

Management of Sub-Gingival Fractured Teeth by Multi-Disciplinary Approach: Endodontics – Forced Orthodontic Extrusion and Prosthetic Rehabilitation: A Case Report

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ABSTRACT

Introduction: At times, traditional periodontal surgery (crown lengthening) cannot be performed on the tooth as it may compromise the functional root length and esthetics. Controlled orthodontic extrusion can be considered as the most desirable method for lengthening of the clinical crown which can provide desirable results with good prognosis and low risk of relapse.

Case Report: This case report describes in detail the chosen treatment for management of subgingival fracture and the final result was successful and showed good esthetics and secured periodontal health.

Conclusion: From the case represented here a multidisciplinary approach is necessary for the restoration of tooth fractured at subgingival level and forced orthodontic extrusion as an alternative to periodontal surgery resulted in good esthetics and function post-operatively.

Keywords: Sub-gingival fracture, Orthodontic Extrusion, Implant, Cast-Gold Post, Zirconium crown.

INTRODUCTION

Traumatic injuries to the teeth most probably in esthetic region constitute a great challenge to a dentist to be able to restore the tooth to proper health and function.¹ The majority of dental injuries involve the anterior teeth, especially the maxillary central incisors. Such dental trauma often lead to tooth fracture, at times when the fracture is below the level of gingiva, the prognosis of such fractured tooth is considered questionable or hopeless.

Nowadays, with the recent trend the common treatment modality remains dental implants with extraction of the tooth. Also, it has been said that replacing the maxillary central incisor remains the most challenging procedure in implant dentistry. As it depends on several factors for its success which include the amount of available bone, the type of soft tissue, correct positioning of the implant, the provisional restoration, the design and material of the implant abutment, and the final restoration.² Thus, orthodontic extrusion can be considered as a feasible treatment approach which can result in significant gains in both alveolar bone and soft tissue. Thus, 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 orthodontic extrusion followed by prosthetic rehabilitation. This case report discusses multi-disciplinary treatment approach of traumatized incisors with sub-gingival fracture.

CASE REPORT

A 48 year old male patient was reported to the Department

of Conservative dentistry and Endodontics, with a chief complaint of fractured anterior teeth. Clinical examination showed horizontal coronal fracture with #11, #21 and #22. It was seen that teeth presented an extensive sub-gingival fracture making the prosthetic rehabilitation difficult. Around 0.5mm of the buccal tooth structure was visible without any mobility [Fig.1A]. Radiographic examination revealed fully formed apices without any periapical lesion or any sign of additional root fracture [Fig. 1B]. Patient had been advised forextraction or a multi-disciplinary treatment, and thankfully patient opted for multi-disciplinary approach.

With patients consent, periodontal crown lengthening was carried out on the same appointment to expose sufficient amount of crown structure [Fig 1C]. After periodontal crown lengthening insufficient amount of coronal structure was seen to support the restoration [Fig. 2A]. The root canal therapy was carried out immediately after 1 week with #11,#21,#22 and the root canal treatment was completed subsequently. After the tooth was asymptomatic for a week, post-space preparation was made with #11, #21, #22 upto peeso-reamer #3 and orthodontic root extrusion was carried out [Fig.2B].

Orthodontic extrusion was carried out by using modified removable appliance having posterior bite plane and labial bow with 3 'J' hooks [Fig.3A]. A 19 gauge 'J' hook was prepared and partially inserted in canals and bonded with light cure composite in the prepared post-space with #11, #21 and # 22 [Fig.3B]. The appliance was worn daily and the patient was called for activation of the appliance after every 15 days. The activation was made between 'J' hook labial bow and 'J' hook individual tooth by using elastic modules. The extrusive force was optimum for individual tooth and it was light and intermittent force. The elastic module was changed after every 15 days. After 5 months of follow up, 3-4 mm of extrusion was seen in every tooth [Fig. 3C]. The orthodontic extrusion was completed and removable appli-

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How to cite this article: Dayanand Chole, Neha Megeri, Vivek Chitte, Prashant Kore. Management of sub-gingival fractured teeth by multi-disciplinary approach: endodontics – forced orthodontic extrusion and prosthetic rehabilitation: a case report. International Journal of Contemporary Medical Research 2016;3(4):1198-1200.



Figure-1: (A) Extensive sub –gingival fracture with #11, #21 and #22; (B) Radiographic Examination with #11, #21 and #22. (C) Periodontal crown lengthening was carried out to expose crown structure

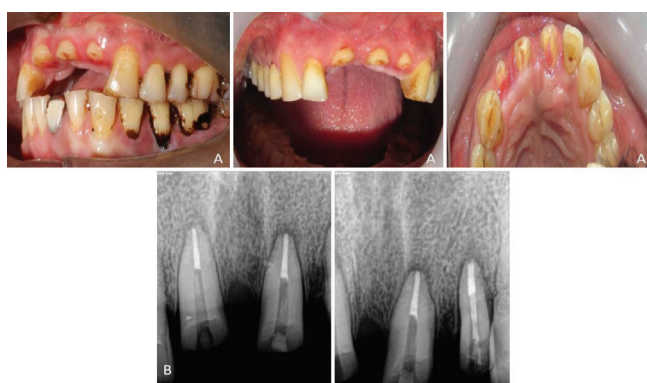


Figure-2: (A) Insufficient amount of coronal structure seen to support restoration; (B) Root canal treatment was completed and post – space preparation was done with #11, #21 and # 22

ance was removed and post-treatment records were taken. On the same appointment, fixed retainer was bonded with #12, #11, # 21, # 22 and # 23 for another two months and patient was referred back to the department of endodontics for further treatment.

