

**Musculoskeletal ultrasound course for
rheumatologists – Basic level
in Plovdiv, Bulgaria 14th January – 16th January, 2016**

Standardized scanning of the ankle and foot

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Scanning approach to the ankle

Best use linear probe 8-13 MHz

Anterior

Posterior

Medial

Lateral



Transducer
Orientation:
- Longitudinal
- Transverse



Standard scans

- 1 Anterior longitudinal scan
- 2 Anterior transverse scan
- 3 Perimalleolar medial longitudinal scan
- 4 Perimalleolar medial transverse scan
- 5 Perimalleolar lateral longitudinal scan
- 6 Perimalleolar lateral transverse scan
- 7 Posterior longitudinal scan
- 8 Posterior transverse scan



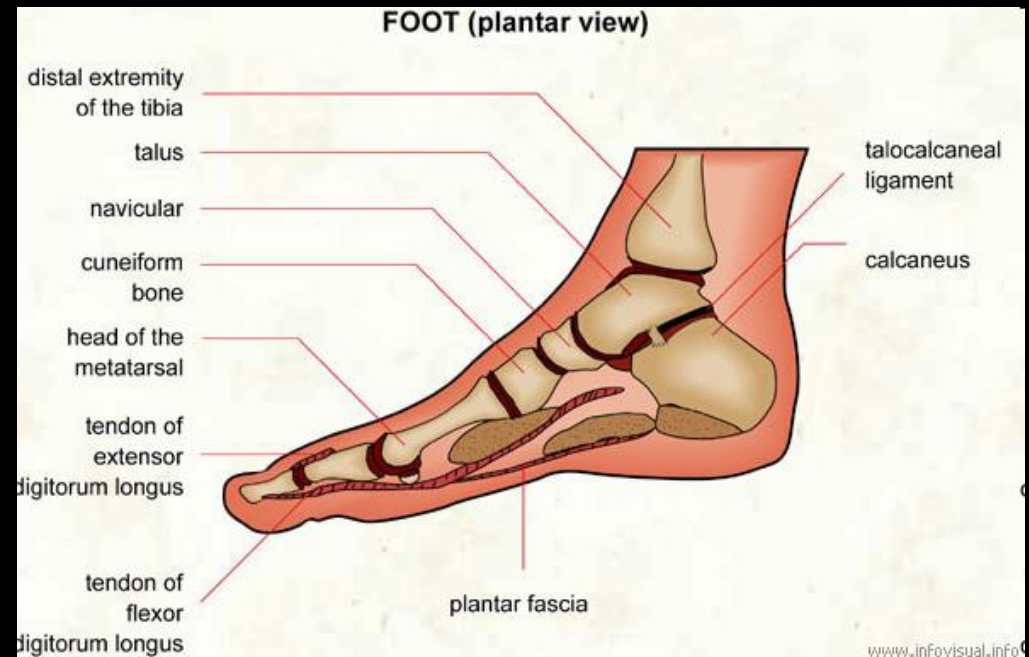
Positioning of the patient

- Supine position for anterior and lateral scans
- Prone position for posterior scan
- For anterior scanning patient should be on the examination bed with the knee flexed 45° , so that the plantar surface of the foot lies flat on the table.

Ankle/foot anatomy reminder - anterior

Joints:

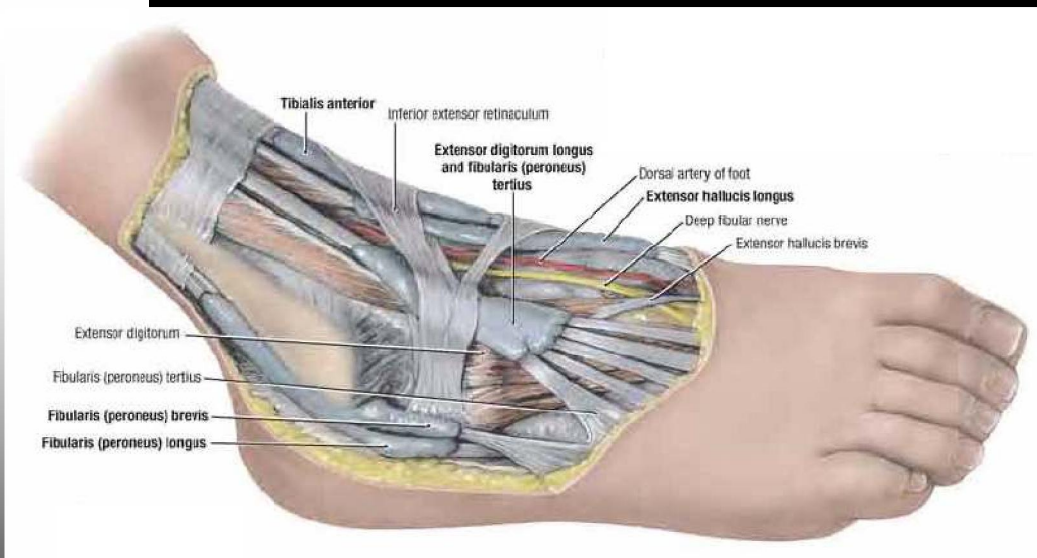
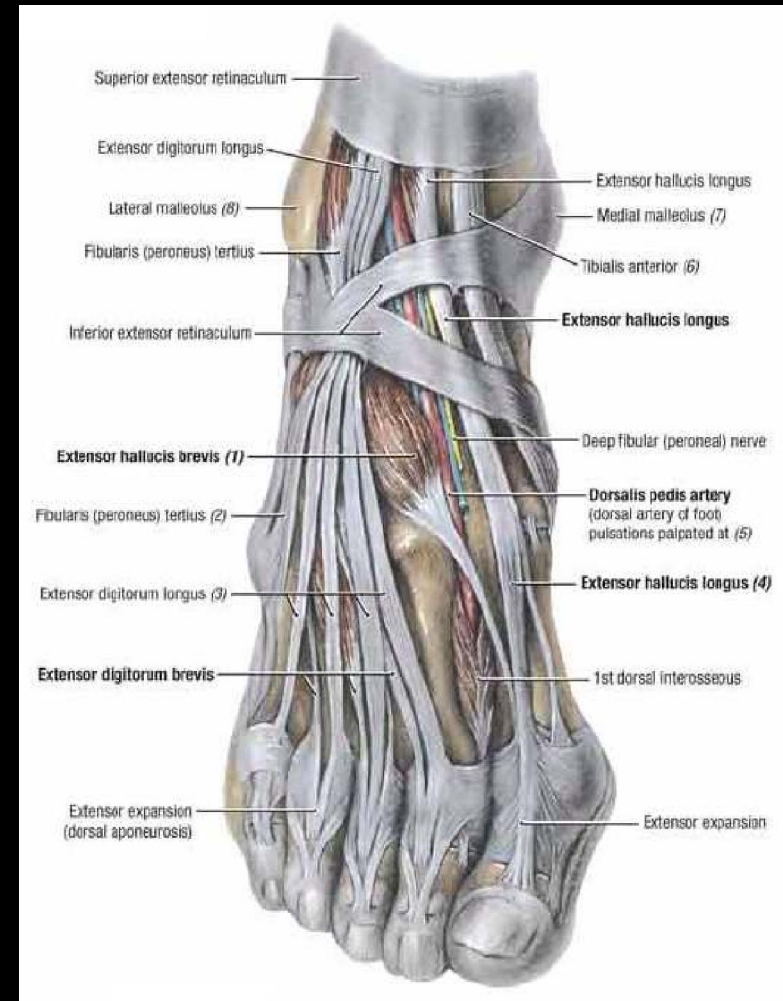
- Tibiotalar
- Talonavicular
- Cuneonavicular
- Tarsometatarsal
- Metatarsophalangeal
- Interphalangeal



More ankle anatomy

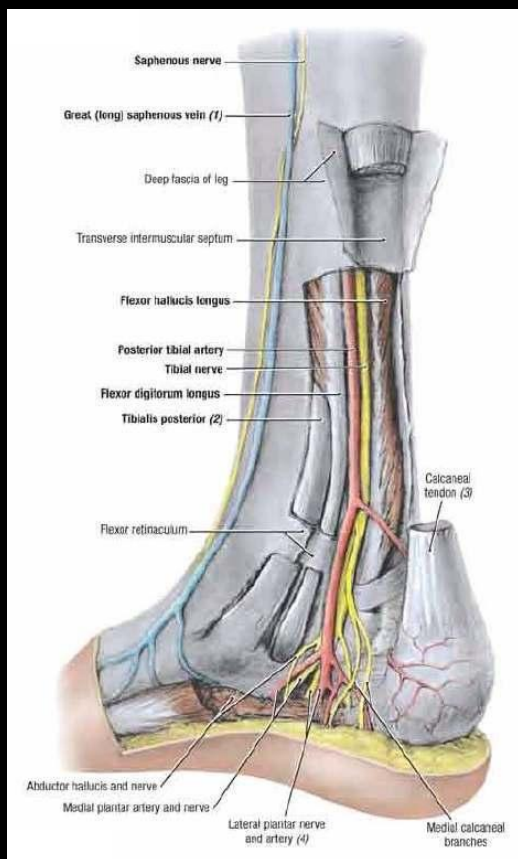
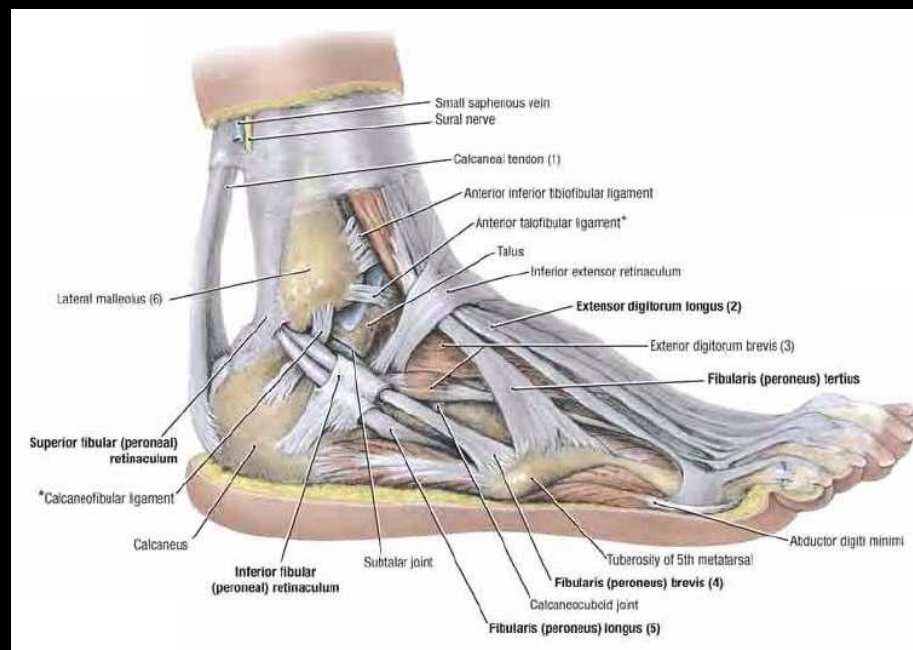
Other structures of interest:

- 10 tendons around ankle
- Dorsalis pedis artery
- Deep peroneal nerve



Ankle tendons

- **10 tendons** cross the ankle joint, but no one actually attach to the ankle.



- We are specially interested in:
 - THD – anterior aspect of the ankle
 - TDH – medial side of the ankle
 - Peroneus longus et brevis at lateral side
 - Achilles tendon at posterior aspect
- Bony crests and retinacula help tendons to change direction from vertical to horizontal
- All tendons have *sheaths* with exception of Achilles
- A small amount of fluid in tendon sheath is completely normal finding

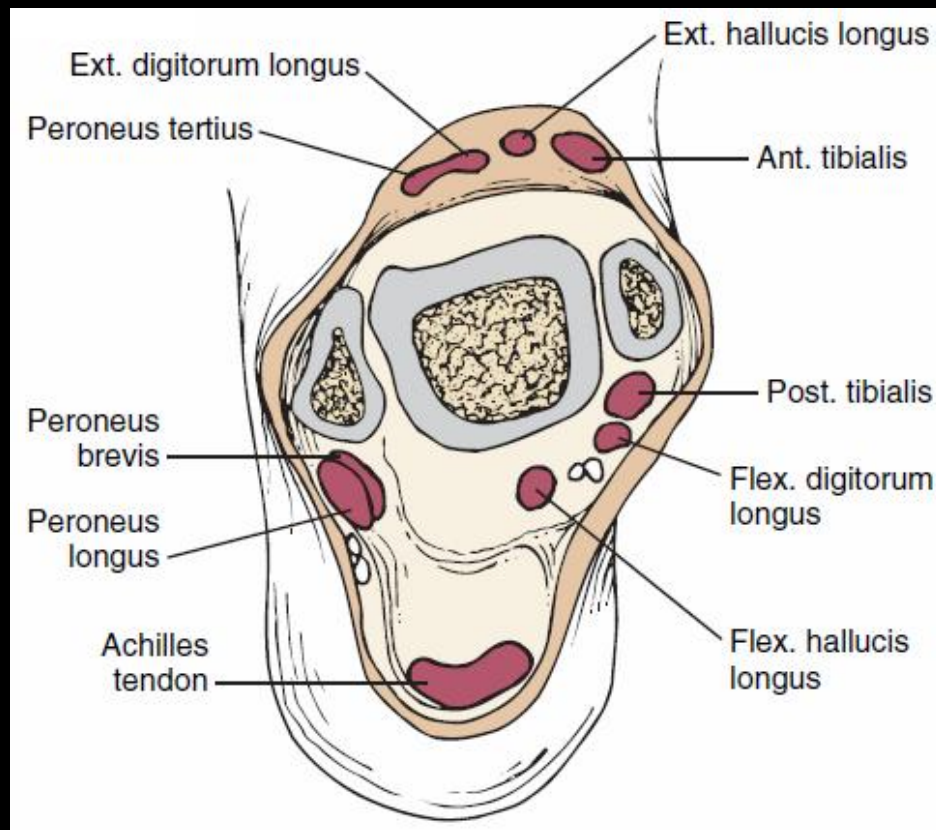
Ankle and foot anatomy- anterior

- **Tendons:**

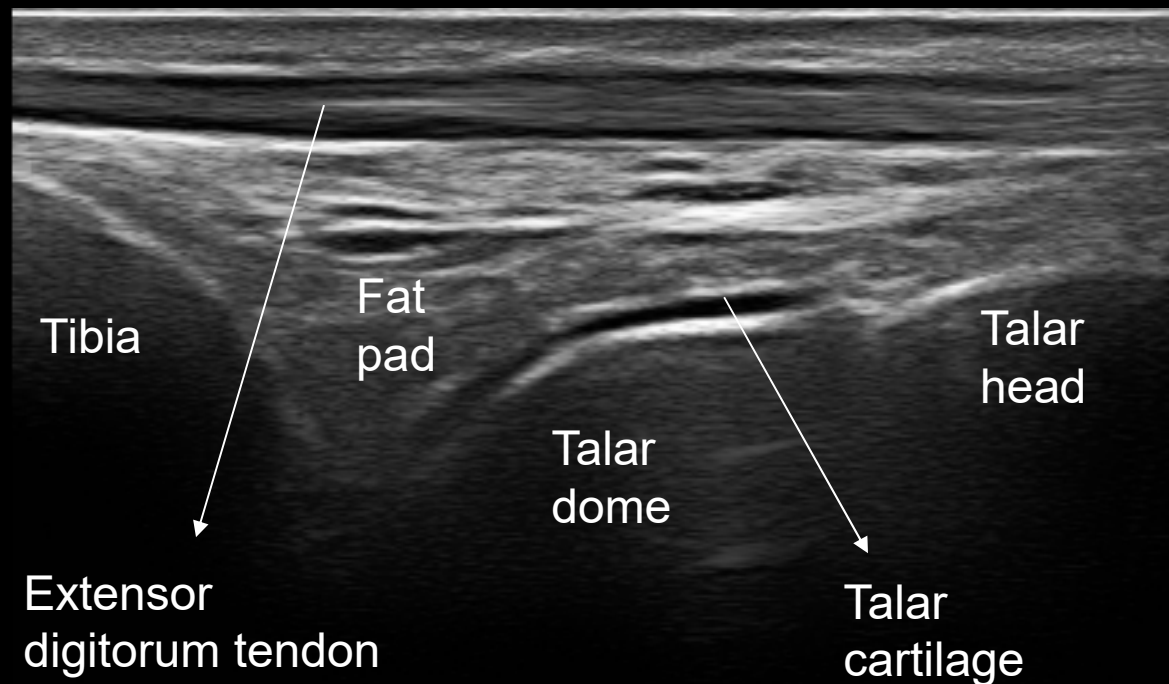
Tibialis anterior (T)

Extensor hallucis longus (H)

Extensor digitorum longus (D)

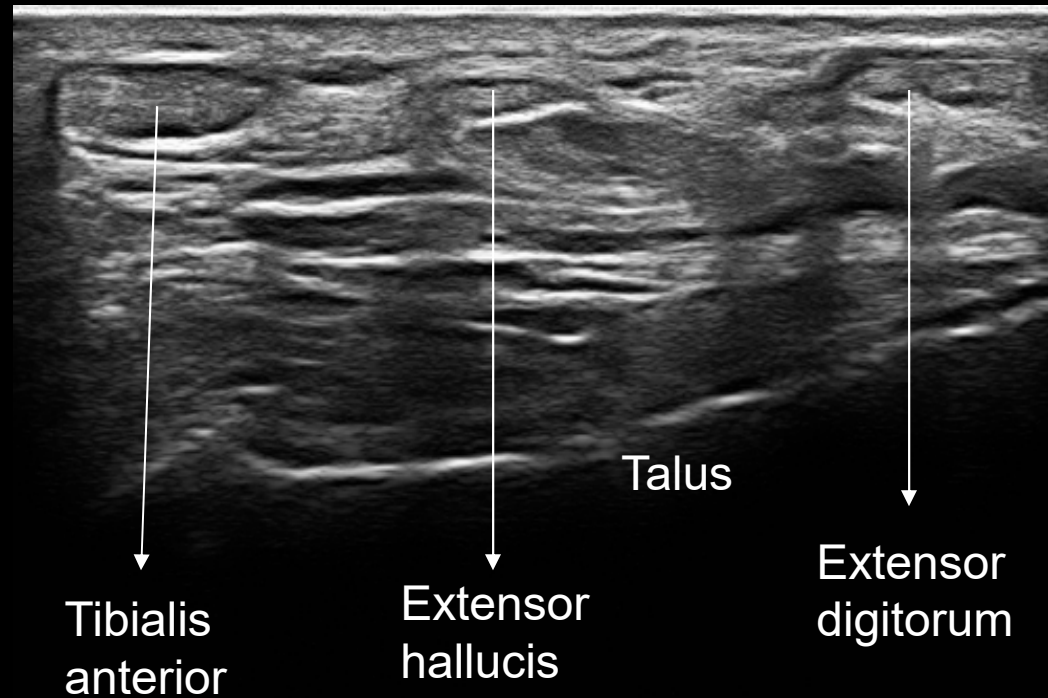


US of normal ankle anterior – longitudinal view



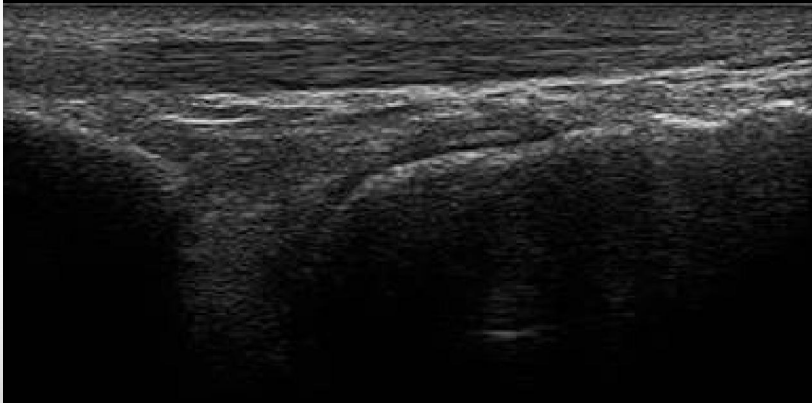
Anterior tendons – transversal view

- From medial to lateral:
 - Tibialis anterior, Extensor hallucis longus and Extensor digitorum – Tom Hates Dick

