Crown dilaceration of permanent central incisor as a result of different etiologic factors - a report of three cases

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Abstract: Two possible causes of crown dilaceration are trauma and developmental disturbances, and it has also been proposed that it might be associated with some developmental syndromes. This article details the diagnosis and describes the alterations in endodontic treatment procedures while managing crown dilaceration in maxillary central incisor. Diagnosis, endodontic access cavity preparation, root canal preparation and obturation, and other related treatments might be complicated by the presence of crown dilaceration. The present case series reports three cases of crown dilaceration in permanent central incisors having varied etiology.

Keywords: dental anomaly, developmental disorder, trauma.

INTRODUCTION

Dilaceration is an angulation or a sharp bend or curve in the root or crown of a developed tooth of 90° or more (Latin: dilacero = tear up). Angulated crown or crown dilaceration is the displacement of a portion of the developing crown of a tooth at an angle to the longitudinal axis of the tooth (1). The most widely accepted cause for this is mechanical trauma to the primary predecessor tooth leading to dilaceration of the developing succedaneous permanent tooth. This anomaly constitutes 3% of all primary tooth injuries (2). The trauma usually responsible for this type of lesion is frequent traumatic intrusion or avulsion during childhood between the ages of 1-5 years (1,3). Other alterations in dental pathology produced by intrusion of primary teeth include, white or yellow-brown discoloration, or circular enamel hypoplasia, root duplication, vestibular or lateral root angulation or dilacerations, partial or complete arrest of root.
formation, sequestration of the permanent tooth germ and disturbed eruption (4). The severity of the lesion on a permanent tooth depends on the developmental stage of the tooth, the force of impaction and the direction of force applied with respect to the permanent tooth (5).

Crown dilaceration usually involves the maxillary incisors and, less frequently, the mandibular incisors, because they are in close contact with the primary incisors and are more prone to injury (6). In about half of these incidents, impaction occurs while there is normal eruption in lingual or vestibular sites in the remaining cases. Clinically, the maxillary incisors show a lingual deviation while the mandibular incisors incline facially (4).

Some recent studies also suggest dilaceration to be a true developmental anomaly that is not related to a history of trauma (1, 7-9). Jamal et al. (10) have emphasized the relation of cleft lip and/or palate to all dental anomalies studied and reported that 19.2% of their subjects of cleft lip and palate had dilacerations. However, there are comparatively fewer case reports that suggest developmental disorders to be related to the etiology of crown dilaceration.

The purpose of this paper is to report cases of crown dilaceration, related to both traumatic injury to the primary predecessor and associated underlying developmental disorder.

Case report 1

A 22-year old male reported to our department with the chief complaint of small sized upper front tooth with occasional pain in that tooth since 15 days. A detailed trauma history of the patient revealed that he injured his maxillary primary central incisors due to a fall when he was two years old. This episode resulted in intrusion of his primary incisors. Medical history of the patient was non-contributory. On clinical examination, the permanent maxillary right central incisor showed crown dilaceration with the labial surface displaced palatally in the incisal third of the crown giving the appearance of short crown length (Fig 1a, 1b). A notch was evident in the incisal edge and there was a characteristic midline diastema (Fig 1a). Percussion test was positive in relation to both right upper central and lateral incisor. An intraoral periapical radiograph of the tooth revealed periapical pathology in relation to 11 and 12. The radiograph also revealed a bend in the crown of 11 at the level of cemento enamel junction, giving the appearance of foreshortening coronally (Fig 1c). Electric pulp testing gave no response for both these teeth indicating non-vitality. Endodontic treatment was decided as the treatment plan for both 11 and 12. Conventional palatal access was obtained under rubber dam isolation, the working length was determined using an electronic apex locator (Root ZX; J Morita Corporation, Japan) and confirmed with a radiograph (Fig 1d). Biomechanical preparation was done using hand K Flex files (Dentsply Maillefer, Switzerland) to an apical size of # 45 in 11 and #40 in 12 using step back technique. Difficulty in instrumentation was encountered while preparing 11 owing to palatal displacement of the incisal third of the tooth. Calcium Hydroxide used as an intracanal medicament for two weeks. Obturation was done with gutta percha cones (Dentsply Maillefer, Switzerland) and AH Plus sealer (Dentsply) using a lateral condensation technique (Fig 1e). Labial contouring of 11 was carried out with light cured composite resin (Filtek Z350;3M ESPE, St Paul
An esthetically pleasing result was obtained with composite restoration (Fig 1f). The patient was recalled after six months to assess the periapical status of the tooth. Considerable healing was evident on the periapical radiograph and the patient was asymptomatic (Fig 1g).

