STUDY REGARDING ROOT CANAL SEALANTS BY USING FOUR DIFFERENT MATERIALS FOR ENDODONTIC TREATMENT

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Abstract: This paper reveals a clinical study regarding four different possibilities of sealing the root canal space. The study was made on extracted tooth (both mono and pluri radicular) that we prepared for endodontic treatment and then, we sealed them with different types of materials that are usually used in daily practice. After the treatment was complete, we made several sections in each root (1 millimetre distance between them) and emerged them into a solution that highlights bacteria (methylene blue). We compared the results regarding which material is the best one for root sealing in treatment conditions, on which tooth and on what type of canals.

INTRODUCTION

Endodontic treatment is an indispensable technique in the every day practice of a dentist, and it is totally necessary to know the internal anatomy of the tooth in order to have good results. Internal conformation of tooth may vary from one single root tooth to another and vary even more if we refer to multiple root teeth. Along the root accessory, root canals are present in many cases and among these, 74% are in the area near the apex, 11% in the middle of the root length and 15% in the cervical part of the root.(1-5) In order to do a correct endodontic treatment, the root or roots must be well prepared, well determined and measured, well cleaned from all bacteria and organic residual parts, but most important, the apical region must be sealed completely. In the apical region we find three anatomical parts: apical constriction, cement-dentin junction and apical foramen.

The apical constriction is considered to be the smallest part in diameter from all root canal diameters and is situated 0,5-1,5 mm above the foramen.(6-10) Sealing this part correctly means the tooth is well treated and chances to keep it on the arch are longer, even for a life time.

Preparing root canals requires knowledge, patience and a lot of practice, different instruments, substances and materials. Main root canal preparation techniques are described in detail in literature and most important are: crown –down, step back, step down, hybrid technique (step back-step down), balanced force technique etc.(10-14)

Using a certain technique requires using several types of materials. Materials for root treatment may be pastes (semisolid) that get hard in the root canal or that stay thick, or they can be solid. Materials that are pastes, sealants are similar to cements and they are used to close any space between guttapercha cone and root walls. Pastes containing calcium hydroxide are known to have highly therapeutic effects as they are antimicrobial and osteo-cemento-genetic. Another important category is glass fibber sealants that are known to have a high adhesion to the dentin from the root canal walls. These are biocompatible and non-resorbing, but they may dissolve in time. However, epoxide resins have a great advantage above all others meaning they have minimum solubility and a good volumetric stability.(15-16)

PURPOSE

The aim of this paper is to verify the root canal sealants ability to isolate root canals after an endodontic treatment using extracted tooth.

A root canal treatment cannot have a good prognostic if during treatment, root canals are not maintained sterile. Methylene blue solution has a high ability to infiltrate into different tissues including root canals. Infiltration rate is considered to be as equivalent to bacterial infiltration.

MATERIALS AND METHODS

This study included a total of 120 extracted teeth, more than half, 80 were pluri-radicular and 40 were mono-radicular tooth.

For this study we had chosen four different materials to test and those were: Adseal (Meta-Biomed), Sealapex (Kerr), MTA Filapex (Angelus), Endoseal (Prevest DenPro).

Adseal (Meta-Biomed) is a sealant based on epoxidic resins (17), Sealapex (Kerr) is a non eugenol sealant with calcium hydroxide (18), MTA Filapex (Angelus) is a sealant based on MTA cement that has the ability to grow in volume during hardening process (19), and Endoseal is based on zinc eugenolate which has antiseptic and anti-inflammatory properties.(20)

Each tooth was meticulously prepared in order to be obdurated/sealed, using specific root canal instruments. Permeabilization of root canal was verified with 5,25% 5 ml sodium hypochlorite irrigation solution and with EDTA. For irrigation, we used special endodontic needles. The length of root canals was determined with electronic instruments due to a high precision rate of 95-98%.(21)

Teeth were equally divided in four different groups so that each group was filled with one type of root canal material as mentioned above: group 1 Adseal, group 2 Sealapex, group 3 MTA, and group 4 Endoseal.

Mechanical treatment was made with rotator micro motors X Smart Plus, and rotated micro needles K3 from Symbron Endo (18) and then, we preceded for the root canal filing all through root canal length (figure no. 1). Teeth were coronarily filled afterwards and overall protected with special lack leaving only apical region without this lack.

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Figure no. 1. Tooth on microscope after instrumental root preparation was complete



By emerging the teeth into methylene blue solution we verified if the sealant material that we used for root canal treatment was able to prevent solution's infiltration into the tooth. Teeth were emerged for 72 hours into methylene blue solution in order for it to be able to infiltrate. We had chosen to cut the teeth in pieces using carborundum discs and not the usual turbine instruments in order to prevent the heating of the bone tissue. Sections were made 1 millimetre distance using a measuring device as seen in figure no 2 a,b,c..

Figure no. 2. Tooth and sections a) incisor, b) premolar, c) molar



We examined each section with a microscope in order to observe methylene blue infiltration and note on which section the solution had infiltrated and how far along the root solution was able to penetrate (figure no 3).





After examining all teeth included in this study, multiple data resulted that we are going to present. To reduce variables, all tooth were kept in the same conditions, same room same temperature and humidity.

RESULTS

Each tooth percentage used in this study was: superior canine 8%, superior incisor 17%, inferior incisor 25%, inferior

premolar 17%, and inferior molar 33% as the next figure reveals.

Figure no. 4. Each tooth percentage used in the study



We compared the milimetrical infiltration of methylene blue in teeth's sections and we also observed, after comparing the results of sections, that the Adseal material had best results regarding the sealing of the apex. Medium values we obtained are presented in figure no 5.

Figure no. 5. Medium values of sealant results separated on groups of materials



In order to make a comparison between results from incisors and molars we calculated medium value between each other and results are presented in figure no. 6.





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DISCUSSIONS

None of the materials presented in this study is an ideal material for sealing root canals because none of the four ones sealed perfectly a whole tooth. Methylene blue solution's infiltration was present in every tooth. The criteria for an ideal root canal material were not the object of this study, as we referred strictly to the four materials that we studied.

Also, we cannot say which material is overall the best one because we studied only one of the properties of each material and each one has several advantages and disadvantages.

CONCLUSIONS

- 1. After teeth preparation and sealing the root canals in similar conditions (not excluding the human factor) we could observe high difference between the material with best results (Adseal) and the one with worth results (Endoseal).
- 2. Sealapex material's results were very close to those of Adseal, followed by MTA and Endoseal. In case of MTA we found methylene blue's infiltration as far from 7,5 mm from apex which concludes in a total failed treatment.
- 3. We found a better apex sealing on molars than on incisors, no matter what the material was.
- 4. Although treatment conditions were very good, not using a high quality material may come as a failure in endodontic treatment.
- 5. Best results regarding sealing were found on tooth with two radicular canals that end in two separate foramens, followed by canals that get united in apical region and better results were found on roots with one canal and one foramen.
- 6. The quality of sealing depends on the calibre of the canal; canals with bigger diameters have lower outcomes.
- Due to the fact that on large canals the diameter is higher, once passed the area where the gutta-percha cone is calibrated, the contact surface between methylene blue solution and the sealing material is bigger and the solution may enter easily.
- 8. When root canal treatment is made on patients, results may not be as presented in this study because the working conditions are not ideal anymore.

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