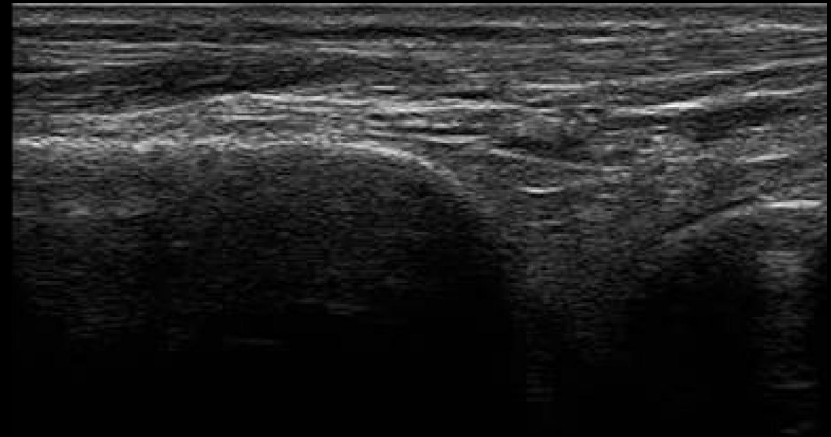


Anterior tendons – longitudinal view

- **From medial to lateral:**
 - Tibialis anterior, Extensor hallucis longus and Extensor digitorum – Tom Hates Dick



Tibialis anterior
Insertion on plantar side of the base
of 1st MT bone

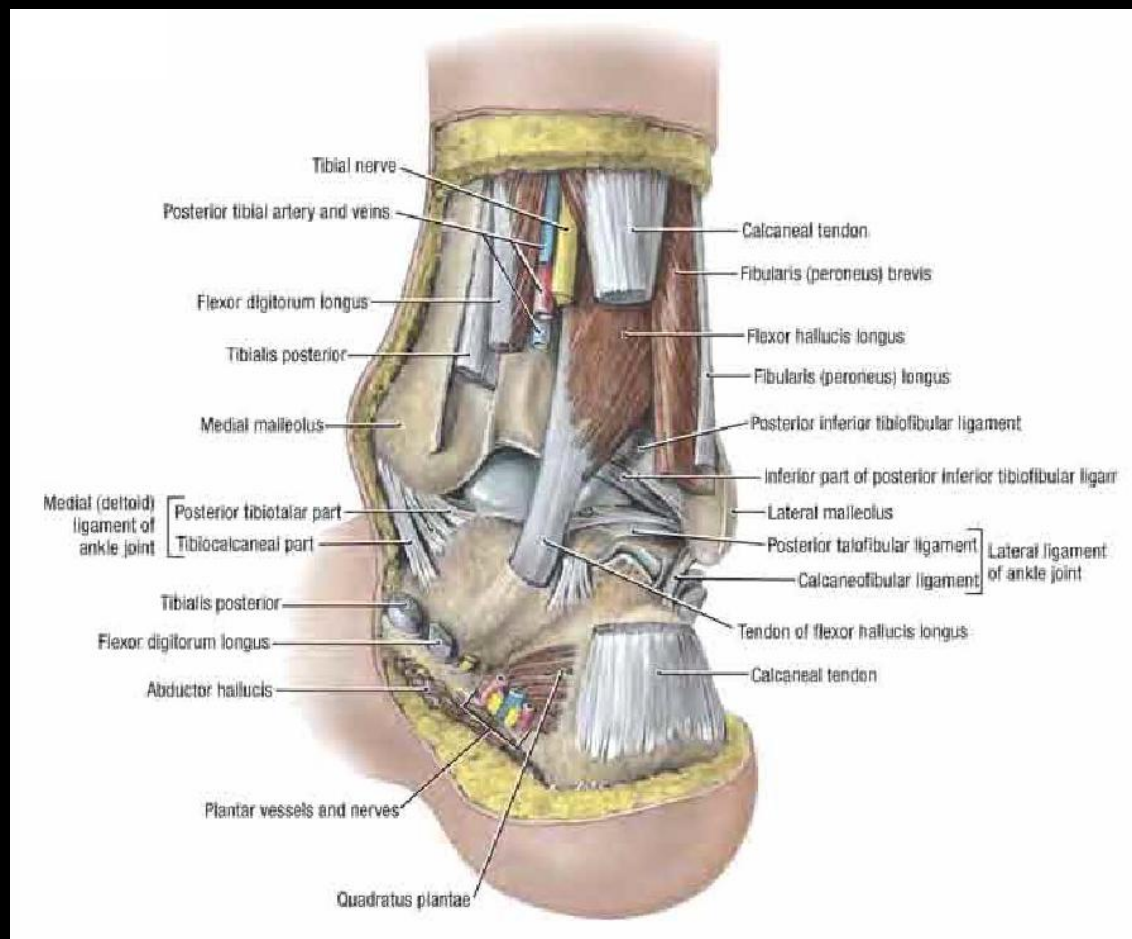


Extensor hallucis longus
Insertion on dorsal side of distal
hallux phalanx

Ankle and foot anatomy – posterior view

Structures of interest:

- Achilles tendon
- Kager's fat pad
- Retrocalcaneal bursa
- Posterior recess of tibiotalar joint
- Flexor hallucis longus
- Plantar fascia



Ankle and foot US – longitudinal posterior view



Achilles tendon

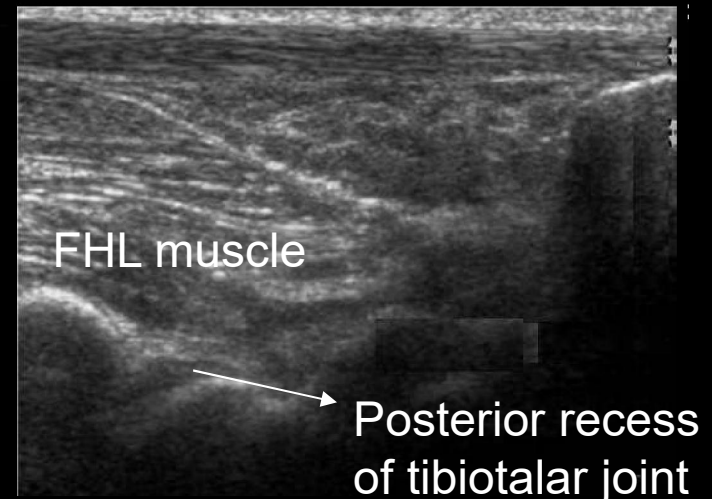
Kager's fat pad



Calcaneus

Achilles tendon facts:

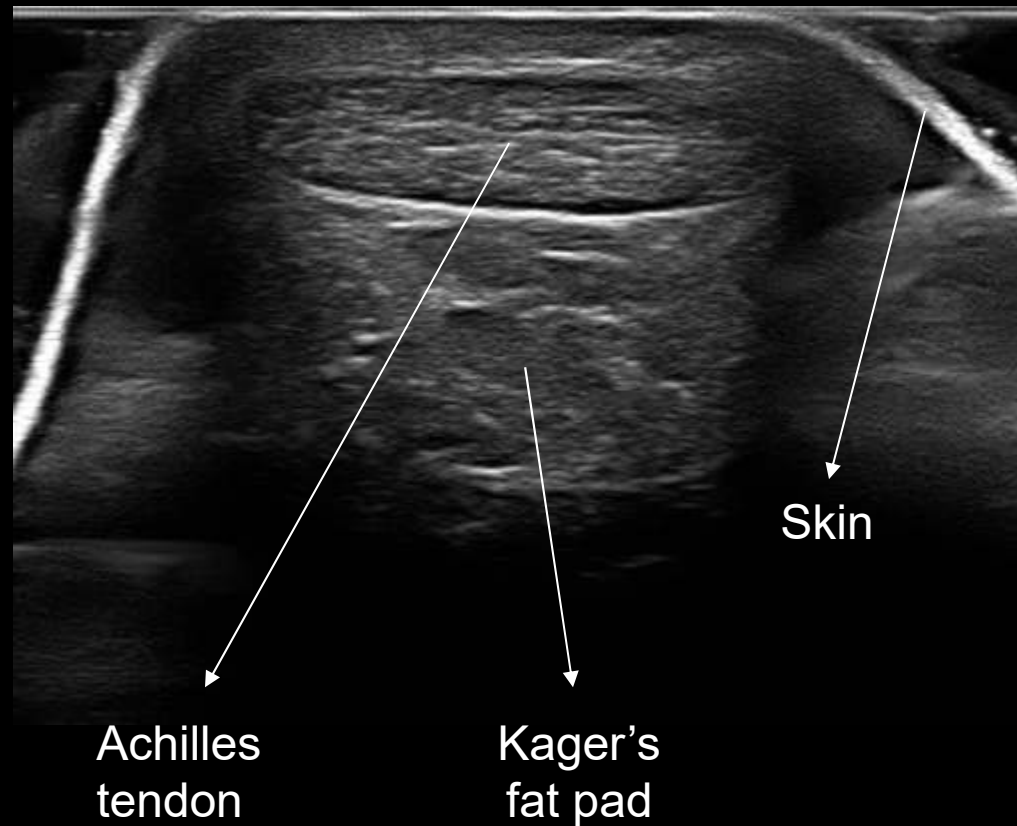
- Length 10 – 15 cm
- Cross section $\approx 7 \times 13$ mm
- Constitutes from fibers of aponeurosis of 2 gastrocnemius heads and soleus tendon
- Origin on calcaneus
- There is no tendon sheath
- Very straight course



FHL muscle

Posterior recess of tibiotalar joint

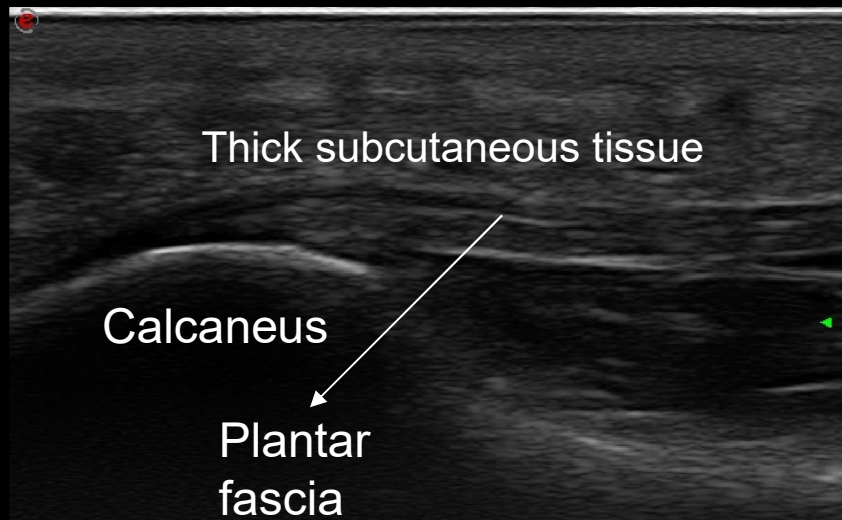
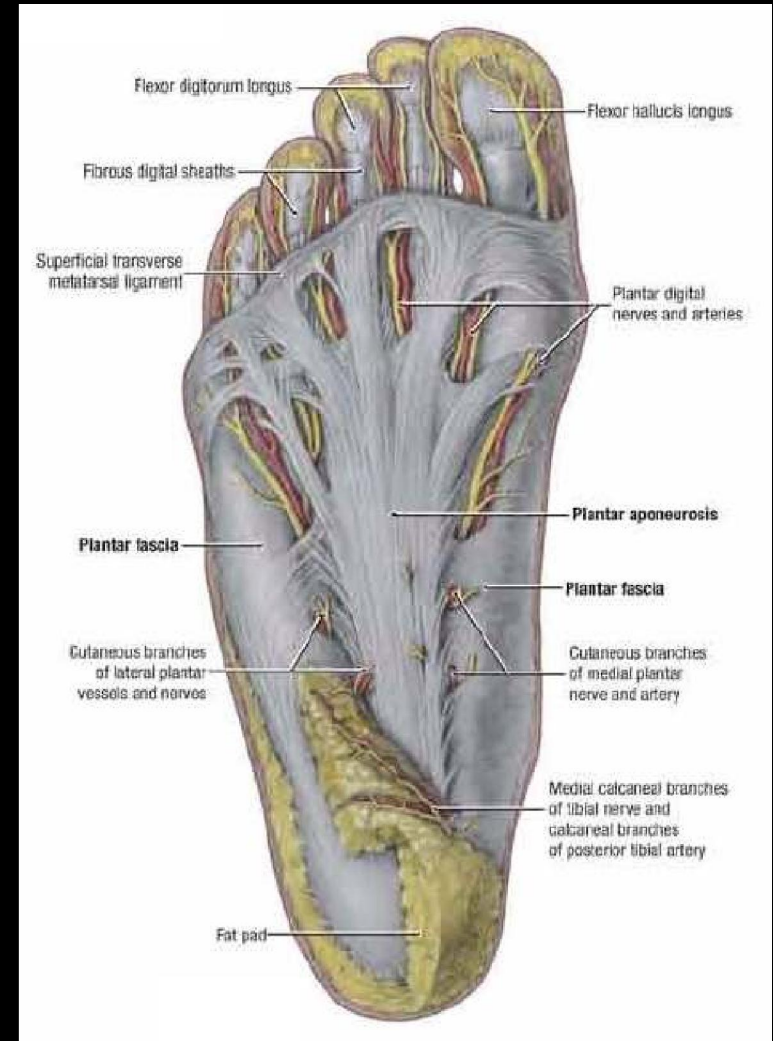
Ankle and foot US – transversal posterior view



Plantar fascia – longitudinal view

Plantar fascia facts:

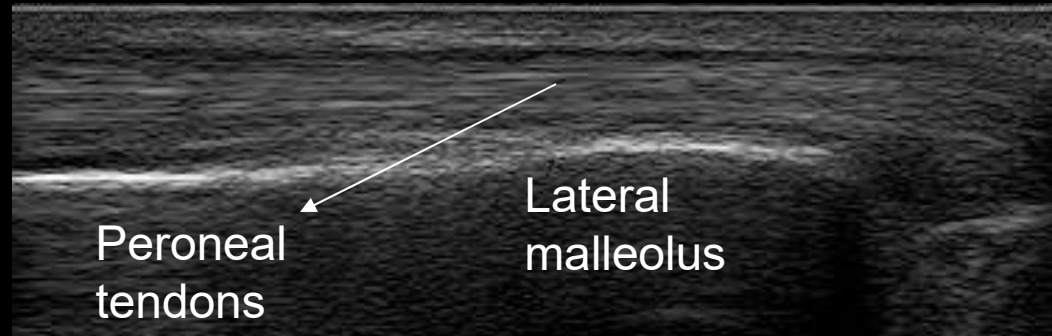
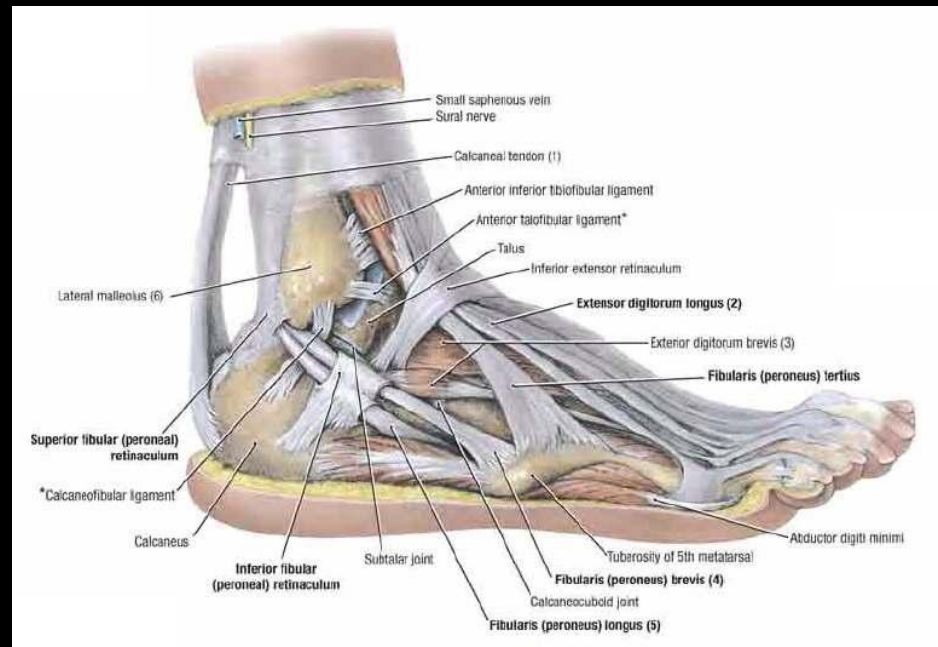
- Superficial fascia
- Network of collagen fibers with fibrous thickening, mostly longitudinally oriented
- Common anisotropy at insertion
- Normally 3 – 4 mm thick



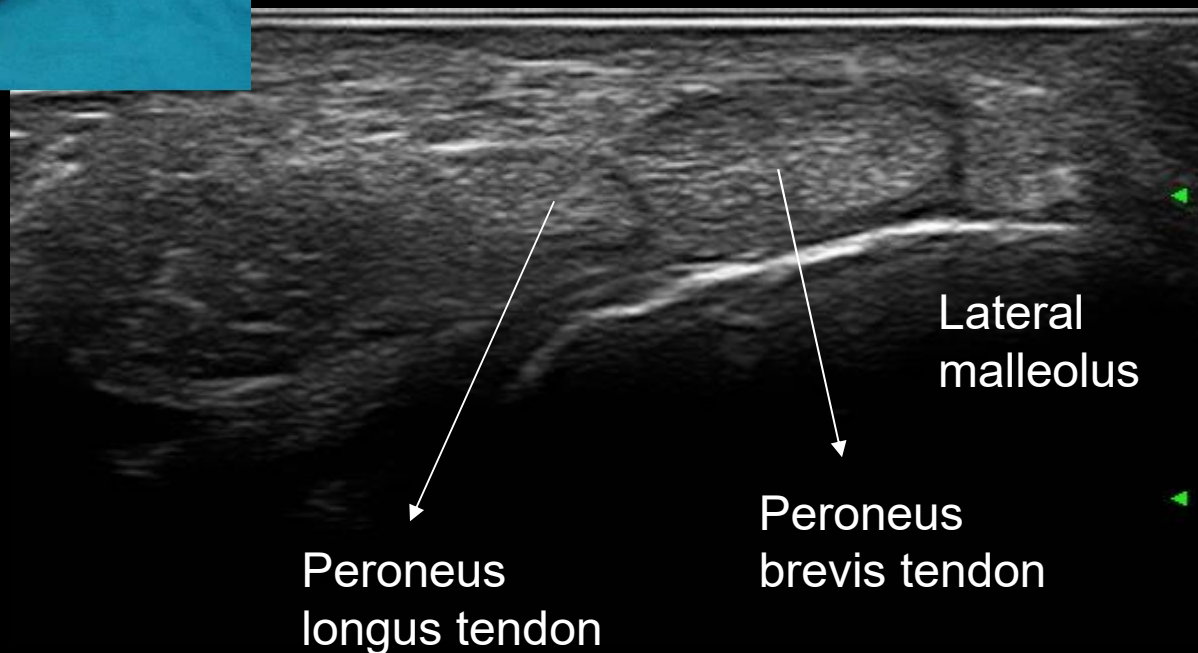
Ankle US – lateral longitudinal view

Peroneal tendons facts:

- They have common synovial sheath in retromalleolar location
- They are curving around lateral malleolus
- Their insertions are on all MT bones



Ankle US – lateral transversal view

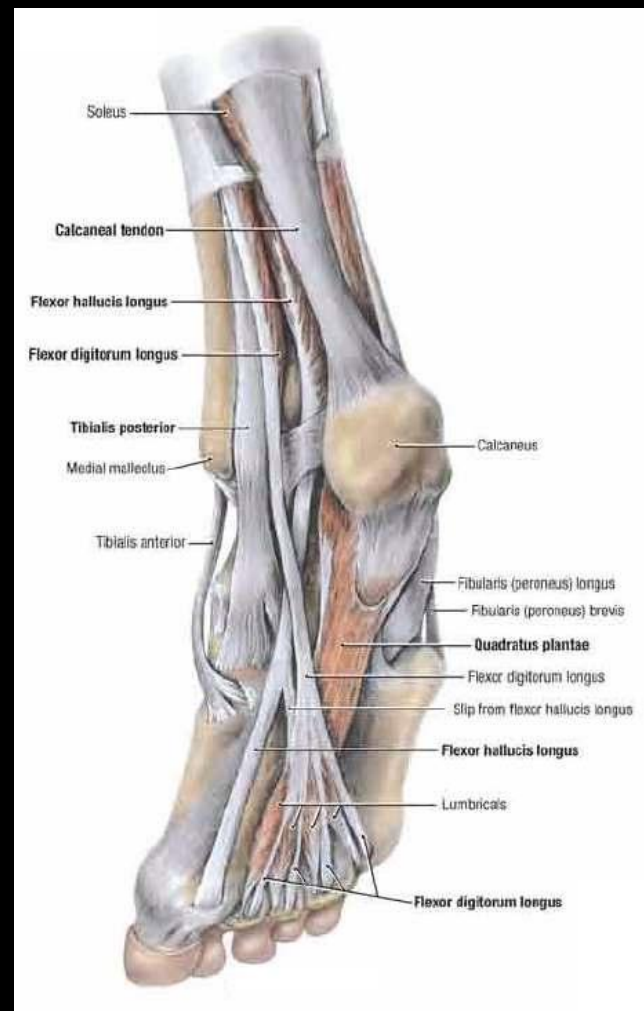


Ankle US – *medial view*

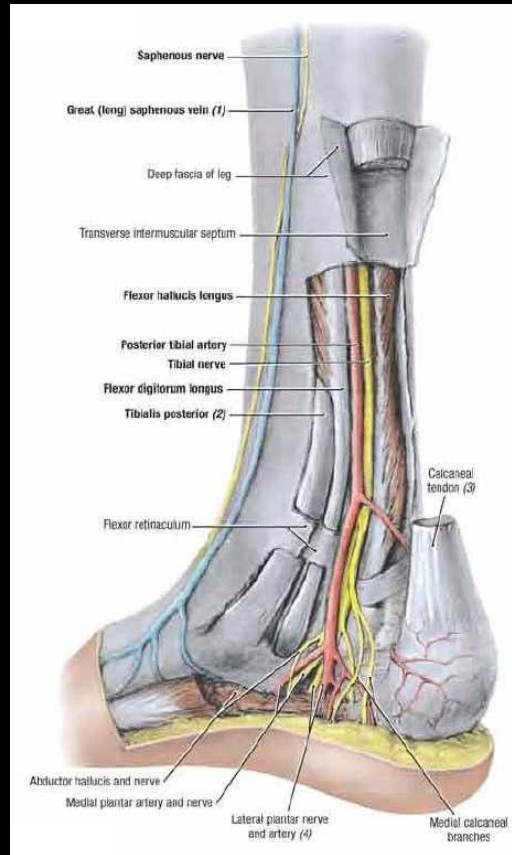
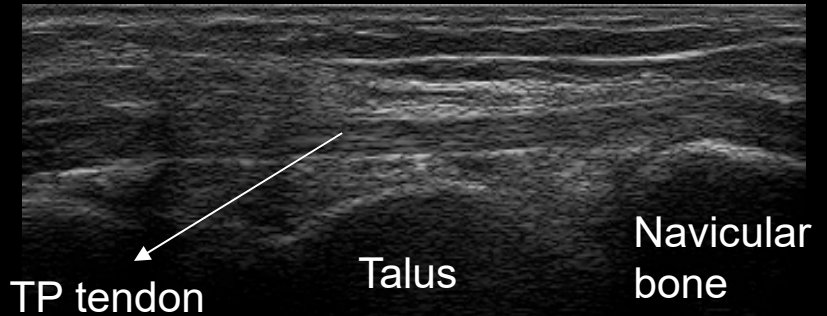
Structures of interest

- Tendons:
Tibialis posterior (T)
Flexor digitorum longus (D)
Flexor hallucis longus (H)
- Tom, Dick and Harry
- Posterior tibial artery and veins
- Deep tibial nerve

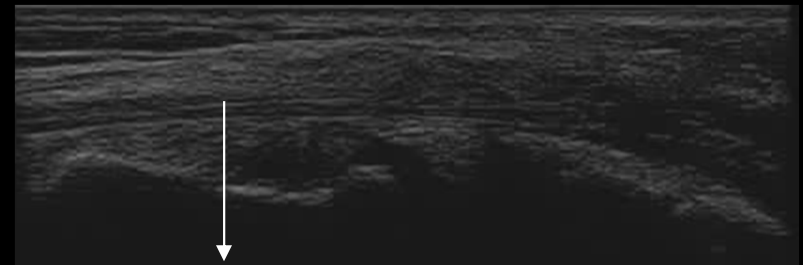
All structures go by
tarsal tunnel – between tarsal bones and flexor retinaculum



Ankle US – medial longitudinal view

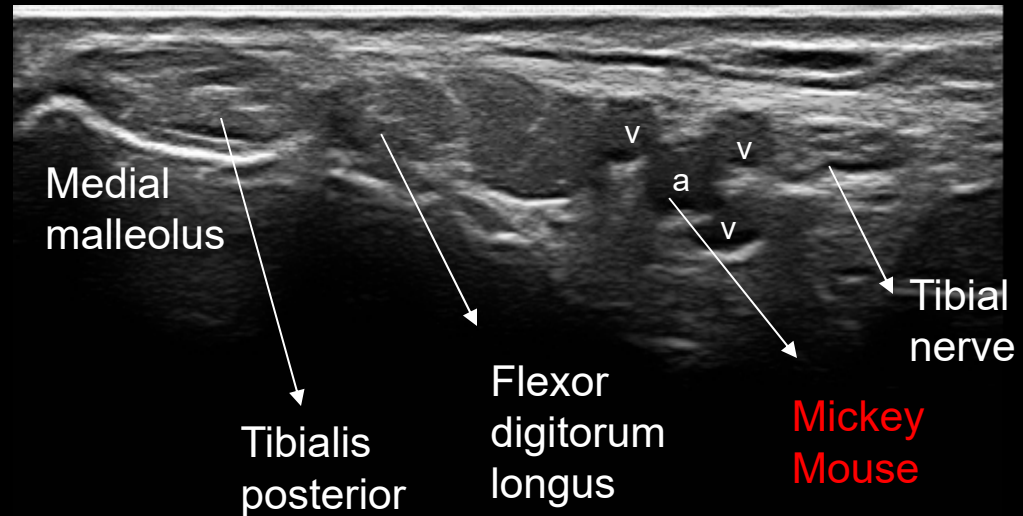


- Tibialis posterior tendon overlaying talonavicular joint space
- Insertion of TP on navicular bone



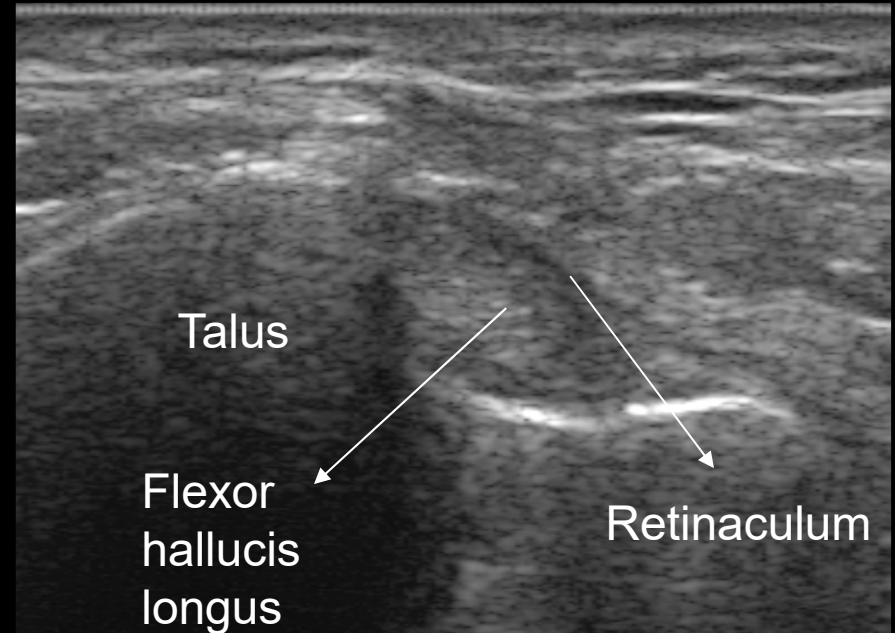
- Flexor hallucis longus has deeper position
- Insertion on base of 1st distal phalanx

Ankle US – medial transversal view



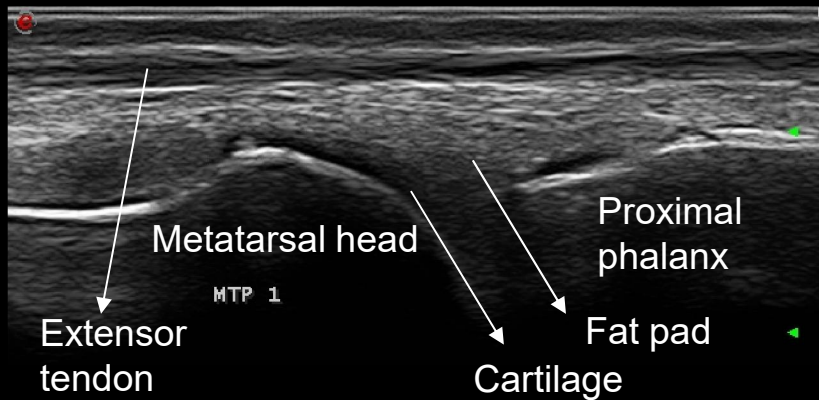
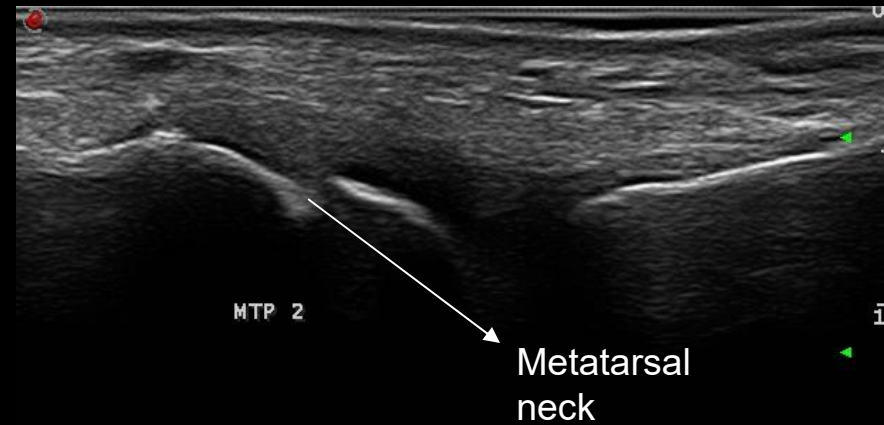
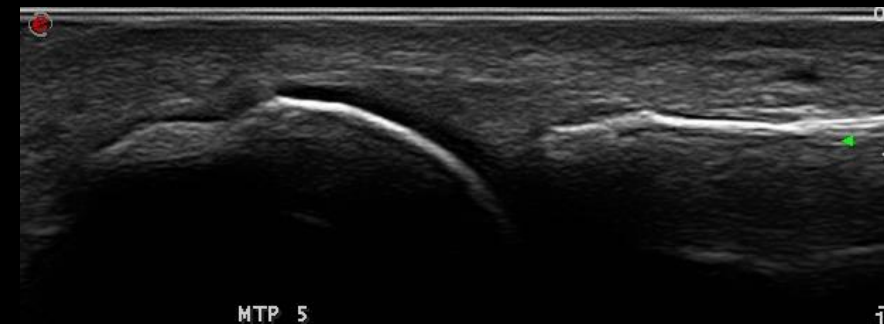
- Tibialis posterior lays in bony groove of medial malleolus.
- Small amount of fluid can be found around tendon normally.

Ankle US – medial transversal view



- To assess Flexor hallucis longus move probe more posterior

MTP Joints – dorsal view



Basic pathological findings

Medical Afflictions OF THE Cartoon World



Parkinson's Disease



Anorexia



Amphetamine Addiction



A.D.D.



Gigantism



Senile Agitation



Narcolepsy



Sexual Addiction



Violent Mood Swings



Napoleon Complex



Severe Lisp

Tibiotalar joint effusion/synovial hypertrophy

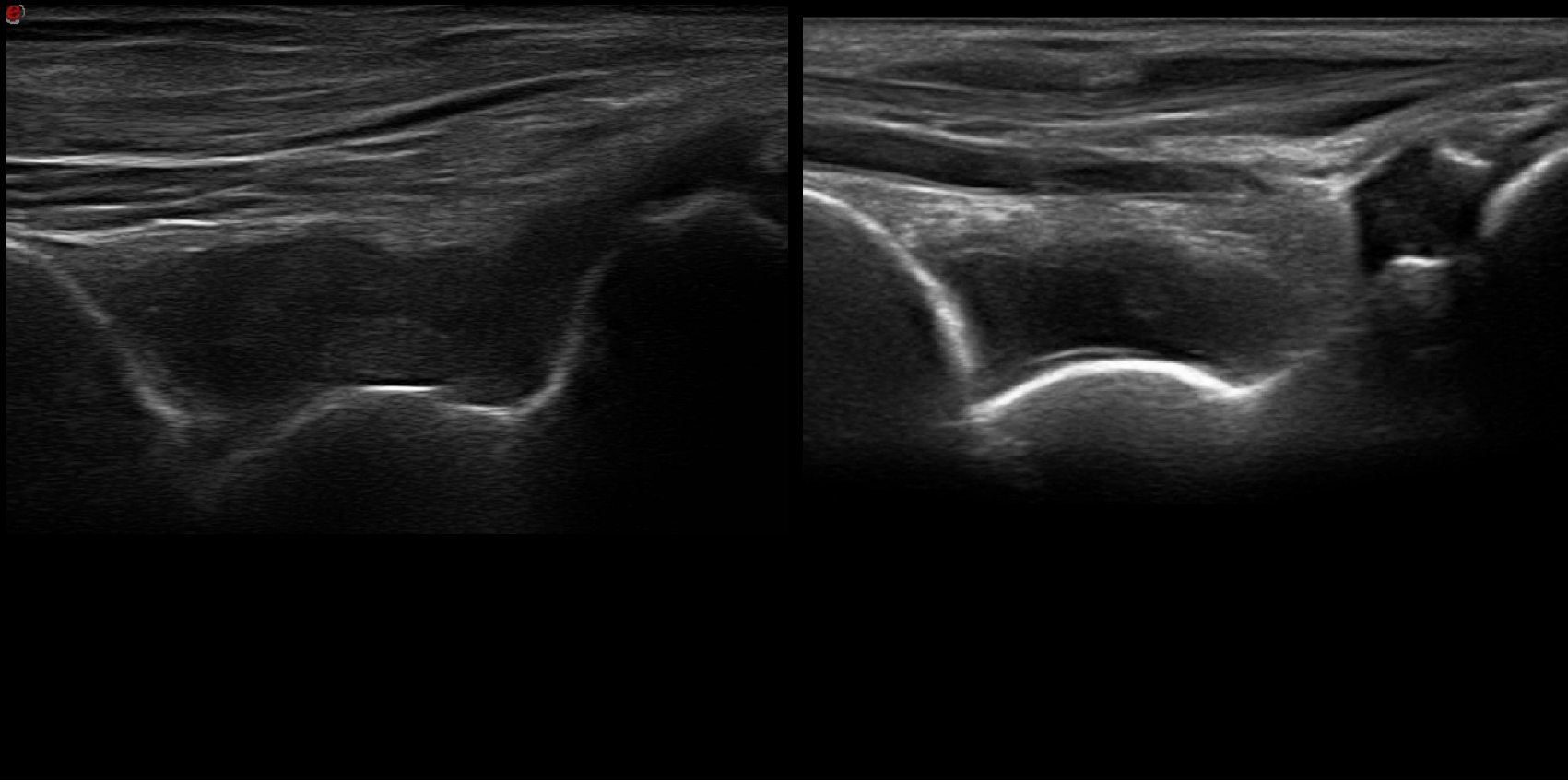
- RA is commonly associated with talonavicular synovitis
- Spondyloarthritis - associated with flexor tendon involvement, plantar fasciitis, Achilles enthesopathy, “sausage” finger
- Gout
- OA



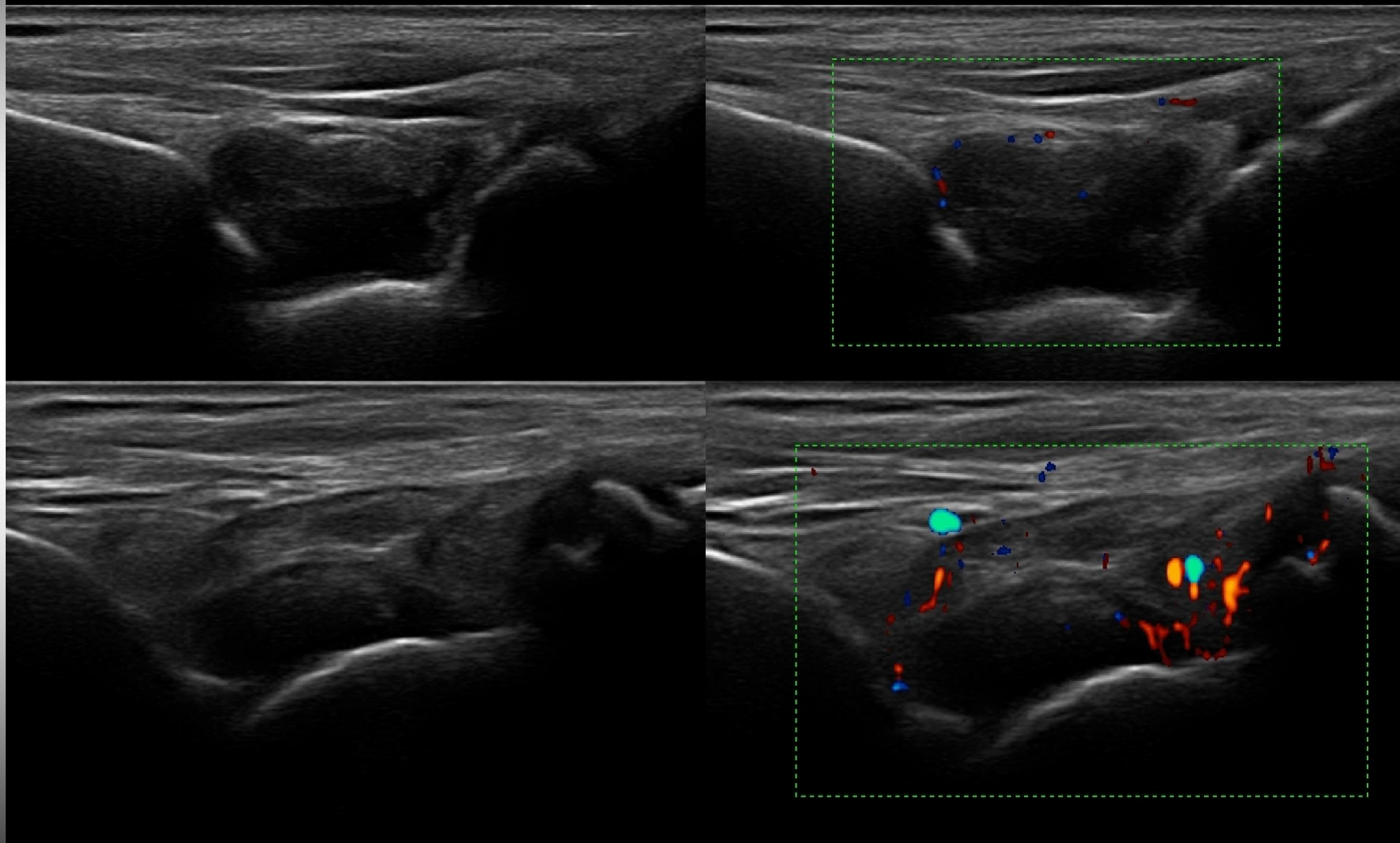
Moderate effusion
of tibiotalar joint

Tibiotalar synovitis

Plantar flexion of foot and lateral translation of probe improve sensitivity in detection of ankle synovitis.

