

## APICAL SEAL BETWEEN ADHESIVE ROOT CANAL OBTURATION SYSTEM AND GUTTA-PERCHA/AH-PLUS SEALER: AN IN VITRO COMPARISON STUDY

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### ABSTRACT

#### BACKGROUND

Three dimensional obturation of the root canal is important for success of root canal treatment. Microleakage is one of the reason for root canal failure. Numerous materials have been used for obturation of which Gutta-percha is the most successful with variety of sealers. One of the recent material to further improve root canal treatment success rate is use of Resilon with Epiphany root canal sealer to apply adhesive concepts in to endodontics. An adhesive bond forms between Epiphany sealer, Resilon and dentin, making it monolithic hence less microleakage if any significantly.

#### METHODS

60 single rooted mandibular premolars were dissected at cement enamel junction with diamond disc. Root canals were explored and working length measured using K file. Root canals of all 60 samples were prepared with ProTaper and irrigated with 5% sodium hypochlorite and 17% EDTA solution. Teeth were divided in to group A and B, each having 30 samples. Group A teeth obturated with Resilon Epiphany obturation system and group B with Gutta-percha and AH-plus sealer. All specimens were stored in incubator for 30 days. Clearing process of samples done with Robertson's technique to make them transparent. All the specimens were immersed in 2% methylene blue dye solution for 7 days. Specimens were then examined under stereomicroscope with 10x magnification to measure dye penetration in mm with image analysis software. The data collected were analysed statistically.

#### RESULTS

This study showed that Resilon Epiphany group has a mean leakage of 1.2307, while the Gutta-percha/AH-plus had a mean leakage of 3.6133. There was statistically significant differences between Resilon and Gutta-percha groups.

#### CONCLUSIONS

1). Resilon Epiphany group showed less apical microleakage than Gutta-percha/AH-plus obturation. 2). Based on result obtained it is suggested that Resilon Epiphany can be recommended for root canal obturation.

#### KEYWORDS

Resilon epiphany, AH plus, Methylene blue dye.

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**INTRODUCTION:** The objective of root canal treatment is to remove diseased pulp, and prepare root canal biomechanically and disinfect it and seal root canal space three dimensionally with obturating material. 70 % of root canal treatments fail due to incomplete obturation or poor quality of seal apically and coronally.

Gutta-percha is most commonly used material since many years to obturate root canal space with good success rate with different types of sealers like Zinc oxide, AH26, AH-plus etc. But Gutta-percha has shortcomings like nonadhesive to root canal walls and sealers used with it. Recently new approach to achieve bond between obturating material and root canal dentin through adhesive sealer is

introduced, that is Resilon Epiphany system. Resilon is thermoplastic polymer material and consists of bioactive glass, bismuth oxychloride, and barium sulphate. Epiphany consists of Bis-GMA, UDMA, hydrophilic difunctional methacrylate and polymerisation initiator. The bond forms between root canal dentin, epiphany sealer, and Resilon obturating material which reduces microleakage significantly.<sup>1</sup>

Many studies shown that Resilon epiphany system is superior to Gutta-percha as obturating material.<sup>1,2,3,4,5,6</sup>

Some studies using bacterial microleakage, fluid infiltration, electrochemical evaluation shown that Resilon Epiphany system is better than any other obturating material and sealer.<sup>2,3,4,5,6</sup> The purpose of this study is to assess the sealing ability of Resilon Epiphany and Gutta-percha obturating material with AH-plus sealer.

**AIM OF THE STUDY:** The aim of this in vitro study is to evaluate and compare microleakage of Resilon Epiphany and

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AH Plus sealer which is most widely used in root canal treatment in recent days.

**OBJECTIVES:** 1) To evaluate the microleakage in teeth obturated with Resilon Epiphany. 2) To evaluate the microleakage in teeth obturated with Gutta-percha/AH-plus sealer. 3) To compare the results obtained in above-mentioned groups.

**MATERIALS AND METHOD:**

**Main Materials Used:** 1) 5% Sodium hypochlorite 2) 17% EDTA 3) ProTaper Gutta-percha points. 4) Absorbent points 5) AH-plus sealer. 6) Resilon points- (Taper 0.06). 7) Epiphany sealer. 8) Cavit. 9) 2% Methylene blue dye. 10) 5% Nitric acid. 11) 100 % Ethyl alcohol. 12) Nail Varnish. 13) Basic root canal instruments and equipment. 14) Air turbine hand piece. 15) Anthogy. 16) Light cure unit. 17) Stereomicroscope. 18) Incubator.

**Teeth Selected For Study:** 60 Permanent mandibular premolars with single root, straight root morphology and mature apices selected.

**Inclusion Criteria:** 1) Mandibular first and second premolars with straight roots. 2) Teeth without root tip resorptions 3) Teeth without any root anomalies.

