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Radiological assessment of periapical wound healing of endodontically treated teeth using two different root canal sealers: An in-vivo study.

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ABSTRACT: The aim of this study was the radiological assessment of the results obtained following endodontic treatments performed using two conventional and widely used root canal sealers. Material and method. There were 30 patients included in the study, undergoing treatment for teeth with periapical pathology. Periapical lesions were assessed at baseline, after 1 month and 2 months using the periapical index (Periapical Index Score, PAI). The group of patients was randomly divided into two groups, with 15 teeth subjected to root canal treatment using AH Plus (DentsplyDeTrey GmbH, Konstanz, Germany) and 15 teeth subjected to root canal treatment using Epoxidin (Tehnodent, Russia) Results. The comparison between the periapical index values recorded revealed a statistically significant difference compared with baseline in both groups.

Conclusion. A proper therapeutic conduct, closely following the rigorous isolation, mechanical and antiseptic preparation and root canal filling stages, is urgently required for a successful therapy.

Key Words: periapical index, periapical healing, root canal treatment, root canal sealers

I. INTRODUCTION:

Although chemical and physical factors can induce periradicular inflammation, overwhelming evidence indicates that microbial agents are essential to the progression and perpetuation of periradicular inflammatory diseases. Root canal treatment is mainly aimed at preventing or treating inflamed periapical tissues. Clinical signs of pulp or periapical inflammation vary and there are few signs indicating these diseases, which occur with unknown frequency. On the other hand, there are currently no saliva or blood tests indicating periapical inflammation. Therefore, for the time being, radiological investigation has become the only method used for assessing periapical inflammation.

The presence of periapical lesions before root canal treatment increases the risk of treatment failure. The success of root canal treatment of teeth with normal periapical structures is significantly higher compared with teeth with periapical disorders. Most studies are based on the success/failure ratio, and lesion follow-up occurred until obtaining normal radiological images of periapical structures

A disinfected root canal environment can pave the way for periapical healing. Long-term success can be reached with three dimensional filling and coronal restoration, which prevent bacterial leakage. Various methods have been recommended for root canal filling. The most frequently used core is semisolid materials such as gutta-percha in combination with root canal sealer or pasteHowever, gutta-percha alone is not appropriate for ideal root canal filling due to lack of efficient flow and adhesion to canal walls. A satisfactory seal cannot be obtained without the use of a sealer

When establishing a root canal procedure following a diagnosis of chronic apical periodontitis, its purpose is to determine apical wound healing. In this situation, it is important that the root canal sealer supports or at least does not slow down periapical bone tissue regeneration processes. Therefore, the aim of this study is to investigate the effect of two root canal filling materials on periapical wound healing using the periapical index scoring system (PAI).

II. MATERIALS AND METHODS:

Patient Selection

The study consisted of a total of 30 patients aged between 20 and 45 years, undergoing treatment for teeth with periapical pathology at

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Department of Conservative Dentistry and Endodontics, Government Dental College and Hospital, Ahmedabad. Each tooth was given a PAI score before treatment. The informed consent on inclusion in the study was obtained from all subjects included in the study. The following patients were not included in the study: patients with systemic diseases, pregnant women, patients who took antibiotics, NSAIDs or corticosteroids one month before treatment. Patients with calcified canals, canals with apparent curvature, inaccessible canals were also excluded.

The group of patients was randomly divided into two groups, A and B, with 15 teeth subjected to root canal treatment using AH Plus (Dentsply DeTrey GmbH, Konstanz, Germany), and 15 teeth subjected to root canal treatment using Epoxidin(Tehnodent, Russia)

The periapical index (PAI)

This index is a simple radiographic assessment method that consists of 5 categories numbered 0 to 5.

Score	Quantative bone alterations in mineral structure
0	Intact peri-apical bone structures
1	Diameter of peri-apical radiolucency >0.5-1 mm
2	Diameter of peri-apical radiolucency >1-2 mm
3	Diameter of peri-apical radiolucency >2-4 mm
4	Diameter of peri-apical radiolucency>4-8 mm
5	Diameter of peri-apical radiolucency> 8 mm
Score (n) + E	Expansion of peri-apical cortical bone
Score (n) + D	Destruction of peri-apical cortical bone

The following steps were carried out:

1. We found the reference radiograph that most resembles the periapical area studied. We gave a score from 1 to 5.
2. Where there was doubt, we granted the highest score.
3. Teeth with more roots were given the highest score identified in any of the roots.
4. All teeth were given a score.

Root canal treatment

Mechanical and antiseptic preparation of root canals

After isolation with rubber dam system and access cavity preparation, we determined the working length using a apex locator and checked it using the radiograph. After biomechanical preparation,intra-canal medicament was given when needed. After that, 15 teeth were sealed using gutta percha and AH Plus sealer whereas 15 teeth were sealed with gutta percha and Epoxidin sealer

Patient follow-up

First, radiological changes in apical structures were examined after a period of 1 and 2 months. This step was performed using the periapical index (PAI).

