

Esthetic and Functional Rehabilitation of Fractured Anterior Tooth through Multidisciplinary Approach: Two Case Reports

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ABSTRACT

Background: Traumatized anterior teeth with sub-gingival crown fractures are a challenge to treat. The management of sub-gingival fractures includes exposing the cervical margin followed by appropriate coronal restoration. The treatment modalities, which involve exposing the cervical margin, are surgical crown lengthening and orthodontic extrusion. Presented here are cases of two fractured central incisors with significant coronal structure loss utilizing interdisciplinary approach of endodontic treatment, surgical crown lengthening, orthodontic extrusion and post and core followed by crown.

Keywords: Fractured maxillary central incisor, surgical crown lengthening, orthodontic extrusion, post and core.

INTRODUCTION

Traumatic injuries to the teeth especially in the esthetic zone pose a challenge to the treating dentist to be able to restore the tooth to proper health and function. At times, when the fracture line is below the level of gingiva, the prognosis of such fractured tooth is considered questionable or hopeless. 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. 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 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.[1-6].

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. Presented here are two case reports with Ellis class 3 fracture with significant coronal tooth structure loss, rehabilitated with Interdisciplinary approach which includes Endodontic treatment, Orthodontic extrusion, surgical crown lengthening followed by post- core and Crown.

CASE 1

A female patient 22yrs presented with Ellis class 3 fracture of maxillary right central incisor following fall from stairs. Clinical evaluation (fig 1a) of the

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case revealed significant loss of tooth structure with subgingival tooth structure loss on palatal aspect of crown (fig1b). Since the patient was female and about to get married an immediate esthetic outcome was planned. Single visit root canal treatment was planned and patient was scheduled for surgical crown lengthening to get adequate tooth structure for placing post and core and crown.

Fig 1c shows adequate coronal structure following crown lengthening procedure which will help in providing adequate ferrule for crown.

Fig 1d shows trail fit of fiber post following post space preparation.

Fig 1e and 1f shows full coverage all ceramic crown.

CASE 2

A male patient 36yrs presented with fractured maxillary right central incisor due to road traffic accident. Careful evaluation of the case revealed remaining coronal structure of approximately 2mm, thick labial frenum leading to midline diastema and proclination of anteriors.

Keeping the above factors in consideration a careful interdisciplinary treatment plan was planned, which included endodontic treatment orthodontic extrusion, periodontic therapy (gingivectomy) and



prosthodontic rehabilitation of the diseased tooth utilising post and core and metal ceramic crown). The treatment planned was explained and proper informed consent was taken from the patient.

In the initial phase of the treatment Endodontic treatment was carried out.

Following endodontic treatment a planned slow orthodontic extrusion was carried out which included extrusion of approximately 2mm which took approximately 6 months time.

Advantages of orthodontic extrusion

- Conservative
- Allows retention of tooth without need of fixed bridge
- Avoids mutilation of adjacent teeth
- No loss of bone or periodontal support as seen in surgical crown lengthening
- More favourable crown-root ratio
- Simple and relatively easier movement

Following orthodontic extrusion, Frenectomy was carried out which was the main reason behind midline diastema and simultaneously crown lengthening procedure was carried out in order to maintain proper gingival zenith in esthetic zone. After complete healing following periodontal

therapy phase custom cast post and core was done to get adequate support for the crown.

PFM crown was fabricated. Patient was scheduled for Orthodontic treatment for correction of proclined anteriors and also for closure of midline diastema.

DISCUSSION

Loss of the coronal part of a permanent incisor in a young patient can cause aesthetic and functional problems, which in turn can lead to severe emotional problems. Various treatment modalities must be considered. Extraction must not be the first treatment choice for fractured and extremely broken down, young, permanent teeth in the anterior region.

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.[7]

Extrusion is easiest of all orthodontic movements because it closely resembles natural tooth eruption.[8] The treatment time for the orthodontic extrusion is a drawback to such a conservative multidisciplinary treatment, and the image-conscious patient may not want to wait for a definitive aesthetic restoration following orthodontic treatment. If cooperation with the patient is not well established, similar cases may be restored in a more invasive manner, such as by removing the remaining segments and subsequent provision of fixed partial dentures. [9]

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.[1]

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]

Various splints and appliances have been proposed for orthodontic-forced eruption. [12,13] The major limitation of this treatment is the longer duration and may impair good esthetic results as the cervical diameter of the extruded tooth is less than the adjacent tooth. The mesio-distal diameter of the root is reduced with progression of the extrusion (especially in the case of anterior teeth with conical roots), which causes expansion of interproximal gingival embrasures. The contour of the crowns must not be exaggerated to compensate for this reduction in diameter, which could adversely affect the marginal periodontium.[14]

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 orthodontic extrusion and or crown lengthening procedure

Orthodontic extrusion/forced eruption and soft tissue management

There are 2 types of orthodontic extrusion:

1. Low intensity extrusion of less than 30 g of force
2. High intensity (rapid) extrusion with forces exerted greater than 50 gm.

Low intensity orthodontic extrusion, using less than 30 g of force, can produce approximately 1.0 mm of extrusion per week. It stimulates the marginal positioning of the crestal bone and allows the gingiva to follow it. Whereas a rapid extrusion will increase the tooth length, leaving its attachment apparatus behind, which is not desired in cases with subgingival fracture of tooth. Following orthodontic extrusion, surgical crown lengthening procedure was carried out to maintain gingival zenith comparable to adjacent central incisor. Post and core provided enough coronal support to the crown.

CONCLUSION

Within the limitation of this clinical case report it can be concluded that for achieving satisfactory clinical outcome in anterior esthetic zone a multidisciplinary approach is needed which includes Endodontic treatment, orthodontic extrusion of crown and or surgical crown lengthening followed by post & core and crown.

CONFLICTS OF INTEREST

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

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