

# Developmental Disturbance of a Maxillary Permanent Lateral Incisor Following Trauma at the Age of 16 Months: A 6-Year Follow-Up

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*A 3 year and 8 months old Chinese boy was referred for a consultation regarding his missing maxillary anterior teeth. He had a history of trauma to his primary maxillary anterior teeth due to a fall at the age of 16 months. Clinical examination of the patient indicated multiple carious lesions and inadequate oral hygiene. Radiographic examination revealed intrusion of the primary left lateral incisor, with evidence of damage to the permanent tooth germ. Subsequently, the patient was followed-up for almost six years during which his permanent maxillary left lateral incisor erupted exhibiting an unusual morphology. Clinically enamel hypoplasia and radiographically dens invaginatus were evident in affected tooth.*

**Keywords:** Trauma, Enamel hypoplasia, Dens invaginatus

## INTRODUCTION

The reported prevalence of traumatic injuries in primary dentition varies from 15% to 35%.<sup>1</sup> Trauma to a primary tooth can be responsible for the malformation of the succedaneous developing tooth germs. Experimental work on animals and observational studies on humans have established that if a region of the jaws is adversely stimulated during the period of tooth development, permanent teeth may fail to develop or be dwarfed.<sup>2</sup> Consequences of trauma to a primary teeth, as reported in the literature, include delayed development, enamel discoloration, enamel defects, dilacerations of the crown and/or root, malformation of the crown, and odontoma like malformations of the permanent tooth.<sup>[3-6]</sup> However, the majority of dental malformations are incidental findings, and few authors have even chosen not to speculate on their etiology. One possible reason for the damage can be attributed to the close anatomic relationship between the roots of primary incisors and permanent tooth germs,<sup>3,5,7</sup> which highlights that any type of trauma to the primary teeth may be of importance. However, the degree of damage to the permanent tooth is dependent on the age of the patient, extent of the trauma, and the stage of development of permanent tooth germ.<sup>8</sup>

Intrusion and avulsion are the most severe injuries that affect the developing tooth germ in children aged between 0-2 years of age<sup>5,8</sup> which corresponds to the time of calcification of the enamel matrix.<sup>4,5,8</sup> Although it has been reported that 88% of intruded primary teeth would erupt spontaneously, the treatment option for severely intruded of primary anterior teeth is extraction.<sup>9</sup> Re-implantation of avulsed primary teeth is contra-indicated.<sup>9</sup>

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The immediate treatment for traumatic injuries to primary teeth is often limited to emergency measures alone, whereas monitoring possible side effects on the developing permanent dentition is commonly overlooked.<sup>10</sup> The extent of the potential damage to the permanent tooth is not always evident during the first examination. Therefore, both immediate treatment and long-term follow-up with regular clinical and radiographic examinations are critical. This clinical report illustrates a patient who encountered trauma to his primary teeth at 16 months of age and its consequence on the permanent successor, which was a permanent maxillary lateral incisor.

**Case report**

A 3 year and 8 month old Chinese boy was referred to the Pediatric Dentistry clinic at the Prince Philip Dental Hospital (University of Hong Kong, Hong Kong, China SAR) for a consultation regarding missing maxillary primary anterior teeth. His past medical history was unremarkable. The past dental history revealed that his primary maxillary anterior teeth were avulsed by trauma at the age of 16 months. The private general dental practitioner who reimplanted the avulsed teeth and stabilized the anterior teeth using a splint provided the emergency treatment under local anesthesia. No further treatment was provided according to the parents. They were unaware when the splint came off or when the teeth exfoliated.

Intra-oral examination of the patient at the time of the initial referral appointment indicated multiple carious lesions and inadequate oral hygiene. Radiographic examination revealed intrusion of primary left lateral incisor (Figure 1a). The parents were advised of possible consequences to the permanent tooth due to the intruded primary maxillary left lateral incisor. The carious teeth were restored and oral hygiene instructions were provided. The permanent anterior teeth began to erupt at the age of 6 years. It was apparent that the anatomy of the permanent maxillary lateral incisor was abnormal on the maxillary anterior occlusal radiograph (Figure 1b). The patient was monitored with regular clinical and radiographic examinations for almost 6 years post-trauma until complete eruption of the permanent maxillary left lateral incisor (Figure 1c). Clinically, there was evidence of enamel hypoplasia on the labial surface (Figure 2a), a deep fissure on the palatal surface, as well as malformation in the tooth morphology (Figure 2b). Furthermore, the periapical radiograph of tooth 22 showed invagination of tooth structures into the pulp hence, the diagnosis made was of dens invaginatus (Figure 3). Gingival inflammation was observed on the labial surface of the permanent maxillary left lateral incisor, which was caused by accumulation of plaque on the hypoplastic enamel surface. At subsequent appointments, the malformed permanent maxillary left lateral incisor responded positively to pulp sensibility testing and a resin composite restoration on the buccal surface (Figure 4a) and fissure sealant was placed as a preventive measure to avoid food trapping and caries on the palatal surface (Figure 4b). The patient is currently under review to monitor the eruption of the remaining permanent teeth.

