

Case report:

Management of Sub-gingival Fracture of Tooth by Multi-disciplinary Approach

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Abstract

Dental trauma is commonly occur in children and may involve adult person also. In permanent dentition crown fracture is common and it may be uncomplicated or complicated. Complicated crown-root fractures require a multidisciplinary treatment modality for long-term success. Here we presented multidisciplinary treatment of a traumatized permanent maxillary incisor of a young male patient where oblique tooth fracture involved coronal pulp. As more than 50% of the crown and palatal coronal part of the root had been fractured and the tooth could not be properly isolated during endodontic procedure which is essential for success of root canal treatment. An intra-canal wire hook was cemented in the root canal and attached to another wire fixed to the adjacent teeth. With the help of elastic band attached with hook the fractured tooth fragment was extruded to create clinical crown. Finally, gingival re-contouring was performed to establish optimum biological width. At last, porcelain fused to metal crown was placed and the patient was comfortable both esthetically and functionally.

Keywords: Crown-root fracture, orthodontic extrusion, biological width.

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Introduction

Accidental injury to tooth especially in the esthetic region poses a great challenge to a dentist in respect to maintain proper health and function. When this accidental trauma causes tooth fracture sub-gingivally, prognosis is considered questionable. As nothing can replace the natural but the natural, every attempt should be made to conserve patient's own tooth part if possible. Although there is recent trend and attitude towards dental implant after extraction that type of tooth. This option can be considered as last one. Treatment modality of this type of sub-gingivally fractured tooth should

involve multi-disciplinary approach including endodontic, periodontal crown lengthening and/or orthodontic extrusion followed by prosthetic rehabilitation. The main problem with sub-gingival fracture is loss of adequate ferrule and a compromised biological width. This condition usually complicates the application of the successful isolation during endodontic treatment. Periodontal crown lengthening involves the removal of supporting crestal alveolar bone while orthodontic intervention forcibly extrudes the tooth. By both attempts sufficient coronal tooth structure can be achieved for proper prosthetic

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restoration. Periodontal crown lengthening may expose excess of root will eventually compromise esthetic results. This condition can be achieved by the use of orthodontic extrusion.¹⁻⁶

As orthodontic tooth extrusion have the advantages of securing the periodontal tissue rather than surgical excision, favorable crown-root ratio and cost affectivity, this process is accompanied with some problems like higher force exerted on tooth may lead to pulpal necrosis and root resorption. However, pulpal death is not a concern for endodontically treated tooth and studies have indicated that root resorption after extrusion is rare.⁷ The main objective of ortho extrusion is to get a sound tissue margin for ultimate prosthetic restoration as well as to create biologic width that will be easy for the patient to maintain. To achieve the above mentioned condition orthodontic extrusion is considered as a choice of treatment.

Case report

A 35-years-old male patient was referred to the dept. of Conservative Dentistry & Endodontics, BSMMU with fractured tooth no. 21 following road traffic accident 2 weeks back. Clinical examination showed oblique crown to root fracture which was complicated one and the root canal was exposed previously.(Fig.-1)



Figure 1(a,b):a. Oblique crown to root fracture on tooth no. 21,b.Initial radiograph shows the involvement of pulp chamber.

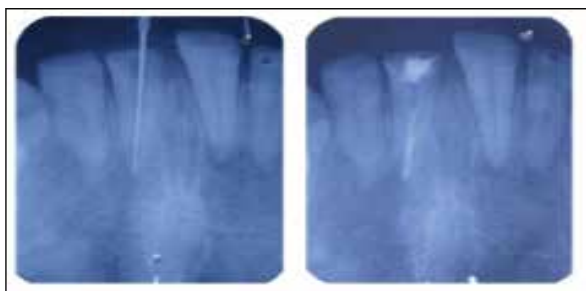


Figure 2(a,b): a. Working length measuring x-ray, b. Root canal obturation and creation of space for metallic hook application.



Figure 3(a,b,c):a. Application of 0.7mm metal wire by twisting into the intra canal space,b. Elastic band is attached between the wire and the horizontal wire adhered to the two adjacent tooth.

