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Management Of Complicated Crown Fracture Using Fixed Sectional Orthodontic Extrusion Technique -A Case Report

Sk Mahboob Rahaman[1], Anuradha Mukherjee[2], Arindam Saha[3], Soumik Kabasi[4] Pintso Tshering Lepcha[5], Tanmoy Patra[6]

Assistant Professor[1,3,4], Professor[2] , Associate Professor[5] , Dental Surgeon[6](BDS).
Dept. of Conservative Dentistry & Endodontics, [3]Dept. of Dentistry,
[4]Dept. of Public Health Dentistry, [5]Dept. of Orthodontics,
North Bengal Dental College & Hospital

***Corresponding Author:**
Dr. Sk Mahboob Rahaman
Assistant Professor, Dept. Of Conservative Dentistry & Endodontics,
North Bengal Dental College & Hospital., Sushrutanagar, Darjeeling -734012

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Abstract

Complicated crown fractures are one of the common situations encountered in the dental practice. It can often be challenging to the clinicians to deal such cases. The complexity of the cases will depend the complexity of the injury, classification of the fractured tooth and aesthetic demand of the patient .The purpose of this article is to describe a case of complicated crown fracture which was managed successfully through segmental fixed orthodontic extrusion technique and its outcome is highlighted with consideration in this method of management.

Keywords: Tooth fracture, Gingival margin, Crown restoration, Orthodontic extrusion, Alveolar ridge, Maxillary anterior teeth

Introduction

Crown-root fractures involve enamel, dentine and/or pulp and comprise up to 5% of all traumatic injuries[1]. The management of fractured tooth is one of the common cases encountered in dental practice and out of all dental trauma fractured central incisor accounts for 71.42 percent in general. With the recent trend and attitude toward dental implants, extraction remains the common treatment modality. This, however, should be considered as the last option, and every attempt should be made to preserve and restore the natural tooth structure[2]. Such treatment modalities involve a multi-disciplinary approach including endodontics, periodontal crown lengthening, and/or orthodontic extrusion followed by prosthetic rehabilitation. Periodontal crown lengthening involves the removal of supporting crestal alveolar bone while orthodontic intervention forcibly extrudes the tooth. Both are attempts to expose sufficient coronal tooth structure for proper prosthetic restoration. Crown lengthening procedures may expose excess of root and in turn, may compromise esthetic results that can be avoided by the use of orthodontic extrusion[3456].

The purpose of this paper is to review this multi-disciplinary treatment approach and to present a case of traumatized fracture maxillary central incisor tooth and its management maintaining the healthy periodontal tissue and alveolar bone.

Case Report

A 46 year old male patient came to the department of Conservative Dentistry and Endodontics of North Bengal Dental College and Hospital with the chief

complaint of dislodgement of crown in the upper front tooth region following a traumatic injury 3 days back. On clinical examination tooth no 11 showed complicated crown fracture with residual cement and a porcelain fused to metal full coverage restoration in 21(figure-1). The patients had generalized stain due to history of habitual smoking since last 5 year. Radiographic examination showed tooth no 11 and 21 were endodontically treated (figure-2). Upon clinical evaluation tooth no 11 showed inadequate amount of ferrule with buried fracture margin below the gingival level (figure-3). There were two options regarding the management of the case either to do a surgical crown lengthening of the tooth but surgical crown lengthening of the tooth will cause apical displacement of the gingival zenith if done only on single tooth and total osteoplasty of the anterior segment will be large procedure and after all any surgical procedure carriers its own complication. Another treatment is orthodontic extrusion of the tooth to gain adequate amount of ferrule. Both the treatment options were told to the patient and he wanted to avoid surgeries so orthodontic treatment was opted .An custom made extrusion hook fabricated using 22 gauge hard stainless steel wire with the help of adams plier and half round plier (figure-4). After residual cement removal a space was created by removing guttapercha from the root canal space (figure-5) and the extrusion hook was cemented with type 1 glass ionomer cement(fuji 1 by GC America)(figure-6). MBT bracket were bonded on Tooth no 13,12 ,21,22,23 . A 0.014 inch round Ni-Ti were preshaped and placed in the bracket slots and the extrusion hook and secured with elastomeric lingering (figure7). Patient is recalled after 1week, 4th week and 6th week respectively. After 6th week adequate amount of ferrule was gained in the labial and palatal aspect .The brackets were debonded and crestalfiberectomy of tooth no 11 done to prevent the relapse. Post space was created after removing the extrusion hook and cement residues from the post space (figure-8). A cast post was fabricated (figure-9) and cemented in the prepared post space with type 1 glass ionomer cement (figure-10) .Finally it was restored with full coverage porcelain fused to metal crown restoration (figure-11) and considerable amount of esthetic changes were seen after the completion of the treatment.

