Ankle Imaging: Twisting Injuries

Ankle Imaging
Twisting Injuries

Ankle Imaging: Twisting Injuries
Anatomy

- Ankle Mortise
- Inversion
- Eversion
- Weber A, B, C

Adolescent

- Juvenile Tillaux
- Triplane

Base 5th Metatarsal

- Jones, Avulsion

Ankle Mortise: 3 Bones

Mortise: Woodworking Term

Mortise: Woodworking Term
Ankle Imaging: Twisting Injuries

Mortise: Very Stable Joint

Norm Abram
- Most famous carpenter in US

Sites of Primary Osteoarthritis:
- Hip = Common
  - Ball- Socket Joint
- Knee = Common
  - Hinge Joint
- Ankle = UNcommon
  - Mortise Joint

Mortise: Very Stable Joint

Ankle Mortise

Tibia
Fibula
 Syndesmosis
Talus

* [Gr] "to bind together"
- Ligamentous joint
- Not synovial joint

Ankle CT

Ankle CT: Syndesmosis

Syndesmosis

Ankle Radiographs

AP view
Does Not Profile Mortise

©Ken L Schreibman, PhD/MD 2008
www.schreibman.info
Ankle Imaging: Twisting Injuries

Ankle Radiographs

- Mortise view
- Internally Rotate 15-20

Ankle Model

- AP view
- Mortise view

Ankle Model

- IOM = Inter Osseous Membrane
- Tib-Fib = Tibia-Fibular (Syndesmotic) Ligaments
- Talo-Fib = Talar-Fibular Ligaments
- Delt = Deltoid Ligament

Weber: Syndesmosis Intact?

- Weber A
- Weber B

©Ken L Schreibman, PhD/MD 2008 www.schreibman.info
Ankle Imaging: Twisting Injuries

Weber: Syndesmosis Intact?

Soft Tissue Swelling: Look Closely for Fracture...

Weber: Syndesmosis Intact?

Compression

Weber: Syndesmosis Intact?
Ankle Imaging: Twisting Injuries

**Weber: Syndesmosis Intact?**

Weber A = Syndesmosis was never at risk

Weber B = LM Fracture = Syndesmosis Intact!

Sometimes the best view of the Fibula fracture is on the LATERAL VIEW, through the Tibia

**Weber: Syndesmosis Intact?**

Weber B = LM Fracture = Syndesmosis Intact!

Requires Stabilization Fixation

Sometimes the best view of the Fibula fracture is on the LATERAL VIEW, through the Tibia
Ankle Imaging: Twisting Injuries

Weber: Syndesmosis Intact?

Weber B = LM Fracture = Syndesmosis Intact!

Weber B = Syndesmosis Intact

Weber C = Fibular Fracture above Syndesmosis


If Syndesmosis is NOT intact, it must be stabilized with a screw.

Syndesmosis = Good for Syndesmosis

Post-Op Syndesmosis Screw
Ankle Imaging: Twisting Injuries

Weber: Syndesmosis Intact?

- 6 Months Post-Op
- Post-Op

Syndesmotic Screw: OK to loosen

- Windshield Wiper

Syndesmotic Screw: OK to break

Syndesmotic Screw: Removed

Weber C: Can be tricky

- AP view
- Where is the Fibula Fracture?

High Weber C = Maisonneuve

©Ken L Schreibman, PhD/MD 2008 9/19/08 www.schreibman.info
Ankle Imaging: Twisting Injuries

