

RADIOGRAPHIC EVALUATION OF THREE OBTURATION TECHNIQUES IN RESTORING ARTIFICIALLY CREATED RESORPTIVE DEFECTS

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ABSTRACT

The objective of this study was to compare four different obturation techniques in obturating artificially created internal resorptive defects. Thirty extracted, human maxillary central incisor teeth were collected for the study. Access cavity was prepared in each tooth. The teeth were instrumented to apical size 50. The roots were sectioned horizontally 7 mm from the apex. Semicircular cavities were created using a No 6 round diamond bur. Cyanocrylate glue was used to join the sections together. The teeth were radiographed to visualize the internal resorption cavity. The teeth were randomly divided into three groups (n=10) according to obturation technique; standard lateral condensation carries based (Thermafill) orthermoplastized gutta percha using Obtura. After obturation both mesio distal and bucco lingual radiographs were taken to access the quality of obturation. Obtura group showed significantly complete obturation in all the ten samples followed by samples obturated with thermafill while lateral condensation showed the least obturation of the resorptive defect.

Key Words: *Obturation, Internal resorption, Obtura, Thermafil, lateral condensation.*

INTRODUCTION

One of the major goals of successful root canal therapy is to achieve total obliteration of the root canal space using a dimensionally stable and biologically compatible filling material. The normal root canal anatomy may be altered by pathological processes making the task very difficult and at times impossible to achieve by normal methods of obturation. One of such conditions is internal resorption, which presents as an irregular defect in the root canal. Internal resorption is an inflammatory process initiated within the pulp space with loss of dentin and possible invasion of the cementum.¹ Resorption phenomena have been described for many years. Most of the articles on this subject focus on external root resorptions, while the internal resorptions also represent a challenge for the practitioner. The etiology is not very clear, however it has been cited that dental trauma and inflammatory

alteration in dental pulp after pulp capping or pulpotomy as risk factors.² Kinomoto et al (2002) adds that it can also happen due to infection of dental pulp or extreme heat use during obturation. The occurrence of internal resorption has been estimated to be between 0.01% and 55%, depending on the inflammatory status of the pulp. The diagnosis of these lesions is difficult to establish and the conventional X-ray is often inadequate. Internal root radiolucencies are not detectable on radiographs at their early stages, when they are small, or because of limitations of this 2- dimensional method.^{1,2}

Once internal resorption has been diagnosed, the clinician must make a decision on the prognosis of the tooth. If the tooth is deemed restorable and has a reasonable prognosis, root canal treatment is the treatment of choice. The aim of root canal treatment is to remove any remaining vital, apical tissue and the necrotic coronal portion of the pulp that might be sustaining the and stimulating the resorbing cells via their blood supply, and to disinfect and obturate the root canal system.^{3,4} The literature describes various obturation techniques which have been advocated by different authors to obturate internal resorption defects. Frank and Weine have suggested the use of heavy lateral and vertical condensation of gutta percha for such cases. Gutman et al have suggested the use of Thermafil obturation technique. Weine recommends

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the use of thermomechanical compaction. This has led to some confusion as to which technique to choose for obturating these defects.⁵ The purpose of this study was to evaluate the efficacy of various obturating techniques for filling the artificially created internal resorptive defect.

METHODOLOGY

Thirty freshly extracted human maxillary central incisors were used in the study. Part of the crown was removed to get a standard root length of 20 mm. A conventional access cavity was prepared in each tooth. Number 15 k-type file (Dentsply Ltd Ballaigues Switzerland) was inserted into the canal until the tip was just visible at the apical foramen. The length of the file was measured and 1mm was subtracted from this length to establish working length. The teeth were instrumented to apical size 50, using step back technique combined with 5.25% NaOCl (Ultradent Inc St Louis USA).

To create artificial resorptive cavities, the roots were sectioned horizontally with a fine diamond disc 7 mm from the apex. Semi circular cavities were created using a low speed No 6 round diamond bur around the periphery of the opening of the root canal of each section. The sections were joined together using cyanoacrylate glue on the dentin surface around the cavities. Care was taken to maintain the patency of the canal by using minimal amount of glue and the patency was confirmed by inserting a file size 50, post gluing. The teeth were radiographed in order to visualize the internal resorption cavity. Each root canal was prepared and filled by the same operator to reduce inter-operator variability. The prepared teeth were randomly assigned to three groups of ten teeth each. Lateral condensation technique was used a control group.

Group I:Lateral compaction

A 50 size gutta percha master cone was fitted 0.5 mm short of the working length. Freshly mixed root canal sealer (AH Plus Dentsply Ballaigues Switzerland) was applied to the canals using lentulospiral. The master cone was lightly coated with sealer and placed into the canal. Lateral compaction was achieved using standardized finger spreaders (Dentsply Ltd Ballaigues Switzerland) size 15-40). When the points prevented the spreader from penetrating the coronal third of the canal, the canal was considered to be adequately sealed and excess gutta percha was removed with a hot instrument Plugger (Dentsply Ltd Ballaigues Switzerland).

