

# A multi-disciplinary approach for the management of a traumatized tooth with complicated crown-root fracture: A case report

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### Abstract:

*Complicated crown-root fractures are rare and often need Complex treatment planning. Forced eruption offers a method of treatment of teeth fractured close to the alveolar crest. The present article describes a clinical case of crown-root fracture, with invasion of the biological width, in an esthetic area, where is not possible to carry out the conventional treatment. The fracture line involved the 2/3 rd of the crown, compromising the pulp and extended subgingivally on the palatal aspect invading the biological width. The procedure used to manage this case included endodontic treatment of residual tooth, orthodontic extrusion to move the fracture line above the alveolar bone. Finally the tooth was restored prosthodontically. This case report demonstrates the importance of establishing a multidisciplinary approach for a successful dental trauma management.*

### Introduction

Seeing children grow from small toddlers into adolescents is an incredible experience for parents. Throughout this youthful and energetic period children are constantly subjected to new experiences and adventures that help them to develop their survival instincts.<sup>1</sup>

Trauma with accompanying fracture of a permanent incisor is a tragic experience for the young children and

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creates the psychological impact on both the parents and children. If the injury involves the loss of extensive tooth structure, it alerts the child's appearance and makes him the target for teasing ridicule by other children.<sup>2</sup>

Simultaneous with the growing up process, they also are more prone to accidents especially accidental injuries to the oro-facial region, in particular dental trauma<sup>3</sup>. Commonly reported causes for dental related injuries are fall<sup>4,5</sup> especially from a bicycle<sup>6,7</sup>, contact sports<sup>5,7</sup> and motor vehicle accidents<sup>5</sup>. Boys are more prone to dental traumas than girls<sup>6-8</sup> and the most frequently affected teeth are the maxillary incisors<sup>4,6-8</sup>, especially the maxillary central incisors<sup>6-7</sup>. Children between the ages of 8 to 11 years old are generally reported to be affected<sup>4,8</sup>. Increased overjet more than 4 mm and incomplete lip closure are said to be some of the common predisposing factors for dental trauma<sup>9-11</sup>. Uncomplicated crown fractures appeared to be the most frequently reported dental trauma<sup>8,12</sup> compared to other forms of dental injuries<sup>13</sup>.

Following trauma four treatment possibilities exist: tooth removal, surgical crown lengthening, surgical intra-alveolar transplantation or orthodontic extrusion. Extraction seems to be the easiest choice, yet it requires prosthetic treatment or implant therapy. Surgical crown lengthening can be successfully used in the posterior region, where the aesthetics is not a major concern<sup>14-16</sup>. The surgical approach requires osseous and gingival contouring which also affects adjacent teeth. It usually lowers gingival papillas, exposes the cemento-enamel junction, causes hypersensitivity and produces compromised aesthetics<sup>16-20</sup>. In a 1988 report,

Kahnberg<sup>19</sup>, described a simple surgical technique involving intra-alveolar transplantation. A carefully extruded root, stabilized by interdental suturing and surgical dressing, required endodontic therapy and a porcelain crown. A highly satisfactory alternative to the surgical approach is the controlled orthodontic extrusion of the fractured root. The method is also called forced eruption, orthodontic eruption, vertical extrusion or assisted eruption<sup>17</sup>. First reported by Heithersay<sup>15</sup> and Ingber<sup>16</sup>, controlled orthodontic extrusion is considered the easiest orthodontic tooth movement that can produce excellent results with a good prognosis and a low risk of relapse. Although highly advantageous, the technique is rarely used; the possible reasons may include the fear of first time approach, a false belief that the procedure is inherently complex, little knowledge in this field and some emphasis on specialist orthodontic aspects involved.

The vertical tooth movement can be obtained with removable or fixed orthodontic appliances, the former using mostly elastic bands or magnets<sup>14 20-24</sup>, and fixed appliances and many modifications thereof referred to when the tooth is extruded mostly applying a fabricated resinbased crown with a bonded orthodontic bracket<sup>15-18,21,22,25-31</sup>. There are also some reports on non-aesthetic solutions, such as a hook cemented in the root canal and connected with the interdental bar or orthodontic wire<sup>17,21,25,28,32</sup>. The lingual orthodontic technique was also proposed for exposing sound tooth structures with excellent aesthetic results<sup>18</sup>.

#### Case Report:

The patient, Md. Monir of 15 years of age came from Sonargoan to the dept. of conservative dentistry and endodontics of BSMMU on 24th October 2005. He gave a history of trauma of tube-well an upper anterior segment, mobility of upper right central incisor. He also gave a history of pain during movement of mobile fragment. Clinical and radiological examination revealed an oblique crown-root fracture in UR1 (11) fracture involving enamel, dentin, cementum and exposing the pulp.

