

# Recommended Guidelines of the American Association of Endodontists for the **Treatment of Traumatic Dental Injuries**

The *Recommended Guidelines of the American Association of Endodontists for the Treatment of Traumatic Dental Injuries* are intended to aid the practitioner in the management and treatment of dental injuries. Practitioners must always use their own best professional judgment. The AAE neither expressly nor implicitly warrants any positive results associated with the application of these guidelines. Although it is impossible to guarantee permanent retention of a traumatized tooth, timely treatment of the tooth using recommended procedures can maximize the chances for success.

The AAE gratefully acknowledges the cooperation of the International Association of Dental Traumatology and Blackwell-Munksgaard who granted permission for the AAE to use substantial portions of the IADT *Recommended Guidelines for the Management of Traumatic Dental Injuries* in the development of the AAE trauma guidelines.

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**TABLE 1. Treatment guidelines for luxated permanent teeth**

|                                      | Concussion   | Subluxation  | Extrusion   | Lateral luxation   | Intrusion  |
|--------------------------------------|--|--|---|--|--|
| Diagnosis and clinical findings      | Tooth tender to touch (no displacement, no excessive mobility).  | Tooth is tender to touch and mobile, but not displaced. Hemorrhage from gingival crevice possible.   | Elongated mobile tooth.   | The tooth is displaced axially and is usually locked into bone. Not tender to touch, not mobile. Percussion test: high, metallic sound (ankylotic tone).   | Tooth is displaced deeper into the alveolar bone. Not tender to touch, not mobile. Percussion test: high, metallic sound (ankylotic tone).   |
| Radiographic assessment and findings | Take one radiograph (2). No radiographic abnormalities will be found.  | Take two radiographs (1, 2). No radiographic abnormalities will be found.  | Take four radiographs (1-4). Increased periodontal space apically.            | Take four radiographs (1-4). Increased periodontal space is best seen on eccentric or occlusal exposures.  | Take four radiographs (1-4). Radiographs not always conclusive.  |
| Treatment                            | Flexible splint is optional – can be used for the comfort of the patient for 7-10 days, or according to trauma diagnoses of adjacent teeth (SA).                 | Flexible splint is optional – can be used for the comfort of the patient for 7-10 days, or according to trauma diagnoses of adjacent teeth (SA). | Reposition. Stabilize the tooth with a flexible splint for up to 3 weeks (A). | Reposition the tooth into normal position (local anesthesia necessary). The tooth must often be extruded (occlusally past the bony lock prior to repositioning). Take one radiograph (2) after repositioning. Stabilize tooth with a flexible splint for up to 3 weeks. In case of marginal bone breakdown, usually observed radiographically (don't probe!) after 3 weeks, add 3-4 weeks extra splinting time (A/SA). | Slightly luxate the tooth with forceps. Spontaneous re-eruption (teeth with incomplete root formation) is possible but not predictable, orthodontic repositioning (teeth with completed root formation) or surgical repositioning is performed. In case of completed root formation, perform prophylactic extirpation of the pulp 1-3 weeks after injury (SA). |
| Patient instruction                  | Soft diet.<br>Brush teeth with a soft toothbrush after each meal.<br>Use of chlorhexidine mouthrinse (0.12%) twice a day for 2 weeks.<br>Follow up (see Table 2) |  |   |  |  |

Radiographs: (1) occlusal (2) periapical central angle (3) periapical mesial eccentric (4) periapical distal eccentric  
 Treatment urgency: A = Acute (within a few hours) SA = Subacute (within 24 hours) D = Delayed (more than one day)

**TABLE 2. Follow up procedures for luxated permanent teeth**

| Time               | Concussion/Subluxation | Extrusion | Lateral luxation | Intrusion |
|--------------------|------------------------|-----------|------------------|-----------|
| Up to 3 weeks      | S+C (2)                | S+C (2)   | S+C (3)          |           |
| 6-8 weeks          | C (1)                  | C (2A)    | C (2A)           | C (3)     |
| 6 months           | C (2A)                 | C (2A)    | C (3)            | C (3)     |
| 1 year             | C (1)                  | C (2A)    | C (2A)           | C (3)     |
| Yearly for 5 years | NA                     | C (2A)    | C (2A)           | C (3)     |

