CASE REPORT

Multidisciplinary management of subgingivally fractured maxillary incisor: A case report

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Abstract:
The sequelae of a fractured anterior tooth may have a huge impact on aesthetics and function. A case of a 27-year-old male patient presented clinically with extensively fractured upper right central incisor that extended subgingivally on the palatal side. Non-responding lower right central incisor to thermal tests was observed. Periapical radiographs showed periapical radiolucencies around the roots of the afore-mentioned teeth. The fractured tooth was managed by surgical crown lengthening, endodontic and prosthetic procedures. A conventional root canal treatment was conducted on the lower right central incisor. The reported case highlights the importance of thorough examination, proper diagnosis and the multidisciplinary approach in managing dental trauma cases.

Key words: Crown-root fracture, multidisciplinary approach, traumatic dental injuries, subgingival fracture.

Introduction:
Traumatic dental injuries are prevalent in primary as well as in permanent dentition with the maxillary anterior teeth being the most commonly affected area.[1] Crown-root fractures account for 5% of all dental injuries affecting the permanent teeth. These injuries involve enamel, dent in and cementum, with or without pulpal involvement.[2]

Several factors may affect the management of a fractured tooth such as biologic width violation, endo-dontic involvement, remaining tooth structure, the presence of fractured segment and its condition for use, occlusion, esthetics, finance, prognosis and patient cooperation.[3] Management of complicated crown-root fracture, especially when the fracture locates in close proximity to or below the crestal bone level, is not an ordinary case for a general dental practitioner.

A subgingival fracture further complicates the execution of the treatment due to difficulty in maintaining a proper dry field during endodontic procedures and possible violation of the biologic width while placing the restorative margin.[4] Damage to the perio-dontium in the form of gingival inflammation, bone resorption and recession may persist as a result of failure to reconstruct the biologic width.[5] To maintain a healthy periodontal-restorative inter-relationship, exposure of tooth structure supra-gingivally becomes necessary which can be achieved by-surgical crown lengthening, orthodontic forced eruption or a combination of both.[5]

Complicated crown-root fractures usually require a multi-disciplinary approach to deliver predictable esthetics and proper function. The aim of this case report was to present a fractured maxillary right central incisor with biologic width invasion that was successfully managed by surgical crown lengthening, endo-dontic treatment, cast post-core system and a crown.

Case Report:
We present a healthy 27-year-old male patient who attended a private dental clinic in Makkah

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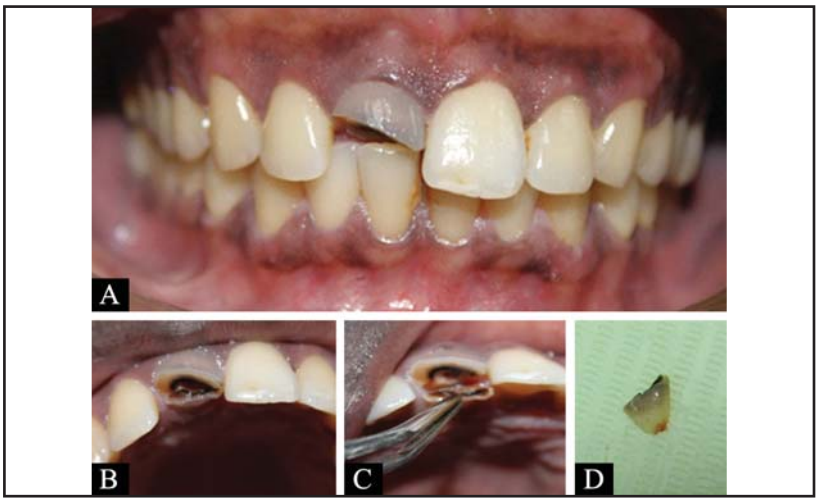

Figure 1: *(A) Preoperative frontal view of the fractured maxillary right central incisor. (B) Preoperative occlusal view of the fractured maxillary right central incisor. (C) A mobile palatal fragment that was still attached to the palatal soft tissue. (D) The fractured palatal fragment.*

