Dental Trauma in the Pediatric Population

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Presented with avulsion of # 8
Extra-oral time 20 min
Disclaimers

All clinical pictures were authored by myself unless otherwise listed on the slide.

Patients and/or parent consent was received for all photos.

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Session Objectives

1. To review the classification of dental trauma to the permanent dentition

2. To understand the treatment protocols depending on the type of trauma
Vocabulary

- **Calcium Hydroxide**: Mineral Trioxide Aggregate: mixture of a refined Portland Cement and bismuth oxide

- **M.T.A.**

- **Patient Instructions**: Stabilization of a loosened tooth or root fracture with a splinting device which allows mobility (within physiologic ranges) during the healing period

- **Flexible Splinting**

- **Flexible Splinting Materials**
Requirements of modern splints for stabilization of traumatized teeth

- Intraoral application
- No damage to gingival tissues
- RCT and sensibility testing should be possible
- Esthetically acceptable
- Be easy to keep clean
- Adequate fixation
- Simple procedure
- No interference with occlusion
- No additional trauma to splinted teeth
- Allowing physiologic tooth mobility
Requirements of modern splints for stabilization of traumatized teeth
Treatment Guidelines for Trauma to Permanent Dentition

- Tooth and/or Alveolar Fractures
- Luxated Teeth
- Avulsed Teeth
Treatment Guidelines for Fractures of Teeth and Alveolar Bone
General Considerations

- Age of the patient
- Cooperation
- Parent desires / concerns
- Dental Development
Treatment Guidelines for Fractures of Teeth and Alveolar Bone

Treatment Timing

- Avulsion
- Alveolar fracture
- Extrusive luxation
- Lateral luxation
Treatment Guidelines for Fractures of Teeth and Alveolar Bone

Treatment Timing

- Intrusion
- Concussion
- Subluxation
- Crown fracture with pulp exposure
- Root Fracture
- Crown fracture without pulp exposure

Treatment May be delayed several hours without compromise
<table>
<thead>
<tr>
<th>Clinical findings</th>
<th>Radiographic Findings</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>● An incomplete fracture (crack) of the enamel without loss of tooth structure.</td>
<td>● No radiographic abnormalities.</td>
<td>● In case of marked infractions, etching and sealing with resin to prevent discoloration of the infraction lines. Otherwise, no treatment is necessary.</td>
</tr>
<tr>
<td>● Not tender. If tenderness is observed evaluate the tooth for a possible luxation injury or a root fracture.</td>
<td>● Radiographs recommended: a periapical view. Additional radiographs are indicated if other signs or symptoms are present.</td>
<td></td>
</tr>
<tr>
<td><strong>Favorable Outcome</strong></td>
<td><strong>Unfavorable Outcome</strong></td>
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<tr>
<td>-----------------------</td>
<td>------------------------</td>
<td></td>
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<tr>
<td>● Asymptomatic</td>
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<td>● Positive response to pulp testing.</td>
<td>● Negative response to pulp testing.</td>
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<td>● Continuing root development in immature teeth.</td>
<td>● Signs of apical periodontitis.</td>
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<td>● No continuing root development in immature teeth.</td>
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<td>● Endodontic therapy appropriate for stage of root development is indicated.</td>
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Enamel Fracture

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</table>

- A complete fracture of the enamel.
  - Loss of enamel. No visible sign of exposed dentin.
  - Not tender. If tenderness is observed evaluate the tooth for a possible luxation or root fracture injury.
  - Normal mobility.
  - Sensibility pulp.
  - Enamel loss is visible.
  - Radiographs recommended: periapical, occlusal and eccentric exposures. These are recommended in order to rule out the possible presence of a root fracture or a luxation injury.

- Radiograph of lip or cheek to search for tooth fragments or foreign materials.

- If the tooth fragment is available, it can be bonded to the tooth.

