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CASE REPORT

Complicated crown root fracture treatment option: a case report

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Keywords

Crown root fracture, orthodontic treatment.

Abstract Complicated crown-root fractures are rare and often need complex treatment planning. This paper describes a simplified treatment option for a complicated crown root fracture that minimally encroached into the biologic region in a growing child without the need for surgery or orthodontic treatment**.**

Introduction

Seeing children grow from small toddlers into adolescents is an incredible experience for parents. Throughout this youthful and energetic period children are constantly subjected to new experiences and adventures that help them to develop their survival instincts. Simultaneous with the growing up process, they also are more prone to accidents especially accidental injuries to the oro-facial region, in particular dental trauma (Gassner *et al.,* 2004).

Commonly reported causes for dental related injuries are fall (Tapias *et al*., 2003; Glendor *et al*., 2007) especially from a bicycle (Castro *et al*., 2005; Cetinbaş *et al*., 2008) & contact sports (Glendor *et al*., 2007; Cetinbaş *et al*., 2008) and motor vehicle accidents (Glendor *et al*., 2007). Boys are more prone to dental traumas than girls (Järvinen, 1979; Castro *et al*., 2005; Cetinbaş *et al*., 2008) and the most frequently affected teeth are the maxillary incisors (Järvinen 1979; Tapias *et al*., 2003; Castro *et al*., 2005; Cetinbaş *et al*., 2008), especially the maxillary central incisors (Castro *et al*., 2005; Cetinbaş *et al*., 2008). Children between the ages of 8 to 11 years old are generally reported to be affected (Järvinen, 1979; Tapias *et al*., 2003). Increased overjet more than 4 mm and incomplete lip closure are said to be some of the common predisposing factors for dental trauma (Brin *et al*., 2000; Al-Khateeb *et al*., 2005; Sgan-Cohen *et al*., 2005).

Uncomplicated crown fractures appeared to be the most frequently reported dental trauma (Järvinen, 1979; Bastone *et al*., 2000) compared to other forms of dental injuries (Marcenes *et al*., 1999).

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Case report

A 10 -year old Malay girl was referred to the Primary Care Dental clinic of the National University of Malaysia with a history of dental trauma to her upper front tooth a day before following a fall that resulted from a scuffle between her and her brother. She complained of throbbing and continues pain of the traumatised tooth and was unable to eat properly. Initial investigation revealed a slight swelling on the left side of her upper lip and bruising noted on the inner aspect of her lower lip. No other abnormalities were detected. No clicking of the temporomandibular joints or deviation of the mandible was observed. Medically the patient has asthma and was on inhaler (terbuteline).

Intra-oral examination revealed mixed dentition status with fair oral hygiene. Patient has a class II Div I malocclusion with deep overbite and 7mm overjet. Examination at the area of complaint showed multiple crown fracture lines on the labial surface of the left permanent maxillary incisor (21) and an oblique fracture of the palatal portion that extended from the incisor edge of 21 to 4mm subgingivally on the palatal aspect. The fractured fragments were held together although they were mobile. Palatally, the coronal fragment was firmly held in position by intact epithelial attachment. Bleeding was observed between the fracture lines and gum surrounding 21.

Intra-oral radiograph revealed multiple cleavage lines of the traumatised tooth. The root formation of 21 was almost complete. Clinical and radiographic examinations were suggestive of multiple complicated oblique crown root fracture of 21 that involved the enamel, dentine, pulp and cementum (Figure 1). The patient and her mother were informed regarding the various treatment options with their respective advantages and disadvantages.

Figure 1: Labial surface view of tooth 21 after removal of fractured crown fragments.

With parental consent, 21 was anaesthetised with local anaesthetic solution (Scandonest). The coronal tooth fragments were removed and the extent of trauma was further investigated. Examination on the labial aspect of 21 revealed a 5mm of coronal tooth structure seen above the gum margin. However, on the palatal side the fracture line had extended 4mm subgingivally (Figure 2).

Figure 2: Palatal extension of fracture subgingivally.

21 was isolated with rubber dam and the tooth was rinsed thoroughly with physiological saline and dried. The pulpal tissue from the root canal was extirpated with barbed broach and the canal was irrigated with physiological saline and dried with paper points. A size 25, K file was used to estimate the working length (18mm), from the upper most edge of the remaining coronal fragment. The canal was later filed 2mm short of the working length with K files up to the size 45. The canal was once again irrigated with physiological saline and dried with paper points. A size 80 gutta percha point was temporarily inserted into the prepared canal above the working length and used as a guide for restoration of the defective crown structure that extended subgingivally with glass ionomer cement. Fuji IX glass ionomer cement was packed around the gutta percha up to the gum margin especially on the palatal side to prevent ingrowths of the gingival tissue towards the canal (Figure 3).

Figure 3: Placement of glass ionomer cement subgingivally to prevent ingrowth of gingival tissue.

Figure 4: A periapical view showing root canal of the traumatised tooth (21) filled with non-setting calcium hydroxide (arrow).

Figure 5: Patient's final restoration in place.

Figure 6: A post treatment periapical view of the traumatised tooth (21) showing restoration of the tooth with fiber reinforced para-post (arrow) and composite.

