DENTAL EMERGENCIES

- General Principles in diagnosis and antibiotic stewardship
- Dento-Alveolar Trauma
- Odontogenic Abscesses

Antibiotic Selection

- ADA issued guidance to stop using Clindamycin for prophylaxis and for therapy.
- Rationale: Black Box Warning…..

- “Clindamycin phosphate therapy has been associated with severe colitis which may end fatally, it should be reserved for serious infections where less toxic antimicrobial agents are inappropriate, as described in the INDICATIONS and USAGE section.”

Clinamycin: use it only when indicated, and see the uses and indications section.

- Clindamycin is still indicated for severe, long-standing infections where other antibiotics are not likely to be sufficient
- Must weight risks and benefits

1. Very good bone penetrance. It is indicated to treat intra-bony infections.
2. Very good anaerobic coverage
3. Risk of Pseudomembranous Colitis is VERY LOW in outpatient settings and with a single course of antibiotics.

New recommendations

- First: Amoxicillin
- Second: Cephalexin IF no history of anaphylaxis, angioedema, or hives
- Third: Azithromycin

If First Line Therapy Fails

- Broaden antibiotic therapy to complement with metronidazole
- OR
- Discontinue first line treatment and change to amoxicillin and calvulanate

More on antibiotic stewardship

- SHORT COURSES: 5 days or less should be the norm
- Don't treat pulpitis with antibiotics.
  - Pulpitis is best treated with anti-inflammatories (NSAIDS, Dexamethasone) or with definitive care (pulpectomy or root canal):
- For immunocompetent patients:
  - don't prescribe antibiotics as an adjunct to definitive care

Sensibility and Vitality Testing

- Several different tests (hot, cold, electrical) used to extrapolate pulp health from a sensory response.
- Vitality tests establish the presence of blood flow: Laser Doppler Flowmetry and Pulse Oximetry. These are not yet practical in a clinical setting.
- Sensibility is defined as the ability to respond to stimuli

Refresher on the nerve fibers we are evaluating:

- A-Delta fibers: “sharp-shooting pain”
  - Larger diameter, so may get selectively blocked by pressure
- C-fibers are contributing to the dull, burning pain w/ slower onset
  - More resistant to hypoxia

Sensibility testing methods

- Cold: Lots of products available. Important thing is you need a cotton pellet that is big enough to maximize surface contact with tooth, but not have any dry cotton that can wick the refrigerant away (no cotton rolls)
- Hot: Gutta percha, heated ball-ended instruments, Touch n'Heat (endo obturating instruments), hot water bath w/ rubber dam
- Electric pulp testing: Works by inducing an action potential in myelinated neurons.

Limitation to sensibility testing

- Cast crowns and cause transference of thermal energy to gingiva or adjacent teeth

- For electric pulp testing:
- Calcified canals may never respond to electric pulp testing
- Hypercalcemia and hyperthyroidism may require twice as much current
- Studies have found that premolar teeth often don't respond, especially in adults.
- Unreliable in young teeth, as it can take up to 5 years for A-Delta Fibers to myelinate

Situational circumstances where sensibility testing has limitations:

- Following trauma: minimum of 4-6 weeks. This is thought to be due to pressure or tension on the nerve fibers, blood vessel rupture, or ischemic injury.
- Orthodontic movement: For up to 9 months after ortho

Which testing should you use?

As a reminder from statistics class:

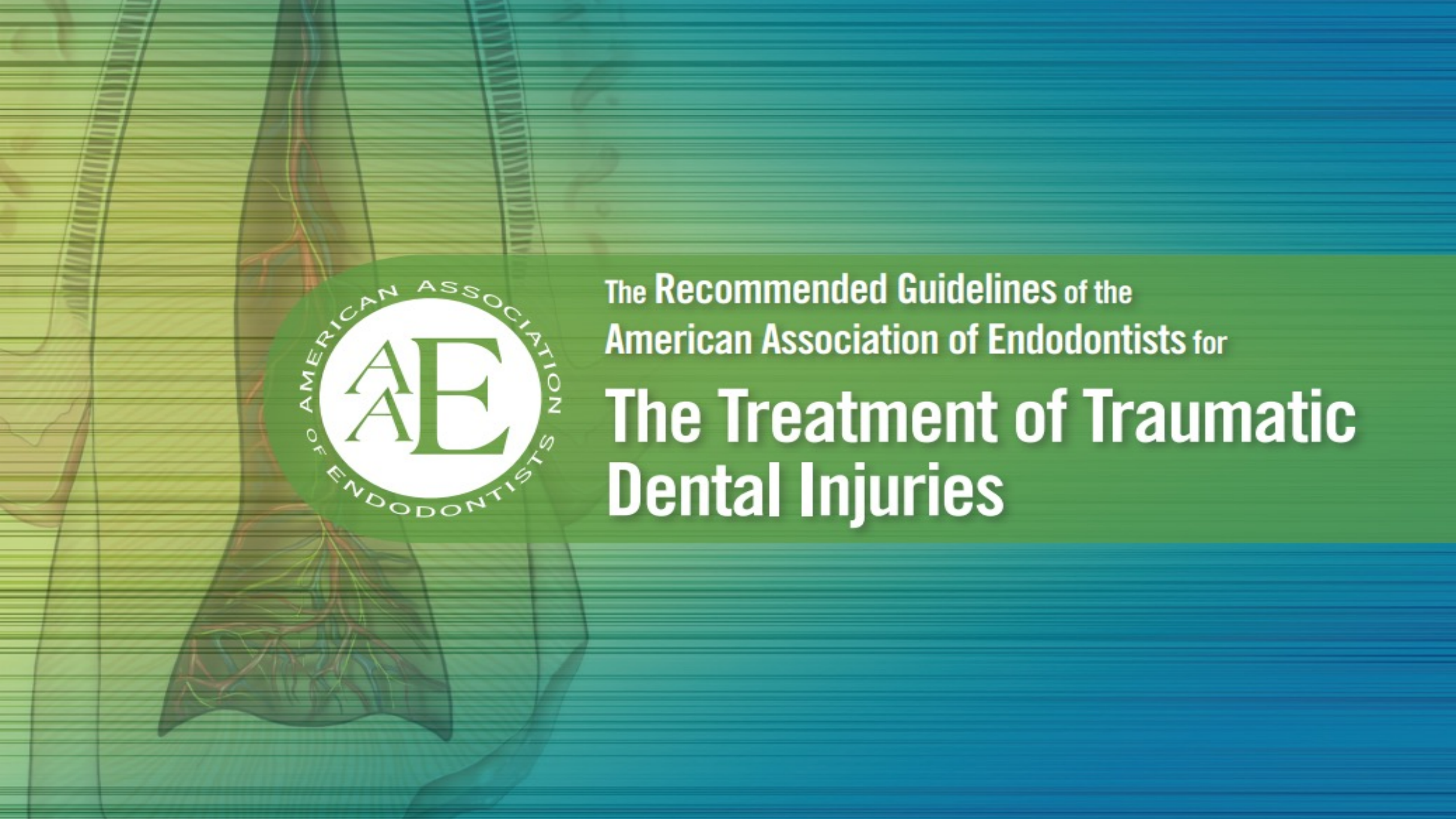
Sensitivity is the probability of a positive test result representing a true positive

Specificity is the probability of a negative test result representing a true negative.

	Ethyl Chloride	Heated Gutta Percha	EPT
Sensitivity	0.83	0.86	0.72
Specificity	0.93	0.41	0.93
Positive predictive value	0.89	0.48	0.88
Negative predictive value	0.90	0.83	0.84
Accuracy	0.86	0.71	0.81

Dento-alveolar Trauma

- Tooth Fractures
- Luxation injuries
- Trauma to the supporting structures
- Jaw Fractures

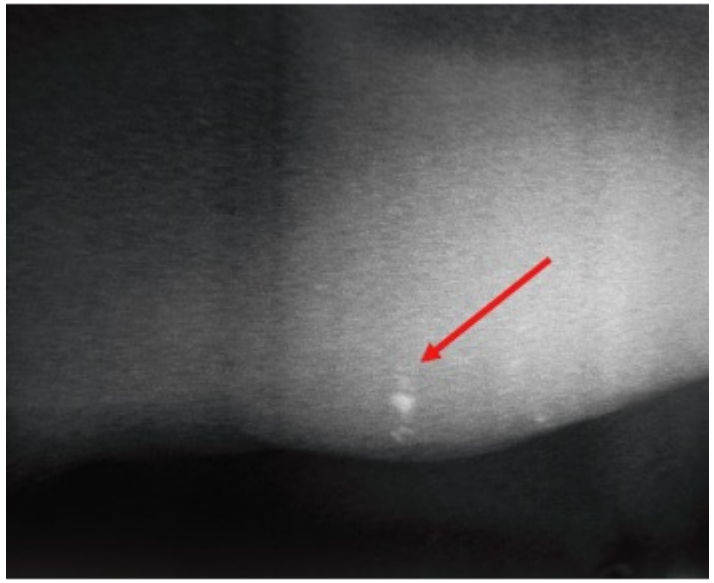


The Recommended Guidelines of the American Association of Endodontists for

The Treatment of Traumatic Dental Injuries

First, a general principle:

- DON'T GET TUNNEL VISION!!
  - Easy to focus on the obvious fracture and ignore adjacent teeth and soft tissue injuries.
  - Be sure to complete a thorough exam



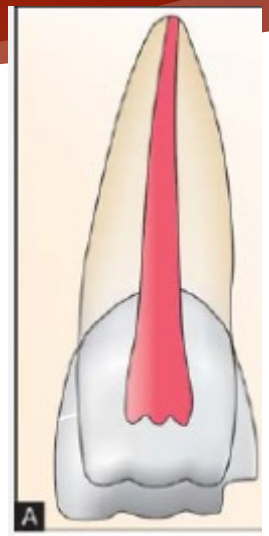
Tooth Fractures – Ellis Classification

- Limited to enamel: Class I
- Enamel and Dentin: Class II
- Involves the pulp, but vitality is not lost: Class III
- Involves pulp and leads to the loss of vitality: Class IV

