

Case Report

Delayed Treatment and Favorable Outcome of the Complication Following Severe Dental Injuries: A Case Report

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Abstract

Objective: Severe dental injuries that affect not only the pulp tissues, but also the periodontal ligament can have a negative impact on the long-term prognosis of permanent teeth. The purpose of this article is to introduce a clinical case of both intrusive and lateral luxations, discuss potential treatment options and highlight possible complications and management. **Methods:** A 35-year-old patient experienced significant dental and soft tissue trauma after falling face forward while riding an electric scooter. Upon clinical and radiographic examination, it was discovered that he had the intrusion of tooth 11 by 3-4 mm, an uncomplicated crown fracture of tooth 21, lateral luxations of teeth 12, 41, 42, as well as bruised and swollen upper and lower lips. Teeth 12, 11, 41 and 42 were surgically repositioned to their original positions and splinted with steel wire and light-cured composite resin for a 4-week period. After the splint was removed, root canal treatment of teeth 11,12,41,42 was initiated using calcium hydroxide as an intracanal medication and followed by root canal obturation with mineral trioxide aggregate and vertical compaction with warm gutta-percha. The postoperative periapical radiograph revealed external inflammatory root resorption with irregular mesial root surface of tooth 11. **Results:** After 15 months, the radiographs and clinical examination showed no signs or symptoms of endodontic pathology.

Conclusion: This case report highlights the effective multidisciplinary treatment of traumatic lateral and intrusive luxation in permanent incisors, as well as the successful management of resultant external inflammatory root resorption.

Keywords: Dental Trauma; Luxation; Intrusion; Mature Teeth; Root Resorption

Introduction

Epidemiological studies indicate that about 20% to 30% of the population has experienced traumatic dental injuries at some point in their lives [1]. Incidents during sports activities or injuries at home typically affect permanent incisors [2]. Consequently, traumatic dental injuries have a significant impact on emotional, functional and social aspects and adversely affect the quality of life related to oral health [3]. Lateral luxation injuries are among the most frequently occurring dental traumas. According to recent studies, the incidence of lateral luxation reaches 29.5% to 57% among all dental injuries. Furthermore, even with treatment involving repositioning and splinting, teeth affected by lateral luxation can develop long-term issues like pulp necrosis, infection and inflammation around the root [4]. Intrusive luxation is considered a severe trauma because it affects periodontal fibers, the neurovascular bundle, cementum and alveolar bone. The prevalence of intrusive luxation among all traumatic injuries ranges from 0.3% to 1.9% [5]. There is a lack of published data on how to manage and predict outcomes for intrusive luxation, possibly due to the rare occurrence of this type of trauma. Treatment of the permanent teeth with complete root development and severe dental injury may require interdisciplinary interventions, such as endodontic, orthodontic and surgical approaches [6]. Managing intrusive luxations is particularly challenging because they are prone to complications during the healing process, such as pulpal necrosis, pulp canal obliteration, external inflammatory and/or replacement resorption and marginal bone loss.

Therefore, it is important to report cases of traumas involving multiple teeth to establish a consensus on treatment approaches, which necessitates addressing the injuries sustained by each affected tooth comprehensively and prognostic outcomes [7]. The aim of this report was to present a case of a patient who experienced both intrusive and lateral luxations, describing the multidisciplinary treatment of traumatized teeth and the management of external inflammatory root resorption that developed as a result of delayed endodontic treatment.

Case Report

A 35-year-old patient experienced significant dental and soft tissue trauma after falling face forward while riding an electric scooter. Approximately 12 hours after the incident, the patient attended the emergency department of the Hospital of Lithuanian University of Health Sciences in Kaunas, Lithuania. The patient provided written informed consent for clinical treatment.

The patient appeared to be in good health with no known allergies, diseases or previous traumas affecting his medical or dental status. His chief complaints were pain, altered occlusion and swelling of the upper lip. After a clinical and radiographic examination, nasal, mandibular or maxillary fractures were not evident (Fig. 1). The patient was referred to the Clinic of Dental and Oral Pathology for treatment of dental trauma injuries. A clinical and radiographic examination revealed the intrusion of tooth 11 by 3-4 mm, an uncomplicated crown fracture of tooth 21, lateral luxations of teeth 12, 41, 42, as well as bruised and swollen upper and lower lips (Fig. 1).



