Guideline on Management of Acute Dental Trauma

Originating Council
Council on Clinical Affairs

Review Council
Council on Clinical Affairs

Adopted
2001

Revised
2004

Purpose

The American Academy of Pediatric Dentistry (AAPD) intends these guidelines to define, describe appearances, and set forth objectives for general management of acute traumatic dental injuries rather than recommend specific treatment procedures that have been presented in considerably more detail in textbooks and the dental/medical literature.

Methods

This guideline is based on a review of the current dental and medical literature related to dental trauma. A MEDLINE search was conducted using the terms "teeth", "trauma", "permanent teeth", and "primary teeth". Also, a review of the journal *Dental Traumatology* was conducted for the years 2000-2003. The recommendations are congruent with the 2001 guidelines developed by the International Association of Dental Traumatology (IADT).[1-5]

Background

Facial trauma that results in fractured, displaced, or lost teeth can have significant negative functional, esthetic, and psychological effects on children.[6] Dentists and physicians should collaborate to educate the public about prevention and treatment of oral traumatic injuries.

The greatest incidence of trauma to the primary dentition occurs at 2 to 3 years of age, when motor coordination is developing.[7] The most common injuries to permanent teeth occur secondary to falls, followed by traffic accidents, violence, and sports.[8-11] All sporting activities have an associated risk of orofacial injuries due to falls, collisions, and contact with hard surfaces.[12] The AAPD encourages the use of protective gear, including mouthguards, which help distribute forces of impact, thereby reducing the risk of severe injury.[13,14]

Dental injuries could have improved outcomes if the public were aware of first-aid measures and the need to seek immediate treatment.[15,16] Because optimal treatment results follow immediate assessment and care, dentists have an ethical obligation to ensure that appropriate emergent dental care is available at all times.[17] The history, circumstances of the injury, pattern of trauma, and behavior of the child and/or caregiver are important in distinguishing nonabusive injuries from abuse.[18]

Practitioners have the responsibility to recognize, differentiate, and either appropriately manage or refer children with acute oral traumatic injuries, as dictated by the complexity of the injury and the individual clinician's training, knowledge, and experience. Compromised airway or suspected loss of consciousness requires further evaluation by a physician.

To efficiently determine the extent of injury and correctly diagnose injuries to the teeth, periodontium, and associated structures, a systematic approach to the traumatized child is essential.[19] Assessment includes a thorough history, visual and radiographic examination, and additional tests such as palpation, percussion, and mobility evaluation. Intraoral radiography is useful for the evaluation of dentoalveolar trauma. If the area of interest extends beyond the dentoalveolar complex, extraoral imaging may be indicated. Treatment planning takes into consideration the patient's health status and developmental status as well as extent of injuries. Advanced behavior management techniques or an appropriate referral may be necessary to ensure that proper diagnosis and care are given.

All relevant diagnostic information, treatment, and recommended follow-up care are documented in the patient's record. Appendix I is a sample document for recording assessment of acute traumatic injuries. This sample form, developed by the AAPD, is provided as a practice tool for pediatric dentists and other dentists treating children. It was developed by pediatric dentistry experts and offered to facilitate excellence in practice. This form, however, does not establish or evidence a standard of care. In issuing this form, the AAPD is not engaged in rendering legal or other professional advice. If such services are required, competent legal or other professional counsel should be sought. Well-designed follow-up procedures are essential to diagnose complications.

After a primary tooth has been injured, the treatment strategy is dictated by the concern for the safety of the permanent dentition.[7,19,20] If determined that the displaced primary tooth has encroached upon the developing permanent tooth germ, removal is indicated.[2,7,21-25] In the primary dentition, the maxillary anterior region is at low risk for space loss unless the avulsion occurs prior to the canines' eruption.[20] To satisfy parental concerns for esthetics or to return a loss of oral or phonetic function, fixed or removable appliances can be fabricated.[7,20]

When an injury to a primary tooth occurs, informing parents about possible pulpal complications, appearance of a vestibular sinus tract, or color change of the crown associated with a sinus tract can help assure timely intervention, minimizing complications for the developing succedaneous teeth.[2,7,26] Also, it is important to caution parents that the primary tooth's displacement may result in any of several permanent tooth complications, including enamel hypoplasia, hypocalcification, crown/root dilacerations, or disruptions in eruptions.[26]

