PILON ANKLE FRACTURES
[FARC Trauma Atlas from PodiatryPrep™]

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TRAUMA SYMPOSIUM

TRAUMA OF THE ANKLE AND LEG
INJURIES OF THE ANKLE

- Ankle Fractures
- Syndesmosis Separations
- Vertical Compression Fractures
INJURIES OF THE ANKLE

• Ankle Fractures

3 Types

A) Malleolar
B) Bimalleolar
C) Trimalleolar
INJURIES OF THE ANKLE

Syndesmosis Separations

Diastasis between the tibia and fibula is unstable and must be repaired
INJURIES OF THE ANKLE

• Ankle Fractures

Classification

Lauge - Hansen

Weber - AO
LAUGE HANSEN

- Based on position of foot during injury
  
  First word - position of foot

  Second word - direction of deforming force, movement of the foot or talus

- Predicts injury
LAUGE HANSEN

- Based on position of foot during injury
- Predicts injury

SUPINATION ADDUCTION I II
PRONATION ABDUCTION I II III
SUPINATION EXTERNAL ROTATION I II III IV
PRONATION EXTERNAL ROTATION I II III IV
WEBER - AO

• Based on level of fracture on the fibula
• Provides consistent classification among Doctors

TYPE A  below the syndesmosis
TYPE B  at the level of the syndesmosis
TYPE C  above the level of the syndesmosis
FRACTURES

• CLOSED
  skin intact no compromise of dermis

• OPEN (Compound Fracture)
  skin broken open allowing possibility of bone contamination and infection.
CLOSED FRACTURE

Skin intact no compromise of dermis
COMPOUND FRACTURE

Skin broken open allowing possibility of bone contamination and infection.
Infectious spread
Infection is the major complication to be avoided and can be related directly to the type of wound.
COMPOUND FRACTURE

Gustilo and Anderson wound classification

- **Type I** - wound less than 1 cm long and clean
- **Type II** - > 1 cm w/o extensive tissue damage
- **Type III** - having extensive soft tissue damage, including muscles, skin, and neurovascular structures, with severe contamination
Gustilo and Anderson wound classification

In their review of open fractures in which immediate fixation was achieved Chapman and Mahoney noted the infection rate in

Type I wounds 2%
Type II wounds 8%
Type III wounds 29%.

This is significant because immediate internal fixation of ankles with type I wounds can be performed without an infection rate greater than that seen in closed fractures.
Type II
Type II
Type II
COMPOUND FRACTURE

Type III - (High velocity injuries, Farm injuries)

a. Adequate soft tissue coverage of bone

b. Extensive soft tissue loss with periosteal stripping and bone exposure, severe comminution

c. Arterial injury requiring microvascular repair, regardless of soft tissue coverage
Type III C

Neurovascular Bundle
Type III C
Ankle Fractures

3 Types

A) Malleolar
B) Bimalleolar
C) Trimalleolar
Single Malleolar Fractures

- Medial Malleolar
- Lateral Malleolar (Fibular Fracture)
- Posterior Malleolar (Posterior Tibial Lip)
Single Malleolar Fractures

• Undisplaced stable fractures can begin weight bearing in a short-leg walking cast for 6 weeks.

• Other unstable injuries should be placed in a long-leg cast with the knee flexed 15 degrees.

• Displaced > 2mm requires closed reduction or Open Reduction with Internal Fixation.
Single Malleolar Fractures

- Appreciate effects of minor displacements on the congruity of the ankle mortise

- A 1-mm lateral shift of the talus reduces the contact area of the ankle joint by 42%

- Up to 2 mm of displacement of the malleoli and 1 to 2 degrees of talar tilt seem to be compatible with a satisfactory result
Bimalleolar Fractures

- Unstable
- Requires ORIF
- If closed reduced, requires long leg cast
- Difficult to reduce without a buttress for stabilization, often reduction is loss without patient’s knowledge.
Bimalleolar Fractures

- Talus faithfully follows the lateral malleolus
- Anatomic reduction of the lateral malleolus is crucial in bimalleolar fractures
Trimalleolar Fractures

- Same as bimalleolar fracture-dislocation plus fractures of the posterior lip of the tibia
Trimalleolar Fractures

- **Posterior Fragment less than 25%**
  Treat the same as a bimalleolar Fx, no fixation of posterior fragment

- **Posterior Fragment greater than 25%**
  Must reduce fragment anatomically and fixate with lag screw.
Posterior Fragment greater than 25% must reduce fragment anatomically and fixate with lag screw.
Syndesmosis Separations

