Syndesmosis Injuries

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Outline

– Anatomy
– Injury types and classification
– Treatment options
  • Nonoperative vs. Operative
  • Indications for operative
  • Operative technique
– Postoperative management
Bony Anatomy of the Ankle Joint

Articulating surfaces: Tibia, Fibula, Talus

- Fibula is posterior lateral to Tibia
- Syndesmosis ligaments maintain distal fibula and tibia union
- Main ligamentous stabilizers of ankle joint are the Deltoids
- Talus articulating body surface is wider Anterior than Posterior
- 90% of weight bearing surface is the tibial plafond on talus, 10% is lateral malleolus on talus.
Anterior tibiofibular ligament
- Most commonly injured (weakest)
- Most important stabilizer

Posterior tibiofibular ligament & Inferior Transverse Ligament
- Strongest Syndesmosis Ligaments
- Attach to Posterior Malleolus

Inferior Transverse Ligament
- Strongest Syndesmosis Ligaments
- Attach to Posterior Malleolus

Calcaneofibular ligament
- Strongest fibular stabilizer

Anterior talofibular ligament
- Most commonly injured (weakest)
- Most important stabilizer
**Syndesmosis Relationship**

- AITFL = Anterior Inferior Tibiofibular Ligament
- PITFL = Posterior Inferior Tibiofibular Ligament
- ITL = Inferior Transverse Ligament
  - **Attaches to the POSTERIOR MALLEOLUS, causes avulsion fractures.**
- IOL = Interosseous Ligament
Medial Collateral Ligaments (Deltoids)

A

Superficial deltoid ligament

B

Deep deltoid ligament

Deep posterior talotibial

Deep anterior talotibial
Lateral Anatomy of the Ankle and Foot

- Sural nerve
- Achilles
- Lesser saphenous vein
- Extensor Digitorum Longus
- Peroneus tertius
- Peroneus longus
- Soleus
- Peroneus brevis
- Superior retinaculum
Medial Anatomy of the Ankle and Foot

Posterior to Medial Malleolus

T<sup>om</sup> = Tibialis Posterior

D<sup>ick</sup> = FDL

A<sup>nd</a> = Posterior Tibial Artery/Vein

N<sup>ot</sup> = Tibial Nerve

H<sup>arry</sup> = FHL
Anterior Anatomy of the Ankle and Foot
Weber/AO Classification

A) Below the syndesmosis
B) At the syndesmosis
C) Above the syndesmosis

- Does not consider medial ligamentous injury
- Level of fibula # not always correlated with syndesmosis injury (B type may have syndesmosis injury and C type may not)

Clinical and Radiological system is better:
1) Medial ankle pain/swelling (deltoid injury)
2) Fractures on radiography
3) Medial Clear Space vs. Superior Clear Space
4) Tibiofibular Clear Space
5) Talocrural Angle
**Medial Clear Space**

**Normal \( \leq 4\text{mm} \)**

Should be equal to the superior clear space on Mortise view

Mortise view should show an equal ankle joint throughout the entire talus articulating surface

Ideally should be compared to the contralateral normal side
Tibiofibular Clear Space

**Normal <= 6mm**

Between the medial wall of the fibula and the incisural surface of the tibia

If syndesmosis is disrupted, this space will most likely be enlarged at neutral position and with external rotation stress views

Ideally should be compared to the contralateral normal side
Talocrural Angle

Normal = 83° +/- 4°

Strong indicator of syndesmosis disruption, because the fibula will be shortened and externally rotated.

Ideally should be compared to the contralateral normal side.
Stable or Unstable

Unstable

- Talus shift/dislocation
- Unequal mortise distances
- Unequal talocrural angle relative to normal side
- Increased tibiofibular clear space relative to normal side
- Fibula fracture at ANY level with Medial tenderness
  - Must do stress views (or clinical exam) to look for Talar Shift/Instability
- Medial/Posterior malleolus fracture with Fibula fracture
  - Must do stress views (or clinical exam) to look for Talar Shift/Instability

Stable

- No Medial tenderness with any level of fibula fracture (Rockwood and Green)
- No Talar shift with stress views or clinical exam
Treatment Options

Stable fractures (non-operative)

• Immobilization at Dorsiflexion (short leg cast or brace)
• WBAT
• F/U fracture clinic for clinical function/xrays
• 4-6 weeks for healing
• Good long-term outcomes
Treatment Options

Unstable fractures (Operative)

1. Reduction
   - Closed or Open
2. Fixation
   - Closed (cast, ex-fix) or Open (ORIF)
3. NWB → WBAT
4. F/U # Clinic with x-rays and clinical exam
5. Usually more than 6 weeks to heal (usually 9)
6. Outcomes vary
Absolute Indications for ORIF

