Impacted post-traumatic maxillary central incisor: A multidisciplinary approach



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DOI 10.23804/ejpd.2020.21.03.10

Abstract

Aim The aim of this paper is to provide clinicians useful information for the management of impacted central incisor due to early childhood trauma.

Case report It is reported the case of an impacted right maxillary central incisor in an 8-year-old male patient who had an intrusive luxation trauma of primary tooth at the age of 4. After clinical and radiographic evaluation, a multidisciplinary treatment plan was planned. Therapy involved a surgical and orthodontic approach in order to expose the tooth and move the incisor in the normal position with a self-ligating appliance system.

Results Through a multidisciplinary approach it was possible to move the impacted incisor in the occlusal plane, preserving periodontal tissues and tooth vitality.

Conclusion When a permanent tooth is impacted, the multidisciplinary approach of surgery and orthodontic treatment is the best way to obtain a suitable outcome in terms of gingival contour, occlusal plane and aesthetics, when compared with other treatment options.

KEYWORDS Childhood trauma, Impacted incisor, Orthodontic traction.

Introduction

Traumatic dental injuries (TDI) occur frequently in childhood, both in primary and permanent dentition, with an incidence rate of 25–30% in children and young people [Cully et al., 2019]. The first high incidence peak occurs in primary dentition between the first and the third year of age, because of the passage to the upright posture, the early stages of walking, a lack of motor coordination and recklessness of the child [Planells del Pozo et al., 2012]. Males are more affected than females (M:F = 3:2) [Andreasen et al., 2006].

The most common causes are falls at home or during sporting activities or playing, but there are some predisposing factors to TDI as Angle Class II or increased overjet (> 4–6mm) that must be intercepted and treated as soon as possible. The most common type of traumatic injury affects the upper maxilla, particularly central incisors (80–90%) [Caprioglio et al., 1996].

If dental cavities and early childhood caries are strongly related to lifestyle and, therefore, preventable [Paglia et al., 2019; Colombo et al., 2019], dental injuries are accidental events that in most cases can not be predictable. Prevention should be focused on educating people, intercepting predisposing factors, getting to wear mouthguards in order to protect the exposed facial areas and preventing the recurrences of post-traumatic events.

In primary dentition intrusion is the most common trauma, around 29.3% [Do Espírito Santo Jácomo, 2009]. When intrusion occurs, the primary tooth disappears totally or partially inside its socket. The trauma displaces the incisor moving the root buccally and the crown palatally and in some cases the root breaks through the vestibular soft bone of the child.

Germs of the permanent teeth are particularly sensitive in the early stages of their development, which occur between the ages of 4 months and 4 years [Altun et al., 2009].

During the trauma, the primary tooth apex can often affect the succedaneous permanent bud; the contact between these two teeth may interfere with the odontogenesis of the permanent tooth, and the defect will be visible after eruption. The patient's age, severity of the trauma and site and extension of the injury affect the type of permanent tooth damage, both to the crown and to the root. Regarding the crown, the trauma can cause enamel or dentine hypoplasia, disturbance in the mineralisation of enamel (brown or yellow discoloration) and crown dilaceration (displacement of a portion of the developing crown at an angle to the longitudinal axis of the tooth) (Dental Traumatology, 2010). In case of root damage, the sequelae could be root duplication, root dilaceration or partial or complete arrest of the development. When the entire bud is involved, abnormality in the path of eruption of the permanent tooth can occur, which may result in delay or acceleration in eruption, or ectopic tooth and impaction. The percentage of developmental disturbances of the permanent incisors that could be attributed to injuries of their predecessors ranges from 12% to 74% [Mendoza-Mendoza et al., 2015].

The aim of this article is to report the surgical-orthodontic management of an impacted central incisor due to trauma in a young patient, avoiding prosthetic/implants replacement.

Case report

An 8-year-old male patient (MS) was referred to the Orthodontic Department of UOC Odontostomatology and