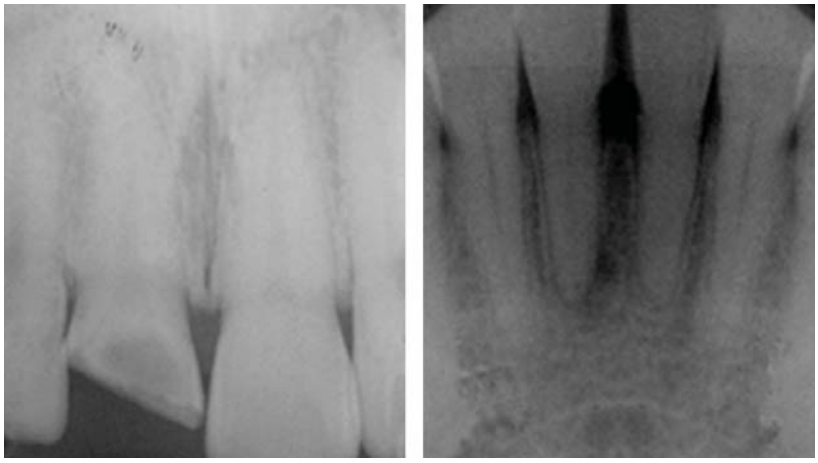

Figure 2: *Preoperative periapical radiographs of (A) maxillary right central incisorand (B) mandibular right central incisor.*

city, Saudi Arabia, with a chief complaint of broken upper anterior tooth. The patient reported falling on his face accidentally during work about a year ago. Extra-oral examination exhibited no abnormalities. Intra-oral examination revealed that the upper right central incisor had an obliquely fractured crown taking up to two-thirds of the clinical crown. The remaining crown was discolored, carious, pulpally involved and presented with a mobile palatal fragment that was still attached to the palatal soft tissue. The tooth showed no sign of mobility; except for the palatal fragment, no sensitivity to percussion or palpation but did not respond to thermal tests. After complete removal of caries from the maxillary right central incisor, the mobile palatal fragment was detached, under local anesthesia, to determine the restorability of the tooth and the extent of the fracture. Upon clinical evaluation, the fracture line extended subgingivally on the palatal side (Figure 1). The remaining upper and lower anterior teeth were also clinically examined. The lower right central incisor showed a total lack of response to thermal tests indicating a possible pulp necrosis.

Intra-oral periapical radiographs of maxillary right central incisor and lower right central incisor demonstrated apical radiolucency around their root apices (Figure 2). No other unusual radiographic findings were noted in the remaining anterior teeth.

The advantages, disadvantages and the cost of each treatment option were explained in details to the patient and consent was obtained for the treatment chosen. A multi-disciplinary approach was decided for the treatment of the fractured tooth which included surgical crown lengthening for exposure of the sub-gingival fracture followed by endo-dontic therapy and prosthetic rehabilitation with cast post-core and complete coverage crown. Root canal therapy was the proposed treatment for the lower right central incisor.

After administration of local anesthesia, a full thickness palatal flap was elevated in relation to the fractured tooth. Bone was removed palatally allowing for at least 3mm distance between the bony crest and the initially prepared finish line, using a rotary diamond bur. A scalloped bony contour was maintained during bone removal. The surgical site was irrigated with normal saline and sutured with interrupted silk sutures. A provisional crown was temporarily cemented to the fractured tooth (Figure 3). Post-surgical instructions were given to the patient. Systemic antibiotic, analgesicand 0.2% chlorohexidine mouthwash were prescribed. Sutures were removed one week after the surgery and adequate exposure of tooth structurewas initially achieved.