***there are additional Ellis Classification, but we will limit this discussion to Classes I through IV

Ellis Class I

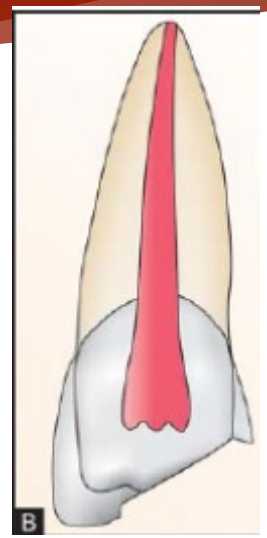
- Generally limited to a cosmetic concern
- Sensibility tests and percussion negative. If percussion positive, evaluate for luxation or root fracture
- Either smooth or place a restoration



Enamel fracture

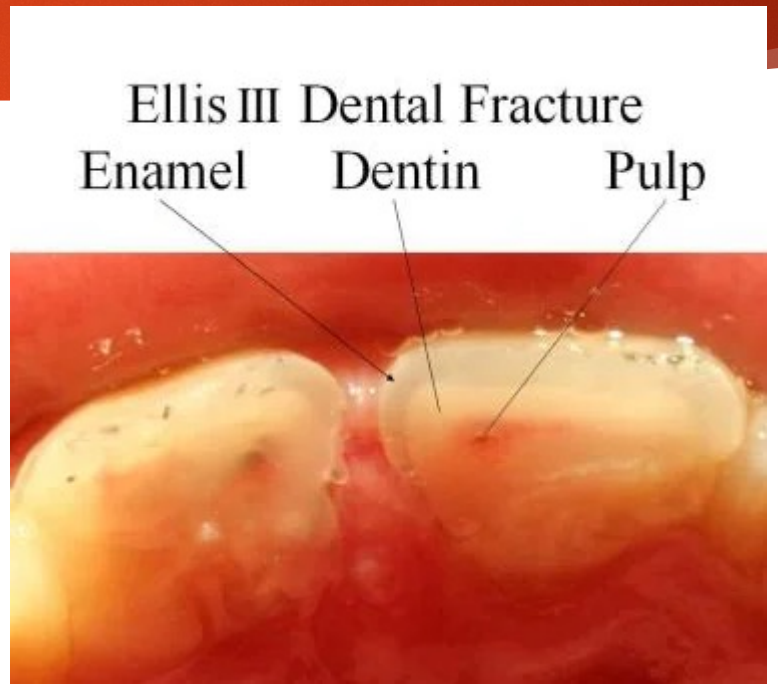
Ellis Class II

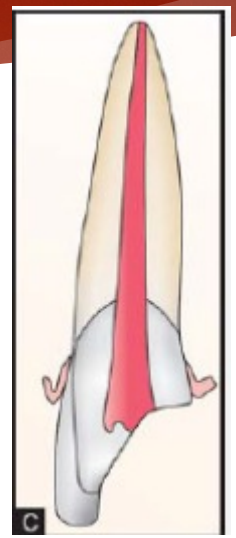
- May exhibit dentin hypersensitivity
- If isolated to only this trauma, treatment is often a composite restoration



Ellis Class III

- Trauma leading to pulp exposure
- Emergency Treatment Required, but initially should be limited to a Cvek Pulpotomy and protective restoration.





Ellis Class III - treatment

- Open apex: Cvek Pulpotomy to maintain vitality and promote apex development. CaOH or MTA both have good evidence for efficacy
- Closed apex: Treatment of choice is ALSO a Cvek Pulpotomy

Cvek Pulpotomy

Approximately 1/3 the risk of pulp necrosis when compared to pulp capping alone.

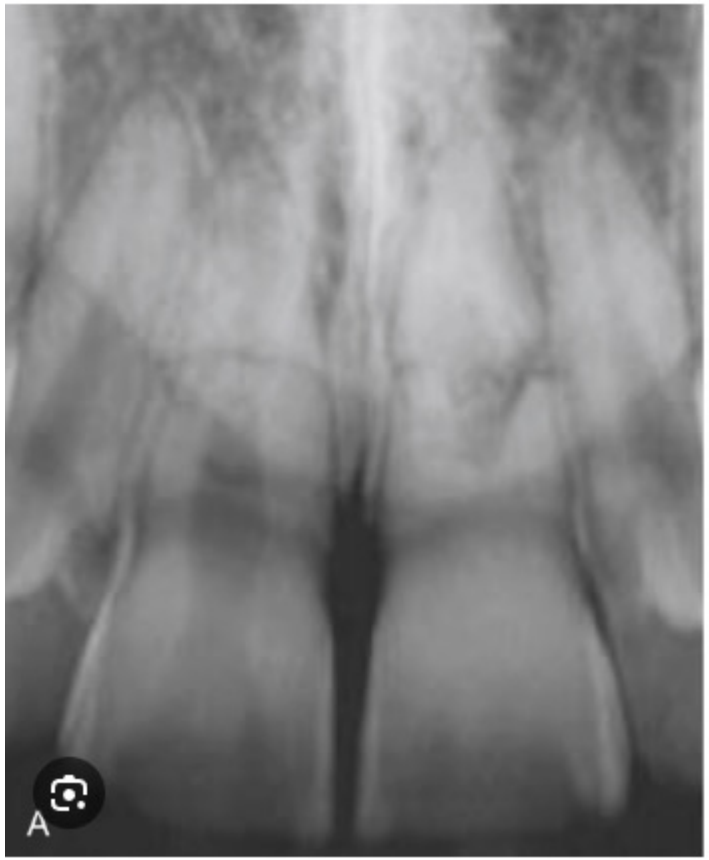
Pulp capping alone is estimated to have a 67% chance of success