On clinical examination, fracture line was 1mm below the gingiva on the palatal side and 2mm of buccal tooth structure was sound{Figure 1(a)}. Radiographic examination speaks for a matured root apex having no peri apical lesion, root resorption or root fracture and 18 mm of patent tooth length was evident.{Fig. (2a,b)}

Two options of treatment was given - extraction or orthodontic extrusion. The patient choose the later one. Multi-visit endodontic therapy was performed. After for a week of root canal obturation, orthodontic extrusion was applied by using hook made by a round 0.7mm SS orthodontic wire within created space in root canal by glass ionomer cement (Fuji II)and another wire was bonded to the adjacent teeth(tooth no. 11,12,22,23) {Fig.3(a,b,c)}. Considering the depth of entire fracture line, 3-4mm extrusion was expected. So, the gap between the hook and the horizontal wire was adjusted so that the estimated extrusion can get. An elastic band tied with the hook and the horizontal wire and was checked at every 3rd day. After 6 weeks, extrusion of 3.5 mm of crown was achieved where about 1mm tooth margin was visible. {Figure:4(a,b)}. Tooth extrusion at that point was considered adequate{Figure:5(a,b)}. The extruded tooth was then stabilized by functional splinting for a period of 6 weeks{Fig. 4(c)}.

After stabilizing period, splint was removed and gingival re-contouring of tooth no. 21 was done palatally {Figure: 5(c), 6(a)}. Coronal core build-up was done using metallic wire as post and composite resin (Spectrum, Densply; Germany) and full-coverage porcelain fused metal was given {Figure 6 (b,c,d,e)}. Patient was under observation for a year and the he was asymptomatic and satisfied.

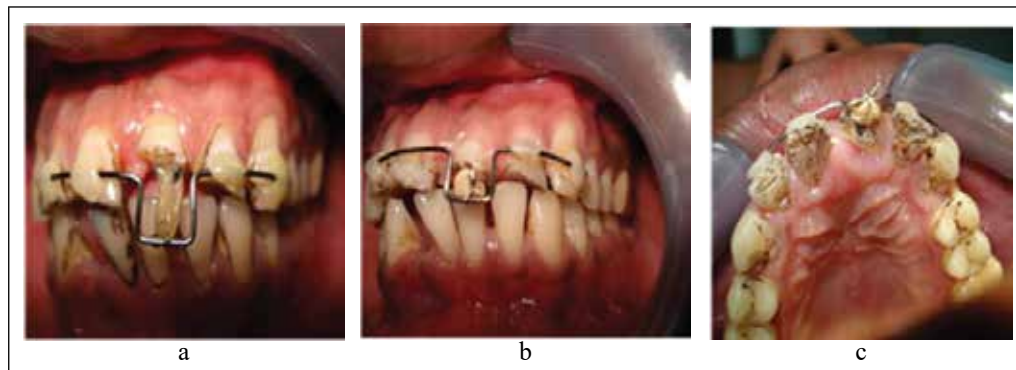


Figure: 4 (a,b,c) a. Initial view of fractured tooth indicating the tooth structure loss and occlusion showing the gap between two opposing teeth; b. tooth extruded down and occlusion indicate that the gap is reduced, c. Stabilization phase

