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Orthodontic extrusion of a traumatically intruded permanent incisor: a case report with a 5-year follow up

CASE REPORT

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Correspondence to: Emine Sen Tunc, Assistant Professor, Department of Pediatric Dentistry, Faculty of Dentistry, University of Ondokuz Mayıs, 55139 Samsun, Turkey Tel.: +90 362 312 19 19-3365 Fax: +90 362 4576032 e-mail: sentunc@yahoo.com Accepted 29 October, 2007 **Abstract** – This report presents a case of intrusive luxation of the immature left maxillary central incisor in an 8-year-old girl. Initially, it was decided to allow the intruded tooth to spontaneous re-erupt because it had open apices. After 12 weeks of monitoring for spontaneous re-eruption, there was no clinical evidence of its occurrence. Therefore, orthodontic extrusion was initiated. The intruded tooth was repositioned with a fixed multibracketed appliance. Twenty weeks after the beginning of orthodontic extrusion, the position of the intruded maxillary central incisor was restored to its original position before its displacement occurred. After 5 years, no clinical or radiographic pathology was detected and obliteration of the pulp canal of the intruded tooth was observed radiographically.

Traumatic intrusion of permanent teeth is a rare injury and accounts for 3% of all traumatic injuries to the permanent dentition (1). Serious damage to the tooth pulp and supporting structures occurs because of the dislocation of the tooth into the alveolar process. Thus, the repair process after intrusion is complex (2). Pulp necrosis, inflammatory root resorption, ankylosis, obliteration of the pulp canal, marginal bone loss, disturbance to the continued development of the root may occur as a consequence of an intrusive luxation (3–7).

There is no current consensus on optimal treatment for intruded permanent teeth (2). In 1996, Oulis et al. recommended that each case should be considered individually and the treatment should take into account the severity of the intrusion and tooth mobility (8).

The management of intruded permanent tooth may consist of (i) allowing spontaneous re-eruption, (ii) surgical repositioning and fixation, (iii) orthodontic repositioning, and (iv) a combination of surgical and orthodontic therapy (2, 5, 9–11).

The purpose of this report is to describe the treatment for intrusion of the left maxillary central incisor and the subsequent complications in an 8-year-old girl. Also, the report emphasizes the importance of careful long-term follow-up monitoring intruded permanent teeth.

Case report

A healthy 8-year-old girl was referred to the Pediatric Dentistry Clinic of Ankara University, following traumatic injury to her teeth caused by a bicycle accident. No previous dental trauma was reported, and there was no history of neurological complications. The medical history was unremarkable.

The extraoral examination revealed no injury. The intra-oral examination revealed a 5.1 mm intrusive luxation of the left maxillary central incisor (Fig. 1). The intruded tooth showed no clinical mobility. There was no evidence of traumatic injury to any other teeth or alveolar structures.

The radiographic examination, which consisted of one panoramic view and three periapical views, revealed that the maxillary central incisors had open apices and the left maxillary central incisor was moderately intruded. The periodontal space surrounding the left maxillary central incisor was diminished, and no root or bone fractures were detected (Fig. 2).

Due to the open apices of the maxillary incisors, it was decided to allow for spontaneous re-eruption. At the 1-week follow-up examination, there was no clinical evidence of re-eruption. Subsequent weekly



Fig. 1. Intra-oral view of the traumatically intruded tooth at the initial visit.



Fig. 2. Preoperative periapical radiograph of intruded permanent left maxillary central incisor.

examinations revealed no eruption of the intruded tooth or evidence of pulpal pathology.

Twelve weeks following the dental injury, a decision was made to reposition the intruded tooth orthodontically. A fixed multibracketed appliance was bonded to the affected tooth and the adjacent teeth with elastic traction. Orthodontic extrusion was started 1 week after the traction and approximately 1 mm of extrusive orthodontic movement occurred. Twenty weeks after the start of treatment by orthodontic extrusion the location of the intruded left maxillary central incisor was restored to its original position before its displacement had occurred. Orthodontic treatment was continued in order to obtain sufficient retention and for other orthodontic problems.

Careful follow-up examinations were done at 3-month intervals in order to observe the intruded left maxillary central incisor. At the 5-year follow-up examination, no problems were detected (Fig. 3) and periapical radiograph revealed obliteration of the pulp canal of the intruded maxillary central incisor tooth (Fig. 4).



