Alternative Approach for the Management of Complete Crown Fracture with Periapical Lesion by Apicoectomy and Orthodontic Extrusion Using Removable Appliance

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INTRODUCTION

Trauma induced periapical lesions often require complex treatment, as conventional root canal therapy poses a high risk of failure due to apical transportation of infection. However, complete crown fractures with a fracture line close to the gingiva or extending subgingivally may require orthodontic extrusion to re-establish the biologic width thereby achieving aesthetic and functional restoration of the tooth. The purpose of this case report is to suggest an alternative treatment approach to achieve healing of periapical lesions and causing extrusion of the teeth by moving the fracture line above the supragingival level for final aesthetic and functional restoration. This case report discusses the management of an anterior tooth with long-standing subgingival fracture and large cyst-like periapical lesion using apicoectomy and orthodontic extrusion with a removable appliance.

PRESENTATION OF CASE

A 13-year-old male patient presented to the Department of Paediatric and Preventive Dentistry with a chief complaint of broken upper front tooth i.e. maxillary left permanent central incisor (UL1) following trauma. On detailed clinical examination, the tooth was seen to have sustained an Ellis class VIII fracture (loss of crown en masse) with the fracture margins extending subgingivally (Fig 1A). On radiographic examination, large periapical radiolucency was seen (Fig. 1B), indicating long-standing periapical pathology due to trauma. The periapical lesion appeared round, unilocular with well-circumscribed borders measuring approximately 1-2 cm suggestive of a periapical cyst.

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Dental trauma if left unattended can lead to subsequent pathological changes over time and result in necrosis of the pulp, ultimately forming periapical lesions. Gingiva and marginal periodontium act as a natural seal around the tooth, protecting it from invasion by bacteria in the oral cavity. When this seal is broken due to trauma, the subgingival location of the fracture line paves way for bacteria to easily gain entry to the pulp and prompts pulpal inflammation by establishing non-tissue-specific granulation tissues. Over time, leading to apical periodontal lesions, which frequently take the form of reactive granulomas and cysts. A periapical lesion with definite lining suggestive of a periapical cyst warrants apicoectomy. Apicoectomy is a surgical procedure that includes surgical removal of tooth root apex which can be done alone or in combination with placing a retrograde filling to seal the apical part of the root. When such periapical lesion is associated with subgingivally fractured incisor, it will require sufficient crown structure above the attached gingiva for the final restoration and this can be achieved either by orthodontic or surgical extrusion of the tooth. However, there have been concerns regarding the possible adverse events that follow surgical extrusion namely ankylosis, surface root resorption, mobility and marginal tooth loss. Therefore, it is advisable to choose a conservative treatment approach like orthodontic extrusion. Hence, this case report discusses the management of a tooth with Ellis class VIII trauma-induced periapical lesion by apicoectomy followed by orthodontic extrusion to achieve sufficient crown structure to aid in final aesthetic and functional restoration post healing.

**Clinical Diagnosis**

Based on clinical and radiographic findings, a diagnosis of Ellis class VIII fracture (loss of crown en mass) with periapical cyst was made and the treatment plan for the case involved. Apicoectomy with cyst enucleation and root canal therapy, followed by orthodontic extrusion of the tooth (UL1) to aid in achieving sufficient crown structure for final aesthetic and functional restoration post healing.

**Surgical Procedure**

Local anaesthesia was achieved using 2 % lignocaine combined with a vasoconstrictor 1:80,000 adrenaline. A semilunar incision was placed convex in marginal direction starting from the vestibule to at least one tooth from the target tooth and keeping always at least 5 mm from the edge of the expected bone defect, then back to the vestibule of the opposite side. The mucoperiosteal flap was reflected in order to visualize the bone defect (Fig 3). Next, osteotomy was performed successfully using a straight fissure carbide bur to enlarge the bony defect to form a labial window and gain access to the cystic structure and roots of the tooth UL 1 (Fig 1C). The granulation tissue was completely curedt along with the cyst lining and the root ends were resected to about 3 mm using a straight carbide bur. The operating field was then debrided using normal saline and manual cleaning and biomechanical preparation of the root canals were achieved by hand instruments using step-back technique up to size 65 K file. This was followed by disinfecting, obturating canals with gutta-percha cones to achieve an apical seal (Fig 1D). Finally, the flap was repositioned and sutures were placed (Fig 1E). Perio pack was placed on the surgical region. A periapical radiograph was taken to confirm the accuracy of obturation and the patient was prescribed analgesics and antibiotics. The child was then recalled after 1 week for suture removal and the surgical site was checked for healing.

