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DENTAL TRAUMATOLOGY

Case Report

Multidisciplinary treatment approach for crown fracture and crown-root fracture – a case report

Poi WR, Cardoso LC, Castro JCM, Cintra LTÂ, Gulinelli JL, Lazari JAB. Multidisciplinary treatment approach for crown fracture and crown-root fracture – a case report. © Blackwell Munksgaard, 2006.

Abstract – The increased incidence of traumatic injuries to anterior teeth is a consequence of leisure activities, where the most common injuries are crown fractures. Treatment of the dental trauma is complex and requires a comprehensive and accurate diagnostic and treatment plan. It is also important to consider the biological, functional, esthetic and economic aspects, as well as the patient's desire. The purpose of this article is to report a case that shows the multidisciplinary approach required to successfully manage the rehabilitation of a maxillary central incisor with a complex crown fracture and a maxillary lateral incisor, that at first presented an oblique crown-root fracture, and after the orthodontic extrusion, suffered a more apical new crown-root fracture.

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Key words: dental trauma; crown-root fracture; comprehensive dental care

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Facial injuries occur more frequently in children than adults and usually as a result of sports activities, falls, car accidents, fights and intentional assaults (1). Blows to the face often affect the teeth and especially the maxillary incisors because of their normal labial projection in relation to the mandibular incisors, most of the time leading to damage to the crowns (2).

The potential difficulties found in the restoration approach depend on the type of fracture, the type of occlusion and the prognosis (3–6). The treatment strategy of a crown-root fracture is complex and the esthetics is an important requirement. The literature reports several different treatments for this kind of problem, ranging from the maintenance and use of the tooth fragment either as a temporary or permanent crown (6, 7); definitive crown after an orthodontic or surgical extrusion or a crown lengthening (1, 6) to an extraction of the residual tooth followed by an immediate or delayed implant surgery (3, 4, 6) or fixed partial denture (8).

The purpose of the present paper is to describe a multidisciplinary treatment approach to traumatized anterior teeth resulting in crown fracture and crown-root fracture. At first, the treatment chosen for this case presenting a lateral incisor crown-root fracture was the use of a definitive crown after an orthodontic extrusion. However, the patient had a new fracture in the same tooth, so the new treatment included the extraction of the residual tooth and placement of a metal free fixed partial denture.

Case report

A 21-year-old white woman was referred to our service showing a dental alveolar injury in the upper anterior teeth, with abrasion of the chin and upper lip mucosa and skin, contusion and edema in the left zigomatic area and corner of the left eye (Fig. 1), following a bicycle accident. In the emergency

Fig. 1. Clinical view after the first evaluation in the hospital.

Fig. 3. Radiographic preoperative view.

room, no bone fracture was diagnosed, and the patient was then referred to the School of Dentistry of Araçatuba, UNESP for evaluation and treatment. One day later, clinical and radiographic examinations were performed. The examinations showed a complicated crown fracture (enamel-dentin fracture with pulpal involvement) in the maxillary left central incisor, associated with pain to thermal stimuli; and an oblique crown-root fracture in the maxillary left lateral incisor (Fig. 2). The fracture line was located in the buccal aspect 2 mm supra-gingivally, in the level of the alveolar crest at the lingual aspect. The mobile crown-root fragment was removed (Figs 3 and 4). A temporary root canal therapy using a calcium hydroxide dressing was immediately performed on both incisors, which were then sealed with a glass–ionomer cement (Fig. 5). The calcium hydroxide was kept for 14 days, until the definitive root canal filling was performed by the lateral

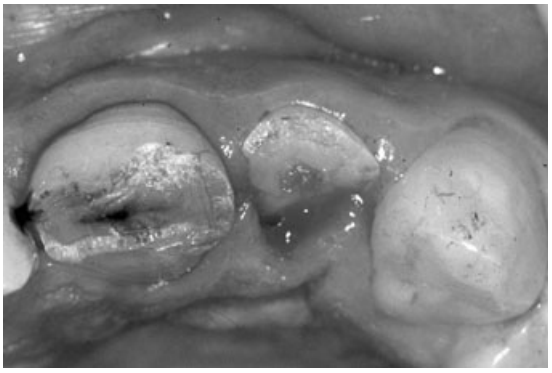

Fig. 4. Intraoral view showing the maxillary lateral incisor after the removal of its crown portion.

