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Case Report

Orthodontic Movement of Horizontal Root Fractured Central Incisor; Case Report

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Abstract

Horizontal root fractures affect up to 7% of all dental traumas in young patients, and are more commonly seen in maxillary teeth, and in association with increased overjet.

In this case report, a 12 year old boy, who suffered a horizontal intra-alveolar fracture 27 months earlier, was treated orthodontically. The patient had a high need for treatment according to the IOTN index and was treated in close association with pedodontics management. The fractured tooth moved successfully using conventional mechanics with centerline correction and treatment of overjet, overbite and crowding.

Keywords: *Horizontal Root Fracture; Transverse Root Fracture; Crowding; Overjet; Centreline Correction*

Introduction

Tooth fractures which involve dentin, cementum and pulp are known as root fractures [1,2]. They are either vertical or transverse root fractures [1]. Vertical root fracture affects patients 40 years and older with an incidence of 18.7% and require extraction of the tooth and replacement with a prosthesis [1,3-5]. Transverse root fractures, also known as horizontal root fractures (HRF), are more common in young patients especially between the ages of 11 and 20 years old [1,6,7]. It represents 0.5 - 7% of all dental trauma cases [6-9]. Horizontal root fractures can occur as oblique fractures with varying orientations [1,9]. HRF is the result of direct horizontal, frontal trauma to the tooth and mostly affects central maxillary incisors [1,3,9].

There are four types of healing for HRF [6,8,10,11]. It is healing with either calcified tissue, connective tissue, bone or granulation tissue. Healing depends on the degree of dislocation of the fragments, growth of the alveolar process and presence of infection [2,7,8]. Usually, patients with increased overjet are more prone to these fractures [6-8].

It is possible to move HRF tooth orthodontically under sufficient care [4,5,10-14]. This case report represents reduction of left central incisor overjet with the pulp chamber completely demolished. Moreover, relief of both arches overcrowding.

Case Report

A twelve-year-old boy was referred to the orthodontic clinic at the University Dental Hospital by the paediatric team for a consultation regarding his malocclusion. He presented with Class III incisor relationship on a mild Class III skeletal base with an increased maxillary-mandibular planes angle and an increased lower facial height.

The lower arch was moderately crowded with the lower second premolars restored. The upper arch was more severely crowded with the upper left canine excluded buccally from the arch.

The overjet was reversed on the upper right central incisor, the overbite was reduced and the only tooth contact was between the lower right and the upper right central incisor. The upper centerline was 4 mm to the left of the facial midline and the lower centerline is coincident with the middle of the face. The molar relationship is Class III on both sides and there was a bilateral posterior crossbite present without any displacement on closure.

Figure 1: *Pretreatment photographs showing patient malocclusion.*

Radiographs show all teeth to be present including the wisdom teeth (Figure 2). The upper left central incisor has a horizontal root fracture between the coronal and middle thirds (Figure 3).

Figure 2: *Pretreatment dental panoramic tomogram (DPT).*

Figure 3: *Pretreatment periapical radiograph showing intra-alveolar horizontal root fracture.*

Dental history (History of trauma)

Patient gave a history of trauma to the upper incisors at the age of nine. The upper left central incisor was subluxated and moved palatially. The upper central incisors were examined for mobility, change of color, tenderness to percussion, and sensitivity to ethyl chloride. Radiographs were taken to establish if any apical pathology was present.

On examination at the first visit, there was slight mobility of the upper left central incisor and the upper left central and lateral incisors were sensitive to ethyl chloride. Radiographically, the upper right central incisor was found to have a horizontal root fracture between the coronal and middle thirds (Figure 4).

Figure 4: *Periapical view in the first visit after trauma, showing horizontal intra-alveolar fracture of the upper right central incisor.*

Following referral from his general dental practitioner, the patient was seen on the Paediatric clinic at the University Dental hospital. Patient was followed-up at regular intervals over a period of twenty-seven months. At each visit the same clinical examinations were performed for the upper incisors. Periapical radiographs were also taken and examined for any abnormalities.

At the final follow-up examination, the upper right central incisor was yellowish in color, with no other clinical abnormality. Radiographically, the root fracture was evident, with the pulp chamber in the coronal aspect of the root completely obliterated (Figure 5).

