

# Ultrasound Evaluation of the Knee and Ankle

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1

## Disclosures

- Consultant: Bioclinica
- Contractor: POCUS PRO
- Advisor: Philips
- Book Royalties: Elsevier
- Not relevant to this lecture

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Fundamentals of Musculoskeletal Ultrasound are  
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2

## Outline

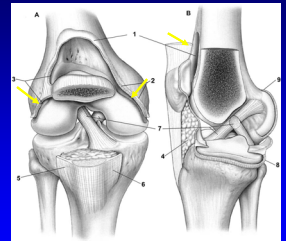
- Knee
  - Joint effusion
  - Extensor mechanism
  - Baker cyst and ganglion
- Ankle
  - Achilles
  - Peroneal tendons
  - Lateral ankle ligaments

3

## Joint Effusion

- Suprapatellar recess: superior
  - Prefemoral & quadriceps fat pad separation
  - Distends with partial knee flexion
- Medial and lateral recesses
  - Adjacent to patella
  - Distends with knee extension
  - Transducer pressure displaces joint effusion

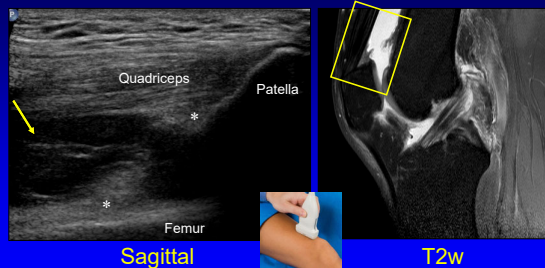
### Suprapatellar Recess and Gutters



*From: Miller PJ et al. Am J Sports Med  
2001;29:822.*

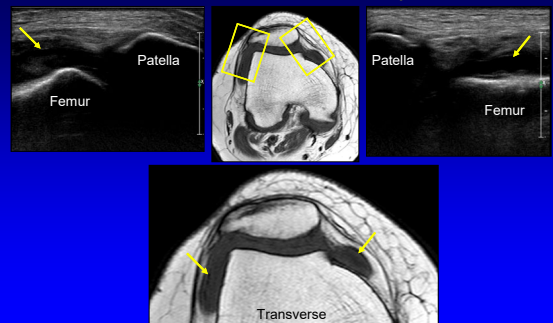
4

## Joint Effusion: sagittal plane

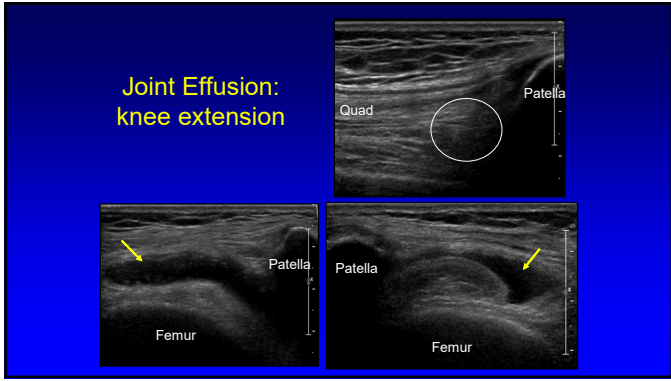


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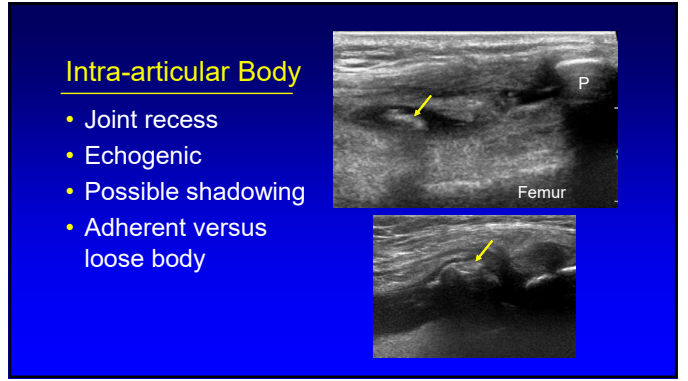
## Joint Effusion: transverse plane



