

“Pragmatic” ultrasound in the diagnosis of soft tissue rheumatic pain

Plamen Todorov

INTRODUCTION

- **Soft tissue rheumatism: nonsystemic, focal pathological syndromes involving the periarticular structures.**
- **STR includes pathology of tendons, entheses, ligaments, bursae, fascia (including retinacula and aponeurosis), peripheral nerves and the subcutaneous tissue.**
- **The pathological transformation is not a part of, or a manifestation of another discrete disease.**
- **These conditions frequently are referred to as regional pain syndromes.**

CONTENT

- **I. The scope of soft tissue pathologies as seen by US.**
- **II. Some general principals for the pragmatic use of US in soft tissues rheumatism.**

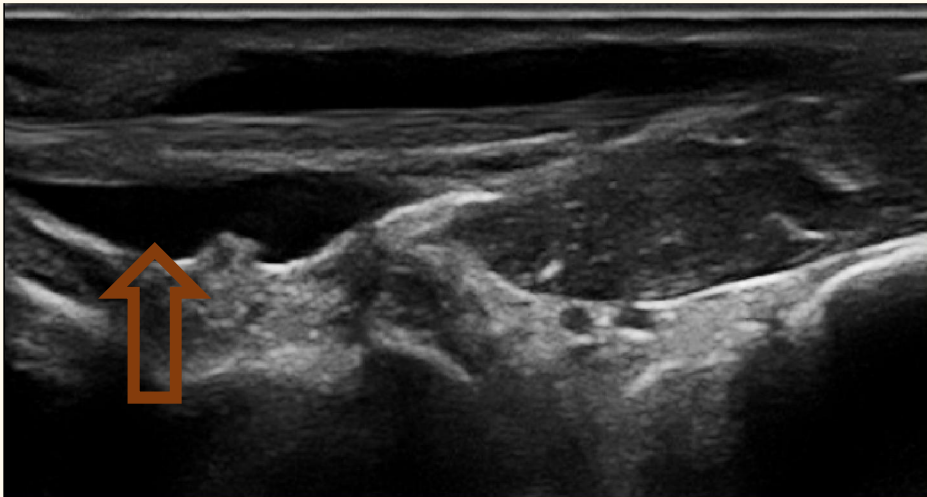
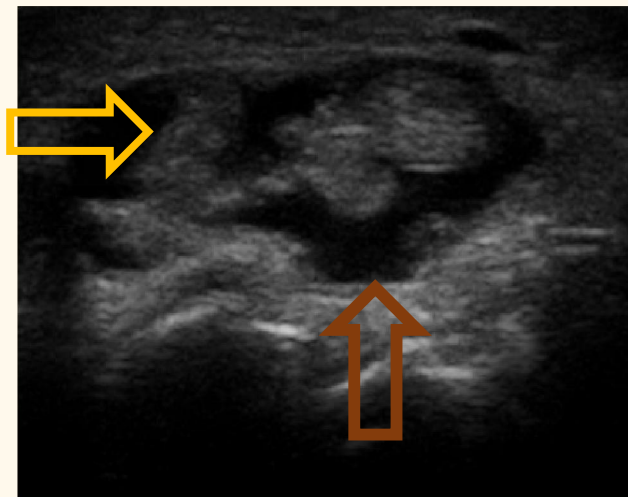
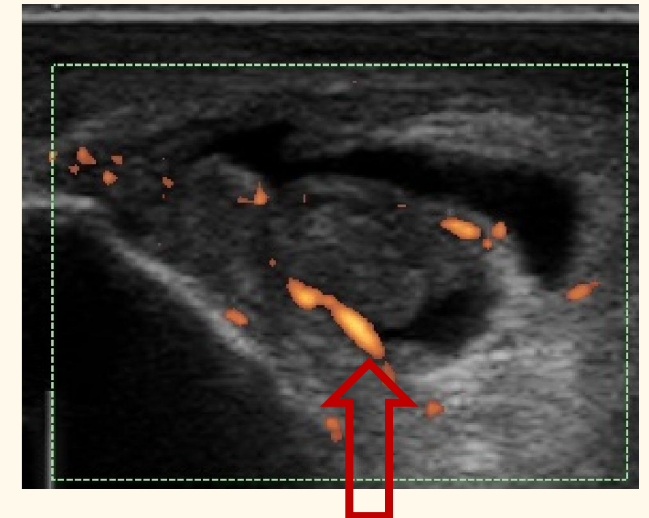
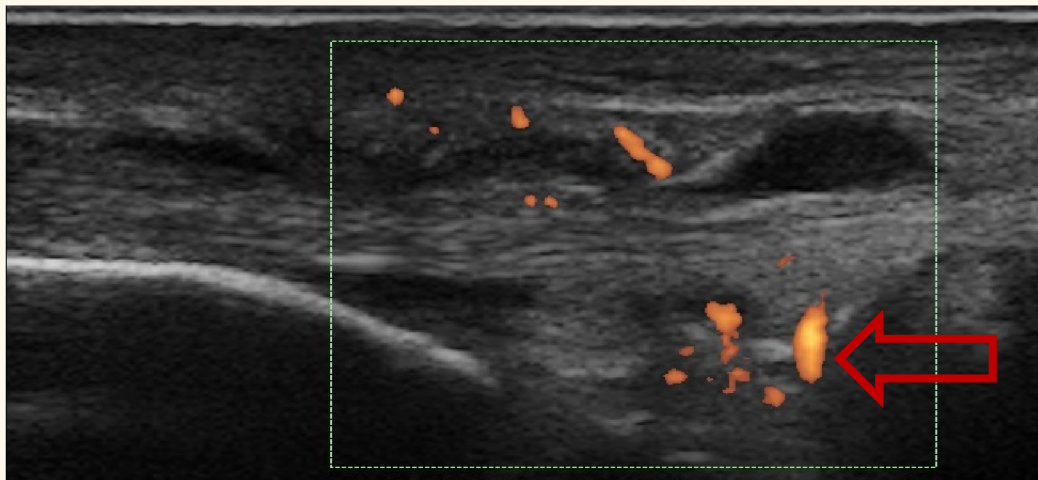
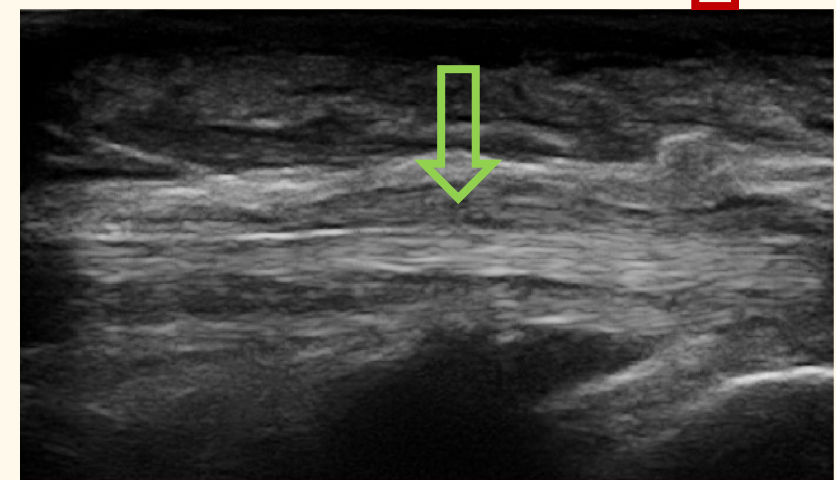
PART I