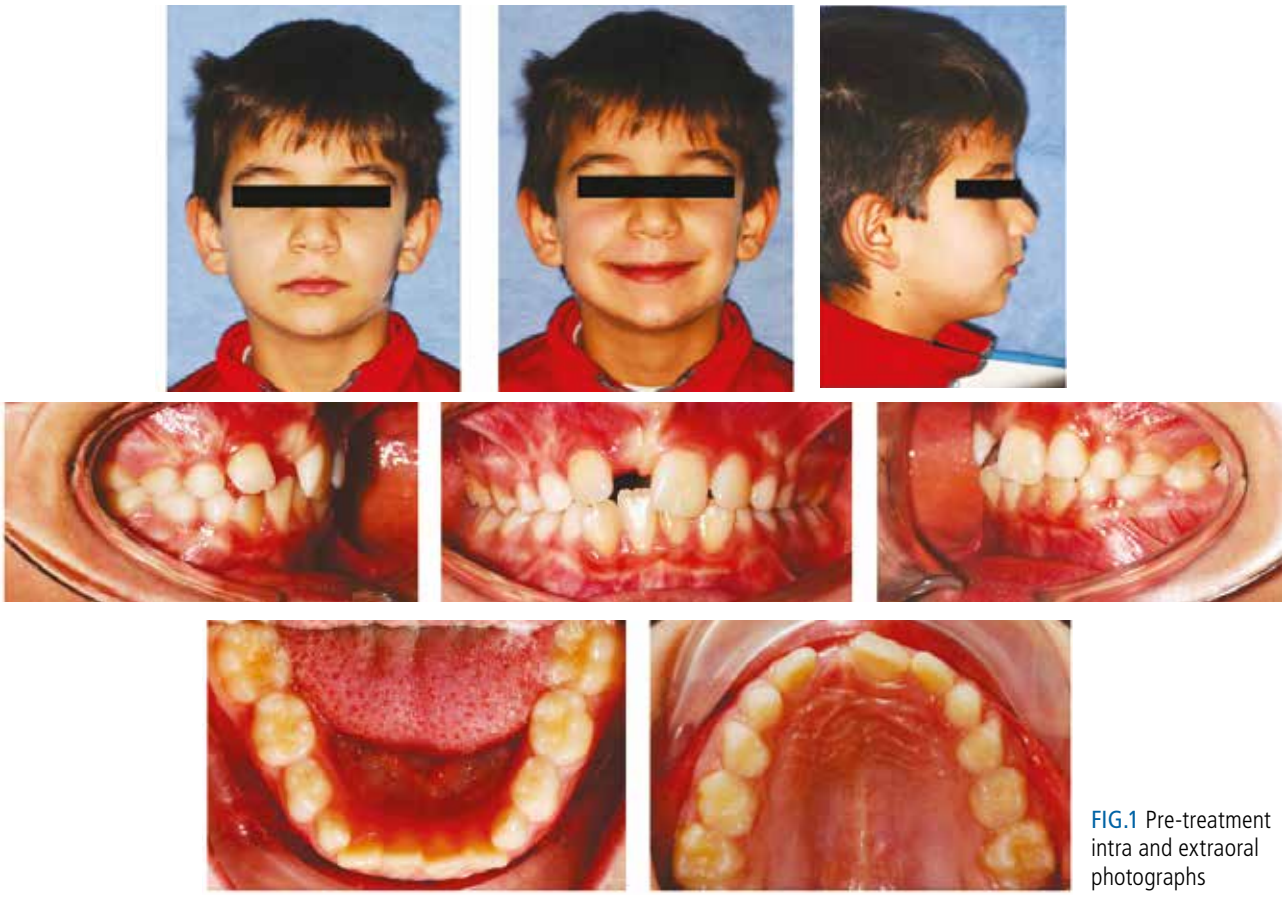


FIG.1 Pre-treatment intra and extraoral photographs

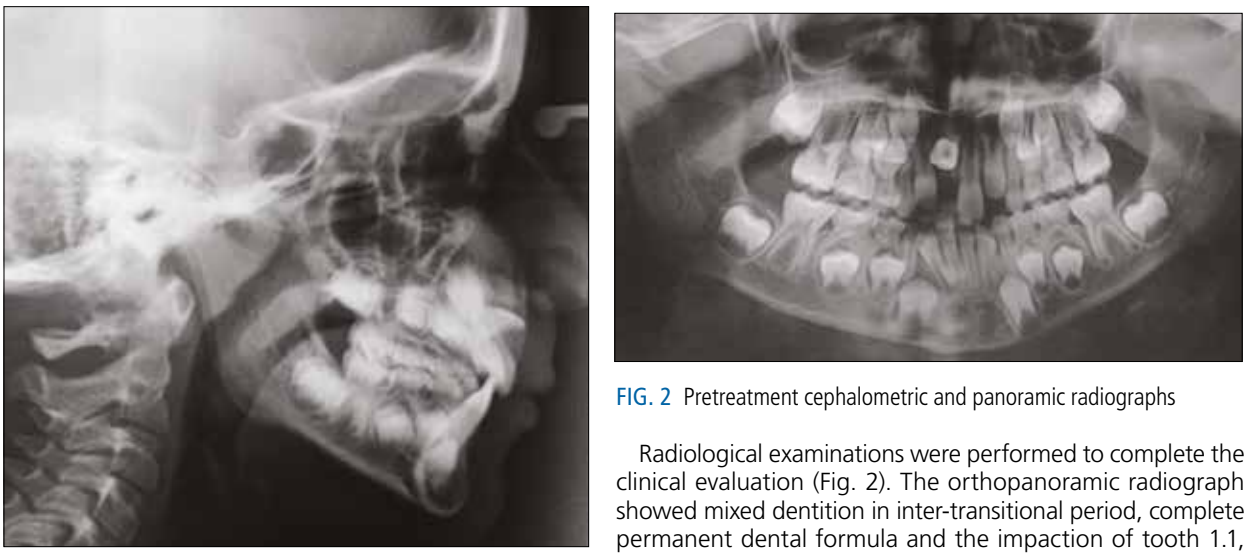


FIG. 2 Pretreatment cephalometric and panoramic radiographs

Maxillofacial Surgery, Fondazione IRCCSS Ca' Granda Ospedale Galeazzi (Milan, Italy) for orthodontic evaluation.

Medical history about general health was unremarkable, but the mother referred a history of anterior dental trauma to the primary incisors at the age of 3. She referred that the right primary incisor had been extracted when the child was 3, after an intrusive luxation trauma occurred in kindergarten.

Clinical intra-oral evaluation showed mixed dentition with the absence of tooth 1.1 and space closure between the right lateral incisor and the left central incisor. Occlusal analysis revealed a molar Class I relationship and crowding level 1 in both arches (Fig. 1).