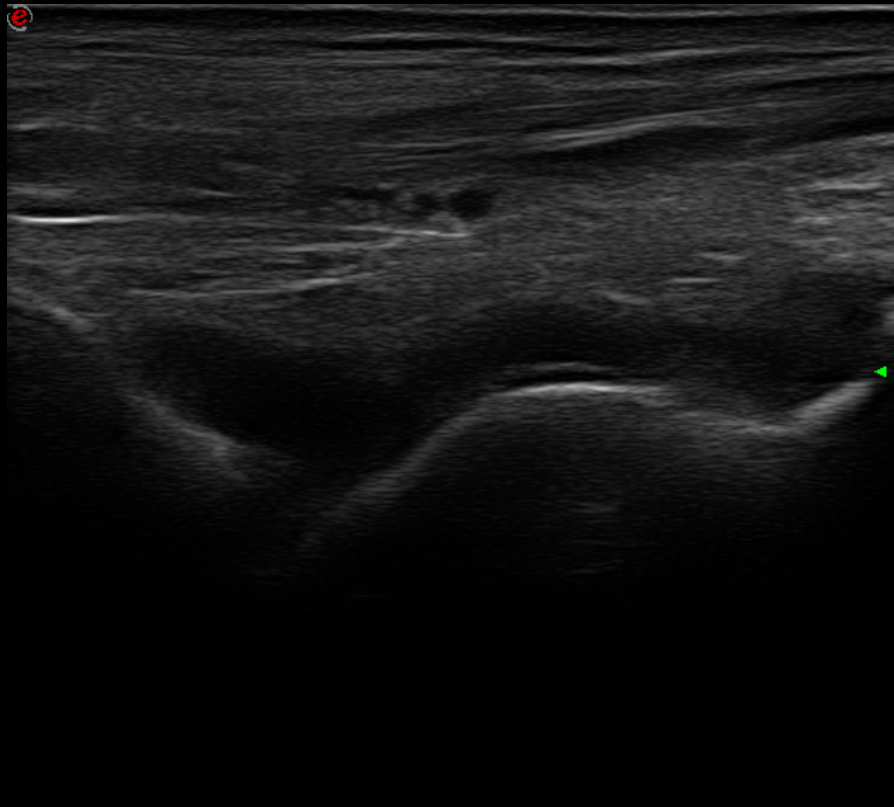


Tibiotalar synovitis



Tibiotalar effusion / hypertrophy

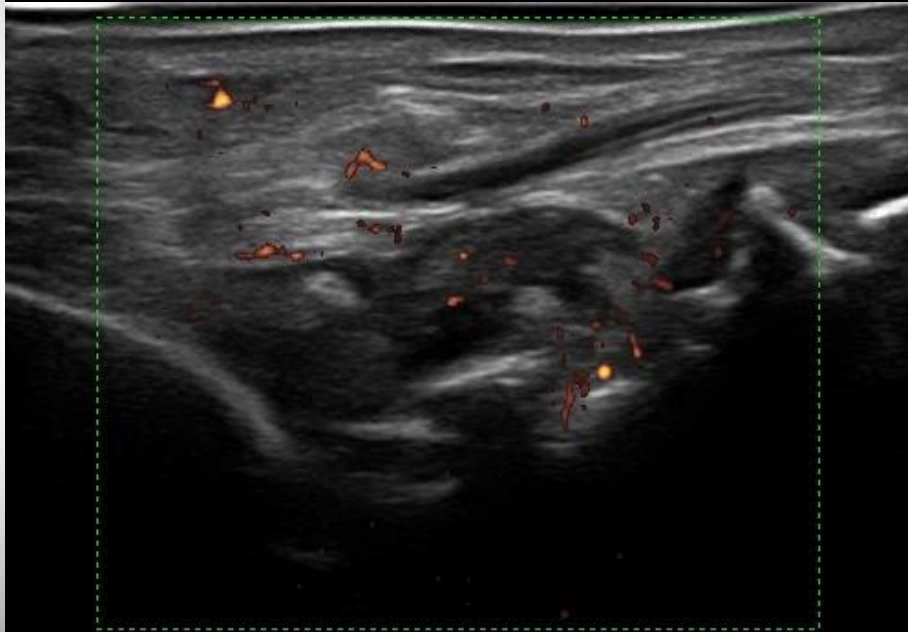
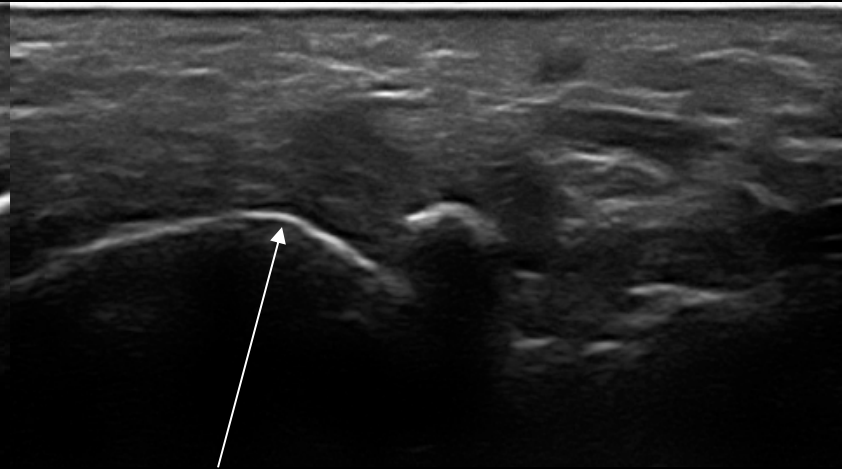
The fat pad is displaced from joint.



Septic arthritis

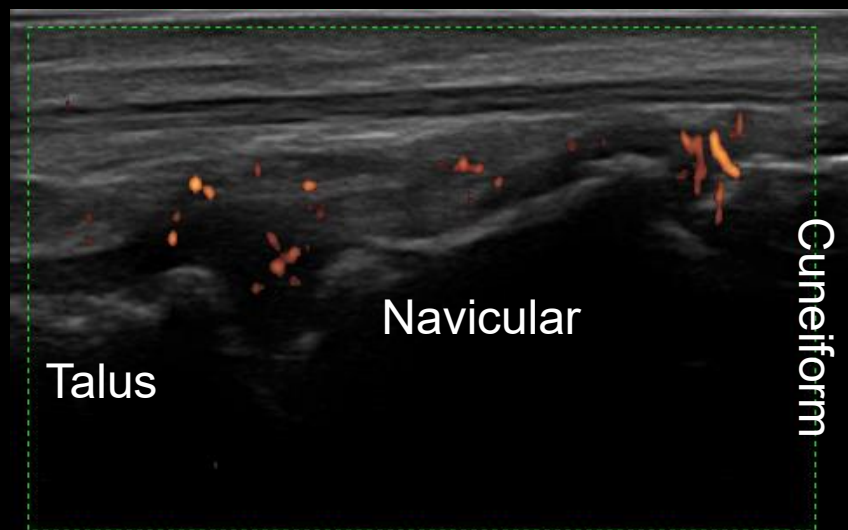
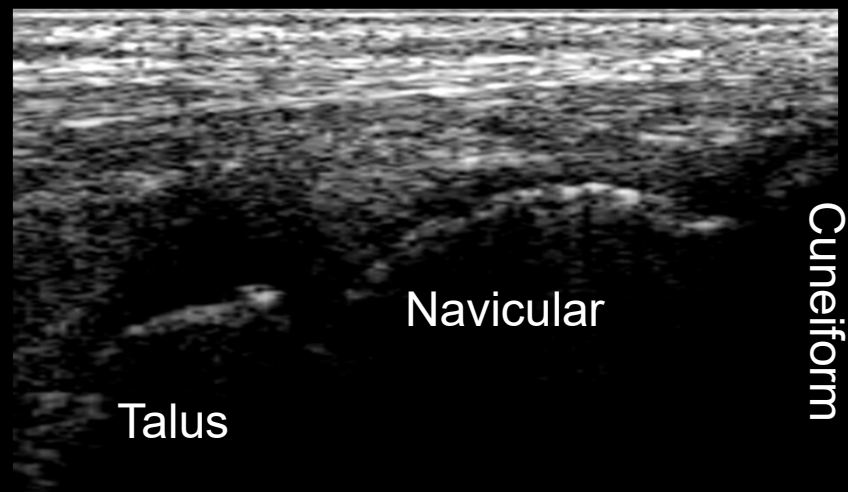
Tibiotalar osteoarthritis

The marked degenerative damage of tibiotalar joint due to diabetic neuropathy

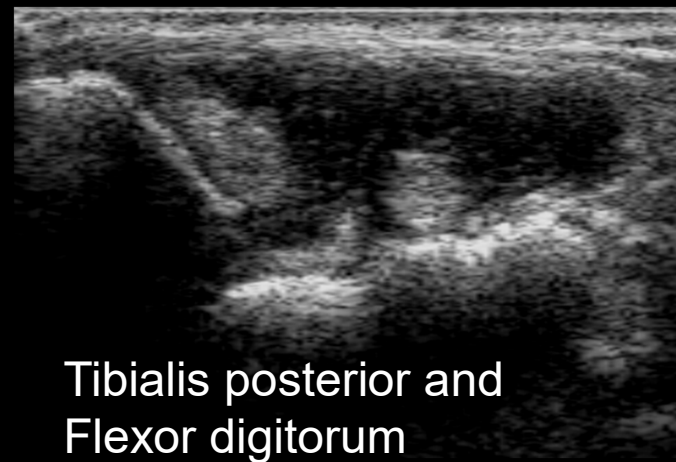


Medial malleolus

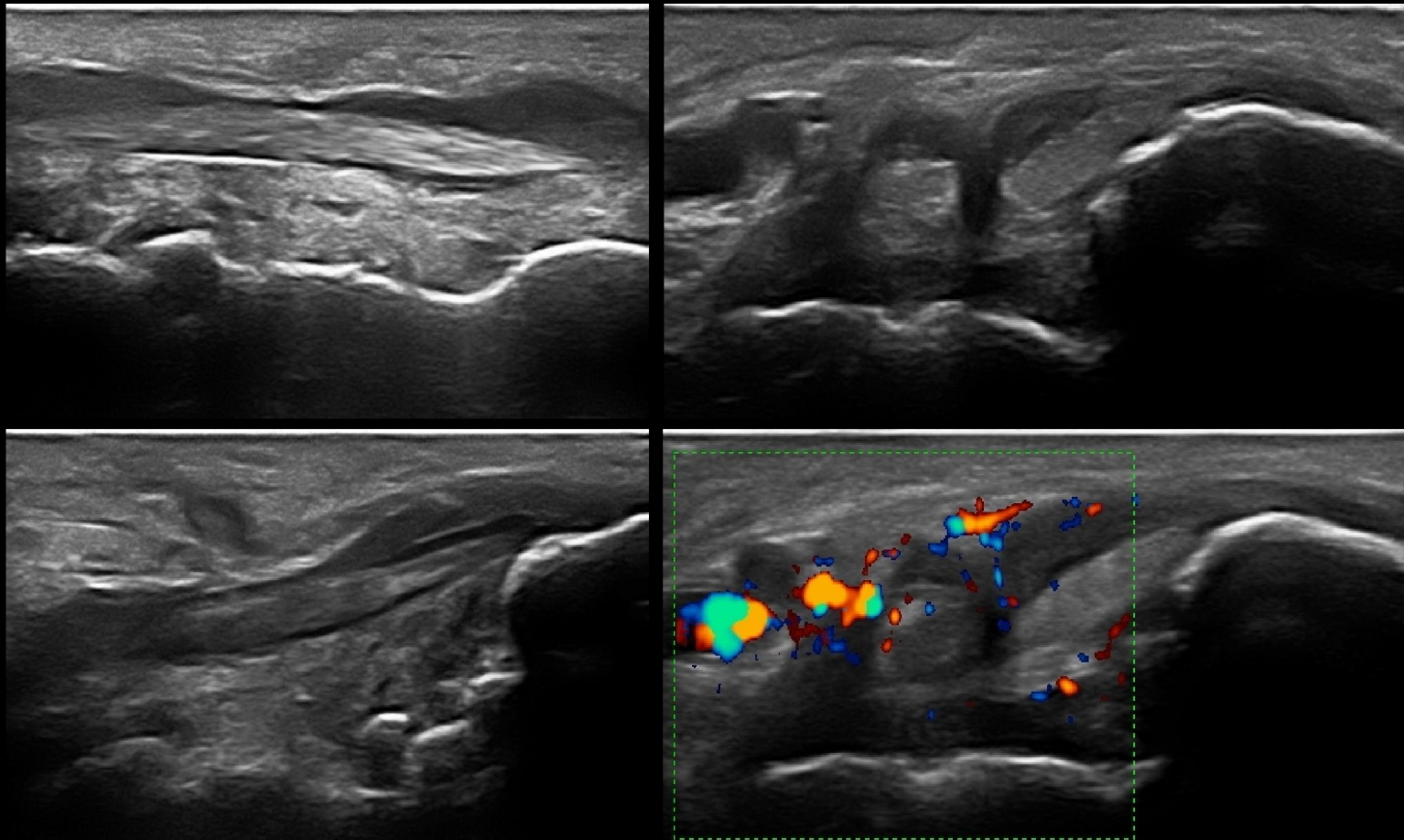
Tarsal joints synovitis



Tenosynovitis

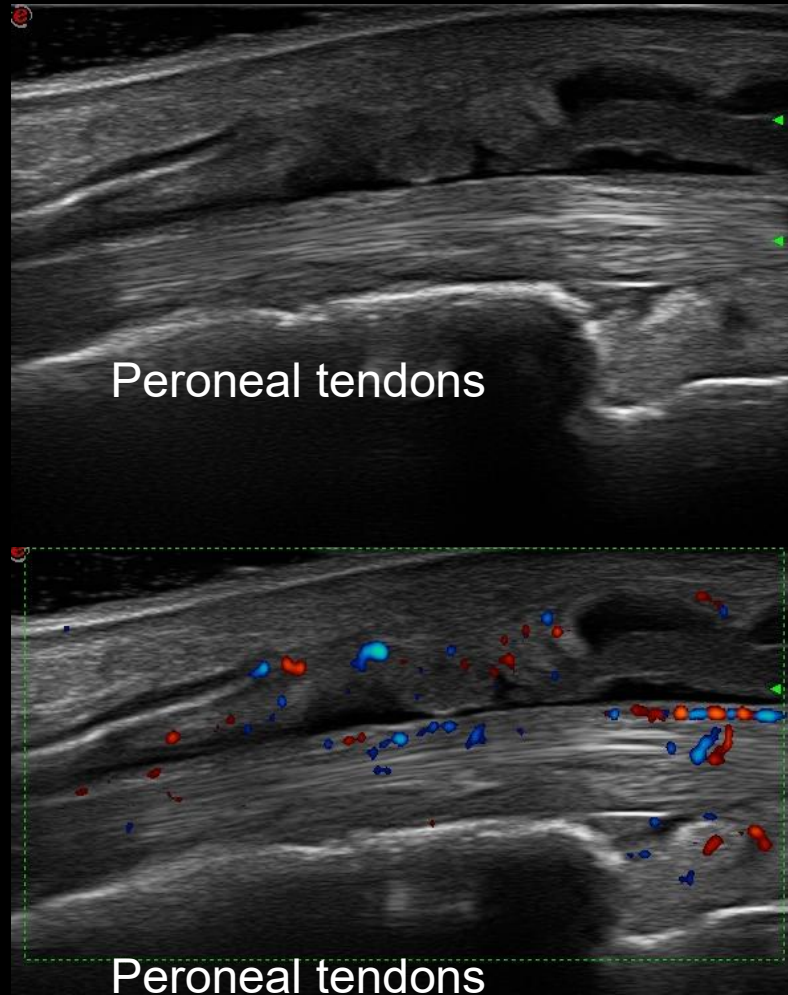
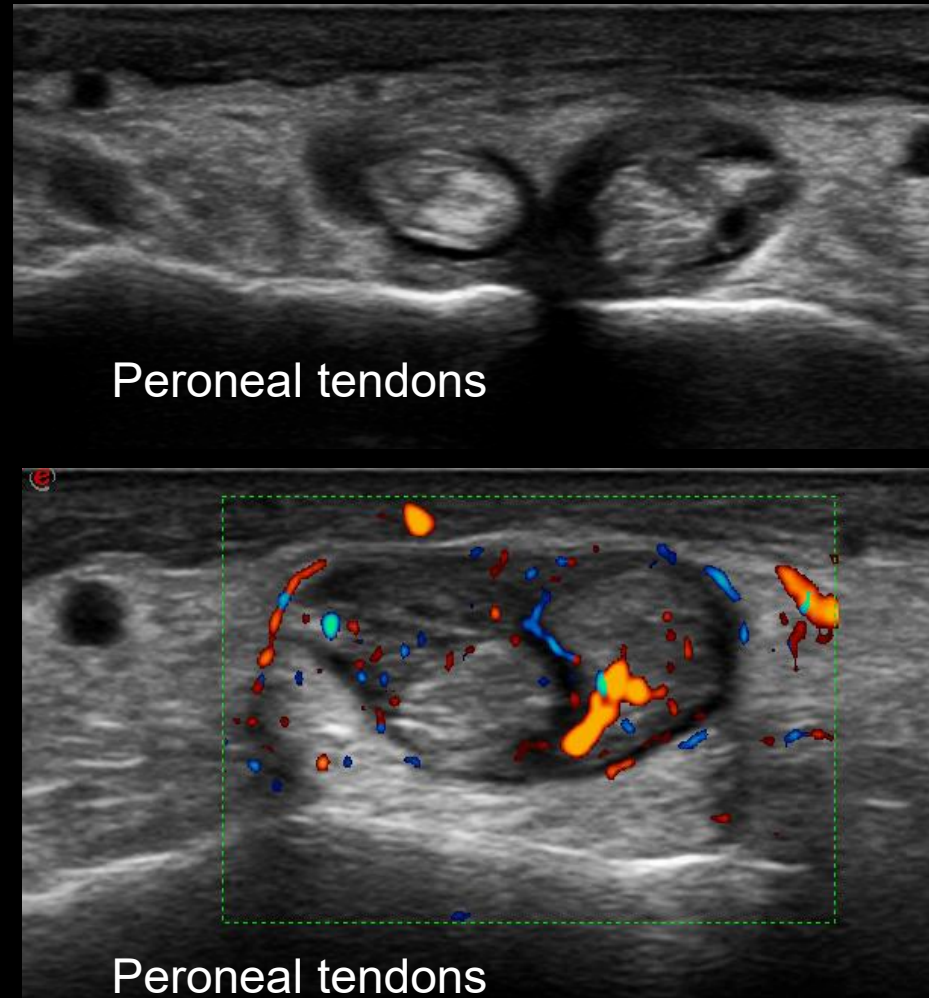