- Contouring or restoration with composite resin depending on the extent and location of the fracture.
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<td>Signs of apical</td>
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<tr>
<td></td>
<td>development in</td>
<td>periodontitis</td>
</tr>
<tr>
<td></td>
<td>immature teeth.</td>
<td>No continuing root</td>
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<td>Continue to next</td>
<td>Endodontic therapy</td>
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<td>evaluation.</td>
<td>appropriate for</td>
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9 year old   bike wreck
9 months later.......
**Enamel-Dentin Fracture**

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<td>A fracture confined to enamel and dentin with loss of tooth structure, but not</td>
<td>● Percussion test: not tender. If tenderness is observed, evaluate the tooth for possible luxation or root fracture injury.</td>
<td>If a tooth fragment is available, it can be bonded to the tooth. Otherwise perform a provisional treatment by covering the exposed dentin with glass-Ionomer or a more permanent restoration using a bonding agent and composite resin, or other accepted dental restorative materials.</td>
</tr>
<tr>
<td>exposing the pulp.</td>
<td>● Normal mobility.</td>
<td></td>
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<tr>
<td>● Sensibility pulp test usually positive</td>
<td>● Radiographs recommended: periapical, occlusal and eccentric exposure to rule out tooth displacement or possible presence of root fracture.</td>
<td>If the exposed dentin is within 0.5mm of the pulp (pink, no bleeding) place calcium hydroxide base and cover with a material such as a glass ionomer.</td>
</tr>
</tbody>
</table>
Enamel - Dentin Fracture

15 years old. Bicycle accident
15 years old. Bicycle accident

Enamel - Dentin Fracture
Enamel - Dentin Fracture

Non-complicated fracture of the crown
Enamel - Dentin Fracture

“band-aid” composite
Enamel - Dentin Fracture
Enamel - Dentin Fracture
Enamel - Dentin – Fracture

Age: 8 year old
Gender: girl
Chief complaint: “hit my face after a bicycle accident”
PMH: Unremarkable
Dental History: Unremarkable
Social History: Unremarkable
Enamel – Dentin Fracture
Enamel–Dentin Fracture
Enamel - Dentin – Fracture

Diagnosis:

Extrusion tooth # 8

Crown-fracture uncomplicated teeth # 8 and 9

Treatment (extrusion):

1. Reposition as soon as possible

2. Stabilize the tooth with splint

3. Splint for → 2 weeks

Enamel - Dentin – Pulp Fracture
Enamel - Dentin – Pulp Fracture
Enamel - Dentin Fracture

Follow up

Favorable Outcome

Unfavorable Outcome

- Asymptomatic
- Positive response to pulp testing.
- Continuing root development in immature teeth.
- Continue to next evaluation.

- Symptomatic
- Negative response to pulp testing.
- Signs of apical periodontitis
- No continuing root development in immature teeth.
- Endodontic therapy appropriate for stage of root development is indicated.
Enamel - Dentin – Pulp Fracture
(Complicated Crown Fracture)

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<tr>
<td>● A fracture involving enamel and dentin with loss of tooth structure and exposure of the pulp.</td>
<td>● Radiographs recommended: periapical, occlusal and eccentric exposures, to rule out tooth displacement or possible presence of root fracture.</td>
<td>● In young patients with immature, still developing teeth, it is advantageous to preserve pulp vitality by pulp capping or partial pulpotomy. Also, this treatment is the choice in young patients with completely formed teeth. Calcium hydroxide is a suitable material to be placed on the pulp wound in such procedures.</td>
</tr>
<tr>
<td>● Normal mobility</td>
<td>● Radiograph of lip or cheek lacerations to search for tooth fragments or foreign materials.</td>
<td>● In patients with mature apical development, root canal treatment is usually the treatment of choice, although pulp capping or partial pulpotomy also may be selected.</td>
</tr>
<tr>
<td>● Percussion test: not tender. If tenderness is observed, evaluate for possible luxation or root fracture injury.</td>
<td></td>
<td>● If tooth fragment is available, it can be bonded to the tooth.</td>
</tr>
<tr>
<td>● Exposed pulp sensitive to stimuli. Enamel – dentin loss visible.</td>
<td></td>
<td>● Future treatment for the fractured crown may be restoration with other accepted dental restorative materials.</td>
</tr>
</tbody>
</table>
10 years old

Scooter accident 7 hours ago

• Past medical history: Unremarkable
• Medications: None
• Allergies: None
Clinical Findings I

- Extra-oral exam (EOE):
  - (-) Thyromegaly
  - (-) Lymphadenopathy
  - (-) Salivary gland enlargement
  - (+) Skin lesions: minor lacerations in the chin and upper lip
  - (-) Click / sounds TMJ

- IO Soft Tissue exam:
  Within normal limits
Enamel - Dentin – Pulp Fracture
(Complicated Crown Fracture)
Enamel - Dentin – Pulp Fracture
(Complicated Crown Fracture)
Enamel - Dentin – Pulp Fracture
(Complicated Crown Fracture)

- Complicated crown fracture
- Partially open apex
Enamel -Dentin – Pulp Fracture
(Complicated Crown Fracture)

• Fracture involves enamel and dentin and the pulp is exposed.

