

Evaluation of Apical Sealing Ability of Three Different Root Canal Sealers.

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Abstract

Aim: Evaluation of apical sealing ability of Resilon with Epiphany sealer, gutta-percha with AH plus sealer and gutta-percha with MTA fillapex sealer using dye penetration method.

Introduction – Success of root canal treatment highly depends of three dimensional obturation of the root canal system. Solid core gutta percha and sealers is preferred method of obturation of the root canal system. None of the available method are capable of providing a fluid tight seal.

Material and Methods: Thirty freshly extracted single rooted premolars were taken and randomly divided into three groups. These teeth were then obturated using following methods. Group I- gutta -percha with AH plus sealer, Group II- gutta-percha with MTA fillapex sealer, Group III- Resilon with Epiphany sealer. All specimens were stored in 100% relative humidity for 48hrs. The teeth were then stored in Rhodamine- B dye for 24hrs and then were sectioned and observed under stereomicroscope.

Results: Data obtained was analysed using Mann whiteny 'u' test. There was statistically significant difference among the groups. Group III showed minimum dye leakage and group II showed maximum dye leakage.

Conclusion: Resilon Epiphany system showed better apical sealing of the root canal as compared to AH plus and MTA fillapex sealer.

Keywords: AH plus, MTA fillapex Epiphany, Resilon, Gutta –percha.

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I. Introduction

The root canal treatment involves access opening, cleaning and shaping and obturating the root canal. Three dimensional obturation prevents any further ingrees of microorganisms, tissue fluids and prevents any further communication between the root canal and the periapical tissue. To achieve this root canal filling should be such that it seals the root canal both laterally as well as apically. To most commonly used obturating material is gutta- percha cones with an endodontic sealer. The sealer used provides sealing of the gutta-percha cone to the canal wall, lubricates the canal and fill the canal irregularities. Many types of endodontic sealers are commercially available and divided according to their chemical composition viz zinc oxide eugenol, epoxy resin, glass ionomer, MTA based, etc.^[1] Hovland and Dumsha once stated that all root canal sealers leak to some extent, but there is probably a critical level of leakage that is unacceptable which might lead to endodontic failure.^[2] In order to improve obturation of the root canal Resilon corporation in 2003 introduced Epiphany obturation system. This system with recently introduced self -etch sealer has been shown to create monoblock which eliminates gaps associated with the core and sealer interface and prevents microleakage also it resists shrinkage and strengthens the root^[3]. The absence of ideal endodontic sealer has led to lots of development of newer endodontic sealer, having properties of improved adhesion and better biological properties. Resin based AH- plus and MTA based fillapex are among them. In order to substantiate these findings an attempt has been made to evaluate and compare the apical sealing ability of laterally compacted Resilon/Epiphany SE sealer, gutta-percha/AH-plus sealer, and gutta percha/MTA fillapex sealer in this in vitro study.

II. Material And Methods.

Thirty freshly extracted human mandibular premolars were selected for this study and decoronated with the help of diamond discs upto average root length of 12mm (figure 1). The working length was determined by a no 10 k file and the biomechanical preparation was done with rotary protaper upto # F3 file. Sodium hypochlorite 3% was used as an irrigant throughout the preparation followed by 17% EDTA solution as a final irrigant to remove the smear layer.

Prepared teeth were randomly divided into three groups containing 10 teeth each

Group I-gutta percha/ AH plus sealer (figure 2)

Group II- gutta-percha / MTA fillapex sealer. (figure 3)

Group III- Resilon/ Epiphany SE sealer. (figure 4)

Obturation of Group I and Group II was completed using lateral condensation of gutta- percha cones and AH plus sealer and MTA fillapex sealer respectively. Obturation of Group III was done by lateral condensation using Resilon points and Epiphany sealer. All specimens were stored in 100% relative humidity at 37% for 48 hrs in an incubator. The specimens were then dried and then coated with a two layers of nail polish with exception of apical 2.0-3.0 mm surface. (figure 5) The specimens were then immersed in Rhodamine-B dye for 24hrs at room temperature (figure 6). After this the root surfaces were washed with distilled water dried, and then the nail polish was removed with a periodontal curette. The roots were then split longitudinally using a diamond disc and the specimens were observed for apical dye penetration under stereomicroscope at 30X magnification and then the images were viewed in image analysis software and the data was collected and subjected to statistical analysis.