1. Open fractures
2. Failed closed reduction-fixation
3. Tibiofibular diastasis >6mm, i.e.
   syndesmosis disruption
4. Large Medial Malleolus fragment (size?)
Operative Methods

• **Fibula fracture** -> 1/3 tubular plate, at least 4 to 6 cortices above and below fracture
• **Medial fracture** -> 2 x 4.0mm partially threaded screws
• Deltoid ligaments NOT explored, unless suspected to block reduction
• Syndesmosis Injury:
  – Percutaneous or ORIF
  – Direct Lateral Approach
  – (1 or 2) x 3.5mm or 4.5mm cortical screws at 3-4 cm above joint line
    • Steel or Bioabsorbable screws
  – 25-30° anterior angulation
  – Parallel to joint line
  – at least 3 cortices fixation per screw
  – Ankle in dorsiflexion when inserting screws

http://www.wheelessonline.com/ortho/technique_of_snydesmotic_fixation
Bimalleolar Fracture

• Clinical:
  • Swelling, pain, blistering, open wounds
  • Medial ankle pain
  • Fibula pain distally

• X-ray:
  • Unequal mortise
  • Unequal talocrural angle
  • Tibiofibular diastasis
  • Fracture lines
  • Dislocation/Subluxation
Bimalleolar Equivalent

- Medial disruption → Medial clear space widening relative to superior clear space.
- Fibular fracture $\geq 3.5$ cm proximal to tibial plafond (Weber C)
- Talar shift (lateral or medial)
- Clinical:
  1. Swelling, Pain with Walking
  2. Medial Ankle Pain (deltoid ligament injury)
  3. Distal/Proximal fibula pain (fibular #)
Maisonneuve Injury

Components:
• fracture of the proximal third of the fibula
• rupture of the distal tibiofibular syndesmosis

associated with:
• fracture of the tibia
• rupture of the deltoid ligament

caused by an ABDUCTION and EXTERNAL rotation force applied to the ankle which forces the talus laterally against the fibula
• Syndesmosis screw loosening

• Common finding with increase motion of fibula on tibia with external rotation
Sources

3. Review of Orthopaedic Trauma by Brinker. Injuries of the Foot and Ankle
4. Rockwood and Green Fractures in Adults. Ankle Fractures.
Extra Slides
Medial Anatomy of the Ankle and Foot

- Tibialis Anterior
- Medial Malleolus
- Extensor Hallucis Longus
- Tibialis Posterior
- Flexor Digitorum Longus
- Posterior Tibial Artery/Vein
- Posterior Tibial Nerve
- Flexor Hallucis Longus
Lateral Anatomy of the Ankle and Foot

- Achilles
- Soleus
- Peroneus Longus
- Peroneus Brevis
- Extensor Digitorum Longus
- Peroneus Tertius
- Lateral Malleolus
Anterior Anatomy of the Ankle and Foot

- Extensor Hallucis Longus
- Medial Malleolus
- Lateral Malleolus
- Tibialis Anterior
- Anterior Tibial Artery
- Anterior Tibial Nerve -> Superficial Peroneal Nerve
- Extensor Digitorum Longus & Peroneus Tertius
- Extensor Digitorum Brevis
- Extensor Hallucis Brevis
Anatomy

Posterior->Medial->Anterior-> Lateral

Nerves

1. Tibial Nerve
2. Saphenous Nerve
3. Superficial Peroneal Nerve (above extensor retinaculum)
4. Deep Peroneal Nerve (below extensor retinaculum)
5. Sural Nerve

Arteries/Veins

1. Posterior Tibial Artery/Vein
2. Saphenous Vein
3. Anterior Tibial Artery/Vein
4. Lesser Saphenous Vein
• **Chaput's tubercle**: Avulsion of the tibia at the origin site of the ATFL.
• **Wagstaffe's tubercle**: Avulsion of the fibula at the insertion site of the ATFL.
• Supination: Lateral structures under tension, thus fail first.
• Pronation: Medial structures under tension, thus fail first.
• Most common injury is **Supination External Rotation (SER)**, starts with Lateral injuries going Posterio and than Medial.
• **Pronation External Rotation (PER)**, starts with Medial injuries going Anterior, Lateral, and Posterior. Facture of Medial Malleolus, Tear of ATFL and Fracture of Fibula above **Syndesmosis**. Most severe involves Posterior Malleolus fracture.
• Posterior Malleolus Fractures: Surgical intervention if > 25% articulating surface involvement and >2mm displaced after reduction.
• Weber Classification A, B, C. Simple because guides treatment (A=cast, B=reduction + cast, C=Syndesmosis Screw + plate + cast) but does not take into account the Medial Ligaments, which are key to Ankle stability.
• “The degree of syndesmosis injury is not always accurately predicted by the level of the fibula fracture. B fractures may have syndesmosis disruption, and C fractures may be stable after reduction and fixation of the fibula without syndesmosis stabilization …”