

Management of a rare combination of dental trauma: A case report

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Abstract

The occurrence of combined injury of intrusion, avulsion and lateral luxation is rare and the mechanism responsible for this is intriguing. This case report describes such a combined injury and its management. The rationale behind the treatment modalities is discussed.

Key words: Avulsion, dental trauma, intrusion, lateral luxation, orthodontic extrusion

Introduction

Tooth avulsion, total displacement of a tooth out of its socket is an infrequent injury, comprising only 0.5-16% of all traumatic injuries. This is an alarming experience, which causes esthetic concern to the patient. Replantation of the avulsed tooth can be done, provided, the tooth can be traced, is not severely damaged and is carried in proper transport medium.^[1] The term traumatic intrusion refers to displacement of a tooth deeper into the alveolar bone due to traumatic force and is usually associated with alveolar fracture. It comprises 3% of all injuries to the permanent teeth. It is usually associated with complications like pulp necrosis, inflammatory root resorption, ankylosis and loss of marginal bone support. These complications may be overcome by early endodontic treatment, for which access to crown structure is required.^[2] For this, the suggested treatment methods are i) observation for spontaneous re-eruption after gingivectomy ii) immediate surgical repositioning and fixation iii) orthodontic extrusion iv) combination of surgical and orthodontic therapy which is usually done in cases of severe intrusion.^[3,4] In lateral luxation injuries, the tooth is displaced laterally from its socket and is also often associated with alveolar fracture. Repositioning of the tooth involves forceful degree of reduction, followed by splinting. A high incidence of pulp necrosis, pulp canal obliteration and external root resorption is associated with this type of injury.^[5] Luxation injuries usually involve two or more teeth and are usually associated with crown fracture, while avulsions usually involve single tooth. The occurrence of combined injury of avulsion, intrusion and extrusion, is rare. Andreason^[6] has studied the association between different types of injury to teeth and found that of 40 intrusively luxated teeth, no associated teeth were observed to have avulsed, while of 196 avulsed teeth, no teeth had been intrusively luxated.

This case report describes the management of rare combined dental traumatic injury involving avulsion of the

central incisor, extrusive luxation of the other central incisor and intrusion of lateral incisor along with crown and alveolar fracture.

Case Report

A 13-year-old male patient came to the dental clinic with dental traumatic injury after falling from a bicycle. On oral examination, 13 had crown fracture involving enamel only, 12 was intruded, 11 had lateral luxation and 21 was avulsed [Figure 1]. The crown of 12 had been completely intruded with only the fractured incisal tip being seen in the oral cavity.

Unfortunately the patient could not trace the avulsed tooth 21. Radiographs were obtained to rule out root fracture and confirm the diagnosis that was done during clinical examination [Figure 2]. He had no other injuries and his medical history was uneventful. The laterally luxated tooth 11 was repositioned and splinting was done for four weeks, as it was associated with alveolar fracture [Figure 3]. When the patient was reviewed after four weeks, mobility of the teeth had reduced. However, radiographically 11 showed signs of external root resorption [Figure 4] and hence endodontic treatment was initiated immediately and calcium hydroxide dressings were given. It was decided to extrude 12 so that endodontic treatment could be carried out at the earliest. A helix was incorporated into 0.016 inch stainless steel arch wire that was bonded onto the adjacent teeth (from premolar on right side to canine on left side). A part of the crown of intruded 12 had to be exposed by gingivectomy and the fractured incisal edge was rebuilt with composite resin so that orthodontic bracket could be bonded. A ligature wire was tied from the bracket to the orthodontic wire [Figure 5]. Slow extrusion was done over a period of five weeks. A 4 mm extrusion was achieved at the end of this period. The remaining extrusion was achieved using 0.016 inch Nitinol wire bonded to the adjacent teeth, in four weeks [Figure 6]. Endodontic treatment was completed in both 11 and 12 [Figures 7 and 8]. All the teeth with crown fractures were restored with composite. A removable partial denture was used to replace the lost 21 [Figures 9 and 10].

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Figure 1: Intra oral view during the first visit of the patient.



Figure 4: Root of 11 shows external root resorption.



Figure 2: Intra oral periapical radiograph showing intrusion of 12, lateral luxation of 11 and avulsion of 21.



Figure 5: Orthodontic extrusion of intruded 12 using stainless steel arch wire.



Figure 3: Splinting of teeth using stainless steel arch wire



Figure 6: Remaining orthodontic extrusion of 12 using Nitinol wire.

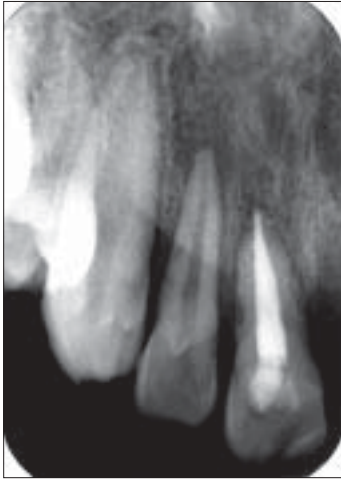


Figure 7: Intra oral periapical radiograph taken after completion of endodontic treatment of 11.



Figure 10: Facial view of the patient postoperatively.



Figure 8: Intra oral periapical radiograph taken after completion of endodontic treatment of 12. Note the apical root resorption of 11.

