Casting Call:
What fractures make the cut?

A guide on which fractures can be casted and which need surgery

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Casting Call: “Goals of this Lecture”

- Review fracture description and diagnosis
- Practice fracture description
- Determine whether they are an appropriate case to cast or whether they need to get cut

A Reminder

Before getting into fracture diagnosis and planning:

- Stabilize trauma patients
- Administer pain meds
- Initiate antibiotics if wounds exist

After that is performed, take orthogonal radiographs centered on the fracture site to diagnose and define fractures

Fracture Characteristics

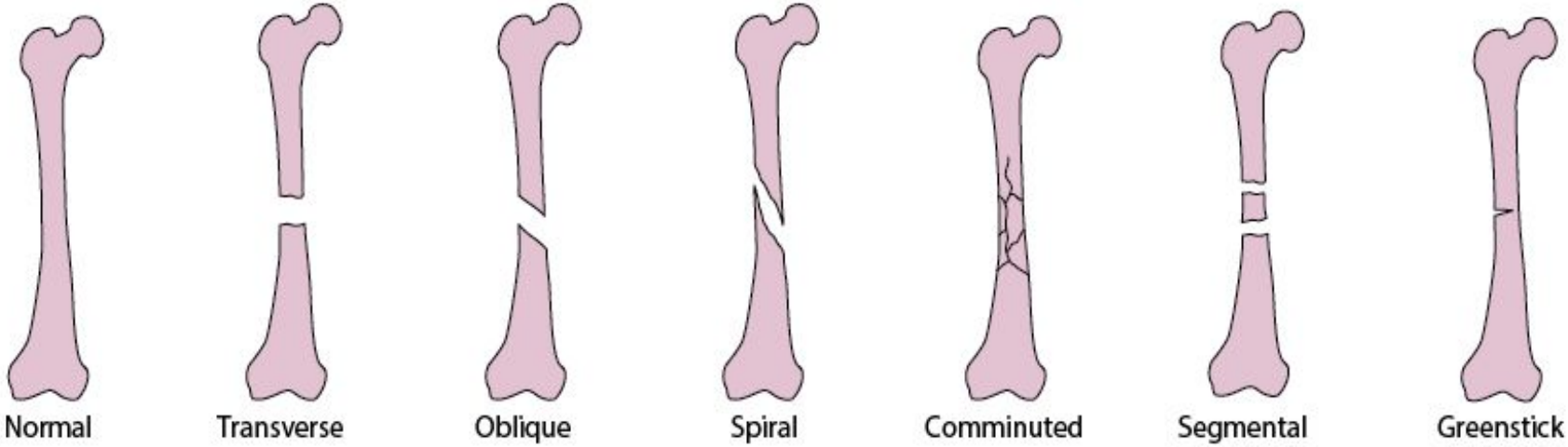
Description of fractures is important to do correctly

Get orthogonal views - can consider slightly rotated views to get correct diagnosis

Important descriptors include:

- Shape
- Location on the bone
- Skin integrity
- “Fracture of the...”
- Sidedness
- Bone(s) affected
- Displacement severity and direction

Fracture Shape Review



Fracture Shape Review

Transverse: Perpendicular to bone

Short oblique: < 1.5-2 times bone width, <45 degrees from perpendicular

Long oblique: >1.5-2 times bone width, >45 degrees from perpendicular

Spiral: Spiral shape, may look like long oblique on one view

Comminuted: More than two fragments

“Butterfly fragment”: Transverse from one cortex that splits into two obliques towards the opposite cortex

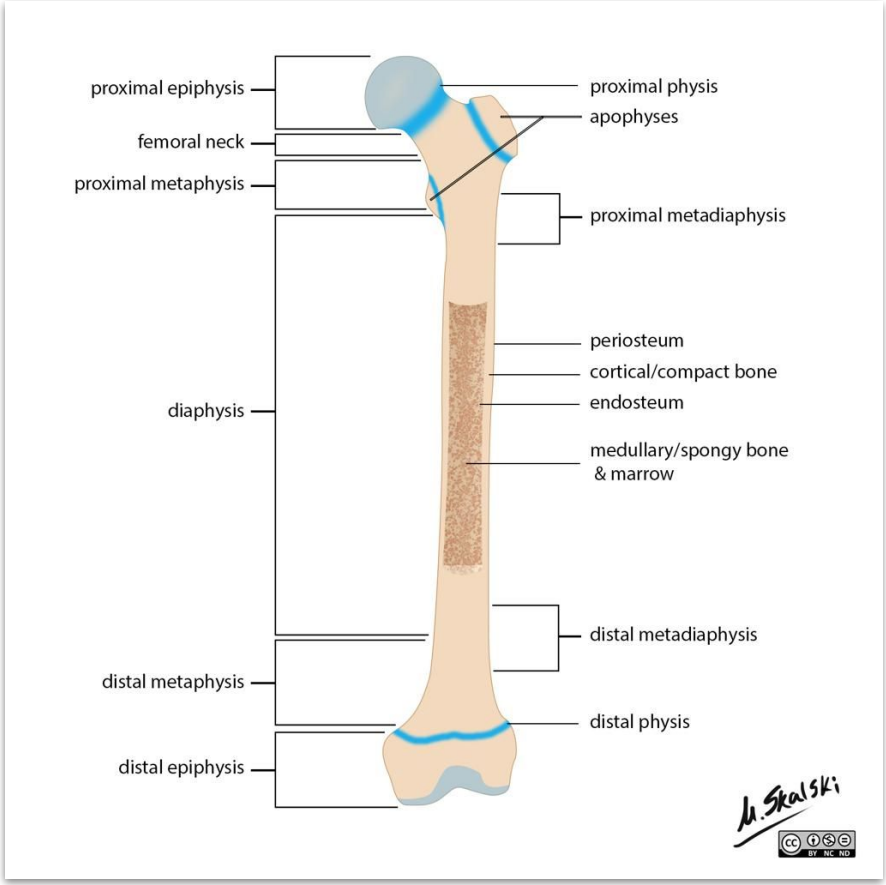
Segmental: Multiple typically transverse fragments in a row