Figure 1: A. Panoramic radiograph revealed no evidence of nasal, mandibular or maxillary bone fractures. B. Clinical examination: the intrusion of tooth 11, uncomplicated crown fracture of tooth 21, lateral luxation of tooth 12, teeth 41 and 42 after reposition, bruised and swollen upper and lower lips, hematoma.

After administering local anesthesia, teeth 12, 11, 41 and 42 were surgically repositioned back to their original positions and splinted using 0.4 mm stainless steel wire and light-cured composite resin for a period of 4 weeks (Fig. 2). Following the procedure, non-steroidal anti-inflammatory drugs and antibiotics (Amoxicillin/1000 mg every 12 hours for 7 days) were prescribed [12]. The postoperative instructions included maintaining cautious oral hygiene, sticking to a soft diet and scheduling an appointment for the removal of the splint and follow-up visits.



Figure 2: After traumatized teeth were surgically repositioned, a steel wire and composite resin splint were placed.

After 4 weeks, the splint was removed. No pathological teeth mobility was observed and the soft tissues had healed (Fig. 3). Teeth 12, 11, 41 and 42 showed negative response to the cold test (Cerkamed, Staliova Volia, Poland) and they were all sensitive to vertical percussion. The radiographic images revealed periapical radiolucency of teeth 12, 11, while the periodontal ligament space of teeth 41 and 42 was widened (Fig. 3). Based on the clinical and radiographic findings, a diagnosis of symptomatic apical periodontitis was established.

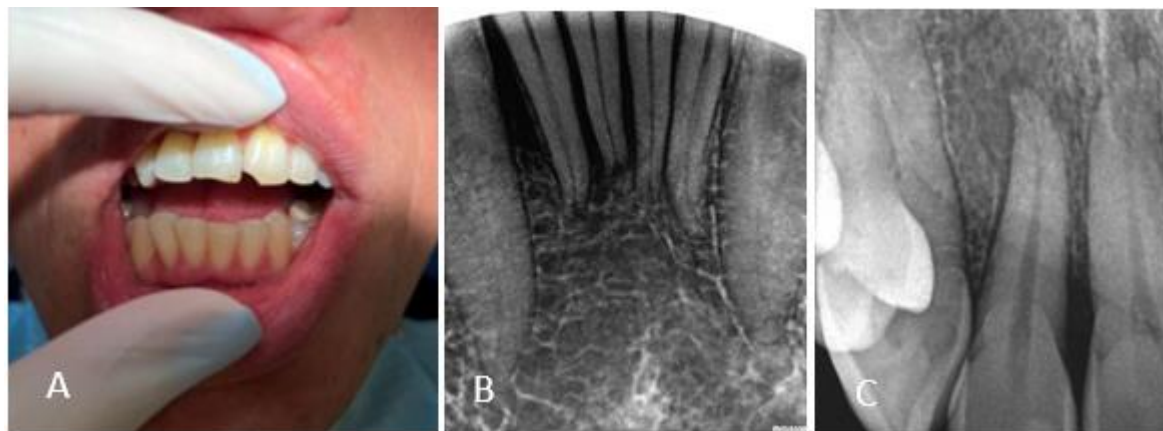


Figure 3: A. Clinical view after the splint removal. B. Periapical radiograph revealed widened periodontal ligament space of teeth 41 and 42. C. Periapical radiograph revealed periapical radiolucency of teeth 11 and 12.

Root canal treatment of teeth 11,12,41,42 was performed with local anesthesia (Articaine 4% Ubistesin Forte 1.7 ml N50 - 3M ESPE Dental AG; Seefeld, Germany), under dental microscope Zeiss OPMI pico (Carl Zeiss Meditec AG, Jena, Germany) and rubber dam isolation. The root canals were thoroughly cleaned and shaped using ProTaper GOLD (PTG, Dentsply Sirona, Ballaigues, Switzerland) and irrigated with 5.25% sodium hypochlorite. Calcium hydroxide paste "Calcipast" (Cerkamed, Staliova Volia, Poland) was applied for intracanal medication [12]. Next appointment was scheduled 4 weeks later based on the patient's possibility to come for a visit. After 4 weeks all the teeth were reopened, the root canals were irrigated and instrumented with finishing file F4 ProTaper GOLD (PTG, Dentsply Sirona, Ballaigues, Switzerland).