• Sensibility testing is usually not indicated.

• In young patients with immature, still developing teeth, it is advantageous to preserve pulp vitality by pulp capping or partial pulpotomy.

• Calcium hydroxide or MTA (white) are suitable materials for the procedure.

• In older patients, root canal treatment can be the treatment of choice, although pulp capping or partial pulpotomy may also be selected.
Enamel - Dentin – Pulp Fracture

(Complicated Crown Fracture)

Profuse irrigation with saline solution

Direct pulp cap with calcium hydroxide
Enamel - Dentin – Pulp Fracture

(Complicated Crown Fracture)

Temporary composite
Enamel - Dentin – Pulp Fracture
(Complicated Crown Fracture)

Temporary composite in place
Enamel - Dentin – Pulp Fracture
(Complicated Crown Fracture)

Occlusion check
8 year old

“Yesterday in gym class we had to run laps to warm up and the mean boy on the bus tripped me and my teeth broke on the floor.”
**Enamel -Dentin – Pulp Fracture**
*(Complicated Crown Fracture)*

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<td><img src="image2.png" alt="Smiley" /></td>
<td><img src="image3.png" alt="Sad" /></td>
</tr>
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- **Follow up**
  - Asymptomatic
  - Positive response to pulp testing.
  - Continuing root development in immature teeth.
  - Continue to next evaluation.

- **Favorable Outcome**
  - Symptomatic
  - Negative response to pulp testing.
  - Signs of apical periodontitis
  - No continuing root development in immature teeth.

- **Unfavorable Outcome**
  - Endodontic therapy appropriate for stage of root development is indicated.
### Clinical Findings

- A fracture involving enamel, dentin and cementum with loss of tooth structure, but not exposing the pulp.
- Crown fracture extending below gingival margin.
- Percussion test: Tender.
- Coronal fragment mobile.
- Sensibility pulp test usually positive for apical fragment.

### Radiographic Findings

- Apical extension of fracture usually not visible.
- Radiographs recommended: periapical, occlusal and eccentric exposures. They are recommended in order to detect fracture lines in the root.

### Treatment

- **Emergency treatment** as an emergency treatment a temporary stabilization of the loose segment to adjacent teeth can be performed until a definitive treatment plan is made. (flexible splint for 3-4 weeks)
- **Non-Emergency Treatment Alternatives**
  - Fragment removal only
  - Fragment removal and gingivectomy
  - Orthodontic extrusion of apical fragment
  - Surgical extrusion
  - Root submergence
  - Extraction

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**Crown-Root Fracture without Pulp Exposure**
Crown-Root Fracture without Pulp Exposure

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- **Follow up**
  - Asymptomatic
  - Positive response to pulp testing.
  - Continuing root development in immature teeth.
  - Continue to next evaluation.

- **Favorable Outcome**
  - Symptomatic
  - Negative response to pulp testing.
  - Signs of apical periodontitis
  - No continuing root development in immature teeth.
  - Endodontic therapy appropriate for stage of root development is indicated.
Clinical Findings

- A fracture involving enamel, dentin, and cementum and exposing the pulp.
- Percussion test: tender.
- Coronal fragment mobile.
- Apical extension of fracture usually not visible.

Radiographic Findings

- Radiographs recommended: periapical and occlusal exposure.

