Management of Complicated Crown-Root Fracture - An Interdisciplinary Approach

S Linu, Lija Issac, Anulekh Babu, Shiji Dinakaran, M S Lekshmi

Email: drdevanshim@gmail.com

Abstract

Traumatized anterior teeth with complicated fractures of crown, which are subgingival, are a challenge to treat. This paper presents a case report on interdisciplinary approach in the management of a complicated crown root fracture of a maxillary lateral incisor. It involves endodontic treatment of the involved tooth followed by orthodontic extrusion, circumferential supracrestal fibrotomy, and gingivectomy and restoration using a post-core and metal ceramic crown.

Key words: Subgingival crown fracture, orthodontic extrusion, gingivectomy

Introduction

Trauma with accompanying fracture of incisors poses a tragic experience for young patients and may have psychological effects on them. Tooth fracture or advanced caries at or below the level of the crestal bone poses a periodontal and restorative challenge.¹ Such fractured teeth are often considered unsalvageable and are extracted. Eventually the extraction results in resorption of the alveolar bone, which makes esthetics difficult to accomplish through artificial replacement of the tooth.

Hence, prior to extraction, alternative treatment options such as surgical or orthodontic crown lengthening should be considered keeping in mind the ultimate goal of preservation of tooth.¹ Only an appropriate treatment planning can provide an acceptable functional and esthetic outcome. The crown lengthening procedure has made the retention and the restoration of such a tooth possible.² Surgical crown lengthening is often recommended, but it can cause possible adverse periodontal changes to the adjacent teeth and compromised esthetics.³ Hence, the use of orthodontic extrusion, also referred as the forced eruption, can be considered an alternative to surgical crown lengthening.⁴

This paper reports a case of complicated crown root fracture of a maxillary lateral incisor in a 22-yearold female managed by an interdisciplinary approach involving endodontic treatment of the involved tooth followed by orthodontic extrusion, circumferential supracrestal fibrotomy, gingivectomy and restoration using a post-core and metal ceramic crown.

Case report

A 22-year-old female patient reported to the Department of Conservative Dentistry and Endodontics with a chief complaint of broken upper right front tooth. She had a history of fall from a bike

How to cite this article: S Linu, Lija Issac, Anulekh Babu, Shiji Dinakaran, M S Lekshmi. (2017). Management of Complicated Crown-Root Fracture - An Interdisciplinary Approach, 2(1), 18-22.

on the previous day. The medical and dental history was non-contributory. On clinical examination, there was oblique fracture of 12 involving pulp and fracture of 11 and 13 involving enamel and dentin. The fracture line on 12 was visible labially, but was subgingival palatally (Figure 1). Radiographic examination showed no signs of periapical pathology or any additional root fracture and it revealed a fully-formed apex of the teeth concerned (Figure 2). Vitality of the teeth was assessed with digital electrical pulp tester - DigitestTM II Pulp Vitality Tester (Parkell Inc, Edgewood, NY) and the teeth 11, 12, and 13 showed positive response.



Figure 1: Subgingival complicated fracture of 12



Figure 2: Intra oral periapical radiograph of 12

Based on clinical and radiographic examinations and vitality tests, following diagnosis was made – complicated crown-root fracture of 12 and uncomplicated crown fracture of 11 and 13.

Considering esthetics, the amount of tooth structure available and the periodontal status, the following treatment was planned for the patient:

- a) Removal of the fractured coronal segment of 12 followed by endodontic treatment of 12;
- b) Rapid orthodontic extrusion of 12 along with supracrestal fibrotomy;

- c) Gingivectomy in relation to 12;
- d) Post and core restoration of 12; and
- e) Jacket crown on 12, composite restoration on 11 and 13.

Treatment procedure

The fractured coronal segment was removed from 12 using an artery forceps (Top Dent, Delhi, India) under local anesthesia (Lignocaine 2%, Adrenaline 1:200000; Aculife Healthcare Pvt. Ltd, Gujarat, India). On periodontal probing (Thin William Screening probe; GDC Marketing, Punjab, India) the fracture line was found extending 3 mm subgingivally on the palatal side. The remaining fragment was endodontically treated under rubber dam (Hygienic; Coltene Whaledent AG, Altstatten, Switzerland) isolation using a split dam technique. Access cavity was refined using peeso reamer #3 (MANI Inc, Utsunomiya, Japan). Pulp extirpation was done with broaches #15 and #20 (MANI Inc, Utsunomiya, Japan). Determination of working length was done with an electronic apex locator (Raypex 6, VDW, Munich, Germany) and confirmed with the radiograph. Canal preparation was done with K-files (MANI Inc, Utsunomiya, Japan) using a step-back technique up to a master apical file size of #40. Adequate irrigation was done with 5% sodium hypochlorite (Pyrex Exports, Roorkee, India) and lubricated using Endoprep-RC (Anabond Stedman, Chennai, India). Obturation was carried out with gutta-percha points (ISO Color-Coded, Dentsply Maillefer, Bellaigues, Switzerland) and AH plus sealer (Dentsply Maillefer, Bellaigues, Switzerland) using a lateral condensation technique.