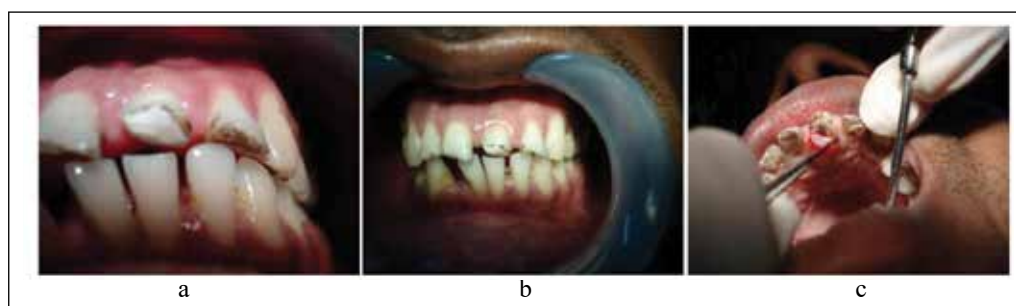


Figure 5 (a,b,c): a&b. after extrusion, c. Gingival contouring palatally

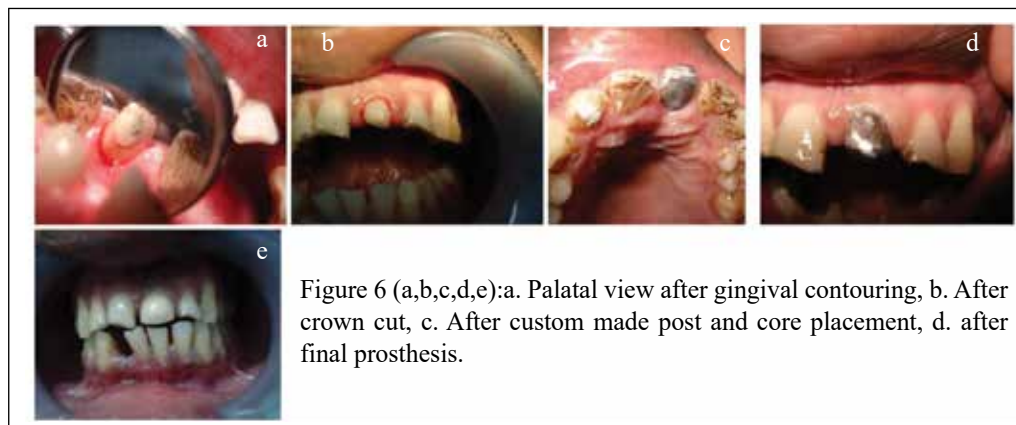


Figure 6 (a,b,c,d,e):a. Palatal view after gingival contouring, b. After crown cut, c. After custom made post and core placement, d. after final prosthesis.

Discussion

Tooth can be extruded by tractional forces create by elastic to the periodontal fiber of tooth fragment. Alveolus is attached to the root by the periodontal ligament and pulled along by the extrusion of the root.⁸ In case of sub-gingival tooth fracture endodontic treatment is indicated only when the tooth length can support a coronal restoration. If root length allows 1:1 crown- root ratio existed tooth fragment should be extruded orthodontically to expose the clinical crown above the gingival margin. These procedures preserving optimum periodontal tissue health and esthetics.⁹ There are many splints suggested using for orthodontic-

forced extrusion.

15g of extrusive force for incisor and 60g for a molar are required for successful tooth extrusion. Some author's recommended that forces for rapid extrusion work at forces higher than 50g.¹⁰ After rapid extrusive movement, a radiolucent area may be evident which may confuse with periapical pathosis and that must be confirmed either it is true lesion of endodontic origin or not. In case of traumatic tooth fracture the adjacent teeth also been suffered from injury, so anchorage can get from 2-3 healthy teeth.¹¹ In this case, we also take anchorage from adjacent sound 5 teeth. As high forces are applied within short time, there

is an issue for long time retention to stabilize the tooth in extruded position. During this period, periodontal tissue became re-oriented at the acquired position. In this case we also stabilized the new achieved position with splinting for 6 weeks.

With the rapid extrusive force the process of keratinization of attached gingiva requires 28-42 days.⁷

The major drawbacks of this treatment is time and patient's looking resulting from traction appliance and less mesio-distal diameter of extruded root than the adjacent tooth.¹²

In this present case, fracture line was below the gingival level at palatal side. Thus, there was lack of tooth structure available for adequate biologic width for prosthetic restoration. This situation left two options in front of the patient-either extraction followed by implant or orthodontic extrusion with prosthetic rehabilitation. The advantages and disadvantages of both treatment strategies were discussed in front of patient. The option of implant was totally rejected due to its expense and psychological stress of extraction. Then the patient agreed of extrusion followed by prosthetic correction as it was devoid of surgery and cost-effective.

Science the patient was a garment worker he was only concerned with the restoration of the injured tooth but not for further correction of the spacing.

So, we concentrated to restoring that tooth only.

A customized hook prepared by 7m.m s.s wire was luted in the root canal system of the fractured tooth and elastic traction acquired by another horizontal wire attached by composite restoration on adjacent five teeth i.e. canine tooth at left side to lateral incisor of right side. This helped equal distribution of the force to all the anchored teeth.

Conclusions

Orthodontic extrusion is a conservative approach of retaining natural tooth fragment. This procedure does not cause loss of bone and periodontal tissue which is common in extraction and surgical crown lengthening. So, the orthodontic extrusion seems simple technique which allows conservation of natural tooth and supporting tissue.

Conflict of Interest

No Conflict of interest has been disclosed by the authors.

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Authors Contributions

Conception and design: AK,SSC

Analysis and interpretation of data: SSC

Critical revision of the article for important

Intellectual content: AK,SSC,RA

Final approval of article: Ak, SSC

Collection and assembly of data: MMAR,SMAQ

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