

TRAUMATIC INJURIES IN PEDIATRIC DENTISTRY: A REVIEW

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ABSTRACT

Traumatic injuries are likely to occur in children. tooth and mouth injuries often occur after a fall, motor vehicle accident, sports injury, or fight. Falls, sports-related injuries, and fights are the most common causes of tooth injury in children. The traumatic injuries classified into different based on the involvement of particular tooth structure. The treatment for dental injuries depends upon the child's age, the type of injury and whether the injured tooth is a primary or permanent tooth. A pediatric dentist should be able diagnose and manage dental trauma, counsel parents on preventive measures.

Keywords: Trauma; Dental Trauma; Pediatric Dentistry, Fractures

INTRODUCTION

Pediatric dental trauma is most common among younger children who are still developing coordination, as well as adolescents involved in accidents and sports.¹ The resulting orofacial injuries can result in pain, tooth loss, dysfunction, and diminish the child's quality of life. The International Association of Dental Traumatology reports that one of every two children sustains a dental injury, most often between the ages of 4 and 12 years. In preschool children, with injuries to the head being the most common, oral injuries make up as much as 17% of all injuries.² Active participation in contact sports may increase the risk for traumatic injuries to oral and dental tissues. Traumatic dental injuries generally affect a single tooth except certain trauma events, such as traffic accidents, violence, and sports injuries, which result in multiple tooth damage. Traumatic dental injuries in the primary dentition appear to be rather stable at approximately 30% in most studies. It is been reported that one-third of all preschool children have suffered from traumatic injuries to the primary dentition in most of the countries. It is estimated that 71% of all traumatic dental injuries occur before the age of 14 years, males experience traumatic dental injuries at least twice more often than females. The main objectives of diagnosis and treatment of traumatic injuries affecting children with primary dentition are pain management and prevention of possible damage to the developing tooth germ.¹⁻⁴

CLASSIFICATION OF TRAUMATIC INJURIES

The classification of traumatic dental injuries proposed by Andreasen & Andreasen is based on a system adopted by the World Health Organization and includes the following injuries:

1 Injuries to the hard dental tissues and the pulp

- : 1.1 Enamel fracture
- 1.2 Enamel-dentin fracture
- 1.3 Enamel-dentin-pulp fracture

2 Injuries to the hard dental tissues, the pulp, and the alveolar process:

- 2.1 Crown-root fracture
- 2.2 Root fracture
- 2.3 Alveolar fracture

3 Injuries to the periodontal tissues:

- 3.1 Concussion
- 3.2 Subluxation
- 3.3 Luxation injuries:
 - 3.3.1 Lateral luxation
 - 3.3.2 Intrusive luxation
 - 3.3.3 Extrusive luxation
 - 3.3.4 Avulsion

ENAMEL FRACTURE

An enamel fracture is a crown fracture limited to loss of enamel only. There is no radio-graphic abnormality observed. Sharp edges are recommended to be smoothed. Small enamel fractures can be polished. Composite resin restoration may be preferred for more involved enamel fractures¹.

ENAMEL DENTIN FRACTURE

This fracture involves enamel and dentin. Pulp is not exposed. There is no radiographic abnormality observed. The relation between the fracture and the pulp chamber can be revealed. Composite resin restorations are good choices if lost tooth structure is large. Clinical examination is required after few weeks. If the fragment is available, reattachment of fragment can be attempted. Intermediate restoration of most enamel-dentine fractures can be achieved by the following: Acid-etched composite applied either freehand or utilizing a celluloid crown-former. The majority of these restorations can be regarded as semi-permanent/permanent. Larger fractures can utilize more available enamel surface area for bonding by employing a complete celluloid crown-former to construct a 'direct' composite crown. As the child becomes older, this could be reduced to form the core of a full- or partial-coverage porcelain crown preparation. Reattachment of crown fragment. Few long-term studies have been reported and the longevity of this type of restoration is uncertain. In addition, there is a tendency for the distal fragment to become opaque or require further restorative intervention in the form of a veneer or full-coverage crown. If the fracture line through dentine is not very close to the pulp, the fragment can be reattached immediately. However, if it runs close to the pulp, it is advisable to place a suitably protected calcium hydroxide dressing over the exposed dentine for at least a month while storing the fragment in saline, which should be renewed weekly.

ENAMEL-DENTIN-PULP FRACTURE

It is a complicated crown fracture involves enamel and dentin with pulp exposure. Radiographic findings can reveal the stage of root development. If the pulp exposure is visible, only a pink spot or bluish exposure site is cleaned and pulp-capping agent is applied development. Preservation of pulp vitality can be accomplished by partial pulpotomy for larger pulpal exposures, partial pulpotomy and direct pulp-capping procedures are performed. The major concern after pulpal exposures in immature teeth is the prevention of physical, chemical, and microbial invasion and the preservation of pulpal vitality in order to allow continued root growth. The radicular pulp has enormous capacity to remain healthy and undergo repair if all infected and inflamed coronal tissue is removed and an appropriate wound dressing and sealing coronal restoration is applied. Pulp amputation by partial pulpotomy or complete coronal pulpotomy is often the treatment of choice, but pulp capping can be considered in certain circumstances.

