



The Reverberations of Traumatized Primary Dentition: A Practitioner's Perspective

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ABSTRACT

The traumatized primary teeth have a great clinical significance because it not only have consequences on itself but also on its succedaneous developing permanent teeth due to its close anatomical relationship. The extent of severity is adjudged by the type of trauma and the age of the child at the time of trauma. For instance, avulsion and intrusive injuries present with high percentage of developmental disturbances in permanent teeth than subluxation and extrusive injuries. When considering the age of the child at the time of trauma, consequences are less severe in children over 4 years of age than in the younger age group.

Clinical significance: It highlights the sequelae of trauma to primary teeth with the aim of aiding in detection of probable alterations in the traumatized primary teeth and its succedaneous permanent teeth.

Keywords: Trauma, Primary and permanent dentition, Sequel.

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INTRODUCTION

Is static cling the aftermath of the big bang, or is it just God's way of trying to tell us something?

Children are naturally prone to traumatic injuries due to their playful nature. Traumatic injuries to developing teeth can influence their further growth and maturation, usually leaving a child with a permanent and often readily visible deformity. Especially when the injury occurs during initial stages of development, enamel formation can be seriously disturbed due to interference during any of the phase of ameloblastic development, i.e. the morphogenetic, organizing, formative and maturation stages. The close relationship between the apices of primary teeth and the developing permanent successors, explain why injuries to

primary teeth are easily transmitted to the permanent dentition. Treatment of the traumatized primary tooth is aimed at minimizing damage to the tooth and the factors that might cause alterations in the germ of the permanent tooth, with successful treatment being dependent on the age of the child at the time of trauma, type and severity of the injury and the period between dental trauma and care.

The prevalence of developmental disturbances, secondary to dental injuries in the primary dentition ranges from 12 to 69%.^{1,2}

Common Consequences of Traumatic Injuries to Primary Teeth

Considering the frequency of traumatic injuries to primary teeth, it is apparent that enamel hypoplasia of traumatic origin must be rather common. Avulsion and intrusive luxation represent injuries with very high frequencies of developmental disturbance, while subluxation and extrusion represent low-risk groups. Furthermore, the age at the time of injury is of major importance. Thus, fewer complications are seen in individuals over 4 years of age than in individuals in the younger age groups.³ According to studies,^{4,5} the frequency of developmental disturbances, due to jaw fractures, ranges from 19 to 68%. Squeal can be categorized into following two categories:

1. Traumatic injuries to the primary dentition affecting the tooth itself:
 - a. Coronal discoloration
 - b. Pulpal necrosis
 - c. Pulp canal obliteration
 - d. Root resorption
 - e. Abscess or cellulitis formation.
2. Traumatic injuries to the primary dentition effecting succedaneous permanent dentition:
 - a. White or yellow-brown discoloration of enamel
 - b. White or yellow-brown discoloration of enamel with circular enamel hypoplasia

- c. Crown dilacerations
- d. Odontoma-like malformation
- e. Root duplication
- f. Vestibular root angulation
- g. Lateral root angulation or dilacerations
- h. Partial or complete arrest of root formation
- i. Sequestration of permanent tooth germs
- j. Disturbance in eruption.

Effects of Traumatic Injuries to the Primary Dentition Affecting the Tooth Itself

All traumas in the primary dentition should be monitored both radiographically and clinically for any changes in the tooth or the supporting structures.

An injured primary tooth may change color during the first few weeks after the trauma, even if the injury is minor. Posttraumatic color change is a well-known phenomenon that occurs frequently. Controversy exists regarding these color changes. Some color changes are physiologic responses to injury, whereas some color changes may indicate a pathologic process requiring treatment. The bumped primary tooth may turn pink, yellow or gray (Fig. 1). A pink primary tooth indicates internal resorption and usually should be extracted. A yellow primary tooth indicates pulp calcification and no treatment is needed. This tooth usually exfoliates normally. Grayish discolorations are the most controversial with respect to the meaning of these color changes and the treatment; if any, indicated. Several clinical studies⁶⁻⁸ revealed that the majority of discolored primary teeth do not develop radiographic or clinical signs of infection and are exfoliated at the expected time.

Pulpal necrosis of the primary incisors is the most common posttraumatic complication. The diagnosis of pulp necrosis of primary teeth is based primarily on radiographic evidence of a periapical rarefaction. Color change is not a

reliable indicator, as this diagnosis can be made 6 to 8 weeks after injury. A therapeutic problem could be whether, during this observation period, pulp necrosis could inflict damage to the permanent tooth germ. Admittedly, there is a long-term effect of pulp necrosis and chronic periapical inflammation upon permanent successors. One to 2 months observation time is justified to establish a diagnosis of pulp necrosis.

In the primary dentition, pulp canal obliteration is a frequent sequel to luxation injuries.⁹ Most of these teeth initially show a grayish discoloration that later fades and becomes yellow, concomitant with radiographic evidence of canal obliteration. Pulp canal obliteration does not interfere with physiologic root resorption; the permanent successors erupt without complication. Secondary pulp necrosis can occur, with reported frequencies of 0 to 13%.¹⁰

A late complication, following luxation injuries in both the primary and permanent dentitions, is root resorption (Fig. 2). Three types of external root resorption can be recognized: surface resorption, replacement resorption and inflammatory resorption.