Cvek Pulpotomy has a success rate of 85-95%

- https://www.youtube.com/watch?v=M4gCL7AwFI8

Root Fracture

- Can be classified based on location (apical, middle, or coronal third)
- Coronal fragment is usually mobile
- Tender to percussion
- Radiology exam will include either a CBCT or at least two PA's with different angulations



Root Fracture - Treatment

- If coronal fragment was avulsed, follow avulsion guidelines
- Rinse exposed root w/ sterile saline or Hanks Balanced Sault Salt Solution
- If displaced, reposition
- Flexible Splint for 4 weeks
  - If fracture is near the cervical area, stabilize up to 4 months

Root Fracture follow up

- Monitor for at least one year
- Determine pulpal status
- If pulp necrosis develops, root canal treatment of the coronal segment to the fracture line is indicated.

Alveolar Fracture

- Reposition any displaced segment and splint for 4 weeks.

Changing gears (slightly) to trauma w/o fracture

- Concussion – "I bumped my tooth"
- Subluxation – "I bumped my tooth and it moved, but went back in place"
- Luxation – "I bumped my tooth and it isn't where it is supposed to be"
- Avulsion – "I knocked my tooth out"

Concussion

- Think of this like a bruise
- Tender to touch and/or percussion but w/o displacement or mobility
- Radiographic and clinical exam with purpose of ruling out more serious pathology (fractures, displacement etc)

- No Treatment Necessary

Subluxation

- Mobility separates this from concussion
- Sensibility testing may be negative initially, indicating transient damage.
- No radiographic abnormalities expected.
- Treat with flexible splint for 2 weeks.

Whenever we say “Flexible Splint”

- “Up to 0.016 Wire”

If your clinic doesn't have ortho wire:

Luxation Injury

- Further categorized by:
  - Extrusive
  - Lateral
  - Intrusive

Extrusive luxation

- Outward or incisal displacement – tooth appears elongated
  - Excessive mobility
  - Sensibility testing will likely be negative.
  - Tender to percussion