**Figure 1.** Anterior occlusal radiographs showing, (a) intrusion of maxillary primary left lateral incisor root traumatizing the permanent tooth germ (at the age of 3 year and 8 months), (b) abnormal morphology of the crown of maxillary left lateral incisor (at the age of 6 year and 1month), and (c) erupted and malformed maxillary permanent left lateral incisor (at the age of 9 years).

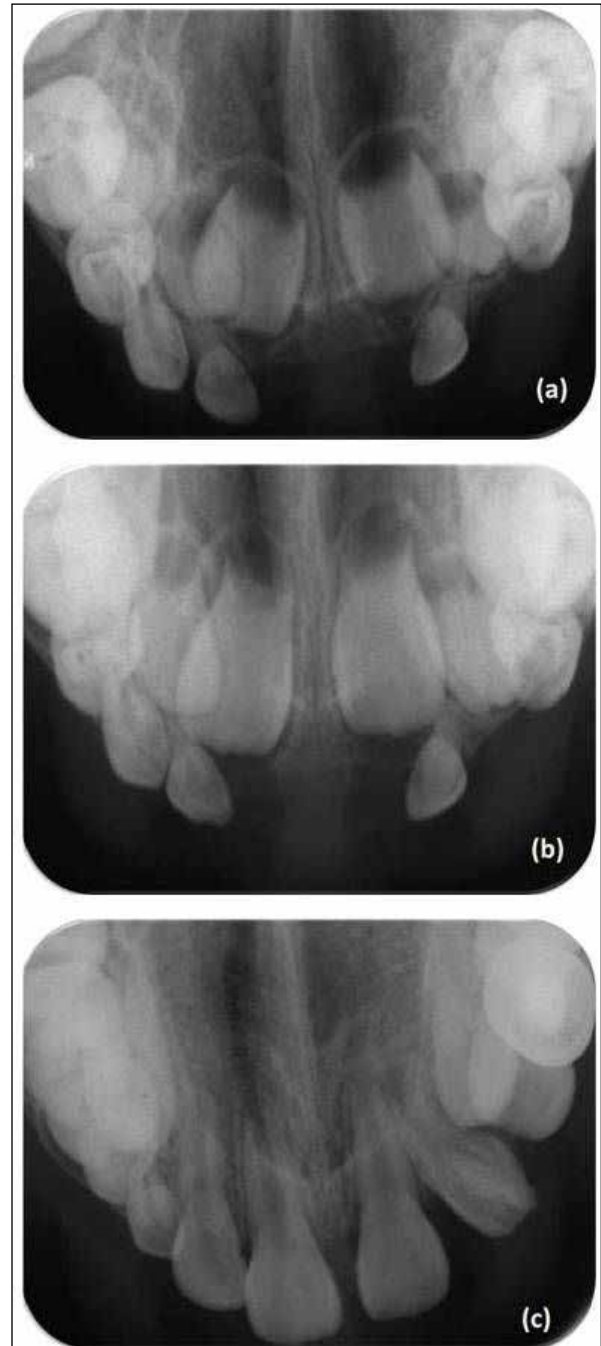


Figure 2. Intra-oral photographs showing, (a) malformed permanent maxillary left lateral incisor with a palatal surface depression (arrow), and (b) labial surface showing enamel hypoplasia (dashed arrow) and gingival inflammation (arrow).

