

The management of traumatic ankylosis during orthodontics: a case report

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Dental ankylosis may be a significant complication in orthodontic clinical practice. This case report describes the management of a malocclusion, complicated by an ankylosed maxillary central incisor, which arose during orthodontic treatment, following an acute traumatic injury. The use of the ankylosed incisor in successfully managing the significant Class II division 1 malocclusion is described.

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INTRODUCTION

Ankylosis is defined as the fusion of the mineralised root surface with alveolar bone. The condition is relatively uncommon and occurs most frequently in the primary dentition. The etiology of ankylosis is unknown. It may occur due to trauma such as avulsion and where the tooth is replanted.¹ Clinical diagnosis of ankylosis, by mobility and percussion tests, is only reliable when at least 20% of the root surface is affected.^{2,3} Radiographic examination may illustrate the obliteration of the periodontal ligament space with fusion to bone, but since only a small area of fusion is required to produce clinical ankylosis, this method of diagnosis is frequently inadequate. Failure of a tooth to move following the application of orthodontic forces is believed, by some investigators, to be the only definitive diagnostic test.¹

Treatment of an ankylosed tooth depends upon whether it is a primary or secondary tooth, the time of onset, time of diagnosis and the location of the affected tooth.⁴ This paper reports a case where ankylosis of a permanent maxillary central incisor occurred during orthodontic treatment. While the ankylosis compli-

cated the orthodontic treatment, it was subsequently used effectively to correct the patient's significant Class II division 1 malocclusion.

CASE REPORT

A Caucasian female, aged 11 years and 5 months, was referred for orthodontic treatment of a marked Class II division 1 malocclusion (Figure 1). The medical history was not significant. The dental health was poor, with generalised gingivitis and some minor carious lesions present. Radiographic examination confirmed the presence of all permanent teeth, including third molars. She presented in the late mixed dentition phase, with an overjet of 10 mm and marked crowding in both arches.

A two-phase orthodontic treatment plan was initiated. Phase I involved Frankel appliance therapy. During this phase, the patient experienced an acute traumatic episode to the maxillary incisor region following a fall from a bicycle. The maxillary right central incisor was avulsed. It was replanted, within 90 minutes of the injury, by the general dental practitioner. Two weeks later, the general practitioner endodontically treated this tooth. (Figure 2). The remaining incisors retained vitality, but the traumatic episode resulted in Ellis Class II fractures to both central incisors and the maxillary right lateral incisor.⁵ Radiographic examination revealed no root fractures.

The second phase of orthodontic treatment was initiated. This phase involved the extraction of four first premolars; upper and lower fixed appliances and extra oral traction. Diagnosis of the ankylosed maxillary right central incisor was made at the first appointment following bonding and initial archwire placement. The central incisor failed to move and over a period of 5 weeks extensive anchorage loss occurred, with obliteration of most of the space generated by the maxillary premolar extractions.

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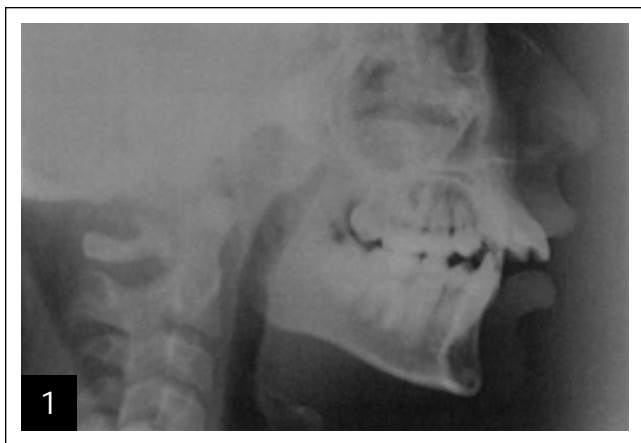


Figure 1. Preoperative lateral skull radiograph illustrating the significant Class II division 1 malocclusion.

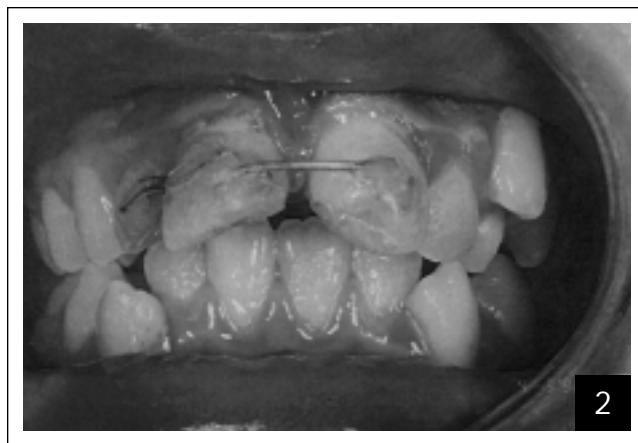


Figure 2. The splint following trauma to the maxillary incisors.



Figure 3. The ankylosed incisor was excluded from the maxillary arch wire mechanics, while the remaining labial segment was retracted.

