

Rescuing Smiles: Managing an Intruded Maxillary Incisor with a Complicated Crown Fracture in a Paediatric Patient

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ABSTRACT

Managing dental traumatic injuries can be challenging for dental care professionals, particularly in the paediatric population, which often presents additional difficulties with anxiety and behaviour management. This case report discusses the management of a paediatric patient with an intrusion injury of the maxillary left permanent incisor, accompanied by a complicated enamel-dentin fracture. Treatment options included active monitoring, extrusion using orthodontic appliances, or surgical repositioning. Orthodontic extrusion was selected, facilitating successful endodontic and restorative treatment of the tooth. This case also

emphasizes the importance of behaviour management in paediatric patients and how it can impact treatment planning.

INTRODUCTION

An intrusive luxation injury involves the apical displacement of a tooth into a socket.¹ These injuries account for 1.9% of all dental traumatic injuries.² Management options in the paediatric patient include spontaneous repositioning, orthodontic extrusion and surgical extrusion.

CASE DETAILS

History

An 11-year-old female was urgently referred to the Paediatric Dental Department from her GDP following dental trauma that was sustained three weeks prior, where she fell on a treadmill at school and knocked her teeth. She visited an emergency dentist the following day, where radiographs were taken and phenoxymethylpenicillin was prescribed. Her GDP referred her two days later.

At the patient's initial assessment in our department, she reported no pain or infection symptoms. Her medical and social histories were unremarkable. She is a regular dental attender with good oral hygiene and dietary habits and experiences moderate dental anxiety.

Examination

The initial examination revealed no extra-oral abnormalities and no intra-oral soft tissue pathology. The patient was in a caries-free permanent dentition and had a class I malocclusion. The maxillary left central incisor was intruded with a complicated crown fracture and gingival overgrowth over the crown.



Figure 1: Pre-operative clinical photographs taken at the new patient assessment appointment, demonstrating the extent of intrusion and crown fracture of the UL1.

Special investigations

Pulp sensibility tests of the UR2 UR1 UL1 UL2 were performed out. These teeth were neither tender to percussion nor mobile. All responded positively and equally to cold sensibility testing. However, the UL1 exhibited slight grey discoloration and a metallic sound upon percussion.

Periapical radiographs of the upper incisors revealed that the UL1 had a fracture extending through the enamel, dentine, and pulp, with a closed apex and no evident periapical pathology. The tooth was intruded approximately 4mm compared to the UR1.



Figure 2: Pre-operative periapical radiograph of the UL1, showing degree of intrusion and loss of periodontal ligament space, as well as extent of fracture line into the enamel, dentine and pulp.

Diagnoses

UL1 – moderate intrusive luxation injury with complicated enamel-dentine fracture

Treatment

The treatment options, along with their associated risks and benefits, were discussed. These included active monitoring or extrusion to enable endodontic treatment. Extrusion options included orthodontic extrusion, surgical repositioning, or surgical

extrusion using the Benex® system. The patient expressed anxiety about a surgical approach. A consultant orthodontic opinion was sought, and orthodontic extrusion of the UL1 with a removable appliance was advised, noting the risk that the tooth might not respond if ankylosed. A Begg bracket was cemented to the UL1, impressions were taken, and an upper removable appliance for UL1 extrusion was fabricated.

