Emergency Management of Trauma

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Aims and Objectives

Knowledge and understanding of the following:

- Epidemiology of traumatic injuries
- Classification
- How to manage trauma in primary and permanent dentition

Epidemiology

- 1:2 children experience trauma
- Usually between:
  - 18 months and 3.5 years of age in primary dentition
  - 8 and 12 years in permanent dentition
- Crown fracture maxillary central incisor most common trauma (73%)
- Simple accidents, sport, play, road traffic accidents (RTAs), or non-accidental injuries.

Epidemiology - associations

- Children who have had trauma before more likely to get trauma (odds ratio 4.85, Ramos-Jorges et al., 2008)
- Overjet (Shulman and Peterson, 2004)
  Compared to individuals with < or =0-mm overjet, odds of trauma
  - 1-3 mm (OR = 1.42)
  - 4-6 mm (OR = 2.42)
  - 7-8 mm (OR = 3.24)
  - >8 mm (OR = 12.47)
- Depends on whether lips are competent or not

Skills

GDP:
- Emergency and Long-term Management Trauma
- Emergency management of avulsion
- Know when to refer
Management

• Detailed history – when, where, how?
• Examination & special tests
• Clinical records / photographs (medico-legal)
• Accurate diagnosis
• Treatment plan
• Communication – patient & parent / carer

Aims of Emergency Treatment

• Relieve pain / discomfort
• Reposition / re-implantation
• Optimise health of pulp
• Optimise health of periodontal ligament
• Retain tooth/root if at all possible

Aims of longterm treatment

• Maintain vital tooth
  *Failing that*
• Maintain non-vital tooth for as long as possible
  *Failing that*
• Maintain space
• Maintain aesthetics

Trauma

In all cases
• Soft diet 10-14 days
• Chlorhexidine mouth rinse 2x daily for 1 week
• Regular review (1 week, 1 month, 3 months, 6 months, 1 year)
• Regular radiographs and vitality tests
• Don’t forget soft tissues

Classification

Hard dental tissues:
• Crown / root / both
Periodontal tissues:
• Concussion
• Subluxation
• Lateral luxation
• Extrusion
• Intrusion
• Avulsion
  *Plus supporting bone and soft tissues*

Trauma to the primary teeth
Primary teeth

Aims of treatment:
• Relieve pain / discomfort
• Avoid damage to the permanent successor

General management:
• Soft diet, analgesics, chlorhexidine rinse/gel
• Regular reviews
• Restoration or extraction

Primary teeth – damage to permanent successor

Depends on:
• Age of child (root length of primary tooth)
• Direction of force
• Type of injury

Primary teeth – damage to permanent successor

• Impaction / scar tissue
• Ectopic eruption
• Enamel hypoplasia / hypomineralisation
• Dilaceration
• Arrested crown or root development
• Root duplication
• Sequestration of tooth

Damage to permanent successor

More likely if
• Intrusion
• Avulsion
• Alveolar fractures

.........in child < 3 years

Trauma to the permanent teeth
Trauma to the permanent teeth

- Dental hard tissues & pulp
- Periodontal tissues

Dental hard tissues and pulp - Crown

Uncomplicated
- Enamel infraction
- Enamel fracture
- Enamel + Dentine fracture

Complicated (involves pulp)
- Enamel, dentine & pulp fracture
- Root fracture
- Crown root fracture

Uncomplicated - Enamel or enamel/dentine fracture

- Aim is to
  - preserve pulp vitality (Seal exposed dentine tubules)
  - Maintain space
- Don’t forget to identify where the fragment is
- Incisor fragment reattachment or composite tip?