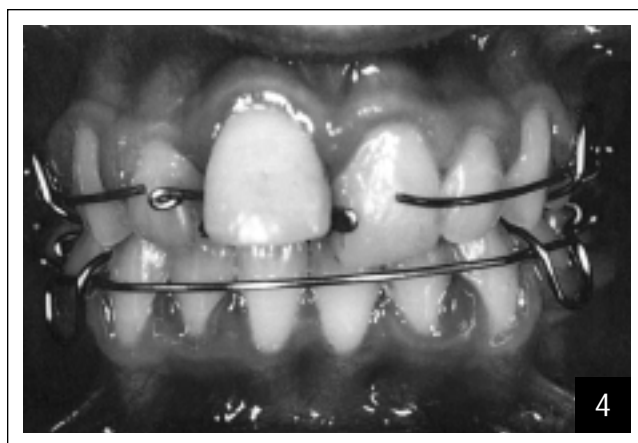


Figure 4. Orthodontic treatment is completed, with the ankylosed incisor in its original anterior position.

The ankylosed incisor was immediately excluded from any further archwire mechanics. To regain the lost space, increased headgear wear was advised. Patient compliance, however, was a problem. To resolve these difficulties, the anterior location of the ankylosed maxillary incisor was used to good effect. When the final stainless steel working wires were *in situ*, Class II elastics were applied bilaterally to the ankylosed incisor. Thus, the ankylosed incisor was used effectively in overjet/overbite reduction and molar relationship correction. At debonding of the brackets, conventional removable retainers were constructed, except for the anterior position of the ankylosed incisor (Figures 3, 4).

As the parents and patient wished to avoid surgery to treat the ankylosed incisor, a conservative restorative approach was undertaken to align this tooth. The clinical crown was reduced, and restored with a light cured composite resin material, using an incremental build-up technique (Figures 5, 6). Long-term definitive restorative treatment using a single endosseous implant, is planned.

DISCUSSION

The treatment of ankylosis in the primary dentition is usually relatively simple. Treatment may be conservative, merely awaiting the normal exfoliation of the primary tooth. The ankylosed primary tooth may be extracted or if necessary restored.^{4,6-8} Treatment of ankylosis in the permanent dentition is more complex, but again will be influenced by the tooth affected and the severity of the ankylosis. Treatment modalities range from a conservative approach such as restorative intervention, to surgical extraction of the affected tooth.¹ Binderman⁶ advocates surgical luxation of the permanent ankylosed tooth, but should the tooth not spontaneously erupt thereafter, to extract it. Geiger and Bronsky⁹ have described successful treatment involving surgical luxation of the ankylosed tooth with prompt application of orthodontic traction using vertical elastics. Complications with surgical intervention do arise, however, including pulpal devitalization or root resorption.^{1,10}

The risk of dental ankylosis or a root resorptive process following trauma is well recognised.² The opti-

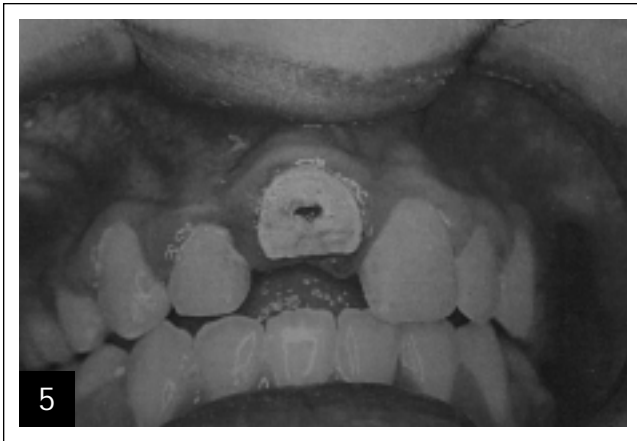


Figure 5. Reduction of the ankylosed incisor crown.



Figure 6. The ankylosed incisor has been realigned and restored.

imum time to initiate orthodontic treatment following trauma is, however, not well established. Zachrisson¹¹ recommends delaying orthodontic treatment to reduce the risk of root resorption, while Andreasen and Andreasen¹² recommend early movement of displaced teeth to avoid the risk of dental ankylosis. In the case of replanted teeth Zachrisson¹¹ recommends an observation period of at least 1 year, which was not a practical option for this patient.

The planned second phase of orthodontic treatment was initiated. In view of the short period, 8 weeks, between the time of injury and the application of orthodontic forces, pre-operative diagnosis of dental ankylosis was not possible. Definitive diagnosis was made following initial archwire placement. The effects of the ankylosed incisor were immediate and undesirable. The anterior position of the ankylosed tooth was however, used to advantage. Bilateral application of Class II elastics to the ankylosed incisor was possible, and helped correct the overall malocclusion.

CONCLUSIONS

The risk of dental ankylosis arising following a traumatic injury during orthodontic treatment is well established. Early detection of an ankylosed tooth will, with its exclusion from all archwire mechanics, avoid deleterious tooth movements. This case report illustrates that the immobility of the ankylosed tooth, depending upon the location and the malocclusion type, may prove a useful adjunct to orthodontic treatment mechanics.

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