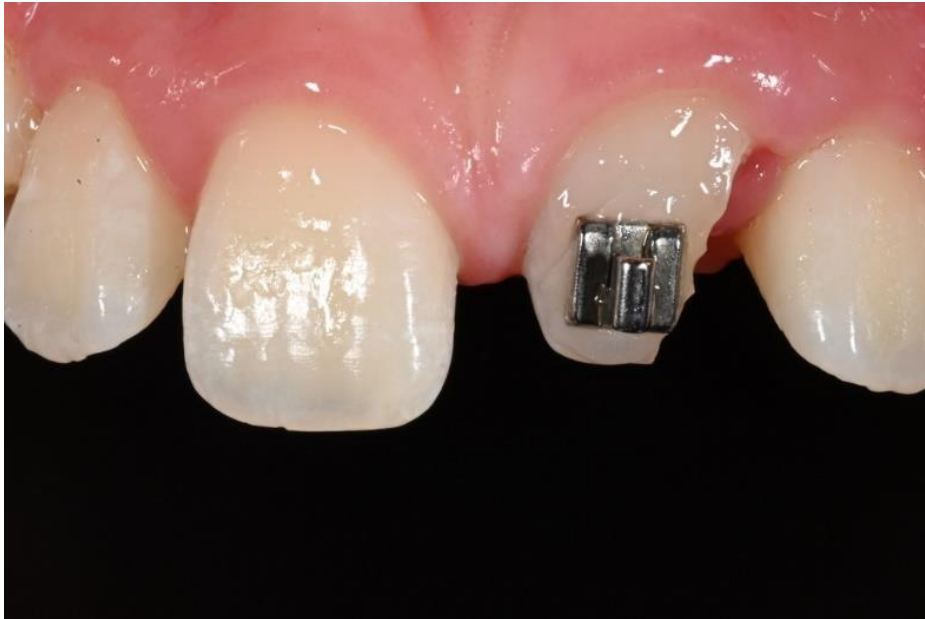


Figure 3: Clinical photograph showing cemented Begg bracket on the UL1 to allow for orthodontic extrusion using a removable appliance

Follow-up

The patient was reviewed 6 weeks later and the UL1 had only extruded by 0.5mm. Pulp sensibility tests were repeated and the UL1 now had a negative response to cold testing. An updated periapical radiograph revealed possible external inflammatory root resorption of the UL1. A small volume CBCT scan was taken to assess the extent of resorption and restorability. This revealed apical inflammatory root resorption, periapical periodontitis and sufficient coronal tissue for restoration.

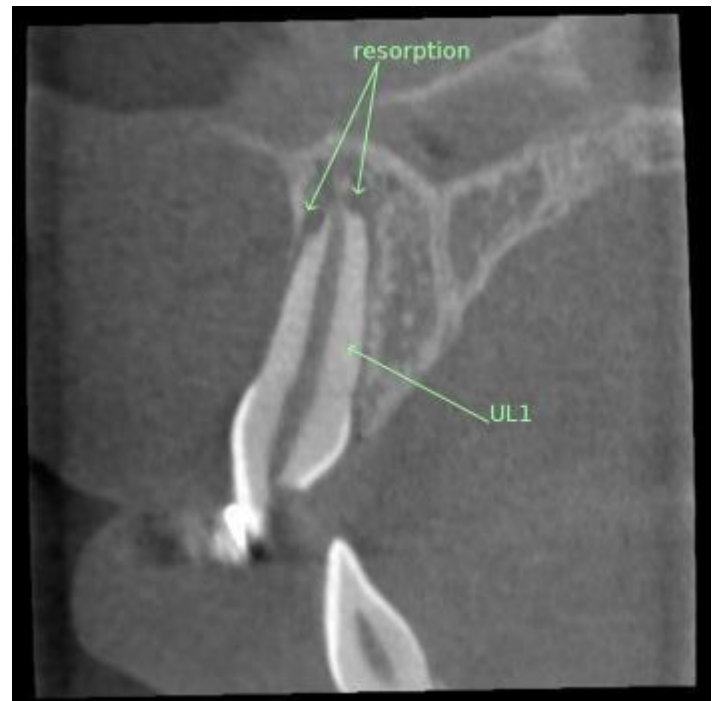
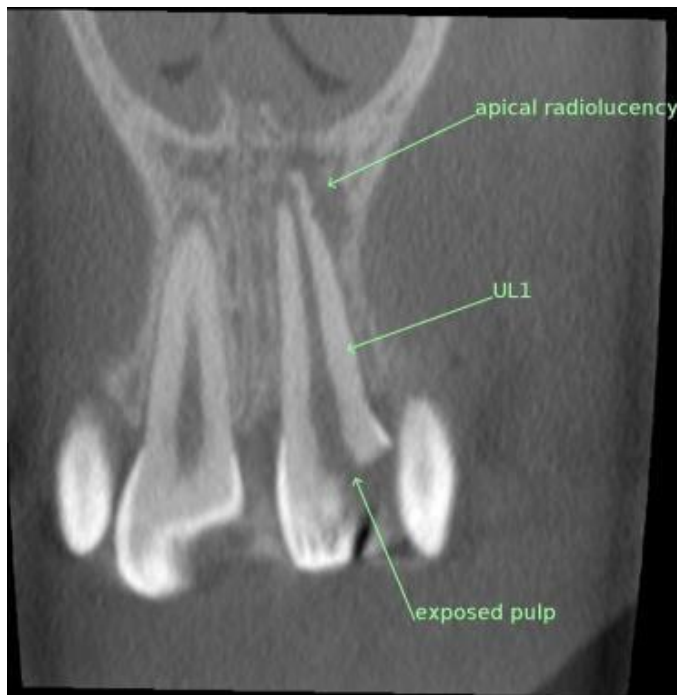


