# Intrusive luxation of primary teeth

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**Abstract** – Traumatic injuries caused by intrusion account for 4-22% of the damage in anterior primary teeth and are generally related to axial impact. They are more frequent in children aged 1–3 years because of the additional high resilience and flexibility of the primary teeth supporting structures. The treatment decision will depend on the magnitude of the trauma and on the displacement position. In most cases, radicular displacement occurs towards the labial bone plate. The clinical decision of spontaneous re-eruption and observation were adopted. This study aims at presenting a literature review illustrated with two case reports of patients having intrusive luxation injuries of the primary incisors.

Accidental intruded tooth falls into the classification of a luxation injury; it is generally the result of an axial impact, which dislocates the teeth into the tooth socket. This action damages the periodontal ligament and neurovascular bundle fibres. Depending on the magnitude of the impact, the injury can be divided into three types: type I, more than 50% of the crown is exposed; type II, < 50% of the crown is intruded (1).

Related literature has shown that luxation injuries of primary dentition represent 21-81% of traumatic injuries, accounting for 4.4-22% (2, 3). Despite the fact that prognosis is closely related to immediate care, most of the parents do not give importance to that fact (4).

The highest incidence of intrusive injuries of primary dentition is found in children aged 1–3years because of the high resilience supporting structures. This fact can be attributed to the larger trabecular spaces – an inherent characteristic of the developing bone tissue. Another factor that makes primary incisors more vulnerable to intrusions is the absence of root resorption (1).

Garcia-Godoy & Pulver (5) stress the importance of the technical-scientific background of staff when treating traumatized teeth. They also state that dentists, when solving those problems, must have the same expertise as they have in other clinical areas.

This article aims at presenting a literature review and a 5 and 10-year follow-up of patients with traumatic intrusive luxation.

#### Protocol for diagnosis and treatment

## Description of the trauma

During the first contact, some questions must be addressed about the general health of children: allergies to medications, vaccination, loss of consciousness or motor capacity after the accident, and time elapsed between the accident and treatment (6). The child's behaviour is a variable that must be taken into consideration in the treatment decisions.

## **Clinical examination**

Before any treatment is carried out, it is important to estimate the extent of the injury following a sequence of severity. Clinical examination should include assessment of vomiting, nausea, sleepiness, loss of consciousness, cyanosis, alterations in the patterns of respiration and speech, rhinorrhoea, otorrhoea and abnormal eye movements. If any sign of concussion is suspected, the patient must be referred to a doctor for a more detailed evaluation.

It is essential to control pain before cleaning the wounds, and an examination of the oral cavity is performed including a careful observation of injury to the soft and hard tissues (6). In addition to clinical examination, initial radiographs should be taken to assess the degree of intrusion and to make the treatment decision. The radiographs and/or photographic documentation might be advisable in order to provide legal protection. Soft tissues and the periodontium must be clinically examined. When necessary, radiographic shots of the damaged tissue areas must be taken to detect foreign bodies.

During visual inspection, the intruded tooth is submerged into the alveolar bone, situated up the line of occlusion, without mobility to palpation. The teeth can also present surrounding bleeding. In a retrospective study, Holan & Ram (7) studied 172 intruded primary incisors, and showed that root apexes were displaced towards the labial bone plate in more than 80% of the analysed cases. This would indicate that a clinical examination should include palpation of the buccal vestibule.

### **Radiographic examination**

Radiographic examination is essential in addition to clinical evaluation, making possible the identification of the type and position of the radicular displacement, diagnosis of bone fractures, degree of root formation and root resorption, relationship between deciduous teeth and its permanent successor and determination of the presence of foreign bodies in soft tissues. According to the International Association of Dental Traumatology (8), an extra-oral lateral and a periapical radiographic should be taken with a central angulation. The images help to determine the direction of intrusion (labial or palatine). They can also indicate a possible perforation of the cortical bone, as well as the deciduous tooth's root apex proximity to the follicle of the permanent tooth germ. In the case of type III intrusion, periapical and extra oral lateral radiographs must be taken as part of the routine procedure (4). The radiographic image will be elongated in case of lingual displacement, suggesting risk for the follicle of the developing permanent tooth germ (1, 4, 9).

#### Treatment plan

The treatment plan for intruded primary incisors is related to a judicious evaluation of some variables, such as the direction and severity of the intrusion and the presence of a fracture of the alveolar bone (1).

