Tri Lake Animal Hospital & Referral Centre

Fractures: How Management in General Practice can Optimize Final Outcome

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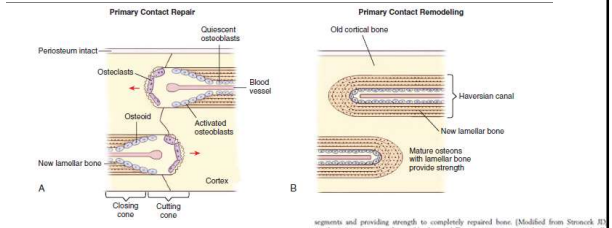
Lecture Overview

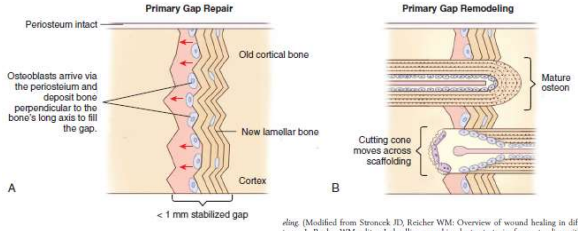
- Bone healing.
- Triage/patient stabilisation.
- Radiography.
- Fracture description/considerations.
- Initial management.
- Definitive management.
- Surgical management.
- Cases.
- Key points.
- Questions.

Bone Healing – Primary Contact



segments and providing strength to completely repaired bone. (Modified from Stroncek JD, Reicher WM: Overview of wound healing in different tissue types. In Recher WM, editor: Indwelling neural implants: strategies for contending with the in vivo environment. Available at: http://www.ncbi.nlm.gov/books/NBK3938/. Accessed June 4, 2011.)

Bone Healing – Primary Gap



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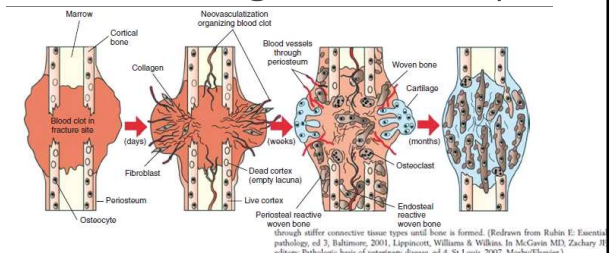
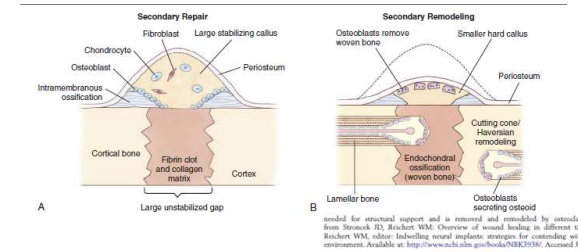
Bone Healing - Secondary



through stiffer connective tissue types until bone is formed. (Redrawn from Rubin E: Essential pathology, ed 3, Baltimore, 2001, Lippincott, Williams & Wilkins. In McGavin MD, Zachary JF, editors: Pathologic basis of veterinary disease, ed 4, St Louis, 2007, Mosby/Elsevier.)

Bone Healing - Secondary



needed for structural support and is removed and remodeled by osteoclasts. (Modified from Stroncek JD, Reichert WM: Overview of wound healing in different tissue types. In Reichert WM, editor: Indwelling neural implants: strategies for contending with the in vivo environment. Available at: http://www.ncbi.nlm.gov/books/NBK3938/. Accessed June 4, 2011.)

Optimal outcome?

- Rapid assessment to mitigate risk.
- Stabilisation of patient.
- Protection of fracture and local structures.
- Well defined management plan:
  - Initial management plan.
  - Definitive management plan.
- Minimize pain and discomfort.
- Rapid return to normal function.
- Appropriate management of expectations.

