

An evaluation of the use different techniques of the thermoplasticized obturators on the coronal seal

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ABSTRACT

Background: The aim of the present study was to evaluate coronal leakage of root canals obturated by various techniques.

Methodology: Straight single rooted teeth with mature apices (6 groups of 10 teeth each). Root canals were prepared according to the crown down technique using hand ProTaper system. Endofill root canal sealer and 2.5% sodium hypochlorite was used. Root canals were obturated using cold lateral condensation Thermafil and Soft Core obturation after root canal filling the six groups was divided into two individual groups of 30 teeth. The first group of 30 teeth was kept for 1 week the second 3 week at 37 °C. Teeth were immersed in india ink. Each was split and sectioned longitudinally and the maximum extent of leakage was measured using a stereomicroscope

Results: Leakage occurred whatever filling technique was used the number of teeth with gross leakage decreased with time up to 3 weeks. There were significant differences in coronal leakage between the various obturation techniques after 1 week, and after 3 weeks. No statistically significant differences were found between soft-Core and cold lateral condensation after 1 week and statistically significant differences were found after 3 weeks. There were statistically significant differences between Thermafil and lateral condensation after 1 week and no statistically significant differences after 3 weeks.

Conclusion: Under the conditions of the present study none of the gutta-percha obturation techniques prevented coronal leakage. Coronal leakage increased during the first week for CLC, Thermafil and Soft-Core obturators, and decreased after 3 weeks. Coronal leakage in the Soft-Core obturators was higher than Thermafil and CLC after one week. Thermafil coronal leakage was lower than others after one week. Coronal leakage in the Soft-Core obturators higher than Thermafil and CLC after three weeks coronal leakage was equal in Thermafil and CLC after three weeks.

Keywords: Endofill root canal sealer HPT, leakage, obturion, CLC, Thermafil, Soft-Core. (J Bagh Coll Dentistry 2012;24(2):18-20).

INTRODUCTION

The provision of a well-compacted and highly tightly adapted root filling is one of the goals of root canal treatment. However, contemporary obturation techniques and filling materials do not seal completely the root canal system up to the level of the cemento-enamel junction. Moreover, it is accepted that both apical and coronal leakage can occur following apparently successful root canal treatment ^(1, 2). Several factors appear to influence the extent of both apical and coronal leakage. Furthermore, various root canal filling techniques based on heated or preheated gutta-percha have been introduced in order to enhance complete filling of the root canal. These include warm vertical condensation ⁽³⁾, warm lateral condensation ⁽⁴⁾, thermatic compaction ⁽⁵⁾, hybrid condensation, i.e. a combination of cold lateral condensation and thermomechanical compaction ⁽⁶⁾, thermoplasticized gutta-percha as a coating on a flexible carrier ⁽⁷⁾, and injection moulded thermoplasticized guttapercha ⁽⁸⁾.

The aim of the present study was to evaluate coronal leakage of root canals obturated by various techniques.

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MATERIAL AND METHOD

Sixty extracted human straight single-rooted teeth with mature apices were used in this study. Both carious (limited occlusal and/or interproximal lesions without pulp exposure) and non-carious teeth were included. All teeth were stored in 10% formalin until the sample was completed.

Sample preparation

The crowns were removed 2mm above the cement-enamel junction with a high-speed fissure bur and water spray.

After gross removal of pulp tissue, a size 10 Flexofile was introduced into the canal until it could be seen in the major apical foramen. The working length was determined by subtracting 1 mm from this length. The root canals were prepared by means of a crown-down technique, using the Protaper Hand system until F3.

The canals were copiously irrigated with 2.5% sodium hypochlorite solution with a 27 gauge endodontic needle.

The canals were dried with paper points and the patency of the apical foramen was confirmed with a size 10 Flexofile. The roots were randomly divided into 6 experimental groups of 10 roots each.

Following drying with paper points, the canals were obturated by one of the following techniques.

Group 1: Cold lateral condensation of gutta-percha

A standard size g.p cone that matched the master apical file was fitted to the working length with atugback Endofill root canal sealer was mixed according to the manufacturer's instructions and placed in the canal by coating the cone with sealer and gently seating it at the working length. Lateral condensation was then carried out using size 20 and 25 accessory g.p cones with endotonic finger spreader placed within 1 mm of the working length. The g.p cones coated with sealer were laterally condensed until they could not be introduced more than 3mm into the root canal.

Following obturation, the g.p was removed from the coronal cavity up to the level of CEJ with a warm instrument and vertically condensed with Machtou pluggers.

Group 2: Thermafil obturation

The correct size of the plastic core thermafil obturator was selected using the verification kit. The obturators were then placed in the Therma-prep oven according to the manufacturer's instructions. The sealer was sparingly introduced into the canal, after which the plasticized thermafil device was inserted to the apical stop. The shank of each carrier was cut at the canal orifice using an inverted cone bur in a high speed hand piece and the g.p was compacted vertically with a plugger.

