

MULTIDISCIPLINARY APPROACH TO TRAUMATIZED TEETH: A CASE REPORT

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ABSTRACT

Treatment of crown fractures often requires a multidisciplinary approach. In the anterior teeth, reestablishment of proper esthetics and function is quite important for the patient. However, crown-root fractures with fracture line below the gingival attachment or alveolar bone crest presents restorative difficulties. This case report presents a cervical tooth fracture that had been treated with minimal invasive approach with different disciplines. A complex procedure was designed to manage this case including the orthodontic extrusion of the tooth to move the fracture line above the alveolar bone and surgical re-contouring of the altered gingival margin. Prosthetic treatment was based on performing the post and core and PFM on the extruded tooth. The less damaged central incisors were restored directly using composite resin. The treatment resulted in a good esthetics and secured periodontal health. This case report demonstrates that a multidisciplinary treatment approach is reliable and predictable method to save the tooth.

KEYWORDS: Tooth fracture; orthodontic extrusion; esthetics; multidisciplinary management

INTRODUCTION

Traumatic injuries to the teeth especially in the esthetic region pose a great challenge to a dentist to be able to restore the tooth to proper health and function. Nothing can replace the natural but the natural. Such dental trauma can lead to fracture of the tooth, particularly in the anterior region of the mouth. At times, when the fracture line is below

the level of gingiva, the prognosis of such fractured tooth is considered questionable or hopeless.^[1] With the recent trend and attitude towards 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. Such treatment modalities involve a multi-disciplinary approach including endodontics, periodontal crown lengthening and/or orthodontic extrusion followed by prosthetic rehabilitation.^[2,3] The major problem with sub-gingival fracture is absence of adequate coronal ferrule and a compromised biological width. This usually complicates the application of the rubber dam during endodontic treatment. 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.^[4-6] The prime objective of tooth extrusion or forced eruption is to provide both a sound tissue margin for ultimate restoration and to create a periodontal environment (biological width) that will be easy for the patient to maintain.^[7,8] Extrusion is the easiest orthodontic movement to achieve because it closely resembles natural tooth eruption. Only 0.2-0.3 N of force is required for the forced eruption of a single rooted tooth. The speed of extrusion is important. In slow extrusion the alveolar bone surrounding the root moves with the tooth. Biologic width realignment is then required to obtain proper



Fig. 1: Intraoral view & IOPA



Fig. 2: Clinical & IOPAR after placement of fixed appliance



Fig. 3: Surgical recontouring & Surgical Dressing

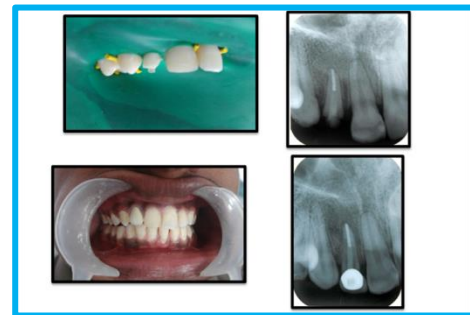


Fig. 4: Cementation of post and PFM crown

contour of the gingiva and crestal bone. A 3-4 mm distance from the alveolar crest to the coronal extension of the remaining tooth structure has been recommended for optimal periodontal health. Forced eruption is usually limited to one, two or three maxillary anterior teeth or premolars with as much as 5 mm of extrusion possible.^[8] The purpose of this paper is to review this multi-disciplinary treatment approach and to present a case of traumatized maxillary lateral incisor tooth with sub-gingival fracture and its management maintaining the healthy periodontal tissue and alveolar bone.