The direction of the intrusive displacement influences clinical decision making, such as whether to monitor and let the re-eruption occur or to extract the tooth. Because of the labial curvature, the roots of the primary incisors, teeth are frequently pushed towards the buccal surface, getting away from the successor permanent tooth germ (10). In the former, spontaneous re-eruption is indicated for a period of 1–6 months (11). When re-eruption does not start in the period of 4 weeks after the accident, an ankylosis of the alveolar socket should be considered. The diagnosis must be completed with radiographic examinations and, if confirmed, the treatment option will be extraction.

In type I, spontaneous re-eruption occurs in most cases and this should be the option for the initial treatment. In types II and III, the probability of ankylosis of the alveolar socket and pulpal necrosis is higher, so clinical and radiographic close systematic follow-up is necessary. According to the clinical progress, the adopted treatment can vary from observation and monitoring to extraction.

Holan & Ram (7) suggested spontaneous re-eruption as the treatment choice for intruded teeth. Ravn (10) observed that 52% of the intruded teeth, which had been left for spontaneous re-eruption, showed development disorders of the permanent successor teeth. On the other hand, when the clinical procedure was extraction, 72%of the teeth presented structural disorders on the permanent tooth germ. Results confirmed that, when the dentist faces dental trauma situations, it is important to be careful when manipulating the damaged area in order to avoid additional traumas.

A review of the literature to support the already defined guidelines was accomplished by Flores (4) in 2002 using an evidence-based approach in order to update established concepts for injuries in primary teeth. The conclusion was that in the majority of luxations in pre-school children, spontaneous healing without the need of interventions occurs. It was also suggested that pain and anxiety relief, as well as follow-up appointments together with a dental plaque control, offers the opportunity of avoiding the loss of many primary teeth affected by this kind of trauma.

Alveolar bone fracture is a complicating factor in the treatment option and prognosis after the intrusion of primary teeth. Borum & Andreasen (12) stated that 54.5% of the intrusive luxation injuries of primary incisors are associated with bone fractures. Josell (13) suggested two alternatives to treat intrusive luxations accompanied by alveolar bone fracture. The first is the extraction of the injured tooth and the second is the reduction of the fractured bone using digital pressure and the use of a splint for 3–4 weeks (8). When pulpal tissues and periapical structures are involved, as well as pulpal necrosis and/or pathological root resorption, it could complicate clinical occurrences after intrusive luxations in primary incisors (14).

Systematic clinical and radiographic monitoring of the intruded teeth are important to control the onset and development of pulpal necrosis. Intrusive luxation is also considered a factor triggering alterations during odontogenesis (15). However, an experimental study in monkeys showed that the periapical inflammatory reaction of primary teeth lasting up to 6 weeks does not induce developmental defects of the enamel on permanent teeth (16).

Thylstrup & Andreasen (16) claimed the lack of macroscopic and histological differences in the permanent tooth germ when the treatment option was spontaneous re-eruption or exodontia of the primary teeth damaged by intrusive luxation.

The prognosis of intruded primary incisors is directly related to the displacement and severity of the intrusion, and the developmental stage of the permanent tooth germ, which is more sensitive to alterations during the early stages of odontogenesis, such as morphodifferentiation, mineralization or pre-eruptive maturation (14, 15, 17). Diab & elBadrawy (1) considered several sequela possibilities that occur in permanent teeth when primary predecessors experienced avulsion injuries.

Clinical and radiographic control of primary damaged teeth must be performed systematically so that an early diagnosis of any harmful changes can be made, avoiding possible risks to the permanent tooth. The follow-up schedule of intrusive luxation in primary teeth should be made in accordance with the guidelines of the International Association of Dental Traumatology (8). The first follow-up must be carried out 1 week after the trauma if the patient does not present any symptoms; the second, 3–4 weeks later; the third, 6–8 weeks later, the fourth, 6 months later; and the fifth, 1 year later. After this



*Fig. 1.* Initial clinical and radiographic aspects (a, b). Spontaneous re-eruption after 2 months of the accident (c). Clinical and radiographic aspect after 14 months of trauma. Teeth 51 and 61 present an accelerated root resorption (d, e). Clinical aspect of teeth 11 and 21 after 5 years of regular monitoring. At this point, an alteration sequence on eruption in relation to the inferior incisors can be noticed. Absence of anomalies of the enamel of teeth 11 and 22 can be noticed (f).



