



Surgical and Orthodontic Treatment of Severely Intruded Permanent Incisors: A Case Report

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ABSTRACT

Traumatic dental intrusion is a serious injury and results in significant damage to the periodontal ligament, dentin-pulp complex, and alveolar bone. This article presents a case of severe intrusion of the two upper permanent central incisors where the treatment option was the combination of the surgical and orthodontic technique. The difficulty of accessing the crowns of these teeth to bond the brackets was solved by lifting a full thickness flap. To disengage the teeth from the alveolus, a careful dislocation motion was performed. After suturing the flap, a removable orthodontic appliance was installed and an extrusive force was applied for 8 weeks. After 10 weeks, the endodontic treatment was performed and the crowns were restored. The 10-year clinical control showed normal mobility. Radiographically, minor losses of the cervical alveolar cortical bone and integrity of the periodontal ligament were observed.

Keywords: Dental Trauma; Intrusive Luxation; Orthodontic Extrusion

Introduction

Traumatic dental intrusion is rare in permanent dentition, and may reach 1.9% of cases [1]. This type of trauma is caused by an axial impact that can lead to displacement of the tooth into the alveolar bone [1, 2], leaving it immobile and resulting in a metallic sound when performing a percussion test [2]. It is considered a serious injury, as the projection of the root against the alveolar wall results in significant damages to the periodontal ligament, dentin-pulp complex, and alveolar bone [3]. Inflammatory root resorption, ankylosis, pulpal necrosis, and loss of marginal bone support are common consequences of this type of trauma [2-4].

The prognosis of this injury is poor and may compromise the longevity of the affected tooth. However, there are reports of compromised teeth that have been repaired and were maintained in function after appropriate treatment [1, 4, 5]. Diagnosis based on patient age and health, root development

stage, time elapsed while seeking care and severity of intrusion, guide the treatment plan [2, 4, 6-8].

When the tooth is deciduous or when root formation is incomplete, treatment can be performed by monitoring spontaneous re-eruption. If root formation is complete, treatment can be performed by active repositioning by surgical or orthodontic movement [2, 3, 6]. Despite the advantages related to orthodontic techniques, there are few cases reported in the literature on the treatment and prognosis about intrusive luxation. The lack of information makes it difficult to define the best technique by considering the occurrence of root resorption and alveolar bone loss [7, 9]. In severe intrusive luxation, a different treatment strategy may be required for a better prognosis. Thus, the reporting of new cases can contribute to the formation of a consensus on the best form of treatment. This report describes a case of severe intrusion of two central permanent incisors, in which repositioning was achieved by combining surgical and orthodontic techniques.