Greenstick: Incomplete fracture, typically in juvenile patients

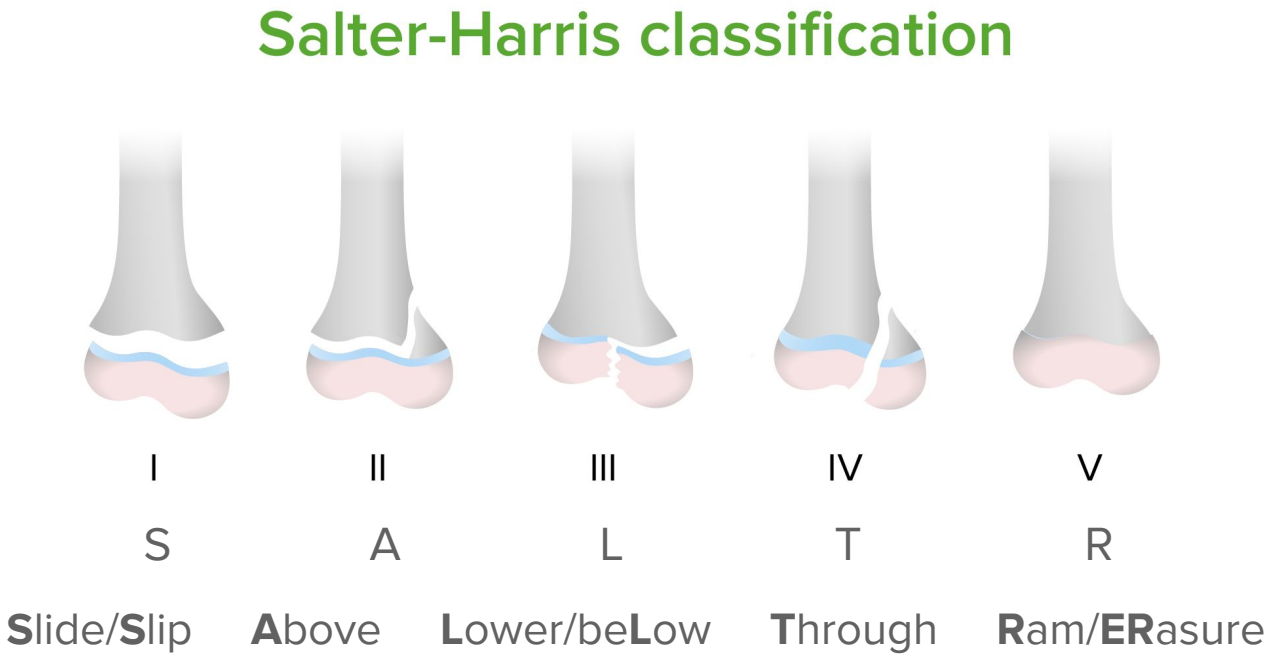
Bone Location

Approximate location of the fracture is acceptable:

- Epiphysis
- Physis - growth plate
- Metaphysis
- Diaphysis



Salter Harris Review

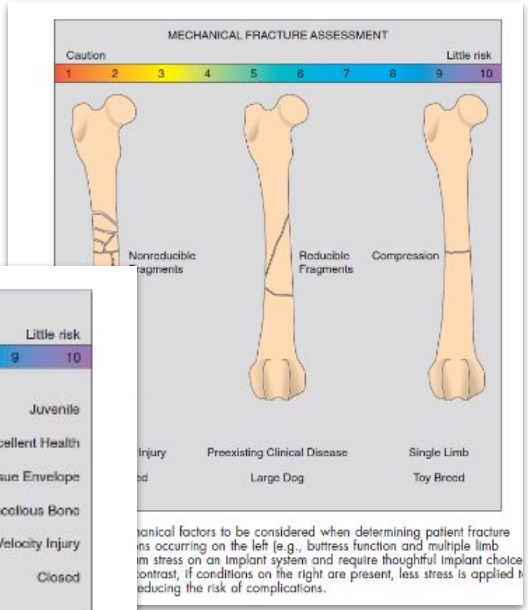


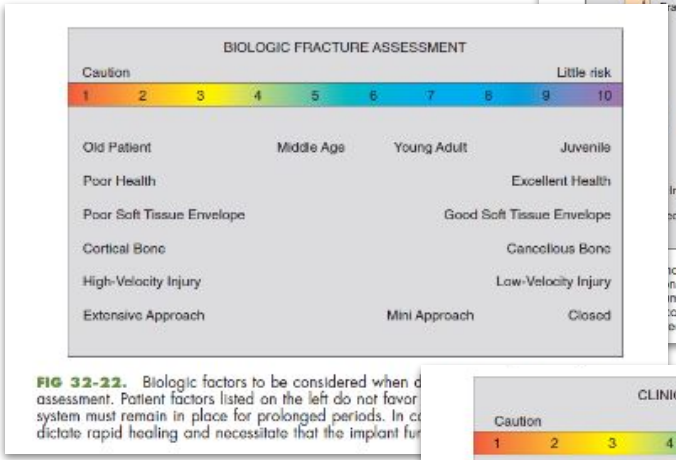
Subjective Success Metrics

Mechanical Fracture Assessment

Biological Fracture Assessment

Clinical Fracture Assessment





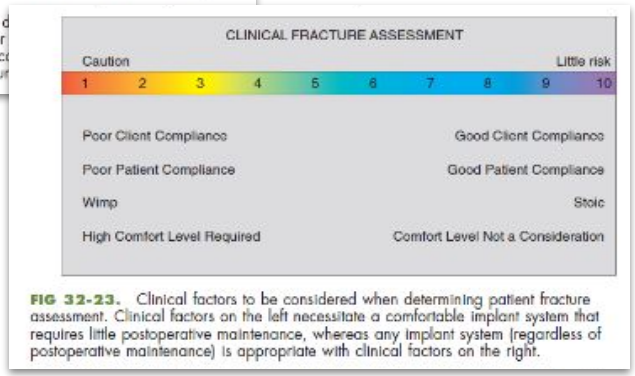


FIG 32-23. Clinical factors to be considered when determining patient fracture assessment. Clinical factors on the left necessitate a comfortable implant system that requires little postoperative maintenance, whereas any implant system (regardless of postoperative maintenance) is appropriate with clinical factors on the right.