**Exclusion Criteria:** 1) Teeth with root caries. 2) Teeth with root fractures. 3) Teeth with bifurcated root tips and developmental anomalies.

**METHOD:** 60 premolars extracted for orthodontic and periodontal reasons were collected and stored in 10% formalin solution. Diamond disc teeth were dissected at cemento-enamel junction to remove teeth crowns at the length of 16 mm for standardisation. Root canal orifices were explored and patency of canals were checked with No.10 file. Working length established with K file. The root canals were biomechanically prepared with ProTaper universal rotary file system. Root canals were irrigated with Sodium hypochlorite 5% and 17% EDTA solution. Teeth were grouped in to Group A and Group B. Each Group having 30 teeth samples.

**Group A:** Resilon Epiphany obturation system used. The Epiphany self-etch sealant was placed with selected master cone. With help of a spreader additional cones were placed until the spreader no longer beyond the coronal third of root canal. With heat coronal Resilon cones were removed and compacted in place. The canal orifices were light cured for 40 seconds.

**Group B:** Gutta-percha and AH-plus obturation: Root canals dried with paper points. Master cone is selected and coated with AH-plus sealer and placed in the root canal. Spreader is used for lateral condensation and secondary cones were used to achieve maximum seal. Excess Gutta-percha is sheared off with hot instrument and compacted with Plugger.

A temporary restoration of Cavit is used to seal all canal orifices. The obturation is examined by radiograph. The specimens were kept 37 degrees centigrade in an incubator for 30 days.

**Dye Penetration In To Samples:** After 30 days, all samples were taken out of incubator and all samples roots were covered with nail polish except for the apical 3 mm of the apex. All 60 samples were immersed in 2% methylene blue dye solution for 1 week. After 7 days, specimens were removed and washed in running tap water and nail varnish was removed using surgical disposable blade. Clearing process was done with all specimens.

**Clearing Process:** Robertson et al<sup>7</sup> technique was used for clearing process to make specimens transparent. First specimens were demineralised using 5% nitric acid for 3 days at room temperature. Nitric acid solution is changed daily and agitated 4 times daily with glass rod. After completion of this procedure, samples were washed in water for 4 hours. Followed by this, specimens were dehydrated using ethyl alcohol rinses according to Robertson technique. Specimens were kept in methyl salicylate for 2 hours to render them transparent.

All the specimens were examined under stereomicroscope with magnification 10x to measure linear dye penetration in millimetres with image analysis software. Statistical data analysis was done using computer.

**RESULTS:** The results of this study showed that Resilon group has mean leakage of 1.2307 and Gutta-percha/AH-plus group had a mean leakage of 3.6133. Gutta-percha and AH-plus showed maximum leakage. The significant difference between groups was tested using one way ANOVA test. ANOVA test shows that there is statistically significant difference between two groups, i.e. Resilon Epiphany and Gutta-percha/AH-plus groups.