- Syndesmosis separations that are unstable should be stabilized.
- With fibular fractures above a syndesmosis separation, some surgeons elect to treat only the syndesmosis separation.
- Fully threaded, 4.5-mm cortical screws are best because they avoid over reduction of the syndesmosis.
the ankle should be held at neutral dorsiflexion when inserting the screw
must avoid over tightening the syndesmosis
removal of the syndesmosis screw by 8 to 12 weeks after injury is usually indicated.
the use of bioresorbable screws for tibiofibular syndesmosis fixation obviate the need for late screw removal
Syndesmosis separation
Wide medial gutter
Hyperdorsiflexion of the ankle produces a vertical shear fracture of the anterior tibial plafond.
Vertical Compression Fractures

2 Types

Tibial Plafond Fracture

Tibial Pilon Fracture

High Energy vs. Low Energy
A comminuted fracture of the ankle is usually caused by vertical loading that produces compression of the cancellous bone above the tibial plafond.
Tibial Pilon Fractures

When the fracture involves the metaphysis and distal shaft, it is known as a pilon (French for “rammer” or “hammer”) fracture.
Vertical Compression Fractures

3 Types

I. Undisplaced

II. Joint Incongruity

III. Comminuted with articular displacement and crushing of cancellous bone
Plafond Classification
Type I Undisplaced
Plafond Classification
Type II Joint Incongruity
Classification
Plafond
Classification of Plafond...
Pilon Classification

Type III: Comminuted with articular displacement and crushing of the metaphysis
Pilon Classification
Tibial Plafond Fractures

Because the degree of comminution and the poor condition of the soft tissues, may make internal fixation impossible
Tibial Plafond Fractures

The surgeon must weigh the goals of surgery against such risks as increased soft tissue trauma from multiple incisions and the adverse effects of prolonged surgery.
Tibial Pilon Fractures

- Avoid ORIF of complex intraarticular Fxs
- Complication rates are high, necessitating further reconstructive surgery
- Soft tissue technique must be atraumatic and meticulous.
Tibial Plafond Fractures

Soft Tissue Technique

An anterior incision between the anterior tibial and extensor hallucis longus tendons
Tibial Plafond Fractures

Soft Tissue Technique

Flaps are developed at the level of the periosteum,
Flaps are developed at the level of the periosteum,
Tibial Plafond Fractures

Soft Tissue Technique

The periosteum must be left attached to the anterior fragment, which can easily be opened like a book.
Tibial Plafond

Talar Dome
Tibial Plafond Fractures

Soft Tissue Technique
Avoid entering the sheath of the anterior tibial tendon
Tibialis Anterior Tendon in sheath
Fixation Devices

- Large Fragment Screws
- Buttress Plates - DCP, Cloverleaf, Spoon
- EBI External Tibial Fixator
- ILIZAROV Thin Wire Ring Fixators
Large Fragment Screws
Screws
Buttress Plates - Cloverleaf

Surfaces aligned. Buttress plates used. Fibular length restored.
Buttress Plates - Cloverleaf
EBI External Tibial Fixator
ILIZAROV Type Thin Wire Ring Fixators
ILIZAROV Type Thin Wire Ring Fixators
Emergency Treatment

Excessive swelling can so compromise the treatment of even minor ankle sprains that patients should all have their lower extremities elevated higher than their heart while undergoing initial evaluation and treatment.
Emergency Treatment

A soft compression dressing and radiolucent long-leg splint should be applied before radiographic examination.
Emergency Treatment

Grossly distorted ankles with severe skin distortion should be reduced immediately in the emergency room to avoid skin necrosis and to eliminate tension on the neurovascular structures.
CRITERIA FOR TREATMENT

For best functional results in the treatment of Plafond / Pilon fractures the following four criteria must be filled.
CRITERIA FOR TREATMENT

1. Dislocations and fractures should be reduced as soon as possible.
2. All joint surfaces must be precisely reconstituted.
3. Reduction of the fracture must be maintained during healing.
4. Motion of joints should be instituted as early as possible.
Case Presentation

Low Energy Type 2 Plafond
Case Presentation

High Energy Type 3 Pilon
33 y/o Window washer
Falls 4 stories
Type III High Energy
X-Fix w/ screws
Pressure on skin
1 month following split thickness Skin Graft
Reconstruction / Salvage

The Sequelae of fractures can result in three major problems:

- Loss of bone with collapse and deformity
- Malunion, resulting from closed treatment
- Severe arthritis
Reconstruction / Salvage

Reconstruction is performed by a variety of techniques, including:

• Fusions
• Osteotomies
• Soft tissue releases

or a combination of these procedures
90° Cannulated LC-Angled Blade Plates
SO NEXT TIME: THINK FIXATOR!

The End