Dental Traumatology 2004; 20: 56–60
Printed in Denmark. All rights reserved

DENTAL TRAUMATOLOGY

Case Report

Multidisciplinary approach to the immediate esthetic repair and long-term treatment of an oblique crown–root fracture

Villat C, Machtou P, Naulin-Ifi C. Multidisciplinary approach to the immediate esthetic repair and long-term treatment of an oblique crown–root fracture. Dent Traumatol 2004; 20: 56–60.
© Blackwell Munksgaard, 2004.

Abstract – This case report describes the esthetic management of a dental trauma at the first visit and its subsequent treatments to restore the esthetics and function. Today, patients expect adequate esthetics and the ability to confidently smile immediately after the first appointment. In addition, they require that esthetics is maintained throughout the definitive treatment phase as well. After the use of the fractured crown as a temporary replacement crown, an orthodontic extrusion was undertaken to restore the physiological periodontal attachment. The tooth was then splinted for 6 months and at completion of this orthodontic stage, the permanent restoration was fabricated.

C. Villat[1], P. Machtou[2], C. Naulin-Ifi[3]

[1]Department of conservative dentistry and endodontics, Faculty of Dentistry, University Claude-Bernard Lyon I, Lyon; [2]Department of conservative dentistry and endodontics; [3]Department of Paediatric Dentistry, Faculty of Dentistry, University Denis-Diderot Paris VII, Paris, France

Key words: dental trauma; crown–root fracture; orthodontic extrusion; esthetic treatment

Dr Chantal Naulin-Ifi, 62 rue Saint-Didier, 75116 Paris, France

Prosthodontic treatment: Drs Yves Sitbon and Anne-Estelle Bregeon.

Accepted 20 March, 2003

Maxillary incisors are the most common teeth involved in dental trauma and, most of the time, dental crowns are damaged (1–3). The difficulties of the restorations depend on the type of fracture (4) according to Dean's classification (5), the type of occlusion (3, 6) and the prognosis (3). Oblique fractures (type B according to Dean's classification) are more difficult to treat than horizontal fractures (type C). Because of the emphasis on esthetics, patients often wish to recover their smile immediately at the first appointment and maintain it throughout subsequent treatment procedures.

The lag time esthetic requirement determines the treatment strategy. Three different treatment options should be discussed:

1 maintenance and use of the fractured portion (4) either as a temporary or permanent crown (7);
2 definitive crown after an orthodontic extrusion or a crown lengthening (7, 8);
3 or extraction of the residual tooth followed by an immediate or delayed implant surgery (3, 4).

This clinical case describes a multidisciplinary treatment approach of an anterior-traumatized tooth along with the esthetic management in a single visit.

Case report

A 19-year-old Caucasian male consulted at the dental clinic 2 weeks after he had been assaulted. The initial clinical examination did not reveal any soft tissue injury but the intraoral examination showed an oblique crown–root fracture of the maxillary left lateral incisor of type B fracture according to Dean's classification (5). The fracture line was located 2 mm supragingivally on the buccal aspect and at the level of the alveolar crest on the palatal aspect. The fragment was extremely mobile as it was only retained by periodontal fibers on the palatal aspect (Figs. 1 and 2). Radiological examination did not show any other fracture or injury on the adjacent teeth.

After extraction of the coronal fragment, it was kept in physiological saline solution. Despite the fracture,

Fig. 1. Preoperative view.

Fig. 2. Clinical view after the removal of the coronal fragment.

the root-canal therapy could be performed with the rubber dam. After cleaning and shaping, the root canal was filled with Pulp Canal Sealer® (Kerr Italia Spa, Montreuil, France) and gutta-percha using the warm vertical compaction technique (Fig. 3).

During this appointment, a temporary crown was fabricated using a post (Normatec®, Tecalliage, Paris, France) and the natural fractured crown. A cavity was made in the coronal fragment to receive the head of the post (Fig. 4). The gutta-percha was partially removed leaving the apical 4 mm of the filling to maintain a good seal (9, 10) and the post was placed (Fig. 5). After etching of the coronal fragment with a 37% phosphoric acid gel for 20 s, the crown was rinsed under running water for 20 s. An adhesive was then applied according to the manufacturer's instructions and the cavity was filled with a composite resin (TPH Spectrum®, Dentsply De Trey, Montigny-le-Bretonneux, France) and placed over the post. The coronal segment was then light cured for 60 s from both palatal and buccal aspects. The crown was removed to eliminate resin excess (Fig. 6). The occlusion was checked and the crown was sealed with a zinc

Fig. 3. Endodontic treatment and temporary crown placement after sealing.

Fig. 4. The fractured crown after removal and preparation.

Fig. 5. Post positioning to accommodate the fractured crown.

Fig. 6. Temporary crown after light curing.

Fig. 7. Buccal view of the coronal fragment after sealing.

phosphate cement (Zinc Cement Improved®, SS White Group, Gloucester, UK) (Fig. 7).

