P<0.001).

Table 2: Comparison of Microleakage of groups Thermafil.

Comparison	Mean Difference	q	P value	95% CI of Difference
THERMAFIL vs PRO POINT	-0.18	28.5 4	p<0.00 1	-0.2018 to - 0.1590
THERMAFIL vs GUTTA FLOW	-0.12	19.4 6	p<0.00 1	-0.1444 to - 0.1016
PRO POINT vs GUTTA FLOW	0.06	9.08	p<0.00 1	-0.03604 to - 0.07876

DISCUSSION

Root canals have a complex anatomy which can result in endodontic failure due to inappropriate sealing of lateral or accessory canals, voids or curved roots. Herbert Schilder described the final objective of endodontic procedure as being the “total obturation of root canal space” or “filling the radicular space three dimensionally”. To fulfill the criteria several newer obturating materials have been introduced which have successfully reduced the rates of endodontic failures.[3] In this research Pro-Points, Gutta Flow and Thermafil obturating materials have been used which shows efficacious results after obturation of root canal. In Pro-Point an expansion(44%) was seen after four hours of obturation. Pro-Point being hydrophilic in nature is a unique obturating system. It can form hydrogen bond to the polar sites present, enabling expansion within the polymer chains. The rate and extent of this expansion is controlled as a part of manufacturing process. The expansion occurs with a miniscule force that is claimed to be well below the reported tensile stress of dentin. The slight positive pressure against the canal wall that is created forms a seal that is believed to be virtually impermeable to bacterial microleakage.[4] An active polymer is there in AH Plus sealer which controls the degree of swelling. The sealer is dimensionally stable and non-resorbable inside the canal. Calcium hydroxide and hydroxyapatite are the by-products of the setting reaction of the sealer, rendering the material both anti-bacterial while setting and very biocompatible once set.[5] Gutta Flow is based on silicone polymer technology. It is composed of gutta-percha powder, polydimethylsiloxane matrix, silicone oil, paraffin oil, platinum catalyst, zirconium dioxide, nano silver and coloring agent. It is a two in one cold filling material and sealer combination that is easily dispensed and provides an excellent 3-dimensional filling of the root canal.[6] The physical properties of Gutta Flow are ideal for a root canal obturation. The sealer part of Gutta Flow is highly thixotropic, and with its fine grain size (Plus) because of its easy handling, adhesion, creates good apical sealing ability, and high penetration into dentinal

tubules. Where as Pro-Points and Gutta Flow showed good adhesion but apical sealing ability is compromised as compared to Thermafil. [5] However, in clinical conditions, there is presence of dynamic nature of periapical tissue which could be different from the in-vitro situation. Further long- term studies are needed for these methods. **CONCLUSION** Study concluded that Thermafil showed statistically significant higher depth and percentage of sealer penetration into dentinal tubules followed by Pro-Points and Gutta Flow technique.

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