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Case Report

Treatment and 18-month Follow-up of Trauma-induced Alveolar Bone Fracture and Lateral Luxation: A Case Report

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CLINICAL SIGNIFICANCE

Prompt repositioning, appropriate splinting, and timely endodontic treatment are essential for managing alveolar fractures with luxation. Maintaining good oral hygiene and regular follow-up significantly influence long-term prognosis and help prevent post-traumatic complications.

ABSTRACT

Traumatic dental injuries are emergencies requiring prompt intervention to prevent complications. This case report presents the endodontic management and 18-month follow-up of a 32-year-old male who suffered an alveolar fracture and lateral luxation of maxillary anterior teeth due to workplace trauma. Clinical examination revealed lacerations, buccal displacement of roots, and palatal displacement of crowns. Manual repositioning and semirigid fiber splinting were performed. Endodontic treatment was initiated on tooth 11 after loss of vitality. Despite initial stabilization and favorable healing, 18-month follow-up revealed pulp necrosis and periapical pathology in tooth 13 and persistent mobility in multiple teeth, likely due to trauma severity and poor oral hygiene. This case emphasizes the importance of early diagnosis, proper repositioning, splinting, endodontic intervention, and strict oral hygiene for optimal long-term outcomes in dentoalveolar trauma.

1. Introduction

Oral traumatic injuries account for approximately 5% of all bodily injuries, with 95% being dental traumas.[1-3] With respect to the intensity and direction of the applied force, injuries may affect only the teeth or may involve the surrounding soft tissues and maxillary or mandibular alveolar bone.[4]

Dentoalveolar traumas typically occur due to falls, sports injuries, assaults, or traffic accidents and most frequently involve the anterior teeth, particularly the maxillary central incisors.[5,6] These injuries include enamel cracks, complicated and uncomplicated crown and crown–root fractures, root and alveolar fractures, concussion, subluxation, extrusive–intrusive and lateral luxation, and avulsion.[7] Crown fractures and luxation injuries are the most common types.[8]

Luxation injuries are the most frequent form of periodontal tissue trauma.[9] Lateral luxation refers to the displacement of a tooth in a direction other than its axial orientation.[10] The diagnosis of luxation is based on clinical and radiographic findings; the crowns of laterally luxated teeth are typically displaced palatally, often resulting in fracture or fragmentation of the labial alveolar bone and significant damage to the periodontal ligament.[9] The apex of the tooth may become locked within the bone. Owing to the severance of the neurovascular bundle, pulp necrosis is common in mature teeth with closed apices following lateral luxation.

Periodontal complications include external root resorption, marginal bone loss, and ankylosis, particularly when repositioning is delayed or improperly performed.[11] Treatment of traumatic dental injuries is complex and challenging; thus, accurate diagnosis, appropriate treatment planning, and regular follow-up are essential for favorable clinical outcomes.[9]

According to current treatment guidelines (International Association of Dental Traumatology – IADT), a flexible splint should be applied for approximately four weeks following repositioning to promote periodontal ligament healing.[7] Furthermore, endodontic treatment is recommended for teeth with closed apices to prevent root resorption.[11]

This case report presents endodontic treatment and 18-month follow-up of a patient with an alveolar bone fracture of the maxillary buccal cortex and lateral luxation of the maxillary incisors due to trauma.

2. Case Presentation

A 32-year-old healthy male patient presented to the Department of Endodontics, Faculty of Dentistry, Recep Tayyip Erdoğan University, three days after a workplace accident. Extraoral examination revealed laceration and edema of the lower lip and ecchymosis of the upper lip. Intraoral examination revealed an alveolar fracture of the maxillary buccal cortex and lateral luxation of teeth 11, 12, and 13. Hemorrhagic and disrupted soft tissues were observed in the anterior maxillary region (Fig. 1).

As the roots of the affected teeth were displaced buccally and the incisal edges were displaced palatally, the teeth were repositioned buccally before the fractured segment was placed. Closed reduction was performed manually, and the segment was stabilized anatomically. Semirigid fiber splinting (Interlig™, Angelus, Brazil) was applied from the right to the left first premolars using light-cured composite resin (Fig. 2). Postoperatively, the patient was prescribed antibiotics [amoxicillin

Fig. 1. Extraoral and intraoral photographs and panoramic radiograph of the patient

Fig. 3. Root canal treatment on tooth 11 and intraoral image after splinting

(1000 mg, 2x/day)] and analgesics [ibuprofen 600 mg, 2x/day]. The patient was advised to avoid trauma, maintain a soft and liquid diet, practice good oral hygiene, and refrain from biting.