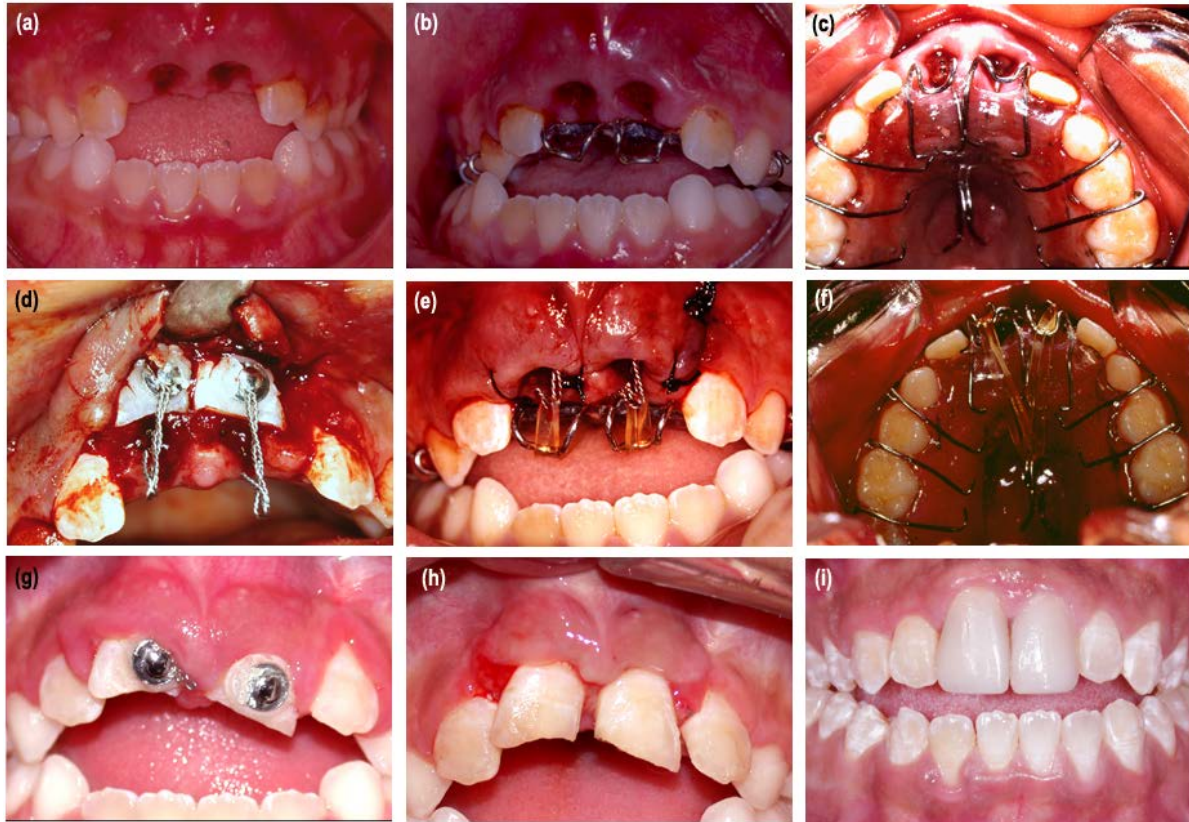


Figure 1. Sequence of the treatment performed. A) Initial clinical condition showing the absence of the crowns of teeth 11 and 21; B) and C) Removable orthodontic appliance with anterior loops to direct the extruding force; D) Exposed crowns with buttons bonded to their vestibular surface; E) and F) Front and occlusal views of the orthodontic appliance activated with orthodontic elastic, after suturing the flap; G) Position of teeth 11 and 21, 14 weeks after starting the extrusive movement; H) Postoperative period of 2 weeks after surgical correction of the gingival anatomy; I) Clinical condition after 10 years of follow-up

Case Report

A 10-year-old male patient sought care at Araçatuba Dental School – UNESP, two days after bicycle accident. The patient had a skeletal malocclusion with an anterior open bite. The intraoral clinical examination showed the absence of teeth 11 and 21 (Figure 1A). The periapical radiograph showed complete intrusion of the crowns (8 mm) of the teeth, featuring a severe intrusion (5). The roots were completely formed with closed apical foramens (Figure 2A). As the treatment option was orthodontic extrusion, a removable orthodontic appliance was manufactured with 0.7-inch thick wire (Morelli Ortodontia, Sorocaba, São Paulo, Brazil). It had two loops in the anterior section to direct orthodontic forces toward the long axes of the intruded teeth (Figures 1B and 1C). The appliance was installed three days after the accident, by lifting a buccal full flap to access the crowns of the teeth. After elevating the flap, enamel and dentin fractures were observed at the incisal edges of both teeth (Figure 1D). As these teeth were immobilized inside the bone

cavity, the crowns were carefully displaced with the aid of a hollenback instrument (SSWhite Duflex, Rio de Janeiro, Brazil) to unlock them, without a major displacement of the roots. Bonding of the buttons and 0.025-inch thick orthodontic wires were performed on the vestibular surfaces of the intruded teeth, using 37% phosphoric acid (3M/ESPE Dental Products, St. Paul, USA) and bonding composite resin system (Transbond XT; 3M Unitek, Monrovia, California, USA) (Figure 1D). An orthodontic tooth tensile force (100 N/cm) was applied immediately after the surgery using 5/16-inch orthodontic elastic (Morelli Ortodontia, Sorocaba, São Paulo, Brazil) (Figures 1E and 1F). Systemic antibiotic therapy was prescribed (amoxicillin, 500-mg capsules-1 capsule every 8 h for 7 days) along with daily mouthwashes with antiseptics (Colgate Periogard; Colgate Palmolive Ltda., São Paulo, SP, Brazil).

Proper extrusion of the teeth was achieved 8 weeks after activation of the appliance (Figure 1G). The teeth were splinted for 8 weeks. Due to extrusion, it was necessary to correct the gingival architecture by gingivectomy (Figure 1H).

