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Multidisciplinary treatment of a case: An unusual combination of avulsion and intrusive luxation

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Abstract

Avulsion and intrusive luxation are two severe and complicated types of dental trauma. Combination of these two types of injury is rare in the literature because they vary in terms of underlying mechanism of occurrence. This case report describes the management of an unusual traumatic injury of two permanent maxillary central incisors with avulsion and intrusive luxation concomitantly. The patient was treated with a multidisciplinary approach of oral and maxillofacial surgery, endodontics and prosthodontics and case progress was followed-up over a two-year period.

Keywords: Dental trauma, avulsion, intrusive luxation, splinting, endodontics

1. Introduction

Injury to the teeth and associated oro-facial structures is one of the main issues of oral and maxillofacial surgery and requires immediate intervention. Trauma to supporting tissues (extrusive, lateral and intrusive luxation, tooth avulsion) includes 15 to 61% of traumatic episodes and considered the most severe lesions [1]. Avulsion is represented by complete displacement of a tooth outside its socket [2]. Children between 8 and 10 years of age are most affected because of the short and incomplete roots and resilient periodontium and bone [3]. Ideal treatment for avulsed teeth is immediate replantation that can provide the reestablishment of esthetics and function [4] but it may not always possible to perform this approach after trauma.

Intrusive luxation is defined as deeper axial displacement of the tooth toward the alveolar bone [5]. Intrusion of permanent teeth is uncommon [6]; reported to comprise 3% of all traumas involving permanent teeth and 5-12% of dental luxations [7]. The majority of them are associated with either enamel or enamel-dentin crown fractures [8]. Recommended treatment strategies are re-eruption, orthodontic extrusion, and surgical repositioning with fixation as splint [9]. Periodontal regeneration may occur in moderate intrusions, but pulpal necrosis, pulp canal obliteration, inflammatory root resorption, alveolar bone loss, replacement resorption and marginal bone loss are the most commonly reported complications [10].

A rare traumatic injury is presented in this paper; combination of avulsion and intrusive luxation of two permanent maxillary central incisors in a young female patient. We objected to document delayed treatment of this case performed by oral and maxillofacial surgery, endodontics and prosthodontics and successful outcomes over a period of two years.

2. Case report

A 19-year-old girl referred to oral and maxillofacial surgery department at Faculty of Dentistry, Ondokuz Mayıs University with a chief complaint of fracture and loss of teeth in relation to upper front tooth region due to traffic accident 2 months ago. She denied that she had presented to emergency department for other associated injuries and no treatment applied for dental trauma. The patient had no history of medical concerns and no known drug allergies were reported. Clinical examinations were carried out; extraorally no remarkable findings were present. Intraoral examination of hard and soft tissues revealed intrusive luxation left maxillary central incisor and missing right maxillary central incisor. Gingiva was hyperemic and enlarged around the broken crown fragment of left incisor. The surface of the wound of was completely re-epithelialized on the right edentate area (Fig.1). An orthopantomogram (OPG)

and periapical radiograph was taken to rule out any broken tooth or bony segment in the socket. No alveolar bone fracture was detected on OPG (Fig. 2). Periapical radiography revealed that right central incisor was avulsed and mesially displaced left central incisor had a complicated crown-root fracture (Fig. 3). Under local anesthesia, left central incisor was repositioned by surgical extrusion. The root was removed with a forceps and semi-rigid splinting using orthodontic wire-composite was performed from right lateral incisor to left lateral incisor. The overgrowth gingival tissue was excised with the help of an electrocautery (Fig. 4). To avoid further injury to the adjacent periodontal tissues, occlusion of the patient was checked to confirm there were no premature contacts. No antibiotic coverage was administered; an analgesic and chlorhexidine 0.1% oral rinse were prescribed to the patient. Postoperative instructions included to maintain good oral hygiene and remain on a soft diet. The patient was recalled after 20 days, pulp sensitivity test applied and revealed a negative response with the left central incisor. Root canal treatment was performed in two visits and splint was removed after 4 weeks (Fig. 5). In order to restore the missing tooth, a 3.3x10 mm dental implant (Straumann AG, Waldenburg, Switzerland) was placed following 4 months healing period after avulsion injury. Crown of the intruded tooth was restored with composite resin, then porcelain veneers was performed by the prosthodontist (Fig. 6). It is noted that the patient has an openbite of 3 mm (Fig. 7). In prognosis of the case, no symptoms of inflammatory root resorption, ankylosis or marginal bone loss have observed for more than 2 years of follow-up based on both clinical and radiographic findings (Fig. 8a and 8b). The patient has been still kept on routine follow-ups.