Initial vs. Definitive Management

- Initial:
  - Triage patient.
  - Identify and classify lesions.
  - Stabilise:
    - Patient.
    - Fracture.
  - Optimise patient for definitive management.
- Definitive:
  - Promote osteosynthesis.
  - Addressing other lesions.
  - (Refer.)

Patient assessment

- Full patient assessment.
- Emergent:
  - Immediate triage.
  - 'Minimum database'.
- Identify all lesions and prioritise.

Biosecurity

- Mitigates hospital contamination.
- Mitigates wound contamination.
- Personal Protective Equipment:
  - Gloves are mandatory.
- Cover wounds.

Correct Radiography

- Why?:
  - Standardisation.
  - Significant findings.
  - Repeatability.
  - Same as textbooks!

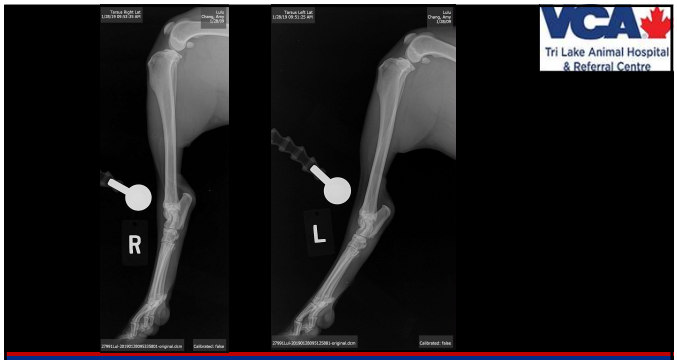
Correct Radiography

- How?:
  - Ideally anaesthetised/sedated.
  - Always orthogonal.
  - Ideally bilateral.
  - Always L/R marker.
  - Ideally scale marker.

Digits.

- Wounds.
- FBs.
- Corns.
- Collaterals.
- Sesamoids.
- Mass.

Stressed Views

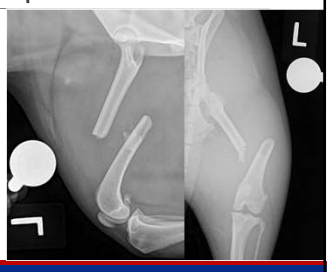


Correct Radiographic Interpretation

- **Is it diagnostic?**:
  - Area.
  - Positioning.
  - Collimation.
  - Exposure.
  - Marker.
- Clinically relevant vs. incidental findings.
- (Blinded.)
- **Treat the patient not the radiograph!**

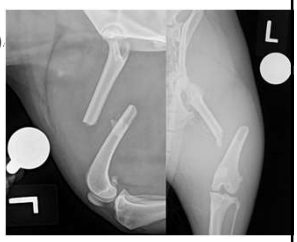
Fracture Description

- Which bone.
- Direction of displacement:
  - Based on distal fragment.
- Configuration:
  - Transverse.
  - Oblique.
  - Spiral.
  - Avulsion.
  - Compression.



Fracture Description

- Location:
  - Diaphyseal (proximal, mid-shaft, distal).
  - Metaphyseal.
  - Physeal.
  - Epiphyseal.
  - Condylar/epicondylar.
  - Joints:
    - Involvement.
    - Proximity.



Fracture Description

- Complete.
- Comminution:
  - Mild.
  - Moderate.
  - Marked.
  - Fissures.
- Open or closed.
- Stability.
- Age of fracture.

Open Fractures

Type I open fracture involving the distal crus of a dog. (Photograph courtesy Nic Lambrechts, BVSc, MMed Vet, Diplomate, ECVS.)

Open Fractures

Type II open fracture involving the medial crus of a dog. The foot is toward the left of the image. (Photograph courtesy Nic Lambrechts, BVSc, MMed Vet, Diplomate, ECVS.)

Open Fractures

Type IIIB open fracture of the tarsus of a dog. The crus is toward the right of the image, the foot toward the left. (Photograph courtesy Walter C. Renberg, DVM, MS, DACVS.)