**Maisonneuve: Can be tricky**

**Weber A?**
No, Weber A has Avulsion Fracture of LM

**Weber A**
Compression Tibia
Avulsion LM

**Maisonneuve**
Avulsion Tibia
Compression MM

**In Summary:**
Weber A ↔ Avulsion Fx: LM
Compression Fx: MM

**Maisonneuve**
Avulsion Fx: MM
Compression Fx: Fibula (above Syndesmosis)

**Clues:**
- Soft Tissue Swelling
- Look more closely
- Tiny Avulsion Fx

**Maisonneuve**
Avulsion Fx: MM
Compression Fx: Fibula (way above Syndesmosis)

**Maisonneuve**
Avulsion Fx: MM
Compression Fx: Fibula (way above Syndesmosis)

**Maisonneuve?**
Need to look higher!

**Weber B?**
No, Weber B has Compression Fx of LM

**Weber B**
Avulsion Tibia
Compression MM

**Maisonneuve**
Avulsion MM
Compression Fibula (below Syndesmosis)

**Weber C?**
No, Weber C has a low Fibula shaft Fx

**Weber C**
Compression Tibia
Avulsion MM

**Maisonneuve**
Avulsion MM
Compression Fibula (way above Syndesmosis)

**Maisonneuve**
Avulsion Fx: MM
Compression Fx: Fibula (way above Syndesmosis)

**Maisonneuve?**
Is this significant? Stress views:
Requires Syndes. Screw

**In Summary:**
Weber A ↔ Avulsion Fx: LM
Compression Fx: MM

Weber B ↔ Avulsion Fx: MM
Compression Fx: LM (below Syndesmosis)

Weber C ↔ Avulsion Fx: MM
Compression Fx: Fibula (above Syndesmosis)

Maisonneuve ↔ Avulsion Fx: MM
Compression Fx: Fibula (way above Syndesmosis)
Ankle Imaging: Twisting Injuries

Ankle: Twisting Injuries
Anatomy
- Ankle Mortise
- Inversion
- Eversion
- Weber A, B, C
Adolescent
- Juvenile Tillaux
- Triplane

Juvenile Tillaux Fx = Salter-Harris III
Quick Review:
- Salter-Harris = Physis Fx
  I. Physis Only
  II. Metaphysis
  III. Epiphysis
  IV. Epiphysis & Metaphysis
  V. Crush

Triplane Fracture = Salter-Harris IV

©Ken L Schreibman, PhD/MD 9/19/08 www.schreibman.info
Ankle Imaging: Twisting Injuries

Triplane Fracture = Salter-Harris IV

AP view

Lateral view

Triplane Fracture = Salter-Harris IV

Coronal CT

Axial CT

Triplane Fracture = Salter-Harris IV

Coronal CT

Sagittal CT

Base 5th Metatarsal

Peroneal Longus

Peroneal Brevis

Base 5th Metatarsal: 2 Different Fxs Both Transversely ↔ Oriented

Base 5th Metatarsal: Normal Apophysis Longitudinally ↑↓ Oriented

©Ken L Schreibman, PhD/MD 2008

www.schreibman.info

©Ken L Schreibman, PhD/MD 9/19/08 www.schreibman.info
Ankle Imaging: Twisting Injuries

Tarsal Coalition: 2 Locations

Why does this 13 year old have foot pain?

1) Calcaneus-Navicular
2) Talus-Calcaneus
   » Middle Facet of Sub-Talar Joint

There is NO normal articulation between the Calcaneus and the Navicular

Base 5th Metatarsal: 2 Different Fxs
Both Transversely ↔ Oriented

Intra-articular Avulsion Fracture

Extra-articular Diaphyseal Fatigue Fracture

Base 5th Metatarsal: 2 Different Fxs
Both present as lateral ANKLE pain

Technologists MUST ALWAYS show proximal 5th MT on one view of the ankle!

Case:
- 51 yo female
- Twisted ankle, lat. pain
- Called her doctor
- He didn’t examine her, just told her to “Get X-rays”

Base 5th Metatarsal: 2 Different Fxs
Both present as lateral ANKLE pain

Technologists MUST ALWAYS show proximal 5th MT on one view of the ankle!

Case:
- 21 yo male
- Inversion injury
- Tender at LM

Base 5th Metatarsal: 2 Different Fxs
Both Transversely ↔ Oriented

Intra-articular Avulsion Fracture

Extra-articular Diaphyseal Fatigue Fracture

Jones’ Fracture?

Transverse fractures of the proximal fifth metatarsal are relatively common. There are two distinct types (Fig. 23-77) that are easily confused with one another. In fact, I had done so in the first edition of this book. Both are due to inversion of the foot. One is an avulsion fracture of the tip of the tuberosity and the other a transverse fracture of the proximal shaft located approximately 1.5 cm distal to the tip of the tuberosity, just distal to the metatarsal+Cuboid joint.

Rogers 23-3

©Ken L Schreibman, PhD/MD 9/19/08 www.schreibman.info
Ankle Imaging: Twisting Injuries

Jones Fracture

Transverse fractures of the proximal fifth metatarsal are relatively common. There are two distinct types (Fig. 23-7) that can usually be distinguished from one another. Jones and Malteus. In fact, I had done so in the foreword of this book. Both are due to inversion of the foot. There is an avulsion fracture of the tip of the tuberosity and the other a transverse fracture of the proximal shaft located approximately 1 cm distal to the tip of the tuberosity, just distal to the metatarsocuneiform joint.