In the next visit, root canal therapy was initiated in the maxillary right central incisor and the mandibular right central incisor. Access cavity preparation and working length determination

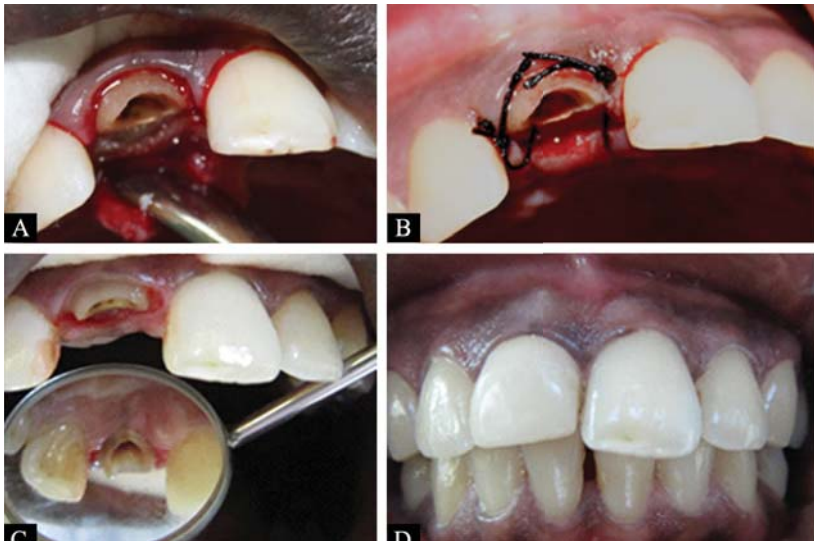

Figure 3: *(A) Palatal flap elevated. (B) Surgical site with silk sutures. (C) One week after crown lengthening with indirect view of the palatal aspect.(D) Temporization of the fractured tooth, frontal view.*

Figure 4: *Post-obturation periapical radiographs of (A) maxillary right central incisor and (B) mandibular right central incisor*

were done under rubber dam isolation. Root canals were thoroughly debrided and stepped back. Irrigation with 5.25% sodium hypochlorite solution was used throughout the procedure. Calcium hydroxide paste (Apexcal, Ivoclar Vivadent, Liechtenstein) was applied in the root canals as an intra canal medicament. Obturation using lateral condensation technique with gutta -percha points (Sure-Endo, Sure Dent Corp., Seoul, Korea) and AH Plus sealer (Dentsply DeTrey GmbH, Konstanz, Germany) was done in a subsequent visit. Post-obturation periapical radiographs were taken for both teeth to verify an acceptable root canal filling (Figure 4).

The patient was then referred to the prosthetic clinic for rehabilitation of the fractured tooth. Fabrication of custom-made post and core was performed intraorally. A post space was created by partially removing the gutta percha leaving 4mm of the filling for apical seal. A powder and liquid brush technique was utilized to fill the post space with redself-curing acrylic (Inlay Pattern Resin Duralay, Reliance Dental MFG Co, Worth, IL, USA). After the acrylic had set completely, the post pattern was removed from the tooth and verified for accuracy. The acrylic pattern was then replaced into the post space and the core was reduced. After complete verification and adjustments of the cast metal post, cementation was done using glass ionomer luting agent (Ketac-Cem, 3MESPE, Seefeld, Germany). Polyvinyl siloxane impression (Elite HD, Zhermack, Badia Polesine, Italy) was taken for laboratory fabrication of ceramo-metal full crown. The marginal fit and occlusion of the crown were evaluated intraorally and cementation was performed using a glass ionomer cement (Ketac-Cem, 3MESPE, Seefeld, Germany) (Figure 5). The mandibular right central incisor received a bonded composite restoration (Filtek Z350XT, 3M ESPE, St. Paul, MN, USA) to fill the endodontic access cavity. The patient was satisfied with the final results of the treatment. The clinical and radiographic evaluation at the one-month follow-up visit demonstrated that the restored teeth were in a good status and the neighboring anterior teeth remained stable with no abnormal findings. The patient was scheduled for further follow-up visits.

Discussion:

Management of crown-root fractures presents a great restorative challenge for the dental clinician. The challenge in the present case was amplified due to the apical extent of the fracture palatally which implied a multi-disciplinary approach for treatment.