Tenosynovitis

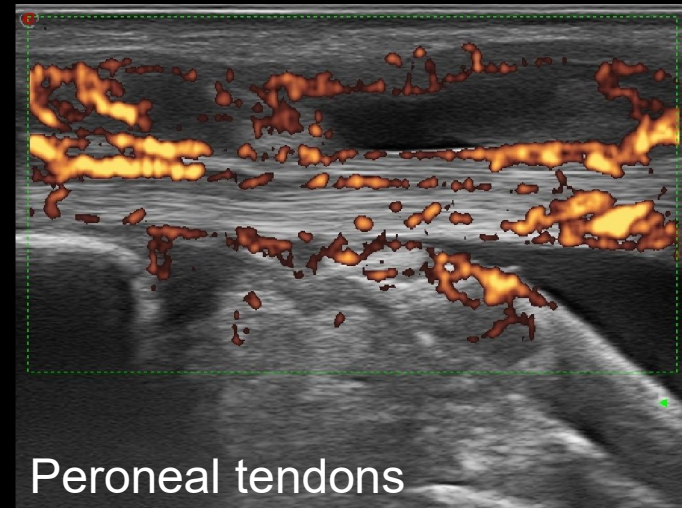
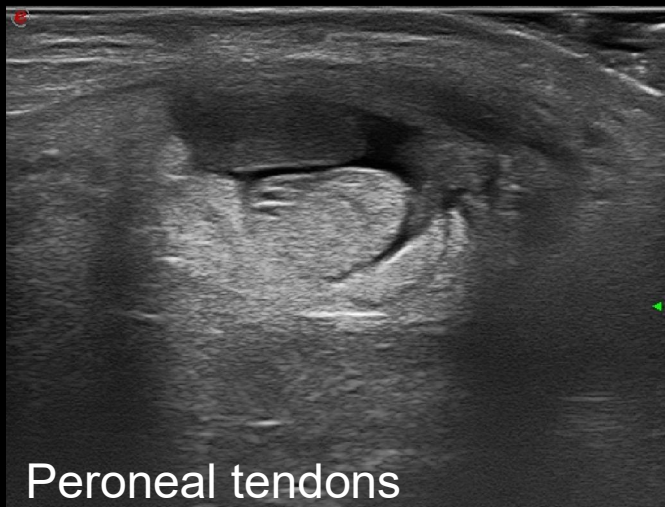
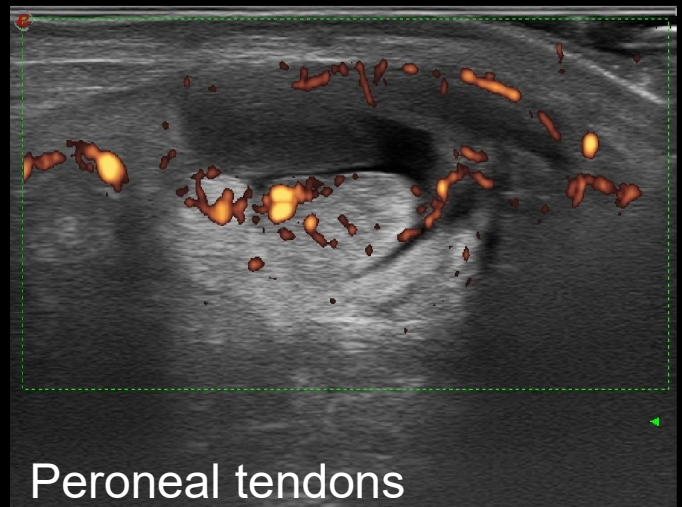


Tenosynovitis of Tibialis posterior and Flexor digitorum

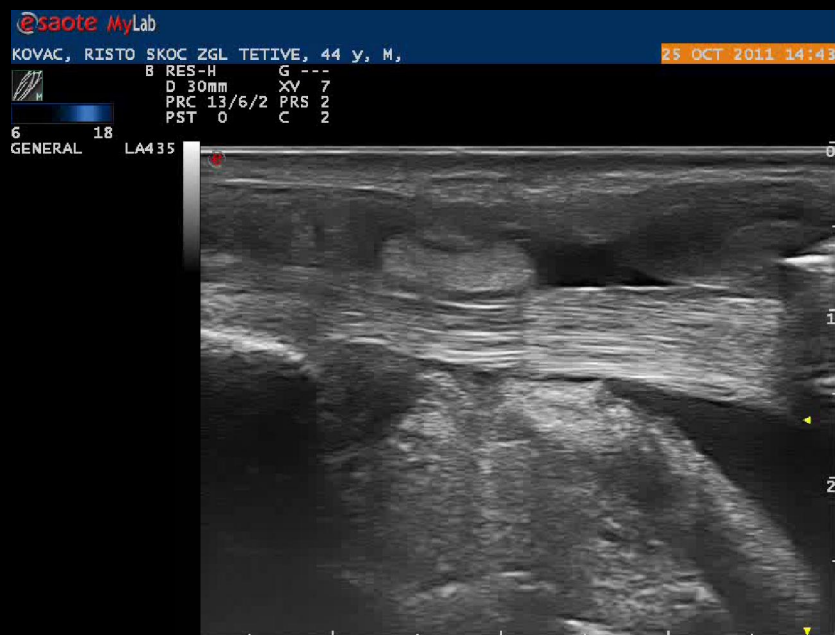
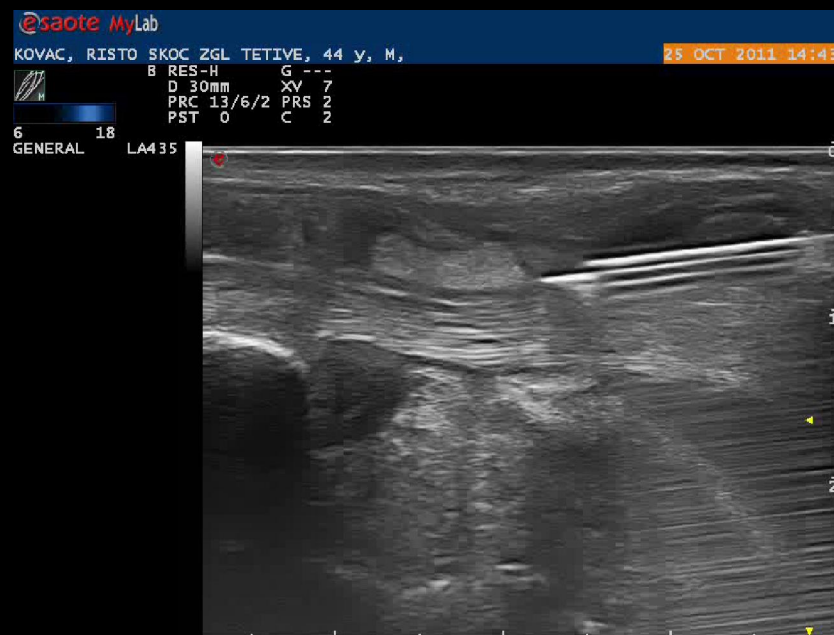
Tenosynovitis



Tenosynovitis

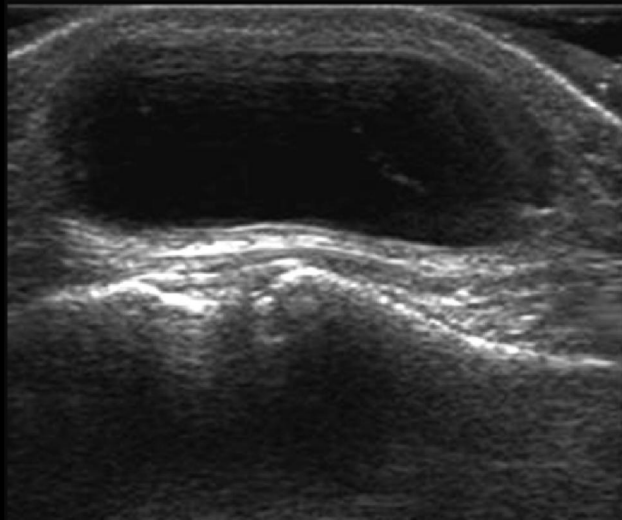
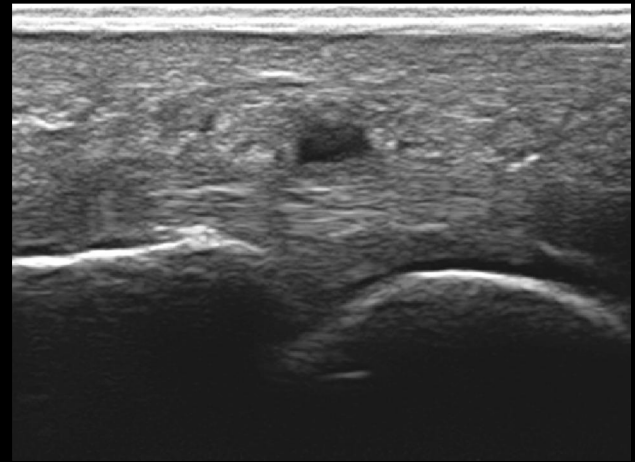
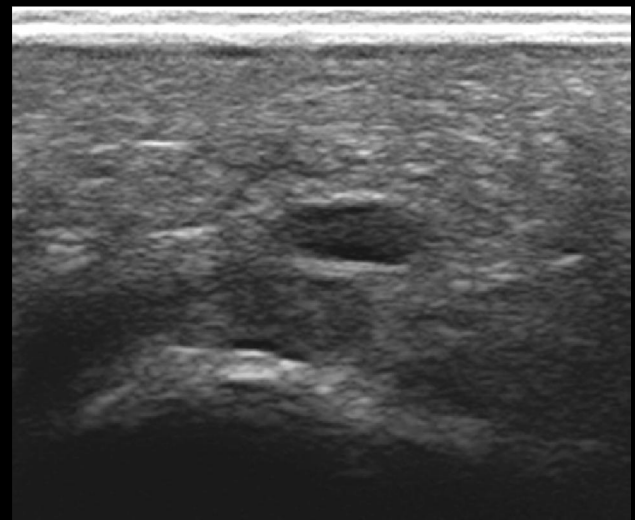


Guided peroneal tendon injection

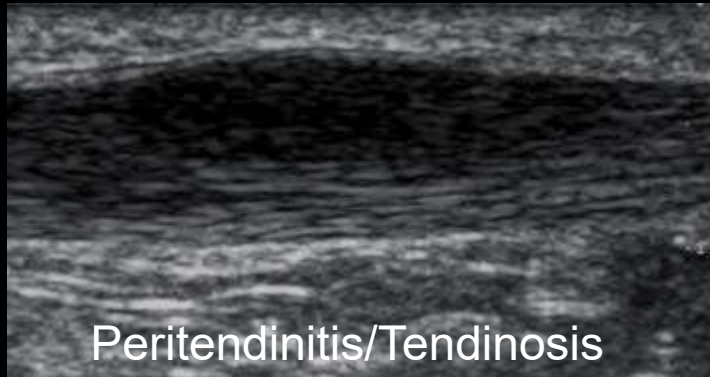
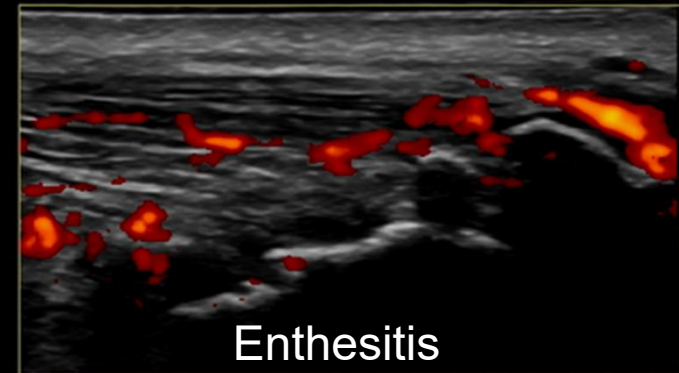
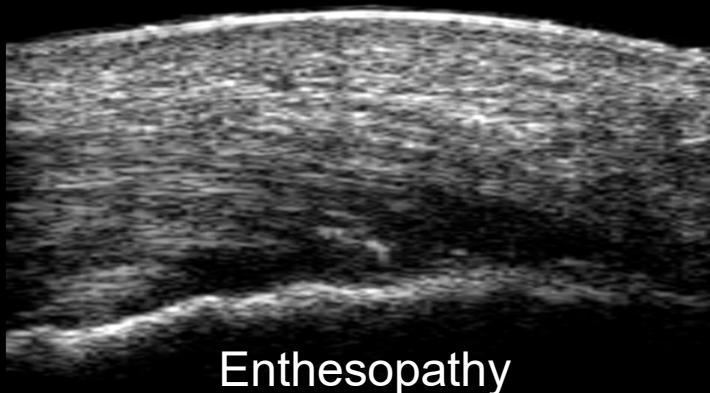


Ganglia

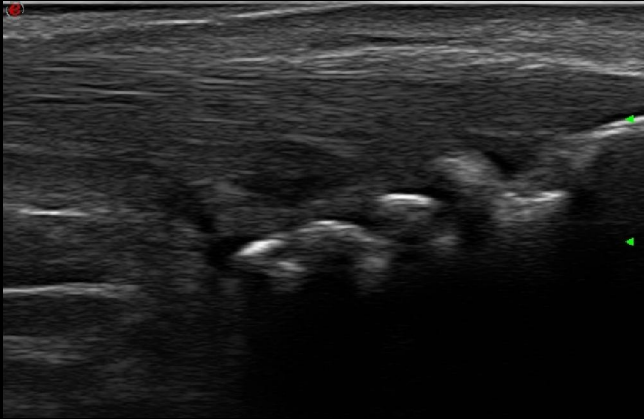
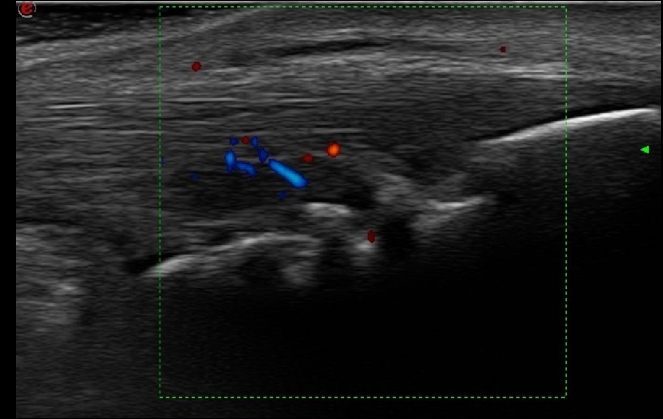
- Ganglions are often seen at the plantar aspect of midfoot.



