

Surgical Management of External Inflammatory Resorption: A case report

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ABSTRACT

AIM: To evaluate the 2D and 3D clinical and radiographic success of an external inflammatory resorptive defect with combined endodontic-periodontal lesion.

Summary: This article present a case report of 17 year old female patient with the history of pain and trauma 1 year back and a sinus tract was present with grade 1 mobility with respect to maxillary anterior teeth region. On 2D and 3D radiographic examination, an external inflammatory resorptive defect was depicted with combined endodontic-periodontal lesion and complete denudement of the buccal cortical plate. Lesion area and volume was also calculated using Corel Draw X7 and ITK snap software both preoperatively and after a period of 12 months and it was observed that lesion area and lesion volume was reduced from 110 mm² to 9 mm² and 825 mm³ to 40 mm³ respectively with complete repair of the resorptive defect using strict microsurgical methods, MTA as a root-end filling material, GTR as a method of regeneration and nanohybrid composite material for the repair of resorptive defect.

Keywords: External inflammatory resorption, surgery, guided tissue regeneration, MTA, nanohybrid composite material.

Introduction

Root resorption is the loss of dental hard tissue (i.e., cementum and dentin) due to odontoclastic action¹. It is broadly categorized into two types-external and internal resorption¹. External resorption is further subclassified into surface, external inflammatory, external replacement and transient apical breakdown¹.

External inflammatory resorption (EIR) affects the root surface and is a sequel to dental luxation and avulsion injuries². Prevalence of EIR after luxation and avulsion injuries reported to be 5-18% and 30% respectively². Traumatic dental injuries such as intrusion, lateral luxation and avulsion may lead to contusion injuries to the PDL. Due to this injury, osteoclasts and macrophages are attracted to the site of injury².

The initial injury causes a breach in the integrity of protective precementum layer which is a prerequisite for the occurrence of all the types of external resorption³. This allows odontoclasts to bind to and resorb the underlying cementum and dentin in a manner similar to the development of surface resorption³. However, EIR differs from surface resorption in the manner that it is a progressive event and depends on microbial stimulation from the infected necrotic pulp for its progression³.

Management of EIR depends upon effective removal of the causal agent that is the infected necrotic pulpal tissue in the root canal space⁴. This arrests the resorption process and creates an environment conducive to hard tissue repair of the damaged root surface⁴. Therefore, in case of EIR root canal treatment should be started as soon as radiographic signs of EIR are identified^{1,4}. Effective chemo mechanical debridement is the fundamental to success of root canal treatment and management of EIR^{1,4}. However, in the present case report the mean area of the lesion size was around 110 mm² and width of the lesion was around 11 mm and moreover the lesion was combined endodontic-periodontal lesion. So, it was not possible to successfully manage the lesion with non-surgical root canal treatment only.

This article presents successful management of a combined endodontic-periodontal lesion with External Inflammatory Resorption using strict microsurgical methods including ultrasonic instruments, microscopes and MTA as a root-end filling material and placement of composite under proper isolation over the resorptive defect and using collagen membrane as a method of GTR to cover the resorptive defect and denuded root surface.

CASE REPORT

17 year old female patient reported to the department of conservative dentistry and endodontics post graduate institute of dental sciences, Rohtak, Haryana with the history of pain. Patient was symptomatic with a history of pain and trauma 1 year back and a sinus tract was present with grade 1 mobility with respect to maxillary anterior teeth region. 2D radiographic examination revealed a uniform radiolucent lesion present in the apical third. The mean radiographic area of the lesion was 110 mm² measured using Corel Draw X7 software. 3D radiographic examination was also performed using CS9300 CBCT machine as it is not possible to exactly define the extent of resorption using 2 D radiographic examination alone.

The mean radiographic volume of the lesion was 825 mm³ measured using ITK snap software (version 3.8.0)⁵. On CBCT analysis, presence of resorptive lesion was confirmed on the distal aspect of the upper right maxillary lateral incisor present in the apical 3rd and approaching the middle 3rd and also there was complete denudement of the buccal cortical plate with the presence of combined endodontic-periodontal lesion. Moreover, the location of bone loss especially complete loss of the buccal cortical bone is an important prognostic factor affecting the periradicular surgical outcomes⁷. Combined endo-perio lesions and such types of defects present a clinical dilemma as their treatment requires both endodontic therapy and periodontal regenerative procedures⁷. The rationale of using guided tissue regeneration introduced in 1980's is to prevent the migration of faster proliferating epithelial cells and connective tissue cells onto the denuded root surfaces⁸.