Secondly, we examined the presence of abnormal clinical signs over 2 months: spontaneous pain, abscesses, mobility, sensitivity to percussion and palpation. All these data were collected and compared with data obtained during the treatment.

Statistical Analysis

Data were distributed as parameters, and differences in the group of patients treated with AH Plus (group A) and the group of patients treated with Epoxidin (group B) were analyzed using the chi-square test. Statistical significance threshold was established at a p value of <0.05.

III. RESULTS

The comparison between the values of the periapical index recorded for each time interval revealed a statistically significant difference versus baseline situation, for both groups (p=0.03)

Group	Mean difference in Peri-apical index score
Group A (AH Plus sealer)	1.066667
Group B (Epoxidin sealer)	0.933333
Chi-square test	0.0328 (<0.05)

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Figure1	 PRE-OPERATIVE IOPA	 POST-OPERATIVE IOPA	 FOLLOW-UP AFTER 2 MONTH
Figure 2	 PRE-OPERATIVE IOPA	 POST-OPERATIVE IOPA	 FOLLOW-UP AFTER 2 MONTHS
Figure 3	 PRE-OPERATIVE IOPA	 POST-OPERATIVE IOPA	 FOLLOW-UP AFTER 2 MONTH

IV. DISCUSSION

Reference radiological images for PAI scores 3, 4 and 5 show clear lesions of the periapical tissue. Calcium hydroxide was used as temporary treatment for a period of 7 days, showing that the use of calcium hydroxide as intracanal medicine for one week is sufficient to reduce the bacterial count to undetectable levels in cell cultures.

According to Bystrom et al (1987), as long as there is a reduction in the size of the lesion, followup is not necessary anymore. Clinical symptoms were absent, so the results were assessed using radiographs and the PAI. In addition, the present study demonstrated clear healing from the very first check-up, 2 months after treatment.

The results of this study demonstrated that mechanical instrumentation, irrigation and root filling play an important role in the healing of periapical lesions. The size of periapical lesions was also considered to be a risk factor, a larger lesion being associated with a lower healing rate when compared to smaller lesions, for the same time interval.

However, the results may be influenced by factors that cannot be controlled. Therefore, diabetic patients were excluded due to possible impaired healing, but smokers were not excluded, although there are studies demonstrating that they may also present delayed healing.

A drawback of this study is represented by the small number of patients, which does not allow the identification of a cause-effect relationship between study variables and results. Therefore, it was not possible to correlate the age of patients, their gender, the treated tooth and the root canal sealer used. All these variables could contribute to differences in periapical healing.

Khabbaz and Papadopoulos (1999) have determined that periapical wound healing is not affected by the presence of root canal filling material in the periapical tissue. They also concluded that healing is due to infection control during root canal preparation and, equally, during root canal filling. Katebzadeh et al (2000) also

mention the importance of root canal filling in the healing of apical periodontitis. Failure due to overfilling is actually caused by infected dentin and debris pushed beyond the apex during instrumentation. Augsberger and Peters (1990) stressed that periapical would healing takes place even if the root canal sealer reaches the periapical tissue, and possible failure is due to other factors, such as improper handling. Lin et al. (1992) stressed that root canal filling material has a much lower irritant effect than microbial factors.

Huang et al (2002) have concluded that the biocompatibility of the root canal sealer is extremely important as it stimulates the reorganization of the affected periapical tissue that it comes into contact with. Tanomaru et al (1998) stated that in case of teeth with chronic periapical infection, root canal filling materials with antibacterial properties that do not irritate the periapical or periradicular tissues can stimulate apexification and therefore healing.

Another interesting aspect of periapical healing is the link between the healing process and the position of the tooth in the dental arch. There are few studies on the subject and neither does the present study assess this due to the low number of patients. It seems that maxillary second premolars as well as maxillary and mandibular canines have a better prognosis than other teeth. The first maxillary molars often have two middle-vestibular root canals, and one of them could remain unspotted, untreated and unfilled, thus maintaining the infection active. Maxillary lateral incisors present anatomical variations, such as pronounced curvature in the apical area and very thin roots, aggravating the correct mechanicaland antiseptic treatment as well as the root canal filling process. However, other studies suggest that there is no connection between periapical healing and tooth position in the dental arch (Orstavik & Horsted-Bindslev 1993).

V. CONCLUSION

The results were favourable and similar. This indicates that a correct therapeutic conduct, closely following the isolation, mechanical and antiseptic preparation and filling stages, is required in order to achieve therapeutic success.

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