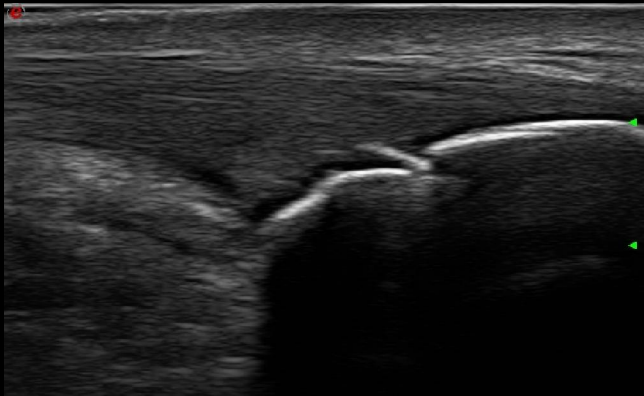
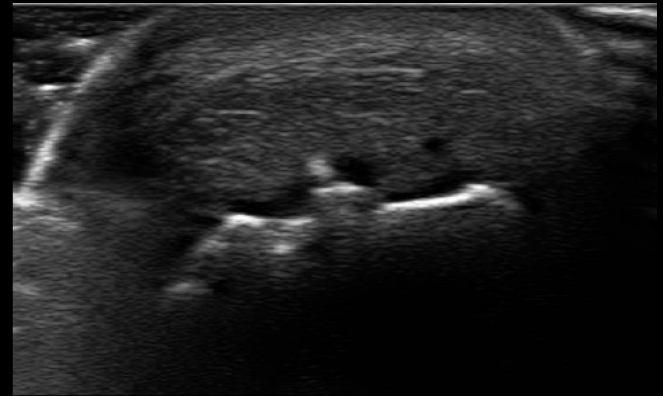
Achilles tendon and plantar fascia pathology



Achilles tendon and plantar fascia pathology

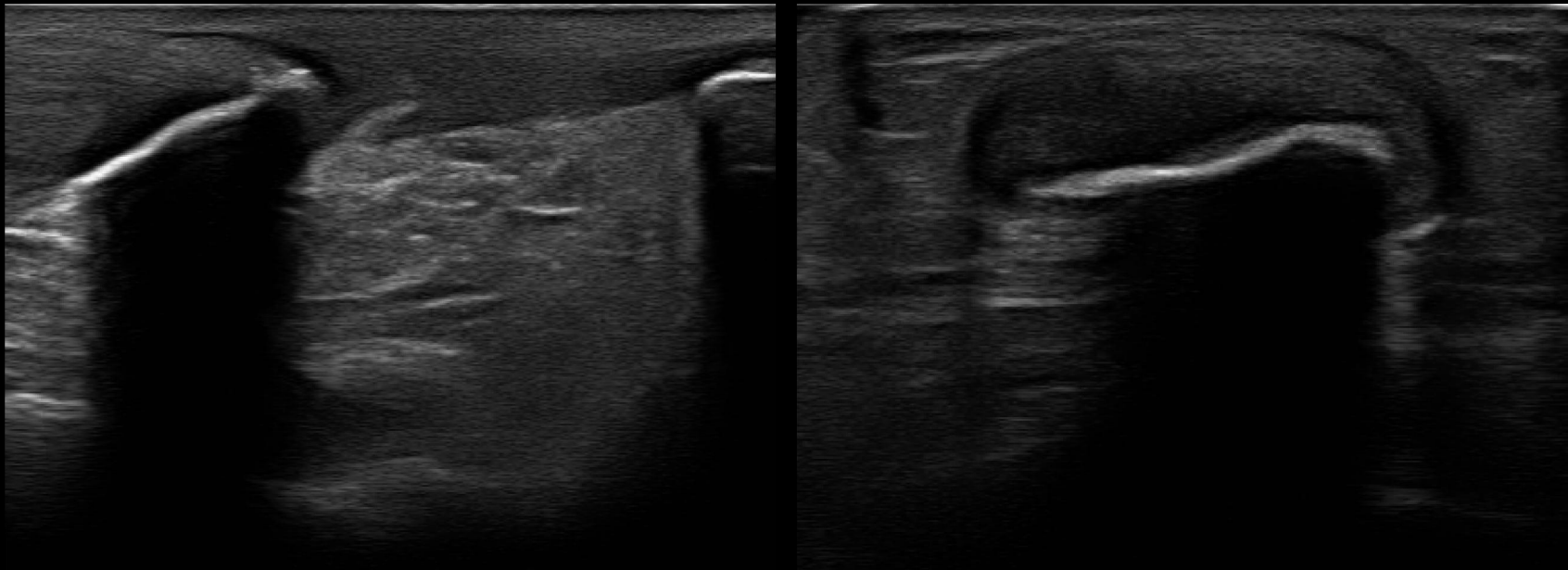


Achilles tendon enthesitis



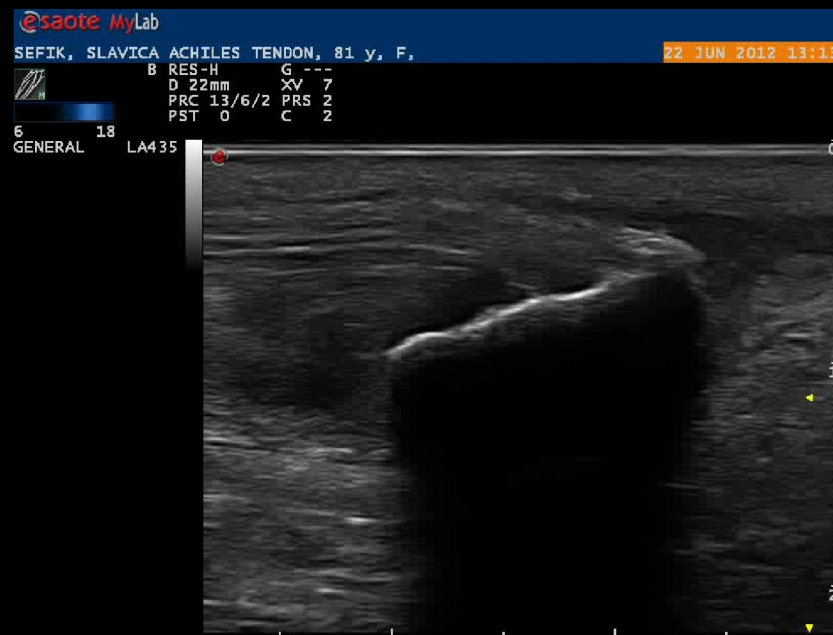
Achilles tendon enthesopathy

Achilles tendon and plantar fascia pathology



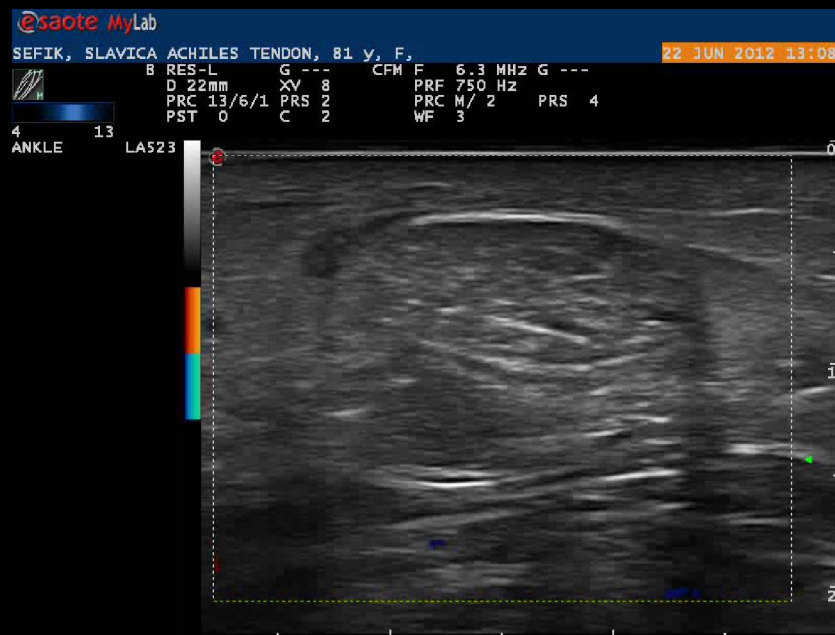
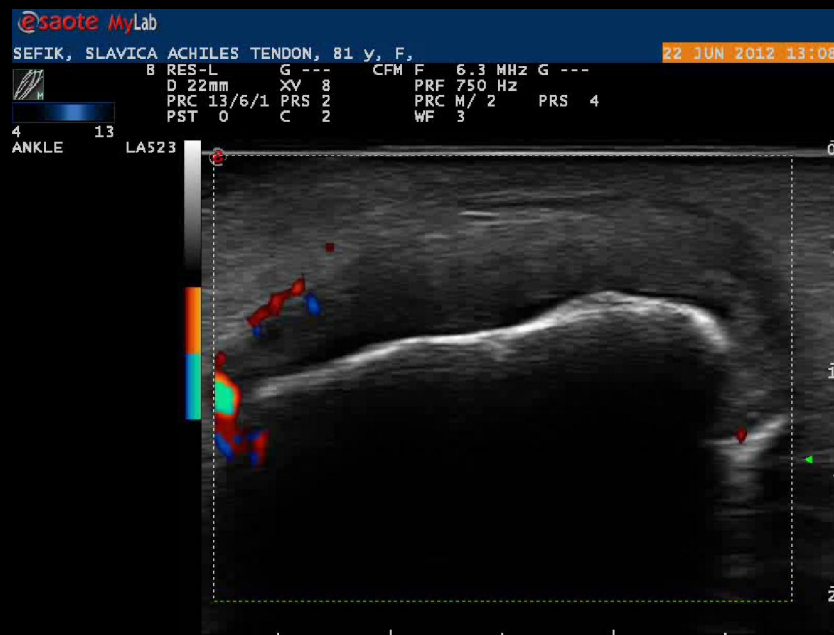
Calcaneus fracture with Achilles tendon avulsion

Achilles tendon and plantar fascia pathology



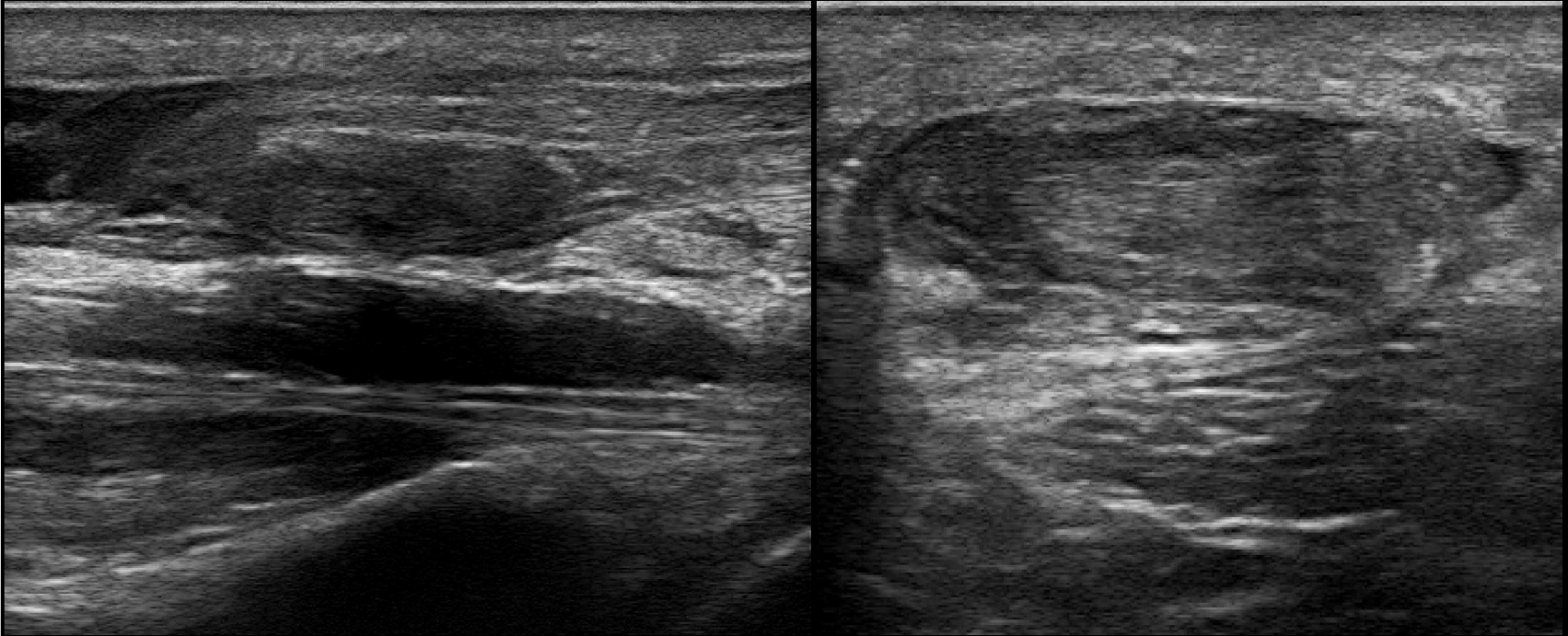
Calcaneus fracture with Achilles tendon avulsion

Achilles tendon and plantar fascia pathology



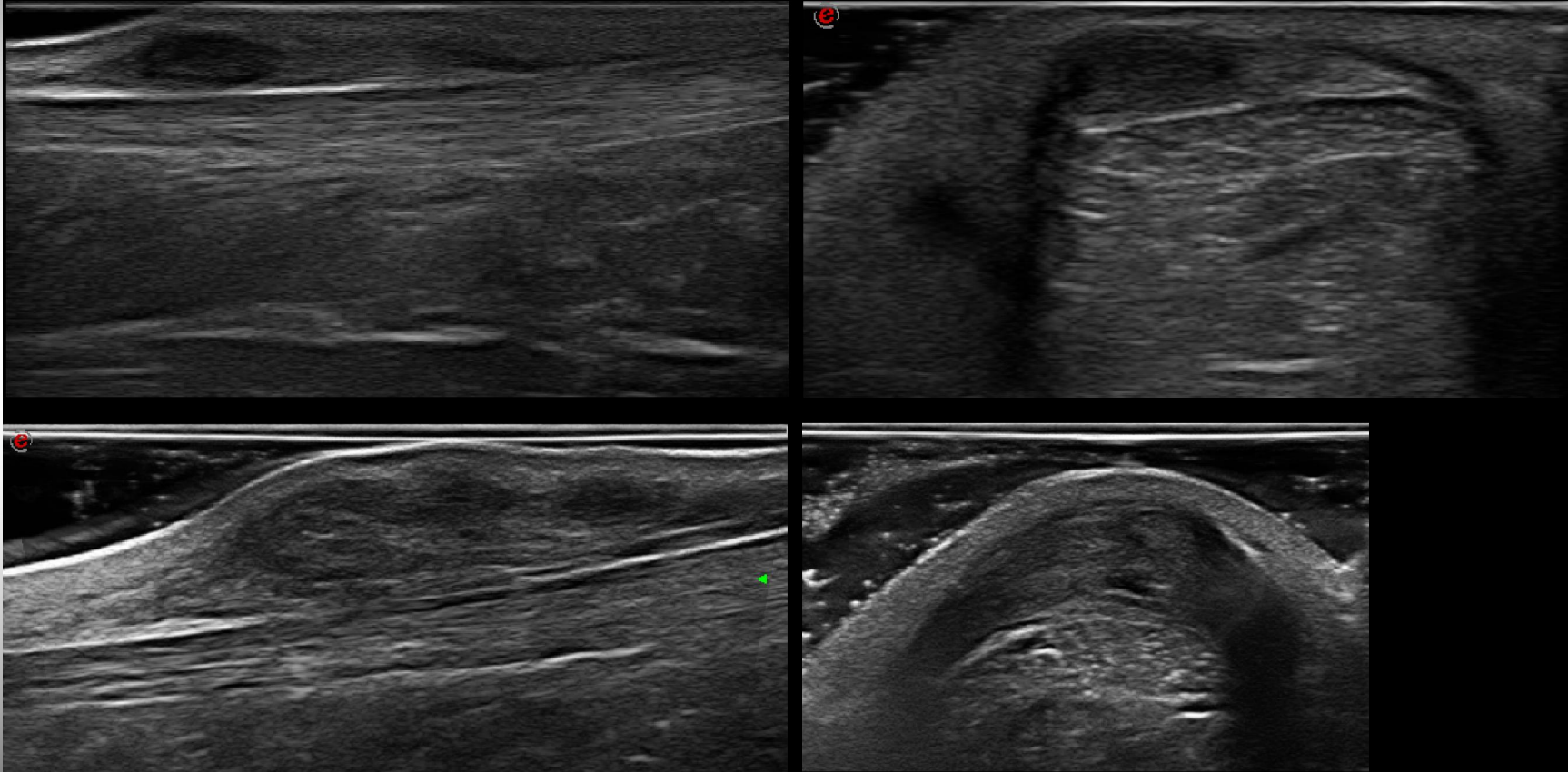
Calcaneus fracture with Achilles tendon avulsion

Achilles tendon and plantar fascia pathology



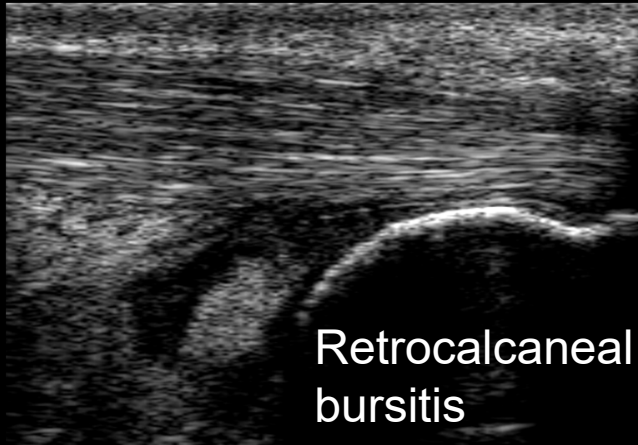
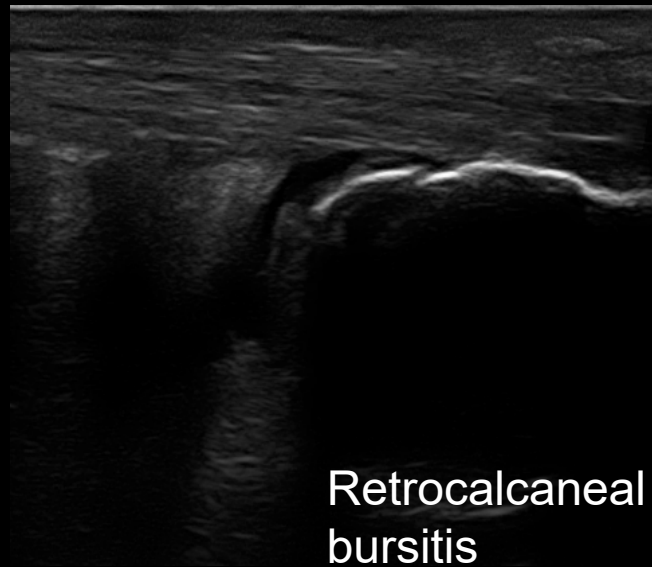
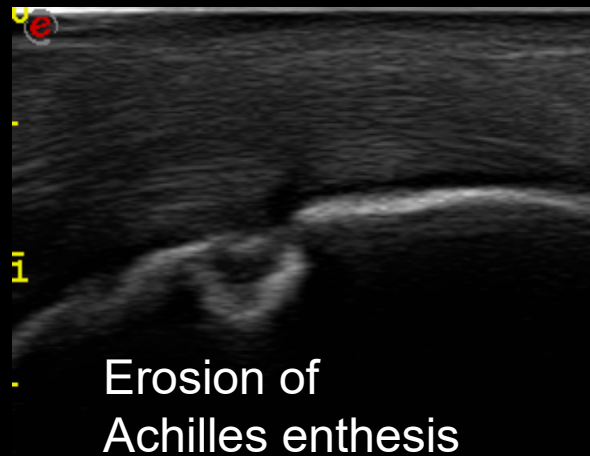
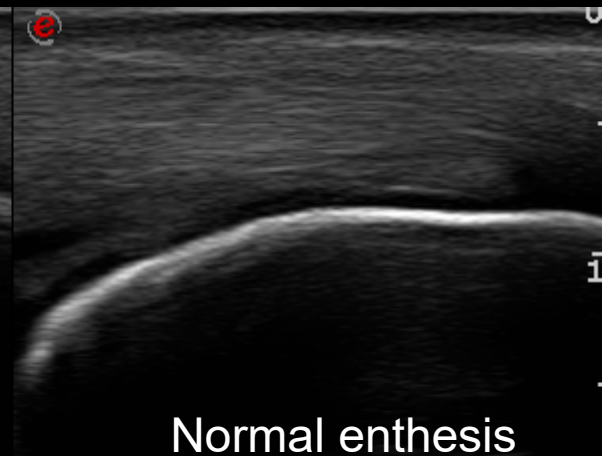
Achilles tendon rupture at musculo-tendineous junction