As there was insufficient dentin to support a restoration, a post-core was prepared to provide retention and support. The cast gold post and core was made with #11, #21 and #22 [Fig4.A, B]. Temporary crown cementation was done with #11, #21 and #22. Periodontal probing was done 1 month after orthodontic root extrusion and observed the maintenance of the periodontal health of the tissues and their adjacent sites with regard to plaque accumulation, bleeding on probing and probing depth. After 1 month, a full coverage Zirconium crown was given with #11, #21 and #22 [Fig:4C]. Patient was reviewed after 1 month, and the treatment outcome was stable and symptomless.

DISCUSSION

In general practice, dentist often encounter teeth that have lost part or all of their clinical crown due to extensive caries or crown fracture that make restoration difficult. One of such etiologic factor is sub-gingival fractures due to traumatic injuries. The major problem with subgingival fracture is absence of adequate coronal ferrule and a compromised biological width.¹



Figure-3: (A) Modified Removable appliance having posterior bite plane and labial bow with 3 'J' hooks; (B) 19 gauge 'J' hook was prepared and partially inserted in canals and bonded with light cure composite in the prepared post-space with #11, #21 and # 22; (C) After 5 months of follow up, 3-4 mm of extrusion was seen in every tooth.



Figure-4: (A) Cast Gold Post cementation done with #11, # 21 and #22; (B) Radiographic image of post cementation with #11, #21 and #22; (C) After 1 month, temporary crown was removed and Zirconium crown was cemented with Resin cement

Ingber suggested that a minimum distance of 3mm is required from the restorative margin to the alveolar crest to permit adequate healing and restoration of the tooth.⁶ Since, maintaining the biologic width is of paramount importance for preservation of periodontal health as placing restorative margins within the biologic width often leads to gingival inflammation, clinical attachment loss and bone loss. Hence, it is very important to preserve health of periodontium during restoration in subgingival areas.⁶ Usually periodontal surgery (crown lengthening) cannot be performed on the tooth in question because of potential compromise to adjacent teeth and long term prognosis to justify treatment. In such cases, orthodontic extrusion can be one of the minimally invasive treatment options.

Heithersay and Ingber were the 1st to suggest the use of forced eruption to treat non-restorable or previously hopeless teeth. Orthodontic extrusion has also been referred as “slow eruption of teeth” which stipulate that by utilizing light eruptive forces, the entire attachment apparatus can be shifted coronally in unison with the tooth.⁷ The main advantage of orthodontic extrusion is that the root can be kept within the alveolus, thus the bone height is maintained without compromising the periodontal support, also it re-establishes bi-

ologic width without affecting the esthetics. Besides several advantages, rapid orthodontic extrusion is accompanied with several problems as higher forces exerted frequently precede to pulpal necrosis, root resorption, ankylosis, mobility and failure of treatment. Various extrusion techniques are available, depending on the clinical conditions encountered. Fixed and removable orthodontic appliances are usually used for extrusion. As in the present case, dental tissue was inadequate for bonding bracket; traction was applied from attachment inserted in to the prepared canal of the tooth after endodontic therapy. The removable appliance was used in this case which was made up of Hawley's retainer with posterior bite plane, Modified labial bow with soldered 'J'hook where extrusion is required and Adam's clasp for molars for better retention. The force was generated by 2 main passive components 'J'hook placed in the canal and labial bow while elastic modules acted as an active component. While the force generated by the appliance was light, intermittent force and it was slightly tipping at the labial aspect. The removable appliance was used in the present case as it is easy to fabricate, it has patient compliance, bite opening can be done easily and simultaneously extrusion can also be carried out. Also, prior to final restoration, it is essential to retain the root in its new position to prevent relapse.⁹ Studies have suggested circumferential supracrestal fibrotomy after orthodontic extrusion.^{10,11} In the present case, different technique was used for slow orthodontic extrusion and follow up of patient showed good periodontal health and stable result.

After orthodontic extrusion, there was insufficient dentin to support the restoration so post and core was prepared to provide retention and support. The cast gold post and core was done in the present case because of its superior adaptation to the root canal, long-term prognosis and high strength in comparison to the prefabricated post.

Although orthodontic extrusion requires a prolonged treatment time, this treatment is preferred over crown lengthening as orthodontic extrusive forces allow the biological way of erupting the tooth, with no removal of alveolar bone and better final esthetics.¹¹ While crown lengthening removes alveolar bone and may become the reason for pocket formation and also compromises the esthetics.¹²

CONCLUSION

This clinical case report outlines the method of implementation of forced orthodontic eruption as an alternative to periodontal surgery and a multidisciplinary approach is mandatory for the restoration of tooth fractured at subgingival level. In the present case, placement of the final restoration after orthodontic extrusion resulted in good esthetics and function post-operatively.

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Source of Support: Nil; **Conflict of Interest:** None

Submitted: 04-03-2016; **Published online:** 04-04-2016