Research Article

JRAD Journal of Research and Advancement in Dentistry

J Res Adv Dent 2020;10:2:6-9.

A Case of Orthodontic Extrusion in Endodontics

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ABSTRACT

Background: The management of patients with traumatic injuries to their dentition is an integral part of general dental practice. Anterior teeth with fractures that extend subgingivally require a complex treatment plan that address biologic, esthetical and functional factors, such as mastication and speech. Treatment of crown fractures often require a multi-disciplinary approach. Orthodontic forced eruption may be a suitable approach without risking the esthetical appearance in tooth fracture below the gingival attachment or alveolar bone crest. Extrusion of such teeth allows elevating the fracture line above the epithelial attachment so the proper finishing margins can be prepared. Restoration after orthodontic eruption may present a more conservative treatment choice in young patients compared with the prosthetic restoration after extraction. Treatment of loss of crown structure due to fracture of tooth often requires a multidisciplinary approach. A combination of endodontic, periodontal, orthodontic and restorative procedures may be required.

Keywords: Endodontics, Orthodontics, Extrusion.

INTRODUCTION

Traumatic injuries to the teeth in the aesthetic region of the face pose a great challenge to the general as well as the restorative dentist. Dentoalveolar trauma accounts for 76% of cases seen among children with maxillofacial injuries[1]. In the context of dental injuries alone, the prevalence has been reported to be between 15% and 20% in the permanent dentition of children and adolescents.[2, 3] A large proportion of the dental injuries was due to accidental fall and sport-related activities,[4] or different types of dental injuries, the crown fracture which accounts for a third commonest type of injuries reported.[5,6,7,8]

Such treatment modalities involve a multi-disciplinary approach including endodontics, periodontal crown lengthening, and/or orthodontic extrusion followed by prosthetic rehabilitation.[9]

Different methods of orthodontic extrusion of fractured teeth have been reported in literature which basically includes two principal approaches namely: Using brackets and wires as part of fixed mechanotherapy and extending a rigid wire across the teeth neighbouring the fractured tooth and applying traction forces to the fractured tooth through this attachment.

Orthodontic extrusion is usually achieved with fixed appliances. During orthodontic treatment, 20-30 g force is required for extrusion.[10] The purpose of this paper was to review this multi-disciplinary treatment approach and to present a case of traumatized maxillary central and lateral incisors tooth with subgingival fracture and its management maintaining the healthy periodontal tissue and alveolar bone.

Received: Dec. 2, 2019**: Accepted**: Dec. 27, 2019
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pISSN 2278-0076
eISSN 2321-9270

CASE REPORT

A 20-year-old female patient was reported to AMC dental college, department of endodontics with fractured upper right central incisor following road accident. Clinical examination showed Ellis class IV fracture of upper right central incisor with the fracture line extending about 2mm from the gingival line. (figure A). IOPA-X ray showed no infections at the apical region.

TREATMENT PLANNING

All the possible treatment options were enumerated to the patient and patient's consent was taken. Treatment planning was decided to restore the tooth after the forced orthodontic extrusion of the fractured tooth with the help of a J shaped pin followed by crown restoration.

Root canal treatment :

Endodontic treatment was started under local anesthesia. Full working length was measured on an IOPA which was 15 mm(figure B). Root canal was prepared by the step back technique with the K files from #15 to 55. Irrigation was performed using a disposable syringe with NaOCl combined with normal saline after each instrument change. After preparation ,the cleaning of root canal was done using 17% EDTA to remove a smear layer followed by a final flush of 2.5% NaOCl. Obturation was done using lateral condensation technique.