S = Splint removal NA = Not applicable

C = Clinical radiographic examination. Success/Failure includes some but not necessarily all of the following:

- 1 *Success* – asymptomatic, positive sensitivity, continued root development (immature teeth), intact lamina dura periradicularly  
*Failure* – symptomatic, negative sensitivity, root does not develop (immature teeth), periradicular radiolucencies
- 2 *Success* – minimal symptoms, slight mobility, no excessive lucency periradicularly  
*Failure* – severe symptoms, excessive mobility, clinical and radiographic signs of periodontitis. Initiate endodontics if closed apex and extent of displacement will likely result in necrosis.
- (2A) *Success* – asymptomatic, clinical and radiographic signs of normal or healed periodontium. Marginal bone height corresponds to that seen radiographically after repositioning.  
*Failure* – symptoms and radiographic sign consistent with periodontitis, negative sensitivity, breakdown of marginal bone – splint for additional period 3-4 weeks; initiate endodontic treatment if not previously initiated, chlorhexidine mouthrinse.
- 3 *Success* – tooth in place or erupting, intact lamina dura, no signs of resorption.  
*Failure* – tooth locked in place/ankylotic tone; radiographic signs of apical periodontitis, external inflammatory resorption or replacement resorption.

**TABLE 3. Treatment guidelines for avulsed permanent teeth with closed apex**

| Diagnosis and clinical situation | The tooth has already been replanted.   | The tooth has been kept in special storage media, milk, saline or saliva. The extra-oral dry time is <60 minutes.  | Extra-oral dry time is >60 minutes.   |
|----------------------------------|---|--|---|
| <b>Treatment</b>                 | Clean affected area with water spray, saline or chlorhexidine.<br>Do not extract the tooth (SA).  | If contaminated, clean the root surface and apical foramen with a stream of saline.<br>Remove the coagulum from the socket with a stream of saline.<br>Examine the alveolar socket. If there is a fracture in the socket wall, reposition it with a suitable instrument.<br>Replant slowly with slight digital pressure (A). | Remove debris and necrotic periodontal ligament.<br>Remove the coagulum from the socket with a stream of saline.<br>Examine the alveolar socket. If there is a fracture of the socket wall, reposition it with a suitable instrument.<br>Immerse the tooth in any available sodium fluoride solution for a minimum of 5 minutes.<br>Replant slowly with slight digital pressure (SA). |
| <b>Additional treatment</b>      | Suture gingival laceration, especially in the cervical area.<br>Verify normal position of the replanted tooth radiographically.<br>Apply a flexible splint for 1-2 weeks.   |  | Suture gingival laceration, especially in the cervical area. Verify normal position of the replanted tooth radiographically. Apply a flexible splint for 4-6 weeks.   |
| <b>Antibiotics</b>               | Administer systemic antibiotics: Doxycycline 2x per day for 7 days at appropriate dose for patient age and weight, or penicillin 4x per day for 7 days at appropriate dose for patient age and weight.<br>Refer to physician to evaluate need for a tetanus booster if avulsed tooth has come in contact with soil or if tetanus coverage is uncertain. |  |   |
| <b>Patient instruction</b>       | Soft diet for 2 weeks.<br>Brush teeth with a soft toothbrush after each meal.<br>Use a chlorhexidine mouthrinse (0.12%) twice a day for 1 week.<br>Follow up (see Table 5)  |  |   |

Treatment urgency: A = Acute (within a few hours) SA = Subacute (within 24 hours) D = Delayed (more than one day)