However, the proximity between the fracture line and the bone crest required an orthodontic extrusion for long-term attachment health. This was started 2 months later and lasted 3 months. A partial arch extending from the maxillary right central incisor to the maxillary left first premolar was used. This procedure was selected to facilitate prosthetic restoration and to restore the physiological periodontal attachment (Figs. 8 and 9). To initiate the extrusion, a stainless steel wire was used. After 2 weeks, a Nitinol wire was used. Most of the extrusion was obtained after

Fig. 8. Initial orthodontic view after bracketts placement.

Fig. 9. Lateral incisor extrusion before removal of the bracketts. During the orthodontic extrusion, the incisal edge has been progressively ground (notice the new level of the brackett).

4 weeks. To avoid reintrusion, the orthodontic wires were maintained during 6 months. At completion of the extrusion, a palatal gingivoplasty was undertaken to reduce the palatal mucosa's thickness. The fractured tooth was then restored with a post and core and a full ceramic crown (Figs. 10–12).

Fig. 10. Occlusal view of the permanent fixed crown.

Fig. 11. Buccal view of the permanent fixed crown.

Fig. 12. Radiographic view after the permanent crown's sealing.

Discussion

Bonding the coronal fragment to the root structure can be a permanent treatment in some cases, but in the present situation, the subgingival location of the fracture line could not allow an optimal sealing. Besides, oral hygiene could have been difficult to maintain. A deficient seal would have increased leakage and jeopardized the outcome of the treatment.

The use of a post increases retention and distributes the stress along the root (2). A carbon fiber post could have been used if a permanent bonding between the crown and the root was preferred (11).

The cooperation of the patient is one of the most important criteria when the conservation of the tooth has been decided. Informed consent has to be obtained from the patient to accept the orthodontic treatment even for a short time after the presentation of alternative treatments such as extraction and implant.

In such a case, two main factors must be addressed: the fracture margin access and the possibility of performing a tight seal restoration. Here, the complete edification of the root allows a quick orthodontic extrusion, which will maintain the periodontal tissues at the same level and restore a physiological attachment. This treatment, the easiest orthodontic movement to obtain, has been preferred to crown lengthening, which removes alveolar bone and compromises esthetic (8). This orthodontic procedure allows the movement of the fracture line supragingivally and then optimizes the marginal sealing. However, the forced eruption is limited to 5 mm (7). The major limitation of this treatment is the increase of the duration of the treatment and a splinting time of 6 months (2, 3). Orthodontic extrusion restores the physiological periodontal attachment and preserves the alveolar bone from periodontal disease that could have occurred if the bonding of the fractured crown had been undertaken without any other treatment.

Using the remaining tooth instead of a temporary resin crown before performing the permanent fixed prostheses provides many advantages: shade, morphology, translucency, physiochemical characteristics, patient acceptance, structurally conservative and financial considerations (3). This also could be a treatment of choice when the fracture line is located coronal to the gingival level.

Conclusion

Restoration of traumatized teeth requires a close collaboration between the different dental fields to avoid extraction. Even if orthodontic extrusion reduces the clinical crown/clinical root ratio (4) and widens the embrasure, this approach allows the practitioner the ability to seal or to bond the crown without any risk of leakage. In addition, adhesive dentistry techniques and prosthetic restorations can be utilized to mask-widened embrasure spaces (7).

The present case shows the multidisciplinary management of a dental trauma, leading to the conservation of a tooth and its permanent restoration.

References

1. Petti S, Tarsitani G. Traumatic injuries to anterior teeth in Italian schoolchildren: prevalence and risk factors. Endod Dent Traumatol 1996;12:294–7.

2. Wadhwani CPK. A single visit, multidisciplinary approach to the management of traumatic tooth crown fracture. Br Dent J 2000;188:593–8.
3. Leroy RLRG, Aps JKM, Raes FM, Martens LC, De Boever JA. A multidisciplinary treatment approach to a complicated maxillary dental trauma: a case report. Endod Dent Traumatol 2000;16:138–42.
4. Trushkowsky RD. Esthetic, biologic and restorative considerations in coronal segment reattachment for fractured tooth: a clinical report. J Prosthet Dent 1998;79:115–9.
5. Dean JA, Avery DR, Swartz ML. Attachment of anterior fragments. Pediatr Dent 1986;8:139–43.
6. Oulis CJ, Berdouses ED. Dental injuries of permanent teeth treated in private practice in Athens. Endod Dent Traumatol 1996;12:60–5.
7. Yoeli Z, Samet N, Miller V. Conservative approach to post-traumatic treatment of maxillary anterior teeth: a clinical report. J Prosthet Dent 1997;78:123–6.
8. Kocadereli I, Taζman F, Güner SB. Combined endodontic–orthodontic and prosthodontic treatment of fractured teeth. Case report. Austr Dent J 1998;43:28–31.
9. Mattison GD, Delivanis PD, Thacker RW, Hassel KJ. Effect on preparation on the apical seal. J Prosthet Dent 1984;51: 785–9.
10. Goodacre CJ, Spolnik KJ. The prosthodontic management of endodontically treated teeth: a review of literature. Part II. Maintaining the apical seal. J Prosthod 1995; 4:51–3.
11. Dean JP, Jeansonne G, Sarkar N. *In vitro* evaluation of a carbon fiber post. J Endod 1998;24:807–10.