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Management of Tooth with Periapical Lesion and Severe External and Internal Root Resorption - 5 year Follow-Up - Two Case Reports

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Abstract: ***One of the main principles of endodontic treatment is the three-dimensional root canal filling, with a focus on filling the apical third of the root. The management of cases with periapical lesion and severe resorption - internal and external, still remains a clinical challenge. Biological approaches of tissue engineering will yield new diagnostic and therapeutic way to repair soft tissue as well as bone structure.Nanosize biphasic calcium phosphate materials play a significant role in various biomedical applications, due to its unique fictional properties, high surface area to volume ratio and its ultra-fine structure, similar to that of the biological bone apatite. These promising materials find a place in contemporary treatment of cases with extremely areas of resorption.***

Keywords: apical lesion, apical resorption, externalroot resorption, internal root resorption, periapical bone regeneration

1. Introduction

In recent years, a new approach based on tissue engineering is now adding in the current treatment protocol. Tissue engineering was introduced in the 1990s and consists of an ensemble of techniques and procedures aimed at the regeneration of biological tissues based on a triad derived from the three major components of tissues: cells, their extra cellular matrix and a signaling system [1,9,10,16]. The regeneration of the bone form and function appears to have limits. Destruction of the critical mass of bone, i.e. a critical-size defect, does not regenerate completely. A complex series of molecular cues temporally and spatially influence healing. A critical-size defect has been defined as an intraosseus deficiency that will not heal with more than 10% new bone formation within the life expectancy. The apical critical-size defect heals with scar formation [3,12,19]. Tissue regeneration by using membrane barriers and scaffolding materials in periapical zone is an example of tissue engineering technology. Membrane barriers and/or bone grafts are often used to enhance periapical new bone formation. However, the periapical tissues also consist of the periodontal ligament and cementum. Little is known concerning the biologic mechanisms that regulate temporal and spatial relationship between alveolar bone, periodontal ligament and cementum regeneration during periapical healing [2,4,5,11].

Tissue engineering is an interdisciplinary field which applies the principles and methods of engineering and the life sciences towards the fundamental understanding of structural and functional relationships in normal and pathological tissue and the development of biological substitutes to restore, maintain, or improve function [14,20]. Tissue engineering is a technology with profound benefits and an enormous potential that offers future promise in the treatment of loss of tissue or organ function as well as for genetic disorders with metabolic disorders [15,17]. The combination of apical lesion and internal root resorption is still a challenge in clinical practice.

The aim of this case report is to present the treatment and follow-up of tooth with periapical lesion and severe external and internal root resorption.

2. Case Report-1

A 32-year-old female patient was referred for management of periapical external resorption in combination with internal root resorption of tooth #47, apparent on the periapical radiograph. The patient was asymptomatic and the medical history was non-contributory. The pre-operative radiograph presents a tooth with periapical lesion - periapical index PAI5 (Fig.1A). In the middle of the distal canal there is an internal resorption which is a complicated clinical situation. Once diagnosed, treatment considerations and prognosis must be rendered. Since removal of vital tissue ceases progression of the lesion, then initiation of root canal therapy is recommended. However, the prognosis for the long-term form and function of the tooth is dependent on the size of the lesion. When a defect is small to medium in the middle and apical part of the root the treatment prognosis is favorable. The treatment was started after the informed consent of the patient. The stages of treatment and follow-up period were presented in Fig.1.

