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REVIEW ARTICLE

Salvaging a Natural Tooth with a Complicated Crown-root Fracture using a Biological Conservative Approach

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ABSTRACT

Crown root fractures are a challenge to any dentist. This case report presents management of a complicated crown-root fracture in maxillary right lateral incisor with the palatal fracture line extending apical to the level of crest of alveolar bone. After the root canal treatment was done, surgical crown lengthening was carried out to expose the fracture line, fiber post placement which was luted using dual-cure resin cement followed by reattachment procedure.

Keywords: Complicated crown-root fracture, Reattachment, Traumatic injuries.

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BACKGROUND

Traumatic injuries to the teeth can affect a patient's social and psychological well-being. As far as the treatment of fracture is concerned, complicated crown-root fracture is the most challenging, constituting 5% of all the dental injuries. A crown-root fracture can affect the enamel, dentin, and cementum and can be classified as either complicated or uncomplicated depending on the pulpal involvement.[1] Coronal fractures of permanent incisors constitute 18 to 22% of all traumatic injuries to dental hard tissues, 28 to 44% being simple (enamel and dentin) and 11 to 15% complex (enamel, dentin, and pulp).[2] The factors that should be taken into consideration when managing complicated crown-root fracture include extent and pattern of fracture, pulpal involvement, stage of root development, associated alveolar bone fracture, biologic width of the tooth, soft-tissue injuries, presence/absence of fractured tooth fragment, secondary traumatic injuries, occlusion, and esthetics.[3-5] Primary aim of the treatment of complicated crown-root fracture is esthetic and functional rehabilitation of the patient. Among the different treatment modalities available, reattachment of the autogenous tooth fragment is an excellent biological approach for natural rehabilitation of the patient. Reattachment provides excellent esthetics to the patient as the patient gets back his/her original tooth form, color, and surface texture, which imparts a positive psychological impact.

This case report describes the biological conservative approach for the management of complicated crown-root fracture of lateral incisor violating the biological width.

CASE REPORT

A 24-year-old male patient reported to the Department of Conservative Dentistry and Endodontics with a history of trauma in front region of jaw due to an accidental fall on the staircase, 2 days ago. Medical history of the patient was nonrelevant. Extraoral examination revealed a lacerated upper lip. Intraoral examination revealed Ellis class III fracture with maxillary right lateral incisor (tooth number 12) and Ellis class I fracture with 11 (Figs 1A and B). The fracture line with 12 was extending cervically on the labial aspect and subgingivally on the palatal aspect. The fractured fragment was still intact and mobile. On sensitivity testing, 11 showed a positive response and 12 showed a negative response. Radiographic examination confirmed a horizontal fracture in tooth 12, labially at the cervical one third and palatally below the alveolar crest. Patient was explained about different treatment modalities available for salvaging the tooth and their possible outcomes. Patient consented for the procedure of reattachment.

The fractured fragment was removed (Figs 1C and D) under 2% lignocaine local anesthesia (Elder Pharmaceuticals Ltd., Mumbai, India) and stored in saline to prevent dehydration and discoloration. Root canal treatment for 12 was initiated. After access cavity preparation under adequate isolation, working length was determined using a #15K file (Dentsply Maillefer, Ballaigues, Switzerland) and an apex locator (Root ZX mini, J Morita, Japan) and confirmed on a radiograph. Biomechanical preparation of the canal was done using step-back technique with

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Figs 1A to D: (A) Preoperative clinical view; (B) preoperative radiographical view; (C) clinical view after removal of fragment: and (D) fractured fragment

2% stainless steel files. The apex was enlarged up to size 30 and step back was carried out to size 50. After each instrumentation, the canal was copiously irrigated using 3% sodium hypochlorite (Prime Dental Products, Mumbai, India). Final flushing of the canal was done using saline and dried using absorbent paper points (Prime Dental Products, Mumbai, India). The root canal was filled for 7 days with calcium hydroxide (Prime Dental Products, Mumbai, India). After 7 days, as the tooth was asymptomatic, obturation was carried out using gutta-percha points (Sure Dent Corporation, Gyeonngi-do, Korea) and zinc oxide eugenol sealer (Prime Dental Products, Mumbai, India).

On completion of the endodontic treatment, patient was appointed for crown lengthening of 12 to enhance the visibility of fracture line on the palatal aspect and maintain the biologic width.