The treatment strategy after injury to a permanent tooth is dictated by the concern for vitality of the periodontal ligament and pulp. Subsequent to the initial management of the dental injury, continued periodic monitoring is indicated to determine clinical and radiographic evidence of successful intervention (ie, asymptomatic, positive sensitivity to pulp testing, root continues to develop in immature teeth, no mobility, no periapical pathology).[3-5,19,25,27] Initiation of endodontic treatment is indicated in cases of spontaneous pain; abnormal response to pulp tests; lack of continued root formation or apexogenesis; or breakdown of periradicular supportive tissue.[3-5,19,25,27] To restore a fractured tooth's normal esthetics and function, reattachment of the crown fragment is an alternative that can be considered.[19,25]

To stabilize a tooth following traumatic injury, a splint may be necessary.[25,28-30] Flexible splinting assists in periodontal healing.[19] Characteristics of the ideal splint include:

1. easily fabricated in the mouth without additional trauma;
2. passive unless orthodontic forces are intended;
3. allows physiologic mobility (except for root fractures);
4. nonirritating to soft tissues;
5. does not interfere with occlusion;
6. allows endodontic access;
7. easily cleansed;
8. easily removed.

Instructions to patients having a splint placed include to:

1. avoid biting on splinted teeth;
2. maintain meticulous oral hygiene;
3. call immediately if splint breaks/loosens;
4. use chlorhexidine/antibiotics as prescribed.

Recommendations

Infraction

Definition: incomplete fracture (crack) of the enamel without loss of tooth structure.
Diagnosis: normal gross anatomic and radiographic appearance; craze lines apparent, especially with transillumination.
Treatment objectives: to maintain structural integrity and pulp vitality.[25,31,32]
General prognosis: complications are unusual.

Crown fracture–uncomplicated

Definition: an enamel fracture or an enamel-dentin fracture that does not involve the pulp.
Diagnosis: clinical and/or radiographic findings reveal a loss of tooth structure confined to the enamel or to both the enamel and dentin.[1,3,7,19-22,27,31,33,34]
Treatment objectives: to maintain pulp vitality and restore normal esthetics and function. Injured lips, tongue, and gingiva should be examined for tooth fragments. For small fractures, rough margins and edges can be smoothed. For larger fractures, the lost tooth structure can be restored.[1,3,7,19-22,26,27,31,33,34]
General prognosis: The prognosis of uncomplicated crown fractures depends primarily upon the concomitant injury to the periodontal ligament and secondarily upon the extent of dentin exposed.[19] Optimal treatment results follow immediate assessment and care.

Crown fracture–complicated

Definition: an enamel-dentin fracture with pulp exposure.
Diagnosis: clinical and radiographic findings reveal a loss of tooth structure with pulp exposure.[1,3,7,19]
Treatment objectives: to maintain pulp vitality and restore normal esthetics and function. [26] Injured lips, tongue, and gingiva should be examined for tooth fragments.

- Primary teeth: Decisions often are based on life expectancy of the traumatized primary tooth and vitality of the pulpal tissue. Pulpal treatment alternatives are pulpotomy, pulpectomy, and extraction.[1,7,20-22]
- Permanent teeth: Pulpal treatment alternatives are direct pulp capping, partial pulpotomy, and pulpectomy (start of root canal therapy).[3,19,35]

General prognosis: The prognosis of crown fractures appears to depend primarily upon a concomitant injury to the periodontal ligament.[19] The age of the pulp exposure, extent of dentin exposed, and stage of root development at the time of injury secondarily affect the tooth's prognosis.[19] Optimal treatment results follow immediate assessment and care.

Crown/root fracture

Definition: an enamel, dentin, and cementum fracture with or without pulp exposure.
Diagnosis: Clinical findings usually reveal a mobile coronal fragment attached to the gingiva with or without a pulp exposure. Radiographic findings may reveal a radiolucent oblique line that comprises crown and root in a vertical direction in primary teeth and in a direction usually perpendicular to the central radiographic beam in permanent teeth. While radiographic demonstration often is difficult, root fractures can only be diagnosed radiographically.[1,3,7,19,25]
Treatment objectives: to maintain pulp vitality and restore normal esthetics and function.[11]

- Primary teeth: When the primary tooth cannot or should not be restored, the entire tooth should be removed unless retrieval of apical fragments may result in damage to the succedaneous tooth.[1,7]
- Permanent teeth: The emergency treatment objective is to stabilize the coronal fragment. Definitive treat

ment alternatives are to remove the coronal fragment followed by a supragingival restoration or necessary gingivectomy; osteotomy; or surgical or orthodontic extrusion to prepare for restoration. If the pulp is exposed, pulpal treatment alternatives are pulp capping, pulpotomy, and root canal treatment.[3,19]

General prognosis: Although the treatment of crown-root fractures can be complex and laborious, most fractured permanent teeth can be saved.[19] Fractures extending significantly below the gingival margin may not be restorable.