Fig 3: Periapical radiography revealed that right maxillary central incisor was avulsed and left central incisor had a complicated crown-root fracture.



Fig 4: Left maxillary central incisor was surgically repositioned and semi-rigid splint was placed. The overgrowth gingival tissue was excised.



Fig 1: Preoperative intraoral view showing the mesially displaced left maxillary incisor with intrusive luxation and completely re-epithelialized edentate area.



Fig 2: Initial panoramic radiography of the patient. No evidence of alveolar fracture was observed.

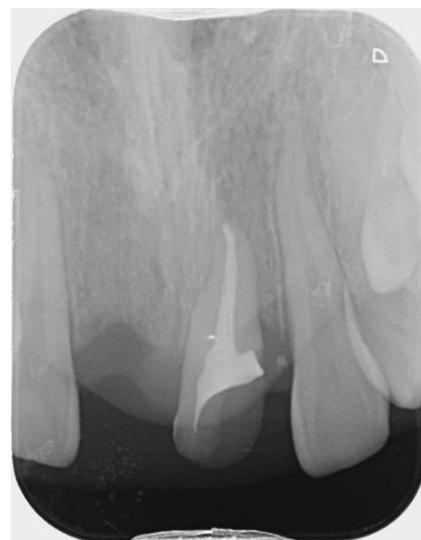


Fig 5: Root canal treatment applied to the left central incisor.



Fig 6: Prosthetic rehabilitation of the patient with porcelain veneers.



Fig 7: The intraoral image shows the proclination of maxillary anterior teeth and openbite of 3 mm.

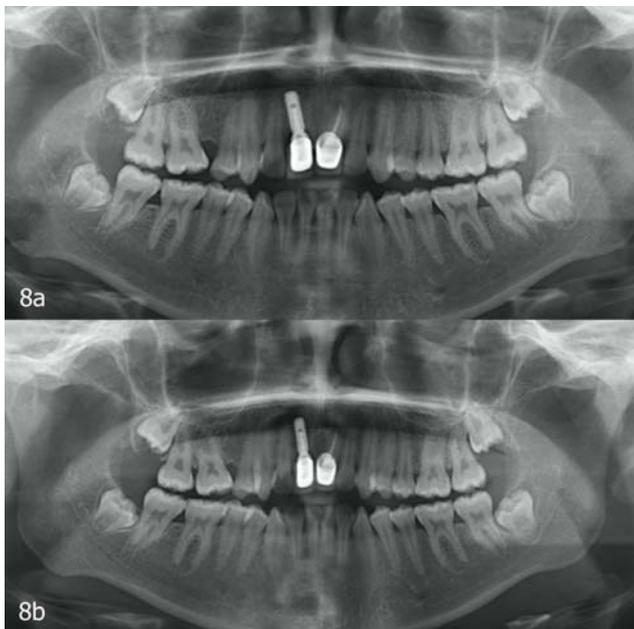


Fig 8: a: Radiographic appearance 15 months after the treatment.
b: The panoramic image taken 2 years after the injury demonstrates asymptomatic left maxillary central incisor and dental implant without any signs of radiographic bone loss and periimplantitis.

