



Survival of a hopeless tooth: A case report with 7 years of follow-up

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A crown-root fracture usually results in the loss of the tooth crown below the gingival margin, and this can create many problems during treatment. This case report presents the management of a complicated crown-root fracture using a multidisciplinary approach including surgical extrusion for crown lengthening, endodontic treatment and a composite restoration. A 23-year-old male patient presented to the Clinic of Endodontics with a complicated crown-root fracture of right maxillary lateral incisor. The intraoral periapical radiographic examination showed coronal tooth loss, the presence of three oblique crown-root fractures and a periapical lesion. Initially, the root canal was prepared, cleaned and temporarily filled with calcium hydroxide; then, the fractures were fixed using composite resin. At the next appointment, a surgical extrusion was performed, and the teeth were splinted with Ribbond bondable reinforcement ribbon. The splint was removed after 8 weeks, and the root canal was obturated. Finally, the tooth was restored using a fibre post-core system and composite resin. After 7 years of follow-up examinations, there were no radiographic or clinical signs of ankylosis, marginal bone loss or periapical disease. Moreover, satisfactory functional and aesthetic outcomes were observed.

Keywords: Crown-root fracture; dental trauma; surgical extrusion.

Traumatic dental injuries are common problems for both children and adults, with maxillary central incisors being affected most often. Anterior tooth injuries are challenging because they may require emergency care, and these patients are apprehensive due to the impaired function, aesthetics and phonetics. While crown fractures occur at the highest percentage of all traumatic injuries to the permanent dentition, crown-root fractures represent only 5%.^[1,2]

A crown-root fracture usually results in the loss of the tooth crown below the gingival margin, which can cause many problems with regard to endodontic isolation, periodontal maintenance and restoration. When the fracture line extends below the marginal bone level, several treatment options are available, including a mucogingival flap and reattachment of the original fragment,^[3] surgical extrusion,^[4] orthodontic extrusion^[5] and intentional re-plantation.^[6] The treatment approach depends primarily

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on the location of the fracture line and the amount of remaining dentin.^[7]

This case report presents the management of a complicated crown-root fracture using a multidisciplinary approach including surgical extrusion to lengthen the crown, a root canal treatment and a composite restoration.

Case report

A 23-year-old male presented to the Clinic of Endodontics 3 hours after falling in the snow and suffering traumatic injuries to his maxillary central incisors. A written

informed consent form was obtained for the treatment and publication of his case. His medical history was unremarkable, but the clinical examination revealed a complicated crown-root fracture and a carious lesion in his right maxillary lateral incisor (Fig. 1a). In the radiographic maxillofacial examination, the maxilla, mandible and other facial bones were found to be intact, without any fracture lines. The intraoral periapical radiographic examination showed coronal tooth loss, the presence of three oblique crown-root fractures and a periapical lesion, confirming the presence of tooth necrosis before the trauma (Fig. 1b).



Fig. 1. Preoperative clinical view showing a crown-root fracture of the maxillary right lateral incisor (a). The preoperative periapical radiograph (b).

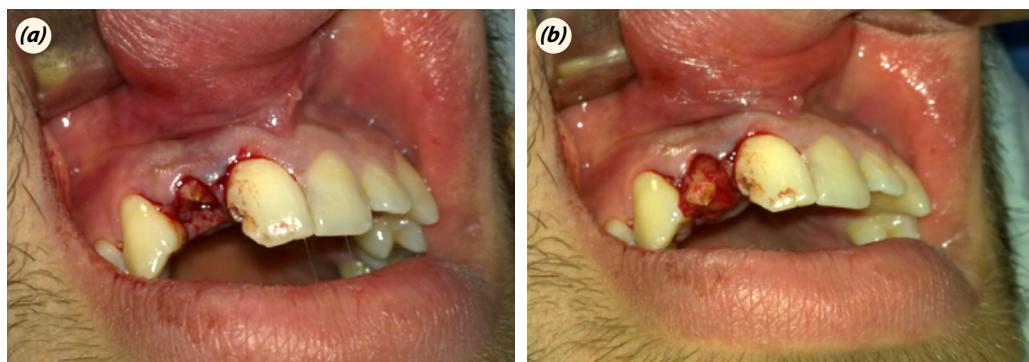


Fig. 2. Clinical aspect immediately before (a) and after (b) the surgical extrusion.