Treatment

- Emergency treatment: Temporary stabilization of the loose segment to adjacent teeth can be performed until a definitive treatment plan is made.
- In patients with open apices, it is advantageous to preserve pulp vitality by a partial pulpotomy. This treatment is also the choice in young patients with completely formed teeth.
- Calcium hydroxide compounds (or MTA) are suitable pulp capping materials. In patients with mature apical development, root canal treatment can be the treatment of choice.
- Fragment removal only
- Fragment removal and gingivectomy
- Orthodontic extrusion of apical fragment
- Surgical extrusion
- Root submergence
- Extraction

Crown-Root Fracture with Pulp Exposure
## Root Fracture

<table>
<thead>
<tr>
<th>Clinical Findings</th>
<th>Radiographic Findings</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>The coronal segment may be mobile and may be displaced.</td>
<td>The fracture involves the root of the tooth and is in a horizontal or oblique plane.</td>
<td>Reposition, if displaced, the coronal segment of the tooth as soon as possible.</td>
</tr>
<tr>
<td>The tooth may be tender to percussion.</td>
<td>Fractures that are in the horizontal plane can usually be detected in the regular periapical 90˚ angle film with the central beam through the tooth. This is usually the case with fractures in the cervical third of the root.</td>
<td>Check position radiographically.</td>
</tr>
<tr>
<td>Bleeding from the gingival sulcus may be noted.</td>
<td>If the plane of fracture is more oblique which is common with apical third fractures, an occlusal view or radiographs with varying horizontal angles are more likely to demonstrate the fracture including those located in the middle third.</td>
<td>Stabilize the tooth with a flexible splint for 4 weeks. If the root fracture is near the cervical area of the tooth, stabilization is beneficial for a longer period of time (up to 4 months).</td>
</tr>
<tr>
<td>Sensibility testing may give negative results initially, indicating transient or permanent neural damage.</td>
<td></td>
<td>It is advisable to monitor healing for at least one year to determine pulpal status.</td>
</tr>
<tr>
<td>Monitoring the status of the pulp is recommended.</td>
<td></td>
<td>If pulp necrosis develops, root canal treatment of the coronal tooth segment to the fracture line is indicated to preserve the tooth.</td>
</tr>
<tr>
<td>Transient crown discoloration (red or grey) may occur.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Root Fracture

Follow up

Favorable Outcome

Unfavorable Outcome

S+ = Splint removal
S ++ = Splint removal in cervical fractures
**Clinical Findings**

- The fracture involves the alveolar bone and may extend to adjacent bone.
- Segment mobility and dislocation with several teeth moving together are common findings.
- An occlusal change due to misalignment of the fractured alveolar segment is often noted.
- Sensibility testing may or may not be positive.

**Radiographic Findings**

- Fracture lines may be located at any level, from the marginal bone to the root apex.
- In addition to the 3 angulations and occlusal film, additional views such as a panoramic radiograph can be helpful in determining the course and position of the fracture line.

**Treatment**

- Reposition any displaced segment and then splint.
- Suture gingival laceration if present.
- Stabilize the segment for 4 weeks.
Alveolar Fracture
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Alveolar Fracture
## Alveolar Fracture

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**Follow up**

- Positive response to pulp testing (false negative possible up to 3 months).
- Signs of repair between fractured segments.
- Continue to next evaluation.

**Favorable Outcome**

- Symptomatic

**Unfavorable Outcome**

- Negative response to pulp testing (false negative possible up to 3 months).
- Signs of apical periodontitis or external resorption.
- Endodontic therapy appropriate for stage of root development is indicated.

*S+ = Splint removal  
S ++ = Splint removal in cervical fractures*
Treatment Guidelines for Luxation Injuries

Concussion  Subluxation  Extrusive Luxation  Lateral Luxation

Image Downloaded from http://www.deardoctor.com/articles/trauma-and-nerve-damage-to-teeth/
## Concussion I

<table>
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<tr>
<th>Clinical Findings</th>
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</tr>
</thead>
<tbody>
<tr>
<td>● The tooth is tender to touch or tapping; it has not been displaced and does not have increased mobility.</td>
<td><img src="image" alt="Radiograph" /></td>
<td>No treatment is needed. Monitor pulpal condition for at least one year.</td>
</tr>
<tr>
<td>● Sensibility tests are likely to give positive results.</td>
<td></td>
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</table>

An injury to the tooth-supporting structures *without increased mobility or displacement of the tooth, but with pain to percussion*
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S+ = Splint removal  
S ++ = Splint removal in cervical fractures  
C++= Clinical and radiographic examination
**Clinical Findings**

- The tooth is tender to touch or tapping and has increased mobility; it has not been displaced.
- Bleeding from gingival crevice may be noted.
- Sensibility testing may be negative initially indicating transient pulpal damage.
- Monitor pulpal response until a definitive pulpal diagnosis can be made.