Open Fractures

Class	Infection	Delayed/Non-union
I	0-2%	0-5%
II	2-10%	1-14%
III	10-50%	2-37%

Tobias and Johnston 2012

Fracture Considerations

- **Is it ambulatory?**
- Local tissues.
  - Tendon/ligament damage.
  - Luxations.
  - Nerves:
    - 81% with peripheral nerve injury had good or excellent neurologic recovery within 16 weeks.
    - 15% had permanent loss of limb function.

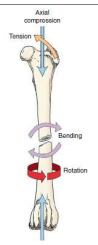
Fracture Considerations

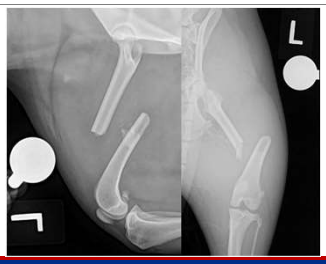
- Cause:
  - Extrinsic – direct or indirect trauma.
  - Intrinsic – muscular, **pathologic**, stress.
  - **Level of energy.**
- Other lesions/comorbidities.

Fracture Considerations

- Patient Factors:
  - Size.
  - Temperament.
  - Age.
- Clinical factors.
  - Skill.
  - Experience.
  - Equipment.
  - Client compliance.
  - Finances.

Forces





Vehicular Trauma

- Dogs - 71% had multiple body system injuries:
  - Pulmonary trauma (29%).
  - Haemoabdomen (15%).
  - Soft tissue injury (15%).
  - Cardiac arrhythmia (9%).
  - Spinal trauma (6%).

Vehicular Trauma

- Pelvic Fractures:
  - Urinary tract injury (2%).
  - 39% had injuries to the urinary tract.
  - 16% having injury requiring surgery.
  - Ruptured bladder (7%).
  - Urethral rupture (5%).
  - Ureteral avulsion (4%).

Vehicular Trauma

- Cats:
  - 53% had thoracic injury.
  - 39% had abdominal injury.
  - 28% had spinal injury.
  - Dogs with pelvic fractures.

Wound classification

- Size.
- Type i.e. laceration/shear/puncture.
- Location.
- Partial thickness vs. full thickness.
- Tissues involved.
- Time frame since injury.
- Stage – debridement, inflammatory, remodelling.

Definitive Management Plan

- Address other lesions.
- Goals of fracture management:
  - Anatomical reduction of fracture fragments.
  - Stable fixation.
  - Preservation of blood supply.
  - Rapid return to normal, pain free function.
- If you are not comfortable managing a case, contact a surgical Specialist to discuss the case.

Non-surgical

- Under reported so minimal evidence.
- Most often primary care practice.

External Coaptation

- Does not provide rigid immobility.
- Good for bending neutralisation only.

External Coaptation – case selection

- Fracture expected to heal quicker than bandage/cast sore developing – 4-6 weeks.
- Closed fracture below elbow or below stifle.
- Amenable to closed reduction.
- Relatively stable:
  - Impacted fractures.
  - Interdigitating.

External Coaptation – case selection

- Young animals:
  - 'Greenstick' fractures.
  - 'Long' bone fractures in young animals when periosteum likely intact.

External Coaptation – case selection

- Young animals:
  - 'Greenstick' fractures.
  - 'Long' bone fractures in young animals when periosteum likely intact.
- Fracture central within external coaptation.
- Local anatomical splinting.
- More than 50% reduced on orthogonal rads.

External Coaptation – case selection

- Not good option for:
  - Fractures unstable to anything other than bending:
    - Oblique or spiral fractures.
    - Comminuted.
    - Articular.
    - Avulsion.
    - Local instability.
  - Femur/Humerus.
  - Distal radial fracture toy breeds.
  - Cat RU.