*Fig.* 2. Intrusive luxation of teeth 51 and 61 (a, b). Re-eruption of the damaged teeth occurred 4 weeks after the trauma (c). Clinical and radiographic aspects after 3 months (d, e). Ten years after the trauma, the appearance of a sequel of the type hypoplastic enamel on teeth 11 and 21 (f). Teeth 11 and 21 aesthetically restored with composite (g, h).

period, clinical and radiographic monitoring should be performed annually until eruption of the permanent successor.

# Instruction to parents

Parents must sign a free and informed consent about the possible risks resulting from traumatic injury, such as

pulpal necrosis, resorption, ankylosis and damage to the developing tooth germ, and must also attend all followup appointments planned for monitoring and evaluation. They must receive clear instructions about all the home care needed to promote a normal healing.

During the first 2 or 3 days after trauma, oral hygiene regimes should be performed four times a day using a gauze pack soaked in 0.12% chlorhexidine solution.

When the child achieves sufficient motor development, he/she will be able to use chlorhexidine in a 0.12% solution to mouthwash twice a day. Three days after the accident, when dental and periodontal conditions are already favourable, the patient should be encouraged to return gradually to the use of toothbrush and dentifrice. Diet counselling should be provided and the patient should be advised to take soft food for 7–14 days.

# Conclusions

In conclusion, traumatic injury caused by intrusive luxation of primary dentition needs careful examination. As there is a higher probability of a displacement of the teeth towards the vestibular surface, it is advisable to wait for spontaneous re-eruption, besides following guidelines about diet and oral hygiene.

#### Appendices

## Case 1

R.D.M., male, 34 months old, with severe intrusive incisor luxation (Fig. 1a), presented teeth 51 and 61 with intrusion of type II (< 50% of the crown is exposed) and teeth 52 and 62 with type III (the entire crown is intruded) (1). The trauma was caused by a bicycle fall and the child was examined 30 min after the accident. Although anxious like his family at the moment of examination, it was possible to make a good diagnosis and treatment plan. After a complete cleaning of the oral cavity with gauze pack soaked in a saline solution (6), a clinical examination and periapical X-ray were performed. Although the 52 and 62 incisors had a type III intrusive luxation, the X-ray showed a labial displacement of the four incisors confirming that the apexes of the teeth were not in close contact with the permanent tooth germs. Therefore, the image of the X-ray was not elongated (1, 4, 9). There were no damages to surrounding tissues and the child had a good general health with the right immunization schedule updated.

The initial periapical radiographic image suggested the absence of bone fractures and of root resorption of the damaged teeth (Fig. 1b). The treatment decision making included spontaneous re-eruption followed by monitoring. Instructions to parents about oral hygiene of the affected area to help a proper environment for healing were given, as well as instructions about affering a soft diet during the first 2 weeks. The use of topic 0.12% solution of chlorhexidine was prescribed twice a day, for 7 days.

The first follow-up visit was performed after 1 week, the second, 3 weeks later; the third, 8 weeks later; the fourth, 6 months later; the fifth, 1 year later; and after this period, clinical and radiographic monitoring were performed until eruption of the permanent successor.

#### Case 2

F.M.D., female, 30 months old, showed intrusive luxation of the central incisors. Tooth 51 had a type III intrusive luxation while tooth 61 had a type II intrusive luxation (1). The trauma was caused by a fall at home. The family and the child were emotionally very upset and although the child was crying and frightened, she had a good general health. She presented an anterior open bite caused by finger suction habit. This leads to vulnerability of the upper incisors to trauma, as the inappropriate protection given by the upper lip was not present.

The examination was performed immediately after the accident and clinical and radiographic examinations were performed. A baseline periapical X-ray was technically deficient due to the child's behaviour. The sequence of examination, and decision making for treatment were basically similar to those carried out in case 1. The treatment decision making included spontaneous re-eruption and after the appointment, the parents were informed about diet, oral hygiene and immunization.

As the child lived in a rural area, the follow-up was not regular – a longer time elapsed in between the recall appointments than would be desired. Nevertheless, even without regular recall, 10 years after trauma, the patient was re-evaluated. Areas of enamel hypoplasia on teeth 11 and 21 was suggestive of follicle invasion at the moment of the trauma, although the radiographic image (Fig. 2b) does not suggest lingual intrusion. The teeth were subsequently aesthetically restored (Fig. 2g,h).

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