Figure 4: A periapical radiograph of the UL1 and images from the CBCT scan of the UL1 showing external inflammatory root resorption and apical pathology

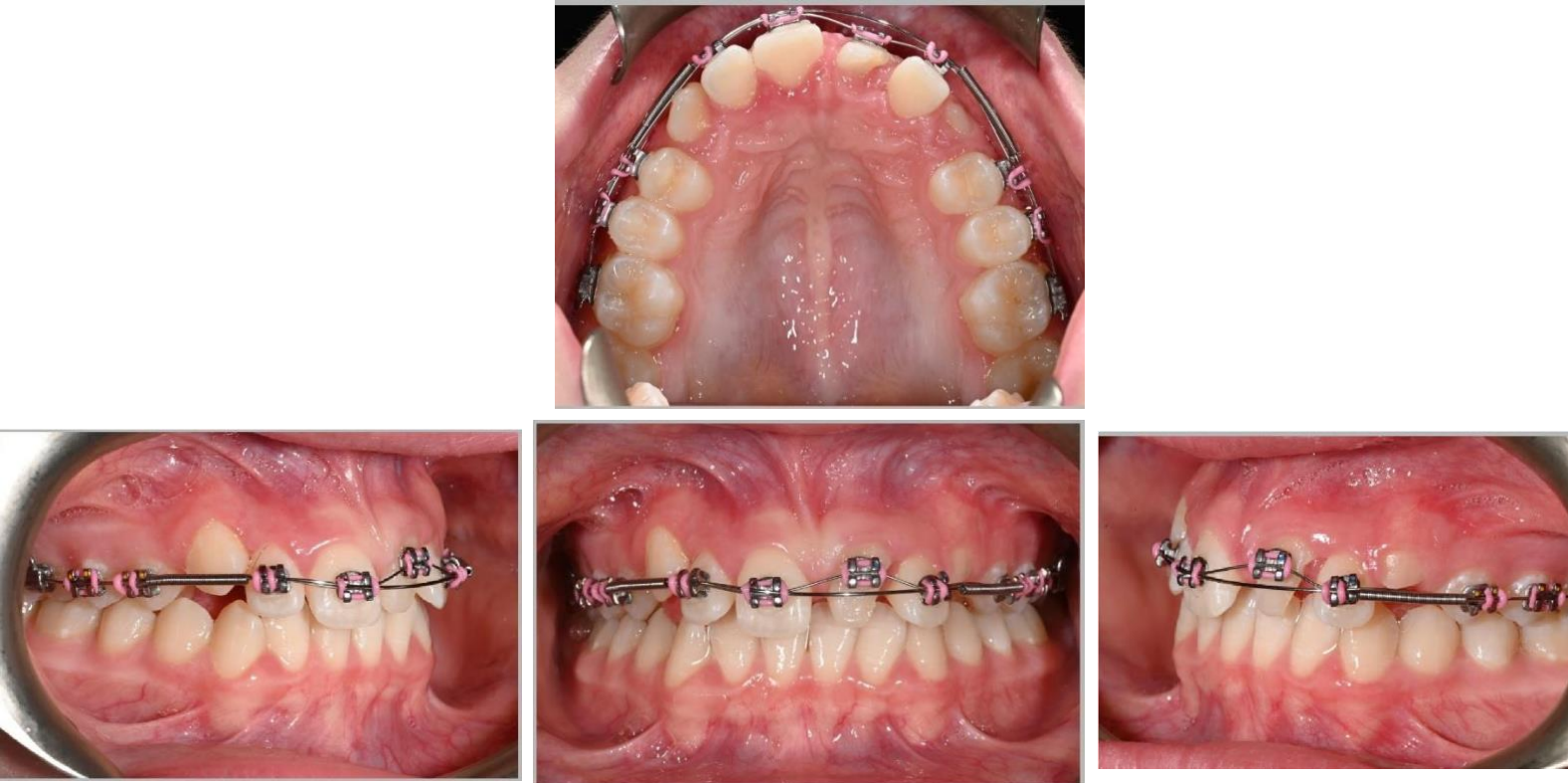
Another orthodontic opinion was sought for using fixed orthodontic appliances to further labially extrude the UL1 to facilitate endodontic treatment. Under consultant