External Coaptation – case selection

- Not good option for:
  - Confirmation:
    - Chondrodystrophoid.
    - Toy.
    - Obese.
  - Sight hounds.
  - Athletic/working dogs.
  - Open.

External Coaptation – Considerations

- Modified Robert-Jones for 2-3 days:
  - Manage swelling.
  - Manage wounds.
- Joint proximal and distal to fracture must be immobilized.
- Toes enclosed in fractures distal to carpus/tarsus.
- Padding around pressure points not over.
- Stirrups.
- Appropriate posture.

External Coaptation – Considerations

- Hospitalise overnight of first external coaptation to reassess for swelling.
- Wounds.
- **COST:**
  - Maintenance of external coaptation may be higher than simple surgical stabilisation.
  - Complications.
  - Time.

Closed reduction

- Deep general anaesthesia.
- Hang weight of animal through fractured limb for 10-30 minutes.
- Slow continuous traction.
- 'Toggling'.
- External coaptation.

External Coaptation

- Modified Robert-Jones:
  - Unlikely to provide support after 48 hours.
  - Excellent choice to control swelling prior to definitive stabilisation.
- Full cast.
- Bivalved cast.
- Custom splint.
- Commercial splint.
- Gutter splint.

External Coaptation - Care

- **Give client printed out dressing care instructions +/- sign.**
- Cage Rest.
- Clean.
- Dry.
- Cover when outside.
- **Physical therapy.**

External Coaptation - Monitor

- Stable or improving function.
- Smell.
- Strike through.
- Discomfort.
- Slippage.

External Coaptation - Monitor

- Monitor digits/nails:
  - Swelling.
  - Spreading.
  - Discharge
  - Temperature.
- **Check every 7-10 days.**

Casts

- Cut out over pressure points of accessory carpal bone and olecranon.

Splints

- Growing animals.
- Minimal padding as closer is stronger.

Spica splint

- Full limb dressing with lateral splint.
- Immobilisation of:
  - Shoulder.
  - Humerus.
  - Coxofemoral joint.
  - Femur.

Non-weightbearing Slings/Splints

- **CARE!** – High risk of complications.

External Coaptation - Stages

- Radiography:
  - Initial.
  - After closed reduction.
  - After external coaptation.
  - (5-7 days after external coaptation).
  - Before removal:
    - Standard eight weeks.
    - Minimum three weeks.
    - Repeat minimum four weeks.

External Coaptation - Stages

- Manipulate fracture to confirm stability.
- Joint laxity in young animals will resolve within few weeks of weight bearing.
- Gradual return to normal exercise.

External Coaptation - Complications

- Meeson et al. 2011:
  - 60 animals that had a cast placed.
  - 63% developed a soft-tissue injury (60% mild, 20% moderate and 20% severe).
  - Injuries could occur any time during coaptation
    - No association with duration of casting and severity.
  - Sighthounds were significantly more likely to develop a soft-tissue injury.
  - Veterinarians identified the majority of injuries (80%) rather than the owners.

External Coaptation - Complications

- Meeson et al. 2011:
  - The financial cost of treating soft-tissue injuries ranged 4-121% the cost of the original procedure.
- **CLINICAL SIGNIFICANCE:**
  - The only reliable way to identify an injury is to remove the cast and inspect the limb.

Non-surgical fractures

- Transverse processes of vertebrae.
- Ulnar or fibular.
- Metacarpal/tarsal.
- Phalangeal.

Non-surgical pelvic fractures

- Ambulatory.
- Controllable pain.
- No neurological deficits.
- Sacroiliac luxation:
  - Stable.
  - (<50% displacement).
- Sacral fractures if no neurological deficits.
- Pelvic canal maintained.
- Pelvic floor and ischiae.

Non-surgical pelvic fractures

- Repeat clinical and radiographic examinations within first 5 to 7 days after trauma to assess for fragment displacement/pelvic canal narrowing.