Case report 2
A 12-year-old boy was referred to our department with the chief complaint of spontaneous but intermittent pain for the last one month in his upper left central incisor. The patient was affected with unilateral cleft lip and palate of the left side and was undergoing orthodontic treatment for the correction of associated malocclusion. Surgical repair of cleft lip and palate was performed for him between the age of 6 to 18 months. Medical history of the patient was insignificant. Clinical evaluation revealed deep distal caries in the crown of 21 (Fig 2a). Intraoral periapical radiograph of the tooth showed close approximation of distal caries to the pulp. It also revealed the presence of crown dilaceration in the same tooth at the cervical level (Fig 2b). Electric pulptest of 21 gave an early response indicative of irreversible pulpitis. Root canal therapy was decided as the line of treatment for the dilacerated tooth followed by esthetic restoration. Coronal shaping of the root was done using Gates Glidden drill (#4-#2) (MANI Inc., Tochigi City, Japan) for obtaining a straight line access and bypass the dilacerated portion of the tooth. Glide path was obtained using a #20 K Flex file (Dentsply Maillefer, Ballaigues, Switzerland). After determination of the working length (Fig 2c), biomechanical preparation was completed using Protaper rotary instruments till F4. Obturation of the root canal was done with Protaper gutta percha and AH Plus sealer (Fig 2d). Post obturation restoration was done using light cure microhybrid composite restoration (Filtek Z350; 3M ESPE, St Paul [MN] USA) after one week (Fig 2e). At a six month recall, the patient was asymptomatic and undergoing his orthodontic treatment.
A 15 year old female who was a diagnosed case of Amelogenesis Imperfecta- hypocalcified type was referred to our department from the Oral diagnosis department for her chief complaint of extreme sensitivity to hot and cold, poor masticatory efficiency and dissatisfaction with the appearance of her teeth. A detailed medical, dental, and social history was obtained. Clinical examination of the patient revealed hypocalcified enamel, marginal gingivitis, improper intercuspation and lack of proximal contact because of tooth surfaces loss. There was generalized attrition resulting in short clinical crowns and marked loss of occlusal vertical dimension. Tissue loss affected all the teeth, the enamel was barely visible and appeared soft, friable and yellow brown in color. The cuspal structure was completely absent in the occlusal portion of the molars. The exposed dentin was hypersensitive. The patient exhibited poor oral hygiene and presented hyperemic and edematous gingiva. A mesiodens was present between 11 and 21. 15, 16, 34, 35, 36, 37 and 47 had proximal caries (Fig 3a, 3b and 3c). CBCT scan showed severe close pulp approximation with all the teeth (Fig 3d). Another significant finding observed on radiographic examination was crown dilaceration of 11(Fig 3e). The treatment plan decided comprised of four phases. The first phase consisted of oral prophylaxis. Endodontic treatment of all the teeth was planned in the second phase of treatment. In the third phase of treatment periodontal surgery was designed. Following this the patient would be referred to the department of prosthodontics for occlusal rehabilitation.

For the purpose of this paper, we would focus on the diagnosis and treatment of dilacerated 11. Vitality test of this tooth revealed an early response indicative of inflamed pulp. Routine access opening was performed and glide path determined using a #15 K-flex file. The access cavity was enlarged mesially to gain straight-line access to the root apex. Biomechanical preparation was performed by crown down manner till MAF #70. Obturation was done by step back technique using 2% Gutta-percha cones and AH Plus sealer (Fig 3f). The access cavity was sealed with composite after one week.

Figure 3a: The occlusal view of maxillary arch. Figure 3b: The occlusal view of mandibular arch. Figure 3c: Clinical appearance of Amelogenesis Imperfecta. Pretreatment labial view of maxillary and mandibular teeth. Figure 3d: Pretreatment CBCT scan. Figure 3e: Pretreatment intraoral periapical radiograph showing dilacerated permanent maxillary right central incisor. Figure 3f: Postobturation radiograph

DISCUSSION
Crown dilaceration is termed a non-axial displacement of already formed hard tissue in relation to developing odontogenic tissues (4). The condition is thought to be due to trauma occurring when the tooth is forming, which alters the position of the calcified portion of the tooth so that the remainder of the tooth is formed at an angle. Trauma alone is unlikely to account for all cases of dialceration (11). Idiopathic developmental disturbances are proposed as another possible cause in cases that have no clear evidence of traumatic...
Injury (1,4,9). Facial clefting is considered to be one of the many contributing factors and it has also been proposed that it might be associated with some developmental syndromes (10,11). Stewart (7) investigated 41 cases of dilacerated incisors and found that trauma accounted for only 22%. In two other case reports of dilacerated teeth in the mandible, no history of trauma to the lower labial segment was found (8,12). In the cases presented here, the etiology of dilaceration was varied. In the first case report, dilaceration in the crown of permanent maxillary right central incisor was a result of traumatic injury to the primary predecessor tooth, while in the other two cases it was associated with developmental anomalies like cleft lip and palate and amelogenesis imperfecta respectively. Histologically, the enamel epithelium gets displaced along with the mineralized portion of the tooth in relation to the dental papilla and cervical looses. This results in the loss of facial surface enamel while on the lingual side a cone of hard tissue is formed that projects into the root canal (4). Brownish discoloration is caused by disturbances in the ameloblastic layer, leading to defective matrix formation. The stretched inner enamel epithelium continues to induce the differentiation of new odontoblast, hence the dentin formation is not affected. Pulp necrosis and periapical inflammation of these teeth without any decay may be a common finding. This is because the bent portion with a defective enamel and dentin act as a nidus for bacterial entry into the pulp space (13,5).

In the first case, this was probably the cause for the pulpal infection of the tooth and hence, root canal treatment was performed.

The other two cases reported here also exhibited clinical and radiographic features in accordance with the earlier reports on teeth with crown dilacerations (13,14). Treatment options for crown dilacerations include (5):

1. Surgical exposure with or without orthodontic realignment
2. Removal of dilacerated part of crown
3. Temporary crown until root formation is complete
4. Semi or permanent restoration
5. Prosthesis or orthodontic space closure following extraction

In the present cases, treatment included endodontic therapy of the involved tooth followed by labial contouring with composite restoration. In the first case endodontic procedure with calcium hydroxide helped in resolution of the periapical pathology. In the second case presented here the patient was referred back to the department of orthodontics for the management of malocclusion associated with cleft lip and palate after completion of endodontic therapy of dilacerated central incisor. The third case reported here was a diagnosed case of Amelogenesis Imperfecta who is undergoing intentional endodontic treatment of the remaining teeth after the endodontic treatment of her dilacerated incisor.

REFERENCES


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