6



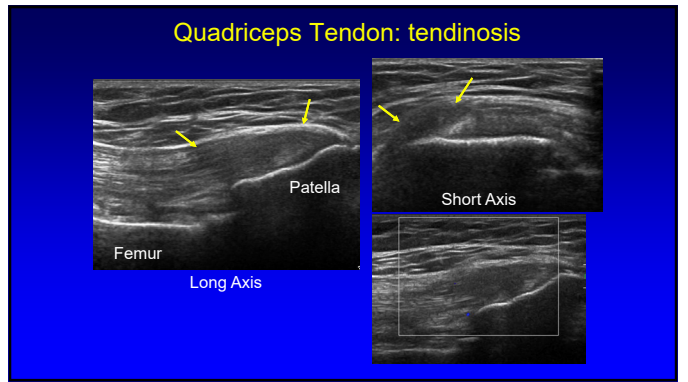
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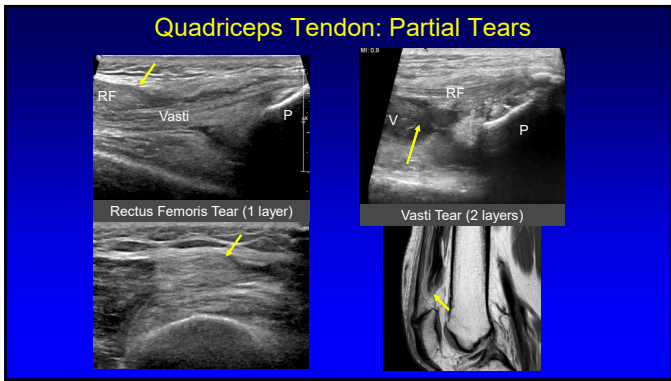
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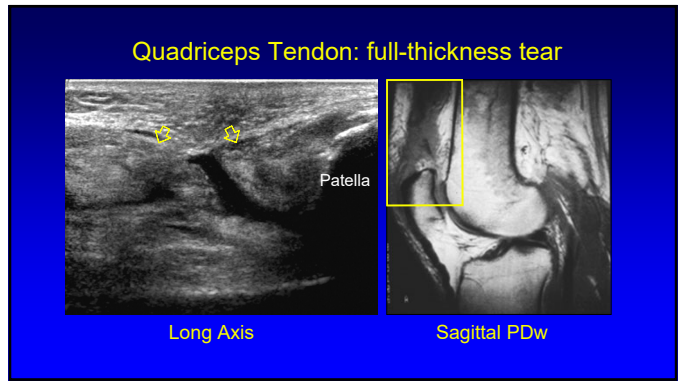
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11

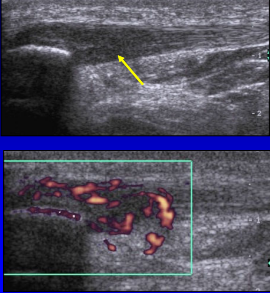


12

### Patellar Tendinosis

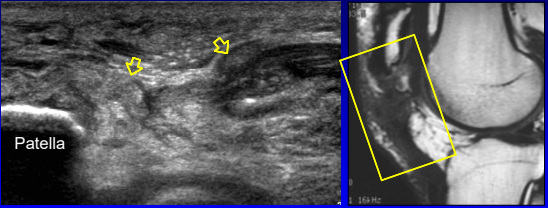
- Jumper's knee
- Mucoïd degeneration
- No inflammatory cells
- Possible partial thickness tear
- Proximal
- Hypoechoic, swollen
- Hyperemia: neovascularity

Radiology 1996; 200:821



13

### Patellar Tendon: full-thickness tear



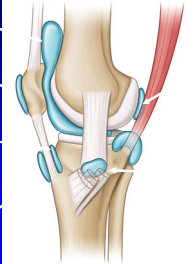
Patella

Long Axis

Sagittal PDw

14

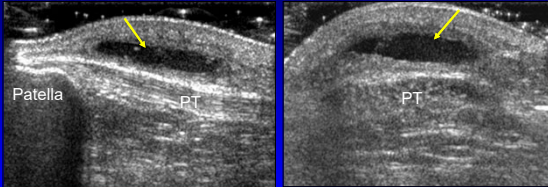
### Knee Bursae



- \*Suprapatellar Recess
- Prepatellar Bursa
- Deep Infrapatellar Bursa
- Superficial Infrapatellar Bursa
- Baker Cyst
- Semimembranosus-Tibial Collateral Ligament Bursa
- Pes Anserinus Bursa

15

### Prepatellar Bursa: aseptic fluid



Patella

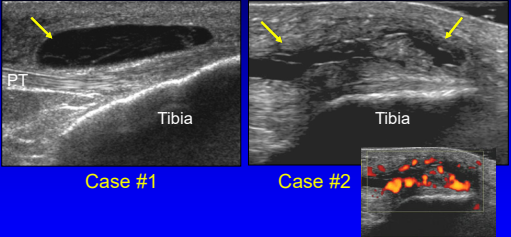
PT

Sagittal

Axial

16

### Superficial Infrapatellar Bursa



PT

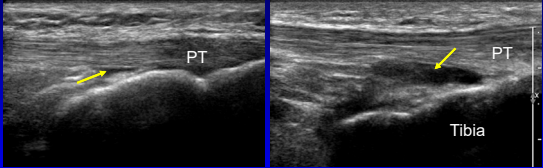
Tibia

Case #1

Case #2

17

### Deep Infrapatellar Bursa



PT

Tibia

Normal

Abnormal

18

### Outline

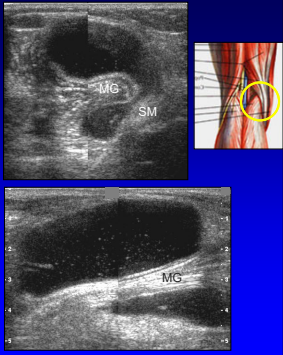
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19

