International Journal Dental and Medical Sciences Research (IJDMSR)
ISSN: 2393-073X Volume 2, Issue 4 (Apr- 2018), PP 16-21
www.ijdmsr.com

Restoration of a Complicated Crown- Root Fracture of Endodotically Treated Anterior Tooth with Forced Orthodontic Extrusion: A Case Report.

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ABSTRACT:- In case of a subgingival crown-root fracture, a clinician faces the challenge of complex treatment plan due to difficulty in preserving the periodontal health of the tooth and hence often extracted. Replacement with implants, fixed and removable prosthesis can be a hindrance with respect to cost, in addition the sound abutment teeth can be effected in case of removable and fixed prosthesis. In accordance to statement by Muller De Van(1952) that "the preservation of that which remains is of utmost importance and not the meticulous replacement of that which has been lost" . This case report describes the restoration of a complicated crown- root fracture of an endodotically treated anterior tooth with forced orthodontic extrusion.

KEY WORDS:- Crown-Root Fracture, Management, orthodontic extrusion, post and core

I. INTRODUCTION

About 5% of injuries involving the permanent dentition are crown-root fractures and direct trauma to the anterior teeth is the most common cause.[1] Owing to the anterior and labial relationship with the mandibular incisors, the maxillary anterior teeth are often affected.[2] These fractures involving enamel, dentin and cementum with or without pulpal involvement.[1] An exhaustive treatment approach is required involving several specialties such as endodontics, periodontics, surgery, orthodontics and prosthodontics.[3]

The line of action involves (i) Emergency treatment (ii) Non emergency treatment. In emergency treatment protocol, the mobile segment can be temporarily stabilized till a more definitive treatment. Non emergency treatment alternatives include removal of coronal fragment with subsequent Root canal treatment and restoration with a post retained crown followed by gingivectomy and occasionally by ostesctomy with osteoplasty. In situations where the fracture line is deeper and the remaining apical fragment is long enough to support a post retained crown, extrusion can be attempted.[4]

Extrusion could be done surgically and/ or orthodontically. Surgical extrusion necessitates surgical repositioning of the apical fragment in a more coronal position.[4] Surgical extrusion has the benefit of being more quick and comparatively easy procedure, in contrast orthodontic extrusion has the benefit of being more conservative, providing biological stability and advantage of the ginigival papilla encircling the tooth.[5]
Various approaches have been described in the literature for orthodontic extrusion of fractured teeth:-

(i) Fixed mechanotherapy using brackets and wires.
(ii) Rigid wire is extended across the adjacent teeth and traction forces are exerted through this attachment.[6]

The purpose of this paper was to present a case of a subgingivally fractured tooth using a multidisciplinary approach while maintaining periodontal and bone health.

II. CASE REPORT

A 32 year old male patient reported to the department of conservative dentistry and endodontics, Government Dental College and Research Institute, Bengaluru with the complaint of mobile left maxillary central incisor. He had reportedly had a fall 48 hrs prior to reporting to the hospital. Past dental history revealed that the tooth was root canal treated 10 years back and was asymptomatic. Intra oral examination revealed that the maxillary left central incisor was discoloured and had an oblique crown root fracture. The fracture line

extended subgingivally on the buccal surface and supra gingival on lingual surface. “fig.1 and 2”. The adjacent teeth exhibited no sign of mobility and electric pulp response gave positive recordings. An oblique crown root fracture was seen on periapical radiographs taken from different angles. It also revealed a well obturated root canal.”fig.3”. The treatment plan was explained to the patient. With the patient’s consent, treatment was initiated.

Figure 1 and 2: Clinical photograph showing the discolored central incisor and the fracture line on the palatal surface

Figure 2: Diagnostic radiographs showing the fracture line.

An orthodontic wire, 0.7 mm in diameter, hooked at one end, was cemented into the canal of the tooth that was to undergo extrusion. Adjacent teeth were etched and an orthodontic wire was bonded with composite on the buccal aspect of adjacent teeth. An elastic (grey module) connected the hook to the rigid anchor wire to activate the mechanism .The elastic was changed every 2 weeks. Forces were applied according to the position of the long axis of the tooth that was to undergo extrusion to prevent buccal or lingual tipping.

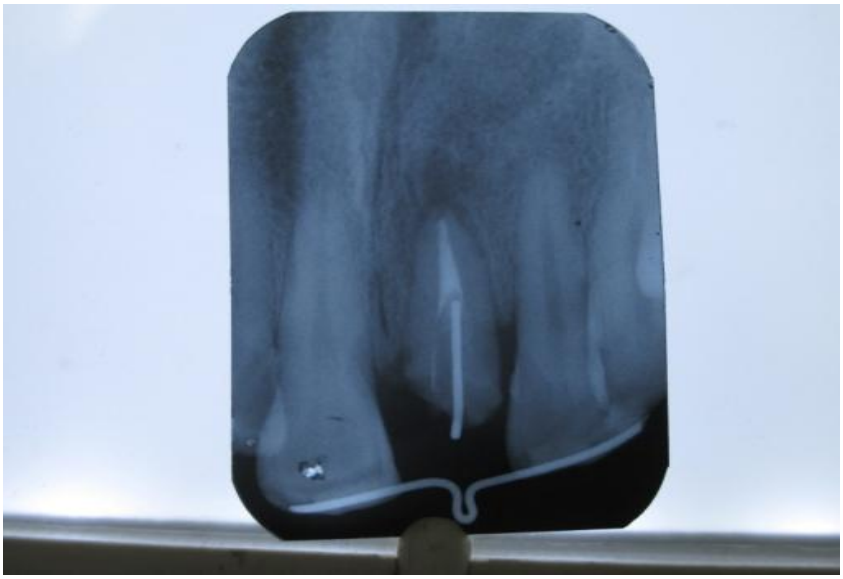

Figure 4: Radiographic photograph of #21 showing simple appliance for rapid orthodontic extrusion

Figure 5: Clinical photograph of #21 showing simple appliance for rapid orthodontic extrusion

Figure 6: Clinical photograph of #21 showing simple appliance with the elastics in place.