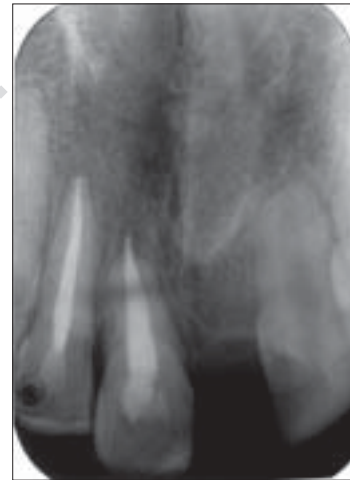


Figure 11: Intra oral periapical radiograph at six month follow up.



Figure 9: Intra oral view after completion of composite restorations and removable partial denture.

At the six-month follow-up appointment, the patient was asymptomatic. Root resorption of 11 was arrested and the root of 12 appeared to be healthy during radiographic examination [Figure 11].

Discussion

The combined occurrence of intrusive luxation, lateral luxation and avulsion is rare. The reason for this uncommon occurrence may lie with the different mechanisms of injury associated with these types of trauma. Although exact mechanisms are as yet unknown, it is agreed that luxation injuries are the result of a direct impact on the incisal edge in an axial/lateral direction and the energy in this form of impact can be expended to crown fracture, while avulsions will result following a blunt impact associated with the high resilience of tooth supporting structures.^[7]

As the lateral luxation is usually associated with fracture of alveolar socket, manipulation is done under local anesthesia using the thumb and the index finger. The laterally luxated tooth should be repositioned first by forcing the displaced apex out of its locked position within the labial bone and then axial pressure is applied in apical direction to manipulate the tooth into its natural position. Splinting is required routinely after reduction of lateral luxation injuries.^[3] The period of splinting should be decided by the clinician based on the extent of alveolar fracture and mobility of injured tooth with follow-up appointment every two weeks.^[8] Andreason^[3] has recommended three to four weeks splinting period for luxation injuries associated with alveolar socket wall fracture.

In the case described above, the intruded tooth was extruded orthodontically to facilitate endodontic treatment. Pulpal necrosis occurs in a significantly large number of intrusive luxation injuries and therefore root canal therapy should be anticipated.^[3] Observation for spontaneous eruption for first two months after the injury is not advisable when the whole crown structure is intruded. Lack of eruption during the observation period involves a number of problems including pulp necrosis, root resorption and ankylosis especially when the traumatic intrusion is severe.^[9] Surgical repositioning leaves the intruded tooth with lack of supporting tissues, thus causing an undesirable esthetic effect. It is also associated with high incidence of root resorption and formation of periodontal pocket.^[5] Orthodontic movement renders a more biological way of repositioning the tooth.^[3] Access for root canal treatment can be established early enough so that inflammatory resorption can be prevented. However, the effectiveness of orthodontic extrusion depends on the mobility of tooth soon after the injury.^[10] An intruded tooth that is clinically immobile may not respond to orthodontic traction as it may be tightly wedged into the surrounding alveolar bone.

The timing of initiation of orthodontic extrusion is important. A cooling off period is also recommended to reduce the possibility of collateral damage. One should keep in mind that when one tooth has been luxated or fractured, the other adjacent teeth may have also suffered injury to some extent. Hence, at least anchorage of 2-3 healthy adjacent teeth should be taken.^[11] In the case described above, in order to bring about orthodontic extrusion, a helix was incorporated in the stainless steel arch wire, which was used to splint the teeth in order to enhance the range of action of the arch wire. According to Oulis *et al*^[2] when the splinting of teeth adjacent to the intruded tooth is recommended, the splint should include the injured teeth and one or two extra teeth on each side, to form a multiple semi-rigid splint unit. This composite dental unit will absorb the reactive component of the light force applied to extrude the tooth, while preventing tipping movements of the other teeth in the splint unit. Using fixed appliances have the advantage of not

depending on patient compliance, in contrast to the removable appliances, which are not always worn full-time, as instructed, thus prolonging the overall treatment time and jeopardizing a successful outcome.^[12] After the 4 mm extrusion, in order to achieve further extrusion, Nitinol wire was bonded. The wire at the region of intruded 12 was tucked onto the bracket bonded to 12, taking advantage of built in memory and super elasticity of the wire.

As the patient could not locate the avulsed tooth, replacement of missing 21 was done with removable partial denture. Though a conventional fixed partial denture was an alternative, a major disadvantage is that it may involve preparation of healthy abutment teeth for crowns. Unless the abutment teeth have extensive preexisting restorations, this may not be acceptable to the patient, who may desire a more conservative treatment alternative. Also, the anatomic considerations of the size of the pulp, continuing soft tissue changes as the teeth continue to erupt and other growth and development that will occur preclude extensive crown preparations.^[13]

The luxated teeth should be tested regularly for pulp vitality, as there is 77% chance of pulp necrosis in case of luxation injuries. Radiographs should be taken regularly to rule out ankylosis, marginal bone loss and root resorption as high incidence has been observed.^[3] Teeth that develop inflammatory resorption should receive endodontic treatment immediately, with several calcium hydroxide dressings in between.^[14] However, its therapeutic value in inhibiting external root resorption, in contrast to short-term calcium hydroxide therapy of one to two weeks followed by obturation with guttapercha and sealer, has been questioned.^[8] In the above case, in spite of multiple calcium hydroxide dressings, some amount of apical root resorption was observed in the follow up appointments.

Conclusion

The combined occurrence of intrusion, lateral luxation and avulsion is rare and the mechanisms responsible for this event are intriguing. Management of such a case with multiple injuries to anterior teeth involves repositioning of the laterally luxated tooth followed by splinting orthodontic repositioning of the intruded tooth, esthetic replacement of avulsed tooth and regular clinical follow up with intra-oral radiographs to monitor pulp necrosis, ankylosis and root resorption.

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