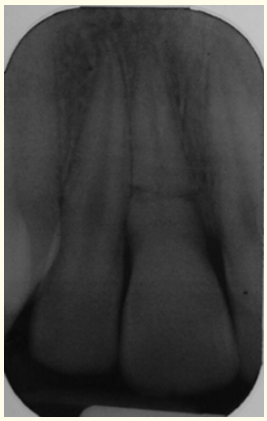

Figure 5: *Periapical view in the final follow-up visit showing pulpal obliteration of the coronal aspect of the fractured tooth.*

Orthodontic treatment plan

The aim of the orthodontic treatment was to camouflage the skeletal pattern and to provide relief of crowding, alignment of the arches, centerline correction, correction of the overjet and to obtain Class I incisor and molar relationships with closure of residual space. Orthodontic treatment planning was carried out in close association with the paedodontic management. As part of the informed consent to treatment, the patient and parents were warned of the risks associated with complex orthodontic treatment. This included decalcification, root resorption, failure to complete care and further root damage to the traumatized central incisor. Orthodontics would be carried out around, and with minimal movement of the fractured tooth.

The treatment plan included the following:

1. Expansion of the upper arch by rapid maxillary expansion utilizing a Hyrax appliance, followed by a quad-helix to retain the expansion.

2. Extraction of teeth number 15, 24, 35, 45 to relief the crowding and provide additional space requirements.

3. Upper and lower fixed appliances using a pre-adjusted straight wire appliance with an MBT prescription.

4. Prolonged retention with bonded upper and lower retainers.

Discussion

The likelihood of healing following intra-alveolar fractures is high, and the literature encourages preserving these teeth as opposed to extractions [1,7,9]. However, there are only few reports in the literature concerning orthodontic movement of a tooth with horizontal root fractures [4,6].

In one case, the patient presented with a Class 1 division 1 malocclusion two years after trauma to the maxillary right central incisor leading to an apical third horizontal root fracture [6]. Headgear was used for 1 year followed by a maintenance program with a Hawley appliance. The maxillary right central incisor was moved both lingually and intrusively during treatment. An 8-year recall revealed that the tooth had remained asymptomatic and was in normal function.

In another case, a patient with an intra-alveolar fracture of the upper left central incisor was treated orthodontically [4]. After three months of orthodontic treatment, radiographic examination showed that the coronal fragment has moved relative to the apical fragment. Orthodontic treatment was therefore terminated.

In this case, orthodontic treatment began 27 months after trauma, and after consultation with the patient's dentist. The patient had a high need for orthodontic treatment with an IOTN DHC of 4D. Anticipated tooth movement of the fractured tooth was labial tipping of the crown and lateral bodily movement to correct the centerline. It was planned to keep forces light and indirect to the fractured incisor to prevent stimulating separation of the coronal and apical segments.

Centreline correction was the major concern, as lateral bodily movement was needed. Several measures were taken to correct this with the lightest force possible. During initial bonding of the fixed appliances, a laceback was placed in the upper right quadrant only, to enhance centerline correction.

In 0.018" stainless steel working wires, push coil was placed between the upper left central incisor and canine, this was primarily to provide space for the upper left lateral incisor, but also has the effect of shifting the centerline to the right. The use of an undersized wire here also had the advantages of keeping the forces low as the teeth slide freely along the wire. The use of a round wire means that any binding due to torque will be eliminated, therefore keeping the forces low again. Towards the end of alignment, and just before closing the residual spaces, the upper centerline was nearly corrected. The remainder of the correction was achieved by Class II elastics on the right side (Figure 6).

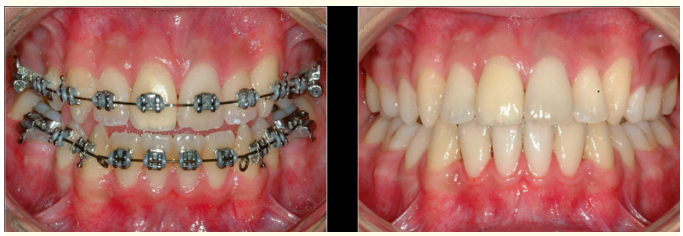

Figure 6: *Centreline correction at the end of alignment and at the end of treatment.*

Fractured tooth remained asymptomatic during orthodontic treatment and there was no radiographic evidence of complications. Patient was followed-up 8 months after completion of treatment. Upper right central incisor had remained asymptomatic and in normal function.

Conclusion

This report shows that a tooth with a horizontal intra-alveolar fracture can be moved successfully with contemporary orthodontic appliances using conventional mechanics. Factors implicated in success of such treatment may include adequate time between trauma and initiation of orthodontic treatment and extra care in the use of light forces to the fractured tooth. Liaison between the orthodontist and the paedodontist is a very important factor and should not be overlooked.

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