

## Orthodontic Movement in a Laterally Luxated Tooth: A Case Report

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### Abstract

There is a small evidence base for the orthodontic movement of certain types of dental trauma beyond the acute and subacute phase in the adult population. This may be due to the vast majority of dental injuries receiving early intervention and few delayed presentations. This report describes a clinical case of central incisor trauma with delayed presentation and its management with a short-term fixed sectional orthodontic appliance. The trauma was treated successfully via a multi-disciplinary approach between Orthodontic and Restorative Departments in a dental hospital within a time frame of 12 weeks.

**Clinical Relevance:** Most dentists are familiar with the emergency management of dental trauma. Some presentations do not fall under one definitive treatment protocol and therefore careful evaluation is required prior to beginning treatment.

**Keywords:** Orthodontic Movement; Dental Trauma

### Introduction

Dental trauma is a relatively common presentation within the population, particularly in paediatric and adolescent age groups. The age group most at risk of dental trauma is 6 - 12 years and the second most prevalent age group 16 - 20 years [1]. A study showed a peak incidence of those attending emergency "after-hours" clinics or departments to be between the ages of 18 - 23 years, with almost a quarter of the injuries to the permanent dentition being a luxation-type trauma [2]. The recommended emergency management for a lateral luxation injury is to manually reposition the displaced tooth digitally, or with forceps, into its correct location (surgical repositioning), followed by stabilisation with a splint for 4 weeks [3]. The earlier this is performed, the greater the chance of periodontal healing. When presentation is delayed, pulpal death and ankylosis or infection related resorption of the tooth is almost certain. This is due to mechanical damage of the periodontal ligament resulting in cellular necrosis which disrupts the normal homeostatic mechanism [4]. Evidence of the efficacy of orthodontic appliances in managing dental trauma is lacking [5]. Guidelines for management suggest following the common acute (less than 1 hour) and subacute (within 24 hours) management protocols [6]. In the delayed presentation of a laterally luxated, mature central incisor where ankylosis is inevitable, early orthodontic movement of the tooth can reposition and align the tooth into its correct position, improving overall long-term prognosis.

### Literature Review

The current literature documenting the treatment outcomes for orthodontically repositioned teeth, following lateral luxation injury, is sparse. However, literature documenting the outcomes of intrusive injuries is more common. There are three accepted treatment options for intrusive injuries: allowing spontaneous re-eruption, orthodontic extrusion or surgical repositioning. As the sequelae of lateral and intrusive luxation injuries are similar, combined results of these studies are outlined below.

Andreasen, *et al.* [7] performed a prospective analysis of the healing outcome (pulpal necrosis, root resorption and marginal bone breakdown) related to treatment delay and method of repositioning for 140 intruded permanent teeth. Allowing spontaneous eruption (in immature teeth with incomplete root formation) resulted in the lowest number of healing complications. This is supported by other studies [8-10]. Their findings also suggest a small but not significant decrease of marginal bone breakdown for orthodontically, as opposed to surgically repositioned teeth.

A retrospective study conducted by Tsilingaridis, *et al.* [8] of intrusive injuries to 60 permanent incisors evaluated treatment alternatives in relation to pulp survival, periodontal healing, degree of intrusion and root development. In this study surgical repositioning was least favourable, suggesting that it may induce a second trauma to the already damaged tooth. Despite this no firm conclusion could be drawn comparing orthodontic extrusion versus surgical repositioning. This is supported by a longitudinal study examining the treatment outcomes of 31 intruded incisors [9]. Both of these studies also highlighted the importance of immediate active treatment (orthodontic traction or surgical repositioning) post-injury. An increased failure rate was observed if active repositioning was performed after 2 weeks.

In summary, where repositioning of a tooth is necessary, there is no clear difference in terms of healing outcomes for surgically repositioned versus orthodontically repositioned teeth. The latter may not be favoured due to increased clinical time and costs incurred [7,9]. Some case reports have documented successful outcomes for intruded teeth repositioned orthodontically, particularly in the delayed presentation where healing processes have begun. Orthodontic repositioning may avoid further trauma to the periodontium in comparison to surgical repositioning [8]. A further benefit may be the avoidance of the loss of bone support and aesthetic defects that can occur after surgical repositioning [11].

## Case Report

### History

A 20-year-old male presented to the emergency dental department more than 48 hours after sustaining dental trauma as a result of a fall. The patient had received some emergency soft tissue management shortly after the injury in a local accident and emergency department. No acute treatment of the dental trauma was provided.

### Assessment and management

Clinical and radiographic examination confirmed a lateral luxation injury to the upper right central incisor which was in anterior crossbite (Figures 1 and 2). The tooth was non-mobile with a degree of intrusion. There was also a complicated crown fracture of the upper right lateral incisor. Due to the delay in presentation and to avoid further trauma to the already compromised periodontium, the decision was made not to reposition surgically. As the tooth was a mature incisor in anterior crossbite, it would not correct spontaneously. A fixed sectional appliance therefore was suggested to assist in repositioning the tooth. The appliance used was a pre-adjusted fixed appliance system (Victory series, 3M Unitek). This was bonded from the upper right canine to upper left canine tooth. A temporary bite-raising glass ionomer restorative was placed on the occlusal surface of both upper first permanent molar teeth to allow for correction of the anterior crossbite.





**Figures 1 and 2:** Intraoral views of trauma.

The patient returned 3 weeks later for orthodontic review and first stage endodontic treatment of the traumatised teeth. At this appointment the upper right central incisor had already moved into an acceptable position and the glass ionomer was removed. The sectional appliance was removed 2 weeks later with a good aesthetic result. The patient’s endodontic and restorative treatment was finished thereafter within a brief period of retention (Figures 3, 4 and 5). Follow-up was arranged for 3-month radiographic review.



**Figure 3:** Period of retention with a Hawley-type retainer.



**Figures 4 and 5:** Endodontic treatment and final restoration.

### Discussion

Most dentists are familiar with the emergency management of dental trauma. However, some presentations, particularly those that are delayed or combination injuries, do not fall under one definitive treatment protocol. Teeth that have been traumatised must be evaluated carefully prior to beginning or continuing orthodontic movement [12]. A minimum 6-month wait is recommended when there has been moderate to severe damage to the periodontium [13]. This is a guideline designed for patients due to undergo orthodontic movement of teeth for general malocclusion and do not reflect presentations such as the above. Following this guideline is likely to result in the tooth becoming ankylosed in an unfavourable position. Early orthodontic repositioning allows supervised ankylosis to occur when the tooth is aligned.

### Conclusion

There is a small evidence base for the orthodontic movement of certain types of dental trauma beyond the acute and subacute phase in the adult population. This may be due to the vast majority of dental injuries receiving early intervention and few delayed presentations. We are unaware of any guidelines that pertain to specific presentations such as in this case where the clinical outcome shows merit for orthodontic tooth movement.

### Contributors

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### Conflicts of Interest

None.

### Ethics Approval

None required.

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