Post and core build up:

After the completion of root canal treatment, Post space was prepared using peaso-reamer and 5 mm plug of gutta-percha at the apical third of the root was left . 18 gauge stainless steel orthodontic wire was taken and it was molded in to a J shaped pin which was used as a post and was a medium to apply force for the extrusion. Serrations were made over the J shaped pin for better adhesion (figure D). Then wire was luted into the canal by using luting Glass ionomer cement (GC fuji) (figure E) and core build up was done using composite resin, (IVOCLAR,Vivadent) (figure F). Patient was sent to the orthodontic department of AMC dental collage and hospital to get the desired fixed orthodontic force to get the extrusion. For that the orthodontic brackets were placed from 13 to 23 teeth and J shaped pin was attached to brackets by wire loops for extension as a part of mechanotherapy (figure G). Then rapid orthodontic extrusion was carried out by extending a rigid wire across the tooth neighbouring the fractured tooth and applying traction forces to the fractured tooth. Rapid orthodontic extrusion is carried out at higher forces for 3 months, hence longer retention period is required to stabilize the tooth for remodelling and adaption of the periodontium to the newly acquired tooth position. Here stabilization period was 12 weeks. The patient was kept on follow up and recalled at the interval of 2 weeks and 2 months subsequently (figure H). There were no sign and symptoms of pain or mobility found.

Gingivectomy and crown preparation:

After 3 months when the desired extrusion was achieved, Orthodontic brackets were removed and stabilization period of 12 weeks was given for bone remodelation and reorganisation of periodontal fibers to prevent relapse. Patient was symptomless during this follow up period. Composite core builtup (IVOCLAR,Vivadent) was done. Impression was taken by using rubber base impression material (Speedex, Coltene whaledent condensation type). Crown cementation (Porcelain Fused Metal crown) was done after 4 days (figure K).

A). Ellis class IV fracture of upper right central incisor, B).Working length IOPA, C). Master cone IOPA, D). Serrations were made over the J shaped pin for better adhesion, E). J shaped pin was luted into the canal by using luting Glass ionomer cement(GC fuji), F). Core build up was done using composite (IVOCLAR,Vivadent), G). Orthodontic brackets were placed from 13 to 23 teeth and J shaped pin was attached to brackets by wire loops for extension as a part of mechanotherapy, H,I). Follow up of patient on 2 weeks and 2 months, J).Gingivectomy was performed, K).Composite core build up and Final prosthesis given.

DISCUSSION

Forced orthodontic extrusion can be defined as a movement of vertical translation in a coronal direction obtained through the application of continuous light forces.[11] 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.

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 afterward, orthodontically extruded to elevate the fracture plane above the gingival margin. These procedures enable more favourable prosthodontic coronal restoration by securing its good sealing and aesthetics, and moreover, preserving a good periodontal tissue health.

Simon et al, indicated that the orthodontic extrusion should become a routine procedure in dentistry[12]. They also stressed that the orthodontically extruded tooth must be stabilized for 8-12 weeks prior to fabrication of a permanent post and core. Here in this case, we have also found that 12 weeks of stabilization of orthodontically extruded teeth has better prognosis.

Ulusoy *et al* and Fidel *et al* described a technique for extrusion using bonded brackets on the adjacent teeth.[14] Here also we employed the same technique to achieve orthodontic extrusion. Forces of 15 g for the root of incisors and 60 g for molars are sufficient for slow extrusion. Some authors recommend that the maximum force for a slow movement should not exceed 30 g.[7,8.] Where as rapid extrusions are accomplished with forces higher than 50 g.[10] Korayem et al. recommended forces of 15 and 50 N for the anterior and posterior teeth, respectively, and a slow and steady extrusion rate of ≤ 2.0 mm/month.[13] During this case we achieved about 3mm extrusion within 3 months. Rapid orthodontic extrusion is carried out at higher forces; hence longer retention period is required to stabilize the tooth for remodeling and adaptation of the periodontium to the newly acquired tooth position. However, with bonded brackets, reciprocal forces of intrusion might act on the adjacent teeth.

CONCLUSION

Fracture of tooth structure at or below the gingival margin compromises rehabilitation and hampers esthetics and function. Management of such cases by orthodontic extrusion with post-core and crown restoration brings success in such cases. This case report provides highly conservative and multidisciplinary approach, which focuses on functions, health of periodontal tissue, and aesthetics. Which is the key of success and brings favourable results. The use of this technique for extrusion may help the general dentist to have a better esthetic result and better patient appreciation.

CONFLICTS OF INTEREST

The authors declare they have no potential conflict of interests regarding this article.

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