At the 14-day follow-up, vitality testing was repeated, and root canal treatment was performed on nonvital tooth 11. The semirigid splint was removed after four weeks (Fig. 3).

At the 6-month follow-up, clinical and radiographic evaluations revealed asymptomatic teeth, positive vitality responses in teeth 12 and 13, and no adverse findings at the fracture site. However, the patient exhibited poor oral hygiene and was educated accordingly (Fig. 4).

At the 18-month follow-up, vitality testing revealed necrosis in tooth 13 with the presence of a periapical lesion on panoramic radiograph and slight mobility. Teeth 11 and 21 also showed mobility, and oral hygiene remained poor (Fig. 5). Despite this, the patient reported satisfaction with the functional and aesthetic outcomes of the treated teeth. Follow-up is ongoing.

3. Discussion

Traumatic dental injuries may result from falls, vehicular accidents, sports activities, and impacts from foreign objects. The extent of damage depends on factors such as trauma severity, characteristics of the impacting object, direction of the force, capacity of soft tissues to absorb impact, and the dental–occlusal relationship.[5,12] These injuries predominantly affect the maxillary anterior region, particularly the central incisors, largely due to the maxilla enclosing and protecting the mandible in the resting and occlusal positions.[13,14]

Trauma to the anterior teeth may lead to aesthetic, functional, and phonetic issues. Treatment planning should consider patient-specific factors such as age, systemic health, type of trauma, and involved tissues.[6] Maxillary alveolar fractures often result from direct or indirect forces transmitted from the mandible and commonly involve 2–3 teeth. These injuries may be accompanied by soft tissue trauma. Although teeth within the fractured segment are often immobile, dislocation or luxation may still occur.[6-15] Clinical indicators of alveolar fracture include segment mobility, disruption of the dental arch, and occlusal discrepancies.[6,16]

In the present case, trauma to the anterior maxilla led to an alveolar process fracture and lateral luxation of incisors with significant soft tissue damage. Treatment of alveolar fractures should begin promptly, as delays are associated with an increased risk of complications and reduced surgical success.[4] Repositioning within the first hour of trauma significantly reduces the risk of pulpal complications.[15]

The primary objective of treatment is to anatomically reposition and stabilize the fractured segment, often achieved through manual pressure. In cases where incisal edges are displaced buccally, correcting this displacement is essential prior to reduction.[5,17] In this case, closed reduction and stabilization were successfully performed. Lateral luxation is among the most frequent injuries to permanent teeth and is commonly associated with pulp necrosis. If not properly managed, complications such as inflammatory resorption and chronic apical periodontitis may