Non-surgical root canal procedure

After straight line coronal access, pulp tissue was extirpated. Working length was determined with the combined use of radiograph and 3rd generation electronic apex locator (i.e., Root ZX) using a 15# K file. After that, complete chemomechanical debridement of the root canal space was performed with proper irrigation using 5.25% sodium hypochlorite as an irrigating solution. The primary non-surgical root canal treatment was completed using crown-down technique and apical preparation was done till 45# k file. For a period of 2-3 weeks, repeated calcium hydroxide dressing was given. In the next appointment, when there was no pus discharge, the canal was completely dried and the obturation was performed using lateral condensation technique and permanent composite restoration was given. The surgery was planned after one month as the lesion was not resolved and was of the same size with orthograde root canal treatment.

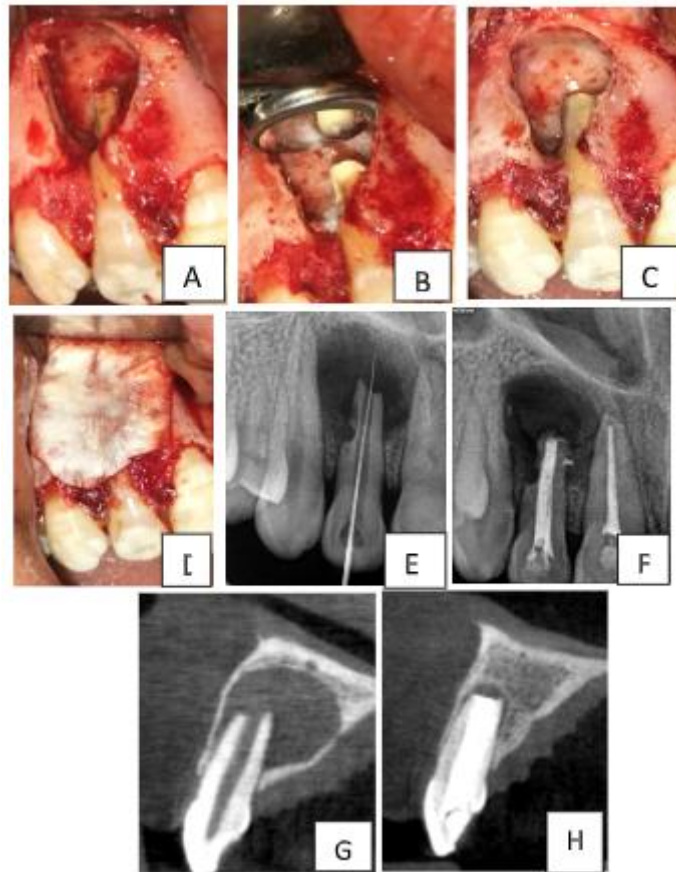
Surgical procedure

The full thickness mucoperiosteal **rectangular or trapezoidal flap** was reflected under aseptic condition by the following technique-

Preoperative mouth rinse with 0.2% chlorhexidine was used. Local anesthesia with 2% lidocaine with 1:80,000 epinephrine was achieved and 10-15 minutes waiting period was observed after giving block anesthesia and before administering the supplemental infiltrations. By using 15 no. blade, a full thickness mucoperiosteal flap was raised by giving one horizontal and two vertical incisions up to the alveolar crest including one tooth mesial & two teeth distal to the lesion. Flaps were gently reflected with periosteal elevator towards the apical area and frequent irrigation with sterile saline to prevent dehydration of the periosteal surface of flap was done. After complete elevation of the flap, debridement (peri radicular curettage enucleation) of the bony lesion was performed. For additional hemostasis during surgery, cotton pellets soaked in 0.1% epinephrine were applied topically as required.

Then the root tip was sectioned upto 2-3mm with 0° to 10° bevel angle with cylindrical surgical carbide burs at high speed under sterile water coolant. Root end preparations extending 3mm into the canal space along the long axis of the root were made by using a piezoelectric ultrasonic unit (P5 Booster, Suprasson Neutron; Acteon Inc, Mt Laurel, NJ) with double angled S12-7D Retro tips (Satelec) coated with diamond abrasives. Root end filling was done with mineral trioxide aggregate (MTA). Then the resorptive defect was thoroughly debrided with 90% tetracycline for 2-3 minutes and under proper isolation it was repaired with tetric-n-ceram (nano-hybrid) composite material. Then the resorptive defect along with the periapical defect and denuded root surface was covered with the bioabsorbable collagen membrane (Healguide).

