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Clinical Technique/Case Report

Multidisciplinary Approach to Delayed Treatment of Traumatic Teeth Injuries Involving Extrusive Luxation, Avulsion and Crown Fracture

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Clinical Relevance

The first dentist to meet a patient with trauma must have sufficient knowledge and equipment for all treatment options to solve traumatic injuries requiring a multidisciplinary approach.

SUMMARY

A 12-year-old boy with extrusion of the maxillary right central incisor, uncomplicated fracture of the left central incisor, avulsion of the mandibular right and left central incisors, and crown fracture of the mandibular right lateral incisor presented to the Kocaeli University Department of Pediatric Dentistry 20 days after sustaining the traumatic injuries.

Orthodontic repositioning of the extrusive maxillary right central incisor was planned. Additionally, this tooth was necrotic and needed root canal treatment. The maxillary left central incisor and right mandibular lateral incisor were necrotic and needed root canal treatment. The orthodontic and endodontic treatments were successfully performed simultaneously.

Restoration of the fractured mandibular right lateral incisor and maxillary left central incisor was completed with resin composite. Subsequent to orthodontic and endodontic treatment, prosthodontic rehabilitation was performed. At the two-year followup, the teeth appeared normal and the patient had no complaints.

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INTRODUCTION

Some of the most commonly encountered dental emergencies are dentoalveolar traumatic injuries.[1-5] Traumatic dental injury can result in damage to both dental and periradicular structures. It may also cause injury to the pulp, with or without damage to crown and/or root, or in severe cases, tooth displacement.[1-6]

Most dental injuries involve the anterior teeth and usually affect a single tooth, although certain types of trauma cause multiple injuries.[1-4,7] Studies have shown that most injuries involve the upper front teeth, and fewer involve the lower front teeth. Finally, very few patients have injuries that affect the incisors of the maxillary and mandibular arches simultaneously.[4,7,8]

Traumatic injuries of anterior teeth in children create a psychological effect on the parents and the child, especially if the injury affects the permanent dentition and involves the loss of extensive tooth structure. Untreated fractured teeth have been directly related to the emotional state and appearance of children. Children with fractured teeth experience difficulties with eating and enjoying food. Children with untreated dental issues have also been found to avoid smiling and experience negative social interactions compared with their noninjured peers. Hence, the importance of treating traumatized anterior teeth is increasing day by day.[8,9]

The prognosis of traumatic injuries depends on early intervention to injured teeth. A delay in treatment may influence the diagnostic results.[6,10-13] For instance, the success rate and treatment options of replanted teeth may vary after an hour from the avulsion.[6,13-15]Similarly, the accepted treatment for extrusion is repositioning the extruded tooth at the earliest opportunity and stabilization with a splint for up to three weeks. In cases where the tooth cannot be repositioned because of blood clot blockage or as a result of delayed treatment, a different option, such as orthodontic intrusion for tooth repositioning, may be considered.[6,10-13]

This current report presents a case of a patient in whom treatment was delayed for traumatic dental injuries in both the maxillary and mandibular jaws, including severe extrusive luxation of a maxillary central incisor, crown fracture of the left central incisor, avulsion of the mandibular right and left central incisors, and crown fracture of the right lateral incisor.



Figure 1. *The smiling appearance of the patient before treatment*.

CASE REPORT

A 12-year-old male patient with dental injury after falling from a bicycle presented to the dental clinic of Kocaeli University Department of Pediatric Dentistry 20 days after the accident.

According to the patient, he was riding with his cousin and sitting on the back seat of a bicycle. The patient sustained trauma to his face involving several skin and mucosa lacerations. He was treated in a medical emergency facility but received no treatment for his dental injuries at that time. The patient was not instructed to present to a dental clinic immediately. Therefore, the patient and his parents postponed going to a dental clinic until the skin and mucosa lacerations healed (Figure 1).

Upon clinical examination of the maxilla, the right maxillary central incisor was found to be severely extruded, and there was an uncomplicated fracture of the left maxillary central incisor (Figures 2 through 4). Both teeth were found to be nonvital according to a sensitivity test. A periapical radiograph showed that both incisors had some degree of



Figure 2. *Periapical radiograph of the upper central incisors before treatment.*

open apices and periapical pathology. The periodontal space around both roots was widened but no root or bone fracture was detected (Figure 2).