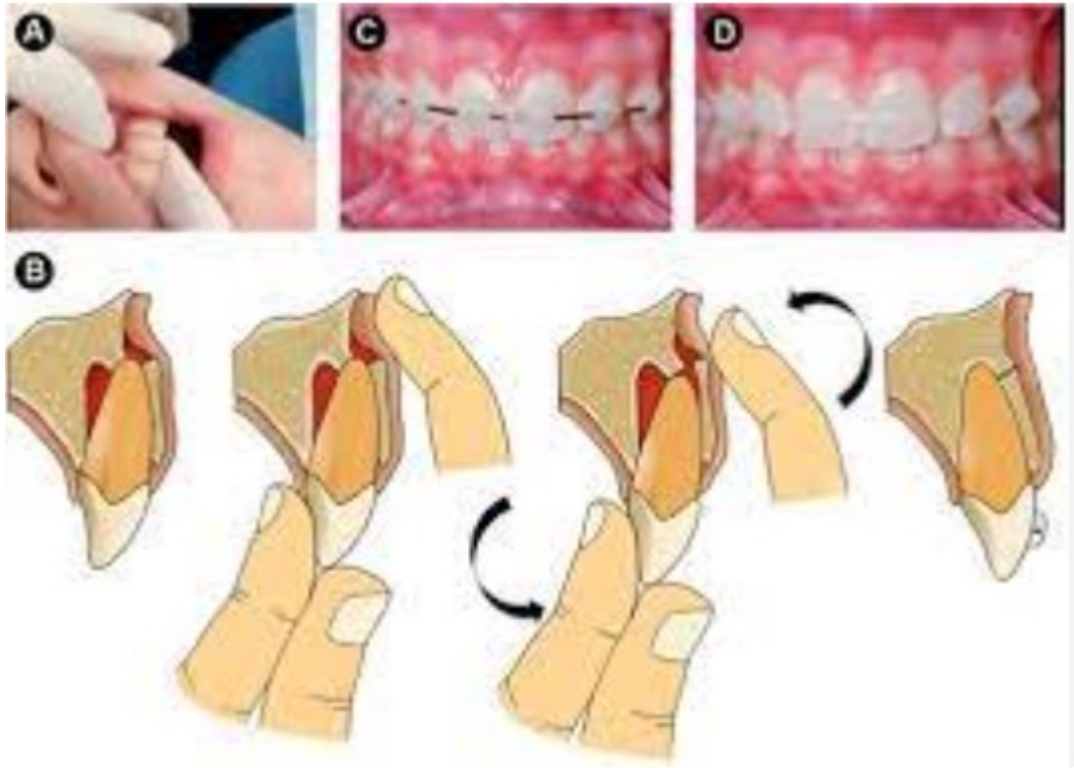
  - PDL space appears enlarged

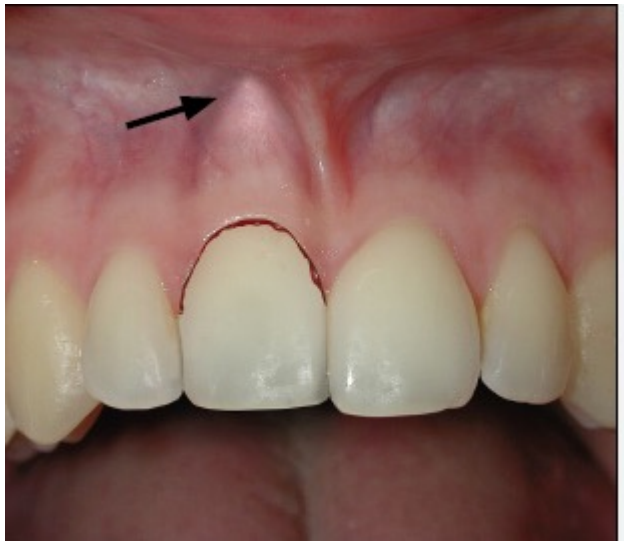
Extrusive Luxation Treatment

- Rinse affected area w/ saline or HBSS
- Reposition tooth
- Splint for 2 weeks (flexible splint). If displacement is extensive, may splint up to 4 weeks.
- Pulp necrosis is common. If diagnosed, root canal treatment is indicated.

Lateral Luxation

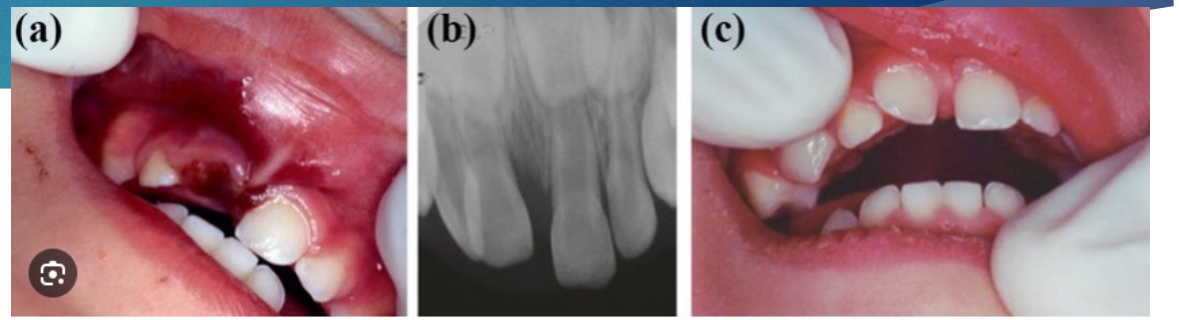
- Usually associated w/ a fracture of the facial cortical bone





Intrusive Luxation

- Displacement of tooth inward.
- Results in a crushing injury. Immobile and locked
- Fracture of alveolar process
- PDL space may be absent on radiograph
- CEJ is located more apical than on adjacent teeth



Treatment depends on status of apex and the extent of intrusion

OPEN APICES:

Treatment depends on depth of intrusion. 7mm rule

- Up to 7mm: Allow for re-eruption w/o intervention. If this is unsuccessful, initiate orthodontic treatment within 3 weeks.
- >7mm: reposition surgically or orthodontically within 3 weeks

Closed Apices:

Treatment is also based on depth of intrusion and on age.

- Up to 3mm AND less than 17 years old: Allow for re-eruption. Reposition surgically or orthodontically within 2-3 weeks if no movement is observed.
- 3-7mm: reposition surgically or orthodontically within 3 weeks and splint for 2 weeks
- >7mm: Same as above, but splint for 4 weeks.

Intrusive Luxation and Pulp Therapy

- If open apex: Monitor. If pulp becomes necrotic, apexogenesis or apexification should be considered.

- If closed apex: Start root canal within 2 weeks (almost certainly will become necrotic). Recommendation for two-stage endo, with up to 4 weeks of CaOH therapy before obturation.

  - Key difference here…..ENDO is initiated at 2 weeks regardless. No need to wait for accurate pulpal diagnosis.

Patient instructions:

- For ALL cases of concussion, subluxation, and luxation, the following is recommended:
  1. Soft Food Diet for 1 week
  2. Maintain Good Oral Hygiene
  3. 0.12% Chlorhexidine rinses twice daily for 2 weeks.

