Case Report

Surgical Extrusion: An Alternate Treatment Modality for Crown-Root Fracture

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Abstract
This paper presents a case report of a mandibular central incisor tooth having complete crown fracture. Root-crown lengthening is performed by surgical extrusion of the root coronally, and then stabilization with interdental sutures and surgical pack. Prognosis was successful after one year later, clinically and on radiograph. The favorable results of this study demonstrate that surgical extrusion in teeth with crown-root fractures may be an alternative treatment to orthodontic extrusion.

Keywords
Crown-root fracture, surgical-extrusion, tooth fracture, dental treatment

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Introduction
Crown-root fracture is a fracture involving enamel, dentin and pulp that occurs in 0.9–18% of all dental injuries and can be classified as either complicated or uncomplicated (1). According to the force and direction of the impact, a fracture line can begin at some point of the crown and extend longitudinally through the pulp chamber extending to the subgingival area and alveolar bone crest (1,2).

The tooth with crown-root fracture presents challenge during coronal restorations because of a lack of crown ferrule. The following situations must be considered when choosing a treatment approach (3):

1. Localization and degree to which biological width has been invaded;
2. The pulpal involvement;
3. The root development stage;
4. The tooth eruption stage;
5. The presence of the fragment adequately adapted to the tooth remnant.

In most cases where the fracture line extends to the marginal bone crest, extraction of the tooth is considered. However many treatment alternatives for this kind of fracture have been recommended. These are (4):

1. Crown Lengthening
2. Orthodontic Extrusion of apical fragment
3. Surgical Extrusion
4. Decoronation (Root submergence)

The aim of the present case report is to describe the clinical management of mandibular left central incisor presenting complete crown fracture and to discuss the treatment decisions and outcomes.

Case Report
A 13-year old, healthy boy was referred to the Department of Pediatric & Preventive Dentistry, Government Dental College & Hospital, Jaipur Rajasthan from a local dentist after he had a fall from a bicycle and got injured a day back. Medical history and the extra-oral examination were normal.

Figure 1: Crown-root fracture of left mandibular central incisor
A careful intraoral examination was done to assess possible injuries by visual inspection and palpation, and teeth in both arches were evaluated for mobility. The mandibular left lateral incisor and right central incisor and lateral incisor were intact and their motilities were within normal limits. However, crown portion of mandibular left central (Tooth no. 31) incisor showed mobility and therefore was removed by the local dental practitioner (Fig.1).

Figure 2: Radiographic appearance of mandibular central incisor.
Radiographic examination revealed that the roots were fully developed and had no periapical radiolucency (Fig.2). The boy had no pain but he was very upset which was an indication of the psychological impact of such trauma.

Considering the benefits of surgical extrusion over orthodontic extrusion, endodontic procedure followed by surgical extrusion and restoration of coronal structure with glass fiber post composite was planned.

In the next appointment, surgical repositioning was performed (Fig.4). To extrude the tooth, adequate anesthesia was achieved with 2% Lidocaine with adrenaline. The surgical procedure involved careful mobilization of the roots with elevators and cutting of the marginal periodontal fibers with a periotome. The root was extruded 3-4mm coronally.

After the access preparation was made, the working length was established 1mm short of the radiographic apex. The root canal preparation was accomplished using 5.25% NaOCl irrigation and hand instrumentation with K-type files. After the completion of chemo mechanical root canal preparation, the canals were finally irrigated with 10 ml of 5.25% NaOCl solution, dried with sterile paper points and filled with calcium hydroxide as intra-canal medicament for 2 weeks. After the removal of the dressings by irrigation with 5.25% NaOCl and by reaming motion with a K-type file, the root canal was dried and obturated with gutta percha using lateral condensation technique (Fig.3). The access cavity was sealed with glass ionomer cement.

After repositioning, bleeding was controlled and stabilization of the root in its new position was achieved with interdental sutures on both sides of the extruded root and a surgical dressing (Coe-Pak™ GC America) (Fig. 5a & 5b). Antibiotic therapy was prescribed for 10 days and the patient was motivated to maintain oral hygiene. The sutures were removed after 1 week and the surgical dressing changed. No post-operative infection was observed.
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Figure 5b: Position of the tooth immediately after surgical extrusion.

The patient was recalled after 6 weeks (Fig.6).

Figure 6: Tooth after 6 weeks.

Glass fiber post followed by composite build-up was given as coronal restoration (Fig 7a & 7b).

Figure 7a: Fiber-post composite restoration was planned.

Figure 7b: Tooth immediately after restoration

Radiographic examination with a standardized technique and clinical examination including assessment of mobility, gingival pocket depth, periapical tenderness and trauma from occlusion was performed at 3rd, 6th, 12th month. During the follow-up period the tooth was clinically symptomless, the gingival pocket depth was normal and the patient was periodontally healthy (Fig. 8a & 8b).

