Therapeutic approach to intrusive luxation injuries in primary dentition. 
A clinical follow-up study

E. SPINAS, A. MELIS, A. SAVASTA

ABSTRACT. Aim This paper reports the results of a fifteen-year study carried out at the Dentoalveolar trauma study Centre of the University of Cagliari Dental Department, on treatment modes utilised for the recovery of periodontal injuries in primary dentition. Materials and methods The data referred to dental injuries were collected and recorded according to Andreasen’s dental trauma classification: clinical signs and symptoms, patient’s age and gender, lesion site and extent of the injury, timeframe between trauma and first dental examination. The authors focused their attention on intrusive luxations in primary dentition, which are a very frequent trauma in children between 1 and 4 years of age. It is extremely difficult to treat such injuries and there is an ongoing discussion about the advisability of extracting the intruded teeth, as opposed to wait and assist their natural repositioning using non-invasive techniques aimed at the maintenance of the eruptive space in the dental arch. Results This careful conservative approach allowed the repositioning of about 60% of the 85 intruded teeth examined. It substantially reduced the number and severity of undesirable sequelae, both local (enamel-hypoplasia) and occlusal (tooth retention), so that only in about 25% of the followed-up cases damages of the successor tooth were found in the permanent dentition. Conclusion The authors conclude their study emphasizing that all those involved in paediatric dentistry must be familiar with periodontal injuries and trained in their treatment, particularly as regards intrusive luxations in primary dentition.

KEYWORDS: Periodontal injuries, Intrusive luxation, Space maintainer, Primary teeth trauma.

Introduction

The term periodontal injury identifies a large variety of traumatic displacement of the tooth in its socket. The displacement may be partial (concussion, subluxation), directed outward (extrusion) or inward (intrusion) and may lead to lateral movement or even exarticulation (avulsion).

These dental traumas are mostly common in the age group between 1 and 4 years old (much more frequent than crown fracture) and among them intrusive luxation is the most frequent, regularly brought to the dentist’s attention.

It should also be considered that many dental “concussions or subluxations” are not referred to the specialist, either because unnoticed or deliberately overlooked by parents who, as well known, only become alarmed when they notice bleeding and/or tooth mobility [Caprioglio C. et al., 1995; Caprioglio D. et al., 1996].

Materials and methods

This clinical operative study on the treatment of these types of traumas is based on data collected over a period of about 15 years at the Dentoalveolar trauma study Centre of the University of Cagliari Dental Department, and on the careful and constant review of the international literature on the topic.

The research was carried out between July 1991 and August 2005 and the data were collected and recorded according to Andreasen’s dental trauma classification: clinical signs and symptoms, patient’s age and gender, lesion site and extent of the injury, timeframe between trauma and first dental examination.
Results

The selected data show that from a total of 250 patients (353 teeth) with primary dentition (160 males and 90 females) examined and treated at our department, 150 patients (85 males and 55 females) had periodontal injuries (218 teeth) (Fig. 1) and 85 of them (50 males and 35 females) had intrusive luxation (130 teeth); 90% of the intrusive traumas involved the upper front teeth (incisors and canines) and the remaining 10% the lower incisors; 50 cases affected just one tooth and the remaining 35 cases involved 2 or 3 teeth. The other periodontal injuries (mixed traumas) where classified as: concussions, subluxations, and avulsions, which were present in 55 cases (73 teeth), while there were extrusions in only 10 cases (15 teeth) (Fig. 2).

Among the most frequent aetiologic factors of such traumas were falls at home, especially in the age group from 12 to 24 months (Fig. 3), while in older children the causes were related to playing, bicycle and tricycle riding, not just in the domestic environment [Andreasen and Andreasen, 1994]

Our department’s experience reports that for 110 patients the first examinations were carried out within the first 24-48 hours from the traumatic event, in 22 cases the dental examination took place within one week, and in other 18 patients the timeframe was longer (even months afterwards), i.e. when the effects or complications of the trauma [Zerman, 1994] become apparent (Table 1).

We observed that intrusive luxation is the most frequent event in this group of patients (Fig. 4), thus our interest will be focused on the conservative treatment of this kind of injuries.

When treating an intrusive luxation, it is important to immediately detect the position of the tooth and particularly its root, which may be displaced as a consequence [Flores, 2002; George, 2004].

In these cases the patient’s age is an important factor since the younger the child the greater the chance that, given the presence of a completely formed and sharp root apex, the intrusive movement will affect the germ of the developing permanent tooth altering its position and/or shape, depending on direction and magnitude

<table>
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<tr>
<th>Time</th>
<th>Patients</th>
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<tbody>
<tr>
<td>Within 24-48 hour</td>
<td>110</td>
</tr>
<tr>
<td>Within 1 week</td>
<td>22</td>
</tr>
<tr>
<td>After 1 week</td>
<td>18</td>
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**Table 1 - First examination from the traumatic event.**
of the traumatic force [Cameron and Widmer, 1997; Gondim and Moreira, 2005; Cunha et al., 2005].

In our study sample complications in the permanent dentition were found in about 25% of cases (32 teeth) and they included: arrested or delayed eruption with migration (ectopia) of the permanent tooth, localised lesions (alterations) of the crown (enamel and dentin hypoplasia have been found in about 35% of the severe intrusions in this study’s sample), tooth dilaceration and/or destruction of the dental germ and development of odontoma-like malformations (Fig. 5) [Andreasen and Ravn, 1970; Andreasen et al., 1970; Nelson–Fhilo et al., 2005].