Mechanical Fracture Assessment

Fracture Shape:

- More success with fewer pieces, better alignment, less displacement
- Single limb trauma more successful than polytrauma

Signalment/Patient Size

- More success with smaller patients given amount of force they put on their limbs relative to larger patients

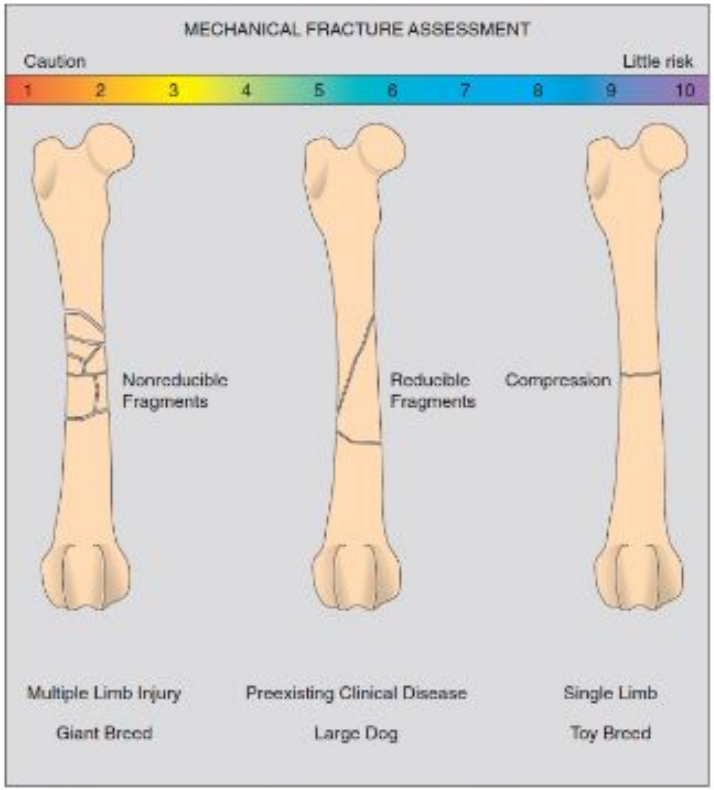


FIG 32-21. Mechanical factors to be considered when determining patient fracture assessment. Conditions occurring on the left (e.g., buttress function and multiple limb injury) place maximum stress on an implant system and require thoughtful implant choice and application. In contrast, if conditions on the right are present, less stress is applied t the implant system, reducing the risk of complications.

Biological Fracture Assessment

Signalment/Age:

- Younger patients heal better than older patients

Health of overlying tissue

- Healthier “soft tissue envelope” encourages better healing
- Less tissue handling to repair fracture means less disrupted healing
- Leaving hematoma around fracture intact aids faster healing

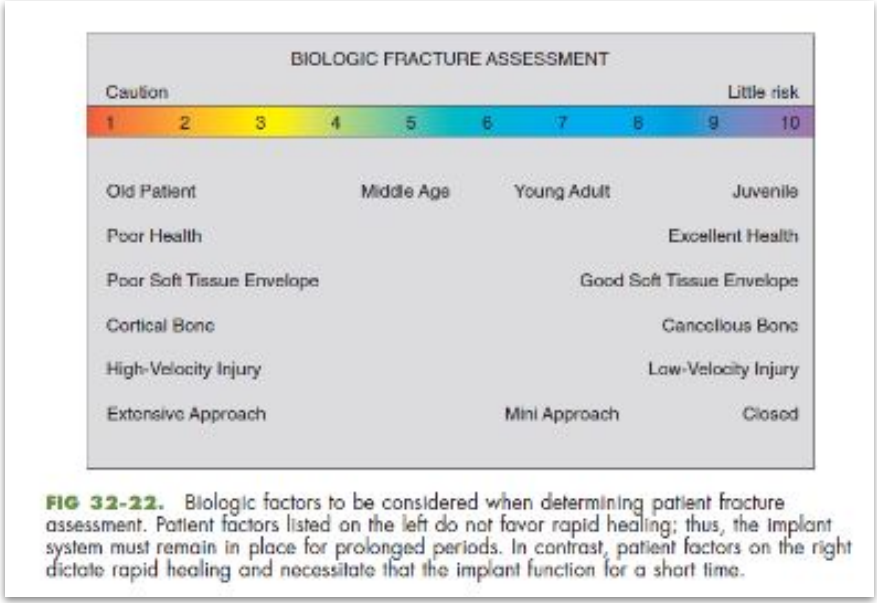


FIG 32-22. Biologic factors to be considered when determining patient fracture assessment. Patient factors listed on the left do not favor rapid healing; thus, the implant system must remain in place for prolonged periods. In contrast, patient factors on the right dictate rapid healing and necessitate that the implant function for a short time.

Clinical Fracture Assessment

Owner and patient compliance:

- More success if owner follows instructions and patient is easier to work with

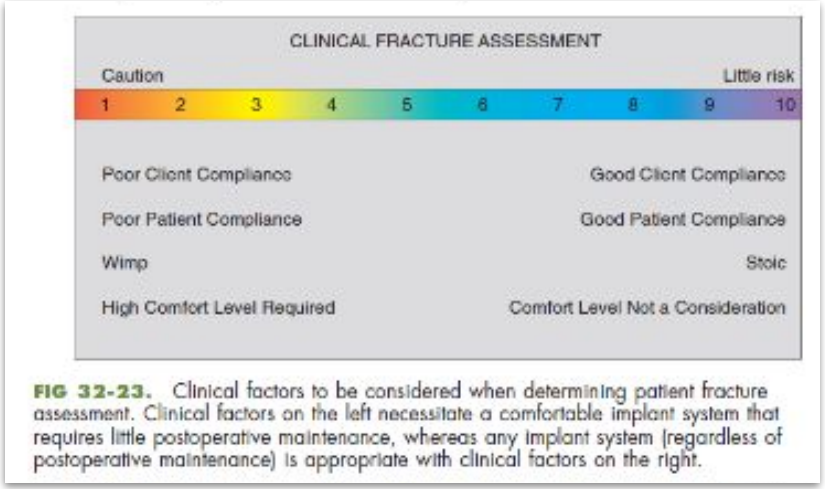


FIG 32-23. Clinical factors to be considered when determining patient fracture assessment. Clinical factors on the left necessitate a comfortable implant system that requires little postoperative maintenance, whereas any implant system (regardless of postoperative maintenance) is appropriate with clinical factors on the right.