The scope of soft tissue pathologies as seen by US.

OR Sonopathology:

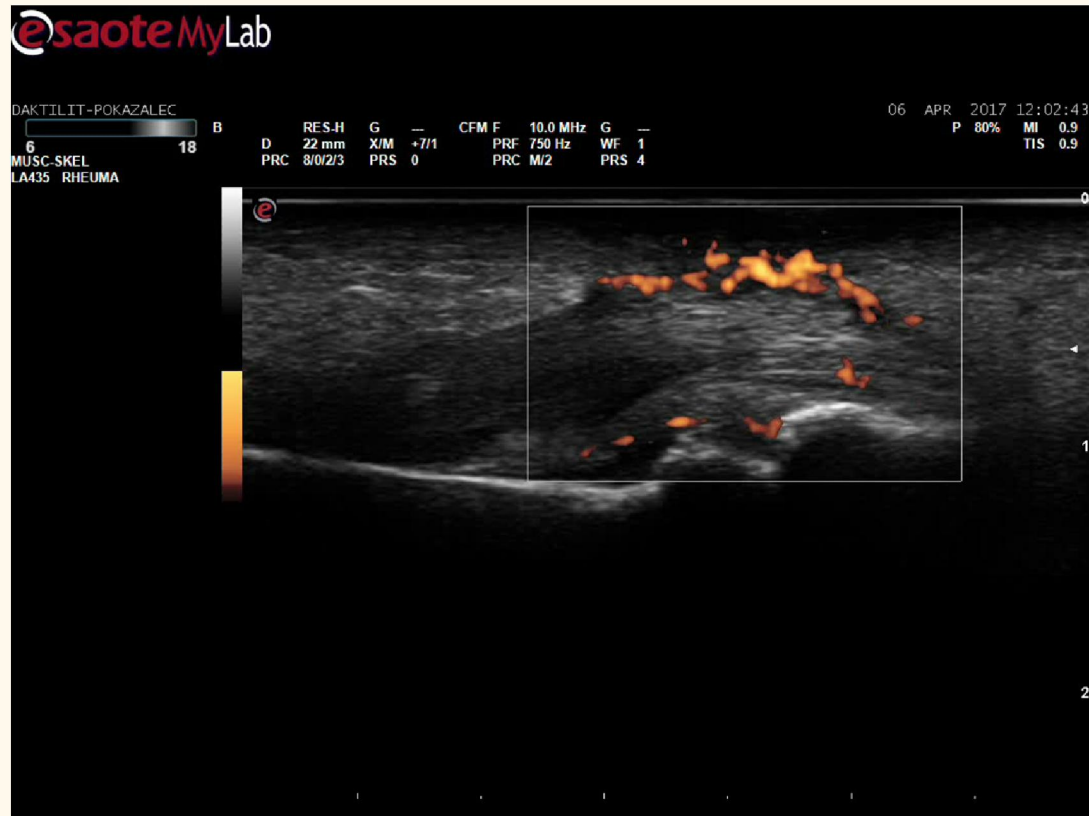
Tendons' sonopathology (1):

1. *Tenosynovitis*: the presence of **concentric an-/hypoechoic compressible halo** around the tendon body, **with or without PD signal** or visible **synovial thickening**. In chronic stages a **non-compressible thickening** of the synovial sheath is present.