**Radiographic Findings**

- Radiographic abnormalities are usually not found.

**Treatment**

- Normally no treatment is needed, however a flexible splint to stabilize the tooth for patient comfort can be used for up to 2 weeks.

---

**Subluxation**

An injury to the tooth supporting structures resulting in *increased mobility, but without displacement of the tooth*. Bleeding from the gingival sulcus confirms the diagnosis.
### Follow up

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<tr>
<td>• 2 Weeks S+  C++</td>
<td>● Asymptomatic</td>
</tr>
<tr>
<td>• 4 Weeks C++</td>
<td>● Positive response to pulp testing</td>
</tr>
<tr>
<td>• 6-8 Weeks C++</td>
<td>● False negative possible up to 3 months</td>
</tr>
<tr>
<td>• 6 Months C++</td>
<td>● Continuing root development in immature teeth</td>
</tr>
<tr>
<td>• 1 Year C++</td>
<td>● Intact lamina dura</td>
</tr>
<tr>
<td></td>
<td>● Symptomatic</td>
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<td></td>
<td>● Negative response to pulp testing (false negative possible up to 3 months)</td>
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<td>● Signs of apical periodontitis or external resorption</td>
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<td>● External inflammatory resorption</td>
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S+ = Splint removal  
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C+++ = Clinical and radiographic examination
## Extrusive Luxation I

Partial displacement of the tooth out of its socket

The alveolar bone is intact (as oppose to lateral luxation)

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<td>The tooth appears elongated and is excessively mobile.</td>
<td>Increased periodontal ligament space apically.</td>
<td>Reposition the tooth by gently re-inserting it into the tooth socket.</td>
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<td>Sensibility tests will likely give negative results.</td>
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<td>Stabilize the tooth for 2 weeks using a flexible splint.</td>
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<td>In mature teeth where pulp necrosis is anticipated or if several signs and symptoms indicate that the pulp of mature or immature teeth became necrotic, root canal treatment is indicated.</td>
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<tbody>
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<td>2 Weeks S+, C++</td>
<td>![Green Face]</td>
<td>![Red Face]</td>
</tr>
<tr>
<td>4 Weeks C++</td>
<td>![Green Face]</td>
<td></td>
</tr>
<tr>
<td>6-8 Weeks C++</td>
<td>![Green Face]</td>
<td></td>
</tr>
<tr>
<td>6 Months C++</td>
<td>![Green Face]</td>
<td></td>
</tr>
<tr>
<td>1 Year C++</td>
<td>![Green Face]</td>
<td></td>
</tr>
<tr>
<td>Yearly 5 years C++</td>
<td>![Green Face]</td>
<td></td>
</tr>
</tbody>
</table>

- **S+ = Splint removal**
- **S ++ = Splint removal in cervical fractures**
- **C++= Clinical and radiographic examination**

### Favorable Outcome
- Asymptomatic
- Clinical and radiographic signs of normal or healed periodontium.
- Positive response to pulp testing (false negative possible up to 3 months).
- Marginal bone height corresponds to that seen radiographically after repositioning.
- Continuing root development in immature teeth

### Unfavorable Outcome
- Symptoms and radiographic sign consistent with apical periodontitis.
- Negative response to pulp testing (false negative possible up to 3 months).
- If breakdown of marginal bone, splint for an additional 3-4 weeks.
- External inflammatory root resorption.
- Endodontic therapy appropriate for stage of root development is indicated.
Lateral Luxation I

Displacement of the tooth (except axially) accompanied by comminution or fracture of either the labial or the palatal / lingual alveolar bone → *partial or total separation of the periodontal ligament*

<table>
<thead>
<tr>
<th>Clinical Findings</th>
<th>Radiographic Findings</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>The tooth is displaced, usually in a palatal/lingual or labial direction.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>It will be immobile and percussion usually gives a high, metallic (ankylosed) sound.</td>
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<td></td>
</tr>
<tr>
<td>Fracture of the alveolar process present.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensibility tests will likely give negative results.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The widened periodontal ligament space is best seen on eccentric or occlusal exposures.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reposition the tooth by gently re-inserting it into the tooth socket.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stabilize the tooth for 4 weeks using a flexible splint.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monitor the pulpal condition.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>If the pulp becomes necrotic, root canal treatment is indicated to prevent root resorption.</td>
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**Lateral Luxation**