### Baker Cyst:

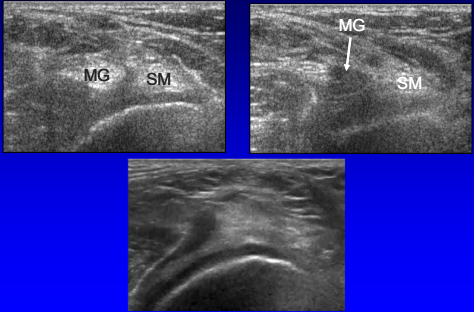
- Semimembranosus-medial gastrocnemius bursa
- 50% over age of 50 have communication with knee joint
- Cyst communication to posterior knee between SM-MG tendons required

AJR 2001; 176:373



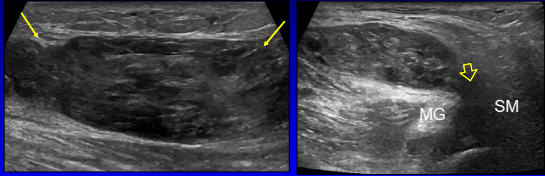
20

### Baker Cyst Evaluation: pitfall



21

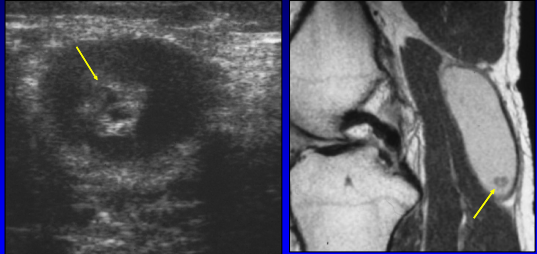
### Baker Cyst: rupture + hemorrhage



Longitudinal      Transverse

22

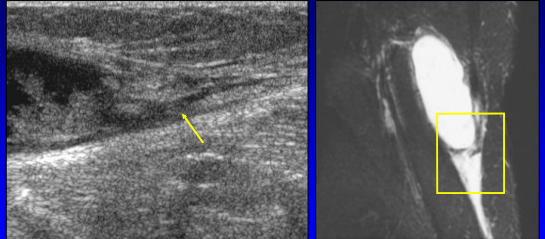
### Baker Cyst: intra-articular body



Transverse      Sagittal PDW

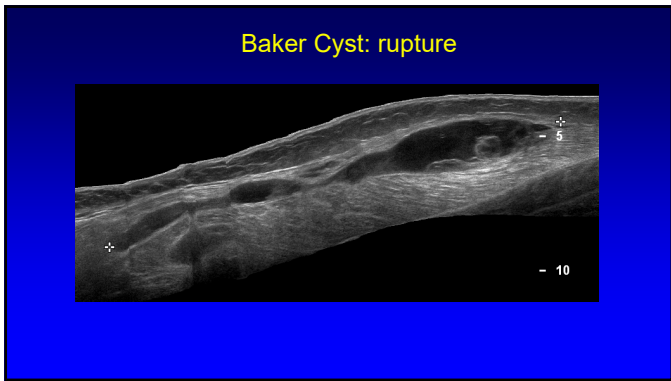
23

### Baker Cyst: rupture



Longitudinal      Coronal T2w

24



25

### Myxoid Liposarcoma:

- Hypochoic
- May look like a cyst
- Not a ganglion:
  - Not multilocular
  - Not a good location
- Not a Baker cyst:
  - No neck

26

### Peroneal Intraneural Ganglion

- Pain: knee or peroneal nerve distribution
  - Possible palpable mass, fluctuating course
- 18% of those with foot drop<sup>1</sup>
- No identifiable etiology
  - Weight loss, trauma, leg crossing
- High body mass index<sup>2</sup>
  - Unlike other causes for peroneal neuropathy

<sup>1</sup>Visser et al. Neurology 2006; 67:1473  
<sup>2</sup>Young et al. Neurology 2009; 72:447

27

### Peroneal Intraneural Ganglion

- Joint fluid from proximal tibiofibular joint
  - Enters peroneal nerve via articular nerve branches
  - Shown at MR arthrography after exercise
  - Extends proximal via epineurial sheath<sup>1</sup>

From: Spinner et al. Skeletal Radiol 2008;37:1091  
 Spinner et al. Clin Anatomy 2007; 20:826