Discussion

Dental trauma, and ensuing fracture of the permanent anterior teeth, can be one of the most stressful situations in a dental practice, demanding a comprehensive treatment planning[7]. Placing restorative margins within the biologic width frequently leads to gingival inflammation, clinical attachment loss, and bone loss. This is thought to be due to the destructive inflammatory response to microbial plaque located at such depths. Thus, it is important to maintain health of periodontium during restoration in sub-gingival areas. Ingber et al. suggested that a minimum distance of 3 mm is required from the restorative margin to the alveolar crest to permit adequate healing and restoration of the tooth that is biologically acceptable[8]. Movement of a tooth by extrusion involves applying tractional forces in all regions of the periodontal ligament to stimulate marginal apposition of crestal bone. Because the gingival tissue is attached to the root by connective tissue, the gingiva follows the vertical movement of the root during the extrusion process. Similarly, the alveolus is attached to the root by the periodontal ligament and is in turn pulled along by the movement of the root[9]. Extrusion is easiest of all orthodontic movements because it closely resembles natural tooth eruption[10]. If the fracture line is positioned both below alveolar bone and gingival free margin, and, if the length of the root segment is sufficient enough to support a coronal restoration, then the root can be endodontically treated and, afterwards, orthodontically extruded to elevate the fracture plane above the gingival margin. These procedures enable more favorable prosthodontic coronal restoration by securing its good sealing and esthetics, and, moreover, preserving a good periodontal tissue health[11]. In normal course of events, bone and gingival movements are produced under low-intensity extrusive forces. When stronger traction forces are exerted, as in rapid extrusion, coronal migration of the tissues supporting the tooth is less pronounced because the rapid movement exceeds their capacity for physiologic adaptation[12]. Thus, rapid extrusion is necessary to prevent movement of the gingival collar and alveolar bone with the elevated tooth. Forces of 15 g for the fine root of a lower incisor and 60 g for a molar are sufficient for slow extrusion. Some authors recommend that the maximum force for a slow movement should not exceed 30 g,[13,14] whereas rapid

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extrusions are accomplished with forces higher than 50 g[15].

When one tooth has luxated or fractured, the adjacent tooth might have also suffered some injury, hence anchorage of 2-3 healthy teeth should be taken[16]. Orthodontic extrusion forces coronal migration of the root and increases the bone ridge as well as the quantity of attached gingiva, in particular when weak to moderate forces are applied. The amount of attached gingiva is increased through eversion of the sulcular epithelium, appearing first as immature non-keratinized tissue (known as "red patch") and then as keratinized tissue; the process of keratinization requires 28 to 42 days[17]. After coronal movement of the periodontal attachment has occurred, minor surgical correction may be necessary[14]. Moreover, when the tooth is moved to a new position, cervical periodontal fibers are stretched and may become a cause of relapse. Thus, such case might require surgical fibrotomy[18, 19]. For the present case, the fracture line on palatal side was below the level of gingiva. Thus, did not provide sufficient coronal tooth structure and adequate biological width for a proper coronal restoration. This left us with the option of either extraction followed by implant or retaining the root fragment with subsequent rehabilitation. All the aspects were discussed with the patient. The option of implant was out-rightly rejected considering the high cost involved and psychological taboo of extraction. The patient was given the other option of retaining the natural root by endodontic treatment followed either by periodontal treatment or forced eruption. The patient agreed for the latter as it was more physiological, no need for any surgical procedure and most importantly, cost-effective.

The amount of extrusion estimated to necessity, considering the 'biologic width' [20,21] was approximately 4 mm. The root length of the fractured incisor allowed the tooth to undergo the necessary amount of extrusion and still retain a crown-root ratio of approximately 1:1. This ratio is favorable for maintaining periodontal support [22]. In this case, the root length of fractured incisor was enough for orthodontic extrusion.

Conclusion

A multidisciplinary approach can help save teeth which would otherwise be indicated for extraction. In this clinical report, a treatment modality for forced eruption therapy that minimizes treatment time and increases ease of use was described. The use of this technique for forced eruption may help the general dentist to have a better esthetic result and better patient appreciation.

The key to success are the right indications for the treatment and the dedication of the dentist to reassure and motivate the patient throughout the whole course of treatment, as well as institute a strict and regular recall regimen to guarantee the long term prognosis.

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Figure-1

Figure-2

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Figure-3

Figure-4

Figure-5

Figure-6

Figure-7

Figure-8

Figure-9

Figure-10

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Figure-11

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