Acute Management of Dental Injuries in Children

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Limitations of trauma research
- Ethical - Patients can’t be randomized to “trauma” and “no trauma” groups
- Animal models – limited clinical applicability to humans
- Retrospective case series studies
  - Individual case reports
- Randomized post-injury treatment interventions
- Comparability of injuries studied


Guidelines for Treatment
- International Association of Dental Traumatology
  Guidelines for the evaluation and management of traumatic dental injuries. Dental Traumatol 2012;28
  - I. Fractures and luxations of permanent teeth
  - II. Avulsion of permanent teeth
  - III. Primary teeth
- American Association of Endodontists
  Recommended guidelines for the treatment of traumatic injuries. Chicago: AAE; 2013
  www.AAE.org

- Common sequelae of trauma
- Management of complicated crown fractures
- Management of luxation injuries
COMMON REACTIONS OF TEETH TO TRAUMA

- PULPAL HYPEREMIA (REVERSIBLE PULPITIS)
- PULP CANAL OBLITERATION
- PULP NECROSIS
- RAPID INFLAMMATORY RESORPTION
- REPLACEMENT RESORPTION (Ankylosis)

- Sample - 637 luxated incisors
- Observation period - 6 months to 10 years

PULPAL CANAL OBLITERATION (PCO) - RESULTS

- PCO dependent on type of injury
- PCO dependent on stage of root development
- PN subsequent to PCO was uncommon (1%)
- PCO occurs later than PN (12 mos. vs 3mos)
- PCO increased with bands / resin fixation
Rapid Inflammatory Resorption

Etiology

- Inflammatory resorption
  - Surface resorption of cementum exposing dentinal tubules
  - Pulp necrosis
  - Toxic products from the pulp provoke an inflammatory response in the PDL

MANAGEMENT OF TRAUMATIC INJURIES TO YOUNG PERMANENT TEETH

Replacement Resorption

- Direct union of bone and root
- Resorption of root - Replacement with bone
- Direct result of loss of vital PDL
TREATMENT ALTERNATIVES IN COMPLICATED FRACTURES OF PERMANENT TEETH

- **DIRECT PULP CAP**: small exposure, < 24 hours
- **PARTIAL PULPOTOMY** (CaOH or MTA) preferred tx; larger exposures, > 24 hours
- **PULPECTOMY**: closed apex


International Association of Dental Traumatology. Guidelines for the evaluation and management of traumatic dental injuries. Dental Traumatol 2007:23

**CALCIUM HYDROXIDE PARTIAL PULPOTOMY**

96% **SUCCESS WITH PULPS EXPOSED 1 HOUR TO 90 DAYS**


**TECHNIQUE**

- 1) Gently Remove Dentin and Pulp to 1-2 mm
- 2) Use Copious Irrigation
- 3) Cover Pulp with CaOH
CRITERIA FOR SUCCESS

- 1) No clinical signs or symptoms
- 2) No radiographic pathology
- 3) Continued development of immature roots
- 4) Formation of calcific barriers
- 5) Sensitivity to electrical stimulation

MANAGEMENT OF LUXATION INJURIES TO THE YOUNG PERMANENT DENTITION

Subluxation (loosening)

- An injury to the tooth-supporting structures with abnormal loosening, but without displacement of the tooth

Concussion

- An injury to the tooth-supporting structures without abnormal loosening or displacement of the tooth but with marked reaction to percussion.

Concussion Treatment:

Inform patient & parent about potential sequelae;
Monitor

Subluxation Tx:

Splint ??
F/U in 2 weeks;
Radiograph at 1 month
Primate studies have demonstrated that rigid and/or prolonged splinting may lead to extensive PDL healing complications, like ankylosis and replacement resorption.


**SPLINTS SHOULD:**
- 1) Be passive and atraumatic
- 2) Be durable
- 3) Be flexible
- 4) Allow for vitality testing and endodontic access
- 5) Be easy to apply and remove

**Splinting**
- Use fish line/acid-etch resin; soft arch wire/resin; ortho brackets with passive arch wire; suture as last resort.
- Circumferential wire splints contraindicated

**Splinting - Home Care**
- No biting on splinted teeth
- Soft diet
- Maintenance of good oral hygiene
Intrusive Luxation (central dislocation)

- A displacement of the tooth into the alveolar bone.
- This injury is accompanied by comminution or fracture of the alveolar socket.

Intrusion Treatment Controversy


2 days post-intrusion
3 weeks post-intrusion

1 Week Post-intrusion
3 weeks post-intrusion
Intrusive Luxation Tx:

OPEN APEX
If < 7 mm allow spontaneous repositioning; ortho extrusion if no movement within 2-4 weeks
If > 7 mm reposition surgically or orthodontically

CLOSED APEX
< 3 mm allow spontaneous eruption; ortho extrusion or surgical reposition if no movement within 2-4 weeks
3 – 7 mm reposition orthodontically or surgically
>7 mm reposition surgically & splint for 2 weeks

- Chlorhexidine mouthrinse
- Remove pulp & fill with CaOH < 2-3 weeks
- Complete endo fill in 1 - 2 months if no resorption
- Antibiotics not helpful

EXTRUSIVE LUXATION
(Peripheral dislocation, partial avulsion)

- A partial displacement of the tooth out of its socket.