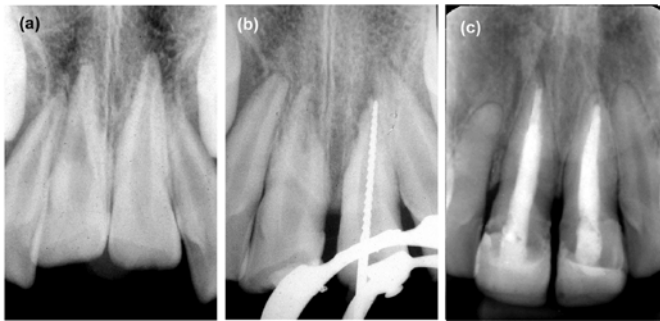


Figure 2. Radiographic images; A) Periapical radiograph showing severe intrusion of teeth 11 and 21, with completely formed roots and closed apical foramen; B) Odontometry of tooth 11 during endodontic treatment; C) 10-year radiographic control, showing the integrity of the periodontal ligament and minor horizontal loss of the alveolar bone

Radiographic control was performed weekly, and the onset of root resorption in the apical third of these teeth was observed 10 weeks after activation of the appliance. Root canals were then instrumented and filled with calcium hydroxide and propylene glycol paste (Biodinâmica, Ibiporã, Paraná, Brazil) (Figure 2B). Thirty days later, the canals were filled using gutta-percha cones (Kerr Dental Corporation, Joinville, Santa Catarina, Brazil) and calcium hydroxide-based cement (Sealapex; Kerr, Romulus, MI, USA). The fracture areas on the incisal edge were restored using 37% phosphoric acid (3M/ESPE Dental Products, St. Paul, USA), the adhesive system Adper Single Bond 2 (3M/ESPE Dental Products, St. Paul, USA) and composite resin Filtek Z 350 XT (3M/ESPE Dental Products, St. Paul, USA).

Minor horizontal bone loss in the cervical region, maintenance of the periodontal ligament, and integrity of the root surface were radiographically detected in the 10-year postoperative control teeth (Figure 2C). Clinically, normal mobility and a gingival sulcus depth of 2 mm were observed in the treated teeth (Figure 11).

Discussion

In cases of severe intrusion, immediate surgical repositioning allows rapid results [10]. However, additional mechanical damages may occur [11, 12], leading to a greater loss of marginal and periodontal bone support that compromise the esthetics of the traumatized tooth [3, 8, 12]. A higher incidence of ankylosis [13], pulpal necrosis, and periodontal pockets has also been observed as a result of this technique [6]. The use of extrusive orthodontic forces after trauma to result in decreased occurrence of ankylosis [6, 14] and there is no evidence that this treatment results in damage to the root surface [14].

Orthodontic extrusion of traumatically intruded teeth can be performed immediately or late. Some professionals delay orthodontic treatment for a few months until the tooth is asymptomatic [14]. However, this waiting period may favor the occurrence of ankylosis and make orthodontic movement infeasible. Close contact of the root surface with the alveolar bone favors the rapid development of ankylosis [15]. This makes immediate orthodontic extrusion more suitable technique. Access to the crown for the beginning of the endodontic treatment can be performed at an earlier stage. This is important because pulpal necrosis is the frequent complication in severe intrusive luxation [4, 14, 16], and endodontic treatment must be instituted to prevent infection-related root resorption [2, 3, 6, 17]. According to the literature, 53.8% of success rate was observed with immediate orthodontic extrusion and 25% was observed with late orthodontic extrusion [14]. However, when the crown is completely intruded, the access for bonding of buttons or brackets becomes difficult. In the case reported, the strategy adopted was exposure of the crowns through a full flap. Small displacements were also made to disengage the roots from the alveolus to facilitate orthodontic treatment. This procedure also contributes to minimize necrosis through the compression of the periodontal ligament [18]. Excessive root displacement was avoided to prevent further trauma, such as those occurring in cases of surgical repositioning, which favor root resorption [3, 8]. Once the appliance was installed, it was immediately activated. The patient reported that there was no discomfort during treatment. Only small points of resorption were observed radiographically after treatment suggesting that the technique was satisfactory. The use of calcium hydroxide as a dressing and antibiotic therapy may have contributed to this [8, 19, 20]. It is also possible that the periodontal ligament, cementum, and other structures crucial to the prevention of root resorption [8, 12, 16] were poorly damaged by the trauma. As bone tissue is more resilient in young patients [4, 21], there would be a reduction in the resistance to root displacement at the time of intrusion. The radiographic image showing the integrity of the periodontal ligament in addition to normal mobility of both teeth, observed 10 years after treatment, suggests repair of the resorption initially observed. According to the literature incisors with severe intrusion present a significant reduction in survival after 5 years [6], which makes this result favorable.

Conclusion

According to the literature incisors with severe intrusion present a significant reduction in survival after 5 years, which makes this result favorable.

Conflict of Interest: 'None declared'.

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