Dental Traumatology 2008; **24**: 244–247; doi: 10.1111/j.1600-9657.2007.00524.x

Traumatic intrusion of maxillary permanent incisors into the nasal cavity: report of a case

CASE REPORT

Aníbal Henrique Barbosa Luna, Roger William Fernandes Moreira, Márcio de Moraes

Department of Oral and Maxillofacial Surgery, Piracicaba Dental School, Unicamp, São Paulo, Brazil

Correspondence to: Dr Márcio de Moraes, Faculdade de Odontologia de Piracicaba, Unicamp, Departamento de Diagnóstico Oral, Av. Limeira, 901, Piracicaba, São Paulo, Brazil
Tel.: +55 19 3412 5324
Fax: +55 19 3412 5218
e-mail: mmoraes@fop.unicamp.br

Accepted 19 April, 2006

Abstract – Complete intrusion injuries in the mixed or permanent dentition are relatively rare and represent one of the most serious injuries to the periodontal ligament in dental traumatology. This paper describes the case history of a 7-year-old boy who sustained displacement of central incisors into the nasal cavity. Surgical repositioning was undertaken and a splint was placed.

Dental trauma is relatively common and occurs from various causes. In childhood, traumatic injury is most often caused by bicycle accidents, sports, recreational activities or falls. Luxation injuries comprise 15–61% of dental traumas to permanent teeth, while frequencies from 62 to 73% have been reported for the primary dentition (1).

Intrusive luxation is one of the five different types of luxation injuries that can be recognized, represented by displacement of the tooth deeper into the alveolar bone. This injury is accompanied by comminution or fracture of the alveolar socket, and the direction of dislocation follows the axis of the tooth. With increasing age, the frequency and pattern of injury change. In the primary dentition, intrusions and extrusions comprise the majority of all injuries, a finding which is possibly related to the resilience of the alveolar bone at this age. In contrast, in the permanent dentition the number of the intrusive luxation injuries is considerably reduced and usually seen in younger individuals (1).

Current management strategies for this injury include: waiting for the tooth to return to its primary position (passive repositioning), immediate surgical repositioning and repositioning with dental traction by orthodontic devices (active repositioning).

Dental intrusions are rare and there are few studies in the literature which report a large enough material to draw clinical conclusions. This case is presented as an attempt to add to the contemporary knowledge of the ideal treatment of this kind of lesions.

Case report

A 7-year-old boy was presented to the emergency department at the Santa Casa de Limeira Hospital, immediately after having fallen (Fig. 1). Past medical history was unremarkable and he was taking no medication and had no allergies. Initial examination of the facial bones and TMJ were within normal limits. Intraoral examination revealed the absence of the central maxillary incisors and gross gingival and mucosal trauma (Fig. 2). No other abnormalities were found in radiographic exam and there were no evidence of significant edema and tenderness. The wounds were closed with cromic sutures and the patient was scheduled after 10 days. In the Piracicaba Dental School – University of Campinas, the patient was evaluated once again and subjected to new radiographic examination-panorex, lateral and periapical radiographs, as these incidences were not available in the hospital. Lateral radiography revealed a maxillary anterior nasal spine fracture, a superior displacement of the maxillary permanent incisors and a maxillary buccal plate fracture (Fig. 3). The incisal edges of the maxillary incisors were located at the apex of the lateral incisor teeth, and the incisor was visible inside nasal cavity (Fig. 4). The amount of intrusion was measured in millimeters based upon radiographic hard tissue landmarks, and was about 12 mm representing a severe intrusion according to the Royal College of Surgeons of England classification (2). No crown or root fracture was detected and no concomitant injuries were found in the physical examination guided by the findings of the history.

The clinical and radiographic findings, risks/benefits of surgery, long-term prognosis of the affected teeth, and the dental treatment plan were discussed with the patient's family. Surgical repositioning was undertaken and a splint was placed as previously described for avulsions (Figs 5, 6) (3). The patient received a 7-day course of penicillin and 0.12% chlorhexidine gluconate

Fig. 1. Extra-oral view of the patient showing nasal deviation.