CROWN/ROOT FRACTURE (WITHOUT PULP EXPOSURE)

This type of fracture involves enamel, dentin, and root structure. The pulp may or may not be exposed. Tooth displacement may be observed as well. Radiographical evaluation will reveal single/multiple fragments of the traumatized tooth. Firstly, necessity of pulp capping or partial pulpotomy is evaluated and then, rearrangement of the fragment is performed. If no need to pulp capping or partial pulpotomy, flowable composite resin may help to combine the fractured parts of the crown. In case the fracture involves only a small part of the root, only fractured fragment is removed and coronal restoration can be done if the stable fragment is adequate for restoration. Otherwise, extraction is required.⁵

CROWN/ROOT FRACTURE (WITH PULP EXPOSURE)

This type of fracture involves enamel and dentin and the pulp are exposed. The stage of development of root can be determined by the radiographic evaluation. Preservation of pulp vitality can be accomplished by partial pulpotomy using calcium hydroxide paste and reinforced by glass ionomer as liner and composite/comonomer restorations. The fractured segment accounts for the larger part of the crown and the fracture line have extended to the alveolar crest or below. These teeth may be seen too difficult to restore, but the location of the fracture line may help to decide the treatment procedure. If the location of the fracture line is located within the coronal third of the root, crown restoration is possible after the extrusion of the root. There are two ways for extrusion of the root: orthodontic or surgical. Unless there is a co-operation with the patient, extraction is an alternative treatment approach.⁷ 6–8 weeks: clinical and radiographic examination 1 year: clinical and radiographic examination

ROOT FRACTURE

Root fracture is a fracture that involves cementum, dentin, and pulp. The fracture line may be horizontal, oblique, or vertical. But vertical root fractures may generally, occur in endodontically treated teeth. The fracture involves the alveolar bone and may extend to adjacent bone leading to segment mobility and dislocation. Root fractures are classified as shallow or deep according to the location of fracture line. The treatment of deep root fracture is simple: repositioning and fixation of coronal segment. Depending on how deep the fracture is and how mobile the coronal segment is, fixation may be required for up to 3 months. 6 months later, if there is no pulp necrosis, there will be no need to root canal treatment. In case of pulp necrosis, root canal treatment is done up to the fracture line. Extraction is the best choice for shallow root fracture. 4 weeks: splint removal, clinical and radiographic examination, 6–8 weeks: clinical and radiographic examination, 4 months: splint removal in cervical third fractures, clinical and radiographic examination, 6 months: clinical and radiographic examination

ALVEOLAR FRACTURE

The tooth is displaced, usually in a palatal/lingual or labial direction leading to mobility. Occlusal radiographic findings will reveal increased periodontal ligament space apically at its best. If there is no occlusal interference, the tooth is allowed to reposition spontaneously. If there is minor occlusal interference, slight grinding is indicated. When there is more severe occlusal interference,

the tooth can be gently repositioned by combined labial and palatal pressure after the use of local Anesthesia. In severe cases, when the crown is dislocated in a labial direction, extraction is indicated.⁸

CONCUSSION

Tooth is sensitive to touch. There is no mobility or sulcular bleeding observed. Radiographic evaluation discloses no pathology as well. Observation is the only treatment option.

SUBLUXATION

Subluxation is clinically defined as injury to the periodontal tissues accompanied by bleeding from gingival sulcus, an increase in mobility but no dislocation of the tooth. There is sensitivity in percussion, and high mobility and bleeding are important criteria in diagnosis of subluxation. Electric pulp testing is important. In immature tooth, electric pulp testing will not respond, so re-test with electric pulp testing after a week is advised. In immature tooth: only follow-up is necessary. Root canal treatment is indicated in the presence of pulp necrosis. When there is a possibility of pulp necrosis, root canal treatment can be initiated without anaesthesia. In mature tooth: follow-up visits without invasive treatment are advised. In case of pulp necrosis, root canal treatment is indicated.

EXTRUSIVE LUXATION

Extrusive luxation results in damage to the periodontal tissues as the tooth is displaced in coronal direction. The periodontal tissue and the root are not completely separated, but the blood supply at the apex is disrupted. There is high mobility, bleeding, and electric pulp testing response is negative. Radiographically, there is widening in periodontal ligament space. Repositioning, fixation, and follow-up are the steps of treatment planning. Root canal treatment is avoided until pulp necrosis is confirmed. After confirmation of pulp necrosis, root canal treatment is indicated. In immature tooth, apexification and apexogenesis may be applicable.