The final irrigation protocol consisted of a one-minute irrigation with 5 mL of 17 % Ethylenediaminetetraacetic Acid (EDTA), followed by a final rinse with 5.25% sodium hypochlorite and passive ultrasonic activation. The canals were obturated with mineral trioxide aggregate cement - (ORBIS MTA Endodontic repair material) (P. L. Superior Dental Materials GmbH, Hamburg, Germany) and creating a 4–5 mm apical plug. The remaining part of the root canal was filled using vertical compaction with warm gutta-percha and TotalFill BC sealer (FKG Dentaire, Le Crêt-du-Loche, Switzerland). After the obturation, a temporary filling IRM (Dentsply, Milford, USA) was placed. The postoperative periapical radiograph revealed external inflammatory root resorption with irregular borders on the mesial root surface of the tooth 11 (Fig. 4).

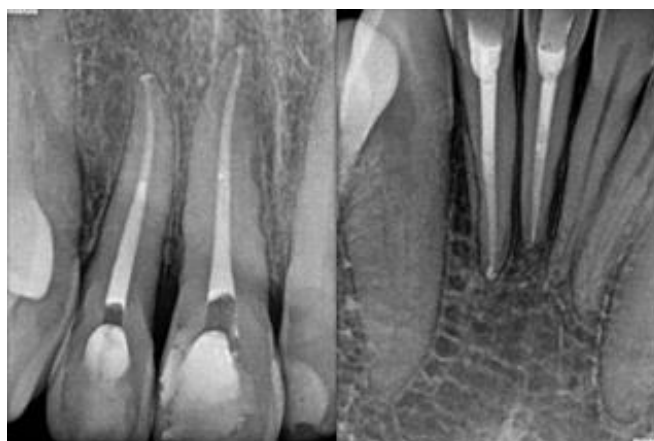


Figure 4: Postoperative periapical radiographs following root canal obturation (8 weeks after trauma).

All endodontically treated teeth 12, 11, 41, 42 and uncomplicated crown fracture of tooth 21 were restored with composite resin. The patient was scheduled for follow-up visits.

One month follow up after root canal treatment of traumatized showed that tooth 12 was slightly more sensitive to vertical percussion compared to the other incisors. Periapical radiographs revealed a reduction in radiolucency of teeth 12, 11, 41, 42 (Fig. 5). Additionally, the patient reported complaints of impaired masticatory function and aesthetic concerns related to the anterior teeth. Thus, an orthodontic consultation was scheduled. It has been decided that orthodontic treatment will be commenced following 12 months after the initial trauma.

During the next follow-up visit, after 6 months, the patient had no complaints and all treated teeth were asymptomatic. No tenderness to vertical percussion or palpation was observed and the adjacent teeth responded positively to the cold test. The radiographic examination revealed restored periapical tissues around teeth 12, 11, 41, 42. However, there were no significant changes observed in the area of the root resorption defect of tooth 11 evaluating periapical radiograph (Fig. 5).

15 months after the treatment, the radiographs and clinical examination showed no signs or symptoms of endodontic pathology. Orthodontic treatment has already been started one year after the trauma. The radiolucency linked to resorption has completely disappeared (Fig. 5).