Enamel or enamel/dentine fracture - Incisor fragment reattachment

ADVANTAGES
- Conservative
- Reduced wear
- Good colour match
- Colour stable
- Tooth contour maintained
- Patient response good

DISADVANTAGES
- Poor colour if tooth fragment is dehydrated
- Unknown longevity

Incisor fragment reattachment

Isolate with rubber dam and protect the pulp with calcium hydroxide

Etch the enamel

Incisor fragment reattachment

If the tooth fragment is dehydrated, then hydrate in saline for at least one hour

Etch, wash and dry the fragment
**Incisor fragment reattachment**

Apply enamel/dentine bonding agent to both fragments.

Apply composite to the fracture line and reattach the fragment.

Cut a groove along the fracture line and fill with composite to improve strength.

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**Composite resin restorations**

- Often best solution
- Remember to “wrap over” enamel if large fracture for increased stability
- A1
- Crown forms allow rapid placement

**Complicated (Enamel, dentine & pulp) crown fractures**

- Aim is to preserve pulp vitality
- Factors to consider
  - Size of exposure
  - Time since trauma
  - Is pulp/tooth vital OR non-vital
  - Open apex (immature) OR closed apex (mature)

**Complicated (Enamel, dentine & pulp) crown fractures**

1. Direct pulp capping
2. Pulpotomy - partial (Cvek) - conventional (coronal)
3. Low level
4. Pulpectomy (extirpation)

**Pulp Capping**

Indications:
- Exposure < 24hrs
- Exposure < 1.0mm
(Vital pulp, open or closed)
Pulp Capping - procedure

- Local anaesthetic
- Rubber dam or cotton wool isolation
- Calcium hydroxide dressing over pulp tissue
- Crown restoration

Pulpotomy

- Partial (Cvek)
- Conventional (Coronal)

Partial (Cvek) Pulpotomy

Indications:
- Exposure > 1mm
- Inflamed pulp tissue at exposure site
- Exposure for more than 24 hours
- Previous trauma with pulp exposure

Partial (Cvek) Pulpotomy – procedure

- Local anaesthetic
- Rubber dam or cotton wool isolation
- Removal of inflamed pulp (~2mm) with water cooled air turbine
- Arrest haemorrhage & removal of blood clot
- Calcium hydroxide dressing (non-setting) over pulp tissue
- Crown restoration

Cleanse the area
• Remove pulp & surrounding dentine to a depth of 2mm
• Use water or saline spray

Arrest haemorrhage with saline and cotton wool pledget

Place Ca(OH)₂ or MTA/Saline paste

• If MTA is used then allow time for it to set
• Restore with etch retained resin
Conventional (Coronal) pulpotomy

Indications
• Modified (Cvek) fails

Disadvantages
• Large access cavity weakens the crown
• Pulp obliteration occurs in 50%

Conventional (Coronal) pulpotomy – procedure
• Local anaesthetic
• Rubber dam or cotton wool isolation
• Removal of inflamed pulp to level of CEJ with water cooled air turbine
• Arrest haemorrhage & removal of blood clot
• Calcium hydroxide dressing (non-setting) over pulp tissue
• Crown restoration

'Low level' pulpotomy
• A pulpotomy where vital tissue remains short of the apex and one is hoping for apexogenesis
• One step further than conventional

Pulpectomy (RCT) - Indications
• Closed or open apex
• Non-vital pulp
• Where the tooth is restorable after RCT
• Don’t forget bigger picture, may need ortho assessment
Pulpectomy (RCT) - Procedures

- Remove necrotic pulp & dress canal to temporary apex with non-setting calcium hydroxide paste

- Isolate
- Sterilize tooth surface
- Create access to pulp

Inadequate Access Cavity

Carry out minimum root canal preparation to preserve tooth tissue

Irrigate canal with sodium hypochlorite solution

Fill the canal with Calcium Hydroxide paste as an interim dressing

Take radiograph**
A tooth fracture that involves dentine, cementum & pulp
- Coronal, middle or apical 1/3
- Horizontal / vertical
- May also involve crown