28

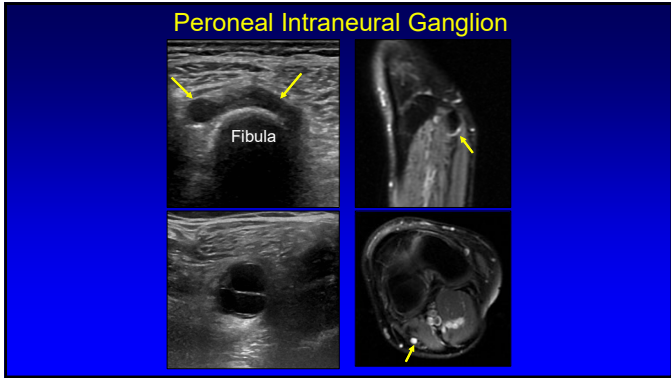
### Peroneal Intraneural Ganglion

Note: "signet ring" appearance

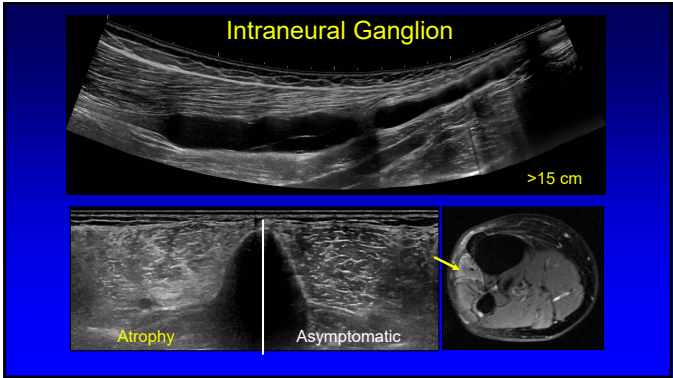
29

### Peroneal Intraneural Ganglion

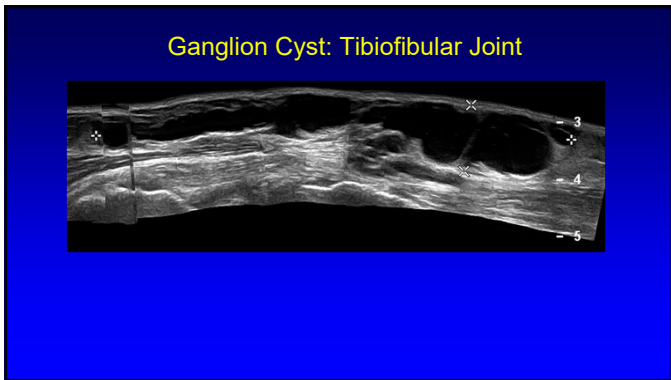
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31



32



33

**Outline**

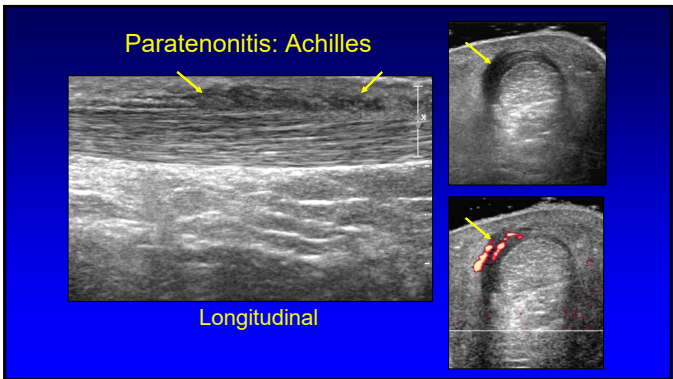
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34

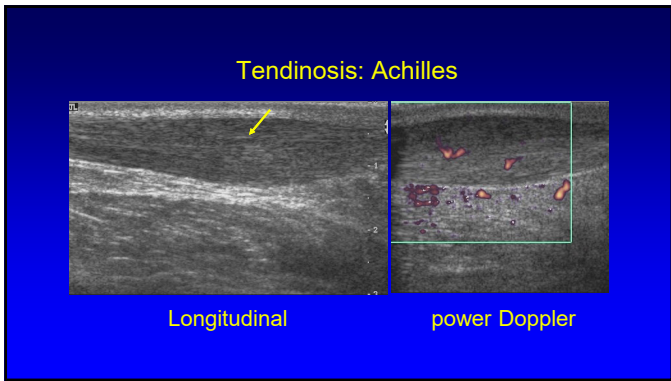
**Achilles Tendon:**

- 2 – 6 cm proximal to insertion
  - Tendinosis
  - Full-thickness tear
- Calcaneal attachment
  - Tendinosis, tear
  - Haglund Syndrome