Group 11: Thermafil

The canals were filled using the Thermafil system (Dentsply, Maillefer). Sealer (AH Plus Dentsply) was applied to the canal walls and a Thermafil obturator was warmed in a Therma-prep oven (Dentsply, Maillefer) for a minimum of 10 seconds in accordance with the

manufacturer's instructions. The heated obturator was slowly inserted into the canal within 0.5mm of the working length. An inverted cone bur was used to cut through the shank of each carrier.

Group 1II: Obtura 3

Canals were obturated by injecting thermoplasticized guttapercha using Obtura gun (Dentsply Maillefer Ballaigues Switzerland). The Obtura gutta-percha delivery system with 23-gauge needle was used by setting the unit temperature to 200°C for achieving maximum plasticity of the material. When the optimum temperature of unit was reached, obtura pellet was loaded inside the dispenser or obtura gun. The needle tip was placed at 2 to 3 mm short of the working length and the thermoplasticized gutta percha was injected into the canal. The needle was slowly withdrawn from the canal to achieve passive obturation of the root canal filled by thermoplasticized gutta percha.

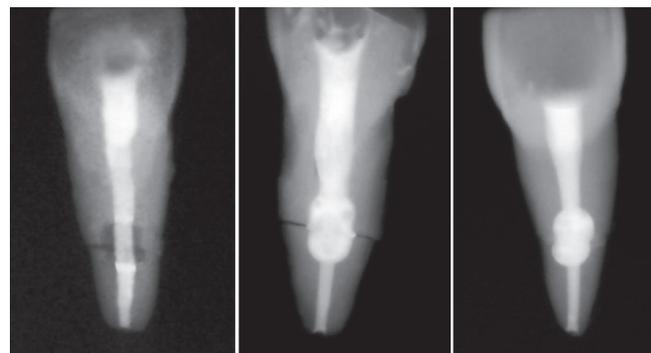
Evaluation method

Two examiners were involved in evaluating the radiographs, the results of first examiner were verified later by the second examiner. The radiographs were checked for the obturation quality. The samples were categorized as 'Complete obturation' if the resorptive defect was sealed completely with no void at all and 'Partially obturation' if there was any radiographic evidence of void. The collected data were then analyzed using descriptive statistics for meaningful results using MS Excel.

RESULTS

Radiographic evaluation of quality of obturation of simulated internal resorptive cavities. In present study Obtura showed the best results followed by thermafil

Groups	Samples	Total obturation	Partial obturation
1	10	0	10
11	10	7	3
111	10	10	0



Lateral
Condensation

Thermafil

Obtura

while lateral condensation showed the least filling of resorptive cavities.

DISCUSSION

Internal root resorption is a pathological process, initiated within the pulp space and associated with loss of dentine. Pulpal involvement is the reason for endodontic treatment. Treatment of internal resorption is complicated by two factors.²

- The area of the resorption usually is inaccessible to method of cleaning and shaping as well as obturation.
- The correct extent of the resorptive defect cannot be estimated by radiograph as they are essentially a two dimensional image of a three dimensional object.

To overcome the complications associated with these two factors many root canal filling techniques have been developed in the hope of achieving total root canal obturation. Most of the currently employed techniques use either a solid core and a cementing substance, or a plastic material which can be adapted more or less to the shape of the root canal system.

In this study obtura showed the maximum sealing. The resorptive cavity was completely filled with the sealer and obturating materials compared to other obturation techniques including thermafil and lateral condensation. This can be attributed to the excellent flow properties of obtura and its ability for good adaptation to the root canal and its irregularities.^{6,7}

In 1978, Johnson introduced a technique in which alpha phase gutta-percha was placed on a metal carrier, heated, and used to obturate the root canal. This system is commercially available as Thermafil Endodontic Obturators. This technique attempts to produce a homogeneous mass of gutta-percha in a rapid fashion utilizing the carrier as a means of condensation.

In the present study, Thermafil was less effective, as it did not fill the void resorptive cavity completely as compared to the thermoplasticized technique. Gutmann et al concluded that the use of Thermafil obturation technique ex vivo was acceptable. However, these results were not confirmed in the present study with regard to filling internal resorptive cavities. Goldberg et al and Agarwal et al² also reported that the Thermafil technique did not fill resorptive. In the present study, hermafil were less effective for filling

experimental internal resorptive defects as compared to the thermoplasticized technique.⁹

Lateral compaction was chosen in this study and served as control as it is one of the most commonly used techniques in endodontics and often has been used as the standard to which the sealing ability of new filling techniques or materials can be compared. Results with lateral condensation technique in filling experimental resorptive defects showed minimum amount of gutta-percha and voids as compared to other two obturation techniques.⁸

CONCLUSION

Under the limitations of the present study, the thermoplasticized gutta percha technique (Obtura) showed the best quality of obturating experimental resorptive cavity of a root canal as compared Thermafil, and lateral condensation.

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