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Original Research Paper

Dentistry

PERSISTENT APICAL PERIODONTITIS AFTER ENDODONTIC TREATMENT: SURGICAL MANAGEMENT

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ABSTRACT The high success of endodontic therapy for apical periodontitis treatment is well known. However, studies showed that between 20% to 60% of treated teeth in the population present with apical periodontitis after root canal therapy. When viable, non-surgical retreatment is the first option while endodontic surgery should be the last resource for elimination of the disease. The aim of this case report is emphasize the potentiality of the successful outcome of surgical endodontic treatment following failed non-surgical treatment of a second maxillary premolar and first maxillary molar.

KEYWORDS : Endodontic Microsurgery; Platelet rich-fibrin; Bioceramics; Mineral Trioxide Aggregate.

INTRODUCTION:

Apical surgery is an option used from decades. Is suggested for treatment of persistent apical periodontitis or symptoms after root canal therapies. Different materials have been used from the beginning to the present, such as Amalgam, Intermediate restorative material (IRM), super ethoxybenzoic acid (SuperEBA), MTA and Bioceramics. Nonsurgical treatment/retreatment is the first choice for symptomatic teeth, apical lesions and previous root canal procedures. Endodontics microsurgey is predictable method to use in effective elimination of persistent apical pathology. However, some drawbacks can be found on the process: obstructed canal pathway, irredeemable materials within root canal and persistent symptoms (1).

Further advances and modern techniques have included use of dental operating microscope, ultrasonic instruments and Mineral Trioxide Aggregate (MTA) as retro-filling material, which reported a success rate of 92% in a prospective study and 91% in a retrospective study using IRM as retrograde filling (2) (3).

The primary steps for Endodontic Microsurgery are resecting 3 mm of affected root, retro-preparation of cavity using ultrasonics tips and filling/sealing with biomaterials compatible with surrounding tissues (4). This agrees with the idea of bacteria and their byproducts, also infected dentinal debrids, may persists in the most apical portion of the canal and jeopardize apical healing (5).

The aim of the present case report was to present the surgical endodontic management following failed non-surgical treatment of second maxillary premolar and first maxillary molar.

Case Report:

A 30 years old female patient was referred to Endodontics Department at School of Dentistry, University of Buenos Aires with pain and swelling in the upper left posterior area. Patient was symptomatic, with no relevant medical history and no routine medication. Her dental history revealed previous root canal treatment in both maxillary second premolar and maxillary first molar. After extra-oral and intra-oral clinical examination, percussion and palpation testing was performed in the area with sensitive results. Radiographic and CBCT examination revealed poor root canal filling, PDL space widened in both teeth and extrusion of the gutta-percha into periapical tissues. Teeth were diagnosed with persistent apical periodontitis. (Fig. 1, 2 and 3)

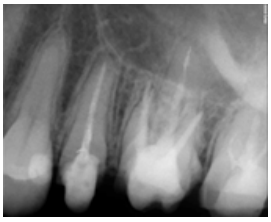

Fig. 1 Pre-op radiograph

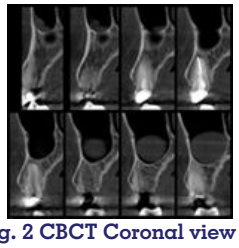

Fig. 2 CBCT Coronal view of maxillary premolar

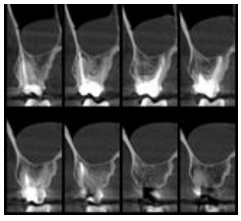

Fig. 3 Coronal view of maxillary molar

After infiltration of local anesthesia using Articaine 4% with epinephrine (1:100,000) a full mucoperiosteal flap was reflected and consequently the surgical area was exposed. Osteotomy with high speed handpiece and round bur was completed with focus in small as possible but as large as necessary to accomplish the clinical objective. Apical canal orifices were detected and 3 mm of the root-end were removed to reduce apical ramifications. (Fig. 4)

Fig. 4 Root-end resections

Root-end preparation cavity was achieved using ultrasonic piezoelectric unit (P5 Booster, Satelec, Merignac, France) and KiS ultrasonic diamond coated tips (Obtura Spartan Endodontics, Algonquin, Illinois, USA) 3 millimeters in depth removing intracanal filling material and irritants. Isthmus in between MB and MB2 canals was carefully cleaned creating an appropriate cavity to place the biomaterial. EndoSequence BC RRM Fast Set Putty (Brasseler, Savannah, GA, USA) was the material of choice for retro-filling. (Fig. 5, 6 and 7)

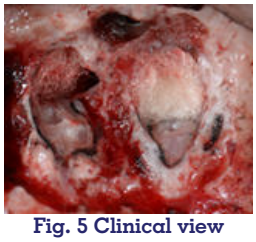

Fig. 5 Clinical view of retro-cavities

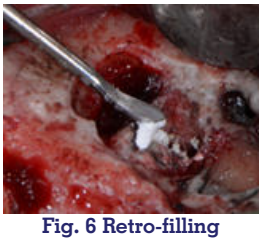

Fig. 6 Retro-filling placement

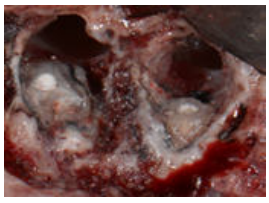

Fig. 7 Retro-filling completed

Platelet rich-fibrin was placed in the surgical site, flap was repositioned and sutured with Ethilon 5-0 sutures (Ethicon, Johnson & Johnson, Somerville, New Jersey, USA). Slight pressure was applied on the zone for ten minutes after suturing. A post-operative radiograph was taken to confirm retro-cavity were filled correctly. (Fig. 8, 9 and 10)