Tendons' sonopathology (2)

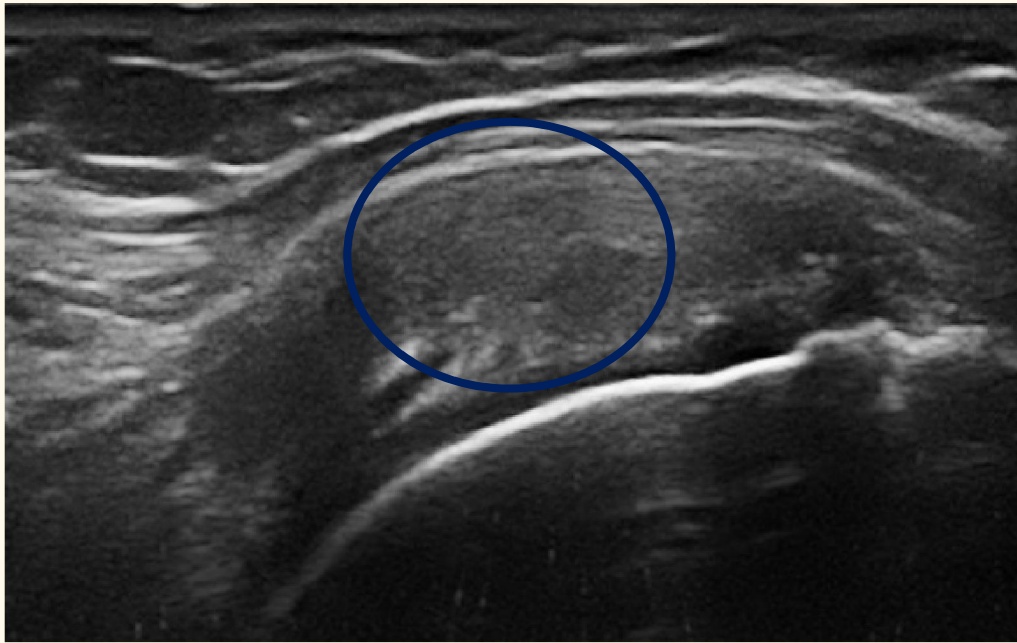
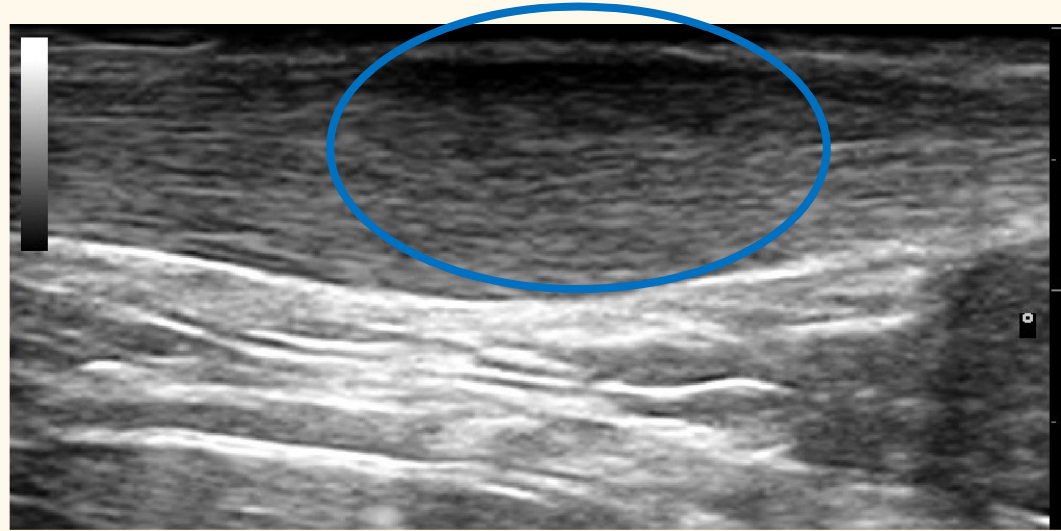
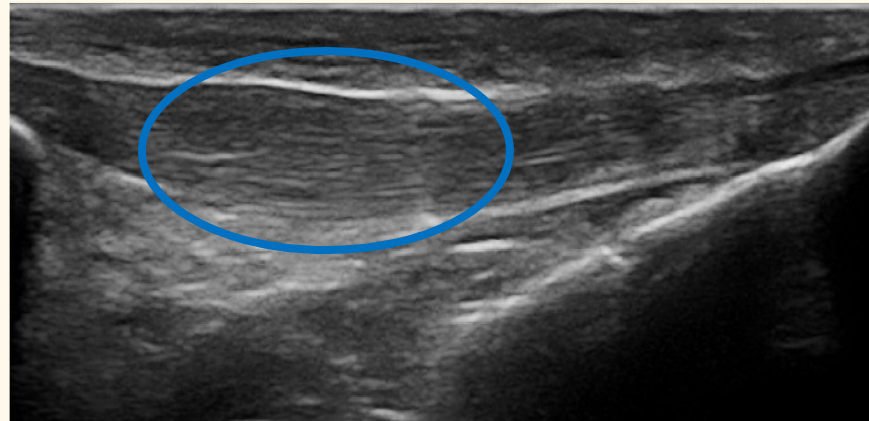
PD signals indicating acute inflammation:



Tendons' sonopathology (3):