Making the “Cast List” Steps

1. Describe the fracture
2. Determine reasons to coapt
3. Determine reasons to cut
4. See which option is better

The Auditions

Audition 1:
“The Hit By Car”

Candidate:

9yo FS Labrador

Fracture description:

- Shape:
- Location:
- Skin integrity:
- “Fracture of the…”
- Sidedness:
- Bone affected:
- Displacement:

Audition 1:
“The Hit By Car”

Fracture description:

- Shape: Irregular transverse
- Location: Distal diaphyseal
- Skin integrity: Closed
- “Fracture of the…”
- Sidedness: Right
- Bone affected: Radius/Ulna
- Displacement: Lateral proximal

“Irregular transverse distal diaphyseal closed fracture of the right radius/ulna with lateral proximal displacement”

Audition 1:
“The Hit By Car”

<u>Reasons to coapt</u>:

- Shape - fragments could interdigitate given irregular margins
- Location - may be difficult to get sufficient implants in distal fragment

<u>Reasons to cut</u>:

- Patient size - cast may not be strong enough to stabilized
- Displacement - may be difficult to reduce closed

<u>Recommendation</u>:
Surgery is preferred, but fracture may do well in cast if reduction is sufficient. Surgery needed if cannot reduce

Audition 2:
“The Frenchie at Daycare”

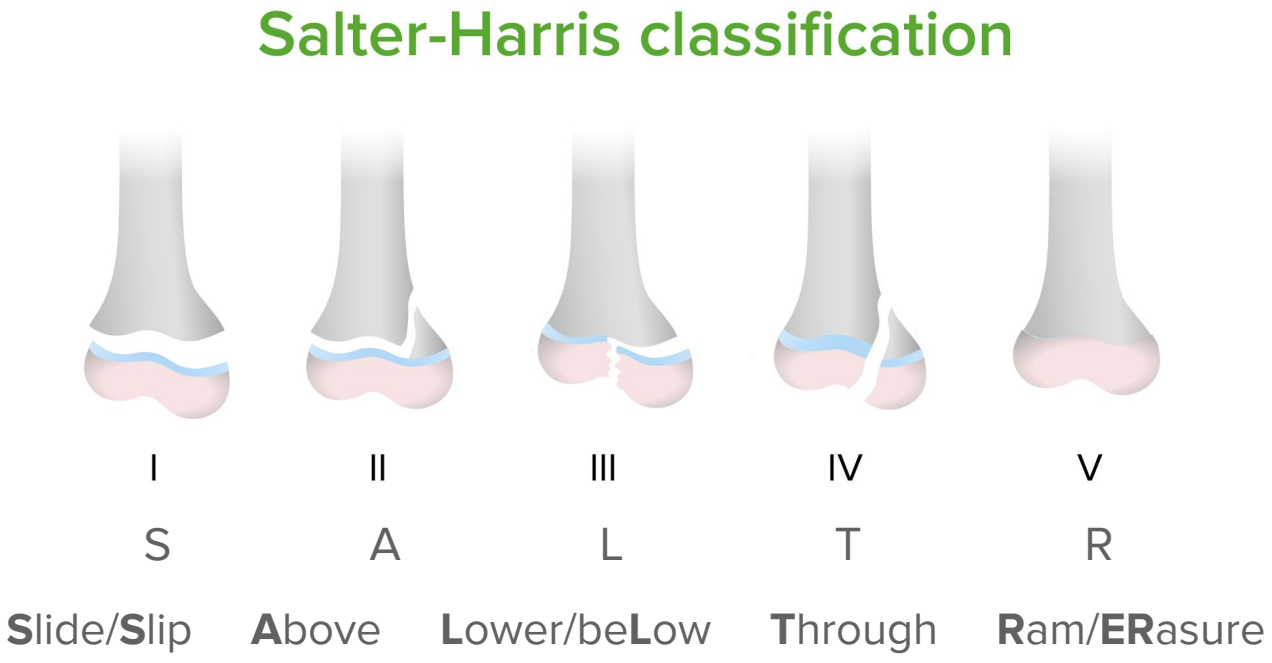
Candidate:

4mo M Frenchie, wiggling like crazy despite having a broken limb

Fracture description:

- Shape:
- Location:
- Skin integrity:
- “Fracture of the…”
- Sidedness:
- Bone affected:
- Displacement:

Salter Harris Review



Audition 2:
“The Frenchie at Daycare”

Fracture description:

- Shape: Salter Harris type 4
- Location: Lateral humeral condyle
- Skin integrity: Closed
- “Fracture of the…”
- Sidedness: Left
- Bone affected: Humerus
- Displacement: Proximal

Full description: “Salter Harris type 4 lateral humeral condylar closed fracture of the left humerus with proximal displacement”

Simple description: “Left lateral humeral condylar fracture”

Audition 2:
“The Frenchie at Daycare”

Reasons to coapt:

- None. This is not a castable fracture

Reasons to cut:

- Fracture location - joint and open growth plate involvement indicates surgery
- Temperament - will not tolerate coaptation long term
- Age - patient will heal quickly and will not have a functional joint without surgery

Recommendation:

Surgery is absolutely needed as soon as possible. Amputation may need to be considered if surgical stabilization cannot be performed

Audition 3:
“The Stepped On Foot”

Candidate:

2yo MN German shepherd

Fracture description:

- Shape:
- Location:
- Skin integrity:
- “Fracture of the…”
- Sidedness:
- Bone affected:
- Displacement:

Audition 3:
“The Stepped On Foot”

Fracture description:

- Shape: Transverse
- Location: Middiaphyseal
- Skin integrity: Closed
- “Fracture of the…”
- Sidedness: Left
- Bone affected: Metacarpals III, IV, and V
- Displacement: Caudoproximal

“Transverse middiaphyseal closed fracture of the left metacarpals III-V with caudoproximal displacement”

Audition 3:
“The Stepped On Foot”

Reasons to coapt:

- When patient is small, bones are too small for implants to be placed
- Displacement is minimalis, so should heal well with coaptation

Reasons to cut:

- When patient is larger, bones are large enough for implants to be placed
- No intact weight bearing metacarpals, so surgery would be ideal to stabilize metacarpals faster

Recommendation:
Surgery for smaller patients isn’t possible, but would be ideal for larger patients if weight bearing digits are fractured. Can reasonably coapt if nonweight bearing digits are fractured

Surgical repair of metacarpal/tarsals

The “Wolverine” surgical repair

Bones needs to be large enough to fit intramedullary pins

Can also consider bone plates, but again, bones have to be large enough for external implants

Typically coapted post-op

Audition 4:
“The Dog Park Chase”

Candidate:

9mo FS Border Collie

Fracture description:

- Shape:
- Location:
- Skin integrity:
- “Fracture of the…”
- Sidedness:
- Bone affected:
- Displacement:

Audition 4:
“The Dog Park Chase”

Fracture description:

- Shape: Greenstick/Long oblique
- Location: Middiaphyseal
- Skin integrity: Closed
- “Fracture of the…”
- Sidedness: Right
- Bone affected: Tibia (intact fibula)
- Displacement: No displacement

“Greenstick long oblique midiaphyseal closed fracture of the right tibia with no displacement”

“Greenstick fracture of the tibial diaphysis with intact fibula”

Audition 4:
“The Dog Park Chase”

Reasons to coapt:

- Intact fibula! Internal splint
- Incomplete (greenstick) fracture
- No displacement
- Young patient who should heal quickly

Reasons to cut:

- None, you’ll just slow down healing by disrupting the fracture hematoma

Recommendation:
Cast that sucker, it’ll heal real quick. Surgery may actually slow healing down

Audition 6:
“The Dog Park Crash”

Candidate:

9mo FS Border Collie

Fracture description:

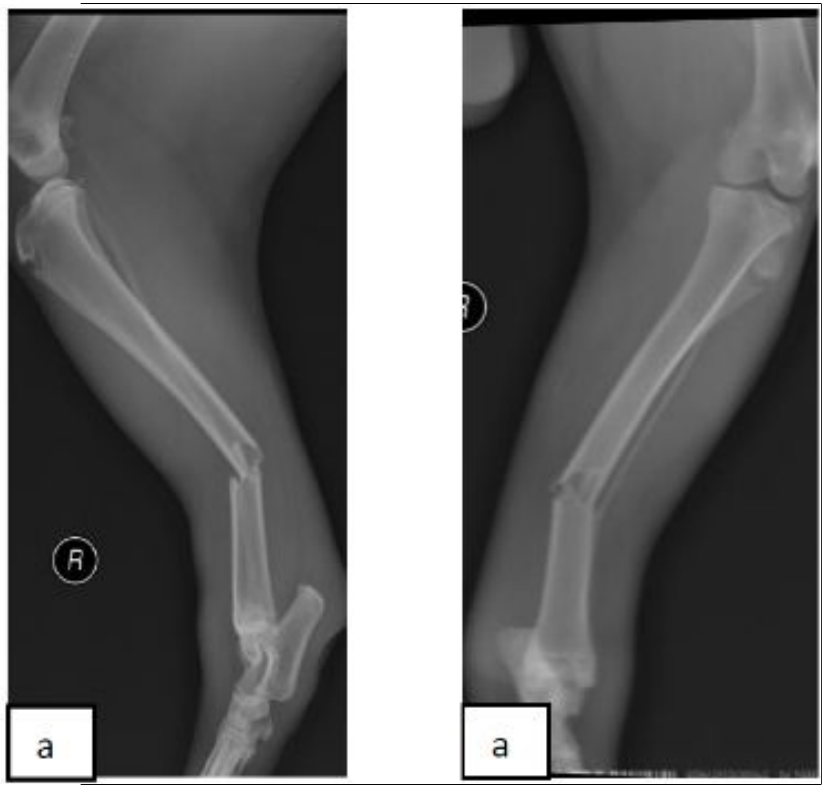
- Shape:
- Location:
- Skin integrity:
- “Fracture of the…”
- Sidedness:
- Bone affected:
- Displacement:

Audition 5:
“The Dog Park Crash”

Fracture description:

- Shape: Transverse
- Location: Middiaphyseal
- Skin integrity: Closed
- “Fracture of the…”
- Sidedness: Right
- Bone affected: Tibia AND fibula
- Displacement: No displacement

“Transverse midiaphyseal closed fracture of the right tibia and fibula with no displacement”



Audition 5:
“The Dog Park Crash”

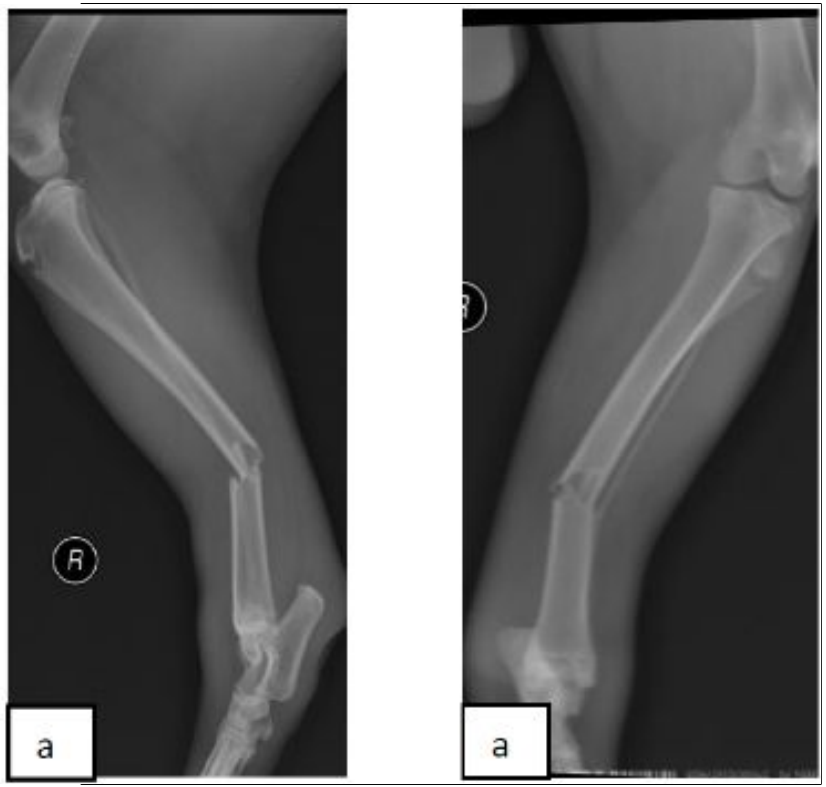
<u>Reasons to coapt</u>:

- Patient age - young dog and will heal well
- Displacement - there is angulation but no displacement of the fragments

<u>Reasons to cut</u>:

- Fibula also broken - no internal stabilizer like the previous tibial fracture example
- Patient temperament - may be too active for a cast and extra stability from surgery may improve outcome

<u>Recommendation</u>:
Surgical stabilization would be ideal, but casting would not be unreasonable given minimal displacement and young patient age



Audition 6:
“The Gun Shot Wound”

Candidate:

6yo MI Pitbull

Fracture description:

- Shape:
- Location:
- Skin integrity:
- “Fracture of the…”
- Sidedness:
- Bone affected:
- Displacement:

Audition 6:
“The Gun Shot Wound”

Fracture description:

- Shape: Comminuted
- Location: Proximal femur/femoral neck
- Skin integrity: Open
- “Fracture of the…”
- Sidedness: Right
- Bone affected: Femur
- Displacement: Proximal

“Comminuted proximal femoral open fracture of the right femur with proximal displacement”

Audition 6:
“The Gun Shot Wound”

Reasons to coapt:

- No. Just No

Reasons to cut:

- Open wound
- Highly comminuted
- Coaptation of the femur should be avoided
- Proximity to joint means high amount of force on fragments - needs implants to reasonably stabilize

Recommendation:

Surgery, no other option. Fixation or amputation are both reasonable. Also could consider an FHO in this case specifically

Audition 7:
“The Hit by Moped”

Candidate:

3yo MN Labrador

Fracture description:

- Shape:
- Location:
- Skin integrity:
- “Fracture of the…”
- Sidedness:
- Bone affected:
- Displacement:

Audition 7:
“The Hit by Moped”

Fracture description:

- Shape: Transverse to oblique
- Location: Body
- Skin integrity: Closed
- “Fracture of the…”
- Sidedness: Unknown
- Bone affected: Scapula
- Displacement: None

“Transverse body closed fracture of the scapula with no displacement”

“Scapular body fracture”

Audition 7:
“The Hit by Moped”

Reasons to coapt:

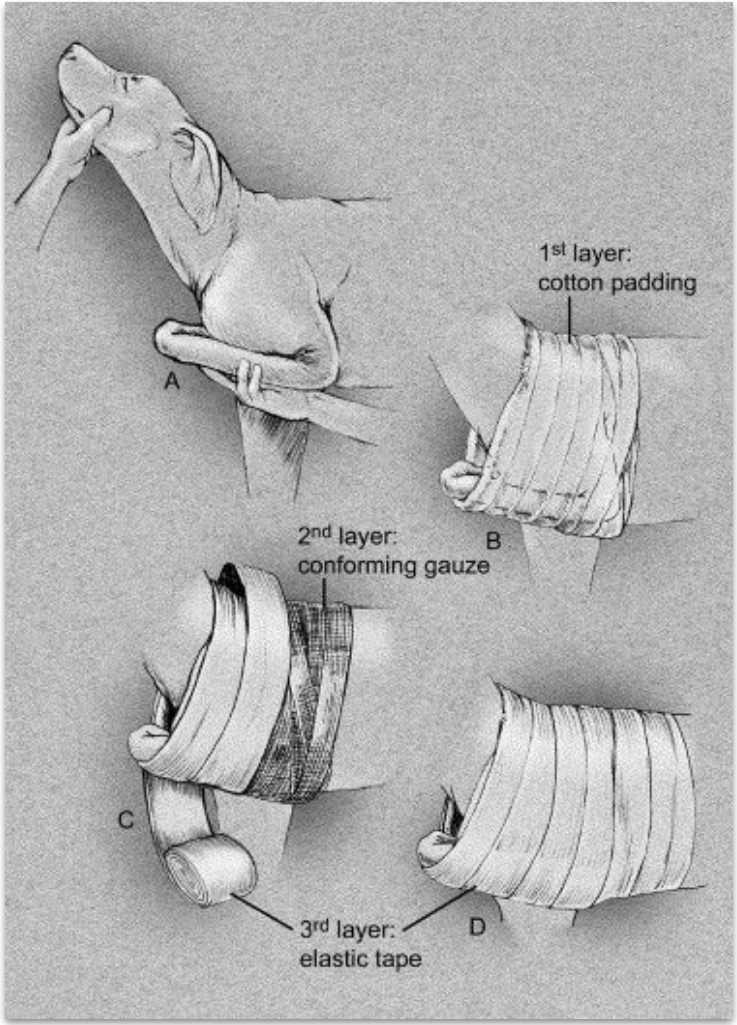
- Location - fracture is in the body away from a joint, so surgery is less vital
- Bone structure - thin bone can be difficult to fit implants on
- Technically difficult - scapular fractures are tough to fix given importance of structures supplying the remainder of the forelimb, high chance for iatrogenic damage

Reasons to cut:

- Angulation - scapular fracture may heal with angulation if not stabilized surgically, but likely would not cause a clinical problem

Recommendation:
Velpeau bandage would be adequate for body fracture.
Surgically stabilize if fracture closer to the joint