3. Discussion

Traumatic dental injuries are one of the most common reasons in dentistry requiring emergent intervention [11]. Important biological predisposing factors reported for dental trauma are large maxillary overjet and inadequate lip coverage [12]. Galea [13] observed that female patients who have prominent

maxillary incisors and incompetent lip closure often had multiple injuries to the supporting structures of the teeth. Recently a higher number of traumatic dental injuries have been detected in children with incisal overjet greater than 3 mm than those with less than 3 mm [14, 15]. Norton and O'Connell [16] concluded that the risk of dental injury is 2.99 times greater if the child has an overjet greater than 6 mm, and 2.02 times greater when an anterior open bite is present. In the present case, the biologic risk factors like open bite of 3 mm, protruded maxillary incisors and incompetent lip closure was also present in the patient making her vulnerable to traumatic injury.

Even though several factors affect the prognosis of replanted teeth, such as concomitant dental injuries, maturity of the root apex, extra-alveolar period, store medium and type and duration of splintation [11], extra-alveolar period is identified as critical for functional healing [17]. In cases that the dry time is less than 30 minutes, it is likely that PDL cells have survived and will regenerate; but after 30-60 minutes PDL cells are irreversibly damaged [18]. As the time elapsed between avulsion and replantation increases, the probability of the necrosis of the pulp tissue, cemental and PDL tissue leading to external root resorption and eventually loss of replanted teeth also increases [17]. Concomitant injuries were present in the current case, so the patient was first assisted to emergency department. Due to the reason of trauma was a traffic accident; it hadn't been feasible to keep the avulsed teeth. When she referred to our clinic, because of the unfavourable conditions, it was impossible to perform replantation. With regard to advantages like preserving the adjacent natural teeth structure, we preferred to perform a dental implant.

Although intrusive luxation rarely involves permanent teeth, when occurs, it can compromise the vitality and finally affect the longevity of the tooth [19]. These injuries may sometimes be accompanied by a comminution or fracture of the alveolar socket [20]. Due to it may lead significant damage to the PDL, pulp and alveolar bone and rupture of neurovascular supply to the pulp, it is considered among most severe types of dental trauma to the teeth [21]. According to IADT, stage of root development, age, and intrusion level are the principle factors to determine the choice of treatment [22]. It is exhibited that intrusions up to 3.0 mm have an excellent prognosis, whereas intrusions greater than 6.0 mm have a poorer prognosis with increased possibility of pulp necrosis and inflammatory root resorption [23]. In the present case, complicated crown-root fracture with the left central incisor was detected, but the alveolar socket was intact. We considered that the appropriate treatment option was to reposition the left central incisor surgically and splint it. Opportunely, 2 mm intrusion depth contributed to good prognosis.

The contemporaneous occurrence of avulsion and intrusive luxation is exceptionally rare, because the vectors of forces causing these two injuries are in different directions. While avulsion occurs as a result of blunt, frontal impacts [24], in intrusion a strict axial impact striking the incisal edge forces an axial displacement of the tooth [22]. This case report presents an unusual condition, the concomitant injury of avulsion and intrusive luxation. In a recent study, Marchiori *et al.* [25] covered a wide spectrum of associated injuries on adjacent teeth, and concluded that the most common injuries were lateral luxation, followed by crown fracture, extrusive luxation, and dentoalveolar fracture, whereas, probably because of difference in force vector intrusion were observed in a few cases. In the case reported here, we have treated a delayed traumatic injury, thus reestablished esthetic and

functional properties and prevented psychological negative impact. After 2 years the left central incisor was asymptomatic, radiographically no signs of resorption or infection was observed. Dental implant's prognosis was also good without any signs of radiographic bone loss, mobility and periimplantitis.

The urgency in seeking treatment in trauma cases is related to the socio-economic status of parents. Unfortunately majority of them have still lack of information about dental trauma management and unaware of the risks. In addition, sometimes patients are not consulted for dental rehabilitation by the emergency department. In conclusion, dental trauma management is usually complicated and requires a coordinated attention of multiple specialty branches. Due to trauma occurred most commonly in permanent maxillary anterior teeth and these teeth have a major esthetic importance, the timing and accuracy of treatment is substantial. Long-term follow-up of the patient is essential because numerous complications may occur even after years of trauma.

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