**TABLE 4. Treatment guidelines for avulsed permanent teeth with open apex**

| Diagnosis and clinical situation | The tooth has already been replanted.  | The tooth has been kept in special storage media, milk, saline or saliva. The extra-oral <i>dry time</i> is <60 minutes.   | Extra-oral dry time is >60 minutes.    |
|----------------------------------|--|--|--|
| <b>Treatment</b>                 | Clean affected area with water spray, saline or chlorhexidine rinse.<br>Do not extract the tooth (SA).   | If contaminated, clean the root surface and apical foramen with a stream of saline.<br>Place the tooth in doxycycline (~100 mg/20 ml saline).<br>Remove the coagulum from the socket with a stream of saline.<br>Examine the alveolar socket. If there is a fracture to the socket wall, reposition it with a suitable instrument.<br>Replant slowly with slight digital pressure (A). | Replantation usually is not indicated. |
| <b>Additional treatment</b>      | Suture gingival laceration, especially in the cervical area.<br>Verify normal position of the replanted tooth radiographically.<br>Apply a flexible splint for 1-2 weeks.  |  |  |
| <b>Antibiotics</b>               | Administer systemic antibiotics: Penicillin V 4x per day for 7 days at appropriate dose for patient age and weight; or, for patients not susceptible to tetracycline staining, Doxycycline 2x per day for 7 days at appropriate dose for patient age and weight.<br>Refer to physician to evaluate need for a tetanus booster if avulsed tooth has come into contact with soil or tetanus coverage is uncertain. |  |  |
| <b>Patient instruction</b>       | Soft diet for 2 weeks.<br>Brush teeth with a soft toothbrush after each meal.<br>Use a chlorhexidine mouthrinse (0.12%) twice a day for 1 week.<br>Follow up (see Table 5)   |  |  |

Treatment urgency: A = Acute (within a few hours) SA = Subacute (within 24 hours) D = Delayed (more than one day)

**TABLE 5. Follow-up procedures for avulsed permanent teeth**

| Time               | Closed apex                      | Open apex  |
|--------------------|----------------------------------|--|
| 1-2 weeks          | S; Initiate endodontic treatment | S; Intiate endodontic treatment or monitor for revascularization |
| 2-3 weeks          | C                                | C  |
| 3-4 weeks          | C                                | C  |
| 6-8 weeks          | C                                | C  |
| 6 months           | C                                | C  |
| 1 year             | C                                | C  |
| Yearly for 5 years | C                                | C  |

S = Splint removal C = Clinical and radiographic examination

**Possible outcomes:**

**Closed Apex**

- (1) **Satisfactory outcome** – *Clinical:* asymptomatic, normal mobility, normal sound on percussion  
*Radiographic:* no periradicular radiolucencies indicative of progressive external inflammatory root resorption (>2x normal lamina dura) or loss of lamina dura indicative of ankylosis and replacement resorption
- (2) **Unsatisfactory outcome** – *Clinical:* symptomatic and/or high pitch percussion sound  
*Radiographic:* periradicular radiolucencies in the root and bone, or radiographic replacement of the root with bone

**Endodontic treatment:** At 7-10 days endodontic treatment should be initiated and calcium hydroxide placed. Calcium hydroxide can be replaced by gutta-percha when an intact lamina dura can be traced around the entire root surface. Usually, if the root canal treatment is initiated at the end of the ideal 7-day period, external inflammatory root resorption is prevented, and obturation can take place within a month. If, however, the endodontic treatment is initiated when root resorption is already visible, calcium hydroxide is needed for an extended period before obturation can take place. The status of the lamina dura and the presence of the calcium hydroxide in the canal should be evaluated every 3 months.

**Open Apex**

- (1) **Satisfactory outcome** – *Clinical:* asymptomatic, normal mobility and eruption pattern, normal sound on percussion, positive sensitivity test  
*Radiographic:* As with closed apex. *Continued root development, pulp lumen obliteration is very common.*
- (2) **Unsatisfactory outcome** – *Clinical:* symptomatic and/or high pitched percussion sound, tooth in infra-occlusion  
*Radiographic:* As with closed apex. *Root fails to develop; the pulpal lumen does not change in size.*

**Endodontic treatment:** If revascularization is a possibility, avoid endodontic treatment unless obvious signs of failure are present. Sensitivity test may take up to 3 months to respond positively. If endodontic treatment is necessary, follow recommendations for apexification.