Root fracture

Definition: a dentin and cementum fracture involving the pulp.

Diagnosis: Clinical findings reveal a mobile coronal fragment attached to the gingiva that may be displaced. Radiographic findings may reveal 1 or more radiolucent lines that separate the tooth fragments in horizontal fractures. Multiple radiographic exposures at different angulations may be required for diagnosis. A root fracture in a primary tooth may be obscured by a succedaneous tooth.[1,3,7,19]

Treatment objectives: to reposition as soon as possible and then to stabilize the coronal fragment in its anatomically correct position to optimize healing of the periodontal ligament and neruovascular supply, while maintaining esthetic and functional integrity.[25]

- Primary teeth: Treatment alternatives include extraction of coronal fragment without insisting on removing apical fragment or observation.[1,7,20]
- Permanent teeth: Reposition and stabilize the coronal fragment.[3,19]

General prognosis: Pulp necrosis in root-fractured teeth (~25%) is attributed to displacement of the coronal fragment and mature root development.[19] In permanent teeth, the location of the root fracture has not been shown to affect pulp survival after injury.[19] Therefore, root fractures occurring in either the tooth's cervical third or apical third could be treated successfully by stabilization of the repositioned fragment.[19]

Concussion

Definition: Injury to the tooth-supporting structures without abnormal loosening or displacement of the tooth.

Diagnosis: Because the periodontal ligament absorbs the injury and is inflamed, clinical findings reveal a tooth tender to pressure and percussion without mobility, displacement, or sulcular bleeding. Radiographic abnormalities are not expected.[2,4,7,19,20,27]

Treatment objectives: to optimize healing of the periodontal ligament and maintain pulp vitality.[2,4,7,19,20,25,27,36]

General prognosis: For primary teeth, unless associated infection exists, no pulpal therapy is indicated.[7] Although there is a minimal risk for pulp necrosis, mature permanent teeth with closed apices may undergo pulpal necrosis due to associated injuries to the blood vessels at the apex and, therefore, must be followed carefully. [19]

Subluxation

Definition: injury to tooth-supporting structures with abnormal loosening but without tooth displacement.

Diagnosis: Because the periodontal ligament attempts to absorb the injury, clinical findings reveal a mobile tooth without displacement that may or may not have sulcular bleeding. Radiographic abnormalities are not expected.[2,4,7,19]

Treatment objectives: to optimize healing of the periodontal ligament and neurovascular supply.[2,4,7,19-25,27,36]

- Primary teeth: The tooth should be followed for pathology.
- Permanent teeth: Stabilize the tooth and relieve any occlusal interferences. For comfort, a flexible splint can be used. Splint for no more than 2 weeks.

General prognosis: Prognosis is usually favorable.[20,27] The primary tooth should return to "normality" within 2 weeks.[7] Mature permanent teeth with closed apices may undergo pulpal necrosis due to associated injuries to the blood vessels at the apex and, therefore, must be followed carefully.[19]

Lateral luxation

Definition: displacement of the tooth in a direction other than axially. The periodontal ligament is torn and contusion or fracture of the supporting alveolar bone occurs.[20, 27]

Diagnosis: Clinical findings reveal that a tooth is displaced laterally with the crown usually in a palatal or lingual direction and may be locked firmly into this new position. The tooth usually is not mobile or tender to touch. Radiographic findings reveal an increase in periodontal ligament space and displacement of apex toward or though the labial bone plate.[2,4,7,19]

Treatment objectives:

- Primary teeth: to allow passive repositioning or actively reposition and splint for 1 to 2 weeks as indicated to allow for healing, except when the injury is severe or the tooth is nearing exfoliation.[2,7,21-25]
- Permanent teeth: to reposition as soon as possible and then to stabilize the tooth in its anatomically correct position to optimize healing of the periodontal ligament and neurovascular supply, while maintaining esthetic and functional integrity. Repositioning of the tooth is done with little force and digital pressure. The tooth may need to be extruded to free apical lock in the cortical bone plate. Splinting an additional 2 to 4 weeks may be needed with breakdown of marginal bone.[4,19,25,36]

General prognosis: Primary teeth requiring repositioning have an increased risk of developing pulp necrosis compared to teeth that are left to spontaneously reposition.[7] In mature permanent teeth with closed apices, there is considerable risk for pulp necrosis and progressive root resorption.