The membrane was placed on the buccal side of the defect in such a way that the membrane extends 2-3 mm in apical, mesial and distal area of the defect ensuring no bubbles should be entrapped between membrane and the defect. Then, the membrane was stabilized by applying gentle pressure with finger and the flap was repositioned and sutured by using 5-0 reverse cutting black silk suture. Before repositioning of the flap, it was assured that the membrane should not be exposed.



RESULTS

2D Radiographic healing was assessed by Molven et al⁹ criteria as follows: 1. Complete healing, defined by re-establishment of the lamina dura, 2. Incomplete healing (scar tissue), 3. Uncertain healing and 4. Unsatisfactory healing. The criteria for a successful outcome included the absence of clinical signs and/or symptoms and radiographic evidence of complete or incomplete healing. 3D healing was assessed using Modified Penn 3D criteria¹⁰ and the outcomes were classified as complete and limited healing as success. 2D healing was assessed at an interval of 3, 6, 9 and 12 months while 3D healing was evaluated after 12 months only. After a follow up of 12 months, clinically the patient was asymptomatic with the resolution of sinus tract and radiographically reformation of periodontal space of normal width and lamina dura over the entire resected and unresected root surfaces. Lesion area was reduced from 110 mm² to 9 mm² while lesion volume was reduced from 825 mm³ to 40 mm³.

DISCUSSION

External inflammatory resorption affects the surface of the root and is the most common form of external resorption after luxation and avulsion injuries^{1,2}. In response to traumatic injuries, granulation tissue is formed in the pulp which leads to the production of odontoclasts, which are similar to osteoclasts and thus the resorptive process begins³. The diagnosis is solely based on radiographic signs and sometimes can be visualised as early as 2 weeks after replantation of avulsed teeth³.

The lesion in this case was diagnosed as external inflammatory resorption and combined endodontic-periodontal lesion which was based on the patient's history and 2D and 3D radiographic examination and complete denudement of buccal cortical plate was confirmed on CBCT examination. As soon as the diagnosis is made, root canal treatment was initiated in order to remove the necrotic infected pulp and to arrest the activity of the cells responsible for resorptive process⁴. As the lesion was located in the apical 3rd region of the root and it was combined endodontic-periodontal lesion it was not possible to repair the resorptive defect non-surgically, hence, endodontic microsurgery with concurrent guided tissue regeneration techniques was planned⁷. GTR promotes regeneration of cells of periodontal ligament and endosteum in combined endodontic-periodontal lesion there is communication between the apical and marginal bone unlike four wall defects, hence there are more chances that the faster proliferating epithelial cells repopulate the wounded area instead of the cells with regenerative potential such as PDL cells and cementoblasts resulting into healing with long junctional epithelium⁸.

MTA was chosen as the root-end filling material as it is biocompatible and sealing ability is superior as compared to other filling materials^{11,12,13}. MTA stimulate repair of periradicular tissues, showed no inflammation and deposition of cementum^{11,12,13}. Trichloroacetic acid (TCA) was applied to the resorptive cavity to promote coagulation necrosis of this tissue as it penetrates the smaller, more inaccessible recesses and resorptive channels. Nanohybrid composite material was used to repair the resorptive defect as the resorption process resulted in loss of tooth structure and moreover the nanohybrid composites has the advantages of less polymerisation shrinkage, more wear and tear resistance and easy polishability.

In the present case, clinical and radiographic success of such a large lesion of area 110mm² and volume 825 mm³ with an external inflammatory resorptive defect and combined endodontic-periodontal lesion was depicted after the use of strict microsurgical methods and with simultaneous placement of bioabsorbable collagen membrane as a GTR material. After a follow-up of 12 months, it was observed that lesion area lesion volume was reduced from 110 mm² to 9 mm² and 825 mm³ to 40 mm³ respectively.

CONCLUSION

The results of the present study concluded that it is possible to repair an external inflammatory resorptive defect with combined endodontic-periodontal lesion and complete denudement of the buccal cortical plate using strict microsurgical methods using MTA as a root end filling material and simultaneous placement of bioabsorbable collagen membrane as a GTR material.

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