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Management of complicated crown-root fracture in a paediatric patient: A case report

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Abstract

Background: A crown-root fracture is defined as one that involves the cementum, dentin, and enamel. It is becoming more and more appealing to rebuild and preserve teeth with these types of fractures rather than extracting them and utilizing prosthesis. Surgical extrusion is one such easily accessible treatment technique.

Objective: The aim of this case report is to evaluate surgical extrusion as a treatment modality for management of complicated crown-root fractures in children.

Method: In order to minimize injury to the marginal alveolar bone, the tooth was luxated and extruded to the proper position before being splinted. The fractured buccal cortical plate fragment was removed, crushed, and used as an autogenous bone graft. After this root canal treatment was performed followed by cementation of metal post, and acrylic crown placement.

Result: The teeth that received treatment were performing well after the procedure, with both mobility and probing depths staying within the expected limits. X-rays indicated a healthy periodontal ligament space and the formation of lamina dura around the extruded roots. There were no signs of root resorption or considerable loss of marginal bone.

Conclusion: This technique might be a promising alternative treatment option especially in the anterior zone to avoid functional or aesthetic complications.

Keywords: Crown-root fractures, surgical extrusion

Introduction

Fracture of crown and root, involving enamel, dentin, and cementum, is considered a significant dental injury. Upper incisors are the most commonly affected teeth by trauma, with crown damage being particularly prevalent ^[1]. Due to their vulnerable position in the arch, anterior teeth are frequently subjected to such traumatic events ^[2]. Crown-root fractures account for 5% of injuries in permanent teeth and 2% in primary teeth. The extent of pulp exposure in these fractures can range from minor pinpoint exposure to complete exposure of the coronal pulp. Major causes include falls, car and bicycle accidents, impacts from foreign objects, and iatrogenic injuries ^[3]. Treating these fractures is challenging due to the risk of pulp necrosis from bacterial contamination if the pulp remains exposed. The success of treatment depends on the severity of the fracture, the promptness and quality of initial care, and adherence to follow-up protocols ^[4,5].

Healing oblique crown-root fractures that extend below the alveolar bone and gingival margin is particularly complex. To prevent complications and maintain the form and function of the gingival attachment, it is crucial to prevent tooth loss and restore the gingival component ^[6]. When the fracture is subgingival, achieving a proper seal with restorations and bonding becomes nearly impossible. Therefore, it is essential to maintain isolation during treatment ^[7].

Treatment options for fractures involving the biologic width include extraction, surgical crown lengthening, surgical extrusion, and orthodontic extrusion ^[8]. Surgical extrusion, a one-step procedure, is generally simpler and quicker than orthodontic extrusion, which is suggested to be a more gradual method for tooth movement ^[9, 10]. Surgical extrusion often provides predictable short- and long-term outcomes and can address some of the limitations associated

with orthodontic extrusion^[11-14], though it may sometimes result in apical root resorption and marginal bone loss^[15]. This approach involves a complex tooth extrusion performed in a single surgical step, facilitating subsequent prosthetic treatments to achieve acceptable aesthetic and functional results.

This report aims to present the successful 6-month follow-up of a 10-year-old boy who underwent surgical extrusion for a crown-root fractured mature permanent maxillary right central incisor.

Case Report

A 10-year-old boy with no underlying health conditions presented to the Department of Pedodontics, accompanied by his father, following a fall from a tree two days prior. Initial treatment and antibiotic therapy were administered at a hospital before referral to our clinic. A comprehensive assessment was conducted, including general, medical, dental, and traumatic histories, which revealed no systemic disease.

Extraoral examination identified abrasions on the chin and perioral muscles, as well as inflammation and bleeding of the labial gingiva surrounding the central incisors (Fig. 1). Intraoral examination revealed intrusion and lateral luxation of both maxillary right and left central incisors, with a complicated crown-root fracture of the maxillary right central incisor (tooth 11) and an Ellis Class I fracture of the maxillary left central incisor (21) (Fig. 2). A periapical radiograph demonstrated an intact periodontal ligament space, complete root formation, and the presence of periapical radiolucency around 11 (Fig. 3). The fracture line extended from the distal aspect of the crown to the cervical one-third of the root, with no evidence of horizontal root fractures.

Although the patient did not report pain, he exhibited signs of psychological distress due to the trauma. Based on the clinical and radiographic findings, surgical extrusion was selected as the optimal treatment approach. A mucoperiosteal flap was elevated, and teeth 11 and 21 were carefully luxated and extruded by 5 mm, with intentional rotation to potentially eliminate the need for future orthodontic intervention (Fig. 4). The teeth were splinted using an 8-ligature wire and light-cured resin, extending from the primary first molar on the right side to the left side (Fig. 5). The fractured buccal cortical plate fragment was removed, crushed, and used as an autogenous bone graft (Figs. 6, 7). Occlusal adjustment was performed, and the area was covered with a surgical dressing. The flap was sutured with nylon, and pulp extirpation was completed for tooth 11, followed by the application of a triple antibiotic paste and a closed dressing. Antibiotics were prescribed for 5 days, and the patient was provided with oral hygiene instructions.

