

Pilon Fractures



Outline

- Initial management
- Assessment
- Approach
- Outcomes



Outcomes



Outcomes



who



Assessment

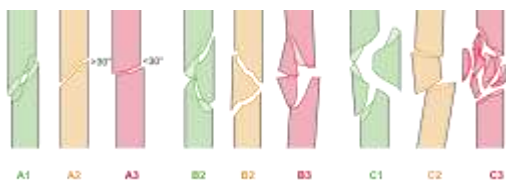
How do we assess soft-tissue injuries?

- A fracture involves:-
 - Skin
 - Subcutaneous fat
 - Muscle
 - Periosteum
 - Bone

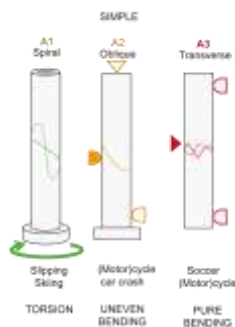


Fracture mechanisms diaphysis

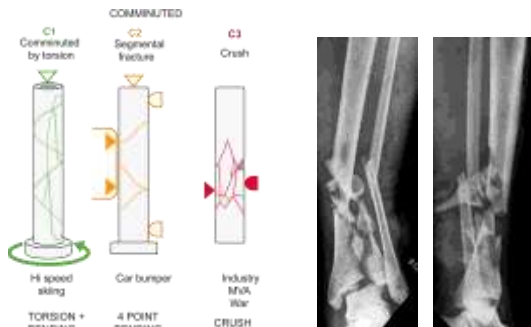
- Torsion (skiing)
- Bending (indirect)
- Compression (fall from a height)
- Contusion (direct, bumper injury)
- Combinations



Low-energy fracture patterns

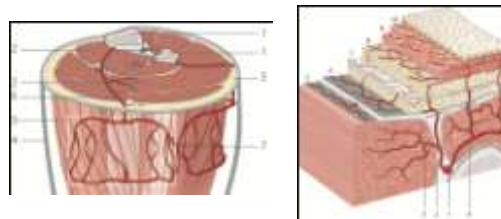


High-energy fracture patterns



Vasculature of the skin

- Vascular supply to the skin is directly related to perforators that come through muscle from named arteries



Classification of closed fractures

Tscherne and Oestern, 1982



C 0

- No, or no significant, soft-tissue trauma
- Simple fracture
- Indirect mechanism

Classification of closed fractures

C I

- Soft-tissue contusion
- Fracture pattern usually simple



Classification of closed fractures

C II

- Deep erosion
- Contusion—localized
- Tangential trauma
- Compartment syndrome possible
- Complex fracture (two levels)
- Direct mechanism



Classification of closed fractures

C III

- Deep erosion
- Contamination
- Contusion—diffuse
- Tangential trauma
- **Manifestation of compartment syndrome**
- Complex fracture
- Direct mechanism



Classification of closed fractures



C IV

- Deep erosion
- Contamination
- Contusion
- Tangential trauma
- Shear injury
- Manifestation of compartment syndrome
- Complex fracture
- Direct mechanism
- **Vascular injury with reconstruction**

AO soft-tissue classification

Integumentum closed (IC)

- IC 1 = no skin injury
- IC 2 = contusion without skin laceration
- IC 3 = local degloving
- IC 4 = extensive, closed degloving
- IC 5 = necrosis due to deep contusion

Rüedi, Border, Hanson, Tschern

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- IC 5 = **necrosis due to deep contusion**



Rüedi, Border, Hanson, Tschern

AO soft-tissue classification

Integumentum open (IO)

- IO 1 = skin perforated from inside out
- IO 2 = skin perforation from outside < 5 cm
- IO 3 = local degloving, contusion > 5 cm
- IO 4 = loss of skin, deep contusion
- IO 5 = open degloving



Rüedi, Border, Hanson, Tschern

AO soft-tissue classification

Neurovascular injury (NV)

- NV 1 = no injury
- NV 2 = isolated nerve injury
- NV 3 = local vascular injury
- NV 4 = combined neurovascular injury
- NV 5 = sub/total amputation

Rüedi, Border, Hanson, Tschern

AO soft-tissue classification

Muscle and tendon injury (MT)

- MT 1 = no injury
- MT 2 = isolated (one group)
- MT 3 = two or more groups
- MT 4 = loss of muscle groups, tendon
- MT 5 = compartment/crush syndrome

Rüedi, Border, Hanson, Tschern

Co-morbidities

- Age
- Diabetes
- Vascular
- Immune compromised
- Steroids etc



Span

- Soft tissues
- Fracture distraction
- Stability



Time to declaration





“I tried to do an ORIF but too much swelling and bleeding so I just closed it up” !

