Diagnosis and Management of Dental Trauma in Children

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Epidemiology of Permanent Tooth Trauma

- Types of trauma vary from crown fractures to luxation injuries
- The prevalence of permanent tooth trauma before the age 18 ranges from 5-33%
- Males >females with a notable increase in trauma is seen in boys 7-10 years of age
- Etiology: Sports and play, Automobiles, Child abuse, Iatrogenic

Location of Trauma

- Anterior > Posterior
- Maxillary > Mandibular
- Maxillary Central

Examination and Diagnosis

- Clinical examination
- Radiographic examination
- Record documentation

Clinical Examination

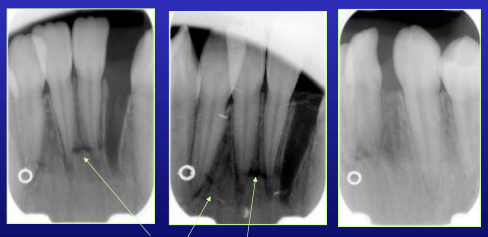
- Soft tissue lacerations
- Edemas and hematomas
- Fractured, misplaced or missing teeth
- Pulp exposures
- Arch continuity
- Occlusion
- Deviation on opening

Courtesy of Dr. Jens Andreasen

Courtesy of Dr. Julie Molina

Radiographic Exam

3 Vertical PA's obtained



Mandibular fracture present including tooth #23-26.

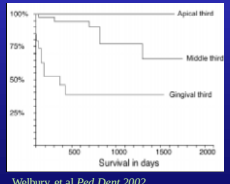
Courtesy of Dr. Julie Molina

Radiographic Exam

- Verify presence/absence of tooth and tooth parts
- Three vertical views
- Diagnosis of periodontal injury
- Assess for root fracture
- Establish a baseline

Root fracture

Factors affecting prognosis:
1) Location of fracture
2) Extent of fracture
3) Displacement of fragments
4) Splinting (?)



Welbury et al *Ped Dent 2002*

Cervical

Mid-root

Apical

Prognosis

Account for Tooth Fragment

- Look for lacerations
- Take lip radiograph
- ¼ the exposure time

Courtesy of Dr. Bill Vann


Courtesy of Dr. Matt Savage

Where's the fractured tooth?

Courtesy of Dr. Matt Savage

Diagnosis and Management

Diagnosis of Injuries to Crown, Pulp and Root

- Crown Infarction [crazeline]
- Uncomplicated Crown Fracture
- Complicated Crown Fracture
- Uncomplicated Crown/Root Fracture
- Complicated Crown/Root Fracture
- Root Fracture

Crown Infraction

Most cases

No Treatment

•**Sensitivity**
• **Multiple infraction lines** that may pick up stains (Andreasen)

Treatment**
- sealant/ adhesive

** May prevent ingression of bacteria through cracks in enamel

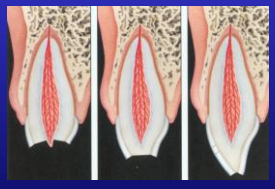
• Sealant over craze-lines

Courtesy of Dr. Bien Lai

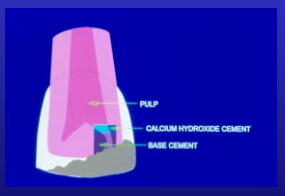
Crown Fracture

- Uncomplicated (No pulp exposure)
  - Treatment:
    - Rule out root fracture
    - Restore with Composite
- Complicated (Pulp exposure present)
  - Treatment :
    - Rule out root fracture
    - Partial Pulpotomy (Cvek)

Complicated Crown Fractures

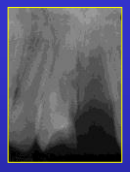


Partial (Cvek) pulpotomies

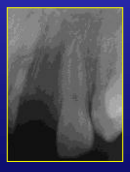


Crown Fracture with Pulp Exposure

Complicated Crown Root Fracture



#8 root fracture



Avulsed #9

Vital Root Submergence/Root retention

- FTMPF is raised and the clinical crown and coronal root are removed with a bur to below the CEJ
- The pulp is removed and the intracanal space is allowed to fill in with blood
- Flap is then sutured over the site
- Can use the crown as a splinted pontic to the adjacent teeth

