

**Orthopedic Emergencies...take two.** Last Fall, we took a look at (and pity on) joint luxations. Take away message, "Get those things reduced ASAP and use lots of narcotics to get there". Now we turn to our most common ortho emergencies, the fracture. With a standard bandage supply stock and a little attention to detail, we can give all of our broken patients a bit of relief. Read on...

## **PART 2. LONG BONE FRACTURES**

The longer a bone is fractured without proper immobilization and stabilization, the longer an animal suffers the consequences.

Consequence #1: A flopping fracture is painful (and it makes a lot of PEOPLE nauseated to watch!); an immobilized fracture is comfortable, for everyone.

Consequence #2: A fracture dancing around in soft tissue is like the head chef at the local teppanyaki restaurant preparing your meal--have you seen what those chefs can do with a couple of cleavers?

Consequence #3: Take pity not only on the patient, sure; but how about the sorry cuss who has to repair that fracture? The longer the leg remains foreshortened with overlapping fragments, the tighter those muscles surrounding the fracture get. This early contracture-- hours to days-- brings lots of lactic acid to the muscles of the surgeon attempting open reduction and stabilization! Never mind the over-stretching and trauma that can result in the muscles being re-lengthened during surgery.

And, consequence #4: When a fracture is allowed time to *go it on its own*, with improper immobilization or markedly delayed rigid stabilization, a malunion will result. This typically manifests as two joints, those above and below, being at odd angles relative to each other. This alignment problem renders the leg useless and/or chronically painful.

So, when that patient comes in with a fractured femur, tibia, humerus or radius, throw some bandaging supplies and skill at it **that same day** (if anesthesia can be tolerated.) The *pain of an acute fracture can be ameliorated well* with a stiff dose of an analgesic to get the work done. Remember that narcotics/opioids are one of the safest drugs we have on several important fronts-- cardiovascular, renal, hepatic. Once that is on-board, immobilization can proceed, with maybe just a little bump with propofol to get past the most painful, initial stage.

*Common message for all long bone fractures:* Immobilize the joint directly above and below the fracture. Point to each when you are done, and make sure each is well covered by your immobilization masterpiece!

And another strong take-away message from this communiqué is to forget about the off-the-shelf splint options out there (waste of money and space), and go with 3M casting tape(3"). You will be well served, need only keep 2-3 rolls in-stock, and will have more fun splinting patients.

### **TIBIA TIPS:**

- A tibia splint is applied laterally.

- Use more padding around the bony parts and less around the muscle-y parts. No need for a gargantuan splint...2-3 layers of cast padding, snugly applied, will do.
- When immobilizing joint above and below the tibia, the hock is easy. Stifles, on the other hand, are tough (especially in brachycephalic and highly muscled breeds; the thighs get in the way.) Your goal should be to create a bandage that is closer to the shape of a sausage than a funnel; you will see less sliding down if there is NOT a narrow zone below the stifle.
- The off-the-shelf rearlimb splints (clear plastic, sorta shaped like a rearlimb) are badly designed, hard/impossible to trim to proper size, commonly lead to pressure sores around the foot and hock, and promote sliding of the whole apparatus below the stifle. The result is a big bandage hinged at the tibia fracture side and swinging like a pendulum. Ouch. They look pretty on the shelf, but not worth the money.

#### **RADIUS RUMORS:**

- Probably the easiest; a radius splint is applied either laterally (for a midshaft or higher) or caudally (for a distal 1/3 fracture).
- The most common overkill site! In a toy breed, the splint should not weigh more than the dog! To do this properly in a toy breed, you will need to cut your supplies down to 1" (cast padding and vetwrap; its quick, see below) and make your own splint (modified tongue depressor; see below)
- Zone of pressure sore: cranial elbow. Do not tape with elasticon around the elbow (elasticon is the devil...in most applications). Take the bandage well above the elbow (and advise owners to monitor site for slip and pressure) or stay below elbow (and pre-test for pressure by flexing elbow fully when splint first applied).
- Zone of pressure sore: caudal point of elbow (olecranon). Do not carry your splint up/over the point of the elbow. Stop just short for caudal splints. No amount of padding will prevent a decubitus ulcer on the olecranon that hurts and takes forever to heal.
- Immobilizing the elbow is hard. It just is. Not much room up the upper arm, high motion site. So, accept this, work hard to get the bandage as high as possible, and then monitor, monitor, monitor! Explicitly point to site (maybe even make a cute little vetwrap "sign" to label it!) and tell owners to watch the location for slippage. Return if slipping.