LATERAL LUXATION

Lateral luxation is an injury to the periodontal and alveolar supporting tissues that the tooth displaces laterally. The crown of the tooth is displaced palatally or lingually, and the tooth may be apically displaced with alveolar bone fracture on the labial side. Radiographically, the root shape and alveolar socket are not aligned. Repositioning, fixation, and regular follow-up are the steps of treatment of lateral luxation. In fixation period, if alveolar fracture occurs, fixation period will take at least 3 months. In young adults, apexification and apexogenesis may be treatment alternatives.

INTRUSIVE LUXATION

Intrusion is a luxation injury that results in apical displacement of tooth. In some cases, alveolar bone fracture is also seen. If there is no clear periodontal ligament in radiograph, the intrusion should be suspected. Time between injury and treatment, type of fixation, and use of antibiotics may also affect the results. Spontaneous re-eruption, orthodontic extrusion, and the surgical extrusion are the main options of intrusive luxation. 2 weeks: clinical and radiographic examination 4 weeks: splint removal, clinical and radiographic examination, 6–8 weeks: clinical and radiographic examination, 6 months: clinical and radiographic examination, 1 year: clinical and radiographic examination

AVULSION

Avulsion is defined as the condition that the whole tooth is completely separated from the supporting tissues. The success rate for an avulsed tooth after replantation depends on the vitality of periodontal ligament and attachment of the tooth. However, Replantation of the avulsed teeth is not recommended. If the permanent tooth is dirty, it should be washed briefly (10 seconds) under cold running water and repositioned in the socket. The patient/parent should be encouraged to replant the tooth at the site of the injury. The child should be instructed to bite on a cloth to hold it in position until he or she can get to the doctor's office or emergency department. If this is not possible, the tooth should be placed in a suitable storage medium (eg, a glass of cold milk or balanced salt solution, if available). If no storage media are accessible, then the patient can drool saliva in to a container and use that as a transport medium. Storing an avulsed tooth in water should be avoided because water causes osmotic lysis of the root fibroblasts. After the tooth has been replanted or placed in a proper storage medium, dental care should be obtained immediately. A flexible splint will need to be placed by the dentist for up to 2 weeks. Most teeth will require root canal therapy, which will need to be instituted within 7 to 10 days after replantation. The tooth should be monitored for the potential of bodily rejection in the form of root resorption. Systemic antibiotics are indicated after replantation of an avulsed permanent tooth. For children older than 12 years, doxycycline is the recommended antibiotic, and for children younger than 12 years, penicillin is indicated. For children who are allergic to penicillin, clindamycin is recommended.³⁻⁶

COMPLICATIONS

Not all sequelae of trauma are immediate and many of them can occur months or years after the initial incident thus required prolonged follow-up. Common complications are pulpal necrosis, pulpal obliteration, root resorption and damage to the successor's teeth in primary teeth dental trauma.

PULPAL NECROSIS

Pulp necrosis usually occurs either as ischaemic necrosis caused by disruption to the blood supply at the apical foramen or as an infection-related liquefactive necrosis following dental trauma. Signs of pulpal necrosis include: Persistent grey colour to tooth that

does not fade, Radiographic signs of periapical inflammation, Clinical signs of infection: tenderness, sinus, suppuration, swelling. Treatment options will be extraction for the primary tooth.

PULPAL OBLITERATION

4-24% of traumatized teeth will have some degrees of pulpal obliteration that is characterized by the loss of pulpal space radiographically and yellow discolouration of the clinical crown. No treatment is needed if it is asymptomatic. Treatment options will be extraction for symptomatic primary tooth.

ROOT RESORPTION

Root resorption following traumatic dental injuries, whether located along the root surface or within the root canal appears to be a sequel to wound healing events, where a significant amount of the PDL or pulp has been lost due to the effect of acute trauma.

DAMAGE TO THE PERMANENT TEETH

Dental trauma to the primary teeth might cause damage to the permanent teeth. Damage to the permanent teeth especially during development stage might have following consequences:

- A. Crown dilaceration
- B. Odontoma-like malformation
- C. Sequestration of permanent tooth germs
- D. Root dilaceration
- E. Arrest of root formation

CONCLUSION

By 14 years of age, 30% of children have experienced a dental injury according to studies. Pediatric dentists can advocate for dental injury–preventive measures and create awareness regarding the same. Parents should be counselled about participation in activities that are appropriate for the child’s age and development, general household safety measures and adult supervision of activities that could lead to dental trauma. Although these measures will not prevent all dental injuries, they can reduce their incidence and severity.

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