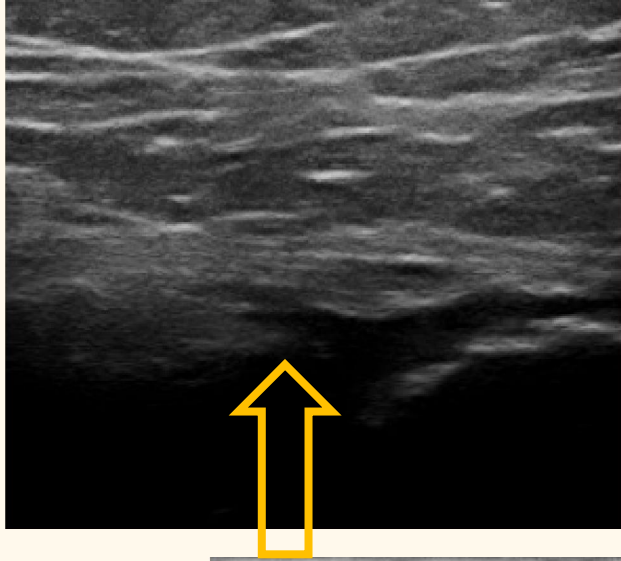
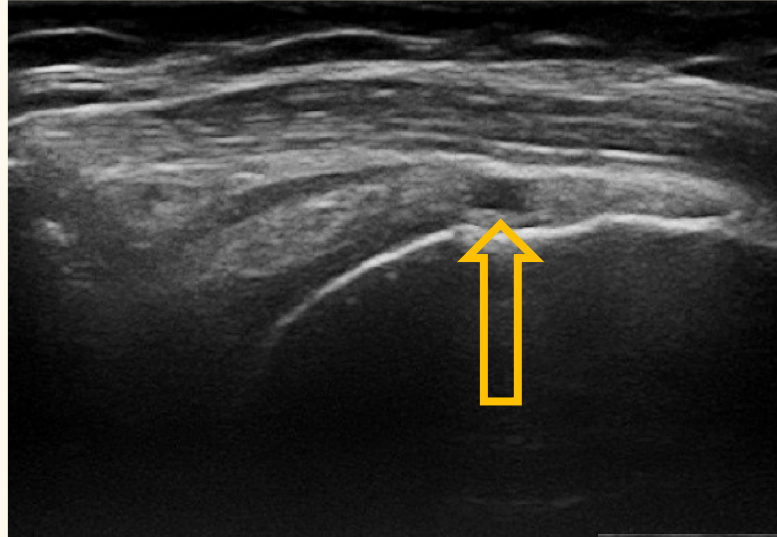
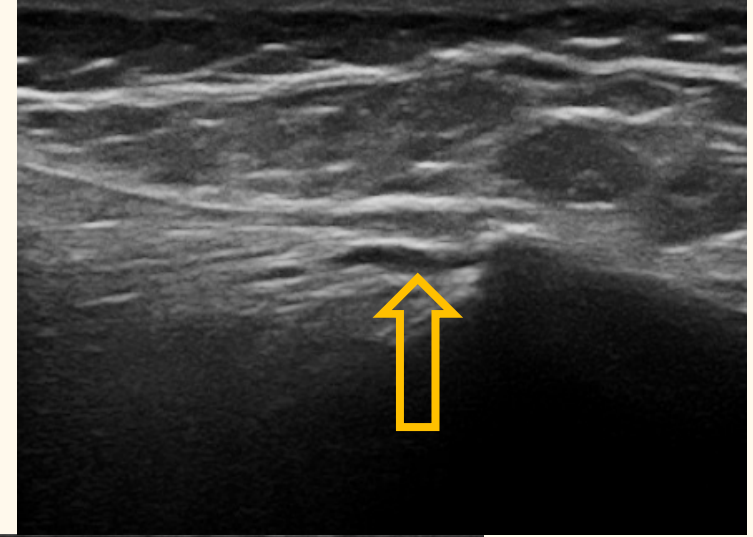
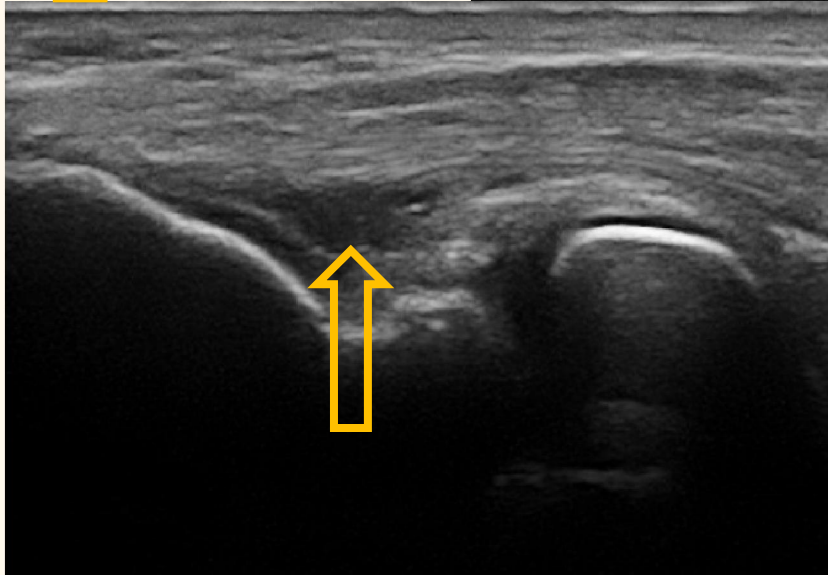
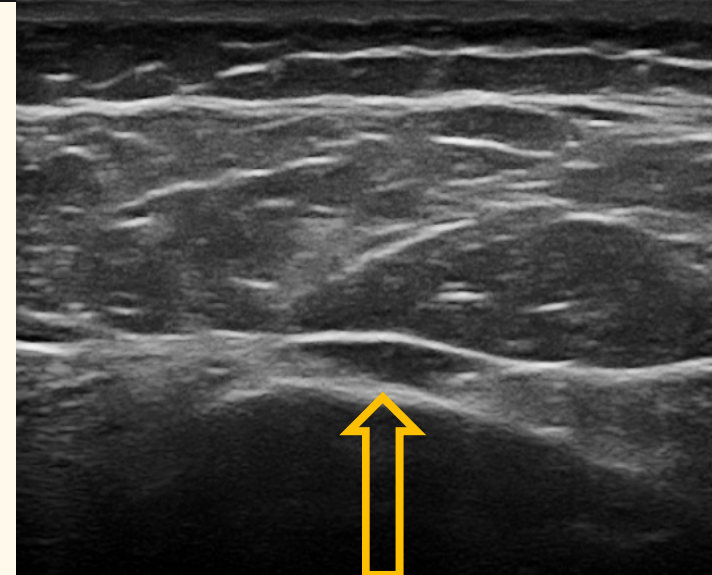
Tendonitis/tendopathy: hypoechoic, locally thickened tendon with altered fibrillar structure. Tendon echoic heterogeneity is an indicator of poor outcome.

