

Longbone Fractures:

Putting Humpty Dumpty back together again.



Synopsis-- Anatomy and the Injury

Long bone fractures in the limbs can be characterized in several ways to best communicate and record the abnormalities.

- 1) Name the bone
- 2) Name the location (diaphyseal vs. metaphyseal, physeal/Salter, articular)
- 3) Describe the architecture of the fracture (transverse, short oblique, long oblique (oblique edge > 2x width of bone), spiral, comminuted (>2 pieces)
- 4) Note degree and direction of displacement (name the direction of abnormal movement of the DISTAL fragment)
- 5) Note open vs. closed nature of fracture.

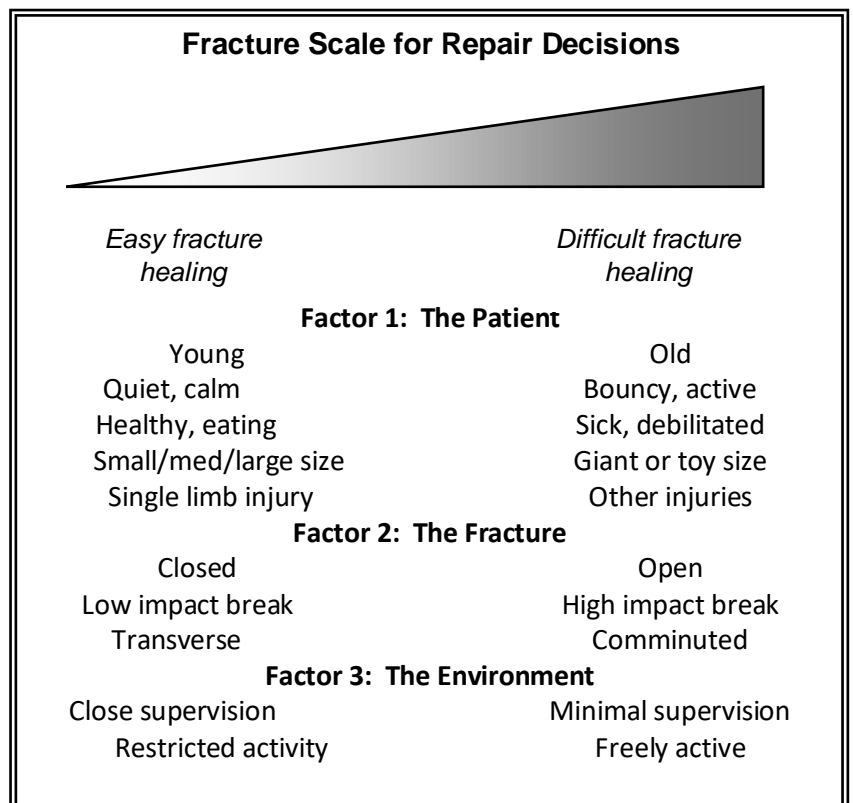
With all this information, a fracture "hologram" pops into the mind of the person receiving the information without even seeing the radiograph! (The surgeon thanks you immensely!)

Other than a few select cases in very young animals (see *Other Options* below), surgical stabilization of the **humerus and femur** results in the most stable and efficient return to leg function. The **tibia and the radius** are somewhat amenable to external coaptation stabilization in certain circumstances (see *Other Options* below); the majority are most efficiently stabilized with surgery.

The type of repair employed is based on several factors (see chart below):

- 1) age of patient
- 2) behavior of patient
- 3) degree of trauma
- 4) owner needs and compliance
- 5) architecture and location of fracture
- 6) availability of implants and expertise

Often, multiple options are reasonable choices, and owner – RDVM – surgeon collaboration directs care.



Surgical Overview:

The leg is prepared using the "hanging leg prep" with clip margins extending above the joint proximal to the fracture and down to the foot. The foot is wrapped in Vetwrap and suspended from overhead (for most procedures the fractured leg is uppermost, and the patient is in lateral recumbency.) Traction at this stage (i.e. the patient is slightly lifted off the table and suspended by the limb) allows body weight to distract the fracture and stretch contracted muscles, making subsequent reduction easier.

The fracture is approached, manually reduced and stabilized with appropriate implants. After closure, when feasible, a compression bandage is applied for swelling and comfort. Radiographs are taken prior to recovery (2-view) and approved by the surgeon before anesthesia is terminated.

Perioperative regional or fracture blocks are easy to employ; they can facilitate fracture reduction, reduce general anesthesia needs, and smooth the recovery.