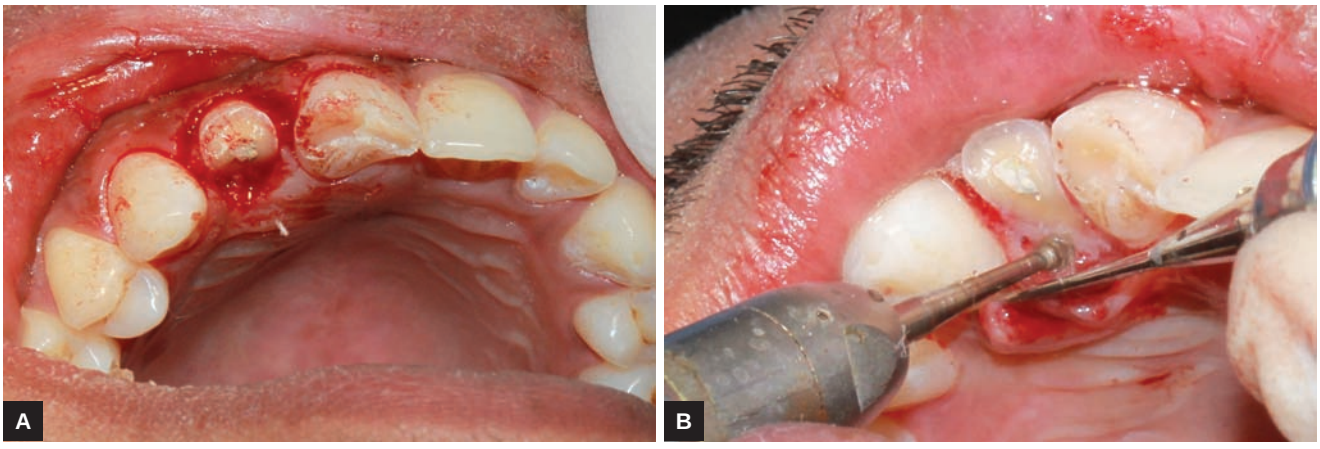
Presurgical Preparation

Preoperative photographs were taken and diagnostic models were prepared for the occlusal evaluation. Routine blood investigations were performed and found to be normal. Oral prophylaxis was completed.

Surgical Procedure

Local anesthesia was administered. Preoperative probing depth measurements were recorded on labial (midlabial—2 mm, ML—2 mm, DL—2 mm) and palatal (midpalatal—5 mm, MP—4 mm, DP—4mm) aspects of the tooth using Williams graduated periodontal probe 2 (Hu-Friedy, Chicago, Illinois, USA). Labial and palatal internal bevel incisions were given with No. 15c surgical blade (Niraj Industries Pvt Ltd., Faridabad, India). Crevicular incisions were performed with No. 12 surgical blade (Niraj Industries Pvt Ltd., Faridabad, India). Interdental incision was given using Orban's interdental knife (Hu-Friedy, Chicago, Illinois, USA) to separate the collar of the gingiva, i.e., left around the tooth. The excision of the gingival collar was done with a Gracey curette No. 1/2 (Hu-Friedy, Chicago, Illinois, USA) (Fig. 2A). Full periosteal flap was raised labially and palatally to expose 2 mm of crestal bone. The magnitude of biologic width was added to the amount of supracrestal tooth structure needed for exposure of the fracture line for reattachment of the crown. The level of the osseous crest was lowered based on this amount using a rotary no. 2 round bur (Surgical Product Solutions, Pittsburg, Pennsylvania, USA). The original bone width was maintained at all sites after osteotomy (Fig. 2B). Flap was repositioned and interrupted 4-0 silk sutures (Centenial Surgical Suture Ltd., Thane, India) were placed.

Reattachment of the fractured fragment of 12 was scheduled a week later to facilitate healing of the surgical