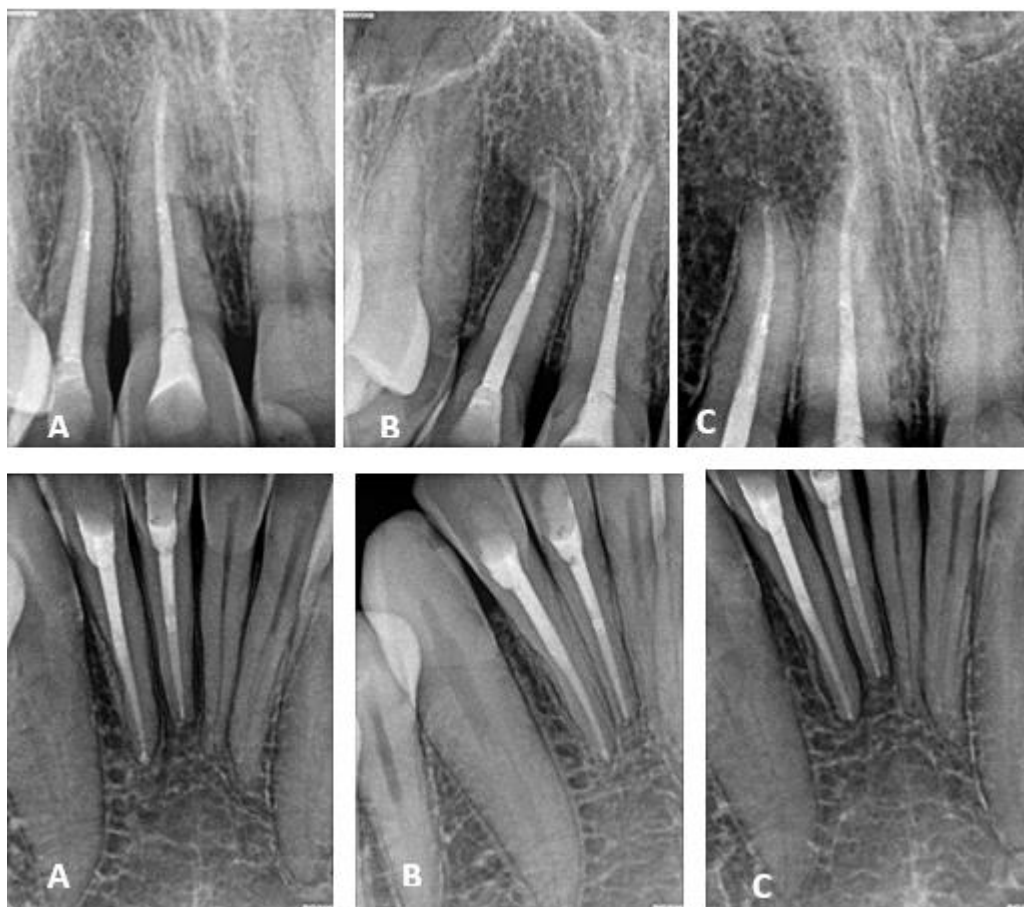


Figure 5: Follow-up periapical radiographs 1 month (A), 6 months (B), 15 months (C) after root canal treatment.

Discussion

The prognosis and treatment plan of dental trauma cases depends on the stage of root development, the type and severity of injury. Intrusion and lateral luxation are most likely to cause pulp necrosis in permanent teeth with complete root formation [8-10]. According to a clinical study conducted by Lima, et al., 100% of cases of mature teeth after intrusion result in pulp necrosis

[11]. In this case, the necrotic pulp was identified in intruded and laterally luxated teeth 4 weeks after the trauma. It was not detected earlier after trauma due to fact that the patient was unable to attend the 2-week appointment for clinical and radiographic evaluations and initiation of root canal treatment as recommended by the International Association of Dental Traumatology (IADT) [12]. The severity of the dental injury, which damaged the periodontal ligament fibers and negatively affected neurovascular functions could affect such outcome [8]. Consequently, the required endodontic treatment was delayed until 4 weeks after the initial dental injury. It could be speculated that the delay in starting the endodontic treatment could have had a negative impact and led to the development of external root resorption.

According to the IADT guidelines, teeth that have been intruded (displaced by 3-7 mm) or laterally luxated with complete root formation should be repositioned to their original location under local anesthesia as soon as possible. After repositioning, the teeth should be splinted for 4 weeks and monitored for complications such as pulp necrosis or resorption [12]. In cases where traumatized teeth have complete root formation, pulp necrosis is highly likely. Therefore, root canal treatment should be initiated within 2 weeks or as soon as the tooth is positioned properly. An intracanal medication, such as corticosteroid-antibiotic or calcium hydroxide, should be used. The goal of this treatment is to prevent inflammatory (infection-related) external resorption. In this case report, initially after the dental injuries the teeth were surgically repositioned and splinted for 4 weeks. It is evident, that the time between dental trauma and initiation of the treatment affects the prognosis of the tooth and leads to complications like pulp necrosis and periapical bone destruction [13]. Delayed emergency care can result in faulty tooth repositioning due to blood clot in the dental alveolus. Therefore, immediate repositioning is crucial to initiate the healing process faster and provide better options for severe dental injuries [14]. A retrospective study by Kallel, et al., found a significant association between delayed consultation and complications [15]. In this case, the patient arrived at the hospital the day after the trauma, approximately 12 hours later and this delay in repositioning may have negatively impacted the prognosis and correlated with a higher prevalence of pulp necrosis [16].