Achilles tendon and plantar fascia pathology

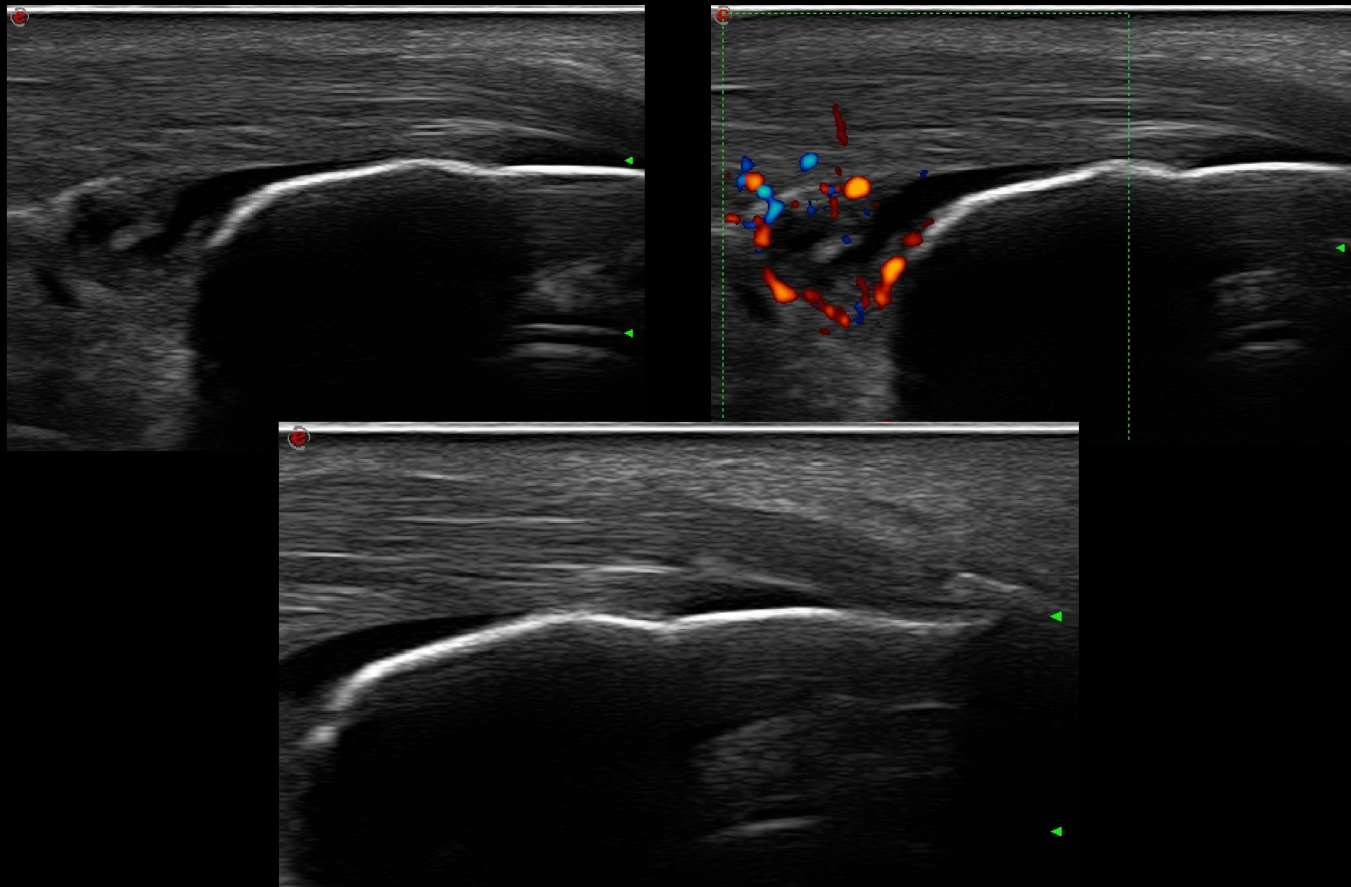


Characteristic rheumatoid nodules close to Achilles tendon

Achilles tendon and plantar fascia pathology

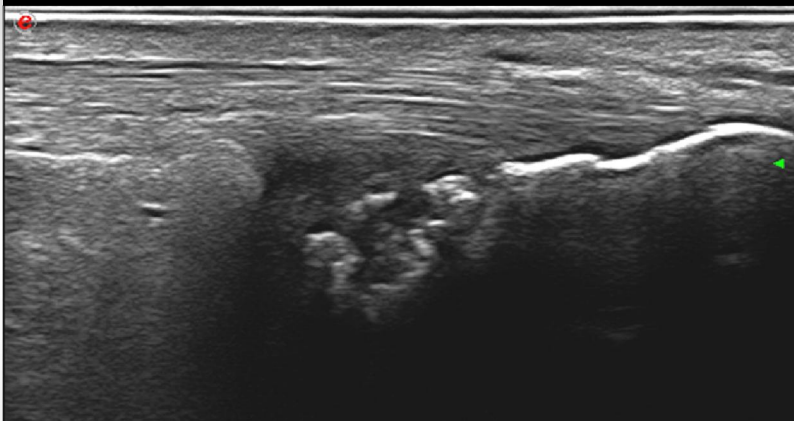
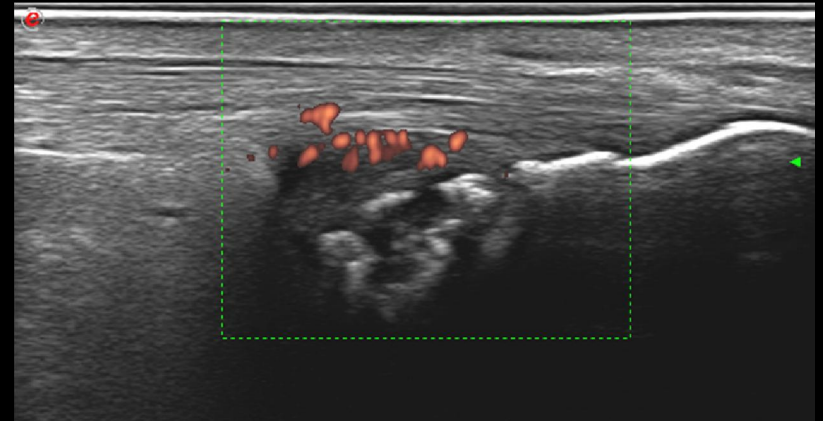


Achilles tendon and plantar fascia pathology



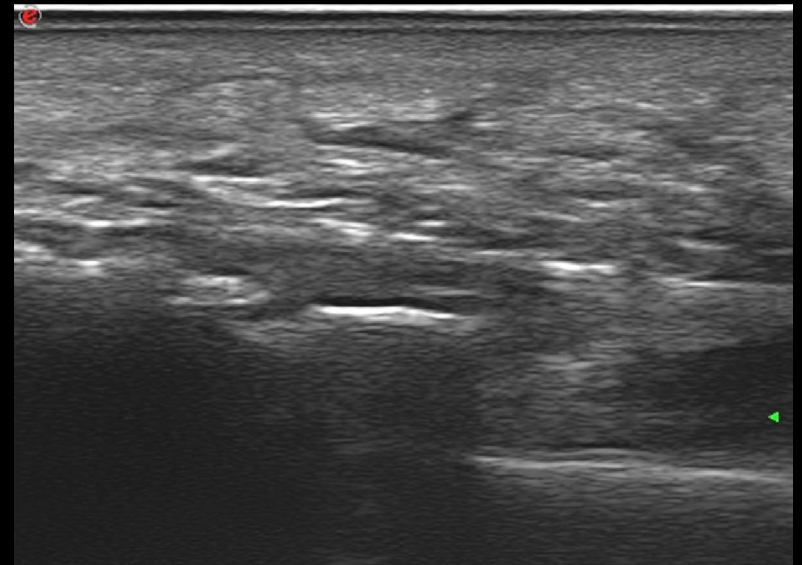
Retrocalcaneal bursitis and Achilles tendon enthesopathy in spondylitis

Achilles tendon and plantar fascia pathology



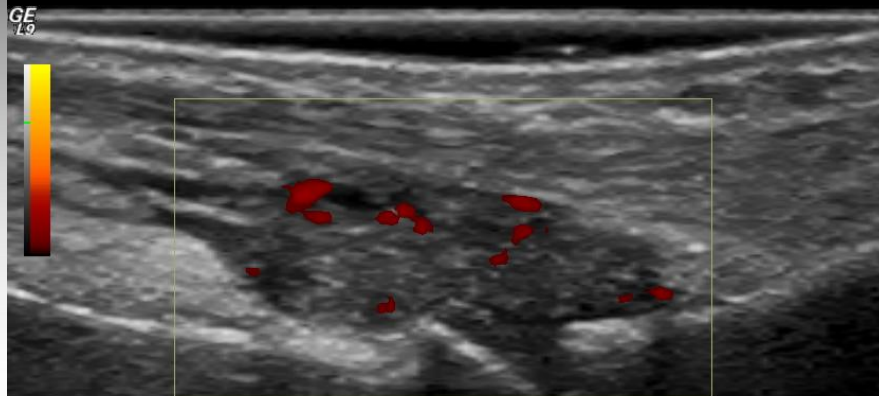
Retrocalcaneal bursitis and calcaneal erosions in patient with long-lasting RA

Achilles tendon and plantar fascia pathology

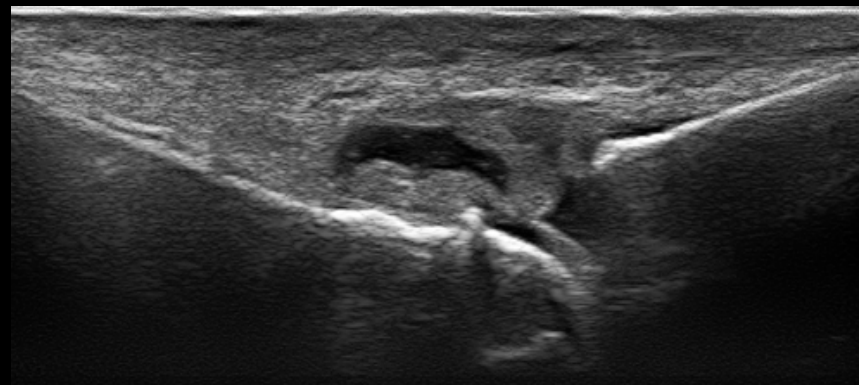


Plantar fascia enthesopathy with and without inflammation

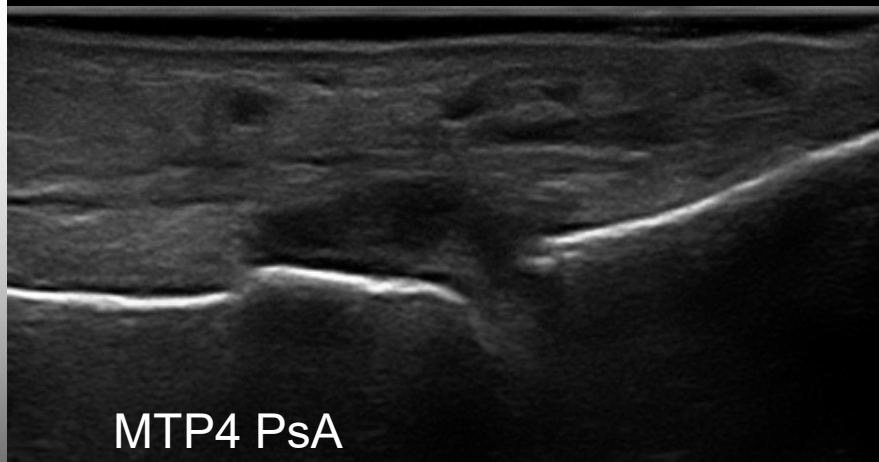
MTP synovitis



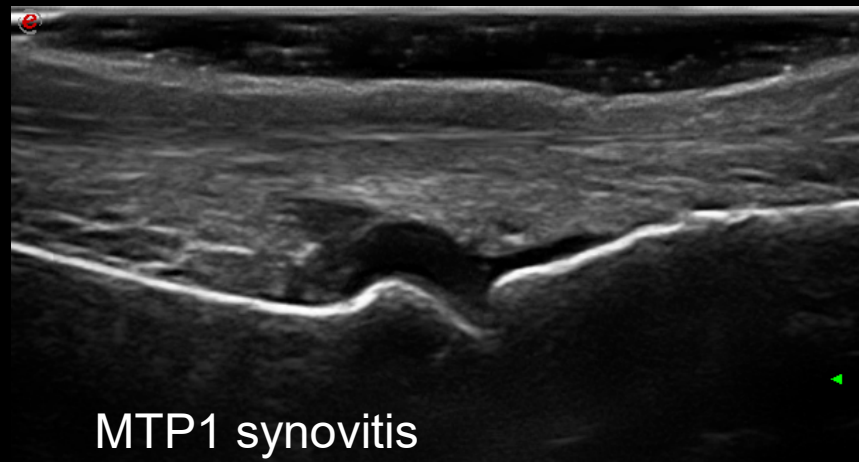
MTP3 synovitis with hypertrophy



MTP2 synovitis with hypertrophy

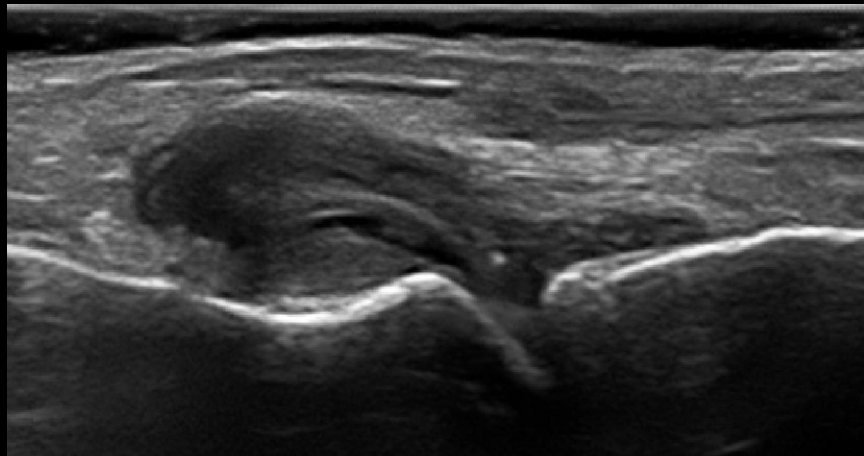
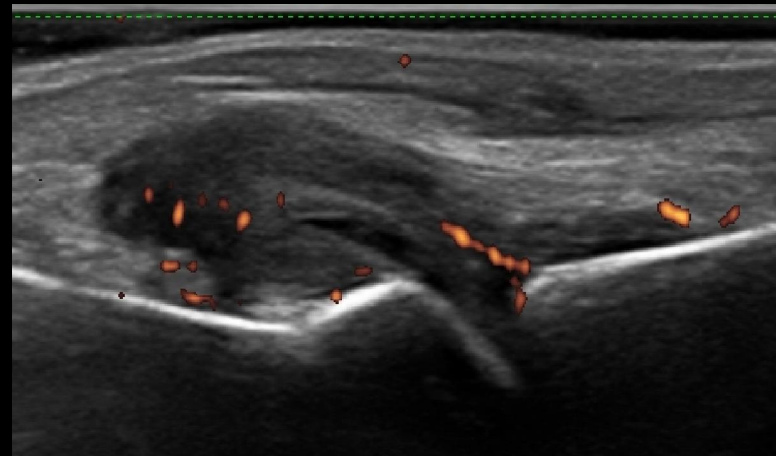


MTP4 PsA

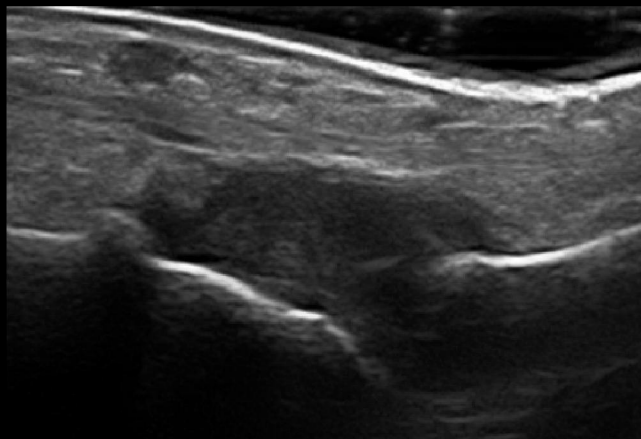
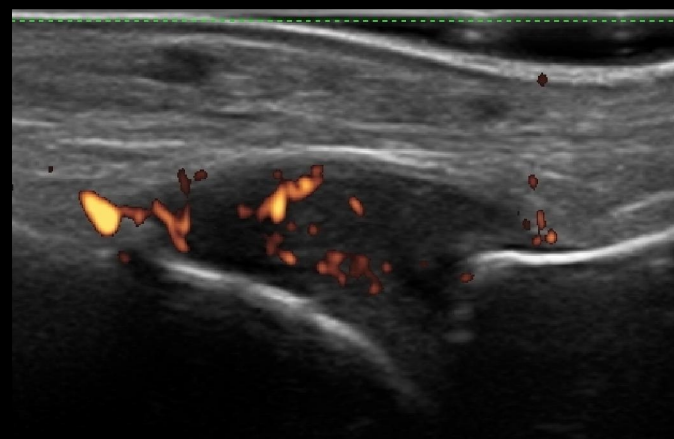