Of importance are the so call “critical zones”: site of tears/calcifications.



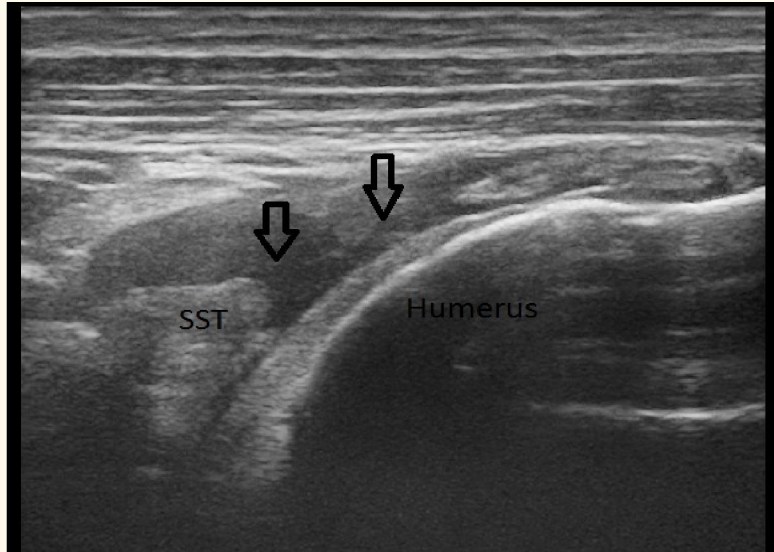
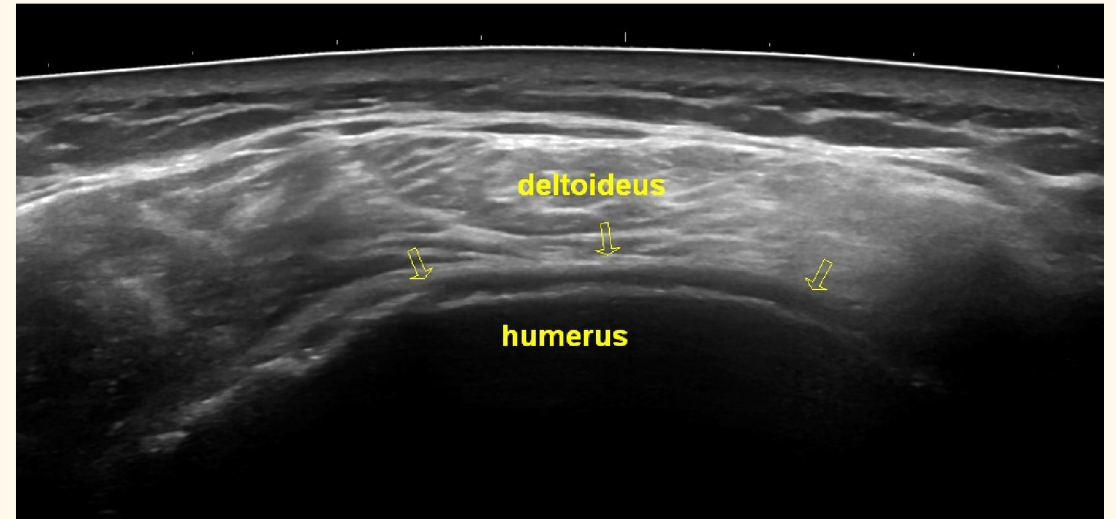
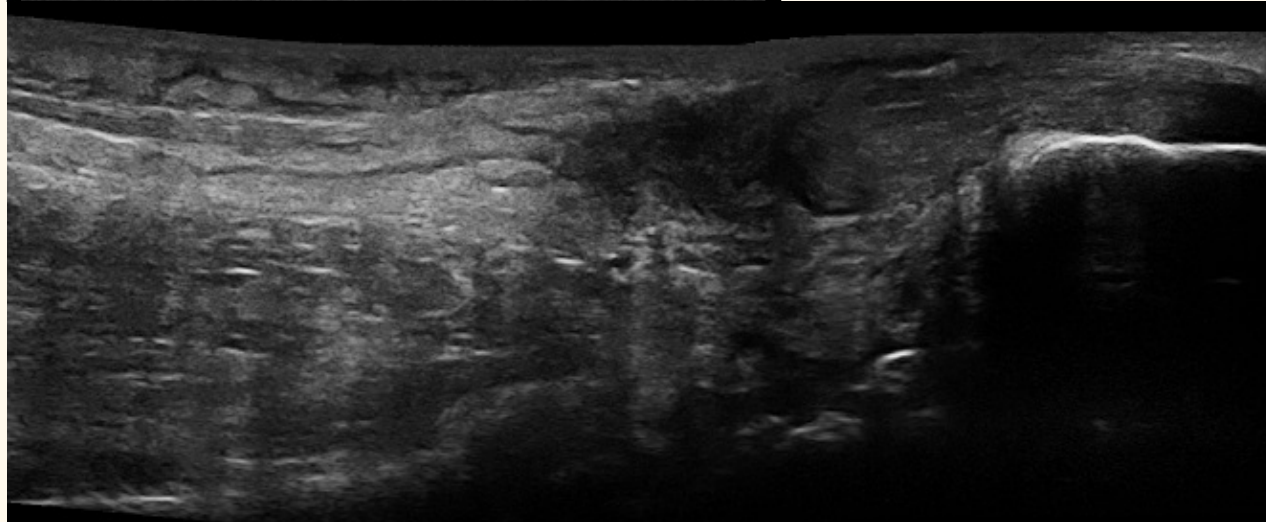
Tendons' sonopathology (4):