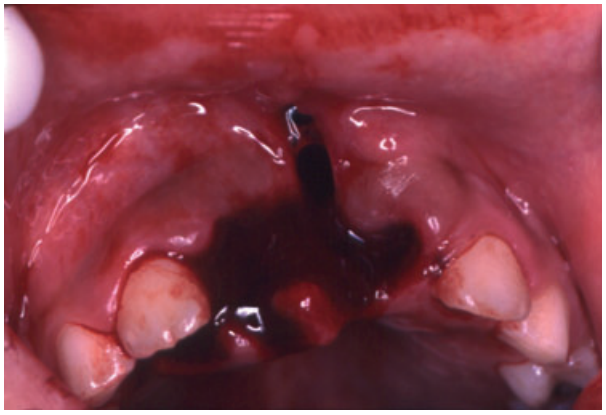

Fig. 2. Intra-oral view showing absence of central incisors.

mouth rinse, and was reappointed within 7 days to institute endodontic treatment.

Surgical procedure

General anesthesia was induced under nasotracheal intubation. After the induction of anesthesia the skin and mucosa was prepared in a conventional way. Xylocaine 2% with 1:200.000 epinephrine was used for hemostasis and local anesthesia. A buccal envelope incision was made from maxillary right first molar to the contra-lateral maxillary first molar region. A full thickness mucoperiosteal flap was then elevated, allowing visualization of teeth 11 and 21, and the decision was made to remove the teeth via the oral cavity. To place the tooth into its correct position, firm digital pressure in an incisal direction was applied. After the tooth was repositioned, the labial and palatal bone plates were compressed, to ensure complete repositioning and facilitate periodontal healing. The lacerated gingiva was

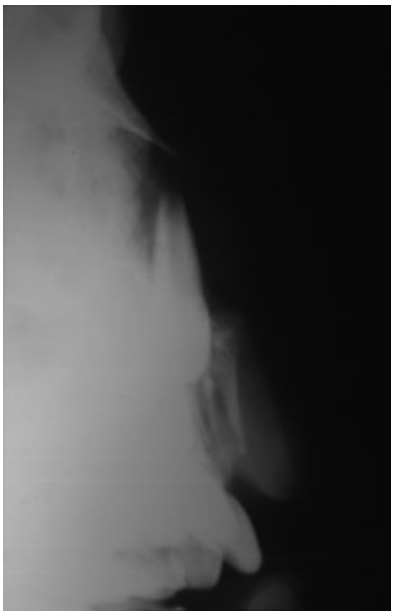

Fig. 3. Lateral radiography showing superior displacement of maxillary incisors.

Fig. 4. Central incisor in the nasal cavity.

Fig. 5. Dental splint in position after surgical repositioning.

Fig. 6. Periapical radiography showing repositioned maxillary incisors.

readapted to the neck of the teeth and sutured with cromic sutures. The tooth was splinted in its normal position and a periapical radiograph was taken to verify this and to register the level of the alveolar bone for later comparison.

Discussion

The treatment of intrusive luxation injuries is still widely discussed in the literature. However, the terminology used to describe the treatment and subsequent outcomes lacks precision and consistency. The term *spontaneous eruption* gives a falsely optimistic impression as tooth movement following injury is both unpredictable and pathological rather than developmental. Another imprecise term is *orthodontic repositioning*. The traction forces used to move intruded incisors exceed those of conventional orthodontic treatment, and severely intruded teeth do not have a functional periodontal ligament, a prerequisite for orthodontic movement. These terms imply that the tooth will return to its original location with time or it can be moved there by the same mechanics and with the same predictability as that of the conventional orthodontic treatment (4). Also, in severely injured teeth, the physiologic barrier represented by the periodontal membrane that protects the root from potential bone in-growth and subsequent root resorption will no longer function; the tooth will be ankylosed and subsequently remodeled in a fashion similar to bone remodeling, with bone gradually replacing the tooth. This process is referred to as replacement resorption, and varies with age and skeletal growth rate of the patient. Furthermore, as the growth of the alveolar process is dependent on the continuous eruption of teeth, which requires a periodontal membrane, dentoalveolar ankylosis will interfere with the vertical growth of the alveolar process.

