

An evaluation the sealing ability of a three retro-filling materials

Raghad A. Mohammed, B.D.S., M.Sc. ⁽¹⁾

ABSTRACT

Background: Retro end filling is important to establish a seal between the root canal space and the periapical tissue. The purpose of this in vitro study was to evaluate the quality of seals obtained with various retro-grade filling materials using dye penetration method of micro leakage measurement.

Materials and methods: Forty extracted human single rooted teeth were used. Following root canal obturation, 30 teeth were divided into three experimental groups and each group was subjected to one of the three filling techniques: a\cold burnishing of gutta percha, b\calcium phosphate cement, c\super EBA cement. The remaining 10 teeth were considered as a control group. The teeth were placed in methylene blue dye for a period of 10 days after which they were washed, sectioned and the apical dye penetration measured.

Results: The results showed that (CPC) and super EBA cement demonstrated less dye penetration than other experimental groups; the difference was statistically significant as compared with groups 1 & 4 and not significant as compared between groups 2&3.

Conclusion: A general trend was observed that the apical leakage was found in all teeth but with different degrees, some leaked more than others, dye penetration was more with the cold burnished gutta percha.

Keywords: Retro-filling materials, sealing ability, dye penetration. (J Coll Dentistry 2005; 17(2): 5-7)

INTRODUCTION

The objective of obturation in endodontic is total obliteration of the root canal system and to develop a fluid tight seal at the apical foramen. It has been shown that the thoroughness with which the root canal system is sealed is a major determinant in endodontic success ⁽¹⁾. The purpose of retro end filling is to establish a seal between the root canal space and the periapical tissue ⁽²⁾. According to Gartner and Dorn ⁽³⁾, a suitable root end filling material should be (a) non toxic, (b) able to prevent leakage of bacteria and their products, (c) non-carcinogenic, (d) biocompatible with host tissue, (e) in soluble in tissue fluids, f\dimensionally stable, (g) unaffected by moistening during setting, (h) easy to use and radiopaque.

It is important for proper root end preparation that the endodontic surgeon has a thorough knowledge of the root canal morphology of the tooth being treated ⁽⁴⁾.

Historically, the quality of apical seal obtained by using the retro filling materials has been evaluated by the penetration of a dye and scanning electron microscope and other techniques ⁽⁵⁾. Dye penetration techniques and radio isotopes are the most frequently methods used ⁽⁶⁾.

Abdal and Reteif have proposed guidelines with regard to biocompatibility and physical characteristics of reverse filling materials. ⁽⁷⁾ CPC has the potential of being a better root canal sealer-filler because it's high biocompatibility and adheres to the root canal surface ⁽⁸⁾. Brown and Chow reported that calcium phosphate powder when mixed with water hardens into cements which have similar chemical composite and crystal structures to those of tooth and bone material. ⁽⁹⁾ Super EBA cement is modified zinc oxide eugenol cement mixed to thick clay like consistency shaped into small cones and attached to the cavity of root end preparation by using spoon excavator ⁽¹⁰⁾. The purpose of this study was to examine the quality of seals obtained with various retrograde filling materials using a dye penetration method of a microleakage measurement.

MATERIALS AND METHODS

Forty extracted human anterior teeth with single canal were used in this study. Following extraction, remnants of the PDL were removed by placing the teeth in a solution of 5.25% sodium hypochlorite. Then the teeth were stored in sterile normal saline ⁽¹⁾. The crowns were removed by using diamond disc bur. Root canal length was determined by using a no. 15-K-File (Kerr Corp, Italy) inserted inside canal until it became visible at the apical foramen, this length minus 1mm, was recorded as the

(1) Assistant lecturer, Department of Conservative Dentistry , College of Dentistry, University of Baghdad.