CASE REPORT

A 20 yr old male patient came to the department of conservative dentistry and endodontics with the chief complaint of fractured front teeth. Clinical examination showed fractured incisal edge of maxillary right central incisor #11 and oblique coronal fracture of maxillary right lateral incisor #12. Past dental history revealed that #12 was root canal treated 2 months back and the patient had not been for the crown. The fracture line extended below the gingival level at the palatal surface of the tooth. The adjacent teeth showed no sign of mobility, and electric pulp responses gave positive readings. Radiographic examination confirmed clinical findings. Intra-

oral Periapical radiograph of the involve tooth showed normal root length. Radiographic examination revealed that the obturation was satisfactory and there was no associated fracture and the root, and lamina dura remained intact (Fig. 1). A definitive treatment plan was designed as follows. Composite build up was done i.r.t #11 and access cavity of root canal treated tooth was provisionally restored with glass ionomer cement. The treatment plan consisted of multidisciplinary approach for plaque control, conservative and endodontic treatment, orthodontic extrusion, periodontal surgery and prosthodontic restoration. Orthodontic extrusion of the tooth was required as the fracture level was below the gingival margin at the palatal surface. The orthodontic treatment consisted of forced eruption of the root of the fractured lateral incisors. By considering the estimated crown root ratio and the extension of the fracture, 3 mm extrusion was considered as adequate to provide sufficient biologic width as well as to provide a ferrule for the final restoration. As advised by various authors, a force of 0.2–0.3 N was used.^[4] Patient was recalled every week to judge the amount of extrusion. The desired extrusion of 3 mm required about 6 weeks. As the tooth was asymptomatic, so orthodontic extrusion was carried out using fixed

appliance (Fig. 2). Edgewise brackets (Gemini MBT brackets, 3M Unitek) were bonded to the teeth 11, 12, 13, 21. Sequence of wire was 0.016in NiTi and 0.016 x 0.022in. NiTi used for leveling and alignment for 1 month, since the arch was fairly well aligned already, and then moved on to 0.018x0.025 in. stainless steel working wire. A labial button was applied to the fractured right upper lateral incisor #12 on labial aspect using light cured composite (3M Unitek). An elastic thread attached to the button was engaged with the main arch wire. Elastic thread was used for extrusion of the fractured right upper lateral incisor using light continuous force and was applied for one month. Elastic thread was periodically replaced every week till required extrusion was achieved. The appliance was kept for retention purposes for further one month (Fig. 2). After the desired amount of extrusion, surgical re-contouring of the labial gingival margin followed by supracrestal fibrotomy was done and surgical Coe-pak (GC America, COE PAK) was given. After 1 week pack was removed and the orthodontic appliance was left passive for 2 months to stabilize the achieved extrusion (Fig. 3). Patient was recalled after 2 months and the orthodontic appliance was debanded. Under rubber dam isolation, the provisional restoration was then removed and the tooth was prepared for a post and core. Post space is prepared and a glass fiber post cementation was done using dual cure resin based cement RelyX Fiber Post- 3M and RelyX Adhesive resin-cement-3M and then core of the tooth was built with composite restoration (Denfil, Dentsply). Crown preparation was done and impression taken (Neocolloid,Zhermack) and sent to laboratory. A full-coverage porcelain fused to metal crown was given (Fig. 4). The amount of extrusion did not affect the crown-root ratio. Patient was reviewed for a year and the treatment outcome was stable and symptomless.

DISCUSSION

Horizontal tooth fractures are observed quite frequently in maxillary anterior region and in young male patients.^[1] Fractures at the cervical region occasionally result in loss of coronal part of the tooth, which creates esthetic problems for the patient. Therefore, traumatized anterior teeth require quick repair for both functional and esthetic needs. The possibility of saving and reconstructing teeth with cervical crown-root

fractures is the preferred method of treatment to extraction of the remaining tooth structure.^[2,3] However, the presence of fracture line below the gingival attachment or alveolar bone crest presents restorative difficulties for the clinician. The possible treatment alternatives include surgical or orthodontic extrusion of the root, osteotomy, and gingivectomy. Surgical extrusion is rather an invasive technique that may cause complications related to surgical procedure or postoperative marginal bone loss. In this case, osteotomy and gingivectomy would affect the esthetics in the anterior region due to retraction of the gingival tissues.^[4-6] Orthodontic extrusion is the most biofavourable method of restoring the fractured tooth as compared to extraction and prosthesis or surgical reposition or crown lengthening.