Sacral/coccygeal fractures

- Recovery of urinary and faecal function:
  - Intact anal tone at presentation – 75-100% recover.
  - Absent deep pain in tail base – 50% recover.
  - If not recovered by two weeks post-trauma, unlikely to recover.
- Consider diazepam, phenoxybenzamine or prazosin.

Smeak and Olmstead 1985

Spinal fractures

- Radiographs:
  - After neuro exam.
  - Survey films entire spine and focus on neuroanatomic localization.
  - 72% sensitivity for detecting osseous lesions in canine spinal trauma.
  - May overestimate the stability of some fractures:
    - Severe displacement may have occurred at the time of injury.

Spinal fractures – Non-surgical

- Several studies report good outcomes for patients managed with nonsurgical treatment alone.
- Case selection:
  - Stable fractures:
    - Intact ventral buttress.
  - Lesions in the lumbosacral spine may be most forgiving:
    - Instability or compression caudal to L6 affects only nerve roots.
  - Lack of concurrent thoracic, abdominal, or pelvic injuries.
- Cage rest for 4-6 weeks with or without external coaptation.

Spinal fractures – Non-surgical

- Splinting?:
  - Best candidates:
    - Smaller animals.
    - Minimal neurologic dysfunction.
  - Ideal duration of splinting is not known:
    - Recommended to maintain external splints for a minimum of four weeks, with an additional 4 weeks of cage rest.

Spinal fractures

- Surgical
  - Most reliable way to stabilize the spinal column.
  - Unmanageable pain.
  - Worsening neurologic status.
  - Paretic animals with intact nociception.
  - Unstable fractures.
  - Spinal cord compression.

Spinal fractures

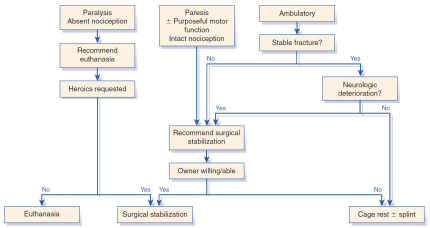


Figure 34-3 Recommended treatment algorithm for spinal fractures.

Tobias and Johnston 2012

Spinal fractures - Prognosis

- Non-ambulatory:
  - Chance of regaining ambulation for nociception negative dogs approximately 5%.
  - Return of motor function and ambulation may take between 4 and 6 months after injury.
  - Dogs that do regain ambulation may not regain nociception and may be severely ataxic, with urinary and/or fecal incontinence.

Spinal fractures - Prognosis

- Cervical spinal injury:
  - Good prognosis.
  - Overall return to function in dogs approaches 70%.
  - Dogs ambulatory on presentation have 13 times greater chance of a functional outcome than dogs with non-ambulatory tetraparesis.
  - Respiratory arrest is a major cause of morbidity and mortality in the remaining cases.
- Thoracolumbar spinal injury:
  - Good prognosis, as long as nociception is intact.
- Dogs with lumbosacral fracture-luxations.
  - Very good prognosis.

Spinal fractures - Prognosis

- Functional recovery
  - 80%-100% of surgically treated animals.
  - 85-95% of conservatively managed patients.
- If intact nociception and survive perioperative period, chance of recovering ambulation <85%.
- Non-surgically treated patients that regained ambulation did so within two to five weeks.
- Time frame for optimal recovery is variable and may be longer than 1 year.

Spinal fractures - Prognosis

- Negative prognostic factors:
  - Increasing neurologic deficits = worsening prognosis.
  - Nociceptive-negative animals carry a worse prognosis.
  - Incontinent patients with absent tail tone, anal tone, and perineal sensation probably have a worse prognosis for return of normal urinary function than those with intact perineal sensation and anal tone.
- Outcomes appear similar for cats and dogs.

Skull fractures

- Non surgical:
  - Masticatory apparatus intact.
  - Non-depressed calvarial fractures.
  - Sinus fractures.

QUESTIONS?