Partial tear: well-defined an-/hypoechoic zone inside the tendon substance, or with a contact with one of the tendon margins.



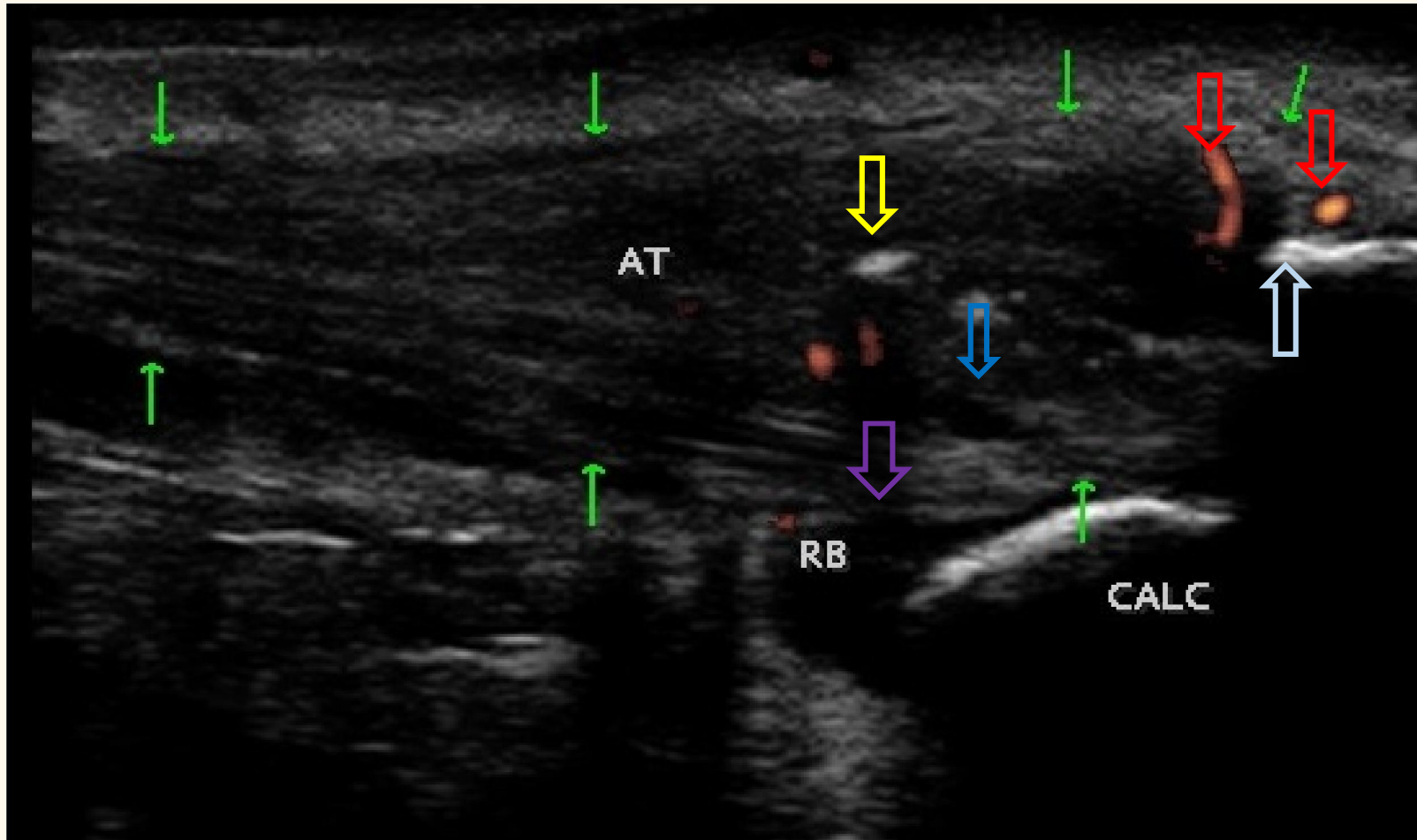
Tendons' sonopathology (5):

Full-thickness tears: a defect in the tendon's fibrillar structure reaching both margins, visible stumps with relaxation of the distal fragment and retraction of the proximal. The size of the defect could be measured.