Clinical examination of the mandible found a cervical crown fracture of the right lateral mandibular incisor. A periapical radiograph revealed a widened periodontal space and a periapical lesion around the root of that tooth. However, the periapical radiograph showed no evidence of root or bone fracture. The tooth was found to be nonvital according to a sensitivity test. In addition, the patient's right and left mandibular central incisors were avulsed, and unfortunately, he had been unable to locate the avulsed teeth (Figure 5).

After clinical examination, a treatment plan was made. Because of the delay in treatment, repositioning the right maxillary central incisor by conventional digital manipulation was not possible. Therefore, orthodontic repositioning was planned (Figure 6). At the same time, root canal treatment



Figure 3. *Orthopantomographic view.*

and apexogenesis of the right and left maxillary central incisors were carried out. In addition, root canal therapy was started for the right lateral mandibular incisor. After accessing and filing the canals, calcium hydroxide was maintained in the canals and changed once a month for six months. Approximately three months after initiating the orthodontic treatment, intrusion of the teeth was completed. Three months after intrusion of the teeth, the root canals were obturated with gutta percha points. Coronal restoration of the teeth was completed using resin composite (Figure 7 through 10).

Prosthodontic rehabilitation was performed using a removable prosthesis for the missing right and left mandibular central incisors after the orthodontic and endodontic treatment was completed (Figure 8).

In the present case, the teeth were stable and the patient was completely asymptomatic for six months after surgery. After a two-year followup, the clinical and radiographic findings demonstrated that the adopted clinical protocol was successful, as the teeth were asymptomatic and there was no gingival inflammation and mobility. Radiographs showed



Figure 4. *Intraoral appearance of the patient before treatment.*



Figure 5. *Periapical radiograph of the lower incisors.*

normal healing of the periapical areas. In addition, the patient was satisfied with his appearance and was smiling well.

DISCUSSION

Facial trauma results in fractured, displaced, or lost teeth[1-16] and can have significantly negative functional, esthetic, and psychological effects.[9,16] In this present case, when the patient presented, he complained of having difficulties eating and was avoiding smiling for esthetic reasons because of his extruded and avulsed teeth.

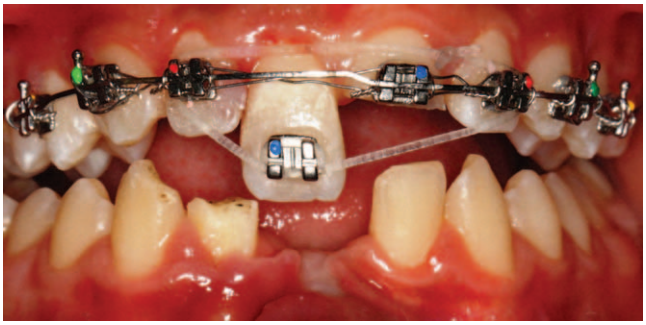


Figure 6. *Orthodontic intrusion of the upper left central incisor.*



Figure 7. *Intraoral appearance of the patient after treatment.*

The main causes of traumatic dental injuries reported in the literature are violence, collisions, falls, sports, leisure activities, and traffic accidents.[7,16,17] The literature suggests that children seven to twelve years old are the most prone to any form of dental trauma. Furthermore, boys sustain dental trauma almost twice as frequently as girls.[7,8,16] Additionally, the literature suggests that most traumatic dental injures involve the maxillary central incisors, followed by maxillary lateral incisors and mandibular incisors.[7,17,18] The findings of this current case are consistent with the available literature. The current patient was a 12-year-old boy with dental injuries involving extrusion of the maxillary right central incisor, uncomplicated fracture of the maxillary left central incisor, avulsion of the mandibular right and left central incisors, and crown fracture of the right lateral incisor after falling from a bicycle.

The literature shows that maxillary teeth are more frequently traumatized than mandibular teeth.[7,17,18] It has been reported that most dental injuries affect a single anterior tooth and very few patients have injuries affecting incisors of the maxillary and mandibular arches at the same time. The occurrence