Avulsion – Tooth replanted before arrival in clinic

- Leave tooth in place
- Clean affected area with water, saline, or chlorhexidine
- Flexible splint for 1-2 weeks

Avulsion – kept in storage medium up to 60 minutes

- Hold tooth by crown. Avoid contact with root
- Clean crown and root surface w/ saline
- Irrigate socket with saline
- Replant tooth slowly

Flexible splint for 1-2 weeks

Avulsion –extra oral time >60 minutes

- Carefully remove necrotic tissue
- Irrigate with saline
- Root canal treatment can be done before replantation or after.
- Flexible splint for 1-2 weeks.

***some suggest soaking root in 2% NaF for 20 minutes, but this is not an absolute recommendation

Avulsion – all cases

- Endodontic treatment should be initiated 7-10 days after replantation* and before splint removal

- As with intrusive luxation, CaOH therapy for up to 4 weeks is recommended.

*ok to do tabletop endo for teeth with >60 extraoral time.

Prescriptions (Avulsions)

- All patients get an antibiotic. Choice depends on age
  - Under 12: Amoxicillin for 7 days
  - Over 12: Doxycycline for 7 days
  - Refer for tetanus booster if tooth was exposed to soil
  - 0.12% Chlorhexidine rinse twice daily

Patient Instructions - avulsion

- Avoid contact sports for 2 weeks
- Soft Diet for 2 weeks
- Brush with soft toothbrush after every meal
- Use athletic mouthguard during contact sports

- Ankylosis is always possible, and unavoidable after delayed replantation. This must be taken into consideration.

Follow-up - Avulsion

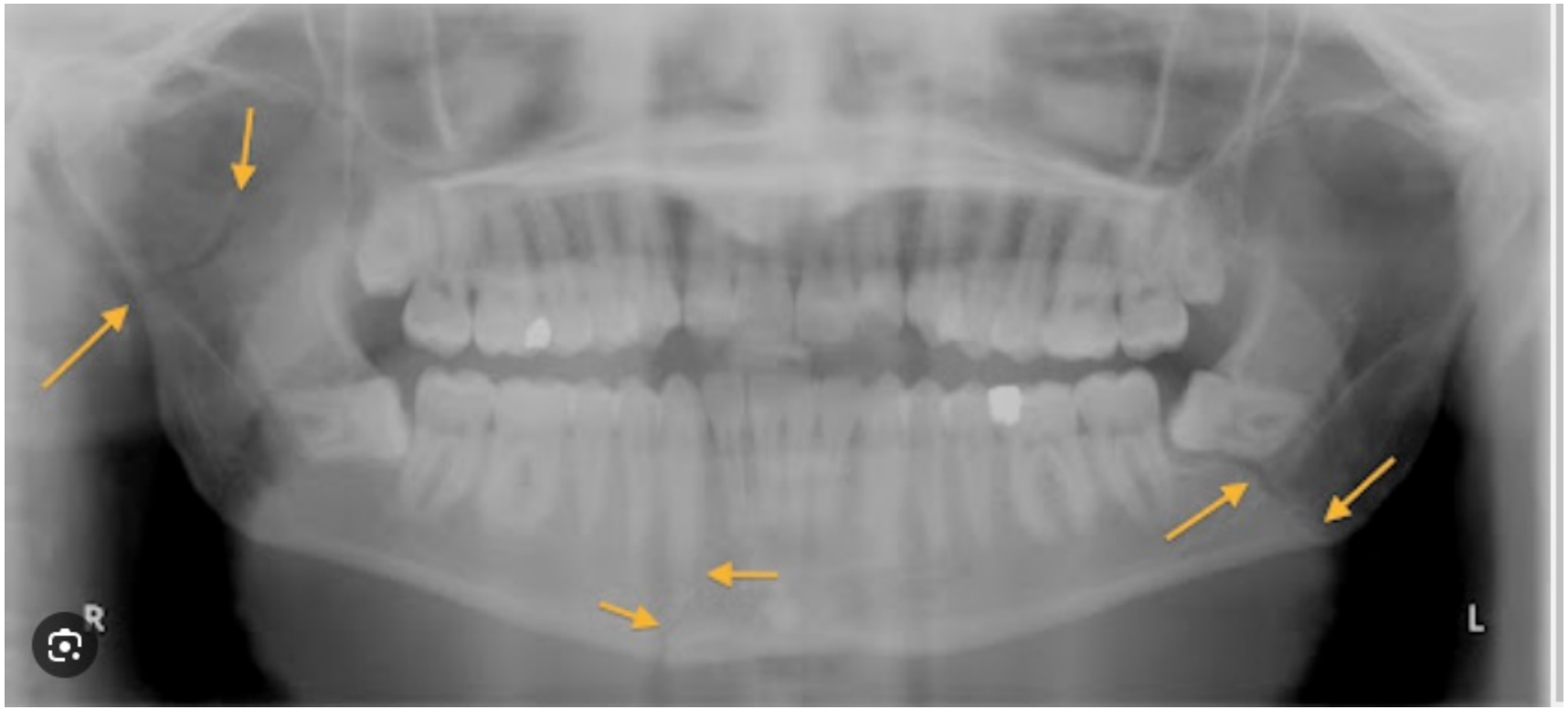
- Splint removal at 2 weeks (4 weeks if extra-oral time is >60 minutes)
- Clinical and radiographic examination at:
  - 4 weeks
  - 3 months
  - 6 months
  - 1 year
  - Then yearly for 5 years.

