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A Comparative Evaluation of Five Obturation Techniques in the Management of Simulated Internal Resorptive Cavities.

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Abstract

Background: This study was conducted for a Comparative Evaluation of Five Obturation Techniques in the Management of Simulated Internal Resorptive Cavities.

Material and methods: Fifty human maxillary central incisors with fully developed root apices that had just been extracted were gathered. For this study, teeth without internal resorption, calcification, or a root canal filling were selected. The roughly 21 mm teeth that were found were cleaned with ultrasonic technology to remove calculus and debris. They were then stored in a saline solution. A size 10 K-file was inserted into each tooth's prepared endodontic access to locate the apical foramen. After the teeth were instrumented using a master apical file size 40 and the step-back procedure up to size 80, they were finally irrigated with saline and 2.5% sodium hypochlorite solution. SPSS software was used for statistical analysis.

Results: In this study, comparing group C for Obtura II with System B, group D for E as well as Q plus with System B, group E for Thermafil, as well as groups A & B for warm vertical compaction and B for lateral condensation, it was statistically significant ($P=0.000$) that group C displayed the highest percentage of gutta-percha plus sealer and gutta-percha and the fewest voids. Table 1 also showed that Group B had a significantly larger percentage of sealers ($P<0.0001$). Additionally, compared to all other groups, Group E exhibits a considerably larger void percentage ($P<0.0001$).

Conclusion: It has been determined that combined Obtura II and System B is the most effective obturation technique for teeth exhibiting internal resorption. Thermafil yielded the lowest quality of obturation when used to treat teeth with internal resorption. Likewise, the lateral condensation technique demonstrated the highest sealer, indicating that it is not suitable for treating internal resorptive cavities.

Keywords: obturation, obtura II, system B, endodontic treatment, thermafil

Introduction

A successful root canal therapy, more often than not, depends upon complete obliteration of root canal space by a dimensionally stable and biologically compatible material.¹ Complete filling of the root canal space with an inert filling material is often considered as one of the vital goals of root canal treatment.²

Root resorption is the loss of dental hard tissues as a result of clastic activities. It might be broadly classified into external or internal resorption by the location of the resorption in relation to the root surface. Internal root resorption presents as an irregular defect in the root canal, making that area inaccessible to normal method of cleaning and shaping as well as obturation.³ Clinically, internal root resorption is usually asymptomatic and diagnosed through routine radiographs or by the sign of a “pink spot” on the crown. Radiographically, internal root resorption appears as a fairly uniform, radiolucent enlargement of the pulp canal and distortion of the original root canal outline.⁴ The complete extent of the defect cannot be determined either clinically or radiographically, which further calls for finding a perfect way of obturating these defects.

This study was conducted for a Comparative Evaluation of Five Obturation Techniques in the Management of Simulated Internal Resorptive Cavities.

Material and methods

Fifty human maxillary central incisors with fully developed root apices that had just been extracted were gathered. For this study, teeth without internal resorption, calcification, or a root canal filling were selected. The roughly 21 mm teeth that were found were cleaned with ultrasonic technology to remove calculus and debris. They were then stored in a saline solution. A size 10 K-file was inserted into each tooth's prepared endodontic access to locate the apical foramen. After the teeth were instrumented using a master apical file size 40 and the step-back procedure up to size 80, they were finally irrigated with saline and 2.5% sodium hypochlorite solution. SPSS software was used for statistical analysis.

Results

Table 1: Estimated least square mean (mean%) evaluated in stereomicroscope (percentage of gutta-percha and sealer, gutta-percha, sealer, and void) between five groups.

Technique	Gutta percha plus sealer	Gutta percha	Sealer	Void
Warm vertical compaction (Group A)	96.43	67.87	54.13	9.12
Lateral condensation (Group B)	93.29	64.11	47.39	11.11
Obtura II with system B (Group C)	99.29	70.44	40.38	3.67
E and Q plus with system B (Group D)	98.22	65.75	41.46	4.38
Thermafil (Group E)	84.08	43.09	44.28	20.63

Comparing group C for Obtura II with System B, group D for E as well as Q plus with System B, group E for Thermafil, as well as groups A & B for warm vertical compaction and B for lateral condensation, it was statistically significant ($P=0.000$) that group C displayed the highest percentage of gutta-percha plus sealer and gutta-percha and the fewest voids. Table 1 also showed that Group B had a significantly larger percentage of sealers ($P<0.0001$). Additionally, compared to all other groups, Group E exhibits a considerably larger void percentage ($P<0.0001$).