Fig. 3. Clinical appearance of the intruded tooth after orthodontic treatment.



Fig. 4. A radiograph which was taken 5 years after the initial trauma, and in which pulp canal obliteration of the intruded tooth can be clearly seen.

Discussion

The treatment for traumatized permanent incisors can pose a challenge. Management of preadolescent with such an injury is determined by two main variables: the stage of tooth development and the amount of intrusion (12). Current management strategies range from conservative approach such as allowing for spontaneous re-eruption to invasive methods that include immediate surgical reposition. In this case, the traumatic intrusion of the left maxillary central incisor tooth was monitored for spontaneous re-eruption for 12 weeks and the position of the tooth remained unchanged. Therefore, orthodontic extrusion was instituted because we felt that spontaneous re-eruption was unlikely to occur.

For a long time, it has been known that intruded primary teeth usually re-erupt spontaneously (2). This may also take place in cases of intruded permanent teeth, especially in instances where there is immature root formation (2, 3, 13). The re-eruption process may last as long as 3–8 months (13). This conservative approach spares the child from overtreatment and enables periodontal healing (9, 14). However, the treatment has two main disadvantages: periodontal surgery, e.g., gingivectomy, may be needed in order to gain access to the root canal while waiting for spontaneous re-eruption to occur; and root resorption or ankylosis may occur during the monitoring period (15).

Surgical repositioning of traumatized permanent incisors was first introduced by Skieler in 1960 and good results have been reported with this treatment (11, 16, 17). It is inexpensive, and provides timely solutions for the management of the teeth that are deeply embedded in the bone (16). However, this method has serious pulpal and periodontal consequences. A significantly large number of instances of marginal bone loss, ankylosis, and pulpal inflammatory responses has been demonstrated following surgical repositioning of intruded teeth when compared to the number of these complications that arises from allowing spontaneous re-eruption to occur or performing orthodontic repositioning (2).

Orthodontic extrusion is another option for treating intruded permanent teeth because it allows for remodeling of bone, and the periodontal apparatus to occur (18). The intruded tooth may be sufficiently repositioned for endodontic treatment within 2–3 weeks, thereby preventing the occurrence of inflammatory resorption, or its treatment, should it developed (15).

Of all the treatment options, it is now evident that both spontaneous re-eruption and orthodontic repositioning cause the least damage to the surrounding tissues (19). However there is no general agreement on when to select the allowance of spontaneous re-eruption or orthodontic extrusion as the treatment. Some authors have recommended that monitoring for the occurrence of spontaneous re-eruption should be done only in cases in which there is very mild intrusion (9). Others have suggested that monitoring for the occurrence of spontaneous re-eruption until the patient is 17 years old should be done, irrespective of the extent of intrusion (19). Some authors have favored immediate orthodontic extrusion with or without complete root formation (20); whereas others have suggested that the tooth should be left alone to allow for spontaneous re-eruption. In the event that spontaneous re-eruption does not occur with the conservative and non-interventional approach, an eruptive orthodontic force could then be applied (21). In this case, the second option was selected because the tooth had open apices. Furthermore, this treatment plan reduced the possibility of collateral tissue damage, particularly root resorption that might occur when orthodontic loading of normally acceptable force levels is applied to the affected tooth.

The follow-up management of dental trauma in which tooth intrusion occurs requires special attention for all structures involved: the pulp, the periodontal ligament, and the alveolar bone (22). The early complications are mainly loss of pulp vitality and external root resorption. The main late complications that arise when endodontic treatment is not initially performed include loss of vitality and concomitant inflammatory root resorption in teeth with closed apices and obliteration of the pulp tissue in the teeth that remain vital (23). However, pulp survival following traumatic intrusion is extremely rare, even when root formation is incomplete (20). Therefore, some authors have adopted a treatment policy of extirpation of the pulp immediately after injury in all cases of severely intruded teeth (1, 3).

The prevalence of pulp canal obliteration following traumatic intrusions has been reported to be 6-35% (2). It is thought that pulp obliteration might be the result of trauma itself, or due to the changes in pulpal blood flow caused by orthodontic extrusion of the impacted teeth (24, 25). The presence of calcified tissue might reduce the tooth's response to thermal stimuli and cause yellowing and increased opacity of the crown. In addition, progress of the calcifying process seems to be correlated with periradicular radiolucency (24, 26). These late healing complications highlight the need for regular long term follow-up examinations for their early detection and treatment.

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