At the next appointment, fibre-reinforced post and core restoration were placed, followed by an alginate impression making of the upper arch for fabrication of Hawley’s appliance with J hook for orthodontic extrusion of UL1 (Fig 1F). ‘J’ hook was soldered onto the appliance and Adams clasp was given on molars for retention. Brackets were placed on the exposed crown structure. Using a Dontrix gauge, the force exerted by the elastics was measured following which elastics were placed from brackets to J hook. This was expected to deliver 30 - 40 gms of force which is enough to cause extrusion of 2 – 3 mm. The patient was advised to change elastics every two weeks.

**Figure 1C. Osteotomy Performed to Gain Access to the Bony Defect**

**Figure 1D. Obturating the Canals with Gutta-Percha**
Outcome and Follow-Up

Periodic follow-up of 2 months, 6 months, and 8 months was maintained and, at two-month follow up the teeth showed extrusion of 2 mm which was enough for establishing aesthetic and functional restoration also periapical radiolucency had reduced. At 8 months follow-up, radiograph findings showed satisfactory healing of periapical lesion (Fig 1G).

PATHOLOGICAL DISCUSSION

Periapical lesion is usually the result of egress of bacteria and its toxins from the root canal into the periradicular space when the apical seal is broken. In traumatic injuries like crown fractures with pulpal involvement, pulp fails in its ability to guard itself against bacterial invasion thus piercing through the dentinal tubules, colonizing the necrotic pulp, and leading to the development of the periapical lesion. The reaction caused by the microbial attacks and host response events, results in apical granulation tissue, specifically periradicular bone resorption and degradation of the apical periodontal ligament. Some of the apical granulomas may perhaps turn into cysts. The reported incidence of periapical cyst formation varies from 6 to 54%.

DISCUSSION OF MANAGEMENT

Approximately 10% of all periapical lesions entail surgery in addition to endodontic treatment. Periapical surgeries include apicoectomy, root-end resection, and retrograde filling. Elimination of just the periradicular lesion will probably result in the recurrence of the lesion if the root-end is not resected since the removal of the diseased periapical tissue by periradicular curettage abolishes only the effect of the leakage, not the cause. Therefore, root-end amputation of about 3 mm removes all of the lateral canals and apical ramifications; posing less risk of reinfection and eventual failure. Apicoectomy is generally performed after failed root canal treatments. But, large periapical lesions with well-circumscribed, unilocular, and definite lining, suggestive of cysts or periapical granuloma can result in concomitant resorption of bone surrounding roots of affected teeth. Moreover lesions measuring more than 1 mm require multiple visits for intracanal medicament placement before root canal treatment. This may not be appropriate for patients who demand a limited number of visits owing to time constrictions. Hence, in this patient apicoectomy procedure with retrograde filling over conventional root canal treatment was performed, as chances of root canal therapy failure is high due to apical transportation of infection. Following this, orthodontic extrusion of the compliant tooth was planned to achieve sufficient crown structure to aid in the final aesthetic and functional restoration of the tooth post healing.

FINAL DIAGNOSIS

This paper reports a case of Ellis class VIII fracture managed by apicoectomy followed by orthodontic extrusion. A comprehensive treatment approach is essential in the treatment of teeth with periapical lesions resulting from longstanding trauma, like complicated crown fractures; in order to attain satisfactory healing of the periapical region as well as to re-establish the aesthetic and functional restoration post healing.

REFERENCES