#### **FEMUR FACTOIDS:**

- Hips are hard; the proximal joints do not cotton to immobilization (intentional pun there!) To prevent the femur from dancing around the femoral artery, you have two immobilization choices. There are risks and benefits to each, just like there are risk and benefits to letting it swing.
- A spica splint incorporates the body, thus reducing movement of the upper joints (hip and shoulder). It also takes lots of bandaging supplies to make it right. The best analogy is a candy cane...hook the

cane over the back, and incorporate it in wraps around the trunk. The "cane" can be a creative undertaking. I've used rolled up office paper from the recycle bin, aluminum rod, 3M casting tape, wire hangers. If it is stiff (relative to the dog size) and can be shaped into a "cane", off ya go.

- A non-weight bearing sling will bring the entire leg up close to the body to minimize flopping of the fracture. It is similar to an Ehmer sling (anyone out there like that technique? Ha!), but no need here to abduct and internally rotate (again, ha!). The goal is to flex the naked limb up to the haunch and wrap it there like a little package. Over-flexing of the knee and hock will itself hurt, so allow a little give to those joints as you strap up the leg.
- The Male Dog Problem: Next time you see me, ask me about my "foot in mouth" episode standing over a GDV surgery in a male dog with two male students in my residency! Nutshell, the prepuce/scrotum get in the way...in this case, of immobilizing the femur using either technique. Just a pain in the neck. Either you can work around them or you can't. Each dog size and shape are different, so devise our fracture plan accordingly.
- The location of the fracture and its character help with decision-making. A distal Salter I of the femur (for example) is an absolutely great fracture to reduce and immobilize with a splint right after it happens. Often these will correct/reduce themselves (close(er) to perfect) in the splint, or at the very least will not turn into an articular fracture while swinging freely. Another example for immobilization preference, sharp oblique main fragments do more soft tissue damage than transverse fragments.
- Choosing between a spica and a sling and nothing/cage rest pending surgery is a balancing act. There is no right answer. Variables to consider while making your plan are:
  1. time lag between injury and surgical repair;
  2. size of dog (can they be crated, carried, etc);
  3. male vs. female dog (see above rant);
  4. location of the fracture;
  5. cost (I consider immobilization "pain management" and talk about it under this label)
  6. mobility of the patient (spicas can get in the way of less mobile/agile patients)
  7. cat vs. dog (some cats and splints; whew! Stand back!)

## **HUMERUS HELPERS:**

- Thankfully, the humerus is probably the least common longbone fracture. Shoulders are another hard joint to immobilize, but actually easier than the hip (see Male Dog Problem above). A spica works well, but a non-weight bearing sling can be quite effective too using the chest wall as your immobilization device.
- Along those lines, here is a little tip that I discovered in my shelter/rescue work with broken animals (mind you, this is not a scientific study with loads of followup, so proceed eyes-open.) For kittens and puppies less than 12wks of age only (my current cut off), I do rely on the chest wall as my immobilization device for a definitive method of repair, i.e. no surgery, no anesthesia risk. It is not for every animal; some will not tolerate the restrictions they feel, but it is only needed for 2-3wks, so drugs can bump up the percentage of patients who will be accepting. Technique is as follows:
  - ❖ Narcotics on board.

- ❖ One person holds the pet in a standing position (under their own steam, or "hang" from grip on dorsal neck and dorsal lumbar...easy to do on these little guys with just thumb and pointer "pinching" around neck base and lumbar muscled just in front of pelvis).
- ❖ Second person pinches the elbow and pulls straight back, so the humerus is parallel to the table and snug to the chest wall. Forearm hangs down, foot pointed to table. Traction here is helpful, so no squeamish elbow tractioners.
- ❖ Third person applies the bandage. Start with 2 or 3" cast padding. Wrap around the body and upper arm. Leave the forearm out, but go as far back as you can to just cover the elbow that is being pinched/tractioned.
- ❖ Next apply 2 or 3" vetwrap in same manner.
- ❖ The goal of this is to have the humerus flat to the chest wall and straight, and the cranial aspect of the elbow "hooked" on the back edge of your bandage to maintain traction, and the pet can breathe. Make sure you have all of those achieved.
- ❖ Change bandage as needed or every 1wk.
- ❖ Total wear time is 2-3wks.