The severity of the intrusion related in this article led the authors to a suspicion of a bad prognosis, explained by extensive damage to the pulp and periodontum, as confirmed by previous reports (4, 5). This injury is typically associated with comminutive alveolar fracture and it is considered to be the most complicated and difficult one to handle among the set of injuries to the periodontal ligament, because of the severe complications that usually compromise the longevity of the teeth such as pulp necrosis, inflammatory root resorption, pulp obliteration, loss of marginal bone support and ankylosis. The occurrence of ankylosis in a preadolescent patient is of great interest, because it may result in infraocclusion and gingival disharmony (6), and the patient and parents must be aware of this possible complication and its consequences.

Early stages of ankylosis can be diagnosed when 10–20% of the root surface is affected. Radiographic diagnosis is less accurate in early stages, but the progression of replacement resorption can be followed in radiographs. Other signs such as lack of mobility and the change of the percussion sound of the affected tooth to a high-pitched tone are found; only when interference with vertical growth of the alveolar process has taken place the infraposition of the tooth is found. There are many different treatment alternatives suggested in the literature to promote a normal development of the alveolar process and the surrounding tissues, as there is no specific treatment for dentoalveolar ankylosis. Once the diagnosis of ankylosis has been established, the patient's growth status must be defined for an accurate choice and timing of treatment because there are many different treatment alternatives for an akylosed tooth. In adult patients, dental ankylosis presents no clinical problems other than the fact that the tooth is gradually resorbed by replacement resorption which can be seen on radiographs. The resorption rate frequently allows the tooth to remain functional for several decades, without the necessity of additional treatment during this period. When the tooth is finally replaced by bone, the crown can be removed and as long as there is sufficient bone in the area, implant placement may be undertaken successfully; in cases with deficiency of bone, bone grafting or other osteopromotive methods are used before implant placement. Hence, in the adult patient, the consequences of dentoalveolar ankylosis and its replacement resorption is not a major problem, in contrast with the challenge of treating the growing patient. Implant treatment is not advocated for the growing patient because it would interfere with growth in the same way as an ankylosed tooth, also resulting in infraposition. Composite build-up of an infrapositioned tooth to the level of the neighboring tooth is not indicated for patients who have not started or are already in the pubertal growth spurt, because the retaining of the tooth will stop the normal development of the alveolar process and the crown of the tooth will be extremely elongated over time. In addition, fixed prostheses should be avoided because they may interfere with growth and development of tissues. Removable prostheses are recommended until the canines are fully erupted. Surgical repositioning of the ankylosed tooth in the correct

position has been indicated to break early bridges of ankylosis (7). However, it remains to be proven whether ankylosis is eliminated by this procedure, suggesting that more studies are required to validate this method. Extraction of the ankylosed tooth in young patients will result in atrophy of the alveolar crest and should be performed only prior to autotransplantation or orthodontic space closure. Also, extraction of an ankylosed tooth may involve loss of the attached bone. A technique to overcome such bone loss is basically based in the complete removal of the crown and reduction of the coronal part of the root surface. This method, called decoronation, will preserve the volume of the alveolar process for later implant treatment when patient has finished growth. When the tooth has been lost or extracted it can be replaced by moving an adjacent incisor, usually a lateral incisor, into the space. This represents a biologically correct alternative, as the replacing tooth has a periodontal ligament that will allow further vertical growth of the alveolar process. Thus, orthodontic movement of lateral incisors to the position of two lost central incisors may give a symmetric and aesthetically pleasant result. In other cases, teeth from other regions, usually premolars, may be successfully transplanted to the place of a lost maxillary incisor and built up with composite to produce an aesthetically acceptable result. The transplanted tooth will continue to erupt, contributing to the development of normal alveolar process and surrounding tissues (8).