Figure 8. *Intraoral appearance of the patient after treatment.*

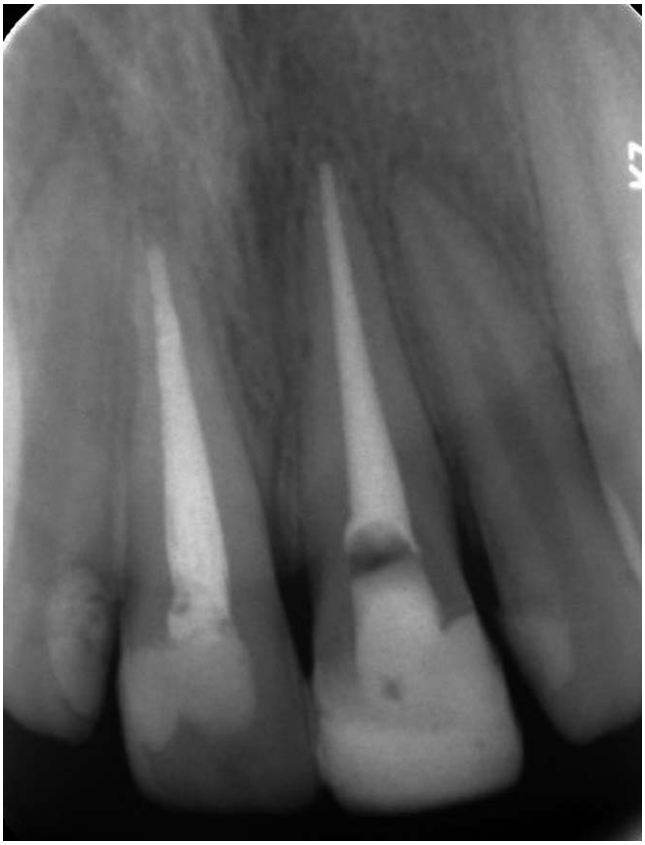


Figure 9. *Periapical radiograph of the upper central incisors after treatment.*



Figure 10. *Periapical radiograph of the lower incisor after treatment.*

of combined injuries of maxillary and mandibular arches is rare.[4,7,8] The reason for this uncommon occurrence may be the different mechanisms of the direction of the sustained force. In the present case, the patient had five injured teeth, two of which were in the mandibular arch and three in the maxillary arch. In the opinion of the authors, the direct impact to the patient's face caused the simultaneous injuries to the maxillary and mandibular arches.

In traumatic injuries, treatment options depend on such factors as injury type, affected teeth, and time elapsed after trauma. In avulsion cases, the current evidence indicates that immediate replantation favors a successful outcome.[6,13,15,19] In the current case, the patient could not locate the avulsed teeth. Therefore, because of the patient's age, the treatment option was a removable prosthesis.

In extrusion cases, the most successful outcomes of extrusion injury occur where the tooth is returned to the original position as soon as possible after trauma. Delays in seeking treatment, poor cooperation, and severity of the traumatic injuries can result in incomplete repositioning of teeth at the time of injury. In cases where the tooth cannot be repositioned because of blood clot blockage or as a result of delayed treatment, a different option, such as orthodontic intrusion for tooth repositioning, may be considered.[6,13] In the present case, orthodontic intrusion with endodontic management was chosen as the treatment option. To reposition the tooth, intrusive orthodontic tooth movement was necessary. Because of the severity of the injury, endodontic treatment was indispensable. If neglected, infection-related root resorption could have been a distinct and dangerous possibility.[12,13,20] In the current case, root canal treatment was carried out at the same time as orthodontic treatment. The reports suggest that extruded, laterally luxated, intruded, and replanted teeth have an increased risk of apical resorption after orthodontic treatment. Therefore, calcium hydroxide was maintained in the canals and changed once a month for six months to reduce the risk of resorption with healing resorptive areas and increase osteoblastic activity.

Pulp necrosis is the most common posttraumatic complication. It occurs mostly in teeth that have had injuries to the periodontal tissues. Complications after uncomplicated crown fractures are rather

uncommon. A concomitant luxation injury has been reported to increase the prevalence of pulp necrosis in teeth with crown fractures.[13,17] A late diagnosis of posttraumatic pulp necrosis can result in the manifestation of additional complications, such as inflammatory root resorption. Root resorption is a serious complication after luxation injuries in permanent teeth.[13,20] In the present case, because of the delay in obtaining treatment, the current authors did not know whether a simultaneous luxation with uncomplicated crown fracture happened when the trauma occurred. However, when the patient presented, the teeth with uncomplicated crown fractures were found to be nonvital. Nevertheless, there was no root resorption. In the opinion of the authors, this lack of resorption was a result of the short time after the trauma occurred.

CONCLUSION

Traumatic injuries may cause functional, esthetic, and psychological problems. A delay in treatment could make these problems more difficult and complicated to treat. These types of injuries can require a multidisciplinary treatment approach. Dentists who first meet a patient with trauma must have sufficient knowledge and equipment for all treatment options to solve traumatic injuries that require a multidisciplinary approach.

Conflict of Interest

The authors of this manuscript certify that they have no proprietary, financial, or other personal interest of any nature or kind in any product, service, and/or company that is presented in this article.

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