Extrusive Luxation Tx:

- Reposition tooth ASAP; best prognosis if completed within 2 hours
- Light splint for 2 weeks
- Remove pulp & fill with CaOH within 7-14 days
- Chlorhexidine mouthrinse
- Complete endo fill in 1 - 2 months if no inflammatory resorption

Lateral Luxation

- A displacement of the tooth in a direction other than axially.
- This is accompanied by comminution or fracture of the alveolar socket.
Lateral Luxation Tx:

- Reposition tooth ASAP; best prognosis if completed within 2 hours
- Light splint for 3 - 4 weeks
- Remove pulp & fill with CaOH within 7-14 days
- Chlorhexidine mouthrinse
- Complete endo fill in 1 - 2 months if no inflammatory resorption

Exarticulation (complete avulsion)

- A complete displacement of the tooth out of its socket.


Treatment of the Avulsed Permanent Tooth

I. Management at site of injury
II. Transport media
III. Management in dental office
IV. Adjunctive drug therapy considerations
V. Endodontic treatment
VI. Restoration of the avulsed tooth
Management at Site of Injury

- Replant immediately, if possible. If contaminated, rinse.
- When cannot be replanted, place tooth in best transport medium available.

Recommended Storage Media

1. Socket (immediate replantation)
2. HBSS
3. Milk
4. Physiologic saline
5. Saliva

Blomlof L. Milk and saliva as possible storage media for traumatically exarticulated teeth prior to replantation. Swed Dent J. 8:1-26, 1981


Management of the Avulsed Tooth

- What tissue should be our primary concern?
  - Pulp?
  - Socket?

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- What tissue should be our primary concern?
  - Pulp?
  - Socket?
  - PDL?

- Ultimate goal
  - PDL healing without root resorption

- Most critical factor
  - Maintaining an intact and viable PDL on the root surface

Managing Mature Tooth

- Extraoral DRY Time < 1 Hour
  - Objective is to maintain PDL cell vitality
  - Place in HBSS during history & exam
  - Handle by crown and gently replant
  - Splint 1 – 2 weeks
  - Remove pulp in 7-14 days
  - Place CaOH
  - Observe canal if no signs of RR in 4 – 6 months

Management of Root Surface

- Objective is to maintain PDL cell vitality
- Keep moist in HBSS
- Do not handle root surface
- Gently remove persistent debris

Management of the Socket

- Gently aspirate without entering socket
- If clot present use saline irrigation
- Do not curette socket
- Do not vent socket
- If alveolar bone collapsed, use blunt instrument to reposition
- Manually compress bony plates after replantation
Management of Soft Tissues

Tightly suture any soft tissue lacerations, particularly in the cervical region.

Splinting

- Use fish line/acid-etch resin; soft arch wire/resin; ortho brackets with passive arch wire; suture as last resort.
- Circumferential wire splints contraindicated
- Maintain splint 10-14 days; longer if tooth demonstrates excessive mobility

Splinting - Home Care

- No biting on splinted teeth
- Soft diet
- Maintenance of good oral hygiene

Antibiotics??

- Hammarstrom, L. et al., Endod Dent Traumatol 1986;
  - Parenteral antibiotics prior to extraction and immediately following replantation resulted in less inflammatory resorption in monkeys. Prevents bacterial invasion of the necrotic pulp and inflammatory resorption; route & timing
- Sae-Lim V. et al., Endod Dent Traumatol 1998;
  - Tetracycline decreases root resorption by affecting the motility of the osteoclasts and reduces effectiveness of collagenase
  - Soaking teeth in topical doxycycline prior to replantation enhances revascularization

Adjunctive Drug Therapy Considerations

- Systemic antibiotics:
  - If < 12 y/o pen v (250 mg/kg/d in 4 divided doses x 7 days)
  - If ≥ 12 y/o doxycycline (100 mg q 12 h first day, then 50 mg q 12 h days 2 – 10)
- Tetanus consultation within 24 hours
- Chlorhexidine mouth rinses
- NSAIDs to inhibit bone resorption & pain relief
PROGNOSIS IS BEST FOR REIMPLANTED TEETH IF:
- Extra-Oral period is minimal
- Periodontal ligament is not traumatized
- If not replanted the transport and soaking solution is HBSS
- Endo therapy is not done in the hand before reimplantation
- An appropriate splint is applied for 1 week
- CaOH pulpectomy is completed in 1 wk

Endodontic Treatment
Mature Tooth < 1 Hour DRY Time
- Remove pulp in 7-14 days
- Place CaOH
- Obtrurate canal in 2-4 weeks

Tooth #7 avulsed at age 10. Extraoral in water for 30 mins. Replanted and endo 14 days later.

- Mouthguards reported to reduce dental injuries up to 90% in contact sports
- Laminated thermoplastic mouthguards are dimensionally most stable
- No ethically feasible in vivo models to complete prospective studies
- No evidence to support claims that mouthguards prevent neck or cerebral brain injuries