Fracture labially above the gingival margin but palatally it was below the gingival margin and near to the alveolar crest. (Fig-1)



Fig 1: picture showing the oblique crown root

A definitive treatment plan was made as follows- removal of fracture fragment under local anesthesia followed by endodontic therapy of tooth. After this, orthodontic extrusion to move the fracture line 3 mm above the crest was planned to regain the lost biological width. Under local anesthesia loose Coronal segment was removed and endodontic treatment was performed on residual root segment. The canal was obturated using lateral condensation gutta percha technique. (Fig-2)

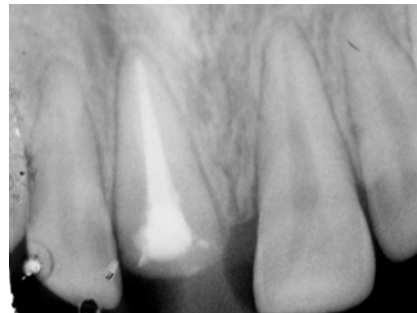


Fig-2: Radiographic view after obturation of root canal

Then a ready-made post was cemented on root canal by removing gutta-percha by peso reamer from the root canal. The orthodontic bracket was placed on the UL1, UR2 & UR3 by light cure GI. (Fig-3)



Fig-3: Image showing post cementation and placement orthodontic bracket

Then an arch wire (0.16-0.22mm) was placed on the bracket slot and ligated with ligature wire (0.0016).

The elastic band (thread) was ligated with post and arch wire, asked the patient to come after 3 weeks. After three weeks change elastic thread.

When I was obtained the desired movement (3mm) then stabilized the tooth in position for 8 weeks by ligating the post to arch wire with the help of passive ligature wire. (Fig-4a,b)

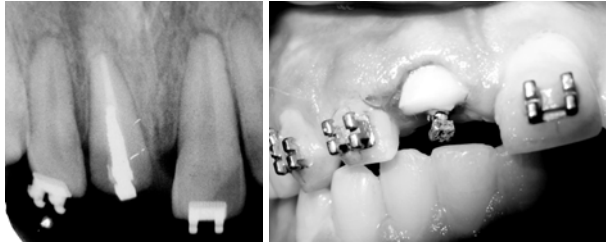


Fig-4a,b: Radiograph & image showing extrusion of fracture tooth.

After stabilization, a light cure composite filling was done around the post and crown cut was given for porcelain jacket crown.(Fig-5a,b)



Fig 5a,b: image showing composite build up and crown cut

Fixed the jacket crown on the tooth with glass ionomer luting cement.(Fig-6a,b)



Fig 6a,b: radiograph and image showing cementation of crown.

## Discussion

Dental traumas due to crown-root fracture are rarely seen when compared to crown fractures<sup>12, 13</sup>. It is even rare to see a complicated crown-root fracture. Complicated crown-root involves tooth structures such as enamel, dentine, cementum and pulp. The severity of presentation also varies depending on the strength of the

impact force and its vector<sup>5</sup>. Some cases may present as vertical crown root fracture, oblique crown-root fracture or with multiple crown-root fractures. Success of treatment of complicated crown-root fracture is generally based on the degree of impact of the trauma to the tooth supporting structures especially the periodontium, root-crown length ratio and extent and complexity of the fracture. There are few treatment options available in treating complicated crown root fractures:<sup>33, 34</sup>.

- Removal of the fractured coronal fragment and restoration of tooth if the fracture line has not encroached into the biologic width
- Removal of the coronal fragment and supplemented with gingivectomy and osteotomy to expose the fracture in order to establish biologic width prior to restoration
- Removal of the coronal fragment and initiation of endodontic treatment and restoration of tooth with post crown
- Removal of the coronal fragment and initiation of endodontic treatment and later by orthodontic or surgical extrusion of the apical fragment prior to restoration with post crown.
- In severe crown-root fracture, the tooth may have to be extracted and replaced with removal or fixed prosthesis.

The extrusion rate used in this case was similar to that recommended by other authors<sup>16,17,26,35</sup>. If the extrusion speed is too high, temporary stabilization is needed. According to recent studies, the force of 30–60 g is required to extrude the tooth<sup>17,20,21,23,26</sup>. While other authors reported that forces of 70–150 g were necessary,<sup>21</sup> in our case the initial force of 60 g did not move the traumatized incisor. The extrusion was possible at 120 g. The application of a large force has been reported to possibly cause pulp inflammation, root resorption, or a bone and periodontal loss, which did not occur in this case.

An orthodontic extrusion of fractured tooth will maintain the periodontal tissue at the same level and restore a physiological attachment. A 3–4mm distance from the alveolar crest to the coronal extension of the remaining tooth structure has been recommended for the optimal periodontal health.<sup>36</sup> This treatment is preferred over crown lengthening which moves alveolar bone and may become the reason for pocket formation. The orthodontic procedure allows the movement of fracture line supragingivally and then optimizes the

marginal sealing. The forced eruption was limited to 3 mm (it should be maximum 5 mm as suggested by Ingle)<sup>37</sup> and was achieved with minimal force (only 0.2-0.3 N).<sup>36</sup>

The major limitation of this treatment is the longer duration of treatment and a longer stabilization period. It may also impair good esthetic resolution because the cervical diameter of extruded tooth is similar to the adjacent teeth.<sup>38</sup>

Finally, the use of a goldern post with composite build up and porcelain jacket crown gives good esthetic result and increases retention and distributes the stresses along the root.<sup>39</sup>

### Conclusion

Restoration of traumatized teeth requires a close collaboration between different dental fields to avoid loss of tooth. Even though orthodontic extrusion reduces crown/root ratio and widens the embrasure, this approach allows to maintain the biologic width and optimizes the marginal sealing.<sup>39</sup>

The present case reports a multidisciplinary management of dental trauma that leads to conservation of tooth and its permanent restoration. In addition, the adjacent teeth need not be prepared for fixed prosthesis and the alveolar bone is conserved.

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