Avulsion Fx = Pseudo-Jones

Fracture of the base of the fifth metatarsal is the most common type of metatarsal fracture. Its etiology is that of a plantar-flexion and inversion stress placed on the foot of the foot. This is accompanied by contraction of the peroneus brevis muscle, avulsion the styloid at the base of the fifth metatarsal, where the tendon inserts. This occurs in the patient who steps into a hole, forcibly turning the foot in, or as a basketball player leaps for a rebound. The sudden increase in tension of the peroneus brevis muscle actually pulls the styloid from the metatarsal. Sir Robert Jones, after whom this fracture is named, first described it after having sustained such an injury himself while dancing.
Ankle Imaging: Twisting Injuries

**Jones vs Avulsion Fractures: So What?**

**Tuberosity Avulsion (Pseudo-Jones)**

- Healing is easily achieved
- Dameron JBJS 57-A: 788 1975
  - 100 Avulsion Fractures
  - Treated with elastic bandage or partial weight bearing
  - 99% clinically healed @ 3 weeks, radiographically healed @ 8 weeks

**Jones Fracture**

- Athletic injury of young adults
- High rate of delayed/non-union
- Torg, Pavlov JBJS 66-A: 209 1984
  - 43 patients, 16-22yo (mean=18yo)
  - All sustained fx during athletics
    - 16 Basketball
    - 15 Football
    - 6 Soccer
    - 5 Baseball
    - 0 Dancing

**Jones Fracture: Delayed Healing**

- 38 yo male, right lateral ankle pain

---

©Ken L Schreibman, PhD/MD 2008 9/19/08 www.schreibman.info
Ankle Imaging: Twisting Injuries

**Jones Fracture: Delayed Healing**

38 yo male, *left* lateral foot pain

One year later...

“Screw it”

2 weeks

**Jones: The Man**

Sir Robert Jones
- Born 1857
  - N. Wales
  - United Kingdom
- Died 1933
  - age 76
- Father of Orthopedic Surgery

**Jones: The Young Surgeon**

Sir Robert Jones
- 1887, 30yo
- Apprenticed with uncle, Hugh Owen Thomas

**Jones: The Experienced Surgeon**

During World War 1, revolutionized the care of wounded soldiers
- Established network of field hospitals
- Rehab hospitals
- Mortality rate for open fractures was reduced from 80% to 20%

1925: “To him and his practical teaching and influence we owe it that our streets today show relatively so few war cripples”

**Manchester Ship Canal**

Welcome to the Manchester Ship Canal Company

www.manchestershipcanal.co.uk

1888
Ankle Imaging: Twisting Injuries

Jones: The Pediatric Surgeon
- Pioneer in the care of crippling diseases of children
- Established the first long-stay orthopedic hospitals for children

Jones: Early X-Ray Proponent
Dec 28, 1895: Röntgen publishes "On a New Kind of Rays"
Feb 22, 1896: Jones publishes in Lancet, "The Discovery of a Bullet Lost in the Wrist by Mean of the Roentgen Ray"
Arguably the first published case history in which x-rays were used as a diagnostic tool

Jones: Early X-Ray Proponent
"In 1896 we were all dancing in a circle round the tent pole. Robert Jones’ ankle seemed to give...he said he had strained such and such a muscle or tendon, exclaiming:
'Most interesting, most painful. I had no idea it could be so painful. Most interesting!"
"At that time he (Jones) had what might almost be described as a new toy – an X-ray apparatus, the first in England.
“He wondered whether it would not be possible for the X-ray to show the torn or swollen muscle, and on experimenting the plate showed to his amazement that a small bone was fractured.
“This disability gave him immense satisfaction. To one patient who came to him with mysterious symptoms he said, after a brief examination,
‘Madam, you could have paid me no greater compliment – this is a genuine Jones fracture.’"


Jones: Inspiration to Others
Memorial Tablet: “Great surgeon: greater man”
Obituary: “As a teacher he was pre-eminent, not in the role of didactic pedagogue, but in the role of leader able to enthuse men, and through them he advanced the art and science of his specialty”

Ankle Imaging: Twisting Injuries
Anatomy
- Ankle Mortise
- Inversion & Eversion
- Weber A, B, C
Adolescent
- Juvenile Tillaux
- Triplane
Base 5th Metatarsal
- Jones, Avulsion