

CRANIOMAXILLOFACIAL TRAUMA AND RECONSTRUCTION

Angus Fechner – Companion Animal Dental Service, NZ

When a patient presents with maxillofacial trauma, it is critical to concentrate on the entire patient and the immediate threats to the animal's continuing survival. However, once the patient is stabilised, the mouth, jaw and oral structures should be further assessed for injury. Though sometimes overlooked, tooth pain can be an ongoing reason for delayed recovery after a traumatic injury or during the repair process. Further, occlusion is paramount to repair and ongoing integrity and function. When fixation and occlusion are good, there is likely to be less pain and discomfort in the immediate post-operative period.

Maxillary and mandibular fracture fixation options

Initially, gentle palpation and manipulation of the jaws to establish whether or not they are in occlusion is very important. Radiographs of the suspected fracture sites are also mandatory, along with survey skull films. Non-displaced fractures are easily missed but fairly common in head injuries. Superimposition of bony structures is greatly reduced by using dental film and in combination with survey radiographs facilitates better treatment planning. CT imaging, if available, can also greatly enhance diagnosis of skull and dental fractures.

Fixation options include:

- Tape muzzle or BEARD/modified button techniques (particularly useful in young animals or cats and where cost is a significant issue)
- Symphyseal wire – for mandibular symphyseal separation
- Dental wiring
- Dental acrylic/composite bonding
- Cerclage wire
- Plate fixation
- External skeletal fixator/acrylic bar
- Excision arthroplasty
- (mandibulectomy)

Treatment goals include:

- pain control
- realignment to normal occlusion
- early return to self feeding
- retaining teeth if possible

When dealing with facial fractures, repair has to be stable but not necessarily rigid. The maxilla is not a weight bearing bone. Intramedullary pins, plates and screws can easily result in radicular (tooth root) damage so should be used with caution. Further to this plates and screws in particular are expensive and require specialized equipment and training; however certain fractures eg. those involving the angle of the mandible, are best repaired using mini plate fixation, if available.

Wiring and acrylic/composite bonding generally remain the method choice for the majority of oral fractures as they are easy, fast and far less invasive than plates or screws. Interfragmentary wires should be placed as close as possible to the alveolar (tension) surface but be aware of tooth roots.

Equipment needed:

- 24-26G orthopedic wire
- wire cutters
- needle drivers
- non-fluoridated pumice – important that polishing products do not contain any glycerin
- 37% phosphoric acid etch – applied to tooth surfaces to be bonded for 30 seconds and then removed carefully and rinsed thoroughly. VERY important that this product does not contact the mucosa or other soft tissue as it is caustic
- (unfilled resin/bond – expensive)
- self mixing acrylic (Maxitemp/Protemp) or composite. This should be applied evenly and be contoured to the whole tooth surface without excessive contact with the gingival margin. Be aware of occlusal surfaces between maxilla and mandibles when applying eg. should only be applied in a very thin layer over the buccal surface of the mandibular molars.
- an acrylic burr - for smoothing acrylics or composites once they have cured

Fractures should be stabilised initially with the appropriate interdental wiring technique and/or cerclage and/or interfragmentary wire

Maxillomandibular fixation (MMF) is usually more applicable to the cat but can equally be used in small dogs. With MMF, again the goal is to be able to close the mouth in occlusion. An oesophagostomy tube is a prerequisite. Initially fix and align the mandibular fractures including any symphyseal separation. using the teeth as markers and anchors. Once in correct occlusion, the canines are bonded together. Both jaws are immobile but the patient can still lap food and often the oesophagostomy tube becomes redundant within a few days of the initial surgery.

Various interdental wiring techniques have been described ⁽³⁾ including Stout's multiple loop wiring, and Essig's and Risdon's wiring. Acrylic is placed evenly over the wire interdentally providing a rigid splinting structure against the tension surface.