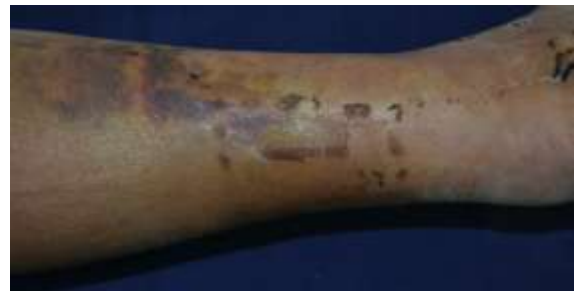
Incision was placed to avoid the blisters!



The wound was closed under tension !!! so fasciotomies seemed like the thing to do” !



2013.03.27





Plan



Fixation

- Ring fix
- Hybrid
- ORIF
 - Anatomical reduction
 - Rigid fixation
 - Bridging
 - Fibula fixation

Ring fixator

- Extra-articular
- Metaphyseal comminution
- WB status?



Ring fixator

- C1 #s
- Metaphyseal comminution



Hybrid



IM hybrid



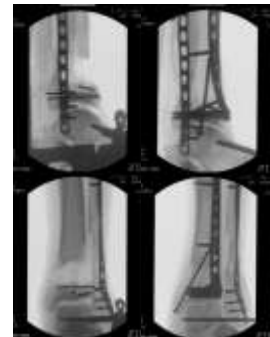
ORIF

- ORIF
 - Anatomical reduction
 - Rigid fixation
 - Bridging
 - Fibula fixation



Classic fibular first fixation

- Classic – fibula fixation
 - Length
 - Rotation

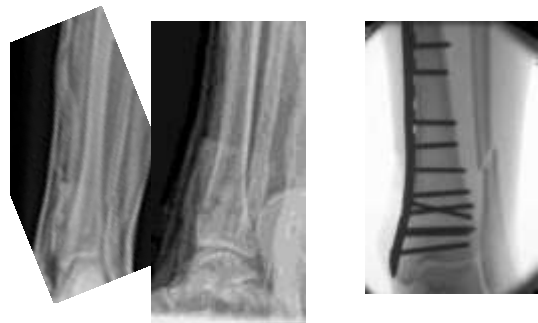


Classic fibular first fixation

- Classic – fibula fixation
 - Length
 - Rotation
- BUT
 - Soft tissue bridge
 - comminution



Tibial first



Rigid fixation !



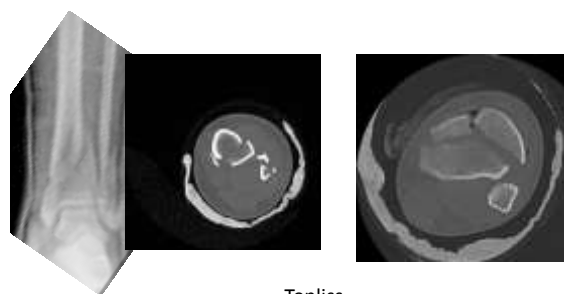
Bridging fixation



Approach

- Medial
- Antero-lateral
- Posterior
- Combined
- MIPO

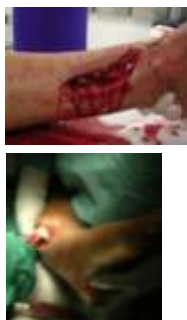
Approach ?



Topliss

Medial

- Open #s
- Healthy /young skin
- Simple # patterns
- MIPO
- Hardware issues



Anterolateral approach

- Soft-tissue swelling has settled
- Fibular incision as posterior as possible
- 7-8 cm skin bridge
- MIPO as much as possible but not at joint
- Start to reduce the joint from posterior to anterior
- Femoral distractor



Combined MIPO



Combined MIPO



Combined MIPO



Combined MIPO



Combined MIPO



“The bone is a plant, with its roots in the soft tissue, and when its vascular connections are damaged, it often requires, not techniques of a cabinet maker, but the patient care and understanding of a gardener”

girdlestone

Techniques for soft-tissue handling

- “Minimally invasive” ≠ small incision
- Proper placement of incision is more critical when using small incisions
- do not squeeze tissue
- Avoid horizontal dissection planes whenever possible (especially between the subcutaneous tissue and fascia)
- Sharp dissection with a knife should be used when possible (rather than cutting with scissors which crushes soft tissues)
- Preserve periosteum

Closure



Take-home messages

- Pilon #s are a soft tissue injury complicated by a #
- Do no harm !
- **SPAN** early
- Soft-tissue injury must be appreciated when deciding how to approach a fracture – **PLAN**
- Soft tissue must not be further injured by careless surgery
- Antero-lateral exposure provides excellent access
- difficult to predict the outcome -