III. Results

The specimens in group c showed minimum dye penetration as compared to group I and group II. The results were highly significant when inter group comparison was done. When group I and group II was compared the results were also significant.

Table-1

	Group I (n=10)	Group II (n=10)	Group III (n=10)
Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD
Group I Group II Group III	2.994 ± 1.34	2.42 ± 1.19	1.196 ± 0.79

Tabel -2

	Group I (n=10)	Group II (n=10)	Mann Whitney 'U' test	'p' value	Result / Significance
	Mean ± SD	Mean ± SD			
Group I Vs Group II	2.994 ± 1.34	2.42 ± 1.19	6.14	0.027	Significant

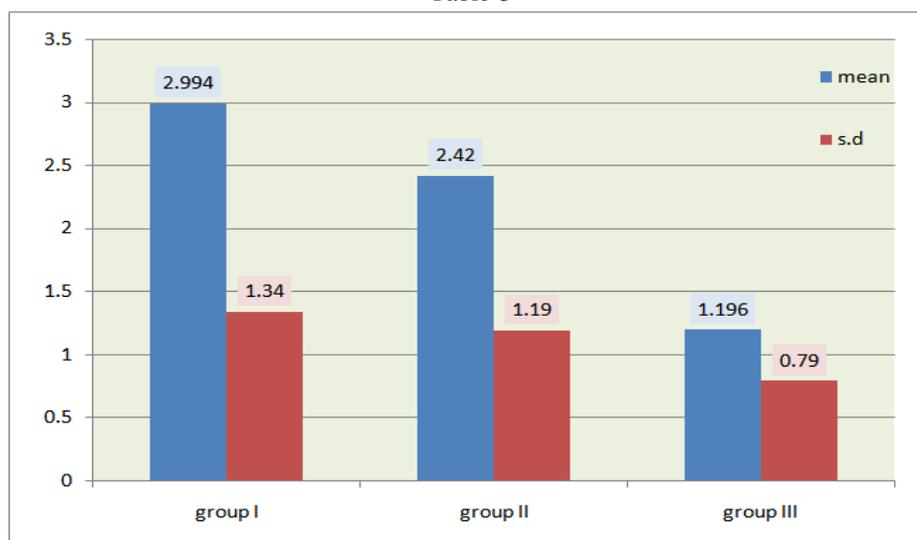
Table-3

	Group II (n=10)	Group III (n=10)	Mann Whitney 'U' test	'p' value	Result / Significance
	Mean ± SD	Mean ± SD			
Group II Vs Group III	2.42 ± 1.19	1.196 ± 0.79	19.92	0.000	Highly significant

Tbale-4

	Group I (n=10)	Group III (n=10)	Mann Whitney 'U' test	'p' value	Result / Significance
	Mean ± SD	Mean ± SD			
Group I Vs Group III	2.994 ± 1.34	1.196 ± 0.79	26.37	0.000	Highly Significant

Table-5



IV. Discussion

As a consequence of the current results obtained the null hypothesis was rejected. Microleakage affects the success of the root canal therapy in which many factors such as canal anatomy, patient cooperation, choice of filling material and root canal sealing play an important role [4,5]. In order to prevent microleakage a hermetic seal is required. But hermetic seal refers to seal against entry or escape of air [6]. So the term impermeable would be more accurate [7]. According to Gutman sealing the root canal completely is impossible with currently accepted methods [8]. Lateral condensation of gutta-percha with sealer is most accepted method currently used. The advantage of this method is controlled placement ease of use and predictability. In order to evaluate the sealing ability of various obturating materials different techniques have been used such as radioisotopes, bacteria and their products such as endotoxins and dyes [9]. Of these the dye penetration method is most commonly used. In our study apical vertical dye penetration was evaluated using Rhodamine-B dye. In this study Resilon, a thermoplastic synthetic polymer based root canal filling material was used. It contains bioactive glass, Bismuthoxychloride, and Barium-sulphate. Dual cure Epiphany SE sealer was used which contains urethane dimethacrylate, Bis GMA, ethoxylated Bis GMA and hydrophilic difunctional methacrylate [10]. In this study group III shows excellent results as compared to group I and II. This is because the Resilon Epiphany system is known for its monobloc formation [11]. The epiphany sealer bonds with the root canal and the Resilon core simultaneously. Various studies have shown that it has good flow properties and exhibit excellent dimensional stability [12,13,14,15]. The results of this study corresponds to the study done by Rajan et al. He stated that root canals obturated with Resilon- Epiphany sealer showed better apical sealing in comparison to gutta-percha and AH plus sealer. Further when compared to group I, AH plus is a epoxy resin based sealer. It has good penetration ability into canal irregularities because of its long setting time and creep capacity, which increases mechanical interlocking between the root dentin and the sealer. But there is inadequate bonding between the sealer and the gutta-percha allowing dye leakage at this interface [16]. The results of this study corresponds to the study by shipper et al whoshowed that bacterial leakage was less in Resilon –Epiphany system as compared to gutta-percha and AH-plus sealer [17]. Further the gutta-percha and the AH plus sealer group showed significantly lesser dye penetration as compared to the gutta-percha and the MTA fillapex sealer. As the MTA fillapex sealer contains salicylate resin, natural resin bismuth and silica the resin component of the MTA fillapex sealer might affect its sealing properties and bonding to dentin [18]. This finding in our study corresponds to the study done by Ali soleymani et al which showed that AH26 sealer is a better barrier against apical microleakage in comparison with MTA fillapex sealer. The results of this present in vitro study showed that Resilon Epiphany obturation system has better sealing properties as compared to AH plus sealer with gutta percha and MTA fillapex sealer with gutta percha.