Vital Root Submergence/Root retention

- Preserves the vertical and horizontal volume of the alveolar process until maxillary growth is completed
- These few years may have provided sufficient time needed for valuable 3D alveolar growth or bone maintenance
- This aids in future restorative planning, maximizes esthetics and treatment options
  - Extraction, however, contributes to further loss of this essential bone

Vital Root Submergence/Root retention

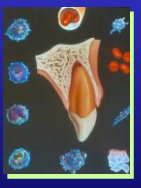
- ~90% 3 year success rate
- 53 teeth 3 yr follow up 5 were lost
- 3 of 5 teeth had pulpotomies completed
- 2 of the 5 had vital pulp left in the canal

Rodd HD, Davidson LE, Livesey S, Cooke ME. Survival of Helen D. Rodd, Lesley E. Davidson. Intentionally retained permanent incisor roots following crown root fractures in children. Dent Traumatol 2002; 18: 92–97.

18 month follow-up

Diagnosis of Injuries to Periodontium

- Concussion [bruising]
- Subluxation [loosening]
- Luxation [displacement]
- Avulsion [out of the mouth]

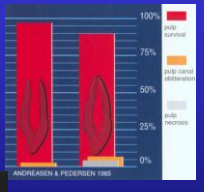


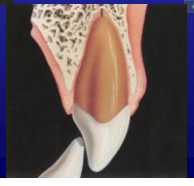
Courtesy of Dr. Jens Andreasen

Consequences of Trauma

- PDL
  - Surface resorption (repair-related resorption)
  - Inflammatory resorption (infection-related resorption)
  - Replacement resorption
- Pulp
  - Pulp canal obliteration
  - Pulp necrosis
  - Severed vascular supply
  - Revascularization

Concussion





Courtesy of Dr. Jens Andreasen

Subluxation

- Bleeding around sulcus
- No displacement
- Minor or no mobility

Courtesy of Dr. Jens Andreasen

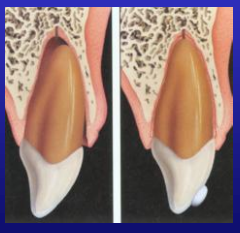
Intrusion

Courtesy of Dr. Jens Andreasen

Intrusive Luxation


Treatment Options
- Watch and monitor for re-eruption
- Surgical reposition with forceps and splint
- Orthodontic movement

Extrusive luxation

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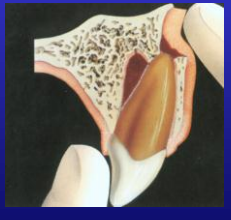
Lateral Luxation

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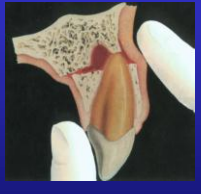
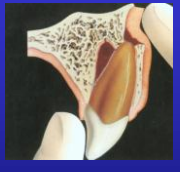
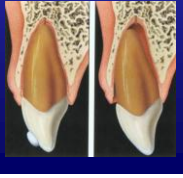
Repositioning

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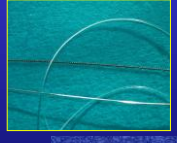
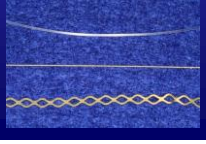
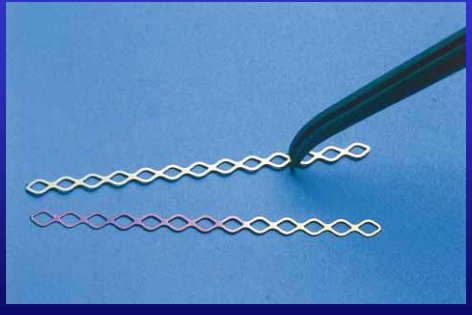
Splinting