### **BANDAGE TECHNIQUE**

I have seen 101+ bandage techniques in my day, some without any technique I could describe! If your technique works, stick with it. If not, or if the thought of bandaging something gives you the willies and you always hand it off to someone else, read on (or pass this on to that person too!)

Goals: To cover and/or immobilize a limb such that the patient will be as or more comfortable than when you started, underlying tissues will remain healthy or get healthier, and the device will remain intact until planned removal.

1. Apply stirrups: White tape. Usually no more than ½" strips (ripped lengthwise for toy, small, medium breeds) or 1" strips (large breed). Length = 2-3x paw length. Apply cranial only or cranial and caudal. (*side note*: medial and lateral is fine too, but if you have someone helping you by tractioning the stirrups, this will squeeze the toes together while you are applying the bandage; the toes will remain uncomfortably squished.) When changing bandages, especially in cats and small dogs, don't yank the stirrups off. Just cut them flush with the foot and apply the new ones on top. When the bandages come off for the last time, only one tape yank to do. The skin will thank you!!!
2. Apply cast padding from foot up, 50% overlap. This CANNOT be applied too tight, literally. But it can be applied too loose. Snug this as you apply each wrap from side to side. No wrinkles allowed; "dart" when you change directions or go wide to narrow. (Sewing reference, look it up.) Number of layers depends...see comments above/throughtout.
3. Apply roll gauze from foot up, one layer w/ 50% overlap. This can be applied too tight. In areas with lots of muscle or lots of cast padding, it's ok to give it a snug tug. The goal is even distribution of snugness. Be consistent as you apply.
4. Install splint device (if using), lateral or caudal.
5. Apply 2<sup>nd</sup> roll of gauze, one layer w/ 50% overlap.
6. Rotate stirrups up and tape to gauze. Stick your finger in between toes and tape and loosen the hairs that are caught in the tape!!!! Great "he was chewing the bandage down there" prevention.
7. Apply vetwrap, one layer w/ 50% overlap.

**Note:** When using a splint, always finish off by making sure the leg is bent slightly in the right places to facilitate walking with the splint on. An uber-straight leg is *aaawk-ward!* For custom 3M splints, this has to happen immediately after applying the 2<sup>nd</sup> roll gauze before the casting tape hardens.

**Note:** Don't twist the foot around when applying the bandage. Easy to do in a fractured limb. An xray with the foot on backward is *aaawk-ward!*

**Note:** Modified tongue depressor splint-- Please see last article Nov15, Ortho Emergencies Part 1.

**Note:** Custom 3M casting tape splint-- Please see last article Nov15, Ortho Emergencies Part 1. Very, very worth it.

### **BANDAGE SUPPLY LIST**

Cast padding: The only stuff worth stocking, in my humble opinion, is **Specialist Cast Padding by BSN Medical**. Easy to get. It will go on without wrinkles, it can be conformed snugly with gentle traction, and the corrugations are built in "how tight" indicators as you apply (just stretch enough to flatten those out.) *Recommend minimum stock: 3" size.* If you will stock two sizes, 2" and 4". For toy breeds and cats, I always cut down to 1". Just unroll slightly and start cutting, then re-roll.

Roll gauze: The only stuff worth stocking, yada yada, is **brown utility gauze**. It is cheap. It is easy to get. It has just enough "give" to it. It stays flat when you apply; often the stretch gauze products will have a band of tight across the middle of the width depending on how you hold it. The end result with brown gauze is a smooth/even compression; the other, not so much. *Recommended minimum stock: 3" size.* If you will stock two sizes, 3" and 6". The larger is great for body wraps, spica splints, and more.

3M Casting Tape: Great stuff, easy to use, easy to source, one-size-fits-most. *Recommended minimum stock: 3" size.*

Vetwrap (or equivalent): *Recommended minimum stock: 4".* If you will stock two sizes, 2" and 4".