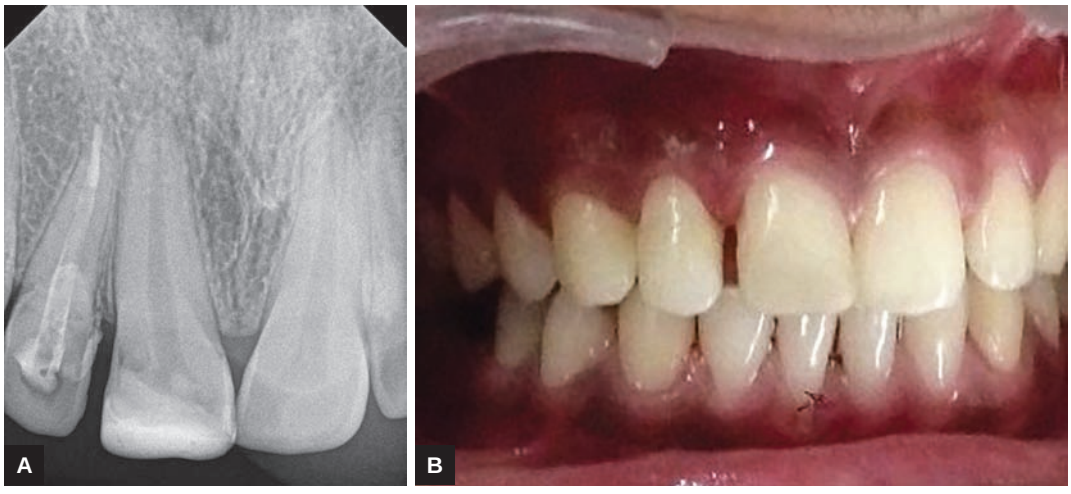
Figs 2A and B: (A) Clinical view after crown lengthening procedure; and (B) osseous recontouring

Fig. 3: Immediate postoperative clinical view

site. For the procedure of reattachment, post space was created in the canal using Peeso reamer (Mani, Tochigi, Japan) until 5 mm gutta-percha remained at apical one third to maintain the apical seal. Space was also prepared in the pulp chamber of the fractured segment for receiving the coronal portion of the post. The Hi-Rem prosthetic S-glass fiber endodontic post (Overfibers S.r.I, Mordano, Italy) was selected and kept aside. The root canal was then etched with 37% phosphoric acid (Pulpdent Corporation, Watertown, Massachusetts, USA), rinsed, and dried with absorbent paper points. Bonding agent (Paracore; Coltene/Whaledent Inc., USA) was applied and the post was luted to the canal using dual-cure resin luting cement (Paracore; Coltene/Whaledent Inc., USA). The detached fragment was similarly etched, bonded, and after proper reapproximation, reattachment of the segment was done using flowable composite resin (Perma Flo; Ultradent products Inc, South Jordan, USA). After completion of procedure, polishing of the tooth was done using composite polishing kit (Shofu Dental Corporation, San Marcos, California, USA). Occlusion was verified and postoperative instructions were given.

After the root canal treatment of 12, tooth 11 was restored using composite resin (3M ESPE, St. Paul, USA) and polished using the composite polishing kit (Fig. 3).

Six-month recall showed no signs and symptoms associated with either 11 or 12 (Figs 4A and B).



Figs 4A and B: (A) Radiological view of 3 months follow-up; and (B) Clinical view of 3 months follow-up

DISCUSSION

Traumatic injuries to the maxillary anteriors are very common in young individuals because of its position in the arch. The incidence of anterior teeth crown fractures in permanent dentition ranges from 26 to 76%.[6-8] Management of a complicated crown root fracture is a great challenge for a clinician because of the difficulties associated, such as isolation which may jeopardize the seal of the restoration.

Various treatment options available for the management of complicated crown-root fracture include the removal of coronal fragment followed by subsequent restoration above the gingival level, removal of the coronal fragment, and surgical extrusion of the tooth, making the fracture line supragingival with the help of gingivectomy and osteotomy or the removal of coronal fragment followed by orthodontic extrusion of tooth.[9-12] First treatment option allows the subgingival healing of fractured segment with formation of long junctional epithelium. The second option helps expose the fracture line and thus facilitate the reattachment procedure. The risk associated with the third technique includes failure in the attachment of periodontal ligament to the root surface which may increase the risk of resorption. The disadvantage with the fourth treatment modality is that this procedure is time consuming.

The psychological disturbance associated due to loss of esthetics can be successfully managed by the procedure of fragment reattachment if the detached tooth fragment is available for the procedure.[11] Reattachment of the separated fragment helps in restoring the natural esthetics of tooth structure. To enhance the bond strength and esthetics of the fractured fragment to the tooth structure, maintaining hydration of fractured fragment when it is outside the oral cavity plays a very important role. In the present case, fractured fragment was preserved in saline.