- Soft splint
- Physiologic movement
- 10-14 days

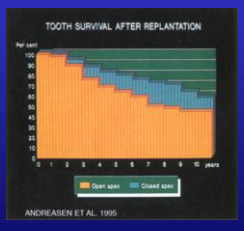



Titanium Trauma Splint



von Arx T, Filippi A, Buser D. "Splinting of traumatized teeth with a new device: TTS (Titanium Trauma Splint)." Dent Traumatol 2001; 17: 180-184.

Avulsion



Courtesy of Dr. Jens Andreasen

Revascularization

Tooth #8 after replantation

Tooth #8 at 6 months follow-up

(Banchs and Trope 2004)

Preserving the PDL

- Immediate replantation = best for PDL
  - Prevents desiccation of the PDL cells
  - PDL should be restored within a few wks if replanted within 5 – 30 minutes
- Tooth transport
  - HBSS = pH-preserving fluid (Save-A-Tooth)
  - Milk
  - Sterile saline

Avulsion (open* apex slightly >1mm)

↓

E/O dry time **<20min** and tooth was transported in HBSS or **milk for 20min→6hrs**

↓

Soak in 1% Doxycycline for 5 min

↓

- Replant tooth
- Obtain PA to verify position
- Place flexible splint for ~14 d
- Rx: Doxycycline/Pen VK for 7d; Chlohexidine rinse for 1 wk
- Assess tetanus vaccination
- Provide post-op instructions; inform of prognosis
- Follow-up in 7-10d

Permanent tooth replantation following avulsion: using a decision tree to achieve the best outcome *(McIntyre et al ;Ped Dent 2009)*

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E/O dry time **> 60 minutes**

↓

Remove PDL cells: use 3% Citric Acid for 3 minutes, Scaler, soft pumice

↓

Soak in Sodium Fluoride for 5 minutes

↓

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Dry Time of 2 hours

- Tooth cleaned
- Scaled PDL
- Placed in Fluoride

The Condemned PDL: Transitional Therapy

In children/growing patients…

to delay the ankylotic process, the remaining PDL should be removed

– PDL removal prevents the injured/damaged PDL cells from becoming a stimulus for inflammation

thereby accelerating infection-related resorption

Decoronation

- Malmgren, B and Malmgren, O. 2002
- An excellent tx option for an ankylosed tooth:
  - When adolescent maxillary growth is completed (recommended to wait until age 18)
  - When the replanted tooth is undergoing ORR, but is after the patient's growth spurt

Decoronation

- FTMPF is raised and the clinical crown and coronal root are removed with a bur to below the CEJ
- The root filling material is removed and the intracanal space is allowed to fill in with blood
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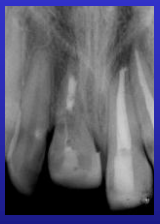


Decoronation

- Preserves the vertical and horizontal volume of the alveolar process until maxillary growth is completed
- These few years may have provided sufficient time needed for valuable 3D alveolar growth or bone maintenance
- This aids in future restorative planning, maximizes esthetics and treatment options
  - Extraction, however, contributes to further loss of this essential bone

Extraction

Extraction of an ankylosed tooth may result:

1. Loss of attached bone
2. Loss of the cortical maxillary plate
3. Bony deformation
4. Less than ideal esthetic contours

Definition of SUCCESS ?

Growing patients

- Keeping the tooth for several years
  - Especially until after growth is completed: age 18
- Endodontic success: revascularization
- No resorption
  - ORR/ankylosis after growth spurt
- Minimal loss of bone

Adults

- Keeping the tooth for several years
- Endodontic success
- No resorption
- Minimal loss of bone

Future Research

Future potential with

- Doxycycline
- Minocycline
- Alendronate
- ICMs, such as Ledermix
- Emdogain

Time will tell….