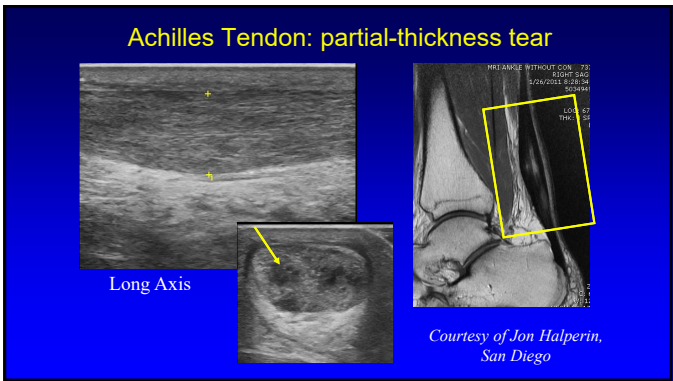
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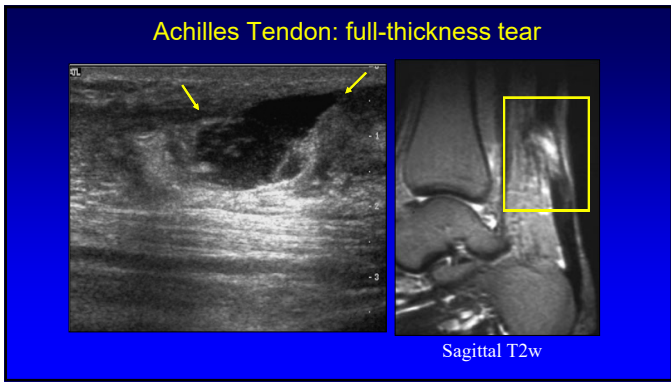
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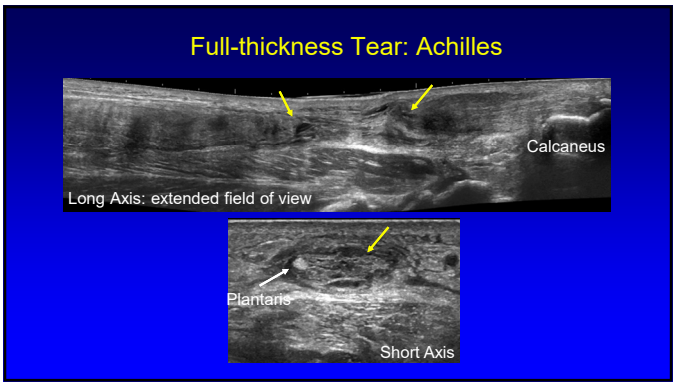
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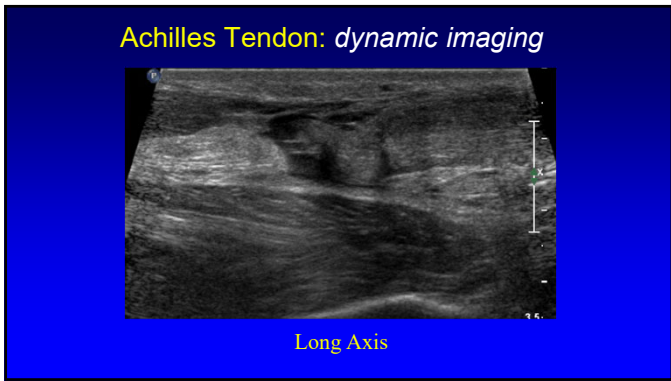
38



39



40



41



42

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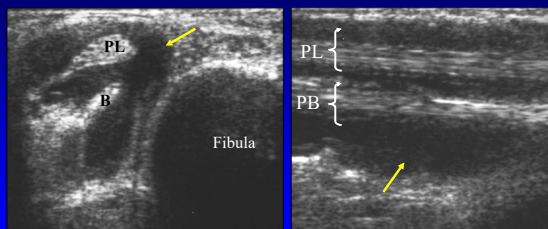
43

### Peroneal Tendons:

- Lateral malleolus
  - Longitudinal split, complete tear
  - Subluxation: retinaculum injury
- Os peroneum: peroneus longus
  - Complete tear, os peroneum fracture
- 5<sup>th</sup> metatarsal: peroneus brevis
  - Avulsion, with aponeurosis

44

### Tenosynovitis: peroneal tendons

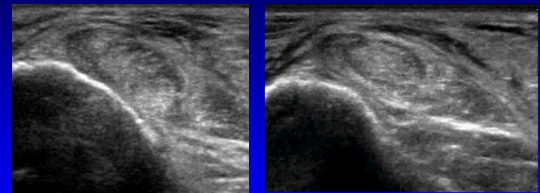


Short Axis

Long Axis

45

### Peroneus Brevis Split Tear



Short Axis

46

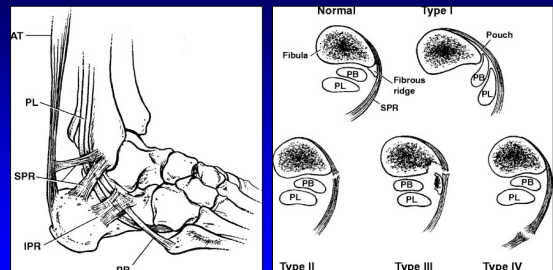
### Peroneal Tendon Subluxation:

- Abnormal movement may only occur dynamically
- Predisposes to peroneal tendon tears
  - Longitudinal split of peroneus brevis
- US: examine with dorsiflexion / eversion
  - 100% accurate diagnosis with US

Neustadter et al. AJR 2004; 183:985

47

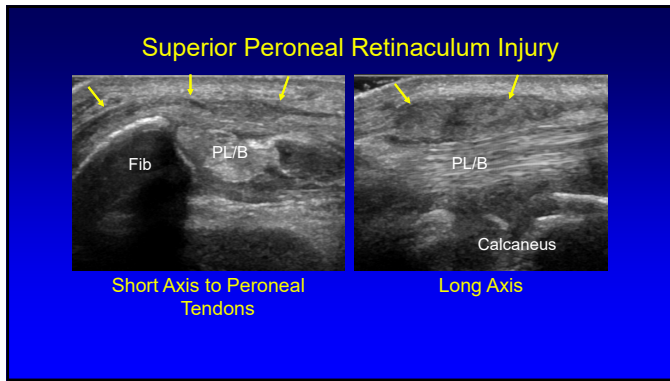
### Peroneal Retinaculum



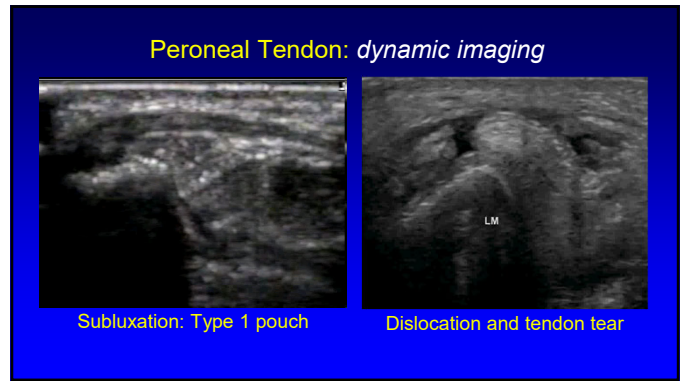
Rosenberg et al. AJR 2003; 181:1551

48





49



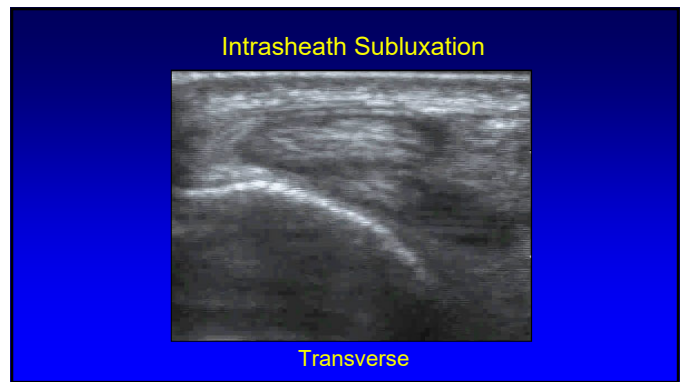
50

### Intrasheath Subluxation

- Abnormal snapping of peroneal tendons
- No lateral displacement, intact retinaculum
- Associations:
  - Convex posterior fibula in 92%
  - Tendon tear in 86%
  - Low lying peroneus brevis muscle in 71%

J Bone Joint Surg Am 2008; 90:992  
J Foot Ankle Surg 2009; 48:323

51



52

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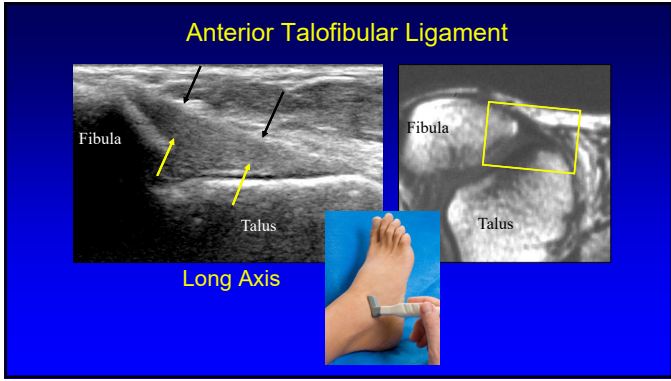
53

### Technique: *lateral*

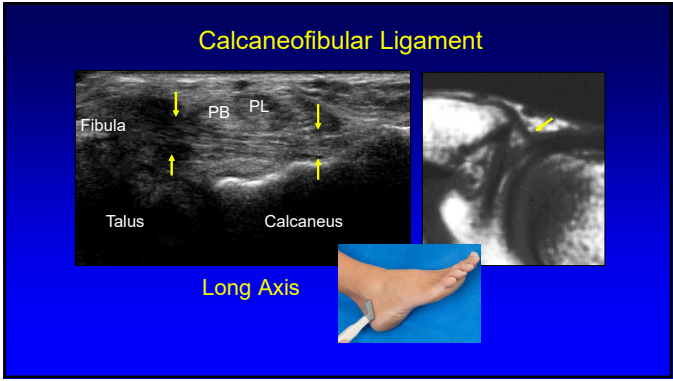
- Anterior talofibular
- Calcaneofibular
- Posterior talofibular
- Anterior tibiofibular
- Posterior tibiofibular