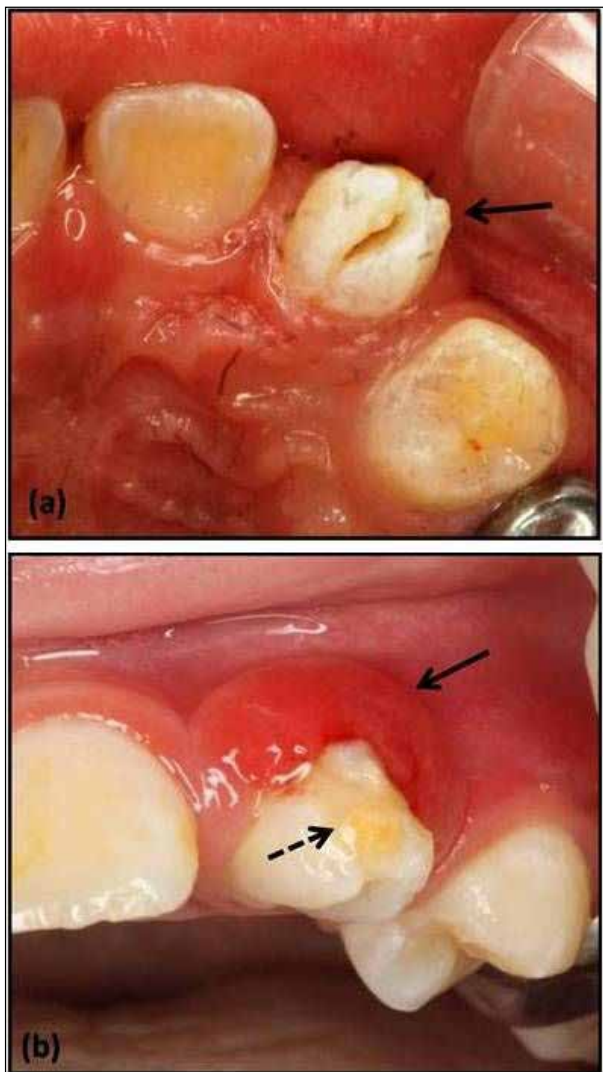


Figure 3. The periapical radiograph showing malformed permanent maxillary left lateral incisor (arrow) with Oehler's Type II dens invaginatus (dashed arrows).



Figure 4. Intra-oral views showing (a) fissure sealant on the palatal surface and (b) composite build-up on the buccal surface of the permanent maxillary left lateral incisor.



## DISCUSSION

Trauma to the oro-facial structures has more unfavorable effects on the permanent teeth in children below 5 years of age than in older children.<sup>11</sup> Trauma to a primary tooth at an early age may cause adverse consequences to its succedaneous tooth. In addition, the younger the child at the time of injury to the primary tooth the more likely, the development of permanent successors will be affected.<sup>12</sup> Parents and clinicians are becoming more aware of the possible complications to the permanent dentition with more information and education regarding injuries to the primary dentition.

von Arx<sup>6</sup> found a high correlation between the degree of intrusion of the primary incisors and the frequency and severity of developmental disturbances of their successors. In a study of trauma to 100 primary teeth, 44% of the permanent incisors had internal discoloration as a result of intrusion injuries to the predecessors before the age of 4 years.<sup>4</sup> Furthermore, enamel hypoplasia results from damage to the coronal portion of the developmental tooth germ during the formation stage of the enamel.<sup>6,13</sup> Finally, severe intrusion of the primary incisor between the ages of 1 and 3 years affect the developing tooth germ, and causes structural malformation.<sup>4,13,14</sup> The degree of tooth germ malformation is directly related to the stage of development at the time of the trauma and the direction of the traumatic forces.<sup>14,15</sup>

The influence of trauma to the primary incisors on their permanent successors can be related to several factors such as the spatial relationship of the involved teeth, the type of injury and the age of the child at the time of injury which in turn relates to the developmental stage of the successor.<sup>15</sup> It has been suggested that periodic clinical and radiographic examinations are important to evaluate the disturbances that have occurred in permanent teeth due to the trauma to its predecessor.<sup>13,16</sup> According to a retrospective study, it seems that a period of follow-up for two years with consecutive radiographic records and clinical examinations are sufficient to demonstrate outcomes such as pulpal necrosis, ankylosis and root resorption.<sup>17</sup> In this case, we observed enamel hypoplasia and malformation of the crown of permanent maxillary left lateral incisor.

Oehler's Type II dens invaginatus<sup>18</sup> of permanent tooth maxillary left lateral incisor may have been due to intrusion of its predecessor into the underlying tooth germ of the successor tooth or dens invaginatus is a coincidental finding. It has been suggested that dens invaginatus can be the result of external forces exerting an effect on the tooth germ during development that was probably caused by its predecessor. These forces could be from adjacent tooth germs, the central incisor or canine that may develop at least six months prior to the lateral incisor while other external factors such as trauma and infection<sup>19,20</sup> have also been suggested for possible reason for occurrence of dens invaginatus.

Prior case reports<sup>21-24</sup> and a few studies<sup>3-6,15-17</sup> support the concept of intrusion injuries of primary teeth as the most common possible reason for developmental disturbances in the underlying permanent teeth. In our case, the malformation of the permanent maxillary left lateral incisor observed was probably due to luxation and intrusion of the predecessor due to trauma at an early age. The primary teeth are vulnerable to trauma and the consequences on the permanent successor may not be easy to predict or may not be evident until it has erupted. Careful radiographic examinations at regular intervals are of the utmost importance when attempting to correlate trauma to the primary incisors and of developmental defects in their successors.

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