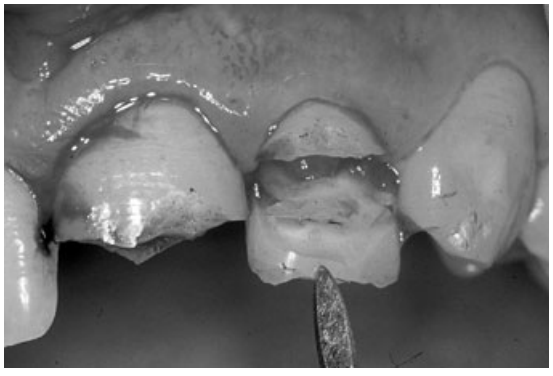

Fig. 2. Fracture of the maxillary left central and lateral incisors.

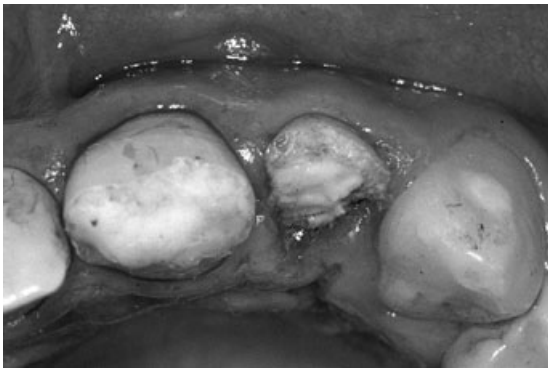

Fig. 5. Intraoral view showing the fractured teeth after their ionomer sealing.

condensation technique with gutta-percha points and Sealapex (Sybron-Endo, Sybron Dental Specialities Inc., Glendora, CA, USA). During this same appointment, the central incisor was restored using photopolymerized composite TPH-A2 (Dentsply, Petrópolis, RJ, Brasil).

An orthodontic extrusion of the lateral incisor was made in order to restore the physiological periodontal attachment. To achieve the tooth extrusion an orthodontic device was fabricated using a 0.7 stainless steel wire, which was bonded to the center of the two neighboring teeth employing the composite resin TPH-A2 (Dentsply) (Fig. 6). Over the device, an esthetic facet was built up. An orthodontic wire was cemented to the fractured tooth; and the elastic was applied from the wire of the fractured tooth to the orthodontic device (Fig. 7). Every week, the patient had a visit for check-up and to reactivate the orthodontic device. Approximately 4 weeks later, the active treatment was completed and an extrusion of about 3 mm was clinically and radiographically evident. The patient wore the orthodontic device for 60 days to avoid a reintrusion and to repair the periodontal tissue. After the extrusion was completed, a gingivoplasty was undertaken to achieve a better gingival design. A temporary crown was fabricated with composite TPH-A2 (Dentsply) over the post core (Figs 8 and 9). Two months later, the patient returned to the dentist office complaining about temporary crown mobility. During the exam, a deeper crown-root fracture was diagnosed. Therefore, the patient was submitted for the extraction of the residual tooth (Figs 10 and 11) followed by the placement of a metal free fixed partial denture with two In-Ceram Zirconia crowns (one crown was constructed over the post core of the central incisor and the other replaced the extracted lateral incisor) with an anchorage placed on the lingual surface of the canine. The gutta-percha was partially removed from the root canal of the left central incisor, leaving 5 mm of the filling material at the apex to maintain a good sealing. The Fiber Kor post (Jeneric Pentron, Pentron Clinical Technologies, LLC, Wallingford, CT, USA) was placed with Enforce-A2 (Dentsply). The core was fabricated with composite TPH-B2

Fig. 6. Radiographic view of the orthodontic extrusion device.

