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A Comparative Evaluation of Different Materials used in Treatment of Internal Resorption

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Abstract: ***The objective of this study was to evaluate the sealing ability of thermoplastics, mineral trioxide MTA, and calcium hydroxide synthetics in simulated endosperm defects. A total of 30 patients with matured pulp and apex were included, and an access preparation was made in each tooth with an ISO 3 stainless steel rotator cuff appliance placed. Internal resorption was confirmed through X - ray before the teeth were randomly divided into three groups: Group 1 - thermoplastic Gutta percha, Group 2 - MTA, and Group 3 - calcium hydroxide, with ten teeth in each group. After one week, both radiographic and clinical evaluations were performed to detect signs of infection. The results were statistically significant, showing that MTA and calcium hydroxide exhibited better infection clearance compared to gutta - percha thermoplastic.***

Keywords: internal resortion, thermoplastic gutta - percha, MTA, calcium hydroxide

1. Introduction

The very high predictability of endodontic success has allowed pulp preservation, and the main reason for this is advances in endodontic treatment. [1] The foundation of endodontic practice is the preservation and preservation of teeth. Infected canal systems become a favorite place for microorganisms and their by - products. [2] Therefore, one of the main goals of successful root canal therapy is to achieve complete cleaning of the root canal space using the biocompatible and stable sized material. [3 - 5] The normal anatomical structure of the root canal can be altered by the disease process. A very difficult task to manage with traditional mixing methods. One of these conditions is internal resorption. Internal resorption is represented by an abnormal defect inthe canal that renders this area incapable of normal cleaning, shaping, and maturation. [6, 7] The cause of resorption is not fully understood. This process occurs on its own without symptoms, leading to a late diagnosis. If the defect is in the pulp chamber, this can cause a (pink dot) to appear as a signal to the operator. However, when it occurs in the root area, it usually goes unnoticed until it has penetrated the outer surface of the tooth. [8 - 10] Once internal absorption has been diagnosed, the clinician must make a decision about the prognosis of the tooth. [11] The prognosis of internal resorption depends largely on the recognition and processing stage of the procedure. [8] The only treatment is to remove the inflamed pulp followed by a filling. Presence of organic residues, bacteria, etc. These abnormalities can affect the success of endodontic treatment [3, 6], so it is important to completely remove the canal space in case of endodontic resorption [3, 5, 12]. Many materials have been evaluated in ex Vito research projects to test their autoclave filling capabilities. [12, 13] A wide variety of materials for endodontic treatment are available, including synthetic mineral trioxide (MTA), monomer glass cement, Super EBA, hydrophilic polymer resins (barium - 2 - hydroxyethyl methyl salt), zinc oxide, eugenol and acetate cements, zinc, dental composites, composite resins, and thermoplastic resins that can be used during endodontic treatment [10]. However, the prognosis of the tooth can be affected by the biomaterial used for the treatment. [10] Therefore, with the availability of different biomaterials, which one is better for endogenous defect remains a matter of controversy. Therefore, current in vitro research focuses on the complete and closed maturation of the root canal system, in the case of internal resorption, using three different materials – gutta percha, MTA and calcium hydroxide [14, 15].

2. Materials and Methods

The study was carried out at the Department of Conservative Dentistry and Endodontics of Prince Ali Military Hospital and Prince Zead Military Hospital in Jordan. Thirty patients with permanent maxillary central incisors were treated for the study and radiographs confirmed that they had an internal canal infection. Acesses were prepared with a round diamond drill. Straight line access has been launched. The working length of each canal is determined using the ISO #15 manual file. The rotary instrument was built with ISO #30 0.06 standard rotary lesion and the canals were irrigated intermittently with saline and 2.5% sodium hypochlorite solution. Fill the canal using an apical seal created by Master Cone GP and sealant AH Plus (Dentsply DeTrey). Now the samples are randomly divided into three groups, where n = 10 for each group. The samples were subdivided according to the material used for infection control, which is as follows:

Group 1: Thermoplastic gutta percha, all samples in this group were fully sealed (edge to butt) thermoplastic gutta percha with a welding gun (Denjoy System) and focused vertically using the #2 Finger Plugger.