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guidance, an upper fixed orthodontic appliance was placed using a 0.16 stainless steel base wire. A 0.12 NiTi wire was placed as a piggyback wire to labially extrude the UL1.

Figure 5: Clinical photographs showing the fixed orthodontic appliance to extrude the UL1



After 4 weeks, the UL1 has sufficient coronal tooth structure to proceed with endodontic treatment and coronal restoration. Under inhalation sedation and local anaesthetic, the UL1 was extirpated and dressed with non-setting calcium hydroxide. A composite restoration was placed using a layering technique in a celluloid strip crown. The canal was obturated with Biodentine™ 8 weeks later.



Figure 6: Clinical photographs of the UL1 following completion of orthodontic extrusion (top) and following composite restoration (bottom)



Figure 7: Periapical radiograph showing obturation of the UL1

The patient continues to be monitored in accordance with the International Association of Dental Traumatology Guidelines³, in particular for replacement resorption and ankylosis. The patient is currently happy with the aesthetics of the UL1, however we have discussed restoration modifications to improve the colour and shape.

DISCUSSION

Intrusive luxation is considered the most severe type of luxation injury due to the significant crushing of periodontal ligament fibres. The risk of complications is high; 85% develop pulpal necrosis and 66% develop root resorption.⁴ Additionally, teeth with crown fractures that have sustained concomitant luxation injuries are at a higher risk of pulpal necrosis.⁵

Management of intrusion injuries depends on the severity of displacement and stage of root development. Guidelines recommend that teeth with incomplete root formation be monitored for spontaneous re-eruption.³ If no movement is observed after 4 weeks, repositioning is advised. For teeth with complete root formation, repositioning is recommended if the tooth is intruded 3-7mm, with surgical repositioning suggested for intrusions greater than 7mm. Endodontic treatment should be initiated within 2 weeks of the initial injury due to the high risk of pulpal necrosis and inflammatory root resorption.

The primary purpose of extrusion is to facilitate endodontic treatment and prevent the onset of external inflammatory root resorption. Given the extent of intrusion, this case was suitable for either orthodontic or surgical extrusion. Surgical extrusion would have allowed rapid repositioning but carries risks of secondary trauma, increased resorption risk, and the need for splint stabilization. The Benex® system provides an atraumatic alternative to conventional surgical repositioning.

In this case, orthodontic extrusion was preferred as it is less traumatic than surgical extrusion and accommodated the patient's significant anxiety around surgical procedures. The removable appliance used for orthodontic extrusion resulted in minimal tooth movement, partially due to erupting maxillary canines affecting the appliance fit and the lack of continuous force applied to the tooth. The fixed orthodontic appliance ultimately achieved a satisfactory outcome in a shorter time with minimal discomfort. Inhalation sedation was offered as a pharmacological behaviour management technique to ease the patient's anxiety around local anaesthesia administration.

CONCLUSION AND CLINICAL IMPLICATIONS

This case demonstrated the management of an intruded permanent incisor using orthodontic extrusion as an alternative to surgical repositioning. It also highlighted how behavioural challenges in paediatric patients can impact treatment options and modalities.

My involvement in the case:

I was directly involved in this case by placing the fixed orthodontic appliance and carrying out orthodontic extrusion, endodontic treatment and restorative build-up of the tooth. I continue to see the patient for reviews. I would like to thank Miss Ajit Tanday, Consultant in Paediatric Dentistry, for her support with this case.

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