**Root Fracture - management**
- No mobility
  - Soft diet, OHI
- Mobility
  - gently reposition
  - *splint 4 weeks*
- If fracture near cervical area of the tooth, stabilise for a longer period of time (up to 4 months)

**Root Fracture – management if coronal portion loses vitality**
- Root fill coronal portion
- Remove coronal portion
- Try and maintain root

**Crown-root fracture**
- Fracture involves enamel, dentine & root structure
- Pulp may or may not be exposed
- Loose, but still attached, segments of the tooth
- Sensibility testing is usually positive
- More than one radiographic angle may be necessary to detect fracture lines in the root
## Crown-Root Fractures

Methods of treatment:
- Stabilise coronal fragments (splint)
- Remove coronal fragment
- Surgical exposure of fracture line
- Orthodontic/surgical exposure of the fracture line
- Extract/maintain the root
- If the pulp is exposed, then pulp therapy is also necessary

## Emergency Replacement of coronal portion

- Denture
- Temporary bridge
  - Everstick
  - Composite
- Resin retained bridge
- Implant long-term

## Follow up all dental hard tissue injuries

- Usually one week
- One month
- Three months
- Six months
- 1 year

## Trauma to the permanent teeth: periodontal tissues

What is happening?
- Damage to periodontal ligament
- May lead to external resorption of the root
What is resorption?

- Damage to precementum/PDL
- Osteoclastic damage of root surface
- Outcomes depend on
  - Size resorptive defect
  - Presence/absence inflammation

Types of resorption?

- If damage to area root small
  - no inflammation/transient inflammation
  - Surface resorption
    - self-limiting process
    - small areas
    - Spontaneous repair from adjacent parts of the periodontal ligament

- If damage to > 20% root surface area
  - no inflammation/transient inflammation
  - Replacement resorption
    - bone replaces the resorbed tooth material
    - leads to ankylosis

- If inflammation
  - Inflammatory resorption
    - initial root resorption has reached the dentinal tubules of an infected necrotic pulp
    - Produces more resorption

Principles of treatment

- Optimise chances PDL remains “alive”
  - Reimplant asap
  - Storage media etc.
- Reduce chances development inflammatory resorption
  - Timing of pulp extirpation
- Remember
  - Probably can’t stop surface or replacement
  - Never going to “get back” resorbed tooth

Classification

- Concussion
- Subluxation
- Lateral luxation
- Extrusion
- Intrusion
- Avulsion
Concussion

Treatment
- Soft diet
- Splinting if very tender
- Monitor up to 1 year

Subluxation

Treatment
- Splinting for up to 2 weeks (flexible) if very tender
- Soft diet
- Monitor up to 1 year

Lateral luxation

Treatment:
- Reposition (painful) – digitally or gently with forceps
- Check occlusion
- Verify position with x-ray
- Splint 4 weeks flexible splint

Extrusive luxation

Treatment:
- Gently reposition with finger pressure
- Check occlusion
- Verify position with x-ray
- Splint (2 weeks) flexible

Intrusive luxation

Treatment:
- Depends on stage of root development
  If immature:
  - Leave to re-erupt (mild - moderate)
  - Orthodontic extrusion if no movement in 3 weeks
  - ? Surgically reposition if very severe
  If mature:
  - Orthodontic extrusion (mild – moderate)
  - Surgically reposition (severe)
  - Pulp extirpation likely

Avulsion

Outcome depends on
- Maturity of the root apex
  - Mature/immature
- Extra-alveolar period
  - < or > than 60 mins
- Storage medium
  - Hank's Balanced Salt Solution, milk, saline, or saliva
Avulsion - Dental First Aid at injury site

- Make sure it’s a permanent tooth!
- Reassure patient and parent / carer
- Pick up tooth by crown and rinse briefly under cold running water for few seconds
- Reposition and bite on handkerchief
- Come straight to surgery