MTP1 synovitis

MTP synovitis

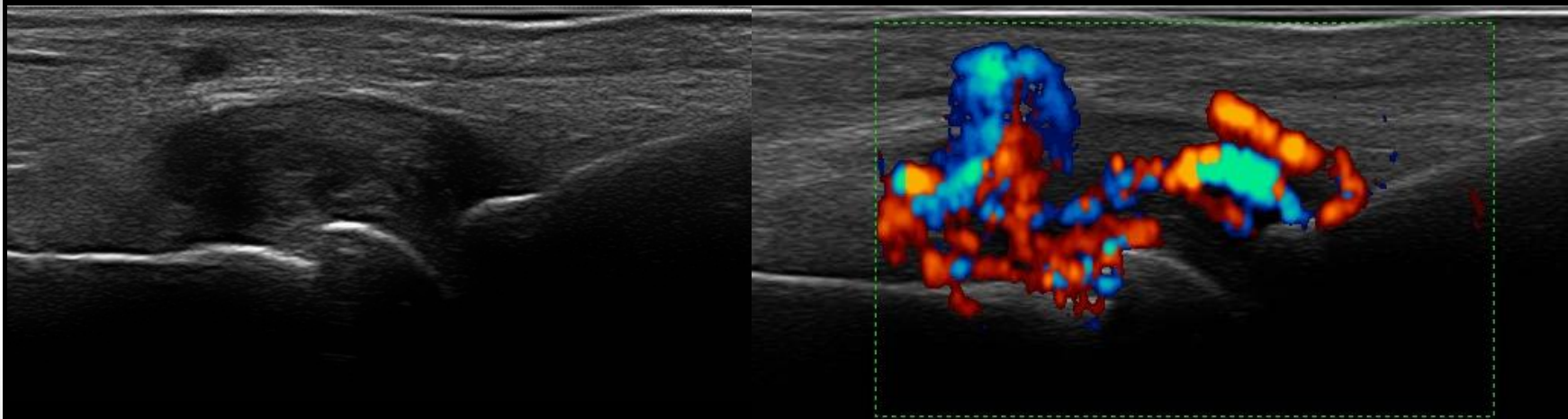


MTP1 synovitis with hypertrophy



MTP2 synovitis with hypertrophy

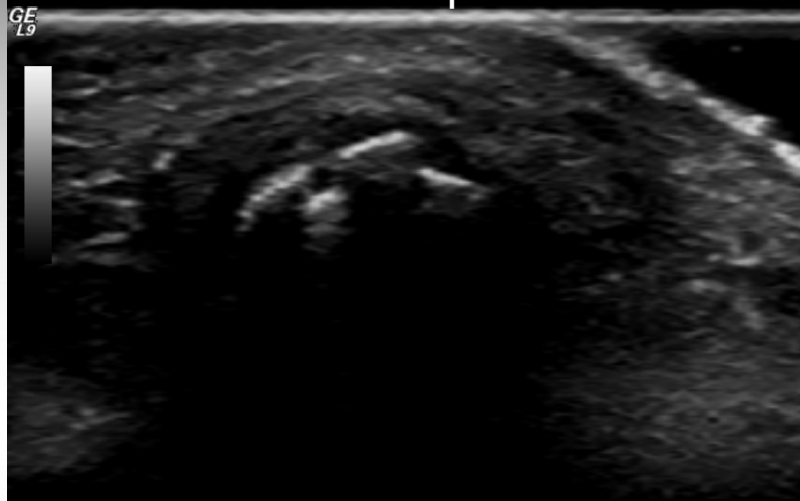
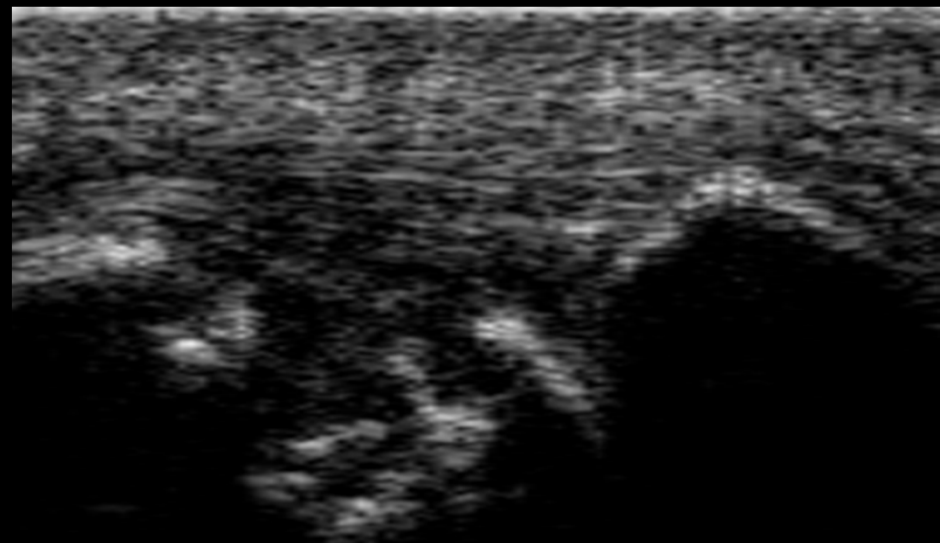
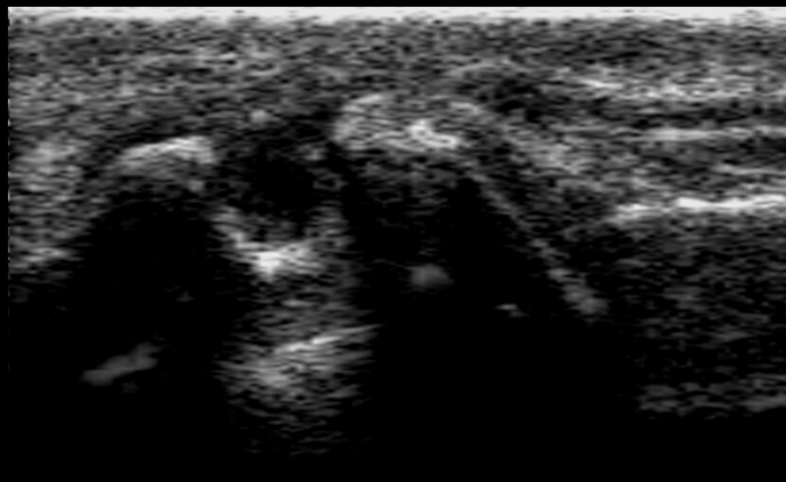
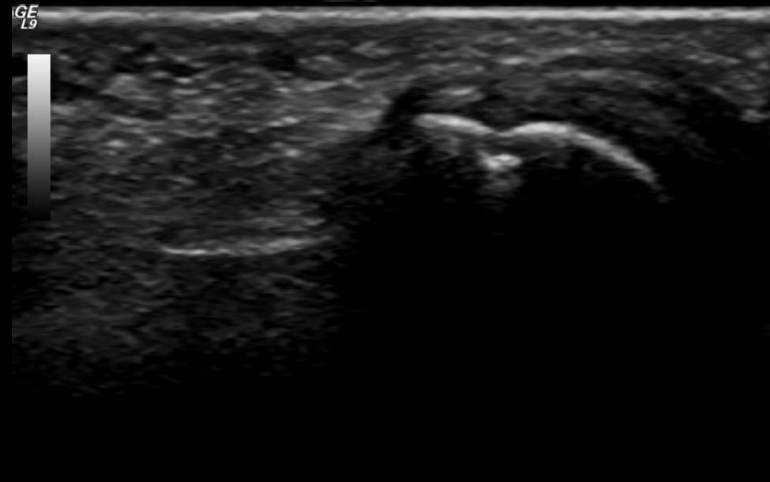
MTP synovitis



MTP3 synovitis with hypertrophy and 3rd degree Doppler

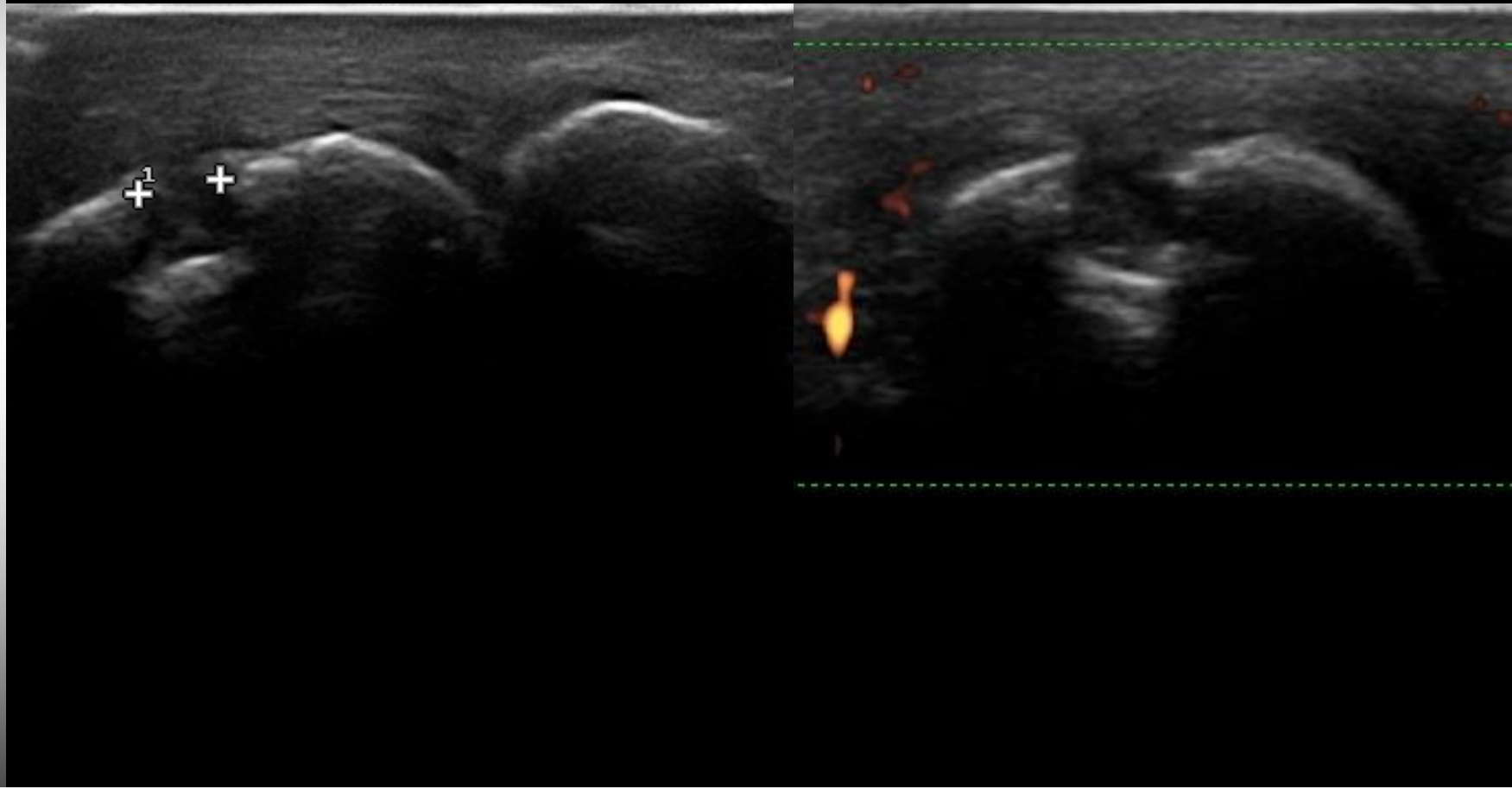
MTP erosions

MT erosions in RA pt

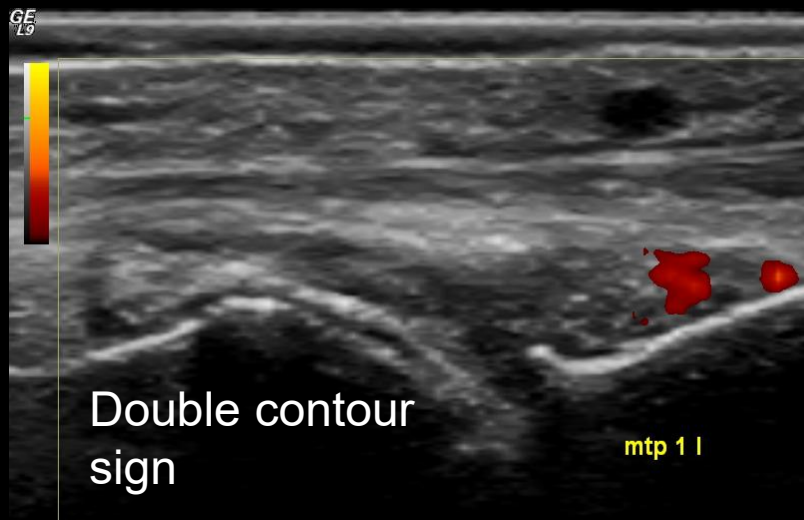
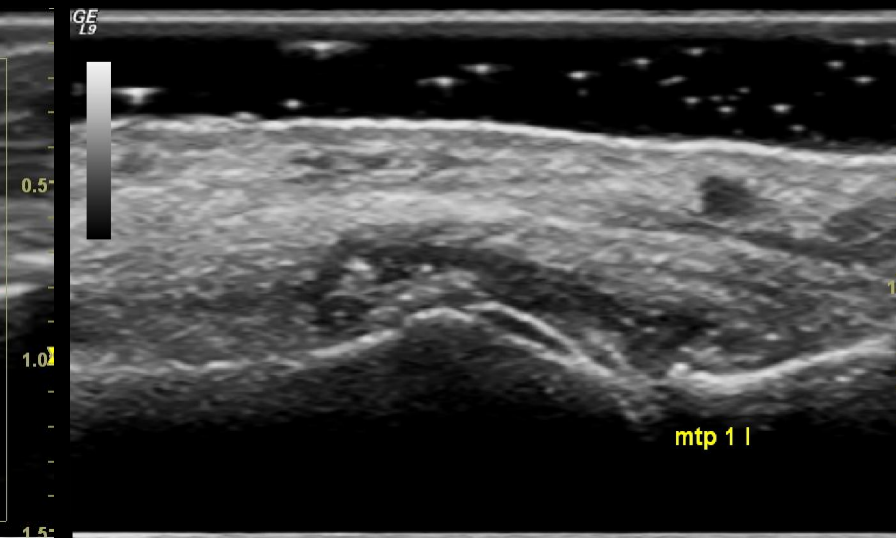
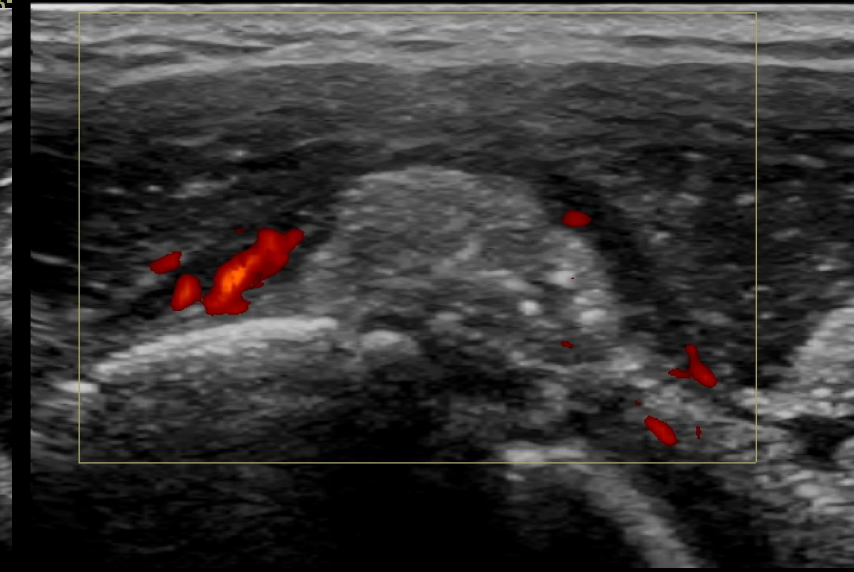


MTP erosions

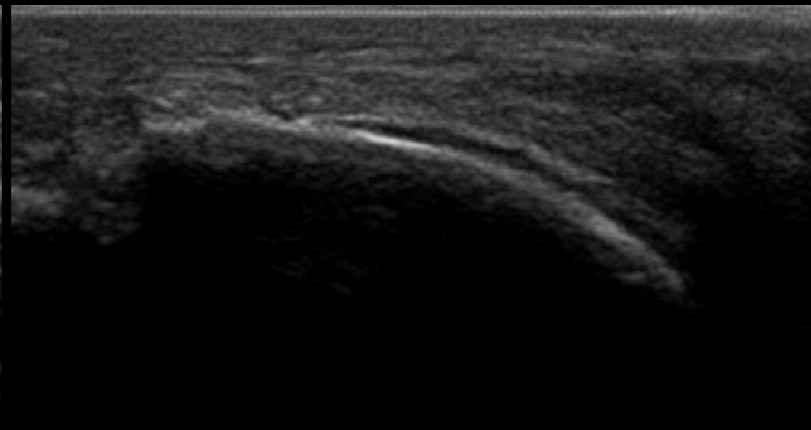
MT5 erosion in RA pt



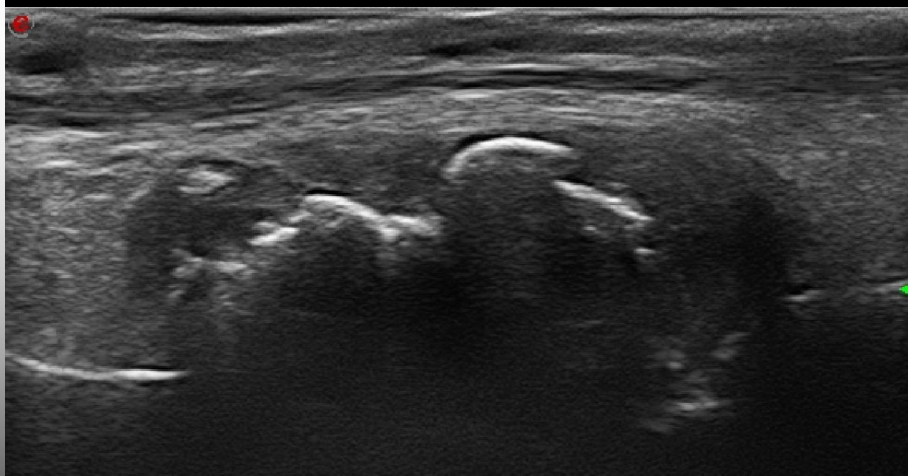
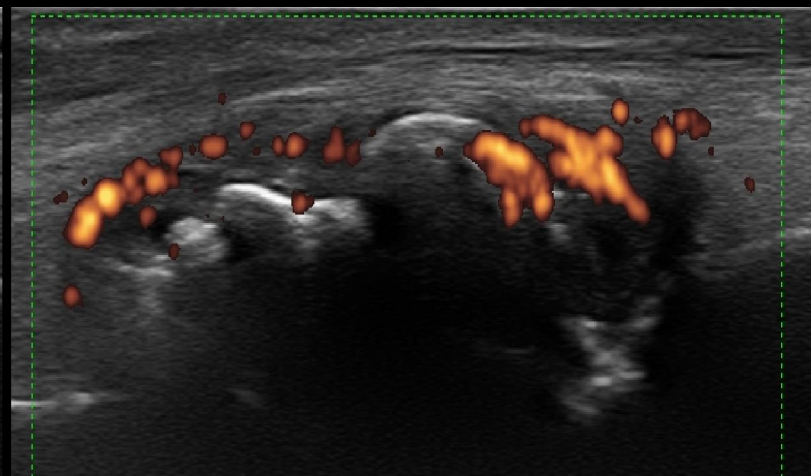
Gout



Gout



MTP1 “Double contour” sign



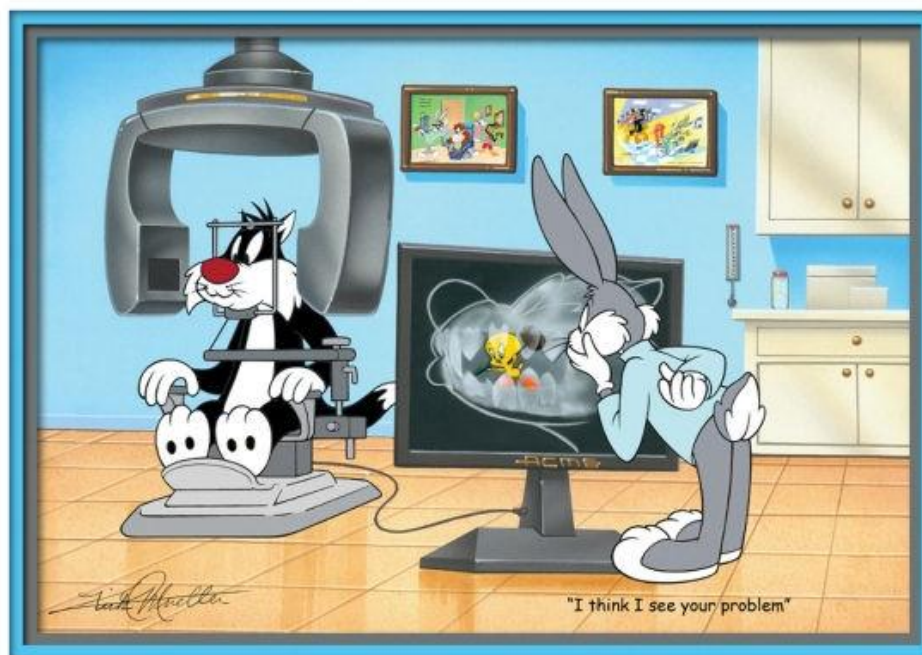
MTP1 Tophaceous gout

Stress fractures of metatarsal bones

- Stress fractures are common among older people, particularly in patients with inflammatory rheumatic diseases treated with corticosteroids.



Thank you!



Thank you!



PRESSED TO IMPROVE PRODUCTIVITY, THE DEPARTMENT
FINALLY INVESTED IN NEW EQUIPMENT.

Thank you!

