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Case Report

Biomimetic Management of a Large Periapical Lesion with an Iatrogenic Defect: A Case Report

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Abstract

Traumatic injury of anterior teeth is common and may lead to cyst over a period of time. Root perforation is contrived communication between root canal system and the supporting tissues of teeth or the oral cavity. Iatrogenic root perforation is a procedural mishap but quite an uncommon event, which may occur at any stage of root canal therapy, from access cavity preparation to post-space preparation, on any tooth. Perforations are reported to result in lower success rates. How they are managed can make the difference between retention and the loss of a tooth. It results in bacterial contamination, peri-radicular tissue injury, inflammation, and bone resorption. The purpose of this case report is to describe the endodontic retreatment and surgical management of a longstanding periapical lesion on maxillary central incisor, associated with perforation using mineral trioxide aggregate. MTA is bioactive material and shows good sealing activity for perforation repair and apical seal. For large periapical cyst healing PRF was used and Novabone putty was used for the healing of osseous defect.

Keywords: Root perforation, MTA, Novabone, Radicular cyst.

INTRODUCTION

Dental trauma to teeth is very common occurrence leading to an urgent situation that includes physical and psychological issues. Approximately one-third of children and a quarter of adolescents and adults experience some type of dental trauma throughout their lives, being proven by epidemiological studies [1]. Traumatic injuries to the anterior teeth are one of the most common unanticipated events that cause pain, disfigurement, and psychological problems. Cyst-like apical periodontitis might be the fate of an untreated traumatically injured tooth. Reaction due to the microbial attacks and the host response events results in apical granulation tissue, that is, periradicular bone resorption and degradation of the apical periodontal ligament. Some of the apical granulomas turn into cysts. The reported incidence of periapical cyst formation varies from 6 to 54% [2].

Most root canal treated teeth fail mainly due to micro leakage and bacterial infection. The presence of new or persistent periapical radiolucency adjacent to a root-filled tooth is often used as a criterion for endodontic treatment failure [3].

Root perforation is contrived communication between root canal system and the supporting tissues of teeth or the oral cavity [4]. Iatrogenic root perforation is a procedural mishap but quite an uncommon event, which may occur at any stage of root canal therapy, from access cavity to postspace preparation, on any tooth.[5] Perforations are reported to result in lower success rates. How they are managed can make the difference between retention and the loss of a tooth [6].

Various dental materials (including amalgam, plaster of Paris, gutta-percha, indium foil, glass ionomer cement, zinc ethoxybenzoic acid cement, and intermediate restorative material) have been proposed over the years for perforation repair with varying

degrees of success. The introduction of bioactive materials such as mineral trioxide aggregate (MTA) is believed to enhance the success rate of such repairs [7].

MTA has several desirable properties in terms of its biocompatibility, bioactivity, hydrophilicity, radiopacity, sealing ability and, low solubility. The most important of these properties in dentistry is its biocompatibility and sealing ability [8].

This present paper describes the treatment approach of iatrogenic perforation with large periapical radiolucency.

CASE REPORT

A 24-year-old male patient reported to the Department of Conservative Dentistry, Aesthetics and Endodontics with the chief complaint of pain and swelling in the front region of the right side of the face since 3 months. Patient is having a history of trauma 10 years back. The patient had undergone root canal Treatment i.r.t 11 after 4 years of trauma. Patient has been experiencing pain in the right side of the face which is dull and intermittent in nature since 3 months.

Extraoral examination revealed swelling in upper front region of right side of the face. On examination, swelling extended anterio-posteriorly from the upper lip border to base of the nose. On palpation, swelling was hard and non-fluctuant. Swelling seemed to be around 2*2 cm. On intraoral examination, tender on percussion was positive i.r.t 11, 12, 21 and Pulp sensitivity test was negative i.r.t 21, 12

Radiographic examination of IOPA showed an evidence of large periapical radiolucency irt 11, 12, 21 in the apical region and radiolucent material was seen in the coronal one-third area and guttapercha was slightly extruded below the apex irt 11. (Figure no. 1).

CBCT examination showed evidence of through and through buccal and palatal plate perforation in the maxilla (Figure no. 2).