Treatment modalities for approaching crown-root fractures range from a minimally invasive procedure as in fragment re-attachment to a more extensive one with the whole fractured tooth being replaced.[6] Fragment re-attachment using adhesive materials offers a conservative approach and immediate restoration of esthetic

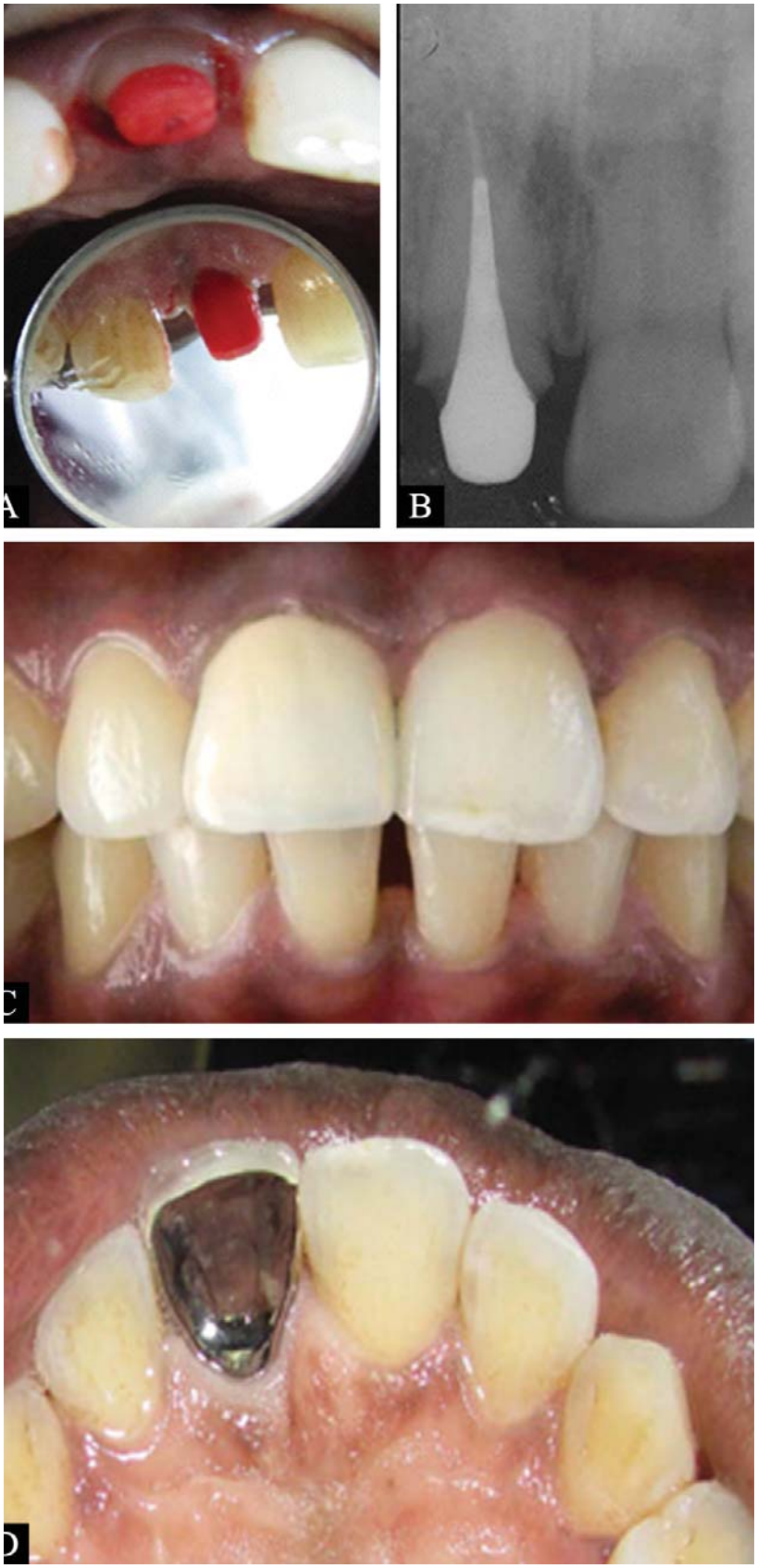

Figure 5: *(A) Acrylic pattern of the post and core placed in the fractured tooth with indirect view of the palatal aspect. (B) Periapical radiograph taken after cementation of the cast post and core. (C) Frontal view of the fractured tooth following crown cementation. (D) Palatal viewof the cemented crown (indirect image).*