In this case, the external inflammatory resorption was observed along the mesial surface of the root of the upper right central incisor. It was detected in dental radiograph after root canal filling, following 8 weeks after trauma. Studies have shown that this type of resorption is more frequently seen in cases of intrusive luxation [17,18]. Since the patient had already undergone root canal treatment, no additional treatment was required for managing external inflammatory resorption. The follow-up radiological examinations revealed that the process of resorption had ceased. To monitor this complication, the patient should have yearly follow-up visits for a minimum of 5 years [12]. If the resorption continues to worsen, extraction may be considered as a potential treatment option [19].

After experiencing dental trauma, the patient reported issues with the occlusion, impaired mastication and misalignment of the anterior teeth. As a result, the patient was advised to schedule an orthodontic consultation. It is important to note that orthodontic treatment can cause pulp inflammation, which is usually reversible. However, in teeth that have been previously injured, the inflammation of the pulp may be more severe than in teeth that have not been traumatized [20-22]. The duration and approach of orthodontic treatment should depend on the severity and nature of the traumatic injury. This disruption can hinder the process of bone remodeling, resulting in irregularities in tooth movement and potentially causing complications like delayed healing, increased risk of root resorption and compromised tooth stability [23].

Immediately after the trauma, there is an inflammatory response of periodontal tissues. This response is characterized by increased blood flow to the affected area of the periodontium. This increased blood flow brings immune cells and nutrients that are necessary for tissue repair. During this process, collagen synthesis occurs. Collagen is a protein that aids in the formation of new connective tissue and helps to reattach the fibers of the periodontal ligament. The newly formed tissue then undergoes remodeling in order to strengthen and mature. As part of this remodeling process, the collagen fibers realign themselves, which enhances their ability to withstand functional forces. This gradual restoration of the periodontium typical structure and function occurs [24].

According to both the British Orthodontic Society and the American Association of Endodontists, it is not advisable to undergo orthodontic treatment for teeth that have experienced moderate to severe dental trauma until full periodontal healing has taken place. Typically, this healing process takes between 6 to 12 months [24,25]. In this clinical case, orthodontic treatment for this

patient began 12 months after the initial injury due to the severity of the intrusive and lateral luxation trauma. During orthodontic treatment, it is important to prioritize biological factors and use gentle forces, along with personalized biomechanical adjustments in orthodontic appliances. Additionally, it is recommended to regularly monitor the root and periodontal condition of traumatized teeth every 3 months [25].

The management of dental injuries, such as intrusion and lateral luxation, is typically complex, time-consuming, expensive and unstable. Therefore, it is crucial to prioritize consistent long-term monitoring for possible late complications and the healing process. This monitoring is as important as the initial endodontic treatment, especially if the patient is planning to undergo orthodontic treatment.

Conclusion

In cases of severe dental trauma, timely and appropriate endodontic treatment is crucial. Although the 15-month follow-up demonstrates successful outcomes, it is essential to continue monitoring to evaluate long-term effectiveness and detect any potential post-traumatic complications. Preserving the tooth after a traumatic event directly impacts the patient's quality of life by restoring psychological and emotional well-being.

Conflict of Interests

The authors have no conflict of interest to declare.

Acknowledgments and Disclosure Statements

The authors provided ethical approval for this case study. Published with consent of the patient. Conflict of interest - none declared.