Group 3 Soft core obturation

The correct size of the plastic core Soft-Core obturator was selected using the size verifier. The obturators were then placed in the Soft Core Over (Soft Core System). When the oven indicated that the obturator was ready, it was removed from one of the slots in the top of the oven endofill sealer was sparingly introduced into the canal, after which the plasticized Soft Coe device was inserted into the apical stop. The handle and insertion pin were removal by a twisting motion. Excess plastic core material was removed with a small inverted cone bur and any extra g.p removed. The g.p was then compacted vertically with a Machtou plugger.

Staining, longitudinal splitting and dye measurement

After obturation, the teeth were stored in 100% humidity for 48 hr. to ensure the sealer was set. The roots were covered with a nail varnish, the first coat was allowed to dry and a second coat was applied. All teeth were immersed in a bath of India ink and stored at 37°C for 1 week and the

other 3 groups for 3 weeks. After which they were thoroughly washed with running water. The nail varnish was removed, the teeth were then air dried. Longitudinal shallow grooves were made on the buccal and lingual surface with a rotating diamond disc of small diameter under continuous water cooling, and the teeth carefully fractured and sectioned with a sharp chisel.

The degree of microleakage was determined by measuring the linear extent of India ink penetration from the surface of the coronal g.p at the level of the amelocemental junction to the position of the maximum dye penetration apically (coronal leakage testing).

To eliminate bias, coronal leakage were measured independently by two evaluators who were unaware of the obturation techniques used. All measurements were obtained by means of a stereo microscope with calibrated scale ocular.

RESULTS

The teeth showed dye penetration along the entire length of each root canal. No significant differences amongst the observers were scored, so that the calculation of the average leakage values of the two observers for each root was justified.

Since the data indicated a non-normal distribution, leakage was assigned using the following categories:

Coronal leakage was measured to the deepest point.

Statistical analysis was carried out using the ANOVA test between six groups to determine whether there were significant differences between the groups. Pairs of groups were compared using the LSD or t-test.

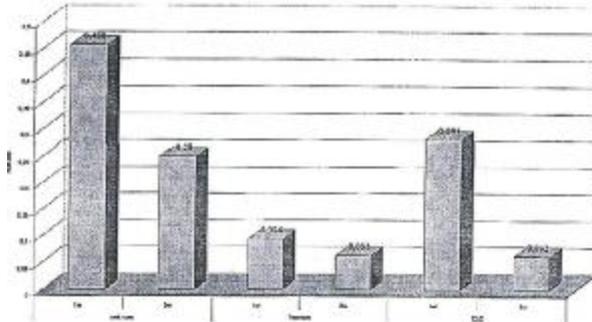
Linear coronal leakage of the experimental roots

The result for coronal leakage is provided in table 1. There were significant differences in coronal leakage between the various obturation techniques after 1 week, and after 3 weeks. According to the t-test statistically significant differences were found between Soft-Core obturators and Thermafil after 1 week and after 3 weeks.

No statistically significant differences were found between soft-Core and CLC after 1 week and statistically significant differences were found after 3 weeks. There were statistically significant differences between Thermafil and lateral condensation after 1 week and no statistically significant differences after 3 weeks.

Table 1. Descriptive statistics of the groups

	soft core		Thermafil		CLC	
	1w	3w	1w	3w	1w	3w
Mean	0,456	0,25	0,094	0,063	0,281	0,063
SD	0,226	0,149	0,062	0,068	0,189	0,044
SE	0,08	0,053	0,022	0,024	0,067	0,016

**Figure 1: The coronal leakage of the different groups in different times**

DISCUSSION

In order to evaluate the sealing ability of root fillings, several in vitro methods have been designed. It is important to appreciate that not only is the apical seal of the root canal of importance, but the coronal seal is of equal importance for the success of treatment⁽⁹⁾. The most common method used to assess leakage remains the measurement of dye penetration⁽⁹⁾. The result of dye penetration studies, however, is confusing and often results in variable conclusions⁽¹⁰⁾. This lack of agreement has been discussed by Wu and Wesselink⁽⁹⁾, who questioned, the validity of leakage studies and recommended that more research should be devoted to leakage study methodology. Longitudinal sectioning of roots and the linear measurement of dye penetration were used in the present study for the measurement of leakage. Splitting the root longitudinally combined with dye penetration enable the demonstration of the pattern of dye penetration.

In the present study obturation with soft core obturators resulted in greater leakage scores.

This may indicate that Soft Core obturators are ineffective these might be related to Soft Core has less taper core so more gutta percha-core ratio than Thermafil therefore it exerts more contraction. In addition, it was also seen that coronal leakage decreased with time up to 3 weeks in all three obturation techniques.

In this study we found that Thermafil coronal leakage was lower than other obturation techniques and this result was disagree with Kontakiotis et al⁽¹¹⁾. These might be related to the

differences in methods of measurement of coronal leakage also the result of this study was in agreement with Saunders and Saunders⁽¹²⁾ in which after 7 days, there was significantly less leakage in these teeth obturated with Thermafil.

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