AN IN VITRO STUDY REGARDING THE QUALITY OF ENDODONTIC SPACE SEALING USING DIFFERENT ROOT FILLING MATERIALS

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Abstract: The purpose of this in vitro study was to compare the ability of five endodontic filling materials to adapt to the root canal walls. Material and Method: The study included 50 canals divided into five equal groups, each group being filled with one of the following materials: Sealapex (Kerr Co.), Apexit (Ivoclar Vivadent Inc.), Metapex (Metadental Corp.), Endomethasone powder and its own liquid (Septodont) and powder of Endomethasone (Septodont) with Eugenol, and gutta-percha cones, by the cold lateral condensation technique. After immersion in a 10% methylene blue dye solution, the samples were cross-sectioned at three levels along the length of the roots -coronal, medium and apical. Dye penetration was evaluated at 10X magnification. Results: By examining the sections was found that the most reduced leakage values in the apical level were obtained with Sealapex and Apexit. Conclusions: The lowest mean leakage values, for the materials we tested, were observed for Sealapex and the highest were observed for Endomethasone powder and liquid.

Cuvinte cheie: obturație endodontică, sigilanți, infiltrație **Rezumat:** Scopul lucrării de față este ca printr-un studiu in vitro să comparăm capacitatea de adaptare la pereții canalului radicular a cinci materiale de obturație endodontică. Material și metodă: Studiul a inclus 50 de canale radiculare împărțite pe cinci grupe egale, fiecare grup fiind obturat cu unul din următoarele materiale: Sealapex (Kerr Co.), Apexit (Ivoclar Vivadent Inc.), Metapex (Metadental Corp.), Pulbere de Endomethasone și lichid propriu (Septodont) și pulbere Endomethasone (Septodont) cu lichid eugenol, prin metoda de condensare laterală în asociere cu gutapercă. Evidențierea infiltrației s-a realizat prin colorare cu albastru de metilen, urmată de secționare transversală și examinarea secțiunilor la mărire de 10X. Rezultate: Prin examinarea secțiunilor la trei nivele - coronar, mediu și apical s-a constatat prezența celei mai mici infiltrații la nivel apical în cazul Sealapexului și a Apexitului Concluzii: Cea mai bună sigilare în regiunea apicală o asigură Sealapexul iar cea mai deficitară Endomethasone pulbere și lichid.

INTRODUCTION

Endodontic treatment can be considered a means of preventing the edentulous and in some cases a necessity for morphofunctional balance through prosthetics. The success of such treatment depends, among other goals, on the best possible three-dimensional closure of the entire root canal system.

OBJECTIVE

The aim of the present in vitro study was to compare the sealing ability of five endodontic filling materials, using a dye penetration method.

MATERIAL AND METHOD

Thirty six human extracted teeth, single and multirooted, totaling 50 root-canals, were used in this study. The five materials chosen as endodontic sealers were: Sealapex (Kerr Co.), Apexit (Ivoclar Vivadent Inc.,) Metapex (Metadental Corp.), Endomethasone powder and it own liquid (Septodont) and powder of Endomethasone (Septodont) with Eugenol.

The teeth were divided into five groups of 10 canals, each group being filled with one of the five materials. The roots were coated with 2 layers of nail varnish, until 2 mm from the apex, using different colors in order to distinguish them. Complex biomechanical instrumentation and shaping of the root canal was correctly performed with 2% taper manual files, using step-back technique to ISO size 40 master apical Kfile. Throughout preparation, the canals were copiously irrigated with 2.5% sodium hypochlorite solution and 3% hydrogen peroxide solution, followed by rinsing with distilled water. After drying, the root canals were filled by cold lateral condensation of gutta-percha and mentioned sealers.

The access cavities of the teeth were not sealed in order to assess the degree of infiltration in coronal-apical direction. So that tracer could penetrate the canal via the apical region only the roots were coated with 2 layers of nail varnish, except the apical 2 mm. Then the specimens were immersed in a 10% methylene blue dye solution for 72 hours. To highlight the dye penetration, cross-sections were made at the coronal third, middle third and apical third of each root, with a low speed carborundum disk. Serial sections obtained were examined at 10X magnification.

RESULTS AND DISCUSSION

Examining the group filled with Endomethasone powder and liquid (Septodont), we found a greater leakage in the apical third 90% and in the coronal third 80%. In the second

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group filled with Endomethasone and Eugenol, higher dye penetration was observed in the apical third 90% and 70% coronary.

Figure no.1. A middle third cross-section of a specimen filled with Endomethasone and eugenol



Metapex (Metadental Corp.) showed apical dye infiltration in 60% cases and 80% coronary infiltration (Figure no.2).

Figure no.2. Apical cross-section of a specimen filled with Metapex



At Sealapex (Kerr Co.) infiltration in the apical third was 40% and coronary 80%.

Apexit (Ivoclar Vivadent Inc.) demonstrated 60% apical leakage and 50% coronal leakage.

Figure no.3. Different levels of dye penetration for the five chosen sealers



Out of the five materials tested by us, the best apical sealing was performed by Sealapex, the best middle third sealing was obtained also with Sealapex and with Apexit and the best coronal sealing was the one with Apexit. The samples with Endomethasone powder and liquid proved the greatest amount of leakage (Figure no.3). The studies made by the University of Iowa have demonstrated that when the coronal part of the filled root canal system is exposed to saliva, it allows microleakage in 85% cases (1). Similar data have been obtained by us, in 80% of the cases.

Besides the used materials, the possibility of leakage is also influenced by the restorative technique. The sealer is capable of filling imperfections and increasing the adaptation of gutta-percha cones between them and to the canal walls (Wu et al, 2000), (2, 3). They also enter the lateral and accessory canals using lateral condensation. The results of the lateral condensation technique, over other methods, show a higher quality of root-fillings in the middle half of the canals, better than the warm vertical condensation technique. (2)

It has been confirmed that leakage may occur by sealer's dissolution at the interface between sealer and the dentine, or between sealer and the gutta-percha (Kontakiotis et al.1997), (3).

The confirmed solubility of sealers implies the necessity to limit its presence to a thin film and increasing the mass of the gutta-percha (3).

All currently available root filling materials allow marginal infiltration. They are not impenetrable.

CONCLUSIONS

Sealing the crown after the root-canal filling is particularly important for a successful treatment. In three days, in its absence, dye infiltration occurs in the upper third of the canal in 80% of cases, in most materials.Both temporary and permanent coronal sealing are very important.

Leakage may occur at the interface between dentine and the sealer, between sealer and the gutta-percha, within the sealer or by its dissolution.

A lateral condensation optimal accomplished determine the gutta-percha to perfectly adapt to the canal walls, the sealer film thickness decreases and therefore the possibility of infiltration.

In apical third, between the materials tested by us, the best sealing was provided by Sealapex (just 40% of cases with leakage), and the most poor sealing was obtained with Endomethasone powder and liquid (90% cases with leakage).

Dye penetration techniques do not provide any information concerning the volume of tracer that actually penetrates but the efficiency of the material to adapt to the canal walls.

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