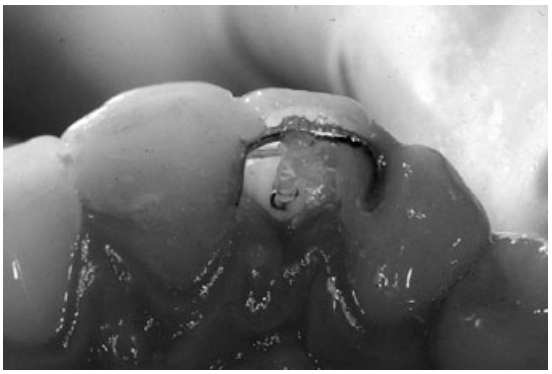

Fig. 7. Lingual view of the orthodontic extrusion device with the esthetic facet.

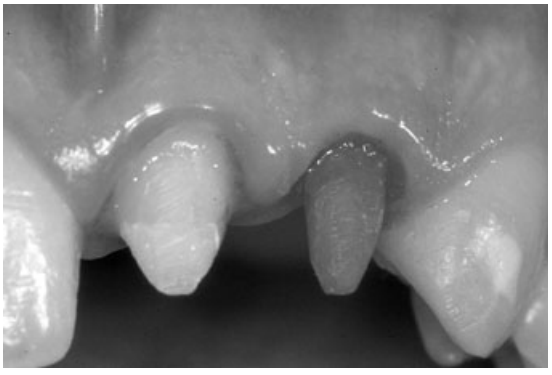

Fig. 8. Clinical view showing the maxillary lateral incisor after the extrusion and the construction of the post core.

Fig. 9. Temporary prosthetically restored maxillary left central and lateral incisors.

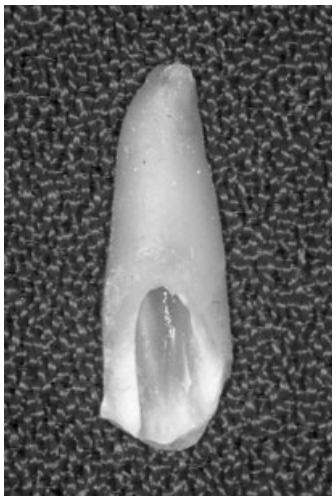

Fig. 10. Clinical aspect of the crown-root fracture depth.

Fig. 11. Intraoral view of the healed area after the extraction and molding preparation.

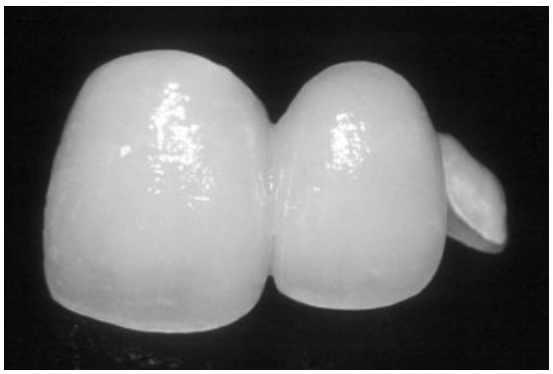

Fig. 12. Laboratory view of two In-Ceram Zirconia crowns with the palatal anchorage.

(Dentsply) and the tooth was prepared for the prosthesis. The patient was successfully rehabilitated with metal free fixed prosthesis (Figs 12 and 13). The patient was examined 6, 12, 18 and 24 months after treatment. The stability and esthetics of the crowns were maintained.

Fig. 13. Postoperative view, immediately after the conclusion of the prosthetically restored maxillary left central and lateral incisors.