Radiological examinations were performed to complete the clinical evaluation (Fig. 2). The orthopanoramic radiograph showed mixed dentition in inter-transitional period, complete permanent dental formula and the impaction of tooth 1.1, whose crown was located at the level of the second half of the left incisor's root. CBCT analysis was required in order to define the exact position of the impacted tooth and any possible relationship with other maxillary structures (Fig. 3). The first consideration to be made is the morphology (usability) of the unerupted tooth and its position [Proffit, 5th edition]. Correct localisation of the impacted tooth plays a crucial role in determining the feasibility of the surgical approach as well as its adequate access, and the proper direction for the application of orthodontic forces. The image revealed that tooth 1.1 was positioned horizontally, in proximity to the anterior nasal spine; the crown was positioned labially, while the root palatally. The cephalometric image showed a skeletal Class II, a tendency to

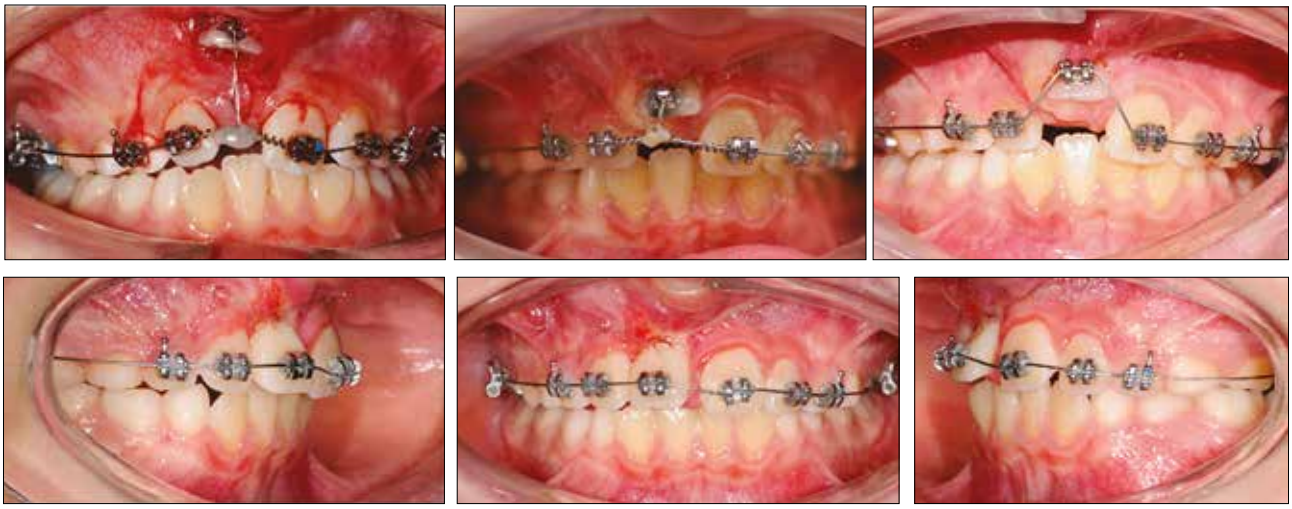
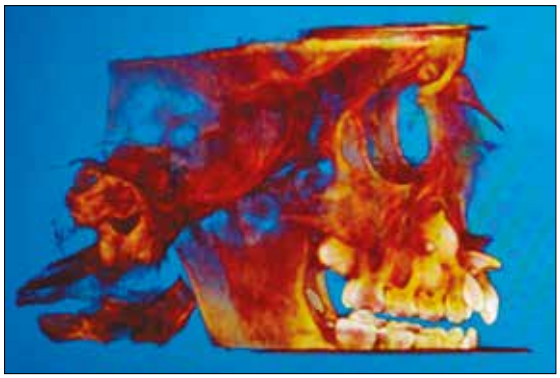


FIG. 4
In-treatment intraoral photographs.