OR

Put in milk, cold water and come straight to surgery

Avulsion - Dental First Aid at surgery

Treatment – open apex, tooth already replanted under favourable conditions
- Verify correct position (radiographically/clinically)
- Reposition if required
- Splint for up to 2 weeks (flexible)
- Antibiotics
- Tetanus?
- Advice to pt: soft diet/ soft toothbrush/ chlorohexidine m/w
- Review in 1 week

Avulsion - Dental First Aid at surgery (t<60 mins)

Treatment – open apex, tooth not replanted, extra-oral dry time less than an hour
- Rinse tooth & irrigate socket (clot)
- Re-implant tooth
- Verify correct position (radiographically/clinically)
- Splint for up to 2 weeks (flexible)
- Antibiotics
- Tetanus?
- Advice to pt: soft diet/ soft toothbrush/ chlorohexidine m/w
- Review in 1 week

Avulsion - Dental First Aid at surgery (t>60 mins)

Treatment – closed apex
- As above but initiate endo 7-10 days after replanted
- Start endo before splint removal
- Intra-canal dressing CaOH

Avulsion - Dental First Aid at surgery (t>60 mins)

Treatment – open or closed apex, tooth not replanted, extra-oral dry time greater than an hour
- Rinse tooth & irrigate socket (clot). May need to clean root surface with gauze
- Re-implant tooth
- Verify correct position (radiographically/clinically)
- Splint for up to 4 weeks (flexible)
- Antibiotics (Pen V)
- Tetanus?
- Advice to pt: soft diet/ soft toothbrush/ chlorohexidine m/w
- Review in 1 week
- Initiate endo 7-10 days after replanted
- Start endo before splint removal
- Intra-canal dressing CaOH

http://www.iadt-dentaltrauma.org/web/
Avulsion – delayed presentation (t > 60 mins)

Consider

- Not to re-implant if very immature
- Extra-oral RCT before replanting

Avulsion

Review (1 week)

If open apex:
- Remove splint
- Monitor 2-3 weeks, x-ray & extirpate pulp if inflammatory resorption, dress calcium hydroxide

If closed apex:
- Extirpate pulp, dress calcium hydroxide
- Remove splint
- Continue with calcium hydroxide / MTA and GP
- Monitor for up to 5 years

Sequelae to trauma

Loss of vitality
Resorption – inflammatory
- Internal
- External
Ankylosis (replacement resorption)
Pulpal obliteration
Extraction

Long term management of space

- Partial denture
- Resin Retained Bridge
- Implant
- Accept Space loss
- ? Transplant

Treatment principles for splinting

- Ideal splint should be
  - passive and flexible
  - Maintain physiologic tooth mobility
- Splint should be left in place for as short a period as necessary
  - rigid or prolonged splinting may lead to external root resorption and dento-alveolar ankylosis
- Promote maximal healing

How long to splint for? (IADT 2007)

<table>
<thead>
<tr>
<th>Type of injury</th>
<th>Splinting time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subluxation</td>
<td>2 weeks</td>
</tr>
<tr>
<td>Extrusive luxation</td>
<td>2 weeks</td>
</tr>
<tr>
<td>Avulsion - less than 1 hour</td>
<td>2 weeks</td>
</tr>
<tr>
<td>Avulsion - greater than 1 hour</td>
<td>4 weeks</td>
</tr>
<tr>
<td>Lateral luxation</td>
<td>4 weeks</td>
</tr>
<tr>
<td>Root fracture (middle third)</td>
<td>4 weeks</td>
</tr>
<tr>
<td>Alveolar fracture</td>
<td>4 weeks</td>
</tr>
<tr>
<td>Root fracture (cervical third) RIGID</td>
<td>4 months</td>
</tr>
</tbody>
</table>
Summary

- May be the child’s first dental experience – behaviour management
- Communication - consider the parent/carer also & prognosis
- Dental age of the child – immature or mature root/tooth
- Prognosis depends on good initial diagnosis and management
- Intrusion bad