As already highlighted, in case of intrusive luxation in primary dentition, the therapeutic approach of choice at our department is a watchful waiting therapy to encourage the spontaneous repositioning of the intruded tooth. When this is not possible because of excessive dental mobility and/or local infection, the affected tooth is extracted [Kalwitzki and Weiger, 2005]. This procedure was necessary in 9 cases (9 teeth) immediately following the trauma; in 9 more cases (11 teeth) extractions had to be performed after a short period from the traumatic event (Table 2).

In most of the treated cases the repositioning was successful, leading to a complete recovery (re-eruption) in 40 subjects (70 teeth total) (case 1, Figure 6).
In 9 cases a partial repositioning (15 teeth) was obtained and 18 more patients (25 teeth) showed no movement of the displaced teeth (Table 3). In such cases, however, the immediate extraction is not necessary, especially in absence of concomitant infection. It will be sufficient to perform regular

<table>
<thead>
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<th>Therapy</th>
<th>Teeth</th>
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<tr>
<td>Immediate extraction</td>
<td>9</td>
</tr>
<tr>
<td>Extraction after 1 week</td>
<td>9</td>
</tr>
<tr>
<td>No extraction</td>
<td>67</td>
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**Table 2** - Dental extraction after trauma.

**Fig. 6A** - Case report 1: lateral intrusive luxation.

**Fig. 6B** - Radiograph of this severe case of lateral intrusive luxation: patient's examination took place 8 hours after the traumatic event.

**Fig. 6C** - Clinical follow-up after 90 days.

**Fig. 6D** - Radiograph 90 days from the injury: note the initial good eruption of the traumatized tooth.

**Fig. 6E** - Clinical follow-up 6 months after trauma.
check-ups with clinical and radiographic examinations to verify if the intruded tooth is interfering with the development and normal eruption of the homologous permanent element. Such procedure may result in infraocclusion (pseudoankylosis) of the intruded tooth but will not interfere with the normal development of the adjacent teeth in formation, maintaining at the same time an adequate space for the homologous permanent tooth (successor) to erupt. Furthermore, with regular check-ups the young patient familiarizes with the operator and the examinations of the injured site and in the future any procedure, included the most invasive ones, will be performed easily and rapidly [Weiger and Heuchert, 1999].

The waiting therapy is justified in light of the future eruption problem that the permanent tooth might incur if the eruptive space is not preserved. Proceeding to immediate extraction of the intruded tooth, at this age, may lead to substantial occlusal asymmetries, as well as phonetic and swallowing complications (lingual interposition), that can only be treated by the positioning of removable space maintainer appliances. Since they are not suitable for children under the age of 24 months, in the youngest patients it is advisable to postpone their use [Weiger and Heuchert, 1999].

If check-ups and radiographic examinations will show eruptive interferences from the infraoccluded tooth, it will be necessary to intervene. In a few cases (7 patients in our group) the subjects were required to wear an expander with NI-TI clasps to regain an adequate eruptive space (case report 2, Figure 7). In some cases, especially in the younger patients where the space closure has not taken place yet, this treatment can be performed after the removal of the infraoccluded tooth.

Following the above therapeutic principles, the extraction of the infraoccluded tooth is usually very fast and simple, at most requiring the elevation of a small flap to allow the grabbing of the intruded tooth’s crown followed by a very small suture with negligible

**Table 3 - Success of dental repositioning.**

<table>
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<tr>
<th>Patient</th>
<th>Teeth</th>
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<tr>
<td>Complete dental repositioning</td>
<td>40</td>
</tr>
<tr>
<td>Partial repositioning</td>
<td>9</td>
</tr>
<tr>
<td>Complete dental immobility</td>
<td>18</td>
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**Fig. 6f** - Clinical follow-up at 9 months from the injury: note the good repositioning of the traumatized tooth.

**Fig. 6g** - Radiograph before the eruption of 1.1 and 2.1 at three years from the trauma.

**Fig. 6h** - Clinical follow-up at four years from the injury: note the significant hypoplastic lesions of 1.1 and 2.1, sequelae of the previous intrusive trauma.
FIG. 7A - Case report 2: intrusive trauma with overlap of tooth +1.

FIG. 7B - Radiograph at about 6 months from trauma.

FIG. 7C - Waiting period of about 3 months to evaluate the behaviour of the permanent tooth germs.

FIG. 7D - Note the easy extraction.

FIG. 7E - The arrested root exfoliation of the infraoccluded tooth can be clearly seen.

FIG. 7F - Image at three months from application of the ACTIVE R.S. Ni-Ti to reopen the eruptive space of 1.1: sufficient eruptive space regained.
The adequate eruptive space maintenance must be assessed with regular check-ups in order to evaluate the timing and direction of the tooth eruption. Upper incisors are often buccally inclined and their eruption may be delayed due to the thicker layer of gingival mucosa covering the area [Holan and Ram, 1999]. In our sample a flap opening procedure, without orthodontic traction, was necessary only in few cases (4 patients) to speed up the eruption of the permanent incisor in the dental arch.

**Conclusions**

Since periodontal injuries of primary dentition are a frequent event, all those involved in paediatric dentistry must be familiar with their evolution and trained in their treatment, particularly as regards intrusive luxation [Spinas, 2003].

In order to achieve successful results, these protocols require a correct approach also considering and taking into account the psychological and emotional state of the child, as well as his parents [Brine et al., 1997].

A carefully planned conservative approach is rewarded in 60% of cases by the spontaneously guided re-eruption of the tooth involved; only in few cases more complex protocols were necessary.

Furthermore, a correct treatment can reduce the chances of possible sequelae that may lead, if
overlooked, to serious malformations; until recently, traumas of deciduous dentition were considered not relevant or deserving of attention. This attitude, expressed by the saying “...the tooth will fall anyway” has never been sufficiently criticised, causing severe and numerous complications for the unfortunate young patients.

References