Discussion

Endodontic treatment also known as endodontic therapy or root canal treatment (RCT) involves the removal of diseased pulpal tissue to prevent and intercept pulpal/periradicular pathosis and protection of the disinfected tooth from future entrenchment by microorganisms. RCT not only prevents severance of periodontal fibers that help in proprioception for occlusal feedback and efficient chewing but also aids in the retention of infected teeth that otherwise might have been extracted.⁵⁻⁷

If RCT is indicated, neither a simple filling nor taking antibiotics can resolve the tooth infection. Further, if the treatment is delayed, the tooth can undergo extensive destruction from decay and can get too compromised to be saved; then extraction is likely the only option which may lead to chain of events such as shifting of teeth, collapsed occlusion affecting the mastication, and harm esthetics of patient.⁸

The goal of root canal filling is to completely obliterate the canal space with a stable, nontoxic material and at the same time creating a hermetic seal to prevent the movement of tissue fluids, bacteria or bacterial by-products through the filled canal.⁹ Obturation provides a seal that prevents reinfection of the canal and subsequent leakage into the periradicular tissues.¹⁰

Good obturation is a key requirement in successful endodontic treatment.¹¹ Cleaning and shaping of the canals affects proper debridement and removal of tissue remnants—an essential step in endodontic therapy. However, an incomplete filling can jeopardize the success of root canal treatment. Inadequate endodontic filling is linked to the development of periapical pathology and considered a failure of the endodontic treatment.¹²⁻¹⁴ In a systematic review, Ng et al., found four factors that significantly improve the outcome of primary root canal treatment, and one of these was the presence of a root filling with no voids.¹⁵

An inadequate root filling is a contributor among other factors.¹⁶ It has been demonstrated that bacteria are a primary cause of endodontic treatment failure.¹⁷ Lack of a hermetic seal in the root canal system creates a favourable environment for bacterial proliferation, especially for facultative anaerobes.¹⁸

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In this study, comparing group C for Obtura II with System B, group D for E as well as Q plus with System B, group E for Thermafil, as well as groups A & B for warm vertical compaction and B for lateral condensation, it was statistically significant ($P=0.000$) that group C displayed the highest percentage of gutta-percha plus sealer and gutta-percha and the fewest voids. Table 1 also showed that Group B had a significantly larger percentage of sealers ($P<0.0001$). Additionally, compared to all other groups, Group E exhibits a considerably larger void percentage ($P<0.0001$).

Gandhi M et al (2017)¹⁹ evaluated and compared the efficacy of different obturating methods used in primary teeth. Forty-one patients aged four to nine years with a total of 60 teeth were selected. Out of the 60 teeth, 32 were primary mandibular first molars and 28 were primary mandibular second molars, the sample was randomly divided into three groups. Disposable syringe, lentulo spiral and past inject were used for obturation. Postoperative evaluation was done for; quality of canal obturation, presence of voids using postoperative radiographs following obturation of teeth. The data were analysed to assess the success rate of the three methods used for obturation using Chi-square test. Among the three groups of the study, past inject exhibited the maximum number of optimally filled canals. Maximum number of underfilled canals was found with lentulospiral, and the maximum number of overfilled canals was seen with disposable syringe. Least number of voids was observed in canals filled with the past inject technique and disposable syringe.

Elenjikal MJ et al (2019)²⁰ compared the quality of root fillings in artificially created internal resorption cavities filled with warm vertical compaction, lateral condensation, Obtura II along with System B, E and Q plus along with System B, and Thermafil, and to calculate the percentage of gutta-percha, sealer, and voids using an ImageJ software. Results between the warm vertical compaction (group I), lateral condensation (group II), Obtura II with System B (group III), E and Q plus with System B (group IV), and Thermafil (group V), group III showed the highest percentage of gutta-percha plus sealer and gutta-percha, and least number of voids, which was statistically significant ($P < 0.000$). It can be concluded that Obtura II along with System B was found to be the most suitable obturation technique for the management of teeth exhibiting internal resorption.

Conclusion

It has been determined that combining Obtura II and System B is the most effective obturation technique for teeth exhibiting internal resorption. Thermafil yielded the lowest quality of obturation when used to treat teeth with internal resorption. Likewise, the lateral condensation technique demonstrated the highest sealer, indicating that it is not suitable for treating internal resorptive cavities.

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