Group 2: synthetic mineral trioxide, all specimens in this group are completely sealed (end to end) with MTA (ProRoot MTA, Dentsply). MTA is mixed manually on a glass dish using a stainless steel cement spatula. The mixed MTA is transported by cannon and placed inside the channel. The material is vertically condensed by No. Hold 2 fingers.

Group 3: Calcium hydroxide, all specimens in this position are completely sealed with calcium hydroxide. Mix flour with salt water to form a dough according to the manufacturer's instructions. The calcium hydroxide mixture

is carried by the paper point and placed inside the channel. The material is vertically condensed by No. Hold 2 fingers.

3. Results

External signs of infection were noted as swelling, redness, pain, and visible pus, and were recorded as tabulated numbers and clinical observations, for each of the three groups. The obtained observations were used for statistical analysis by the Kruskal - Wallis test, and the mean rank of each group was calculated [Table 2). The level of significance considered is, $P < 0.05$. The "P - value" obtained here is 0.000, the result obtained is therefore statistically significant.

Table 1: Mean rank for each group using Kruskal–Wallis test

Group	Sample size (n)	Mean rank
Score		
1	10	23.35
2	10	15.30
3	10	7.85
Total	30	

4. Discussion

It is often associated with chronic pulpitis, and bacteria can be detected in granulomatous tissue when the lesion is severe enough to be identified on conventional radiographs. Because he had no symptoms, he was discovered by accident during a routine X - ray. Internal absorption occurs only when current is lost near the site of chronic inflammation due to trauma or some other unknown cause. In a study of 27 patients, the most common etiological factor was trauma (43%), followed by caries (25%). This condition may go unnoticed until lesions have progressed, leading to perforation or symptoms of acute or chronic periodontitis after complete necrosis and infection of the pupae. Therefore, root canal treatment should be initiated as soon as possible after destructive inflammatory lesions are detected to avoid further loss of hard tissue and the possibility of root perforation. [3, 6, 16] Endodontic treatment of endodontic teeth remains a difficult challenge for endodontists. According to Basavanna et al [14, 15]. Torabinejad first developed MTA in 1993 as a material for surgical root repair. Subsequently, MTA has attracted great interest due to its biocompatibility and potential bioactivity. MTA is a mechanical mixture of three powdered components: Portland cement (75%), bismuth oxide (20%) and gypsum (5%). It also contains traces of SiO2, Can, Go, K2SO4 and Na2SO4. The main ingredient, Portland cement, is a mixture of calcium silicate, calcium silicate, calcium aluminate and tetra calcium aluminate ferrite [5, 17]. Calcium hydroxide, due to its high pH around 12, can cause dentin deposition and inhibit bacterial growth. In this study, in addition to the two biomaterials MTA and calcium hydroxide, thermoplastics were also used to compare the clogging potential in such autoclave cases. Various studies have shown that thermoplastics are superior to conventional lateral condensation techniques, especially in the case of internal resorption. Clinical evaluation of thermoplastic fillers revealed the presence of MTA and calcium hydroxide - associated infections, with no evidence of infection on radiographs. The reason could be the temperature difference when the material is introduced into the channel and it condenses. Samples containing calcium hydroxide showed more signs of infection than samples containing MTA. Therefore, according to the results, thermoplastics should be a last resort in such cases, as they cannot effectively seal or inhibit the inflammatory process. Comparing the effectiveness of MTA and calcium hydroxide in these cases, their biological activities are similar due to the strong alkaline reaction, they inhibit the inflammatory process and thereby inhibit the absorption process. However, looking at the X - ray image above, MTA can be considered superior to calcium hydroxide.

5. Conclusion

Therefore, within the limits of this study, it can be concluded that MTA has a better ability to resolve internal resorption lesions than calcium hydroxide and thermoplastics under same conditions.

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