Here, reattachment of fragment was accomplished by endodontically treating involved tooth, followed by crown lengthening and osteotomy. Approximation of fracture segment to tooth structure was achieved with fiber post and dual-cure composite resin. Fiber post was preferred over metal posts as it offers many advantages like preservation of tooth structure, less wedging forces at apical one third, bonding to the tooth structure, and modulus of elasticity close to that of dentin. In addition, as the fiber-reinforced post requires minimal preparation, it utilizes the undercuts and surface irregularities to increase the bonding interface, thus reducing the possibility of detachment of fracture segment during function or traumatic injury.[13-16]

CONCLUSION

Using autogenous tooth fragment for salvaging the natural tooth is the most conservative and least invasive technique for the management of complicated crown root fracture. With the advent of newer materials in adhesive dentistry, reattachment is no longer thought of as a provisional restoration but a permanent treatment option providing favorable prognosis and esthetically predictable results.

Clinical Significance

Management of complicated fractures in the anterior teeth is a challenge for the clinician as the patients will be under psychological stress and will be worried about the esthetic disfigurement. An interdisciplinary approach wherein the fractured fragment is removed, crown lengthening and osseous recontouring procedure is done prior to reattachment of the fragment presents a realistic chance of success.

REFERENCES

1. Andreasen, JO.; Andreasen, FM.; Andersson, L.; editors. Crown-root fractures. In: Textbook and color atlas of traumatic injuries to the teeth. 4th ed. Copenhagen: Blackwell Munksgaard; 2007. p. 314-336.
2. Pagliarini A, Rubini R, Rea M, Campese M. Crown fractures: effectiveness of current enamel dentin adhesives in reattachment of fractured fragments. Quintessence Int 2000 Feb;31(2):133-136.
3. Olsburgh S, Jacoby T, Krejci I. Crown fractures in the permanent dentition: pulpal and restorative considerations. Dent Traumatol 2002 Jun;18(3):103-115.
4. Andreasen FM, Norèn JG, Andreasen JO, Engelhartsen S, Linh-Strömberg U. Long-term survival of fragment bonding in the treatment of fractured crowns: a multicenter clinical study. Quintessence Int 1995 Oct;26(10):669-681.
5. Sargod SS, Bhat SS. A 9 year follow-up of a fractured tooth fragment reattachment. Contemp Clin Dent 2010 Oct;1(4): 243-245.
6. Andreasen, JO.; Andreasen, FM. Textbook and color atlas of traumatic injuries to the teeth. Copenhagen: Munksgaard; 1993. p. 216-256.
7. Andreasen, JO.; Andreasen, FM., editors. Crown-root fractures. In: Textbook and color atlas of traumatic injuries to the teeth. 3rd ed. Copenhagen: Munksgaard; 1994. pp. 257-277.
8. Zerfowski M, Bremerich A. Facial trauma in children and adolescents. Clin Oral Invest 1998 Sep;2(3):120-124.
9. Wilson S, Smith GA, Preisch J, Casamassimo PS. Epidemiology of dental trauma treated in an urban pediatric emergency department. Pediatr Emerg Care 1997 Feb;13(1):12-15.
10. Delattre JP, Resmond-Richard F, Allanche C, Perrin M, Michel JF, Le Berre A. Dental injuries among schoolchildren aged from 6 to 15, in Rennes (France). Dent Traumatol 1995 Aug;11(4):186-188.
11. Agrawal AN, Manwar NU, Chandak MG. Reattachment of anterior teeth fragments with two different treatment techniques: report of two cases. Int J Dent Clin 2011 Jan-Mar;3(1): 107-108.

12. Pontoriero R, Carnevale G. Surgical crown lengthening: a 12 month clinical wound healing study. J Periodontol 2001 Jul;72(7):841-848.
13. Shashikala K, Sharma S. Clinical and radiological evaluation of cast metal and quartz fiber posts in endodontically restored teeth. Endodontology 2011;3:37-46.
14. Pereira JR, de Ornelas F, Conti PC, do Valle AL. Effect of a crown ferrule on the fracture resistance of endodontically treated teeth restored with prefabricated posts. J Prosthet Dent 2006 Jan;95(1):50-54.
15. Kaur J, Sharma N, Singh H. In vitro evaluation of glass fiber post. J Clin Exp Dent 2012 Oct;4(4):204-209.
16. Dayal C, Dhingra A, Neetika D. A comparative evaluation of fracture resistance of endodontically treated teeth restored by different post system – an vitro study. IOSR J Dent Med Sci 2014 Dec;13(12):63-67.