Traumatic injuries in primary teeth

Avan Mohammed[1]

Trauma to the primary dentition in the early years is common, as children learn to walk and run. Studies have shown that dental injuries account for 17% of all physical injuries in preschool children (Petersson et al, 1997).

Crown calcification of the secondary maxillary and mandibular incisors starts from birth and is completed at four to five years. On average, when the teeth erupt, approximately half to two thirds of the root is formed and continues after eruption for up to three years.

The potential damage to the permanent teeth depends on the dental age at the time of the injury. This is due to the proximity of the primary incisor roots and the developing permanent tooth germ in early years. It is thought that traumatic dental injuries in children up to the age of three years can affect the developing permanent tooth.

A long-term study that looked at 255 traumatised primary teeth found 23% of the corresponding permanent teeth to have developmental disturbances. Severe injuries, such as intrusion and avulsion, can cause developmental malformations in permanent teeth (Andreasen and Ravn, 1971).

Malocclusion factors

Multiple factors affect the severity of damage to the permanent tooth germ, including the force and direction of impact, type of dental injury and the stage of crown development at the time.

The most common malformation sequelae of traumatic injuries to the primary teeth include enamel hypoplasia and developmental disturbances.

Furthermore, several malocclusion predisposing factors have been associated with higher incidence of dental trauma:

- Increased overjet in the primary dentition. The risk of dental trauma is three times greater with an increased overjet greater than 6mm, whereas children with an overjet less than 3.5mm are half as likely to suffer from dental trauma
- A positive association between anterior open bite and traumatic injuries has also been found
- Incompetent lips/inadequate lip support.

Disturbances to the secondary dentition

The extent of these malformations depends on the developmental stage of the permanent tooth and the severity of the trauma.

[1] Avan Mohammed is an award-winning specialist orthodontist working in private practices in Marylebone, Islington and South Kensington.

Contact:
avan.mohammed@dentex.group

Figure 1A: Severe enamel hypoplasia of the partially erupted UL1 after traumatic injury to the primary central incisors.

Figure 1B: Localised hypoplasia affecting the UR1, causing white discolouration of the enamel as a result of intrusion trauma the URa.

Figure 2: Ectopic eruption of UL3 as a result of previous trauma to the ULc.

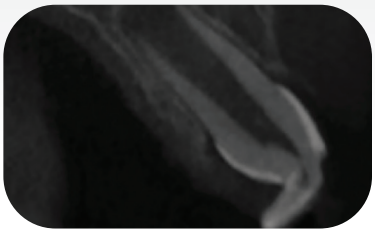

Figure 3: The UL1 crown is partially erupted through the crestal bone. The crown is malformed with a dilacerated appearance (sagittal CBCT view).

Figure 4: Partially resorbed crown of the ULb. The UL2 root has a 45-degree dilaceration in the cervical region. The root is narrow as would be seen on a peg lateral (sagittal CBCT view).

Children with acute dental trauma and severe tooth displacement are often managed by dentists or paediatric dental specialists. However, not all children are diagnosed at the time of injury with parents often not remembering, and therefore unaware of the potential long-term impact to the developing dentition.

Often, parents notice a problem during the early mixed dentition when the incisors fail to erupt and start to seek help. Taking a detailed history often reveals past trauma to the primary teeth.

The severity of the developmental defects to the permanent teeth varies from mild to severe developmental disturbances.

Types of developmental disturbances

1. Mild to severe enamel hypoplasia

This is defined as a developmental disturbance resulting from incomplete or defective enamel matrix formation.

Enamel hypoplasia commonly affects maxillary central incisors and can vary from mild white brownish discolouration of the enamel to severe pitting (Figures 1a and 1b).

These defects can be categorised according to severity (Golpaygani et al, 2009):

- Type I hypoplasia: enamel discolouration due to hypoplasia
- Type II hypoplasia: abnormal coalescence due to hypoplasia
- Type III hypoplasia: some parts of enamel missing due to hypoplasia
- Type IV hypoplasia: a combination of the previous three types of hypoplasia (circular enamel hypoplasia).

2. Ectopic eruption

Traumatic dental injuries such as avulsion or intrusion may result in the physical displacement of the permanent tooth germ disturbing its normal path of eruption (Figure 2).