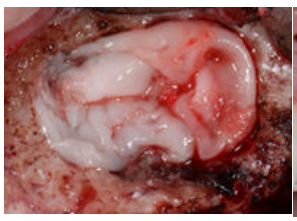

Fig. 8 Platelet rich-fibrin in situ

Fig. 9 Flap repositioned and sutured

Fig. 10 Post-op radiography confirming retro-fillings

DISCUSSION:

Endodontic Microsurgery is a reliable alternative treatment for persistent apical periodontitis after non-surgical root canal therapy with high reported success rate of 90% (6). This is possible due to new technologies such as Cone-beam computed tomographic (CBCT) imaging, magnification with dental operating microscope, ultrasonics retro tips design and retro-filling biomaterials. However, some drawbacks in diagnosis, treatment planning or clinical skills can be conditionals on the outcomes. Also, has been considered as an option for restored endodontically treated teeth with periapical lesions and symptoms where endodontic retreatment was failed, non-viable or traumatic. Endodontic surgery consists in removing pathological tissues from periapex and periradicular zone generating supportive conditions for healing of surrounding tissues around the tooth. The treatment outcome of periapical surgery should be determined clinically and by the use of radiographs and CBCT.

In this particular case study, after anesthesia infiltration a full-thickness mucoperiosteal flap elevation was completed with just one vertical incision. Adequate hemostasis with ferric sulfate solution delivered directly in the surgical site was achieved. High-speed handpiece and round burs were used for osteotomy, root tips were resected 3mm and retro-cavities were performed 3 mm in depth with ultrasonic retro-tips. Bioceramics was material selected for retro-filling and platelet rich-fibrin (PRF) was used to stabilize the bone.

Platelet-rich fibrin (PRF) is a new generation of platelet concentrates, with simplified processing and without biochemical blood handling. Platelet concentrates are autologous with relatively simple preparation. They include concentrations of growth factors such as transforming growth factor-beta (TGF-beta), vascular endothelial growth factor (VEGF), and platelet-derived growth factor (PDGF) (7).

Platelet rich-fibrin was developed in France by Choukroun et al. and has been used to stimulate soft/hard tissue healing and as a fibrin-based living biomaterial. It´s advantageous over platelet-rich plasma (PRP) because of preparation and application, minimal expense, and lack of biochemical modification (no bovine thrombin or anticoagulant is required). Blood is collected in tubes and then centrifuged during 10-12 min. to separate the blood in three layers: red blood cells on the bottom, acellular plasma on the top and platelet-rich fibrin in the middle. PRF support healing process in regeneration and surgical procedures (8). However, deeper research is needed to reinforce the idea that it can be used as a bioscaffold in oral surgical therapies.

Mineral Trioxide Aggregate (MTA) was approved for endodontic use by U.S. Food and Drug Administration in 1998. Is the preferred choice of capping, filling and repair for furcal perforation because sealing ability and induces calcified barrier formation. Has been used in pulpotomies, apexifications, vital pulp therapy and multiple endodontics applications (9) (10). However, the material is very grainy, sandy and has a poor consistency, making it ardous to use in some clinical situations.

MTA is biocompatible and stimulate cell proliferation due to cell attachment to material surface and promotion of healing process. It has granular surfaces where attached cells can grow. Stimulates osteoblast differentiation and inhibits macrophague differentiation into osteoclasts, thus bone resorption. MTA increase proliferation of periodontal and gingival fibroblasts, osteoblasts and dental pulp cells (11).

MTA is a mixture of a refined Portland cement and bismuth oxide, with parts of Silicon dioxide (SiO2), Calcium oxide (CaO), Magnesium oxide (MgO), Potassium sulfate (K2SO4) and Na2SO24 formula. Portland Cement, is a mixture of dicalcium silicate, tricalcium silicate, tricalcium aluminate, gypsum (wich is decisive factor of setting time) and tetracalcium aluminoferrite. Some studies showed the gypsum accumulation of MTA is close to half that Portland cement, therefore this indicates a prolonged maximum setting time is required for MTA. When the mixture of powder and water occurs, cement is converted from a fluid to a solid state and express a continuous increase in the stiffness with time. MTA produces mechanical seal and hydroxyapatite crystals, reacting with dentine and creating chemical adhesion (12) (13).

Calcium silicate cements are stable and set in the presence of moisture, such blood and other fluids. MTA used as root canal sealer generates closure of main canal foramen by formation of new cementum and absence of inflammatory cells after 6 months (14). However, it may cause discoloration due to release of ferrous ions.

Bioceramics are calcium silicate cements. Assorted studies suggested that this materials develop osteo-odontogenic

differentiation by enlarging the expression of osteo/ odontogenic markers and calcium deposit (15).

Bioceramics are composed of calcium silicates, zirconium oxide, tantalum pentoxide, calcium phosphate monobasic, and filler agents. Clinical applications for calcium silicate cements are: apexification, regenerative endodontics, perforation repair, root canal filling, root-end filling, restorative procedures, periodontal defects and treatment of vertical and horizontal root fractures. Bioceramics has improved handling characteristics, physical properties and better microhardness. Setting time and porosity are decreased when compared with MTA (16) (17). However, statistics and long-term efficacy are low, more studies and evidence are necessary in the future to implement clinical directives.

CONCLUSION:

Although endodontic periapical microsurgery seems to be effective and should be considered as a treatment option reliable for recurrent or persistent apical periodontitis, more evidence is needed in order to obtain optimal and predictable long-term results.

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