Displacement of the tooth (except axially) accompanied by comminution or fracture of either the labial or the palatal/lingual alveolar bone → *partial or total separation of the periodontal ligament*

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<th>Follow up</th>
<th>Favorable Outcome</th>
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<tr>
<td><img src="image" alt="Graph" /></td>
<td><img src="image" alt="Smiley" /></td>
<td><img src="image" alt="Sad" /></td>
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- Continuing root development in immature teeth
- Symptoms and radiographic sign consistent with apical periodontitis.
- Negative response to pulp testing (false negative possible up to 3 months).
- If breakdown of marginal bone, splint for an additional 3-4 weeks.
- External inflammatory root resorption.
- Endodontic therapy appropriate for stage of root development is indicated.
### Intrusive Luxation I

**Clinical Findings**

- The tooth is displaced axially into the alveolar bone.
- It is immobile and percussion may give a high, metallic (ankylosis) sound.
- Sensibility tests will likely give negative results.
- The periodontal ligament space may be absent from all or part of the root.
- The cemento-enamel junction is located more apically in the intruded tooth than in adjacent non-injured teeth, at times even apical to the marginal bone level.

**Radiographic Findings**

- The tooth appears to be intruded.

**Treatment**

- **Teeth with incomplete root formation**
  - Allow eruption without intervention.
  - If no movement within few weeks, initiate orthodontic repositioning.
  - If tooth is intruded more than 7mm, reposition surgically or orthodontically.

- **Teeth with complete root formation**
  - Allow eruption without intervention if tooth intruded less than 3mm. If no movement after 2-4 weeks, reposition surgically or orthodontically before ankylosis can develop.
  - If tooth is intruded beyond 7mm, reposition surgically.
  - The pulp will likely become necrotic in teeth with complete root formation root canal therapy using a temporary filling with calcium hydroxide is recommended and treatment should begin 2-3 w. after surgery.

- Once an intruded tooth has been repositioned surgically or orthodontically, stabilize with a flexible splint for 4-8 weeks.
Age: 9 year old

Gender: Girl

Chief complaint: “Hit the street”

PMH: Unremarkable

Dental History: - Tooth # 9 was traumatic intruded in September of 2011
- Bracket placed March 2011

Social History: Grandfather is the legal guardian
Intrusive Luxation I
Intrusive Luxation I
Intrusive Luxation I
**Intrusive Luxation II**

Displacement of the tooth into the alveolar bone

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<td><img src="image3.png" alt="Sad Face" /></td>
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- **S+ =** Splint removal
- **S ++ =** Splint removal in cervical fractures
- **C+++ =** Clinical and radiographic examination

- **Tooth in place or erupting.**
- **Intact lamina dura**
- **No signs of resorption.**
- **Continuing root development in immature teeth.**
- **Tooth locked in place/ankylosis.**
- **Percussion.**
- **Radiographic signs of apical periodontitis.**
- **External inflammatory root resorption or replacement resorption.**
- **Endodontic therapy appropriate for stage of root development is indicated.**
Avulsion

“A case apart...........”
Avulsion

- Pt. presented to Peds Dentistry on for evaluation of #9.
- Father states that Pt. wrecked her bike in the drive way and avulsed #9 two weeks prior.
- Father states that it took aprox. 30 minutes to find the tooth and another 30 minutes to get to the local dentist.
- Father placed the tooth in milk once he found it.
- Dentist re-implanted #9.
Avulsion
Avulsion
Avulsion

So........what we know?

- Avulsion of tooth # 9

- Extraoral time: approximately 60 minutes

- 30 minutes dry and 30 minutes in milk

- Open apex (more than 1 mm)

What we suppose to do?
Avulsion of a permanent tooth is one of the most serious dental injuries, and a prompt and correct emergency management is very important for the prognosis.