Fig. 2: Internal root resorption



Fig. 1: Yellowish discoloration primary tooth

Effect on Permanent Dentition Due to Traumatic Injuries to the Primary Dentition

Immediate pathological changes consisted of contusion and displacement of the reduced enamel epithelium and slight displacement of the hard dental tissue in relation to the Hertwig's epithelial root sheath. After 6 weeks, metaplasia of the reduced enamel epithelium into a thin stratified squamous epithelium took place. In most cases, changes in morphology of the dentin and/or enamel matrices were seen. An injured permanent tooth germ often suffers posttraumatic inflammation of the pulp and surrounding tissue. If this occurs after crown maturation and during root formation, disturbance of odontoblastic activity induces

acceleration of hard tissue deposits in the pulp chamber that is usually found during the healing process. This results in almost complete pulp canal obliteration (PCO) within a few years.

White or yellow-brown discolorations of enamel (Fig. 3) appear as sharply demarcated, stained enamel opacities, most often located on the facial surface of the crown; their extent varies from small spots to large fields. The frequency of these lesions has been reported to be 23%¹¹ following injuries to the primary dentition, commonly affecting maxillary incisors, with the age of patients at the time of injury ranging from 2 to 7 years. Radiographic examination prior to tooth eruption will usually not reveal defective mineralization.



Fig. 3: Yellow-brown discoloration

White or yellow-brown discoloration of enamel with circular enamel hypoplasia, is more severe manifestation of trauma sustained during the formative stages of permanent tooth germ. The typical finding in this group, which distinguishes these lesions from those in the previous group, is a narrow horizontal groove, which encircles the crown cervically to the discolored areas. As a rule, the injury to the primary tooth is either avulsion, extrusive or intrusive luxation.

Crown dilacerations (Fig. 4) are due to traumatic nonaxial displacement of already formed hard tissue, in relation to the developing soft tissues. Due to their close contact to the primary incisors, crown-dilacerated teeth are usually maxillary or mandibular central incisors. The trauma to the primary dentition which can result in crown dilacerations is usually avulsion or intrusion.

Odontoma-like malformations are rare sequel to injuries in the primary dentition. Reported cases^{12,13} are confined primarily to maxillary incisors. The age at the time of injury ranges from less than 1 to 3 years. The type of injury affecting the primary dentition, appears to be intrusive luxation or avulsion. The histology and radiology of these cases show a conglomerate of hard tissue, having the



Fig. 4: Clinical and radiographical appearance of crown dilacerations of incisors

morphology of a complex odontoma or separate tooth elements.

Root duplication is rare occurrence, seen following intrusive luxation of primary teeth. This complication is usually the result of an injury at the time when half or less than half of the crown is formed. Radiographically, a mesial and distal root can be demonstrated which extends from a partially formed crown.

Vestibular root angulation ('sickle' incisor) appears as a marked curvature confined to the root as a result of an injury sustained at the age of 2 to 5 years. The malformed tooth is usually impacted and the crown palpable in the labial sulcus. The only teeth demonstrating this malformation are maxillary central incisors. The injuries to the primary dentition consist of intrusive luxation and avulsion.

Lateral root angulation or dilacerations appear as a mesial or distal bending confined to the root of the tooth. They are seen in 1%¹²⁻¹⁴ of cases with injury to the primary dentition, usually avulsion. The injury usually occurs at age 2 to 7 years and usually affects the maxillary incisors.

Partial or complete arrest of root formation is a rare complication among injuries in the primary dentition, affecting 2%^{12,14,15} of involved permanent teeth. The injury to the primary dentition usually occurs between 5 and 7 years of age and normally affects maxillary incisors. The injury sustained is usually avulsion of the primary incisors.

Another rare complication is development of dentigerous cyst following trauma¹⁶ (Fig. 5). Theories regarding its formation suggest that the immature permanent tooth encounters a radicular cyst originating from its primary predecessor. According to Killian et al¹⁷ trauma to deciduous teeth can lead to odontogenic disturbances ranging from



Fig. 5: Excised dentigerous cyst developed following trauma to primary dentition

hypoplastic defects of crown to even cyst formation associated with permanent tooth.

Sequestration of permanent tooth germs is exceedingly rare after injuries to the primary dentition. Infection can complicate healing of jaw fractures. In these instances, swelling, suppuration and fistula formation are typical clinical features, sometimes leading to spontaneous sequestration of involved tooth germs. Radiographic examination discloses osteolytic changes around the tooth germ, including disappearance of the outline of the dental crypt.

Disturbances in eruption of permanent tooth eruption may occur after trauma to the primary dentition and it is suggested that this is related to abnormal changes in the connective tissue overlying the tooth germ. The eruption of succeeding permanent incisors, in general may be delayed for about 1 year after premature loss of primary incisors, whereas premature eruption of permanent successors is rare. Early loss of primary incisors (avulsion or extraction) leads to space loss only in rare instances. However, ectopic eruption of permanent successors has been seen, possibly due to lack of eruption guidance otherwise offered by the primary dentition. These teeth often erupt labially. Impaction is very common among teeth with malformations confined to either the crown or root. When the permanent tooth does erupt, it is often in facio- or linguoversion.

CONCLUSION

Whenever, injury disrupts tissues, a sequence of events is initiated whose ultimate goal is to heal the damaged tissue. It is the duty of the clinician to minimize the tissue damage. The aim of this article is to enhance the understanding of sequelae of trauma to primary dentition with its clinical manifestations which will help the clinician to face the

challenging clinical situations in day to day practice. The sound knowledge of the biology of residual effects that these injuries may leave will both motivate and equip the clinician to keep the sequelae to a minimum and renders him to provide better functional and esthetic rehabilitation.

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