At the 2-week follow-up, sutures were removed while the splint remained in place for an additional 2 weeks (Fig. 8). Subsequent weekly evaluations led to the removal of the splint at 4 weeks. Tooth 21 was diagnosed as non-vital, and radiographic examination revealed a periapical abscess. Following splint removal, an access opening was created in tooth 21, and a calcium hydroxide dressing was applied for 2 weeks. Biomechanical preparation of tooth 11 was performed, followed by the application of a calcium hydroxide dressing for 2 weeks. Once the patient was asymptomatic, obturation of both central incisors was completed. Due to the significant loss of crown structure in tooth 11, a metal post was cemented, and a core build-up was performed (Fig. 9). The tooth was then prepared for an acrylic crown, and an alginate impression was taken (Fig. 10). The crown was cemented one week later (Fig. 11). For tooth 21, obturation was followed by

composite build-up.

Follow-up evaluations at 3 and 6 months included radiographic and clinical assessments, such as mobility, gingival pocket depth, periapical tenderness, and occlusal trauma. The teeth remained symptom-free, with normal gingival pocket depths, and the patient exhibited periodontal health. Both the teeth and restorations were functionally stable and aesthetically satisfactory.

Discussion

Crown-root fractures, often resulting from direct trauma, are commonly observed in the maxillary anterior teeth of children. The appropriate treatment is determined by the fracture line's position and the remaining root length^[3, 4]. In this clinical study, a surgical technique proved effective for extruding teeth with crown-root fractures, achieving approximately 5 mm of extrusion. This extrusion was adequate to facilitate subsequent coronal restoration. Previous clinical studies have demonstrated that surgical extrusion can be advantageous for preserving the root^[9, 10, 16]. Caliskan *et al.* also suggested that surgical extrusion could be a viable alternative to orthodontic extrusion for managing intruded permanent teeth^[17].

Crown-root fractures extending below the gingival attachment and alveolar bone level present significant restorative challenges, with extraction historically being a common solution. However, extraction should not be the first line of treatment for children, as the loss of a front tooth can lead to aesthetic and emotional concerns for both the child and their parents. Consequently, alternative treatment options should be considered.

While orthodontic extrusion is regarded as a more biologically favorable approach, it requires multiple appointments and high levels of patient compliance. In contrast, surgical extrusion is a single-step procedure, making it simpler and less time-intensive. Several case reports have demonstrated the successful restoration of even subgingival tooth fractures^[18-20]. The use of a fiber post cemented with resin enhances the retention of the tooth segment and creates a monoblock effect^[21]. Tegsjö *et al.* reported an external root resorption rate of 12% over four years, whereas Caliskan *et al.* reported a rate of 5% over three years^[11, 17].



Fig 1: Preoperative extra-oral presentation



Fig 2: Preoperative intra-oral presentation



Fig 3: Preoperative radiographic presentation



Fig 4: Teeth (11, 21) was carefully luxated and extruded by 5 mm



Fig 5: Teeth was splinted from the primary first molar on the right to the left side using an 8-ligature wire

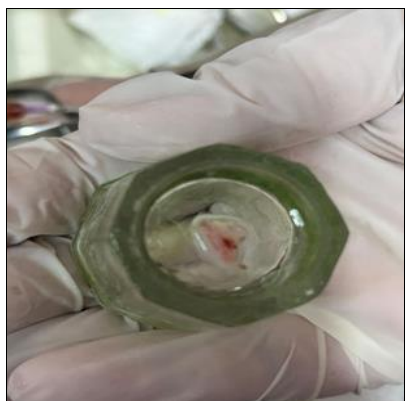


Fig 6: Fractured buccal cortical plate fragment was removed, crushed, and used as an autogenous bone graft



Fig 7: Placement of autogenous bone graft



Fig 8: Two week follow-up

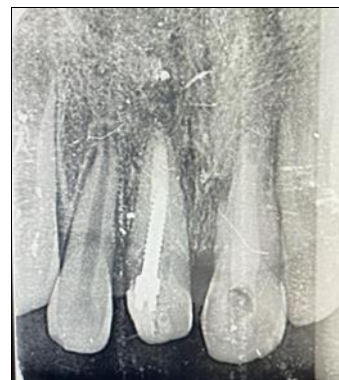


Fig 9: Root canal treatment performed followed by cementation of metal-post



Fig 10: Tooth preparation w.r.t 11



Fig 11: Placement of acrylic crown wrt 11 and composite build-up w.r.t 21

In this case, no radiographic evidence of progressive root resorption was observed during the follow-up period. The use of intracanal calcium hydroxide, as recommended by numerous authors, effectively controls contamination, infection, and resorption [22]. In this case, calcium hydroxide was maintained as an intracanal medicament for three months, and no pathological signs were noted clinically or radiographically. These findings align with existing literature [9, 10, 17].

Based on the success of this case, we recommend considering surgical extrusion as a viable alternative treatment approach for crown-root fractures. During the follow-up period, there were no clinical signs of mobility, tenderness, or pain, and no pathological findings were observed radiographically.

Conclusion

Surgical extrusion can be recommended as a viable treatment option for managing complicated crown-root fractures in permanent anterior teeth. In the present case, the surgical technique involved the atraumatic extrusion of the intruded tooth to its proper position, followed by splinting. This approach effectively prevented complications such as root resorption, ankylosis, and marginal bone loss in the affected tooth.

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Nil

Conflict of Interest

Not available

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