Fig. 2. Application of the fiber splint

Fig. 4. Intraoral photographs of the patient at the 6-month follow-up

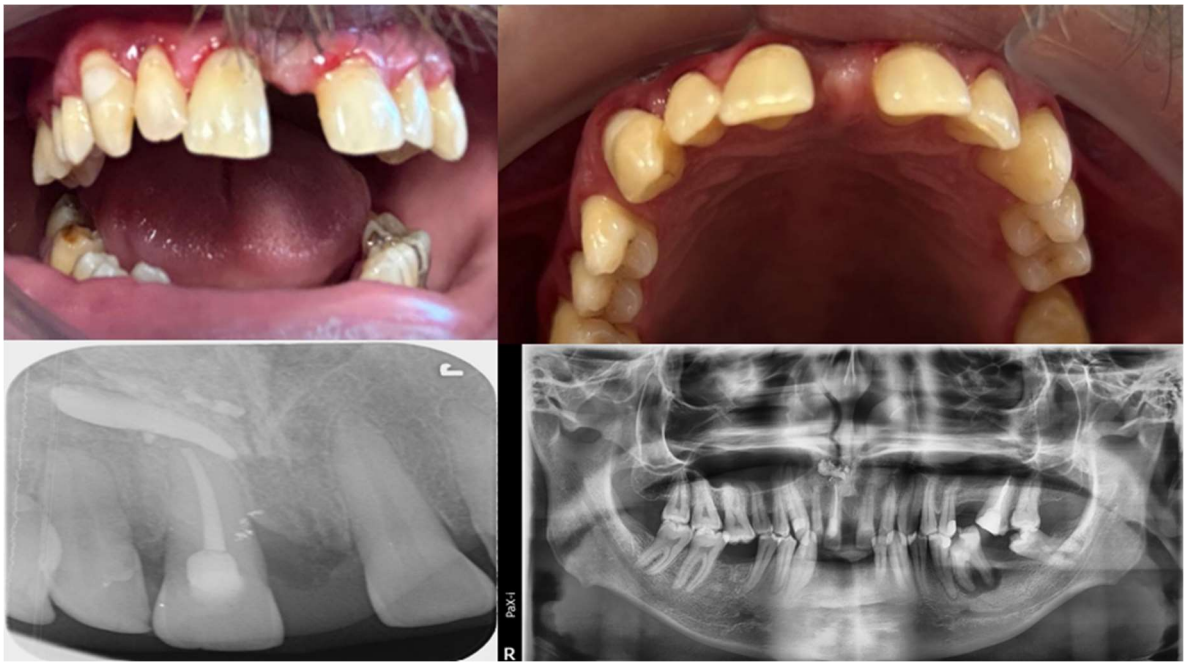

Fig. 5. Clinical and radiographic images obtained after 18 months of follow-up

arise, highlighting the need for long-term follow-up.[12]

Stabilization of displaced teeth is a critical step in trauma management. Teeth should be splinted to adjacent stable teeth to prevent damage from masticatory forces.[18] Proper repositioning and stabilization also support periodontal and neurovascular healing.[19] Flexible splinting is considered best practice, as it allows physiological movement, reduces discomfort, increases patient compliance, and protects against further trauma.[20]

Several splinting methods are used in dentoalveolar trauma management, including wire composites, fiber splints, and titanium splints. Among these, flexible materials are preferred.[5,6,21] Fiber splints offer the additional benefits of aesthetics, biocompatibility, and ease of application.[21] In the present case, a semirigid fiber splint was used to achieve stabilization.

The ideal duration of splinting varies with the type of trauma. For alveolar fractures and lateral luxation, four weeks is generally sufficient. In cases with poor periodontal support or marginal bone fragmentation, this period may need to be extended.[9] However, prolonged splinting is associated with risks such as root and bone resorption, pulp necrosis, and ankylosis. Studies have shown no additional benefit in splinting non-dislocated teeth or extending splinting beyond four weeks.[22] Teeth within fractured segments that lose vitality should undergo endodontic treatment within two weeks.[7] In this case, the splint was removed after four weeks, and endodontic treatment was performed within the recommended timeframe.

Post-trauma instructions, such as a soft diet for two weeks, soft brushing after meals, and 0.1% chlorhexidine rinses for soft tissue injuries, are critical for optimal healing.[7]

Despite appropriate initial management, complications following dentoalveolar trauma can include marginal bone loss, pulp necrosis and infection, apical periodontitis, ankylosis, root resorption, tooth loss, splint-related periodontal problems, and malocclusion.[7,23] The rate of post-traumatic pulp necrosis is reported to range from 20% to 50%.[24,25] In this case, 18-month follow-up revealed pulp necrosis and apical periodontitis in tooth 13. Long-term mobility was observed in several teeth, likely due to the severity of the initial trauma and poor oral hygiene. Gingival recession and bone loss were also noted, emphasizing the importance of appropriate post-traumatic care.

This case highlights the critical role of early diagnosis, rapid and accurate repositioning, and consistent oral hygiene in achieving favorable long-term outcomes following alveolar fractures and lateral luxation injuries.

4. Conclusion

Dental trauma is a significant emergency involving hard and soft tissues of the teeth, often resulting from accidents. Early diagnosis, correct treatment protocols, and long-term clinical and radiographic monitoring of permanent dental injuries are crucial for managing potential complications.

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Conflict of Interest

The authors declare no conflict of interest.

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