Fixation is usually required for 4-8 weeks depending on the age of the patient and extent of the injury. After this time any wire and acrylic can be removed and the jaws and teeth assessed for any further required treatment. Acrylic should be removed with care as excess force can damage enamel or fracture cusps of teeth. The dental arcades should receive a full scale and polish.

Dentoalveolar Trauma

On initial phone consultation, the time frame of the injury should be ascertained. In cases where avulsion has been within an hour then the tooth should be placed in milk. Successful reintegration of the tooth into the periodontal structure of the alveolus (with follow up RCT) can be successful for up to 6 hours after the injury where milk is used as a transport media. The tooth or alveolus should not be cleaned or flushed by the owner even if there is gross contamination of the avulsed tooth as this may affect the viability of any remaining periodontal ligament cells. If an avulsed tooth has been separated from the alveolus for more than an hour and the tooth has not been placed in any transport media, then any efforts to stabilise the tooth are unlikely to succeed long term. Any previous periodontal disease may also significantly decrease the chances of success.

Tooth avulsions and luxations are usually easy to diagnose. Avulsion is the complete removal of the tooth from the alveolus. Luxation refers to a tooth that has been moved from its socket but has not been completely disarticulated from the alveolus.

While luxations frequently need follow up endodontic treatment (root canal therapy (RCT)), avulsions will always need this. Luxations and avulsions most often affect the canine teeth, and as a result of the forces of any trauma, there may be significant damage to the lateral alveolar bone. These factors often determine the feasibility of any ongoing attempts to save teeth at the time of initial presentation and may make extraction a more viable option. When discussing options with the owner, however, remember that mobile teeth may still be very useful in the short term with certain fixation techniques when mandibular or maxillary fracture are involved. These teeth may then be removed, if necessary, at follow up surgical visits eg. when splinting devices are removed.

When initially replacing and splinting the tooth, the alveolus and tooth can be flushed with either Hartman's or isotonic saline but should not be curetted. Prior to replacement of the tooth, dental radiographs should be taken to ensure there are no root fractures of the avulsed tooth. The lacerated soft tissues can then be sutured and a fixation applied. A figure of eight wire is sometimes a good option for a displaced tooth. The tooth only needs splinting for 2 weeks and although initial endodontic treatment may be performed at this stage, the final root canal treatment is usually left for 10-12 weeks to allow the tooth to become more stable and to assess the periodontal structures with follow up dental radiography at this point.

Recommended textbooks

1. Oral and maxillofacial surgery in dogs and cats – Frank Verstraete, Milinda Lommer
2. Blackwell 5 minute veterinary consult – Small animal Dentistry - Heidi Lobprise
3. BSAVA Manual of Small animal dentistry – David Crossley, Susanna Penman
4. Veterinary Dentistry Principles and Practice – Bob Wiggs, Heidi Lobprise {*no longer in print*}

References

1. Harvey CE, Emily P. Small Animal Dentistry. Philadelphia: Mosby-Year Book, Inc., 1993: 312-335.
2. Gorrel C, Penman S, Emily P. Small Animal Oral Emergencies. New York: Pergamon Press, 1993: 37-45.
3. Wiggs RB, Lobprise HB. Veterinary Dentistry Principles and Practice. Philadelphia: Lippincott – Raven Publishers, 1997: 259-279.
4. Legendre LFJ. Use of maxillary and mandibular splints for restoration of normal occlusion following jaw trauma in a cat: a case report. J Vet Dent 1998; Vol. 15 no.4 (Dec): 179-181.
5. Niemiec, B. Small Animal Dental, Oral and Maxillofacial Disease - A Color Handbook. Manson, 2010: 90-12
6. Lewis JR, Reiter AM. Trauma Management in the dog and cat. Oxford: Wiley Blackwell, 2011: 279-292
7. Reiter AM, Lewis JR. Trauma Management in the dog and cat. Oxford: Wiley Blackwell, 2011: 255-278
8. Lewis JR. Tooth fractures. Clinical Veterinary adviser, 2nd ed. Philadelphia: Mosby Elsevier, 2011: 1102-1103