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Orthodontic Extrusion of Traumatically Intruded Upper Central Incisor

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Introduction

The incidence of traumatic dental injuries varies with age and has a high prevalence worldwide. [1] In most cases, the front teeth are the most affected, with the central incisors being at the highest risk of dental trauma. [2] [3] The maxillary arch is involved in a higher percentage (95.72%) of incidents when compared to the mandibular arch. [4]

Intrusion luxation can be defined as the form of traumatic dental injury that leads to tooth displacement deep into the alveolar bone. This usually results in severe complications (pulp necrosis, inflammatory root resorption, ankylosis); for this reason it is classified as a severe form of traumatic dental injury. [5] [6]

Management of traumatically intruded anterior teeth is of prime importance, since these teeth are so important both aesthetically and functionally. Management of these traumatised teeth differs according to the root apex maturity and the severity of the intrusion luxation itself. Pulp necrosis occurs in one hundred percent of cases involving intrusion luxation of mature permanent teeth with fully-formed apex and in 62.5 % of those involving intruded teeth with open apex. [7] [8] This case report aims to emphasise the importance of immediate orthodontic loading of traumatically intruded mature permanent teeth with closed root apex.

Diagnosis and Etiology

A 15-year-old female was referred to the orthodontic clinic for dental evaluation. Her chief complaint was, "I have a displaced upper front tooth following a sport accident." (Figure 1) During orthodontic evaluation, the patient reported that she had received a sport injury one day ago. As an emergency treatment, she received immediate therapy by a general dentist, consisting of bleeding control, prescription of an antibiotic and an anti-inflammatory analgesic. Clinically, "The patient presented a dolichofacial pattern and normal occlusion, with well-aligned teeth, except for the traumatised upper left central incisor (4 mm intrusion depth) (Figures 1 and 2). Symptoms of temporomandibular disorders were not found. Pulp vitality of the traumatised tooth was tested with ethyl chloride, and a negative result indicated the presence of necrotic pulp tissue."

Treatment Objectives

The patient had an intruded upper left central incisor tooth as a result of a traumatic accident, so the following treatment objectives were established:

1. Extrude the intruded upper left central incisor into its original physiologic position
2. Allow easy access for necrotic pulp extirpation from the intruded incisor.

Treatment Plan

The treatment plan should aim to extrude the intruded tooth back into its original physiologic position within the upper arch. Three treatment alternatives were available:

1. Giving the tooth its own chance to re-erupt spontaneously.
2. Surgical repositioning for the intruded tooth
3. Orthodontic extrusion.

The authors preferred the third treatment option, so the treatment plan was to orthodontically extrude the traumatically intruded upper left central incisor as soon as possible following the traumatic injury. Additionally, endodontic treatment was also planned in order to extirpate the necrotic pulp (the tooth had complete root development), thus minimising the chances of external root resorption and tooth loss.

Treatment Progress

Two days after the traumatic injury, the authors were able to bond the upper teeth with a fixed orthodontic appliance extending from the upper right 1st permanent molar to the upper left 1st permanent molar. A 0.022-in slot / Roth prescription pre-adjusted brackets (Pinnacle-Ortho Technology) were used with a 0.012 inch NiTi orthodontic wire (Ortho Technology company) as an initial aligning arch wire. (Figure 3)

During the first week of treatment, the patient was instructed to follow a soft diet, with the aim of avoiding any traumatic contact with the traumatised tooth.

Three weeks following the start of the alignment phase, the tooth was extruded enough (close to the level of the other central incisor) to allow easy access for necrotic pulp extirpation (ethyl chloride examination

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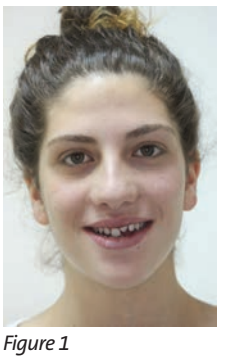