Summary

- Splint for two weeks: Subluxation, Lateral Luxation, Minor extrusive and minor intrusive luxations
- Splint for four weeks: Root fracture, alveolar fracture, Major extrusive and intrusive luxations
- Splint for up to 4 months: Root fractures occurring in the cervical area

	CONCUSSION	SUBLUXATION	LUXATION EXTRUSIVE LATERAL INTRUSIVE
PERCUSSION	YES	YES	YES
MOBILITY	NO	YES	YES
DISPLACEMENT	NO	NO	YES

Jaw Fractures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Odontogenic Infections

- Periapical infections:
  - Acute. No sinus tract. Acute swelling
  - Chronic. Characterized by presence of a sinus tract and periapical radiolucency

- Fascial Space Infections

Spaces in the Maxilla – Canine Space

- Most often from the canines or premolars
- Boundaries: orbicularis oris, maxilla, levator labii alaeque nasi, zygomaticus major
- CLINICAL FEATURES

1. Pain, tenderness, swelling (anterior cheek)
2. Obliteration of nasolabial folds
3. Edema of lower eyelid and upper lip
4. Obliteration of labial vestibule

Canine Space Infection treatment

- Incision and drainage at canine fossa
- Can drain abscess by initiating endodontic treatment:
  - Open and broach tooth
  - Aspirate abscess through the tooth
- Extraction or Endodontic Treatment of offending tooth.
- Aggressive treatment with antibiotics is required due to risk of hematogenous spread.

Complications and Medical Emergencies

- Cavernous sinus thrombosis
  - Characterized by:
    - bilateral involvement with rapid progression from one eye to the other.
    - Proptosis (eye protrusion), chemosis (swelling of conjunctiva), lid edema

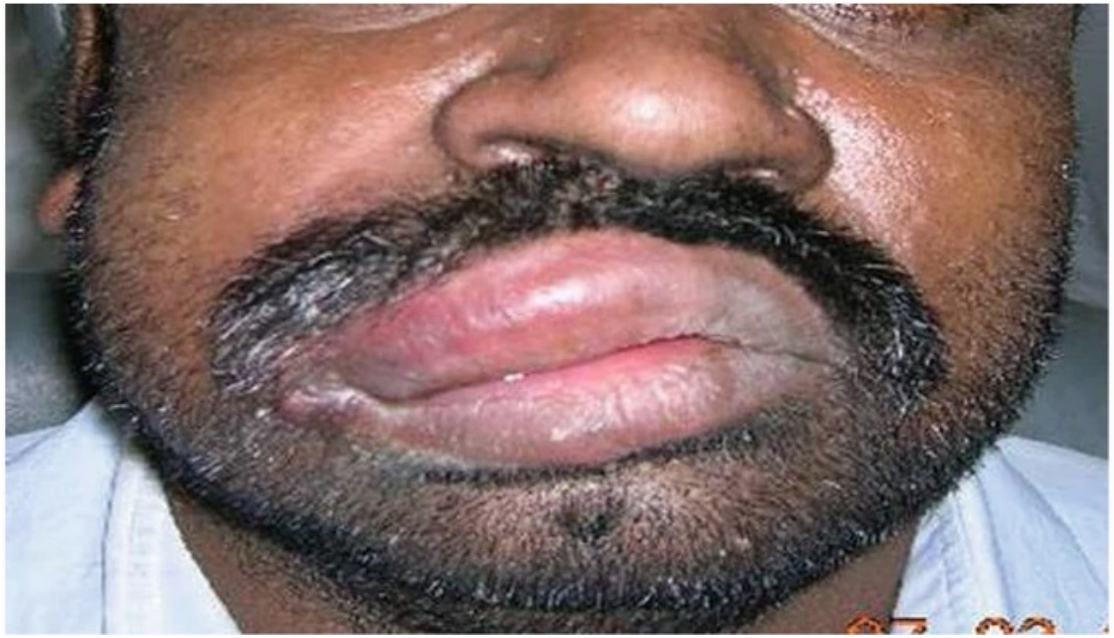
Subdural Empyema

- Rare
- Patients report a pansinusitis intervening between the dental infection and the brain abscess

- Odontogenic brain abscesses arise from direct extension through the sinuses
- Cavernous sinus thrombosis seems to arise from ascending thrombophlebitis (no valves in the veins of the head and neck)

Buccal Space

- Source of infection is:
  - maxillary and mandibular premolar and molar tooth with root apices superior (maxillary) or inferior (mandibular) to buccinator attachment