Fig-1: Preoperative IOPA

Fig-2: CBCT of maxilla

Based on clinical and radiographical examination it led to a provisional diagnosis of periapical cyst or granuloma irt 11, 12, 21.

Treatment options were explained to the patient and agree with retreatment of the tooth irt 11and root canal treatment irt 12, 21 followed by surgery.

During the removal of material in the coronal 1/3rd of root, pus discharge and a bleeding spot was seen. On further process during removal gutta percha from canal, another apical root perforation was suspected. So the tooth was temporized and it was decided to treat it at the time of the surgery.

After the access opening was performed irt 21, 12. Cleaning and shaping was done with copious irrigation of 5.25% sodium hypochlorite (NaOCl) and finally was washed with 17% EDTA. The teeth were then obturated using cold lateral condensation before surgery.

After giving local anaesthetic agent (Lidocaine 2%), trapezoidal flap was performed. A vertical incision was placed from the distal surface of the left maxillary central incisor to the distal surface of the right maxillary canine. A full‑thickness mucoperiosteal flap was reflected beyond the apical portion to expose the defects. Granulation tissue was removed and enucleation was done. (Figure 3A) There were two perforations seen coronal and apical root portion irt 11. (Figure 3B) Guttapercha was removed from the canal (Figure 4A) and the file was inserted to confirm apical foramen. Maxillary right central and lateral incisors were apically resected 3 mm from the apex and the

retrograde cavity was prepared using the ultrasonic tip. The entire canal was restored with MTA. (Figure 4 B) Novabone graft was placed and PRF placed into the bony cavity and suture was taken. Biopsy of the enucleated lesion was sent for a histopathological examination. Patient was recalled after 7days for suture removal.

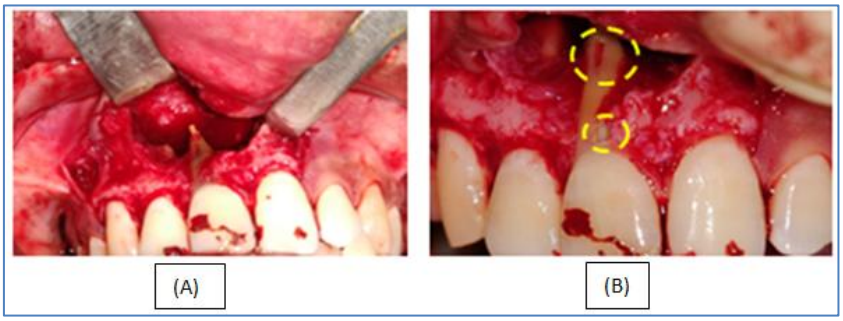

Fig-3: (A) Enucleation of cyst (b) yellow ring indicating apical and coronal perforation

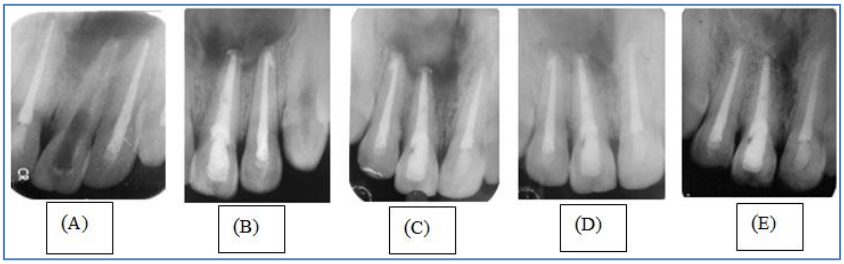

Fig- 4(A) GP removed from canal at the time of the surgery irt 11 (B) entire canal was obturated with MTA and root end filling irt 11 (C) 1 month follow up (D) 4 months follow up (E)15 months follow up

DISCUSSION

Perforations can be pathological, resulting from caries or resorptive defects, but most commonly occurs iatrogenically during or after root canal treatment. Indeed, perforations occurring during root canal therapy may account for as many as 10% of all failed endodontic cases. [9] Perforations of the coronal third often result whilst attempting to locate and open canals. An exaggerated or misdirected access cavity is also conducive to root perforation and makes the tooth susceptible to coronal/radicular fracture [10]. Inadequate cleaning and shaping of the canal can cause blockages and ledges. Once formed, these can cause instruments to deviate, transporting the canal away from the center of the root, until perforation occurs [9].