Figure 8a: One-year follow-up clinical picture

The percussion sound was normal and did not differ from adjacent normal teeth, indicating no ankylosis. There were no radiographic signs of progressive root resorption, marginal bone loss or periapical disease. The tooth and restorations were functionally acceptable and aesthetically pleasing.
Discussion

Crown-root fracture below the gingival attachment and alveolar bone level presents restorative difficulties and extraction was formerly used in many cases. But extraction must not be the first choice of treatment in children. Loss of a tooth in anterior region of a young patient may create esthetic and emotional problems not only in the young patient but also in the parents and alternative treatment modalities must be considered. Osteotomy/Osteoplasty and gingivectomy are aesthetically contraindicated in anterior region (5,6). For these cases, orthodontic and surgical extrusion has been recommended (1,3). Although it is suggested that orthodontic extrusion renders more biological method, the procedure requires multiple visits and excellent cooperation of the patient. Surgical extrusion is a one-step procedure which is simpler and less time-consuming than orthodontic extrusion (7-10).

The basic principle of surgical extrusion is to move the affected tooth area to a supra-gingival position, leaving sound tooth structure exposed supra-alveolarly, and providing room for the reestablishment of the biological width. This treatment is only indicated for teeth with complete root formation, and the remaining intra-alveolar root portion should be long enough to support a core retained crown (11). It is, however, not recommended for crown-root fractures in young teeth with open apices where vitality should be preserved (4).

Examination of our patient indicated that the treatment had provided functional and esthetic results 12 months after the surgical extrusion. The patient appreciated the treatment he received because the initial damage of his tooth was quickly treated. Kahnberg (7) described two different extrusion techniques. The first involves the flap operation with apical exposure. A piece of bone transplanted from the nasal spine region or adjacent alveolar process is positioned above the root after the extrusion to secure the new position. The second technique involves careful extrusion of the tooth by marginal luxation and stabilization by interdental suturing and surgical dressing. In the present case, the second technique was used. This technique was easy to perform and gratifyingly free of major complications such as root resorption, periapical destruction, ankylosis and marginal bone loss. Avoidance of surgery in the periapical region seemed to reduce the incidence of root resorption markedly.

The use of intracanal calcium hydroxide recommended by many authors is effective for the control of contamination, infection and resorption (12,13). But it has been hypothesized that calcium hydroxide may cause the resorption by passing through the apical foramen, although it has not been proven scientifically (14). In the present case, calcium hydroxide was used and maintained for 2 weeks as an intracanal medicament and no pathological signs were observed clinically or radiographically. These results were in accordance with much of the literature (7,8,10).
Although splinting has been widely accepted as a necessary procedure for luxated and replanted teeth, no experimental or clinical trial exists to support this claim. In addition, experimental studies on intentional dental reimplantation in animals show that splinting could be detrimental to periodontal healing, enhancing the risk of root resorption. Functional stimulus might also have an important role in periodontal healing, eliciting the reorientation of the periodontal ligament fibers following reimplantation of avulsed teeth (15). Berude et al (16) reported that no significant difference was found in the periodontal healing patterns of physiologically splinted, rigidly splinted, or non-splinted replanted teeth. In the present case, splinting of the root with interdental sutures, together with application of a surgical dressing, was found to be very effective.

For esthetic coronal restoration, Glass fiber reinforced composite resin post (GFRC) was used. Glass fiber reinforced composite resin posts (GFRC) are new to the pediatric world and can be used as an alternative to the other post systems. The properties of fiber-reinforced posts are dependent on the nature of the matrix, fibers, interface strength and geometry of reinforcement (17).

The fiber post technique offers certain advantages: (17)

1. Employs fiber posts that are ready to use.
2. Provides homogenous mechanical and chemical bonding of all components.
3. Reduces the risk of root fracture, since its modulus of elasticity is similar to that of root dentine and its diametric tensile strength is low.
4. Presents no potential hazards of corrosion and hypersensitivity

The viability of the cementoblasts is very important for the healing of the socket and formation of a new functioning periodontal membrane (7). Dehydration of the root surface cells can lead to ankylosis or root resorption and the viability of the cementoblasts is undoubtedly of importance for healing of the socket (7,18). As the root never leaves the alveolus in this extrusion procedure, surgical extrusion may be compared with extrusive luxation of teeth which according to Andreasen (12) has a comparably favorable prognosis with root resorption occurring in only 7% of the cases. External root resorption in surgical extrusion has been reported in 12% of the cases by Tegsjo et al (13), over a period of 4 years and 5% by Caliskan et al (8), up to 3 years. In our case there were no radiographic signs of further progressive root resorption and the percussion sound and mobility was normal during the follow-up period of up to 12 months.

Under successful conditions of this case, surgical extrusion of teeth with crown-root fractures proves to be an alternative treatment approach when the orthodontic procedures are contraindicated. But it was suggested that the patients must be followed for 5 years so as to see at which point the final evaluation of the method will be made (7,19).

References