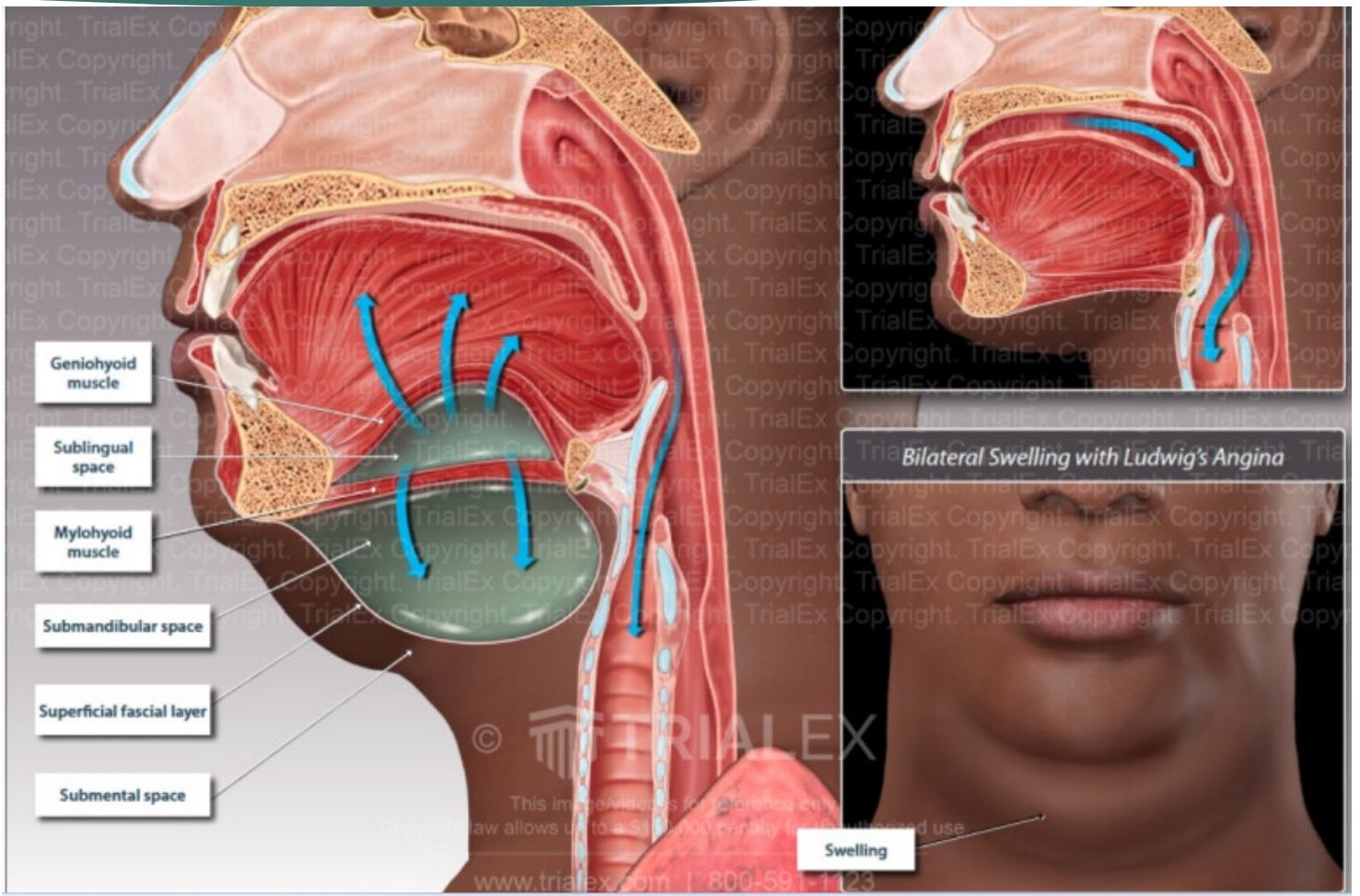
Spaces around the mandible

- Submandibular
- Sublingual
- Submental

Signs of a medical emergency include:

- Difficulty swallowing saliva
- Elevation of tongue
- Difficulty breathing

Ludwigs Angina



General Principles of Management of Infection

1. Remove the cause
2. Establish drainage
3. Antibiotics
4. Supportive care.

Citations

- Donnelly A, Foschi F, McCabe P, Duncan HF. Pulpotomy for treatment of complicated crown fractures in permanent teeth: A systematic review. Int Endod J. 2022 Apr;55(4):290-311. doi: 10.1111/iej.13690. Epub 2022 Feb 16. PMID: 35076954; PMCID: PMC9304243.
- Chen E, Abbott PV. Dental pulp testing: a review. Int J Dent. 2009;2009:365785. doi: 10.1155/2009/365785. Epub 2009 Nov 12. PMID: 20339575; PMCID: PMC2837315.
- Shahrour R, Shah P, Withana T, Jung J, Syed AZ. Oroantral communication, its causes, complications, treatments and radiographic features: A pictorial review. Imaging Sci Dent. 2021 Sep;51(3):307-311. doi: 10.5624/isd.20210035. Epub 2021 Jul 13. PMID: 34621658; PMCID: PMC8479434.