Indications of orthodontic extrusion^[7]

- Treatment of a sub-gingival or infraosseous lesion of the tooth between the cemento-enamel junction and the coronal third of the root. (e.g., caries, oblique or horizontal fractures, perforations.)
- Treatment of a restoration impinging on the biological width.
- Reduction of angular bone defects and isolated periodontal pockets.
- Orthodontic extraction where surgical extraction is contraindicated (e.g., in patients receiving chemotherapy-bisphosphonates or radiotherapy)
- To facilitate the endodontic treatment.

Contraindications to orthodontic extrusion^[7]

- Ankylosis or hypercementosis.
- Vertical root fracture
- Root proximity and premature closure of embrasures.
- Short roots, which do not allow for adequate support of the restoration (that is, when the crown-root ratio is less than 1:1)
- Insufficient prosthetic space.
- Exposure of the furcation.

For the present case, a fixed orthodontic appliance was fabricated for this patient, consisting of edgewise brackets bonded on to the adjacent teeth and labial button placed on the tooth to be extruded. As relatively high forces were anticipated when using such model for extrusion, anchorage from the adjacent teeth

including the canine teeth on either side was taken. This helped to evenly distribute the exerted force on the anchor teeth and minimized any untoward tooth movement. Orthodontic extrusion was the least invasive choice of treatment despite its requirement of a certain treatment time and a long retention period. Some clinicians prefer using rapid orthodontic extrusion for the treatment of traumatized teeth. However, rapid extrusion involves stretching of the periodontal fibers without any marked bone remodeling. Rapid tooth movement may cause a relapse before apical fiber reorganization. Thus, fibrotomy to the stretched supracrestal periodontal fibers has to be performed. On the other hand, it has been shown that new bone formation can be seen after 4–5 weeks of orthodontic extrusion.^[6,7] 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. After coronal movement of the periodontal attachment has occurred, minor surgical correction may be necessary.^[7,8] Moreover, when the tooth is moved to a new position, cervical periodontal fibers are stretched and may become a cause of relapse. Therefore it is advisable to perform fibrotomy of the supracrestal periodontal fibers to minimize the risk of relapse and to reduce the retention period.^[8] For the treatment of the present case, a slower extrusion rate was preferred together with a retention period of 2 months, and combined gingivectomy and fibrotomy was performed to prevent any possible relapse. However, longterm follow-up is needed to evaluate the stability of the case. In this case, before final restoration, a glass fiber post is placed into the tooth provides retention of a core to support coronal restoration especially with extensive tooth loss. This provides root strengthening to the remaining tooth structure. According to the findings of finite element analysis of stresses in endodontically treated teeth restored with posts, flexible glass post systems give the most benign stressing

condition as compared to carbon or steel posts. These adhesive systems transmit the stresses between the post and the root structure, reducing stress concentration and preventing fracture.^[9,10] For the treatment of the present case, a composite core was built up over the fiber post. The tooth was successfully restored with a full veneer crown constructed over the post core. The patient was examined two years after treatment. The stability of the crowns can be seen clinically and radiographically in Fig. 4. Thus, in this case, apart from achieving the goal of extrusion for crown ferrule and long-term restorative success, we have tried to achieve esthetics during the course of treatment also, so that the extrusion is not only in a biological way but also ensures a psychological comfort as the patient need not compromise on anterior esthetics.

CONCLUSION

Orthodontic Extrusion is a conservative approach that preserves the natural tooth and maintains the periodontal architecture. This simple technique requires a relatively easy movement and helps in subsequent restoration of the tooth and can be considered as a savior for both the natural tooth and its supporting tissues. A disadvantage of the approach is the long treatment duration compared to extraction and replacement. Careful evaluation of the case is of utmost importance to achieve the best possible results which includes planned utilization of the multidisciplinary approach. The treatment modality should be focused toward the treatment outcome in terms of function and esthetics. The goal of the treatment was achieved in this case namely preserving biological width, sterility of the root canal system, the ferrule effect and aesthetics..

CONFLICT OF INTEREST & SOURCE OF FUNDING

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