From: Netter's Atlas of Human Anatomy

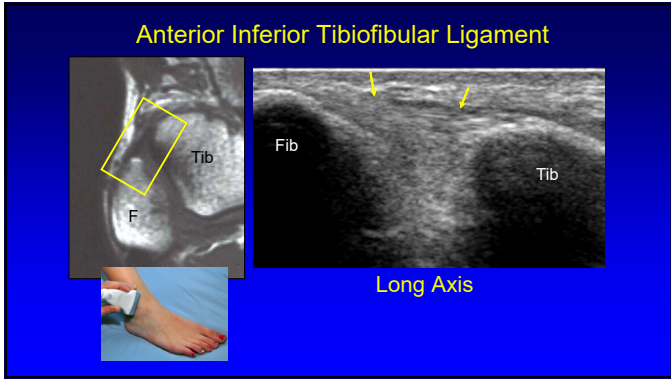
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55



56



57

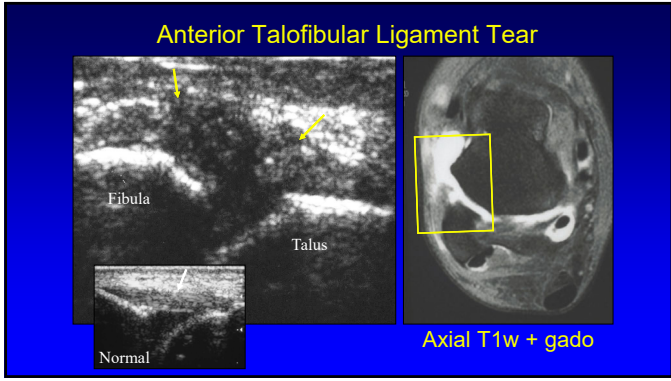
### Trauma: *ligament*

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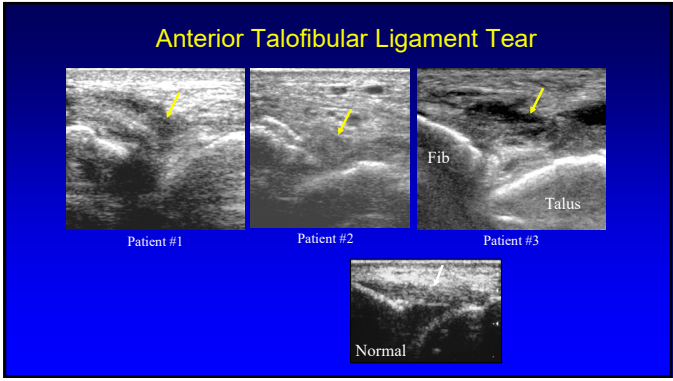
- Lateral:
  - Anterior talofibular: isolated tear in 66%
  - Calcaneofibular
    - 20% calcaneofibular + anterior talofibular
  - Posterior talofibular: dislocation
  - Anterior tibiofibular: high ankle sprain

Helgason. Radiol Clin N Am 1998; 36:729

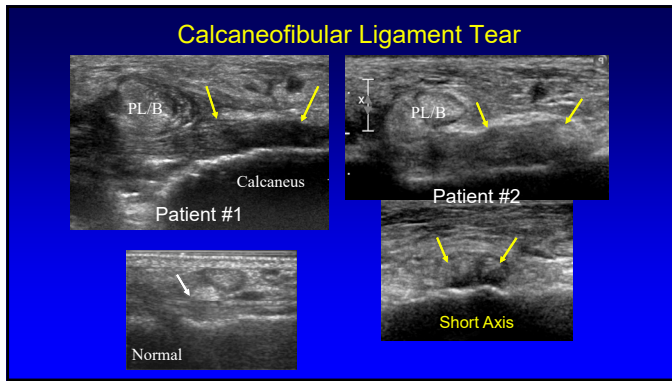
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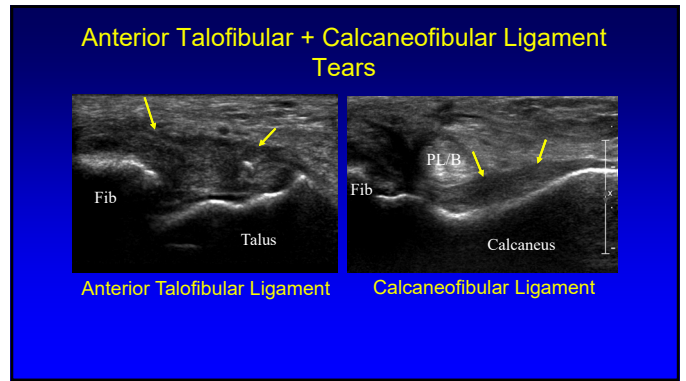
59



