

Dentoalveolar Trauma – Classification, Diagnosis & Treatment
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Dentoalveolar trauma is very common in our companion animals and can lead to many sequelae if not diagnosed and treated.

Endodontics: ENDO = inside & ODONTO = tooth; the specialty of study and treatment of dental pulp
The root canal system is made up of the pulp chamber (crown) and root canal (root)

Anatomy of the Pulp-Dentin Complex

- The outer most layer of the pulp is made of **odontoblasts**.
 - o These cells are of neural crest origin and their function is production of dentin (= dentogenesis)
- The cell body of the odontoblast sit on the outer surface of the pulp, while the cytoplasmic processes of these cells extend into the dentin, within the dentin tubules.
- This allows communication between the pulp tissue and dentin

Pulpal Response to Insult

- Initial/early response is recruitment of inflammatory cells, leading to *pulpitis*
 - o This will either be reversible OR lead to pulp necrosis

Response to Exposed Dentin

- Tertiary dentin is formed when there is damage/loss of enamel and exposure of dentin
 - o Reactionary dentin = existing odontoblast lay down the dentin
 - Tends to be due to mild stimulus and is well organized
 - o Reparative Dentin = reserve mesenchymal cells differentiate to odontoblast
 - Tends to be due to string stimulus and is poorly organized

Non-Traumatic Dentoalveolar Injuries

Caries (cavities)

- Dental hard tissue decay
- UNCOMMON in dogs (~5% of population)

Abrasion

- Dental wear – loss of dental hard tissue due to contact with external objects (ex. bones, antlers, metal, hard plastics, hair/alopecia)
- SPEED of wear: slow often getting retreating pulp & tertiary dentin, with fast often get pulp exposure (leading to pulpitis)

Attrition

- Dental wear – loss of dental hard tissue due to ABNORMAL contact between teeth (malocclusion or physiologic)
SPEED of wear: slow often getting retreating pulp & tertiary dentin, with fast often get pulp exposure (leading to pulpitis)

Treatment of Abrasion & Attrition

- FIRST THING needed: RADIOGRAPHS – to check for vitality
 - o Evidence of non-vitality: wider pulp chamber and/or periapical lucency
 - IF NON-vital: RCT or extraction
 - IF VITAL: needs to continue to be monitored RADIOGRAPHICALLY

Enamel Infarction

- Crack/craze lines in enamel (and enamel ONLY); no treatment required (document)

Enamel Fracture

- Loss of enamel ONLY, no dentin exposure
- VERY Uncommon in cats and dogs:
 - o Enamel is very thin, only 0.1 – 0.6 mm thick
- Treatment: smooth rough (plaque retentive) edges; Monitor RADIOGRAPHICALLY

Enamel-Dentin (Uncomplicated) Fractures

- Can be crown only OR crown-root
- BUT are these injuries Uncomplicated?
 - o Exposed dentin – sensitivity and pain
 - o Risk of pulpitis/infection
- RADIOGRAPHS are needed initially – need to check/assess vitality
 - o IF ACUTE – analgesics
- Treatment: “close” dentinal tubules
 - o This may already be done – by tertiary dentin, OR can place restoration/sealant
 - o IF ROOT involvement, must make a flap to explore and treat
 - o The CONTINUE with radiographic monitoring

Enamel-Dentin-Pulp (Complicated) Fractures

- With pulp exposure treatment is ALWAYS REQUIRED
 - o There will be pulpitis and eventual pulp necrosis
 - o Most states require by law, and is ethical obligation, to discuss all treatment options
 - o Treatment options: Vital Pulp Therapy*, Root Canal Therapy or extraction

Vital Pulp Therapy vs Root Canal Therapy

Depends on two main things:

- DURATION of pulp exposure
 - o With increased time: increased contamination & depth of pulpitis
 - o <48 hours TRUE dental emergency
- AGE of patient
 - o Immature tooth = open apex and THIN dental walls

Vital Pulp Therapy = pulpotomy = removal of contaminated pulp, followed by hemostasis and then placement of MTA (mineral trioxide aggregate), glass ionomer and composite

Root Canal Therapy = pulpectomy = removal of entire pulp; involves the Endodontic Triad

- Preparation (instrumentation): shaping the canal
- Sterilization: removing and/or killing organic material
- Obturation: complete filling & sealing of canal

Crown-Root Fractures

- Almost ALWAYS require exploratory surgery: to determine extent of fracture
- Need to consider the relationship of PERIODONTAL health and extent of restoration
 - o Need to consider biological width

Root Fractures

- Apical third: little-no mobility (alveolus acts as splint); great prognosis
- Middle third: increased mobility; fair to good prognosis
- Coronal third: significant mobility; grave prognosis
- Pulpal healing in tooth fractures
 - o With MINIMAL displacement: pulp INTACT: hard tissue union
 - o With increased displacement: pulp STRETCHED: connective tissue growth
 - o OR necrosis of coronal segment: pulp severed: granulation tissue between segments

Luxation Injuries

- Concussive Injury
 - o Most concussion injuries show NO signs of injury
 - o Typical no long-term consequences, however with severe injury can get hemorrhage, thus intrinsic staining/discolouration
 - o Literature: 89.6 - 92.2% of discoloured teeth have are NON-vitality
 - o RADIOGRAPHS to determine vitality
 - IF non-vital: RCT or extraction
- Subluxation Injury
 - o Injury that leads to “loosening” of PDL;
 - NO fracture, Periodontal dz
 - Contusion of PDL +/- concussion
 - o Treatment: IF mobile: splint, IF NOT mobile no treatment (alveolus as splint)
 - MONITOR RADIOGRAPHICALLY for evidence of non-vitality
- Luxation Injuries
 - o Intrusion
 - INTO alveolus (intruded), very rare
 - Typically maxillary canine INTO nasal cavity
 - o Extrusion
 - Partially OUT of alveolus (extruded), VERY Uncommon
 - o Lateral
 - In an AXIAL direction (accompanied by alveolar fracture)
 - Part of tooth OUT of alveolus, partial PDL severed
 - Often apical blood supply compromised or severed
 - Typically canine teeth (maxillary OR mandibular)
 - Treatment: soft tissue healing (PDL) AND bony healing (alveolus)
 - TRUE EMERGENCY IF going to save the tooth
 - Time sensitive: <4 hours; need to preserve PDL cells
 - Need to splint in place, and then RCT later
 - o Avulsion
 - ENTIRE tooth OUT of the alveolus, entire PDL severed
 - Apical blood supply is SEVERED
 - Treatment: soft tissue healing (PDL) *rarely bony/alveolus involvement
 - Extremely time sensitive: <1 hour
 - o Need to prevent desiccation of PDL fibroblast
 - Milk, egg albumin, Hank's balanced salt solution, saliva