- Extraoral time
- Maturation stage → open vs. close apex
Avulsion

First Aid for Avulsed Teeth

Find the tooth and pick it up by the crown

If the tooth is dirty, wash it briefly (10 seconds) under cold water and reposition it

If this is not possible, place the tooth in a storage medium (milk or Hanks balanced solution)

The tooth can also be transported in the mouth

Seek emergency dental treatment immediately
Avulsion

Save your tooth
Most of your permanent teeth may be saved if you know what to do after a blow to the mouth

What to do if your tooth is BROKEN
1. Find the piece of the tooth
2. The piece can be glued on
3. For this to be possible, seek attention immediately from a dentist

What to do if your tooth is KNOCKED OUT
1. Find the tooth
2. Hold it by the crown
3. (Plug the sink) Rinse in cold tap water

FOLLOW ONE OF THESE ALTERNATIVES

a. Put the tooth back in its place
b. Place the tooth in a cap of milk or saline
c. When milk is not available, place the tooth in the mouth between the cheeks and gums

Seek immediately specialized dental treatment, within a two-hour time period

First Aid for Avulsed Teeth
Avulsion

• Assess medical history and rule out any neurological and non-dental injuries
• Rule out alveolar fracture
• 3 radiographic projections
• Pulp vitality

Management of an Avulsed Permanent Incisor with an Open Apex (>= 1mm)

• Replant / reposition
• Obtain periapical radiograph to verify position
• Place flexible splint for 2 weeks
• Prescribe antibiotics (doxycycline or penicillin V for 7 days)
• Chlorhexidine rinse for 1 week
• Assess tetanus vaccination: if needed, get booster within 48 h.
• Provide post-operative instructions
• Follow up in 7 to 10 days

McIntyre J, Lee J, Trope M, Vann WJ, Permanent tooth replantation following avulsion: Using a decision tree to achieve the best outcome. Pediatr Dent 2009;31(2):137-
Avulsion
Management of an Avulsed Permanent Incisor with an Open Apex (≥ 1mm)

- Assess medical history and rule out any neurological and non-dental injuries
- Rule out alveolar fracture
- 3 radiographic projections
- Pulp vitality

Tooth was transported in Hank’s Balanced Salt Solution (HBSS) or milk

Soak in doxycycline solution for 5 minutes

- Replant / reposition
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Change transport to HBBS or cold milk

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Avulsion

Management of an Avulsed Permanent Incisor with an **Open Apex** (>= 1mm)

- **Immediately replanted**
- **Extraoral dry storage <20 min**
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- **Assess medical history and rule out any neurological and non-dental injuries**
- **Rule out alveolar fracture**
- **3 radiographic projections**
- **Pulp vitality**

• Replant / reposition
• Obtain periapical radiograph to verify position
• Place flexible splint for 4 weeks
• Prescribe antibiotics (doxycycline or penicillin V for 7 days)
• Chlorhexidine rinse for 1 week
• Assess tetanus vaccination: if needed, get booster within 48 h.
• Provide post-operative instructions
• Follow up in 7 to 10 days

Debride with soft pumice prophylaxis, gentle scaling / root planing, or 3% citric acid for 3 minutes and rinse well to remove the PL.
Management of an Avulsed Permanent Incisor with an Open Apex (>= 1mm)

- Assess medical history and rule out any neurological and non-dental injuries
- Rule out alveolar fracture
- 3 radiographic projections
- Pulp vitality

Monitor every 4 weeks + pulp test + radiographs

**Ideal outcome:** Revascularization and / or apexogenesis over the next 12 to 18 months

**Alternative outcomes:**
- Initiate apexification with MTA or calcium hydroxide or root canal therapy is signs / symptoms
- Consider decoronation procedure if ankylosis

Follow up: 1 week, 1 month, 3 months, 6 months, 12 months and annually for 5 years

McIntyre J, Lee J, Trope M, Vann WJ, Permanent tooth replantation following avulsion: Using a decision tree to achieve the best outcome. Pediatr Dent 2009;31(2):137-
Avulsion

Management of an Avulsed Permanent Incisor with an **Closed Apex** (< 1mm)

- Assess medical history and rule out any neurological and non-dental injuries
- Rule out alveolar fracture
- 3 radiographic projections
- Pulp vitality