FIG. 3
Pretreatment CBCT.





a hyperdivergent profile and a prediction of mandible growth in post-rotation, with a short ramus. The IMPA was 90.6° and the value of Wits was 4.5 mm.

The surgical-orthodontic approach was chosen in order to reposition the impacted tooth in proper alignment and to create a complete anterior dentition and a functional occlusion, for mastication, phonetic and aesthetic purposes. A quad helix appliance was applied to the upper arch as anchorage and in order to create arch expansion to regain the lost anterior space. The teeth from the primary right canine to the left were bonded with Unitek 3M Smart Clip and a 0.016" nickel-titanium wire was used for the initial alignment. An open coil spring was placed between the right lateral incisor and the left central incisor to create the space for the right central incisor.

Surgery was planned to bond the impacted tooth's incisor with a bracket linked to a metal chain. The metal chain was connected to the archwire and gradually activated until tooth eruption, to reposition the bracket, since the initial bonding during the surgical procedure was less than ideal (Fig. 4). When possible, a 0.012" NiTi wire was engaged in the self ligating brackets (Fig.5).

Discussion

Diagnosis

Clinical diagnosis of permanent incisor damage is evident when the tooth does not erupt, which concerns the parents during the early mixed dentition. A clinical sign of impaction is a delay of more than 6 months with respect to the contralateral tooth.

Diagnosis of impacted tooth is made through a radiographic evaluation. According to the Italian Guidelines of radiographic evaluation in growing patients (National Guidelines, November 2017), the first radiographic step in intrusive traumas is a periapical image (Strength of recommendation grade A, Level of evidence IV), which can provide enough information for the treatment. If bidimensional imaging can not give satisfactory data, 3D imaging is needed, especially when a complex treatment plan must be programmed. CBCT should be recommended when the diagnostic information gathered by 3D analysis improves the treatment results; limited FOV should be selected as imaging modality, delivering less radiation [Rodrıguez et al., 2017]. Due to the highly detailed three-dimensional information obtained, computerised tomography is the method of choice for accurately defining the position of an unerupted tooth and identifying any root resorption of adjacent teeth not detectable by other methods [Huber et al., 2008].

Treatment

Treatment plan of an impacted maxillary incisor requires a multidisciplinary approach; after a careful radiographic



FIG. 5 Post-treatment intraoral photographs.

examination, orthodontic, surgical, endodontic and periodontal considerations are essential for a successful treatment.

At the moment of the trauma, if the primary tooth apex is displaced toward or through the labial bone plate, the tooth is left for spontaneous repositioning; on the other hand, if the apex is displaced into the developing tooth germ, extraction is the standard treatment (Dental Trauma Guidelines, 2012). Sometimes after primary tooth's removal, the permanent incisor erupts without any additional treatment. When the displacement is severe and prevents spontaneous eruption, a multidisciplinary treatment is necessary [Spinas et al., 2006].

Literature suggests different solutions depending on the localisation of the impacted incisors: surgical extraction of the permanent incisor and the opening or closing of the space, planning implant or prosthodontic restoration of the lateral incisor instead of the central one, and orthodontic space opening and traction of the impacted incisor into proper alignment [Farronato et al., 2009; Celli et al., 2015; Hurley et al., 2018]. The first solution is unavoidable when the impaction is too deep or the tooth is too damaged, nevertheless, whenever possible, the best solution is the surgical-orthodontic approach. After orthodontic creation of the space, a surgical exposure of the impacted tooth is needed in order to bond a bracket and make the orthodontic traction to the occlusal plane.

Conclusion

Traumatic dental injury in primary dentition can affect the permanent dentition, especially in the case of intrusive luxation. The close relationship between the apexes of the primary teeth and the developing permanent successor can, in turn, lead to multiple complications, which are greater when the permanent tooth is affected in the early stages of development.

When a permanent tooth is impacted, the multidisciplinary surgical and orthodontic approach is the best way to obtain a suitable outcome in terms of gingival contour, occlusal plane and aesthetics.

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