V. Conclusion

Resilon obturating material provided better apical obturation as compared to AH plus and MTA fillapex sealers when used with Gutta-percha.

.Figures

Figure 1



Figure 2



Figure 3



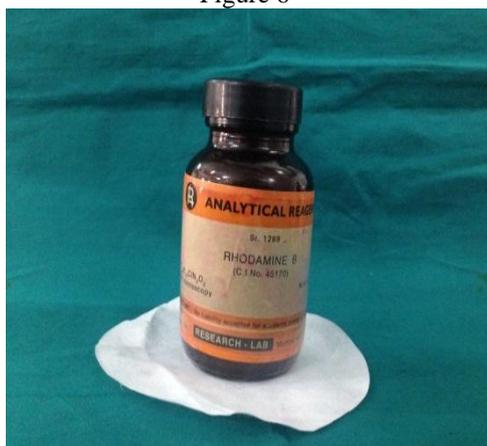
Figure 4



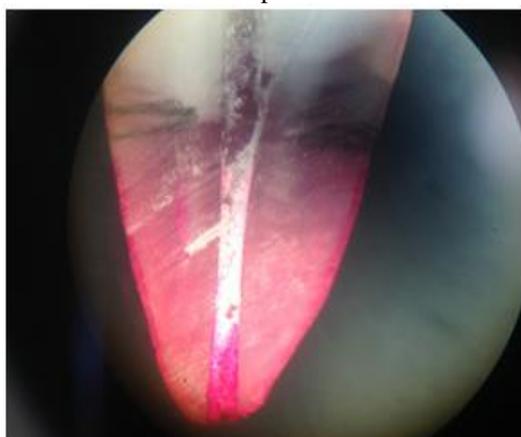
Figure 5



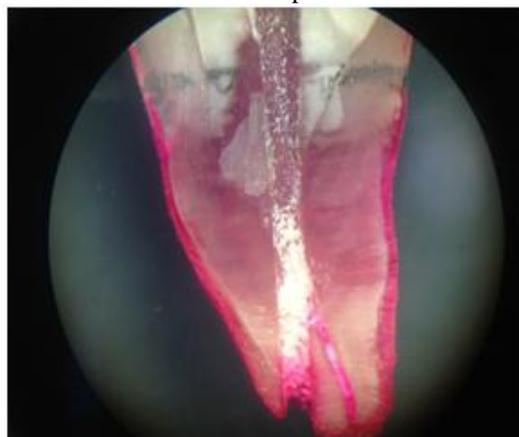
Figure 6



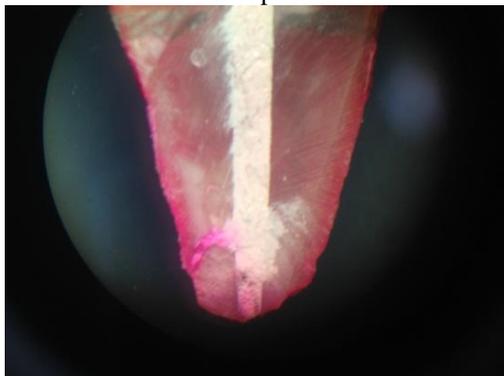
Group I



Group II



Group III



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