working length. The root canals were enlarged at working length to a minimum size of no.55K-File used in a circumferential motion with 2.6 solution of NaOCl as an irrigant⁽⁹⁾ During the progression from one file to the next size, the patency of apical foramen was maintained by passing the tip of no. 15 K-File through the foramen. The gates glidden drills were used for flaring the coronal two thirds of the canal, then the roots were stored in normal saline till the obturation⁽¹⁰⁾. From 40 extracted teeth, 30 teeth were selected randomly and obturated by using lateral condensation technique, then excess gutta-percha (Dia Dent International, Korea) was removed from the coronal portion of the canal with a heated glick no.1 (Union Broach) instrument and the access was sealed with cavit (Premier Dental Products Co., Norristown). The teeth were stored in 100% humidity for 48 hours at room temperature to allow time for the cement to set⁽¹⁾. Endodontic surgery was performed by removing 2mm of the root apices in a plane perpendicular to the long axis of the teeth with a special bur operated at high speed with water coating, and then the teeth were divided randomly into three groups consisting of 10 teeth in each group. In group 1, exposed gutta-percha obturation material was burnished with an amalgam burnisher. In group 2, the teeth received a class 1 apical preparation, and 2mm depth using a tapered fissure bur, and the super EBA cement (Harry C. Bosworth Co., Skokie, IL) was placed. In group 3, by placing CPC (Alpha Dental Products Co., USA) in the apical preparation. Following retrograde procedure the teeth were again stored in 100% humidity at room temperature for 24 hour. The remaining 10 unobturated teeth (group 4) served as controls and were treated in the same manner as the teeth in other experimental groups except following biomechanical instrumentation and the resection of the root tips, no reverse filling were inserted. A small cotton pellet was placed into the coronal orifices of all the teeth and the access sealed with cavit. A string of brass wire was tied around the coronal aspect of each root, two layers of sticky wax (Kerr/ Sybron) were coated leaving only the resected surface exposed, then stored for 24 hour at 100% humidity at room temperature. Apical portion of teeth were suspended in test tubes, each tube contained 1 ml of a 1% solution of methylene blue dye for 10 days to allow sufficient time

for possible leakage⁽¹¹⁾. The teeth were washed for 1 hour and left to dry. The wax was removed from the root surfaces and longitudinal grooves were cut into the labial and lingual surfaces and sectioning of the teeth was done. The gutta-percha in the root canals was removed and the amount of linear dye penetration was measured from the resected surface to the most coronal portion of the root canals to which the leakage had occurred. The measurement was done with aid of a stage micrometer under a dissecting microscope (Wild, Heerbrugg, Switzerland, magnification x 6).

RESULTS

Statistical comparison of apical leakage in the experimental groups are shown in Table 1

Table 1: Mean and standard deviation of the experimental groups

Group	Type of Material	No. of Teeth	Mean	SD
1	Cold burnished gutta percha (cbgp)	10	2.73	0.814
2	Super EBA cement	10	0.68	0.216
3	CPC	10	0.57	0.178
4	Control	10	8.92	2.673

One way analysis of variance (ANOVA) test was performed to test the differences between the means of leakage among the experimental groups as shown in Table 2.

Table 2: ANOVA test

Source of variation	SS	df	M=SS/df	F value
Between groups	276.46	3	92.15	49.27
Within groups	67.38	36	1.87	
Total	343.84	39		

SS: sum of squares, df: degree of freedom, M: mean of squares, F value: MS (between groups) / MS (within groups).

The results showed that there was a statistical significant difference between groups 4 and 1 as compared with groups 2 and 3 but there was no significant difference between groups 2 and 3. The measurements of the dye penetration into the root canals of the experimental groups where represented in Figure 1.

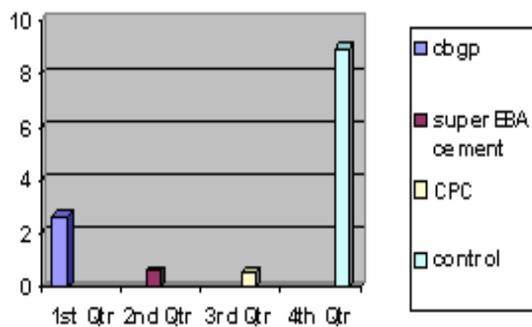


Figure 1: Bar chart graph to compare the mean leakage for the experimental groups.

DISCUSSION

Endodontic surgical techniques involves the placement of a filling material in properly resected and prepared root apices for the purpose of creating a fluid tight seal⁽¹²⁾. Dow and Ingle⁽¹³⁾ suggested that failure of the apical seal may be a significant factor in determining whether clinical treatment succeeds. A significant difference in leakage was discovered when cold burnished gutta-percha was compared with the super EBA cement and CPC and there was no significant differences of the sealing ability between super EBA cement and CPC, the sealing ability of CPC slightly less than super EBA cement. Chohayeb and Chow⁽¹⁴⁾ showed that CPC appears to be devoid of dimensional changes during setting and provides superior adaptation to the canal surface allowing a better hermetic seal of the apical foramen and accessory canals located in the apical third of root. Knell and Wefel⁽¹⁵⁾ proved that CPC to be a biocompatible material because of its similarity to dentine could act as its own apical barrier. Several investigators have previously reported that EBA cement to provide excellent seals as retro fillings measurement of microleakage over time demonstrated cold burnished gutta-percha doesn't provide

adequate seal as reported⁽¹⁶⁾. Qynick and Qynick examined two clinical samples histologically with the scanning electron microscope and found super EBA cement to be biologically compatible.⁽¹⁷⁾

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