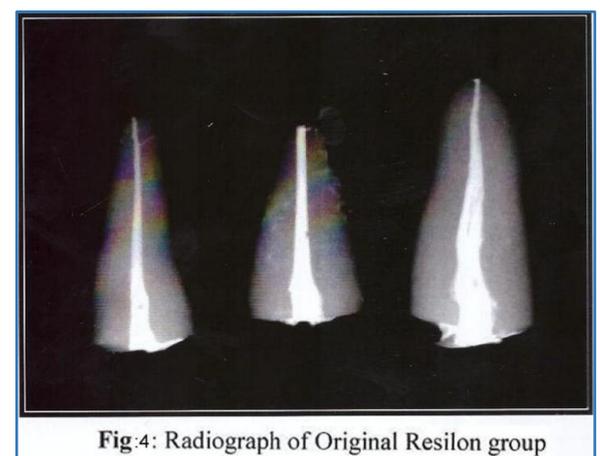
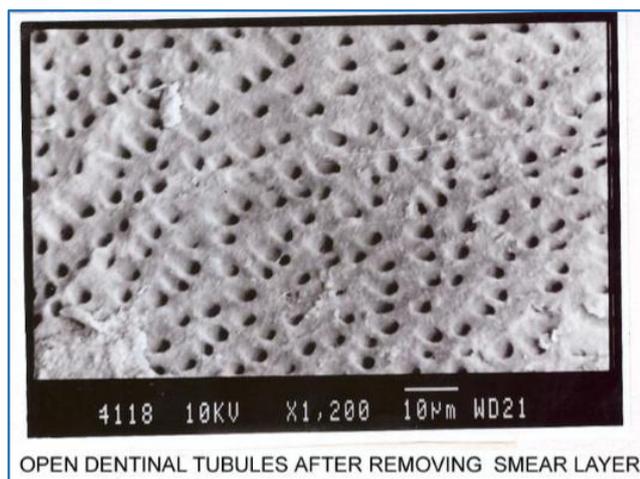
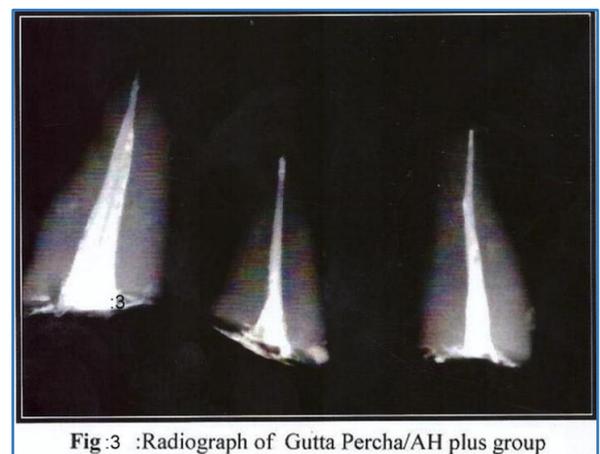
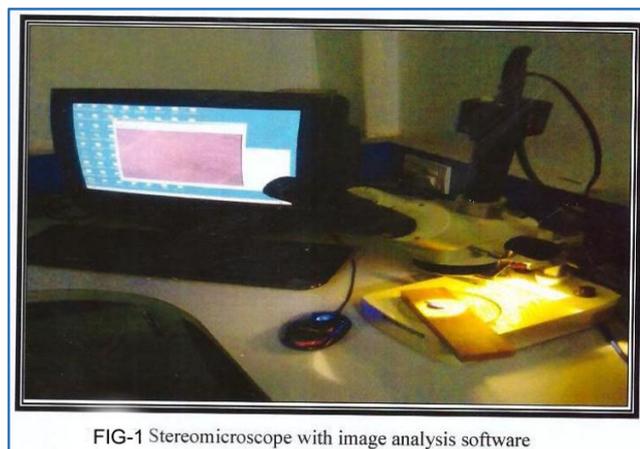
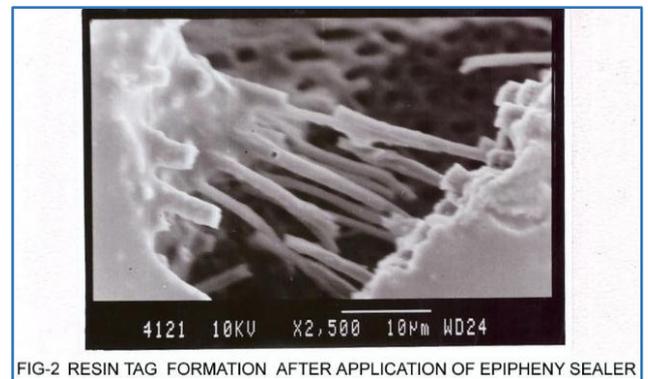
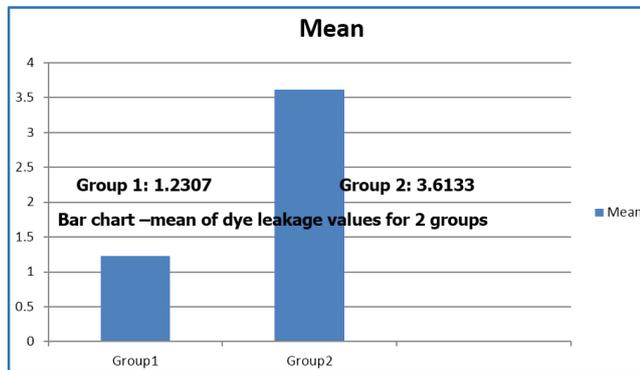
Group	N	Mean	Std. Deviation	Std. Error	Minimum	Maximum
Resilon Epiphany	30	1.2307	0.4362	0.0796	0.30	2.20
Gutta-percha/AH-plus	30	3.6133	1.1147	0.2035	0.90	5.10

**Table 1: Mean and Standard deviation of dye leakage values in mm of two groups**

	Sum of squares	df	Mean Square	F	Sig
Between groups	152.125	4	38.031	74.275	0.000**
Within groups	53.764	105	0.512		
<b>Total</b>	<b>205.889</b>	<b>109</b>			

**Table 2: One way ANOVA test of Variance for significance between two groups**

\*\* P value is highly significant.