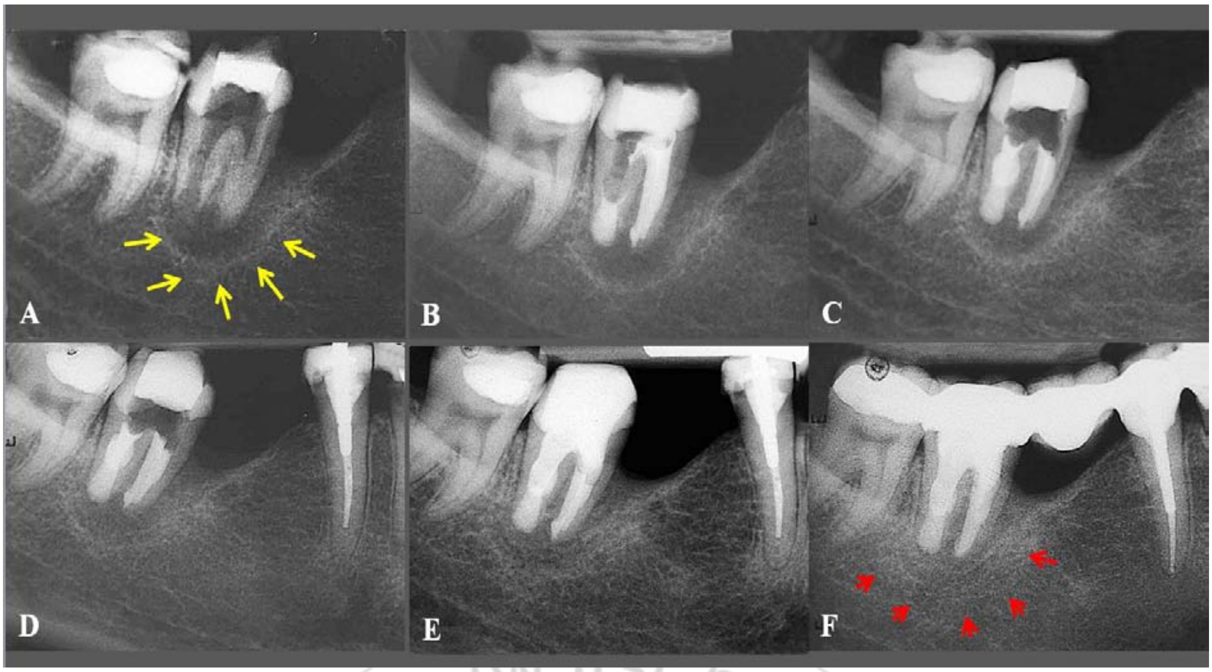

Figure 1: A/Initial radiographic situation - PAI5; **B**/Post-operativeradiograph of obturation of medial canals and apical zone of distal canal with MTA; **C**/Post-operative radiograph after 3 months; **D**/Post-operative radiograph after 6 months; **E**/ Post-operative radiograph after 12 months;**F**/ Post-operative radiograph after 2 years - the definitive prosthetic restoration was done an year ago

3. Case Report-2

A 39-year old male patient was referred for treatment of severe internal resorption of central incisor. The patient was asymptomatic and reports for a trauma in the frontal zone in childhood. Periapical radiographic presents the advanced process of internal and apical resorption (Figure 2A). The patient's desire was to keep the natural tooth. It was done the cone-beam computed tomography (CBCT) for more precise decision if there a chance for satisfactory treatment outcome. On CBCT images was analyze the remaining hard dental tissue (Figure 2B,C). The treatment starts with preparation of endodontic access and chemical preparation of radicular walls of root canal. Because of internal resorption it was not use a mechanical preparation with endodontic instruments. Passive ultrasound irrigation was the method of choice to achieve a maximum preparation of dentine for sealing of root canal. It was used a standard irrigation protocol - 17% ЕДТА, 5.25%NaOCl, 40% citric acid and saline solution for final irrigation. Due to periapical resorption it was used an apical barrier with bi-phasic calcium phosphate to create conditions for maximal apical sealing without overpressing of paste. The root canal was sealed with iRootSP (*Innovative BioCeramix, Canada*) and injectable gutta-percha BeeFill (*VDW, Germany*) (Figure 2D-F). The radiographic follow-up was done after the control x-ray for assessmentof sealer adaptation (Figure 2 G-J).