Figure 1

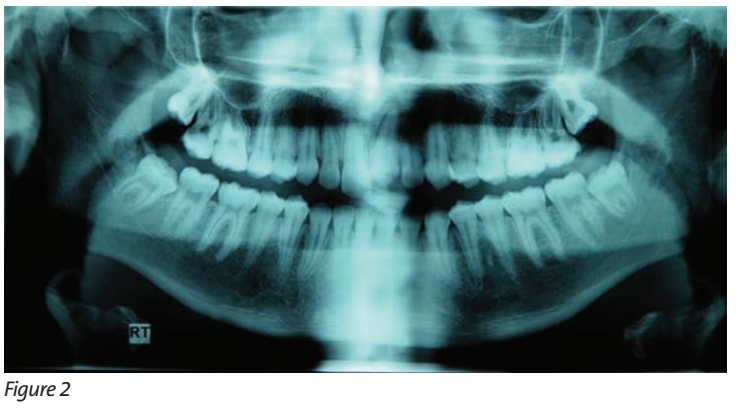

Figure 2

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Figure 3


Figure 4a


Figure 4b


Figure 4c


Figure 4d


Figure 5

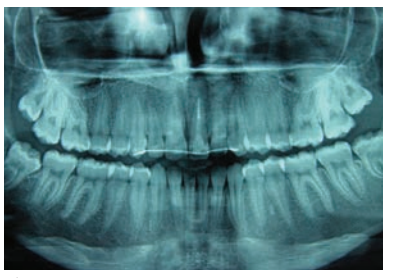
Figure 6


Figure 7


Figure 8

confirmed the necrotic pulp status). (Figure 3)

The necrotic pulp was extirpated two weeks following the start of orthodontic treatment and a non-setting calcium hydroxide root canal filling material was placed for about three weeks. The aim of using the calcium hydroxide dressing material was to dissolve any pulp remnants, and to alkalinise the environment to minimise the inflammatory root resorption. [9]

Then 0.014 and 0.016 inch NiTi wires (Ortho Technology Company) were used, in order to complete the alignment phase by moving the traumatised tooth back into its normal and physiological position. The alignment phase took about three months, after which the tooth was normally positioned within the line of the arch. (Figure 4. a-d)

The result was maintained with an upper fixed lingual retainer (Ortho Technology) extending from upper right canine to upper left canine. (Figure 5, 6)

By the end of treatment, the gingival margin of the affected tooth was not level with the contralateral central incisor (Figure 4:A); this may be the result of the rapid extrusive forces which were applied to the intruded tooth. A gingivectomy for the upper left central incisor was performed about one year later in order to level it with the gingival margin of the right central incisor. (Figure 7,8)

Discussion

Traumatic intrusion luxation is a serious type of injury, and it occurs most frequently in upper incisors. [4] Management of traumatically intruded permanent teeth differs according to the root apex maturity and the severity of the luxation injury itself. In case of mild intrusion of teeth with incomplete root formation, the intruded teeth are given the chance to re-erupt spontaneously within three weeks. [10] [11] [12] If the intruded tooth does not erupt by itself during the three week observation period, it is preferable to extrude the tooth, in order to replace it in the line of the arch.

In our case, spontaneous re-eruption was not preferred because, according to the UK national clinical guidelines, the chances of spontaneous re-eruption in mature teeth are low, especially if the intrusion is above 3 mm and, if eruption occurs, the tooth will not reach up to the preinjury occlusal level.[12] [13]

As a result, the authors preferred immediate orthodontic extrusion, aiming to minimise the chance of ankylosis. This concurs with Andreason, who states that orthodontic forces should be applied within the first few days following the intrusive luxation injury. [14] The initial arch wire was thin with low force to minimise any heavy and non-physiologic loading on the luxated tooth).

Endodontic treatment was mandatory in our case, since the intruded tooth had a fully-formed root with completely closed apex. [7] The pulp was extirpated, to avoid the development of external root resorption, which can lead to tooth loss. [15] Surgical repositioning was not preferred because it usually produces severe trauma to the periodontal ligament, leading to replacement resorption and tooth loss. [16]

Conclusion

The application of immediate orthodontic extrusive forces to reposition the traumatically intruded upper left permanent central incisor was effective. Early tooth repositioning created easy access for pulp extirpation which probably minimised the chances of external root resorption, ankylosis and hence tooth loss.

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