Premature loss of primary incisors can also cause lack of eruption guidance for the permanent tooth. Failure to treat ectopic teeth can result in malocclusion and loss of arch length. Early orthodontic treatment is often indicated in these cases.

3. Crown malformation and dilaceration

The abnormal bend of the crown can often be seen as the teeth start to erupt. These are most commonly seen in permanent maxillary incisors, which often erupt in a labial or palatal position. Depending on the severity of the crown malformation, it may be possible to restore the tooth with a crown to improve aesthetics. If the tooth fails to erupt, expose and bonding with orthodontic traction will be necessary.

Grossly deformed teeth will need to be extracted and the space replaced with a prosthesis. In the mixed dentition, patients can be provided with a prosthetic tooth retained on an upper removable appliance (Figure 3).

4. Root dilaceration

This is defined as the abrupt deviation of the long axis of the root portion of the tooth. This is more common in the apical half of the root.

Depending on the severity of the dilaceration, the tooth may erupt naturally, or may require surgical exposure with orthodontics or, in severe cases, surgical extraction (Figure 4).

5. Odontome-like malformations

Odonome malformation are mineralised tissue with structure similar to the tooth germ. They are a rare complication of dental trauma with an incidence less than 0.1%.

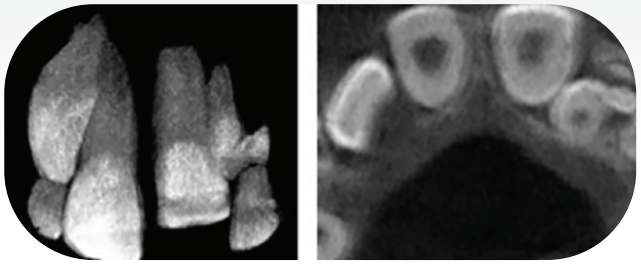

Figure 5: CBCT showing an odontome lying immediately superior to the apex of the ULb and fused to the crown of the unerupted UL2 (somewhat resembling a fused supernumerary tooth).

Figure 6: Delayed eruption of UR1 and UL1 in a nine-year-old due to previous trauma.

They are often confined to maxillary primary incisor trauma with the time of the injury occurring before the age of three years, during the early stages of odontogenesis. Odontome often require surgical removal to facilitate eruption of the permanent teeth.

6. Partial or total arrest of root development

Root development starts as soon as the crown formation has been completed at the cementoenamel junction. Traumatic injuries that occur during that time can result in malformations of the root developments such as partial or complete arrest of roof formation. This is more common in children over the age of four years during the time when the crown of the permanent tooth is in its final stage of formation.

7. Eruption disturbances

Delayed eruption should be considered when the contralateral tooth has erupted for more than six months. Trauma to the upper primary incisor can result in ectopic permanent central incisors (Figure 6). Surgical exposure and orthodontic traction maybe necessary.

Conclusion

The impact on the development of the permanent tooth germ from traumatic injuries to primary teeth can be significant. The successful management of severe dental injuries depends on the early diagnosis of development disturbances.

As treatment can be complicated and lengthy, a multidisciplinary team approach involving general dentists, paediatric specialists, orthodontists and oral surgeons is required for diagnosis and management. Close monitoring and timely action should be carried out during the expected time of eruption to prevent further complications.

References

Andreasen JO, Ravn JJ (1971) The effect of traumatic injuries to primary teeth on their permanent successors. II. A clinical and radiographic follow-up study of 213 teeth. Scand J Dent Res 79(4): 284-94

Golpaygani VM, Mehrdad K, Mehrdad A, Ansari G (2009) An evaluation of the rate of dental caries among hypoplastic and normal teeth: a case control study. Res J Biol Sci 4: 537-41

Oliveira LB, Marcenes W, Ardenghi TM, Sheiham A, Bönecker M (2007) Traumatic dental injuries and associated factors among Brazilian preschool children. Dent Traumatol 23(2): 76-81

Petersson EE, Andersson L, Sörensen S (1997) Traumatic oral vs non-oral injuries. Swed Dent J 21(1-2): 55-68

This article first appeared in Clinical Dentistry and has been reprinted with permission. Mohammed A, Traumatic injuries in primary teeth. Clinical Dentistry 4(2): 15-16