Intrusion

Definition: apical displacement of tooth into the alveolar bone. The tooth is driven into the socket, compressing the periodontal ligament and commonly causes a crushing fracture of the alveolar socket.[20,27]

Diagnosis: Clinical findings reveal that the tooth appears to be shortened or, in severe cases, it may appear missing. The tooth's apex usually is displaced labially toward or through the labial bone plate in primary teeth and driven into the alveolar process in permanent teeth. The tooth is not mobile or tender to touch. Radiographic findings reveal that the tooth appears displaced apically and the periodontal ligament space is not continuous. Determination of the relationship of an intruded primary tooth with the follicle of the succedaneous tooth is mandatory. If the apex is displaced labially, the apical tip can be seen radiographically with the tooth appearing shorter than its contralateral. If the apex is displaced palatally towards the permanent tooth germ, the apical tip cannot be seen radiographically and the tooth appears elongated. An extraoral lateral radiograph also can be used to detect displacement of the apex toward or though the labial bone plate. An intruded young permanent tooth may mimic an erupting tooth.[2,4,7,19]

Treatment objectives:

- Primary teeth: to allow spontaneous re-eruption except when displaced into the developing successor. Extraction is indicated when the apex is displaced toward the permanent tooth germ.[2,7,21-25]
- Permanent teeth: to reposition passively or actively and stabilize the tooth in its anatomically correct position to optimize healing of the periodontal ligament and neurovascular supply while maintaining esthetic and functional integrity. In teeth with immature root formation, the objective is to allow for spontaneous eruption. In mature teeth, the goal is to reposition the tooth with orthodontic or surgical extrusion and initiate endodontic treatment within the first 3 weeks of the traumatic incidence.[4,19,25,36]

General prognosis: In primary teeth, 90% of intruded teeth will re-erupt spontaneously in 2 to 6 months.[20] Even in cases of complete intrusion and displacement of primary teeth through the labial bone plate, a retrospective study showed the re-eruption and survival of most teeth for more than 36 months.[37] Ankylosis may occur, however, if the periodontal ligament of the affected tooth was severely damaged, thereby delaying or altering the eruption of the permanent successor.[7] In permanent, mature teeth with closed apices, there is considerable risk for pulp necrosis and progressive root resorption.

Extrusion

Definition: partial displacement of the tooth axially from the socket. The periodontal ligament usually is torn.[20,27]

Diagnosis: Clinical findings reveal that the tooth appears elongated and is mobile. Radiographic findings reveal an increased periodontal ligament space apically.[2,4,7,19]

Treatment objectives:

- Primary teeth: to reposition and allow for healing, except when there are indications for an extraction (ie, the injury is severe or the tooth is nearing exfoliation). If the treatment decision is to reposition and stabilize, splint for 1 to 2 weeks.[2,7,20-25]
- Permanent teeth: to reposition as soon as possible and then to stabilize the tooth in its anatomically correct position to optimize healing of the periodontal ligament and neurovascular supply while maintaining esthetic and functional integrity. Repositioning may be accomplished with slow and steady apical pressure to gradually displace coagulum formed between root apex and floor of the socket. Splint for up to 3 weeks.[4,19,25,36]

General prognosis: There is a lack of clinical studies evaluating repositioning of extruded primary teeth.[7] In permanent mature teeth with closed apices, there is considerable risk for pulp necrosis. These teeth must be followed carefully.[4,19]

Avulsion

Definition: complete displacement of tooth out of socket. The periodontal ligament is severed and fracture of the alveolus may occur.[20,27]

Diagnosis: Clinical and radiographic findings reveal that the tooth is not present in the socket or the tooth already has been replanted. Radiographic assessment will verify that the tooth is not intruded when the tooth was not found.[2,7,19,20,27]

Treatment objectives:

- Primary teeth: to prevent further injury to the developing successor. Avulsed primary teeth should not be replanted because of the potential for subsequent damage to developing permanent tooth germs, and pulpal necrosis is a frequent event.[2,7,19,20,24,25]
- Permanent teeth: to replant as soon as possible and then to stabilize the replanted tooth in its anatomically correct location to optimize healing of the periodontal ligament and neurovascular supply while maintaining esthetic and functional integrity except when replanting is contraindicated by:
  1. the child's stage of dental development (risk for ankylosis where considerable alveolar growth has to take place);
  2. compromising medical condition; or
  3. compromised integrity of the avulsed tooth or supporting tissues.