As suggested by Alhadainy, several options exist, when considering treatment of teeth with failure of endodontic therapy, including no treatment, endodontic retreatment, endodontic surgery, or extraction [3]. In this case, there was a large periapical lesion, we already planned surgical treatment therefore treatment of perforation was carried out at the time of surgery. After the enucleation of lesion, the perforated tooth was treated with MTA. MTA used as perforation sealing material as well as root-end filling material.

Mineral Trioxide Aggregate (MTA) was introduced in endodontics in 1990 as a material with the ability to seal communication between the tooth and the external surfaces [11, 12].

MTA has been considered as a perfect material for perforation repair, apexification, retrograde filling, pulp capping, etc. MTA is a mineral powder that is made up of hydrophilic particles. These superior properties of MTA such as lesser bacterial leakage, biocompatibility, and better adaptation to cavity walls make it a useful material in sealing the root perforation and enhanced the prognosis of perforated teeth [13]. Furthermore, there is an additional biological seal obtained by the proliferation of cells directly on the cementum during the healing process [14].

The four critical factors that influence bone regeneration after the periapical surgery are primary wound closure, angiogenesis as blood supply and source of undifferentiated mesenchymal cells, space maintenance, and stability of the wound (PASS principle) [15].

Regenerative therapies like bone graft and barrier membranes have been used for the optimal healing of the periapical defect area after degranulation of the lesion [16]. Bioactive Synthetic NovaBone Puttynovabone putty has shown the positive effect of bone improve healing and a resolution of osseous defects[17].

NovaBone Putty – CMF is a bioactive synthetic graft. Putty is composed of a bimodal particle distribution of Calcium Phosphosilicate (CPS) (active ingredient), with Polyethylene Glycol (PEG) as an additive and Glycerin as the Binder. The volume of the active ingredient is approximately 70% [18]. Osteostimulative and osteoconductive property, manufactured by NovaBone, Florida, available in putty consistency. It consists of two-particle phases: Phase 1 – 90–710 µ bioactive glass particles and Phase 2 – 32–125 µ calcium phosphosilicate. Phase 2 particles enhance the physical characteristics and improve handling. Spaces between particles permit rapid vascularization and bone ingrowth and regeneration [17].

Bioactive glass in NovaBone can be considered a scaffold for the delivery of growth factors in PRF [19]. PRF is within the sort of a platelet gel and may be utilized in conjunction with bone grafts, which offers several advantages including promoting wound healing, bone growth and maturation, graft stabilization; wound healing, and haemostasis and improving the handling properties of graft materials. Clinical trials suggest that the combination of bone graft along with the growth factors in the PRF may be suitable to enhance bone density. PRF is a rich source of PDGF, TGF, and IGF, etc., in vivo application of PDGF increased bone regeneration in calvarial defects when a bio-absorbable membrane was used as a carrier. TGF-stimulates the biosynthesis of type I collagen and induces the deposition of bone matrix in vitro. When TGF-was applied with a biodegradable osteogenic material, bone growth around calvarial defects increased significantly. IGF-I stimulates bone formation by proliferation and differentiation [15].

In Novabone, the negatively charged hydroxyl-carbonate apatite layer attracts proteins such as growth factors and fibrin which act like an organic glue attracting osteoblasts and stem cells to the layer which differentiates to produce bone. Collagen attaches to the surface and embeds in the hydroxyl-carbonate apatite layer, and this, in turn, inhibits epithelial migration. The PDGF and TGF in PRF function in promoting the development and differentiation of periodontal and alveolar bone cells rapidly [19].

Hence, it is proved that by the use of MTA, PRF and NOVABONE can provide a good satisfactory result in large periapical lesion after 15 months follow up

CONCLUSION

This case report describes good clinical outcome using MTA for perforation repair as well as retrograde filling for successful and effective sealing ability. Bioactive synthetic NovaBone Putty has shown the positive effect of bone healing and a resolution of osseous defects.

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