and function to a traumatized anterior tooth.[7,8] In the present case, however, the fragment re-attachment could not be suggested as a treatment option because of significant loss of coronal structure and the palatal fragment had a poor adaptation to the remaining tooth structure as a result of caries removal and thus could not be utilized for restorative purposes.

Orthodontic and surgical methods can be employed to expose a sub-gingival fracture avoiding the invasion of the biologic width. Orthodontic extrusion restores physiological peri-odontal attachment and preserves alveolar bone[9] without compromising the esthetic appearance.[10] The major limitation of this approach is that it is relatively long and expensive, uncomfortable for patient and surgical intervention is still necessary.[11] Thus, the technique requires multiple visits and patient cooperation.[12] By contrast, surgical crown lengthening is a faster procedure but involves removing the supporting alveolar bone, produces a high gingival contour, hampering soft tissue esthetics and decreases crown-root ratio.[11,13] The surgical procedure also compromises the peri-odontium of the adjacent non treated teeth.[14] This approach produces an aesthetic problem in the anterior area, however, the palatal location of the sub-gingival fracture in our case permitted the exposure with a palatal flap elevation and osteotomy with minimal manipulation of the labial and inter-proximal tissues. In the present case, the patient refused the orthodontic treatment for financial reasons as well as for the prolonged treatment time.

Although crown lengthening procedures are usually carried out after completion of root canal therapy, the sequence is altered in case of sub-gingival fracture where a crown lengthening procedure can be performed initially to facilitate endodontic and prosthetic procedures.[4]

Based on the clinical and the radio-graphic findings, maxillary and mandibular right central incisors had an endodontic diagnosis of necrotic pulp with asymptomatic apical peri-odontitis. To improve the outcome of root canal therapy in these teeth, calcium hydroxide was applied

as an intra canal medicament. Reduction in the pathogenic species, especially in cases of necrotic pulps and periradicular lesions, was noted when calcium hydroxide was used as intra canal dressing during conventional root canal therapy.[15]

The time interval between the surgical crown lengthening and the initiation of the definitive prosthesis was taken into consideration. It was observed that the free gingival margin requires a minimum of three months period to establish its final vertical position following surgical crown lengthening procedure.[16] In the present case, commencement of the prosthetic phase was carried out twelve weeks after the peri-odontal surgery to allow for favorable tissue healing and stability of the marginal gingiva.

The utilization of post system is recommended in traumatized teeth where the fracture involves two-third of the crown part.[17] The use of prefabricated post was precluded in the present case because the remaining coronal tooth structure was minimal, therefore, a cast post and core was fabricated and the tooth was restored with porcelain-fused-to-metal crown. The choice of non precious alloy cast post over gold cast post was due to patient's economic reasons.

The present case report showed the importance of cooperation between a peri-odontist, endodonticst and prosthodontist. The fractured maxillary right central incisor reached a satisfactory condition to meet an acceptable esthetics and proper function. The case report also illustrated the importance of re-establishing of the biologic width when planning prosthetic restorations of teeth suffered a deep sub-gingival fracture.

Conclusion:

A variety of clinical problems arise during rehabilitation of anterior tooth with crown-root fracture. The presence of sub-gingival fracture further complicates the clinical condition. The successful outcome of the present case was highly dependent on the knowledge and the skills of the multi-disciplinary dental team.

Conflict of interest: None

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Role and contribution of authors:

Dr Abdullah S. Habbad, collected the data and references and wrote the case report

Dr Nadia K. Awad, helped in collecting the data and references and critically review the article to make final changes.

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