The **indications & rationale** for surgical treatment are:

- All bones—patient or client not amenable to high quality splint management
- All bones—articular fractures (anatomic reconstruction ideal for optimal joint function)
- All bones—open fractures
- Humerus or Femur—patient > 4mo age; displaced fracture
- Femoral neck—repair moderate-high risk failure; FHO conversion or total hip conversion (large breed)
- Radius—toy breeds (>4mo); other breeds, displaced fracture/no cortical contact and fractured ulna
- Tibia—displaced fracture/no cortical contact and fractured fibula
- Ulna—distal fracture (if collateral ligament function in carpus lost)
- Ulna—proximal fracture (if articular or if triceps insertion lost)
- Fibula—distal fracture (if collateral ligament function in tarsus lost)
- Metacarpal/metatarsal—MC/MT x 4 displaced; articular fracture or working dog/athlete
- Phalanges—articular fracture and/or working dog/athlete
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Other options for treatment (*besides surgery*; contact DVS for info) are:

- All bones—general anesthesia or heavy sedation/narcotics; manually “bend” back to alignment or “traction” to appropriate length and alignment (*no place for squeamishness here!*)
- Humerus puppy/kitten (6-16wks)—“thorax splint” custom bandage x 2wks
- Radius puppy/kitten (1-12mo, non-toy breed)—appropriate sized/minimalistic splint x 2-4wks
- Radius puppy, toy breed (6-16wk)— “tongue depressor splint” x 2-4wks
- Tibia puppy/kitten (6-16wk)-- “tongue depressor splint” x 2-4wks
- Salter I, manually reducible (distal/proximal radius, distal tibia, rare proximal tibial plateau, rare distal femur)-- appropriate sized/minimalistic splint x 2-4wks
- Greenstick/non-displaced-- appropriate sized/minimalistic splint x 2-4wks

- Femoral neck—no surgical treat; planned non-union; if painful result > 2mo, consider FHO before marked loss of muscle and range of motion.
- Radius w/ intact ulna-- appropriate sized/minimalistic splint x 2-4wks
- Tibia w/ intact fibula-- appropriate sized/minimalistic splint x 2-4wks
- MC/MT—1-4 bones; appropriate sized/minimalistic splint x 4-6wks
- Phalanges—non-working dog; bandage for comfort x 2wks

The **perioperative experience** for pet and owner includes:

- (If polytrauma or overweight/obese), a recumbent patient in need of significant assistance with walking and personal hygiene pre and postop.
- Splint/bandage management, preop
- Pet confinement and pain when moving, if limb not bandaged preop.
- Strict confinement to leash and small area of house (indoors) for restricted postop period.
- External fixator postop care, weekly (when applicable)
- Veterinary visit for exam 2wks, radiographs 1-2mo
- Implant removal under general anesthesia (**when applicable**; usually brief)
- Steady improvement in leg use from non-weight bearing postop to normal gait, over healing period (1-3mo)

Expectations for outcome are:

- Dependent upon fracture location and comorbidities (**call for discussion**)
- Good for return to normal/near-normal leg use (in non-articular fractures)
- Longer healing period for older/geriatric and overweight/obese patients
- Increased prevalence of surgical complications in older/geriatric and overweight/obese patients
- Implant removal may be needed (pre-planned or if implants migrate (pins, common) or are infected (plates, uncommon))

Complications that may arise with this procedure are:

- Superficial or deep **surgical infection** (rare, requiring long course Abx),
- **Implant infection** (rare and significant, requiring Abx course and surgical implant removal),
- **Implant breakage** (rare and significant, may require additional surgery if early postoperative)
- **Non-union or delayed union** (rare and significant, may require additional surgery)

Postoperative **outcomes may be poor** due to the above complications, and/or:

- Pathologic fracture diagnosed preop or intraop
- Poor patient/client compliance with postop care, restrictions, evaluations

What a surgeon needs prior to surgery:

- Affected leg/body part “marked” by owner for confirmation (wax “costume makeup” works well)
- Skin near the surgery site CLEAR of infection (papules, pustules, crusts, collarettes, etc.) If urgent surgery, owner must be alerted to *increased risk* of incisional, deep and/or implant infections.
- Two-view radiographs for surgical planning
- Appropriate chest/abdomen evaluations, in cases involving trauma

General considerations and complications for all surgery/anesthesia procedures are:

- *Difficult and/or painful anesthetic recovery (variable; may require additional medications or re-hospitalization)*
- *Incisional infections (rare, minor; usually require oral antibiotics)*
- *Incisional dehiscence (rare, minor or major; may require surgical revision)*
- *Adverse anesthetic event (rare, major; may result in serious impairment or death)*

Proper owner expectations are important to a successful experience and patient outcomes. Please discuss this information with your clients while assisting them with decision-making for **Long Bone Fractures**.

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(See additional materials at www.directvetsurg.com for veterinary professionals and pet owners.)