**TABLE 6. Treatment guidelines for tooth fractures and alveolar fractures in the permanent dentition**

|  | Crown fracture   |   | Crown-root fracture  | Root fracture   | Alveolar fracture  |
|--|--|---|--|---|--|
|  | Uncomplicated  | Complicated   |  |   |  |
| <b>Diagnosis and clinical findings</b>                   | Enamel fracture or enamel-dentin fracture; no pulp exposure.   | Enamel-dentin fracture, with pulp exposure.   | The coronal fragment is attached to the gingiva and mobile. The pulp may or may not be exposed.  | The coronal fragment is usually mobile and sometimes displaced. The apical segment is usually not displaced.                    | The bone segment containing the involved tooth/teeth is mobile.                      |
| <b>Radiographic and clinical assessment and findings</b> | Take one radiograph (2). Evaluate size of pulp chamber and stage of root development. Sensitivity test.  | Take one radiograph (2). Evaluate the size of pulp chamber and stage of root development. Sensitivity test.   | Take four radiographs (1-4). Radiographs taken at different angulations are useful. Sensitivity test.  |   |  |
| <b>Treatment</b>   | Account for fractured segment. Radiograph soft tissue lacerations for tooth fragments or other foreign bodies. Provide a temporary glass-ionomer cement bandage or a permanent restoration using a bonding agent and composite resin. If very close to pulp, consider Ca(OH) <sub>2</sub> base. If an intact fragment exists, a bonding procedure may be carried out (SA/D). | <i>In immature tooth:</i> Perform pulp capping or partial pulpotomy and bacteria-tight coronal seal.<br><i>In mature tooth:</i> As with immature tooth or pulpectomy and root canal filling (SA). | In an emergency, stabilize the coronal fragment with an acid etch/resin splint to adjacent teeth. Expose subgingival fracture site by:<br>a) Gingivectomy<br>b) Orthodontic or surgical extrusion. If root formation is complete, root canal treatment is indicated. Otherwise, pulp capping or pulpotomy, and wait for completion of root formation (SA). | Reposition the coronal fragment as soon as possible. Check position radiographically. Stabilize the tooth with a splint (A/SA). | Reposition the fragment. Stabilize the fragment to adjacent teeth with a splint (A). |
| <b>Patient instruction</b>                               | Soft diet.<br>Brush teeth with a soft toothbrush after each meal.<br>Use chlorhexidine mouthrinse (0.12%) twice a day for 7 days.<br>Follow up (see Table 7)   |   |  |   |  |

Radiographs: (1) occlusal (2) periapical central angle (3) periapical mesial eccentric (4) periapical distal eccentric

Treatment urgency: A = Acute (within a few hours) SA = Subacute (within 24 hours) D = Delayed (more than one day)

**TABLE 7. Follow-up procedures for fractured permanent teeth and alveolar fractures**

| Time               | Crown fracture |             | Crown-root fracture | Root fracture | Alveolar fracture |
|--------------------|----------------|-------------|---------------------|---------------|-------------------|
|                    | Uncomplicated  | Complicated |                     |               |                   |
| 3-4 weeks          |                |             |                     | S+C (2)       | S+C (2)           |
| 6-8 weeks          | C (1)          | C (1)       | C (1)               | C (2)         | C (3)             |
| 6 months           |                |             |                     | C (2)         | C (3)             |
| 1 year             | C (1)          | C (1)       | C (1)               | C (2)         | C (3)             |
| Yearly for 5 years |                |             |                     | C (2)         | C (3)             |

S = Splint removal

C = Clinical and radiographic examination

- Success* – positive sensitivity, root development continues (immature teeth). Continue to next evaluation  
*Failure* – negative sensitivity, signs of apical periodontitis, root development does not continue (immature teeth). Start endodontic therapy
- Success* – positive sensitivity (false negative possible at 3-4 week evaluation). Signs of repair of fractured segments. Continue to next evaluation  
*Failure* – negative sensitivity (false negative possible at 3-4 week evaluation). Clinical signs of periodontitis. Radiolucency adjacent to fracture line. Start endodontic therapy to level of fracture line
- Success* – positive sensitivity (false negative possible at 3-4 week evaluation). No signs of apical periodontitis. Continue to next evaluation  
*Failure* – negative sensitivity (false negative possible at 3-4 week evaluation). Signs of apical periodontitis or external inflammatory resorption. Start endodontic therapy.