Intruded teeth often show marked displacement, especially in the primary dentition. Most intruded teeth, because of their locked position in the socket, are nonsensitive to percussion and often elicit a high-pitched metallic sound, and are completely firm. This test is of great importance in determining whether or not the erupting teeth are intruded. The tooth may be completely buried in the alveolar process and be erroneously considered avulsed until radiograph shows the intruded position. Palpation of the alveolar process may reveal the position of the intruded tooth, if edema is not present. If a permanent central incisor is completely intruded, it should be considered that the apex is most likely forced into the nasal cavity, resulting in bleeding from the nose. Examination of the floor of the nostril will reveal the protruding apex.

Acute management of preadolescent intrusions is complicated by three treatment choices and two major variables: stage of tooth development and amount of intrusion. In the absence of an evidence-based classification of extent of injury, we chose the Royal College of Surgeons of England classification of <3, 3–6 and >6 mm as mild, moderate and severe intrusions, respectively. In this case, the root development suggested that a spontaneous re-eruption was not expected. In addition, the risk of having complications developed as a result of waiting for the intruded tooth to re-erupt spontaneously is high. In the cases of complete root formation, authors suggest that the crown of the intruded tooth should be exposed through surgery, thus allowing the endodontist to have immediate access to the pulp space and enable orthodontic traction to reposition the tooth and prevent ankylosis. However, the severity of intrusion in the presented case made the authors suspect that the orthodontic forces could not overcome the mechanical resistance of the alveolar bone, or that this process would be time consuming, because the teeth have been firmly driven into it. So, even if orthodontic replacement renders a more biological way of repositioning the tooth, its lack of predictability and the impossibility of an early endodontic treatment preventing inflammatory resorption supported the indication of surgical repositioning.

In a longitudinal study undertaken to identify the variables that significantly influenced tooth survival as well as pulpal and periodontal outcomes for intruded permanent maxillary incisors of children and adolescents, Humphrey et al. (4) used all the three methods of treatment for the full range of severity of intrusions, and found that none was identified as superior for a given type of injury. Treatment methods are not reliable predictors of clinical outcomes, probably because the injury-related variables, severity of intrusion and stage of root development affect outcomes sufficient to confound predictions. Only when facial growth is completed, these unpredictable outcomes pose rehabilitation challenges that may involve oral surgery, periodontal surgery and/or dental implants.

Patients should be informed at the time of the accident that discrepancies in gingival contour are an expected outcome and also to be aware that extraction is likely an inevitable outcome.

References

1. Andreasen FM, Andreasen JO. Luxations injuries. In: Andreasen JO, Andreasen FM, editors. Textbook and color atlas of traumatic injuries to the teeth, 3rd edn. Copenhagen: Munksgaard; 1994. p. 315–78.
2. Kinirons MJ. Treatment of traumatically intruded permanent incisor teeth in children, UK National Clinical Guidelines in Paediatric Dentistry. Int J Paediatr Dent 1998;8:165–8.
3. Barret EJ, Kenny DJ. Survival of avulsed permanent maxillary incisors in children following delayed replantation. Endod Dent Traumatol 1997;13:269–75.
4. Humphrey JM, Kenny DJ, Barret EJ. Clinical outcomes for permanent incisor luxations in a pediatric population. I. Intrusions. Dent Traumatol 2003;19:266–73.
5. Martin BS. Traumatic intrusion of maxillary permanent incisors into the nasal cavity associated with a seizure disorder: report of a case. Dent Traumatol 2003;19:286–8.
6. Malmgren B, Malmgren O. Rate of infraposition of reimplanted ankylosed incisors related to age and growth in children and adolescents. Dent Traumatol 2002;18:28–36.
7. Andreasen JO. Atlas of replantation and transplantation of teeth, 1st edn. Fribourg: Mediglobe; 1992.
8. Andersson L, Malmgren B. The problem of dentoalveolar ankylosis and subsequent replacement resorption in the growing patient. Austr Endod J 1999;25:57–61.