Subsequently the gutta percha was removed and the canal was filled with non setting calcium hydroxide paste up to the prepared canal length using lentilo-spiral (Figure 4). The canal orifice was sealed with cotton pledget and zinc-oxide eugenol (Kalzinol®). An upper alginate impression was taken to construct an upper removable acrylic appliance with stops on the mesials of upper right maxillary permanent central incisor (11) and upper left maxillary permanent lateral incisor (22), to avoid space loss due to tilting or migration of the respective teeth toward the fractured 21.

The patient was reviewed 2 weeks later. Patient did not complain of any pain or discomfort. Intra-oral examination at the area of trauma did not show any abnormalities. The glass ionomer cement placed subgingivally was still intact and gum healing was excellent without any gingival over-growth. Periapical radiograph was taken and no obvious changes were noted. The upper removable appliance was placed and the wires were adjusted for proper fitting, and the patient was given a subsequent appointment.

The patient was seen 2 months later. Again clinical and radiographic examinations did not reveal any changes. 21 was isolated with rubber dam and the root canal was re-accessed. Canal was irrigated with physiological saline and dried with paper points. The canal was assessed for apical patency with gutta percha point size 45, up to the working length. The gutta perca stopped at the estimated working length (18mm) indicating an apical hardening that represent the apical barrier. The canal was filled with size 60 master point and various sizes of accessory points by lateral condensation technique using finger spreader and AH 26 Plus® root canal sealer. Post-obturation radiograph was taken prior to cutting of the excess extensions of the gutta percha points. The gutta percha was further condensed with a plugger and the canal orifice was sealed with Kalzinol®.

A week later, the patient was reviewed. There was no evidence of any abnormalities associated with 21. Rubber dam was placed and the gutta perca within the canal was removed up to 4mm short of the obturated length. A suitable sized fibre reinforced para-post was inserted into the prepared canal up to 14mm and cemented with glass ionomer cement. Aesthetically matched composite was used to reconstruct the fractured crown using free hand technique (Figure 5). The usage of upper removable appliance was discontinued after this. The patient was reviewed 3 months and 6 months later without any complications either clinically or radiographically. Patient is currently under annual follow-up.

Discussion

Dental traumas due to crown-root fracture are rarely seen when compared to crown fractures (Marcenes *et al*., 1999; Bastone *et al*., 2000). It is even rare to see a complicated crown –root fracture. Complicated crown-root involves tooth structures such as enamel, dentine, cementum and pulp. The severity of presentation also varies depending on the strength of the impact force and its vector (Glendor *et al*., 2007). Some cases may present as vertical crown root fracture, oblique crown-root fracture or with multiple crown- root fractures. Success of treatment of complicated crown –root fracture is generally based on the degree of impact of the trauma to the tooth supporting structures especially the periodontium, root-crown length ratio and extent and complexity of the fracture.
There are few treatment options available in treating complicated crown root fractures: (Brown and Welbury 2000; Fariniuk *et al*., 2003).

- Removal of the fractured coronal fragment and restoration of tooth if the fracture line has not encroached into the biologic width
- Removal of the coronal fragment and supplemented with gingivectomy and osteotomy to expose the fracture in order to establish biologic width prior to restoration
- Removal of the coronal fragment and initiation of endodontic treatment and restoration of tooth with post crown
- Removal of the coronal fragment and initiation of endodontic treatment and later by orthodontic or surgical extrusion of the apical fragment prior to restoration with post crown.
- In severe crown –root fracture, the tooth may have to extracted and replaced with removal or fixed prosthesis.

In the present case, the fractured coronal fragments were removed and the fracture line was found to be extending 4mm subgingivally on the palatal aspect, which encroached into the biologic width. In view of the fact that the patient is only 10 years old and the root apex of 21 is not completely matured, it was decided that there is no need to orthodontically or surgically extrude the apical fragment. Endodontic treatment was initiated to extirpate the pulp tissue and non setting calcium hydroxide was placed into the canal. The apical fragment was allowed to erupt by itself, therefore with time the fracture line will move more cervically closer to the free gingival margin.

The fractured area of tooth that lies subgingivally was replaced with glass ionomer cement up to the free gingival margin. This was carried out to prevent ingrowth of gingiva into the fractured region and also to allow healing of healthy periodontal cuff around the fractured region. Glass ionomer cement was used because it can tolerate small amount of moisture contamination from cervicular fluid and it is less likely to cause gingival irritation.

One of the main problems with complicated crown-root fracture is the relationship of the fracture line to the alveolar crest. Extension of the fracture line sublingually

may have an effect on the periodontal status and the survival of post-trauma restoration if it encroaches into the biologic width. In this case although the fracture line has extended subgingivally, there was no evidence of periodontal pocketing on the palatal aspect was found during subsequent follow-up period. The periodontium has healed well around the glass ionomer cement placed to replace missing tooth structure.

During subsequent visits the canal was obturated with gutta percha and later a fiber reinforced para-post was placed into the canal and restored with composite (Figure 6). It is believed that with spontaneous eruption of tooth, the fracture line will move more cervically in years to come and move closer to the free gingival margin. This in turn will facilitate construction of fixed crown later upon completion of growth around 16 to 18 years of age. The patient is currently under annual follow-up. There is no evidence of periodontal pocketing or root resorption seen clinically and radiographicaly.

Conclusion

Treating a complicated oblique crown root fracture that extends below the alveolar crest without any surgical or orthodontic extrusion may be an alternative option. This may be feasible provided the fractured tooth has substantial remaining crown-root ratio, with immature apex. The in growth of the gum into fractured space can be prevented with suitable materials and periodontal health can be maintained.

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