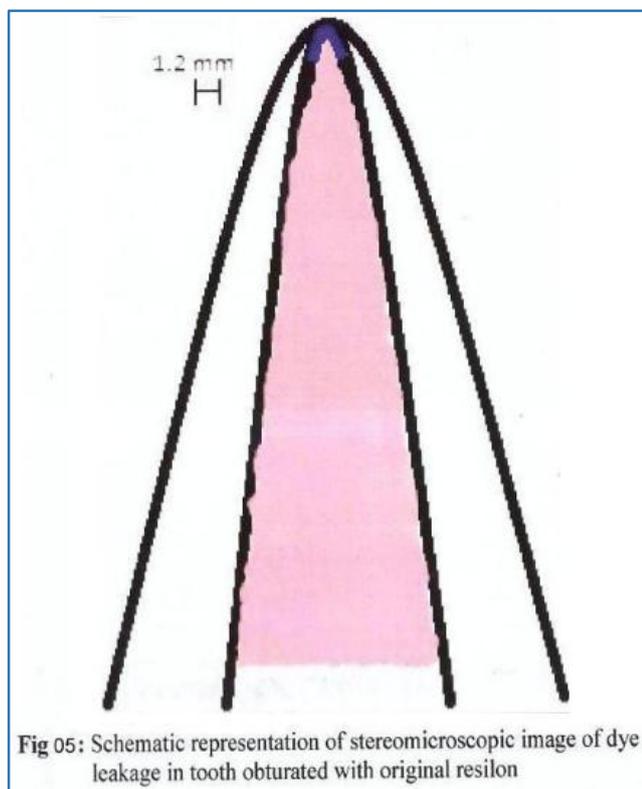


Fig 05: Schematic representation of stereomicroscopic image of dye leakage in tooth obturated with original resilon

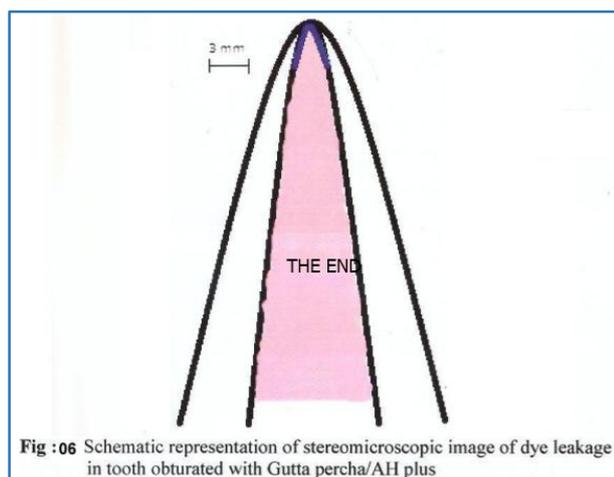


Fig :06 Schematic representation of stereomicroscopic image of dye leakage in tooth obturated with Gutta percha/AH plus

**DISCUSSION:** Three dimensional obturation of root canal including apical seal greatly depends on sealing ability of obturating material and root canal sealer. Now a days AH-plus is the choice of root canal sealing material with Gutta-percha because of its low solubility, good adhesion to dentin, ability to penetrate in dentin irregularities, and good working time.<sup>8</sup> In present study, Gutta-percha and AH-plus sealer is having greater microleakage than Resilon Epiphany system, because Gutta-percha does not bind to AH-plus sealer. Microscopic gaps between AH-plus sealer and Gutta-percha observed by Shipper et al.<sup>2</sup> With advancement in adhesive technology, bonding of sealer and core obturating material is achieved with Resilon Epiphany system. In this study, Resilon group showed less microleakage than Gutta-percha/AH-plus group which is in agreement with Bodrumlu et al<sup>3</sup> and Kqiku et al.<sup>4</sup> This is because of formation of resin tags which penetrates in to dentin tubules thereby bonding of Resilon Epiphany to dentin. Scanning Electron Microscope

(SEM) examination of Resilon Epiphany and dentin interface showed resin tags in dentinal tubules.<sup>1,2,9,10,11,12</sup> 17% EDTA is used in smear layer removal from root canal dentin which helped in opening of dentinal tubules and penetration of resin from sealer in to dentin thereby achieving bond to dentin and less microleakage.

Apical microleakage is evaluated by various methods. The most common method is dye penetration method. In this study, methylene blue dye is used because molecular size of this dye is similar to bacterial by-products like butyric acid which can leak out of root canal and irritate periapical tissues.<sup>13</sup> So methylene blue dye is used in this study.

In this study to assess microleakage, clearing of teeth method is used as it is cost effective and sensitive enough to identify leakage of methylene blue dye in apical region. In present study, considerable less microleakage occurred in Resilon Epiphany group because of resin bonding to smear layer free root canal dentin surface.

Clinical significance of this study is that Resilon Epiphany system is better option for root canal obturation than Gutta-Percha/AH-plus sealer, as it would resist microleakage at apical area of root canal, hence better success rate in root canal treatment.

**CONCLUSION:** To conclude Resilon Epiphany root canal obturation system showed less apical microleakage than Gutta-percha and AH-plus sealer obturation. Hence Resilon epiphany obturation system is choice of material for root canal obturation.

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