60



61



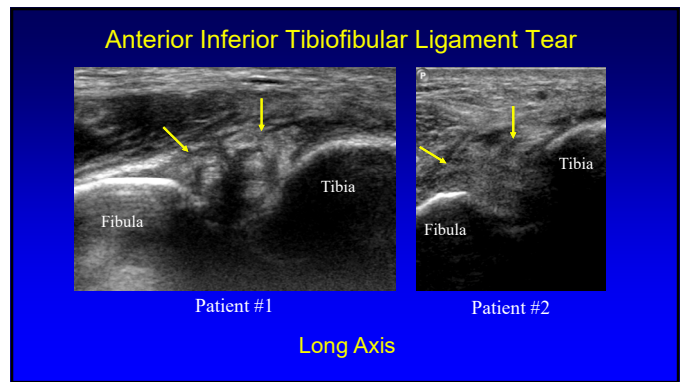
62

### Anterior Tibiofibular Ligament

- Dynamic: widening of syndesmosis<sup>1</sup>
  - Dorsiflexion and external rotation
- If normal:
  - Interosseous ligament usually normal
- Impingement
  - Thick inferior fascicle (Bassett ligament)<sup>2</sup>

<sup>1</sup>Am J Sports Med 2009; 37:1009  
<sup>2</sup>Skeletal Radiol 2008; 37:27

63

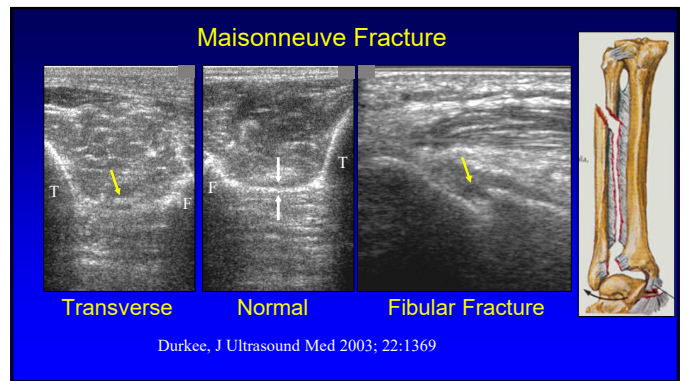


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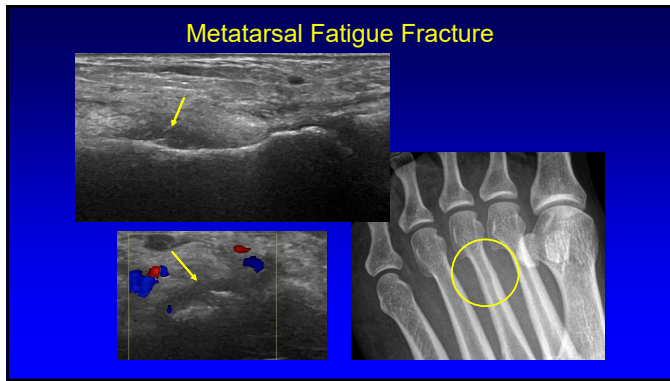
### Ligament Tear:

- Anterior inferior tibiofibular ligament:
  - Look for interosseous membrane tear if absent lower fibular fracture
  - Maisonneuve fracture

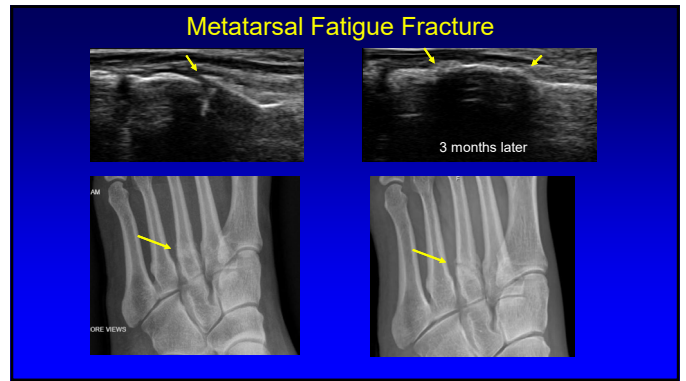
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66



67



68

- ### Take Home Points
- Knee effusion:
    - Suprapatellar and medial/lateral recesses
  - Extensor mechanism: dynamic evaluation
  - Baker cyst: must see neck to diagnose
  - Achilles: dynamic imaging
  - Peroneal: dynamic, subluxation
  - Ankle ligaments: transducer positioning

69

Thank you!

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[www.jacobsonmskus.com](http://www.jacobsonmskus.com)

Twitter handle: @jjacobsn

70