References

1. Andersson L. Epidemiology of traumatic dental injuries. *Pediatr Dent*. 2013;35(2):102-5.
2. Brüllmann D, Schulze RK, d'Hoedt B. The treatment of anterior dental trauma. *Dtsch Arztebl Int*. 2010;108(34-35):565-70.
3. Da Silva RLC, Dias Ribeiro AP, Almeida JCF, Sousa SJL, Garcia FCP. Impact of dental treatment and the severity of traumatic dental injuries on the quality of life of Brazilian schoolchildren. *Dent Traumatol*. 2021;37(4):562-7.
4. Clark D, Levin L. Prognosis and complications of immature teeth following lateral luxation: A systematic review. *Dent Traumatol*. 2018.
5. Shalish M, Abed J, Keinan D, Slutzky-Goldberg I. The consequences of orthodontic extrusion on previously intruded permanent incisors-A retrospective study. *Dent Traumatol*. 2024;40(1):54-60.
6. Andreasen JO, Bakland LK, Matras RC, Andreasen FM. Traumatic intrusion of permanent teeth. Part 1. An epidemiological study of 216 intruded permanent teeth. *Dent Traumatol*. 2006;22(2):83-9.
7. Al-Badri S, Kinirons M, Cole B, Welbury R. Factors affecting resorption in traumatically intruded permanent incisors in children. *Dent Traumatol*. 2002;18(2):73-6.
8. De Souza BDM, Dutra KL, Reyes-Carmona J, Bortoluzzi EA, Kuntze MM, Teixeira CS, et al. Incidence of root resorption after concussion, subluxation, lateral luxation, intrusion and extrusion: a systematic review. *Clin Oral Investig*. 2020;24(3):1101-11.
9. Lam R. Epidemiology and outcomes of traumatic dental injuries: a review of the literature. *Aust Dent J*. 2016;61(1):4-20.
10. Goswami M, Rahman B, Singh S. Outcomes of luxation injuries to primary teeth-a systematic review. *J Oral Biol Craniofac Res*. 2020;10(2):227-32.
11. Lima TFR, Silva EJNLD, Gomes BPFA, Almeida JFA, Zaia AA, Soares AJ. Relationship between Initial Attendance after Dental Trauma and Development of External Inflammatory Root Resorption. *Braz Dent J*. 2017;28(2):201-5.
12. Bourguignon C, Cohenca N, Lauridsen E, Flores MT, O'Connell AC, Day PF, et al. International Association of Dental Traumatology guidelines for the management of traumatic dental injuries: 1. Fractures and luxations. *Dent Traumatol*. 2020;36(4):314-30.
13. Tewari N, Bansal K, Mathur VP. Dental trauma in children: a quick overview on management. *Indian J Pediatr*. 2019;86(11):1043-7.

14. Kenny DJ, Barrett EJ, Casas MJ. Avulsions and intrusions: the controversial displacement injuries. *Journal (Canadian Dental Association)*. 2003;69(5):308-13.
15. Kallel I, Douki N, Amaidi S, Ben Amor F. The incidence of complications of dental trauma and associated factors: a retrospective study. *Int J Dent*. 2020;2020:2968174.
16. Rovira-Wilde A, Longridge N, McKernon S. Management of severe traumatic intrusion in the permanent dentition. *BMJ Case Rep*. 2021;14(3):e235676.
17. Soares AJ, Souza GA, Pereira AC, Vargas-Neto J, Zaia AA, Silva EJ. Frequency of root resorption following trauma to permanent teeth. *J Oral Sci*. 2015;57(2):73-8.
18. Hecova H, Tzigkounakis V, Merglova V, Netolicky J. A retrospective study of 889 injured permanent teeth. *Dent Traumatol*. 2010;26(6):466-75.
19. Patel S, Krastl G, Weiger R, Lambrechts P, Tjäderhane L, Gambarini G, Teng PH. ESE position statement on root resorption. *Int Endod J*. 2023;56(7):792-801.
20. Gazit E, Sarnat H, Lieberman M. Timing of orthodontic tooth movement in a case with traumatized and avulsed anterior teeth. *ASDC J Dent Child*. 1988;55(4):304-7.
21. Owtad P, Shastry S, Papademetriou M, Park JH. Management guidelines for traumatically injured teeth during orthodontic treatment. *J Clin Pediatr Dent*. 2015;39(3):292-6.
22. Kugel B, Zeh D, Müssig E. Incisor trauma and the planning of orthodontic treatment. *J Orofac Orthop*. 2006;67(1):48-57.
23. Li Y, Zhan Q, Bao M, Yi J, Li Y. Biomechanical and biological responses of periodontium in orthodontic tooth movement: up-date in a new decade. *Int J Oral Sci*. 2021;13(1):20.
24. Sandler C, Al-Musfir T, Barry S, Duggal MS, Kindelan S, Kindelan J, et al. Guidelines for the orthodontic management of the traumatised tooth. *J Orthod*. 2021;48(1):74-81.
25. Fields HW, Christensen JR. Orthodontic procedures after trauma. *J Endod*. 2013;39(3):S78-87.

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