Flexible splinting for 1 week is indicated.[5] Tetanus prophylaxis and antibiotic coverage should be considered.[5,19,25,38-44]

General prognosis: Prognosis in the permanent dentition is primarily dependent upon formation of root development and extraoral dry time.[5,19] The tooth has the best prognosis if replanted immediately. If the tooth cannot be replanted within 5 minutes, it should be stored in a medium that will help maintain vitality of the periodontal ligament fibers.[26] Transportation media for avulsed teeth include (in order of preference): Viaspan; Hank's Balanced Salt Solution (tissue culture medium); cold milk; saliva (buccal vestibule); physiologic saline; or water.[38,42-45] The risk of ankylosis increases significantly with an extraoral dry time of 15 minutes.[26]

Additional considerations: There are possible contraindications to tooth replantation. Examples are immunocompromise, severe congenital cardiac anomalies, severe uncontrolled seizure disorder, severe mental disability, severe uncontrolled diabetes, and lack of alveolar integrity.

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ASSESSMENT OF ACUTE TRAUMATIC INJURIES

PATIENT

NAME:_____

DATE OF BIRTH: _____

DATE: **TIME:** **REFERRED BY:**

MEDICAL HISTORY:

ALLERGIES: DATE OF LAST TETANUS INNOCULATON:

DATE & TIME OF INJURY: TIME LAPSED SINCE INJURY:

WHERE INJURY OCCURRED:

HOW INJURY OCCURRED:

HISTORY

Check if present and describe:

- Non-dental Injuries
- Loss of consciousness
- Altered orientation/mental status
- Hemorrhage from nose/ears
- Headache/Nausea/Vomiting
- Neck Pain
- Spontaneous dental pain
- Pain on mastication
- Reaction to thermal changes
- Previous dental trauma
- Other complaints

MANAGEMENT PRIOR TO EXAM
By Whom:
Describe:

EXTRAORAL EXAM

Check if present and describe:

- Facial fractures
- Lacerations
- Contusions
- Swelling
- Abrasions
- Hemorrhage/drainage
- Foreign bodies
- TMJ deviation/asymmetry

OTHER FINDINGS/COMMENTS:

INTRA-ORAL EXAMINATION

Check if injured and describe

- Lips
- Frenae
- Buccal Mucosa
- Gingivae
- Palate
- Tongue
- Floor of mouth

Occlusion

- Molar classification R____L____
- Canine classification R____L____
- Overbite (%) _____
- Overjet (mm) _____
- Crossbite **Y N**
- Midline Deviation **Y N**
- Interferences **Y N**

DIAGRAM OF INJURIES

TOOTH NUMBER

DENTAL INJURIES

- AVULSION — Extra-oral Time; Storage Medium
- INFRACTION
- CROWN FRACTURE
- PULP EXPOSURE — Size; Appearance
- COLOR
- MOBILITY (mm)
- PERCUSSSION
- LUXATION — Direction; Extent
- PULP TESTING — Electric; Thermal
- CARIES/PREVIOUS RESTORATIONS

RADIOGRAPHS

- PULP SIZE
- ROOT DEVELOPMENT
- ROOT FRACTURE
- PERIODONTAL LIGAMENT SPACE
- PERIAPICAL PATHOLOGY
- ALVEOLAR FRACTURE
- FOREIGN BODY
- DEVELOPMENTAL ANOMALY
- OTHER

TREATMENT

Check if performed and describe

- Soft tissue management
- Medication
- Pulp therapy
- Repositioning
- Stabilization
- Restoration
- Extraction
- Prescription
- Referral
- Other

SUMMARY

INSTRUCTIONS AND DISPOSITION

Check if discussed

- Diet
- Hygiene
- Pain
- Swelling
- Infection
- Prescription
- Complications:
  - Damage to developing teeth
  - Abnormal position/ankylosis
  - Tooth Loss
  - Pulp damage to injured teeth
  - Other:
- Follow-up:
- Other

This sample form, developed by the American Academy of Pediatric Dentistry, is provided as a practice tool for pediatric dentists and other dentists treating children. It was developed by experts in pediatric dentistry, and offered to facilitate excellence in practice. However, this form does not establish or evidence a standard of care. In issuing this form, the American Academy of Pediatric Dentistry is not engaged in rendering legal or other professional advice. If such services are required, competent legal or other professional counsel should be sought.