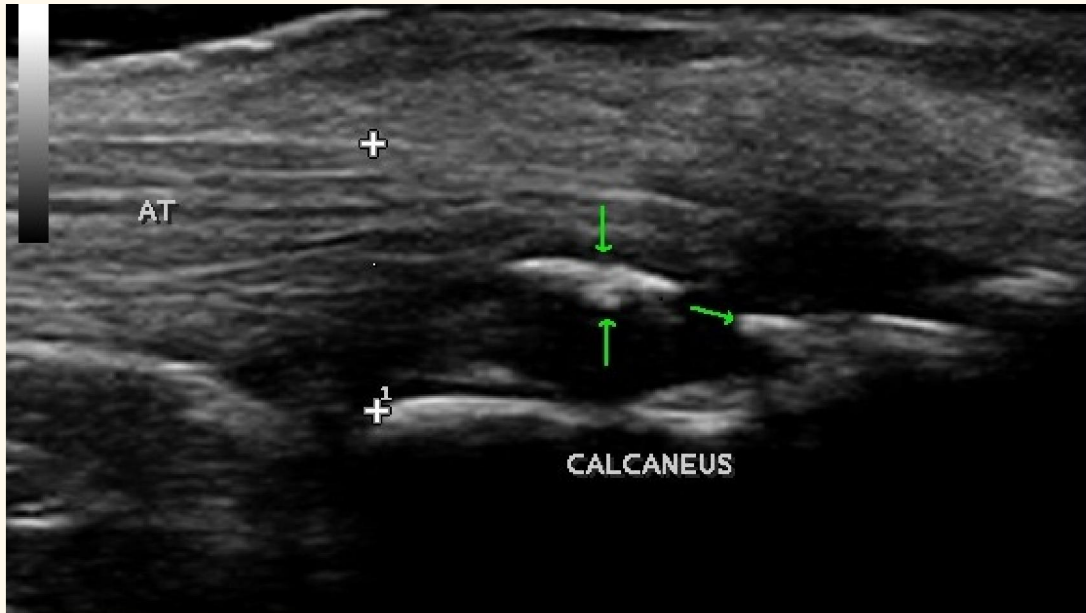
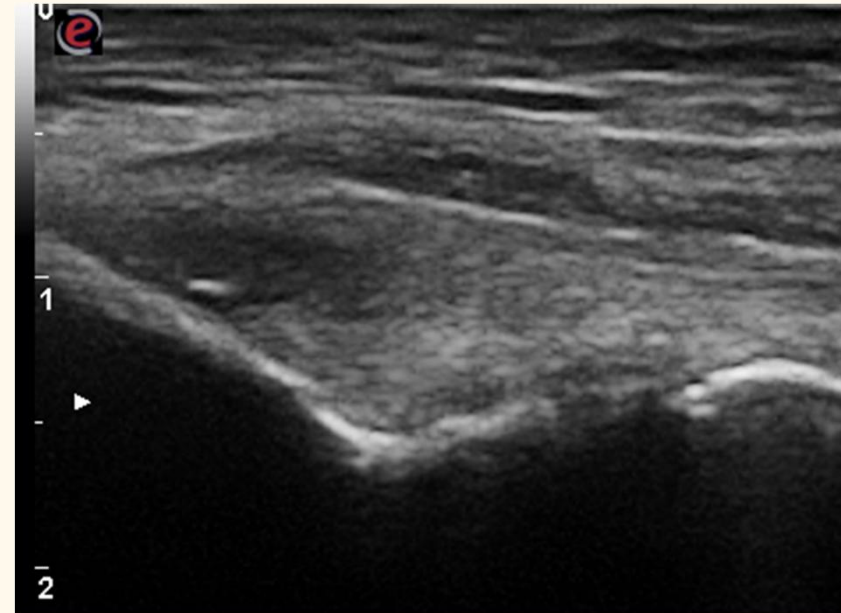
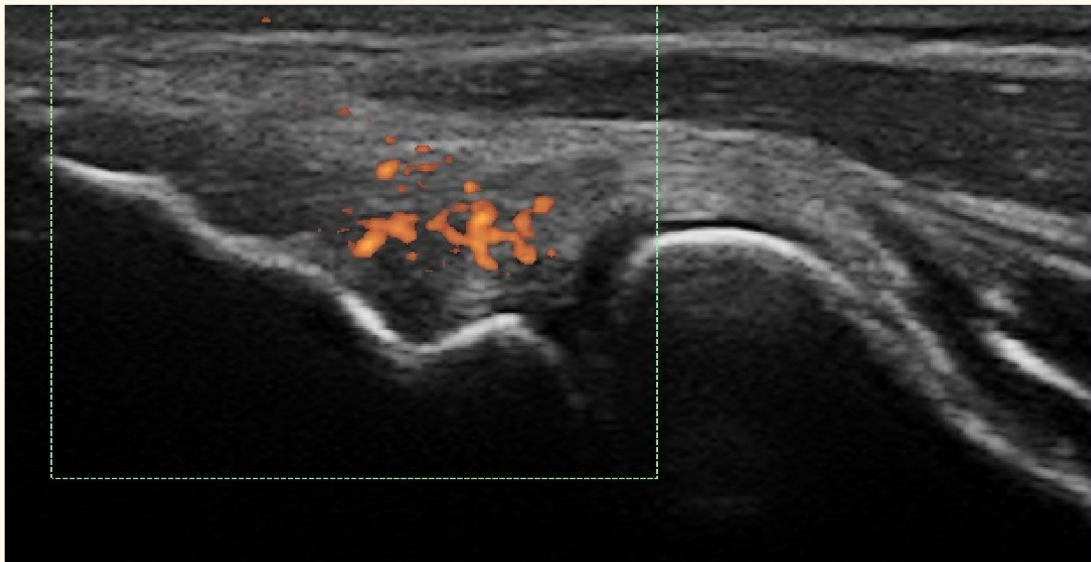
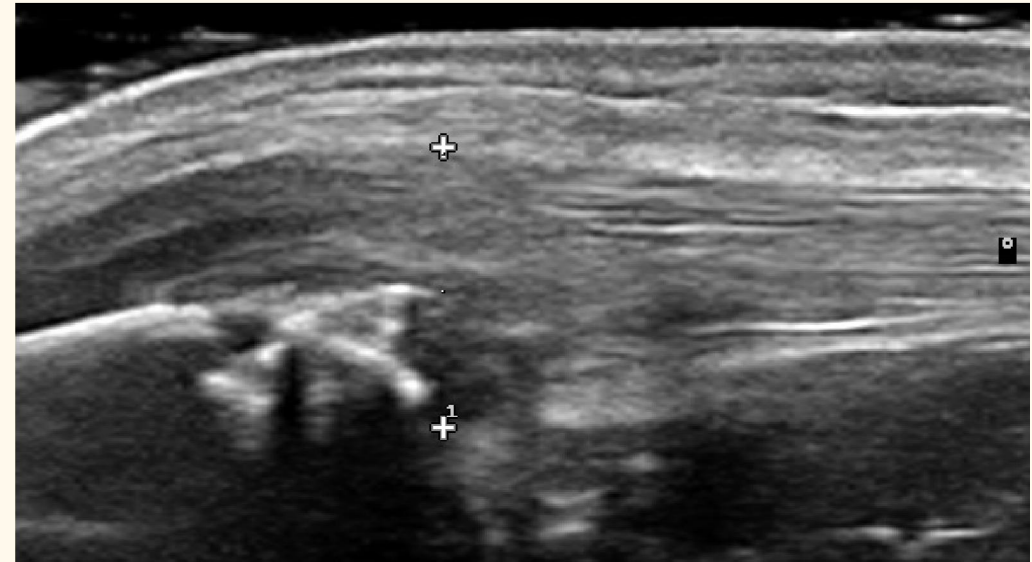