Velpeau Sling



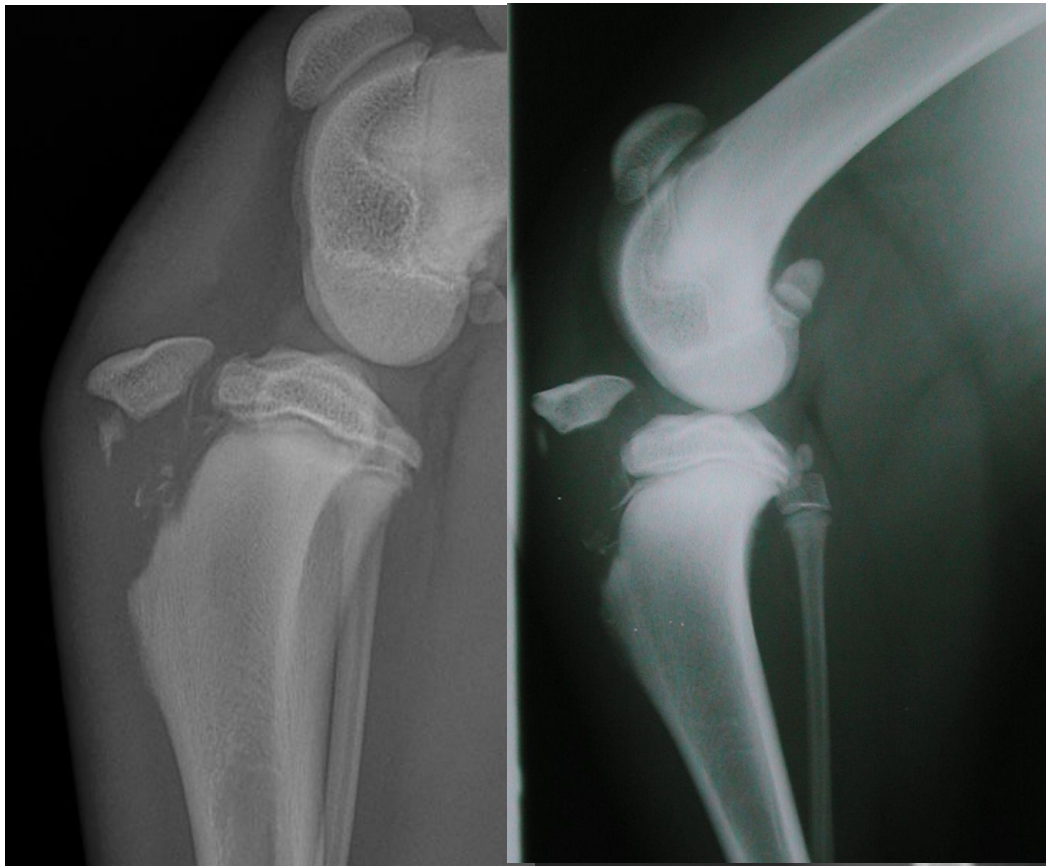
Audition 8:
“The Hyperactive Puppy”

Candidate:

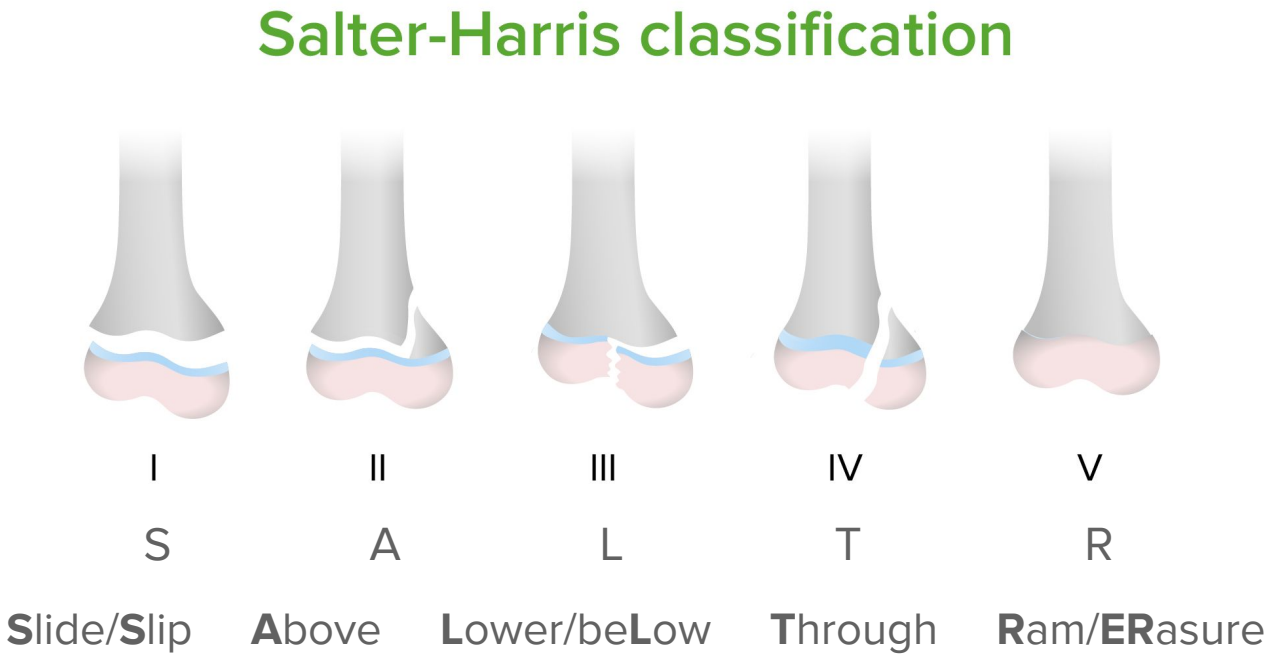
4mo MI Shiba Inu

Fracture description:

- Shape:
- Location:
- Skin integrity:
- “Fracture of the…”
- Sidedness:
- Bone affected:
- Displacement:



Salter Harris Review



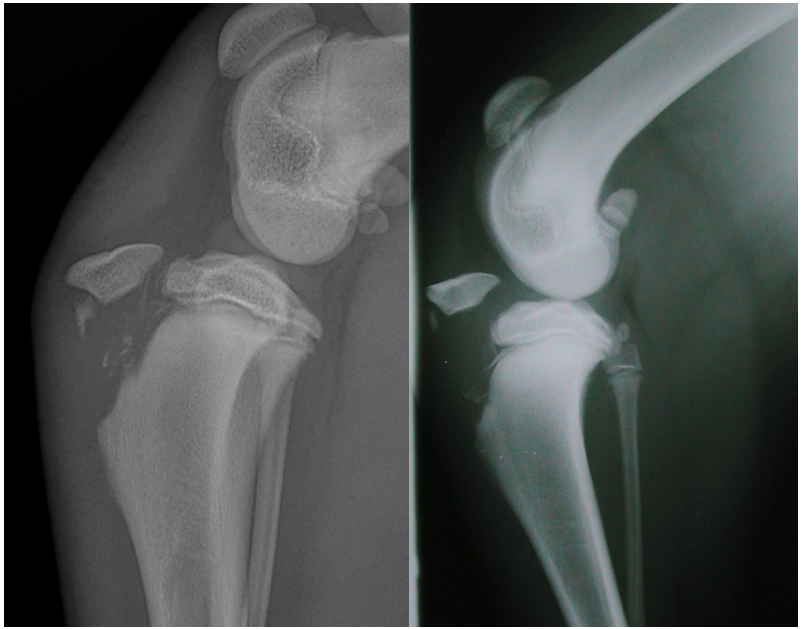
Audition 8:
“The Hyperactive Puppy”

Fracture description:

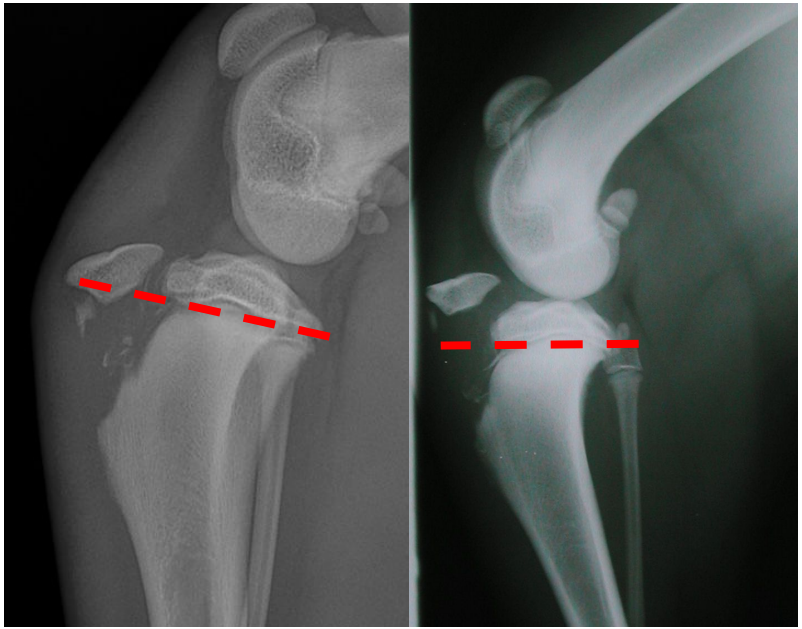
- Shape: Salter Harris type I (could be argued it’s type II)
- Location: Tibial tuberosity
- Skin integrity: Closed
- “Fracture of the…”
- Sidedness: Can’t tell from radiographs
- Bone affected: Tibia
- Displacement: Proximal displacement

“Salter Harris type I closed fracture of the tibial tuberosity with proximal displacement”

“Tibial tuberosity avulsion fracture, moderately and severely displaced”



Audition 8:
“The Hyperactive Puppy”



Reasons to coapt:

- If level of displacement is not severe (meaning the tuberosity is not proximal to the tibial plateau), it can heal on its own without major issues

Reasons to cut:

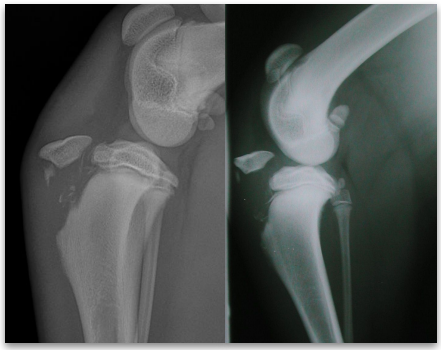
- If displacement is severe (meaning the tuberosity is proximal to the tibial plateau), the displacement will impact the patellar function and increase risk for patellar luxation

Recommendation:
Surgical stabilization is always an option, can consider coaptation if displacement is not severe AND you regularly recheck radiographs to ensure that displacement does not worsen (like every 1-2 weeks until displacement is static between rechecks)

The Call Backs:

Who made the cast list?

Call Backs



The Cast List

Fractures that **DO** make the cast list:

- Simple, non-comminuted fracture shape
- Closer to diaphysis and does not involve a joint or an open growth plate
- Minimally displaced fractures with at least 50% overlap between fragments
- Patients who should have a good healing response
- Patients who will tolerate having a cast in place and will tolerate frequent bandage changes (or whose owners will comply with bandaging instructions)
- Closed fractures or open fractures where skin can be closed fully

The Cast List

Fractures that **DON'T** make the cast list:

- Comminuted fractures
- Joint or open growth plate involvement
- Severely displaced fractures that cannot be reduced
- Patient who may not heal the best in a cast like older animals or small dogs with less blood supply to distal extremities
- Patients who won't tolerate having a cast in place, or are more aggressive for frequent bandage changes
- Open fractures where skin cannot be closed fully

Curtain Call (The main takeaways)

- Correctly describing a fracture is the first step for planning
- Orthogonal views of fractures are important to ensure that you see the fracture fully
- Center radiographs over the fracture to avoid distortion
- Can consider slightly rotated radiographs to make sure fracture is correctly identified
- Consider all the factors involved in healing so you can assess whether coaptation or surgical stabilization is better

Contact us!

Questions about a case or just want help confirming your diagnosis and fracture management plan?

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