Discussion

The increased incidence of traumatic injuries to anterior teeth is a consequence of modern leisure activities (9) and the most common injuries are crown fractures (6). Different treatment approaches have been indicated for fractured teeth, depending on the location of the fracture (2). A crown fracture may be restored with an artificial crown or with an acid-etch composite system, as was performed on the lateral incisor described in this paper. However, a tooth with a complicated crown-root fracture presents many problems related to the coronal rehabilitation, especially when the fractured line extends below the marginal bone level (10).

The treatment must, therefore, aim to expose the fractured margins, so that all clinical procedures can be managed with strict moist control and bleeding control. Furthermore, the prognosis may be improved through better plaque control by the patient. This type of treatment usually implies a multidisciplinary approach, with an endodontist, an orthodontist, a periodontist and a prosthodontist (11) or a comprehensive dental care by a general dentistry in a Trauma Integrated Clinic, as the one performed for the patient of this present investigation.

The literature reports several different treatments for this kind of problem (2). The selection of one of the potential approaches will depend on the extent of the subgingival lesion, the morphology of the lesion, the length and/or the morphology of the root and the appearance of an 'esthetic sensitive' region. The treatment options reported in the literature include the following: (i) fragment removal and status quo, followed by restoration (11); (ii) gingivectomy and osteotomy (crown lengthening) (1, 2, 6, 11); (iii) forced extrusion with/without gingivoplasty (1, 2, 6, 11); (iv) forced surgical extrusion (1, 2, 6, 11); (v) vital root submergence (11) and (vi) extraction followed by surgery implants (3, 4, 6, 11) or fixed partial denture (8).

Although orthodontic extrusion requires multiple visits and is more time-consuming than surgical extrusion, it was the preferred treatment for the lateral incisor extrusion because the orthodontic forces allow a biological way of extruding the tooth, with no removal of the alveolar bone as a crown lengthening which could compromise the esthetics (6, 12, 13).

The lateral incisor showed a new fracture, probably because of the fragility of the remaining root when submitted to masticatory stress, requiring a new treatment plan. It is well known that the extraction treatment followed by implants can provide advantages, because it keeps the tooth structure (not requiring the preparation of the neighboring teeth for prosthesis) as well as disadvantages, such as its higher cost. In this specific case, the patient chose the use of metal free fixed partial denture for financial reasons.

The functional and esthetic restoration of severely compromised anterior teeth with fixed partial denture is a challenge for clinicians in their daily practice. The use of metal infrastructures in teeth in general does not allow the professional to easily mimic the physical characteristics of an intact tooth, such as its shade, translucency, and fluorescence. Therefore, the development of reinforced ceramics and non-metallic post systems enable the use of metal-free ceramic restorations in severely compromised anterior and posterior teeth (14).

For a conservative treatment, the prosthetic treatment included metal-free fixed partial denture with two In-Ceram Zirconia (Vita) crowns and anchorage on the lingual surface of the canine. The metal free prosthesis and the In-Ceram Zirconia (Vita) material were chosen for esthetic reasons and because of the fact that this material has been shown to be more resistant (500–600 Mpa) than the In-Ceram system and also more resistant than the direct or indirect fiber-reinforced fixed partial denture (15). The satisfactory esthetic results and the prognosis achieved in this clinical case were as successful as the literature has reported (6, 7, 9, 13, 16).

The need for a multidisciplinary approach in the treatment of routine dental problems has been recognized for some time (16), especially for dental traumas that require comprehensive treatment and an accurate diagnosis and treatment plan, respecting the biological, functional and esthetic aspects, as well as the patient's will. The general dentist would be the ideal professional to treat dental traumas, because of the multidisciplinary involvement of those cases.

Conclusion

The key factors in a successful functional and esthetic rehabilitation of complicated crown fracture and crown-root fracture are multidisciplinary approaches, which involves surgeries, endodontics, orthodontics, periodontics, and prosthodontics.

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