• Replant / reposition
• Obtain periapical radiograph to verify position
• Place flexible splint for 2 weeks
• Prescribe antibiotics (doxycycline or penicillin V for 7 days)
• Chlorhexidine rinse for 1 week
• Assess tetanus vaccination: if needed, get booster within 48 h.
• Provide post-operative instructions
• Follow up in 7 to 10 days
• *Initiate pulpectomy / debridement on all teeth within 7 to 10 days*
Avulsion
Management of an Avulsed Permanent Incisor with an Closed Apex (< 1mm)

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- Replant / reposition
- Obtain periapical radiograph to verify position
- Place flexible splint for 2 weeks
- Prescribe antibiotics (doxycycline or penicillin V for 7 days) - Chlorhexidine rinse for 1 week
- Assess tetanus vaccination: if needed, get booster within 48 h.
- Provide post-operative instructions
- Follow up in 7 to 10 days
- Initiate pulpectomy / debridement on all teeth within 7 to 10 days
Avulsion

Management of an Avulsed Permanent Incisor with an **Closed Apex** (<1 mm)

- **Immediately replanted**
- **Extraoral dry storage <20 min**
- **Tooth moist for 20-60 min**
- **20 to 60 minutes of dry extraoral time**
- **>60 min extraoral time**

- **Replant / reposition**
- **Obtain periapical radiograph to verify position**
- **Place flexible splint for 2 weeks**
- **Prescribe antibiotics (doxycycline or penicillin V for 7 days)**
- **Chlorhexidine rinse for 1 week**
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Management of an Avulsed Permanent Incisor with an **Closed Apex (< 1mm)**

- Immediately replanted
- Extraoral dry storage < 20 min
- Tooth moist for 20-60 min
- 20 to 60 minutes of dry extraoral time
- > 60 min extraoral time

**Assess medical history and rule out any neurological and non-dental injuries**
**Rule out alveolar fracture**
**3 radiographic projections**
**Pulp vitality**

**Replant / reposition**
**Obtain periapical radiograph to verify position**
**Place flexible splint for 4 weeks**
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<td><img src="image" alt="Smiley face" /></td>
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<td><img src="image" alt="Sad face" /></td>
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If root canal therapy was initiated, complete within 1 month or:
If patient does not present until > 2 weeks after trauma and / or if radiographic resorption is present:
- Pulpectomy / debridement as soon as possible
- Long term calcium hydroxide therapy and change every 3 months
- Complete root canal therapy when PL is observed healthy

Follow up: 1 week, 1 months, 3 months, 12 months, and annually for 5 years

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Avulsion

Management of an Avulsed Permanent Incisor with an Closed Apex (Apex < 1 mm)

- If tooth was kept moist for more than 1 hour, stored in either non-physiologic, medical, or for 20-60 minutes
- 20 to 60 minutes removed dry storage
- 30 minutes removed dry storage
- Root canal therapy immediately initiated, complete within 1 month
- If patient does not present until >2 weeks after trauma and/or if radiographic examination is present:
  - Pulp necrosis may develop as soon as possible
  - Complete root canal therapy when periodontal ligament remains is observed/healthy

Follow-up: 1 week, 3 months, 6 months, 12 months, and annually for 5 years.

Decision Trees for Management of an Avulsed Permanent Tooth

Management of an Avulsed Permanent Incisor with an Open Apex (Apex ≥ 1 mm)

- If tooth was kept moist for more than 1 hour, stored in either non-physiologic, medical, or for 20-60 minutes
- 30 minutes removed dry storage
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  - Complete root canal therapy when periodontal ligament remains is observed/healthy

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* Adapted with permission from McIntyre J, Lee J, Trope M, Vann WJ. Permanent tooth replantation following avulsion: Using a decision tree to achieve the best outcome. Pediatr Dent 2009;31(2):137-44.
Avulsion
Avulsion

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- Father states that Pt. wrecked her bike in the drive way and avulsed #9 two weeks prior.
- Father states that it took aprox. 30 minutes to find the tooth and another 30 minutes to get to the local dentist. (Dr. Allen in London, Ky)
- Father placed the tooth in milk once he found it.
- Dr. Allen re-implanted #9.
Avulsion
Avulsion

Management of an Avulsed Permanent Incisor with an Open Apex (>= 1mm)

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- Rule out alveolar fracture
- 3 radiographic projections
- Pulp vitality

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Conclusions

Comments? Questions?

jfyepes@iupui.edu