Extrusion was completed in approximately 16 weeks. A stabilization period of 4 weeks was given. Gingivectomy was done, the tooth was restored with a light transmiting fibre post-core system cemented with dual cure resin cement, the core build up was done with composite resin and a metal –ceramic crown was then placed.

Figure 7: Coronal core build-up with composite restoration.

Figure 8: Post-operative photograph showing the fractured tooth with full coverage of porcelain fused to metal crown

A Follow-up was conducted for 6 months after the treatment. Clinical and radiographic examination showed healthy tissues and teeth, and no evidence of apical periodontitis was seen. The tooth presented satisfactory functional and aesthetic outcome.

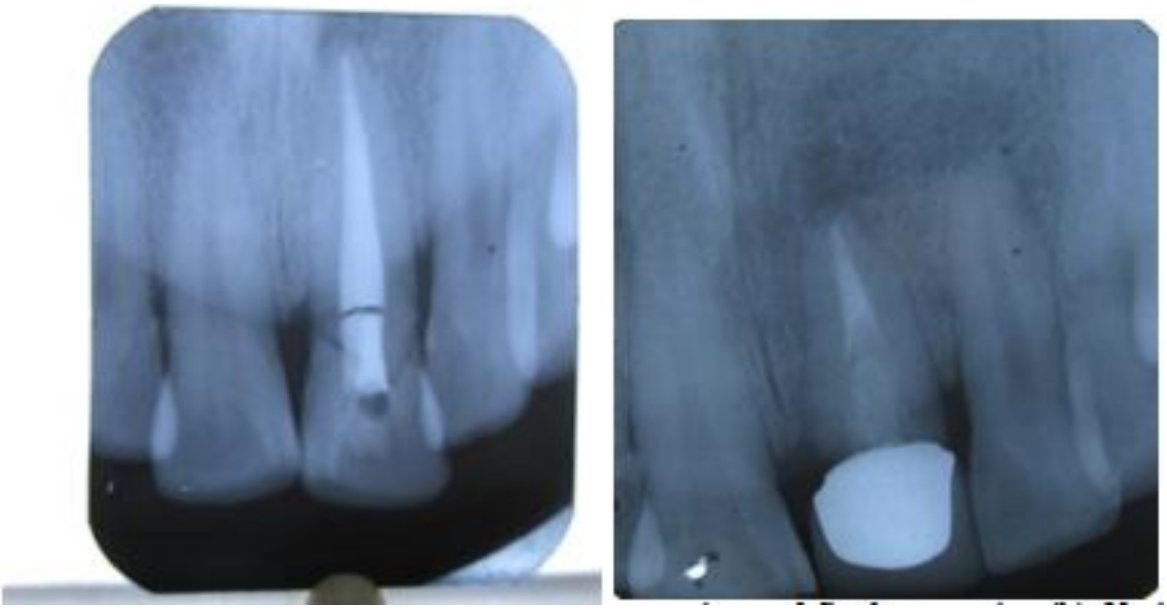

Figure 9: Radiograph showing tooth #21 before (a) and after extrusion and final restoration (b). Notice the amount of the distance of the extrusion

III. DISCUSSION

Adequate tooth structure is vital to give a ferrule over sound dentine for prosthetic crown. The functional force on the post-core root complex is nullified by the ferrule. This is the main cause for performing forced eruption by orthodontics.[7] Simon claimed that the amount of force used and how rapidly the root is extruded determines the occlusal movement of the root fragment along with its gingival. Surgical contouring may be needed prior to preparation of the tooth for prosthesis, if the gingival tissue moves with the tooth fragment.[8] In case of rapid extrusion of the root, stretching and readjusting of the periodontal fibres happens whereas rapid movement does not give bone adequate time to remodel. Therefore coronal shift of the marginal bone doesn't happen, facilitating prosthetic restoration without the need to reshape the bone.[9] According to others, sulcular incision given at the beginning of the stabilization period or at each appointment during the extrusion process is necessary to prevent soft tissue and bone movement. [10,11] Violating the biological width by placing the restorative margins in close proximity to the alveolar crest leads to gingival inflammation, clinical attachment and bone loss. Therefore it becomes imperative to preserve the health of periodontium during the placement of the prosthetic margins in the subgingival areas. As advocated by Ingber et al, for a restoration to be biologically acceptable and to permit adequate healing, the distance between the restorative margins and the alveolar crest should be a minimum of 3mm.[12] In the present case, the fracture line on the buccal side was subgingival. Therefore, it did not provide adequate coronal tooth structure and sufficient biological width for a successful coronal restoration. In the given case we were left with the possibility of extraction followed by fixed partial denture, implant or preserving the root fragment followed by rehabilitation. The patient was explained about the options . The patient declined the options of fixed partial denture and implants because of the cost factor and the psychological factor of undergoing a surgical procedure for implants and trimming of two unaffected teeth for fixed partial denture. The patient consented for the option of extrusion of the remaining fragment and replacement with a single unit crown.

IV. CONCLUSION

A tooth fractured at a subgingival level needs a multidisciplinary approach to restore it because the margins need to be supragingival. In comparison to extraction and prosthetic replacement, extrusion of a fractured tooth has several advantages. This approach is conservative and preserves the natural tooth and maintains the periodontal health. On the flip side, long treatment duration is a disadvantage. We have successfully used the above described technique in the patient and have got satisfactory results.

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