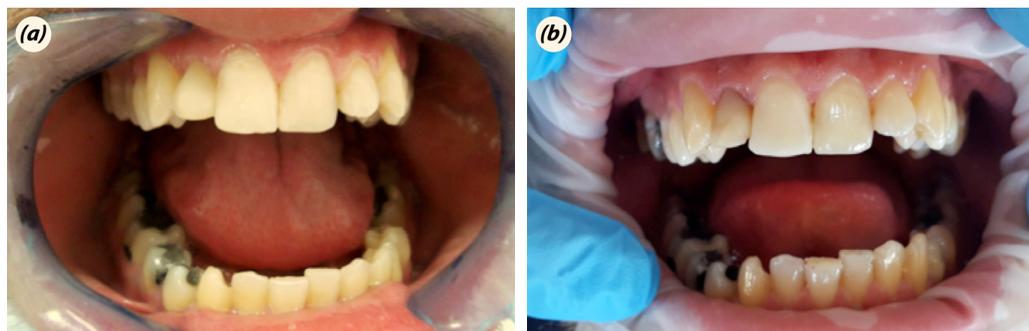


Fig. 3. Clinical view immediately after the restoration of the maxillary right lateral incisor (a) and at the 7-year follow-up (b).

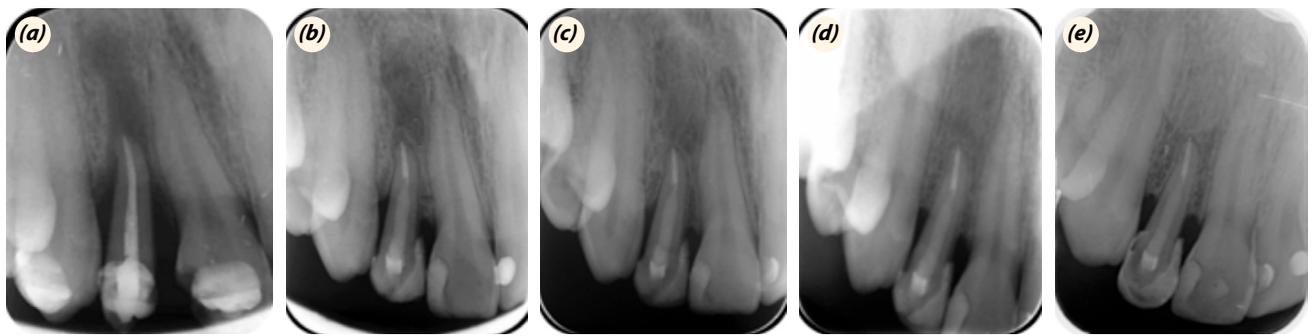


Fig. 4. Radiographic appearance after the root canal obturation (a), after 6 months (b), after 1 year (c), after 6 years (d) and after 7 years (e).

The pulp vitality of the maxillary anterior teeth was evaluated using an electric pulp vitality tester (Parkell, Inc., Edgewood, NY, USA) and thermal testing spray (Endo-Ice; Roeko GmbH & Co., Langenau, Germany). The anterior teeth exhibited a positive response to the cold and electric pulp sensibility tests, with the exception of the maxillary right lateral incisor. Therefore, a root canal treatment was planned for the maxillary right lateral incisor. A conventional endodontic access cavity was prepared, and the working length was determined with the help of an apex locator (Root ZX; J. Morita Corp., Tokyo, Japan). In addition, an individual intraoral periapical radiograph was taken to confirm the working length. The root canal was enlarged to a size #40, and it was irrigated using 2.5% sodium hypochlorite (NaOCl; Caglayan Kimya, Konya, Turkey). Calcium hydroxide (Sultan Chemists, Inc., Englewood, NJ, USA) was placed into the root canal as a root canal medicament, and then, the fractures were fixed using composite resin (Clearfil Majesty, Kuraray Medical Inc., Tokyo, Japan). The surgical extrusion was performed during the following appointment (Fig. 2a, b). Then, the anterior teeth were splinted with a bondable reinforcement ribbon (Ribbond Inc., Seattle, WA, USA) using a flowable light-cured composite resin. The splint was removed 8 weeks later. Four weeks later, the patient was brought back for a root canal obturation. During that appointment, the root canal was irrigated with 2.5% NaOCl, followed by a saline solution to remove the excess NaOCl. Chlorhexidine (Drogsan Pharmaceuticals, Ankara, Turkey) was used as a final irrigation solution, followed by root canal drying using paper points (DiaDent Group International Inc., Chongju, Korea). The root canal was filled using AH Plus (Dentsply, De Trey, Konstanz, Germany) and gutta percha (DiaDent Group International Inc.). Finally, the root was restored with a glass fibre post (Superpost Ultrafine; Superdont; Rio de Janeiro; RJ, Brazil) and composite resin (Clearfil Majesty; Kuraray Medical Inc.). After seven years, the clinical and radiographic follow-up examinations showed good functional and aesthetic out-

comes (Fig. 3a, b), as well as the absence of radiographic signs of periapical pathology or resorption (Fig. 4a–e).