Elasticon: Love-hate relationship with this stuff. Let's just start with, *it's expensive*. Next, *please do NOT apply this as an outer wrap to bandages* (like Vetwrap is commonly used). It is heavy (adds unnecessary weight to your bandage), and you need Arnold Schwarzenegger and a chainsaw to cut it off. *Also, please, please, please do NOT tape directly to the patient.* It is nasty to get off. Now, I understand that is why folks like to tape it to the patient, so bandages don't go anywhere. I can empathize with that, certainly. But I can also empathize with the dog or cat that has tape pulling on their hair the entire time the bandage is on. And I can empathize with the skin of the groin or armpit when trying to peel this industrial stick-um off that tender skin. If you absolutely must tape to the patient, use that uber-stick-um to your advantage and minimize the pet morbidity during multiple bandage changes. Put on a layer or ring of Elasticon on the pet. Use that as your "base plate" that you tape "to". During each bandage change, untape "from" that base plate and then reapply to it. Don't remove the base plate until the last bandage removal...then treat the skin with some spa products to make up for it. The only places I use Elasticon are: 1) square patches pasted on the bottom of the foot to prevent premature wear of the bandage, and 2) Ehmer slings with roll gauze underneath majority of the bandage preventing excess skin-hair removal when sling time is over. Whew, ok, enough about Elasticon.

White tape, 1"

Tongue depressors

Used IV bags (cut end off, poke holes, thread with roll gauze for tie-on, waterproof foot protection.

### **WHAT BONES NEED SURGERY**

There are a lot of ways to get something to heal. Which is the best way depends on the pet owner's goal. I know it is often easier and faster to just say, "this is what you need to do to fix this fracture". It just isn't accurate and puts ALL of the liability directly on your shoulders. Most owners don't want the discussion either, I KNOW. But it does not stop me from having the discussion of choices given all of the risks and benefits. They choose, they assume some of the responsibility.

With just the question of surgery vs. no surgery to heal a fracture, here is a nutshell answer:

#### **Need surgery:**

Femur, all ages, 99% of the time

Humerus, >12wks age, 99% of the time

Tibia, >16wks, 90% of the time, majority do better with surgery

Radius, >16wks, distal radius, toy/small breed, 99% of the time

Open fractures any bone.

Pathologic fractures any bone.

Articular fractures any bone.

#### **No surgery viable option:**

Humerus, <12wks age

Tibia, <16wks, intact fibula, green stick, 50% overlap fragments (all support no surgery)

Radius, <16wks, medium/large breed, intact ulna, green stick, 50% overlap fragments (all support no surgery)

### **NAMING A FRACTURE**

One last note..."clean break". *What is that?* Ya'll navigated the same challenging vet school entrance requirements I did, went to the same classes I did in school, paid the same large sum of money for the privilege. And now many of you want to describe a fracture to me using the phrase "clean break"? Just don't do it; means nothing. Where are your \$20 and \$100 words? You earned them! Flex your knowledge, wow me with your creative descriptions! And make my life oh-so-much-easier with a fracture description that paints an accurate picture. Just like a standard signalment (those are appreciated too!), there are standard descriptive components to a fracture (**"F"ive for "F"racture**):

1. Bone
2. Location
  - a. Proximal 1/3
    - i. Articular
    - ii. Non-articular
  - b. Midshaft
  - c. Distal 1/3
    - i. Articular
    - ii. Non-articular
3. Architecture
  - a. Transverse

- b. Short oblique (width of the end of the fragment is 1-2x diameter of cortex; just a little angle)
  - c. Long oblique (width of end of fragment is >2x diameter of cortex; a good lookin' spike!)
  - d. Spiral (wraps around a bit)
  - e. Comminuted (more than just the 2 proximal and distal main fragments)
  - f. Avulsion
  - g. Pathologic
    - i. Lytic
    - ii. Proliferative
    - iii. Combination
4. Open vs. closed
- a. Wound overlying only
  - b. Bone exposed
  - c. High velocity projectile penetration
5. Duration
- a. Known
  - b. Estimate

Example: "I've got a 2yr old male neutered Brittany with a 3 day old (5) distal 1/3 articular (2) comminuted (3), closed(4) femur (1)) fracture that needs probable surgical repair."

Ok, so off you go. I have been yammering on long enough here. Put out a sign, "Fractures R Us" and get those suckers splinted. The patients will love you. The clients will thank you. And the receiving surgery team (when applicable) will sing your praises to the fracture goddess!!

Lara Rasmussen, DVM, MS  
Diplomate, American College of Veterinary Surgeons