Post space was prepared with peeso reamer #2 and #3 and a 'J' shaped hook made with 19 gauge orthodontic stainless-steel wire (Ortho Wire 19 No Konark, Samit Products, New Delhi, India) was luted using zinc phosphate cement (Harvard Dental International, Hoppegarten, Germany) into the post space for orthodontic extrusion (Figure 3). Subsequently, adjacent teeth were bonded with 022 MBT brackets (Unitek Gemini; 3M Oral Care, St. Paul, MN, USA) and elastic traction of the fractured tooth was done with offset bend on 0.018 inch A J Wilcock wire (A J Wilcock, Hay Mills, Birmingham,

Linu S, et al: Management of Complicated Crown-Root Fracture - An Interdisciplinary Approach

England) (Figure 4). The force applied was around 35 to 50 grams. After achieving extrusion of 4 mm in one month, circumferential supracrestal fibrotomy was done (Figure 5). To minimize further chances of relapse, the appliance was kept in place for a period of four months.



Figure 3: 'J' hook placed into the post space



Figure 4: Orthodontic extrusion

On removal of the appliance, the marginal gingiva on the labial and palatal aspect was noted enlarged and unaesthetic and the probing depth was 4 mm. Hence, gingivectomy was done around 12 both labially and palatally under local anesthesia (Figure 6).



Figure 5: Circumferential supracrestal fibrotomy



Figure 6: Gingivectomy of 12



Figure 7: Placement of fiber post

On review after 2 weeks, the gingival healing was found to be satisfactory and the probing depth was 2 mm. The core build up (ParaCore; Coltene Whaledent AG, Altstatten, Switzerland) was done after luting fiber post (Tenax Fiber White – TFW11; Coltene Whaledent Inc., Ohio, USA) and the tooth was esthetically restored using metal ceramic crown (Figures 7 and 8). The teeth 11 and 13 were restored with a composite resin (Filtek Supreme Ultra Universal Restorative; 3M ESPE, St. Paul, MN, US). On 6-month review, the tooth 12 was found functional and the sensibility tests showed a positive response on 11 and 13.



Figure 8: Full coverage restoration

Discussion

Crown lengthening is a procedure that is done to increase the length of the clinical crown to permit the esthetic restoration of the tooth without violating the biologic width.⁵ It is mandatory that sound tooth structure should be present coronal to the tooth's attachment apparatus to restore the tooth.⁶ Several techniques are available for crown lengthening. This case describes the successful and optimal restoration of the tooth 12 that was fractured at the subgingival level.

As the tooth 12 was fractured at the subgingival level, there were three options for the restoration of the involved tooth – surgical crown lengthening, orthodontic forced eruption, and surgical extrusion.

Crown-root ratio of the tooth was favorable for forced eruption. When faced with the option of slow and rapid extrusion, rapid extrusion was decided as it is as rapid as 1 mm per week and prevents immediate formation of bone around new CEJ (cementoenamel junction).⁷ The forced eruption coupled with fibrotomy is the most preferred option, when crown lengthening is required for a single tooth as it is easier, fast, and cost effective. Orthodontic extrusion is a relatively simple procedure with no sacrifice of periodontal ligament or bone and no compromise on supporting structures of adjacent teeth.⁸

After 4 mm of extrusion, the tooth was stabilized in place for 4 months and this allowed for the reorganization of periodontal fibers. The periodontal fibers are stretched and obliquely oriented as the root is moved coronally and these fibers take about 6 weeks to 6 months to reorient themselves. Circumferential supracrestal fibrotomy was performed to sever the gingival fibers. In addition, in the 4 - 6 months period, the bone remodeling and maturation occurs preventing the re-intrusion of the tooth.⁸

During the fixed appliance treatment, there is an increase and change in the microbial load.⁸ Hence, most of the patients treated with the fixed orthodontic appliance experience a moderate gingivitis and varying degrees of gingival hyperplasia. Here in this case, the gingivectomy was done and the physiologic gingival contour was obtained.

Conclusion

Multiple treatment options are available for restoring a tooth with gingival or subgingival fracture. An important criterion, which the clinician has to bear in mind, is the preservation of the biologic width. However, the choice of the treatment depends upon several tooth related factors and the clinician's preference. This multidisciplinary technique of forced eruption is the best choice when the clinical crown lengthening is required in the esthetic zone for a single tooth, provided the tooth has favorable root length and taper.

References

- Galagali SR, Balaram S, Kumar B, Navaneetha H, Choudary BS. Vertical Root Fractures: Diagnosis and Management - A Review. *International Journal of Dental Clinics*. 2011; 3 (3): 59 - 61.
- Heithersay GS, Moule AJ. Anterior subgingival fractures: A review of treatment alternatives. *Aust Dent J*.1982; 27(6), 368 - 76.
- Planciunas L, Puriene A, Mackeviciene G. Surgical lengthening of the clinical tooth crown. Stomatologija Baltic Dental and Maxillofacial Journal. 2006; 8 (3)88 - 95.
- Pontoriero R, Celenza F, Ricci G, Carnevale G. Rapid extrusion with fiber resection: A combined orthodontic-periodontic treatment modality. Int J Periodontics Restorative Dent. 1987; 7 (5): 30 -43.

Linu S, et al: Management of Complicated Crown-Root Fracture - An Interdisciplinary Approach

- Nethravathy R, Vinoth SK, Thomas AV. Three different surgical techniques of crown lengthening: A comparative study. J Pharm Bioall Sci. 2013; 5: 14 - 16.
- Felippe LA, Monteiro Júnior S, Vieira LCC, Araujo E. Reestablishing biologic width with forced eruption. *Quintessence Int.* 2003; 34, 733 -38.
- Uddin M, Mosheshvili N, Segelnick SL. A new appliance for forced eruption. N Y State Dent J. 2006; 72, 46 - 50.
- Bach N, Baylard JF, Voyer R. Orthodontic extrusion: periodontal considerations and applications. J Can Dent Assoc. 2004; 70 (11); 775 -780.