Discussion

This case report presented the conservative treatment of a crown-root fractured lateral incisor via surgical extrusion. The application of a rubber dam was not possible in this case; however, the isolation was performed using cotton rolls. In order to stabilize the obliquely fractured segments, the restoration was done using composite resin. Additionally, this quick restoration helped preserve the natural tooth structure, while relieving the patient's discomfort. A careful surgical extrusion was performed, along with marginal luxation and minimal rotation (avoiding uncontrolled force), in order to obtain a crown lengthening of approximately 4 mm.

In the literature, there have been reports of the use of orthodontic extrusion as the treatment strategy for other cases of this kind.^[8,9] Orthodontic extrusion has many advantages, including its safety and the fact that it permits the biological extrusion of the tooth.^[10,11] However, orthodontic extrusion requires multiple visits, because up to 1 mm/week of tooth extrusion can be gained in order to prevent periodontal ligament damage. Therefore, a total orthodontic extrusion could last for 3–6 weeks.^[12] Moreover, additional surgical correction of both the gingival tissue and bone margin may be required in many cases.^[13] In this case report, a surgical extrusion was preferred to expose the fracture line within the oral cavity and seal any marginal defects. Surgical extrusion offered an effective and immediate resolution of this case, and with this technique, we shortened the operative time. Although some previous studies have reported common complications due to surgical extrusion,^[14,15] neither root resorption nor marginal bone loss were observed in the present case. Previous studies have also confirmed that surgical extrusion is a viable and useful alternative for the management of a crown-root fracture, when the fracture extends subgingivally.^[14,16] Another advantage of this treatment is the fact

that surgical extrusion allows for the detection of additional root fractures.^[16]

Root stabilization after the extrusion was accomplished using a Ribbond splint. Ribbond is a kind of bondable, reinforced polyethylene fibre, which provides a semi-rigid type of splinting, and it allows some physiological movement during the periodontal ligament healing period. It has been shown previously that Ribbond exhibits higher flexibility with low deformation energy and passivity.^[17] Although, splinting does not appear to relate to the healing process of non-displaced teeth,^[18] it has been revealed that Ribbond is the best suited splint choice for the treatment of traumatic lesions involving the supporting tissue of the tooth.^[17] Furthermore, Ribbond is an easy, adequate and well-tolerated method for splinting and stabilizing traumatized teeth,^[19] as confirmed by the present case.

For the restoration of the traumatized tooth, a glass fibre post covered with composite resin was used. Glass fibre posts offer an aesthetic solution, and a survival rate of 89–93% was reported in one retrospective study.^[20] The present case helps to confirm the long-term success of a glass fibre post and composite reconstruction, without the need for a crown restoration, because neither debonding nor any other type of failure due to the glass fibre post were observed. One clinical study revealed that the clinical success of endodontically treated premolars restored with fibre posts and direct composite restorative materials exhibited equivalent failure rates and failure modes in teeth restored in the same manner but with full crown coverage.^[21] Another study has also shown the good clinical performance of fibre posts and direct resin restorations.^[22] Restoring teeth with fibre posts and composite materials without crown coverage is more economical and conservative than crown coverage. However, the tooth preparation for crown coverage requires occlusal, interproximal, labial and lingual reductions. A composite restoration is less time-consuming, because it can be completed in one session, and a composite repair is easier than a crown coverage repair.

At the 7-year follow-up, resin composite and tooth discoloration were detected. The endogenous discoloration of nonvital teeth can occur due to the dissemination of the blood components into the dentinal tubules, which is caused by pulp extirpation or pulpal haemorrhaging induced by traumatic injury.^[23,24] It has also been reported that endodontic materials can induce intrinsic discoloration via the diffusion of the materials into the dentin tubules or via the darkening of the material remnants in the pulp chamber over time.^[25,26] Moreover, resin composite discoloration could be seen in the intraoral photograph taken during the 7-year follow-up. The long-term colour

stability of composite resins can be impaired by intrinsic discoloration caused by physicochemical reactions in the restoration or extrinsic discoloration due to the accumulation of plaque and stains.^[27]

Conclusion

As shown in this case report, the clinical and radiographic findings of this tooth treatment after 7 years showed that it was successful. For now, the tooth does not need to be replaced with an implant or a bridge restoration. Surgical extrusion is a clinically feasible option for the treatment of complicated crown-root fractures. However, additional long-term follow-up studies are essential in order to observe the treatment success of traumatic dental injuries.

Conflict of interest: None declared.

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