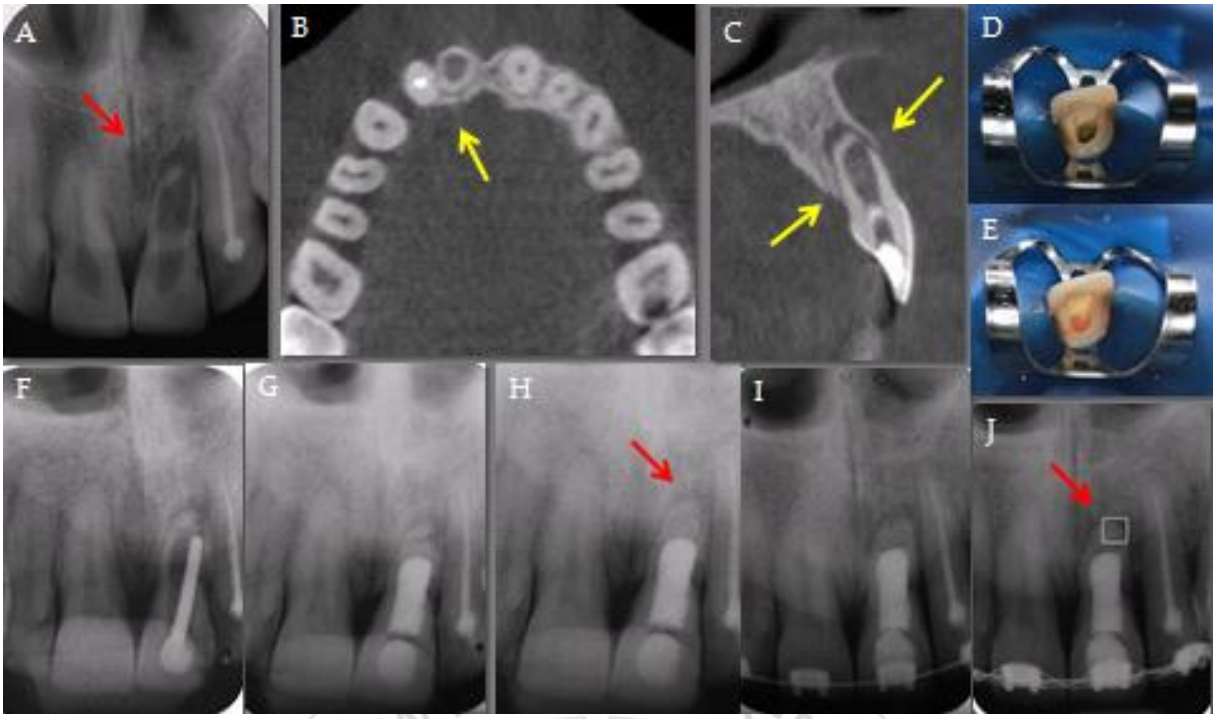

Figure 2: A/ Initial radiographic situation of tooth #21 - PAI5;**B/** CBCT image - a horizontal reconstructed slice; **C/** CBCT image - a vertical reconstructed slice; **D/** Intraoral view **-** the prepared orifice and root canal; **E/** Intraoral view - the obturated orifices and root canal;**F/**Control radiograph with gutta-percha point;**G/** Post-operativeradiograph, definitive obturation with β-TCP and bioceramic (iRoot SP);**H/**Post-operative radiograph after 3 months; **I/**Post-operative radiograph after 12 months; **J/** Post-operative radiograph after 24 months

4. Discussion

Only a few decades ago, the treatment of apical resorption-complicated teeth was carried out through conventional obturation techniques, while the planning of an apical surgery, immediately after filling the root canal, was a part of the standard treatment protocol. In a large percentage of cases, the presence of a foreign body in the periapical zone is accompanied by clinical symptoms and thereby, apical surgery and retrograde obturation of the root canal are indicated. This clinical case presents satisfactory periapical healing with orthograde treatment protocol. The pathogenesis of internal and external resorptive processes in the dental tissues and those of the periapical zone is not fully understood, but the main purpose, either in teeth with internal resorption or in teeth with periapical lesions, is decontamination of the endodontic space and subsequent three-dimensional obturation in order to isolate periapical and oral tissues and prevent reinfection [7].

Compliance with the principles of creating an apical stop, the instrumentation of the root canal space and the apical zone protects the periapical tissues and the anatomical narrowing from trauma and transportation. The lack of a physiological constriction leads to overpressing of the sealer or gutta-percha, which in 62-89% of the cases, affects adversely or delays significantly the healing process [6, 13, 18]. Following the practice of the injectable implant material (Daculsi, 2006) in this study milled material was used as a scaffold, mixed with saline solution. The use of nanosize biphasic calcium phosphate materials plays a significant role in various biomedical applications as well as in periapical bone regeneration [8, 9].

Processes of repair and regeneration of periapical tissues after conservative or surgical treatment follow the general principles typical of tissue repair. At the same time, there are some specifics since in this zone there isprevention a viable approach. The role of the dentist will continue to evolve along the lines of currently visible trends.

The mechanisms of healing processes caused by calcium orthophosphates usually depending on a complex of physiochemical processes on and in the implant material and from series sequences of biological processes in local biological environment, but the relative significance of these mechanisms is not yet clearly understood [8].

5. Conclusion

The orthograde treatment of severe periapical lesions in combination with apical resorption can heal with good bone regeneration after adequate decontamination and creation of biomimeticapical stop. The orthograde application of promising nanosize biphasic calcium phosphate materialsstimulate the mechanisms of completely bone regeneration as well as in cases with critical-size apical bone defects.

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