Tendon insertional sonopathology (1):

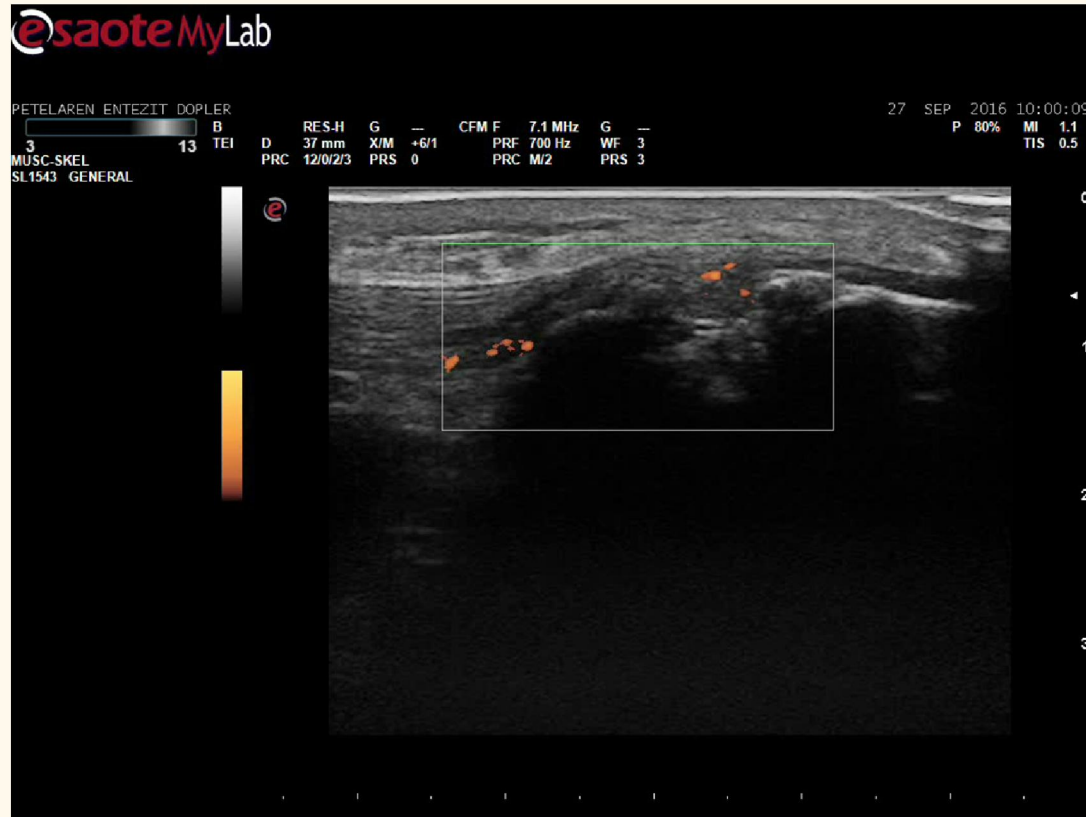
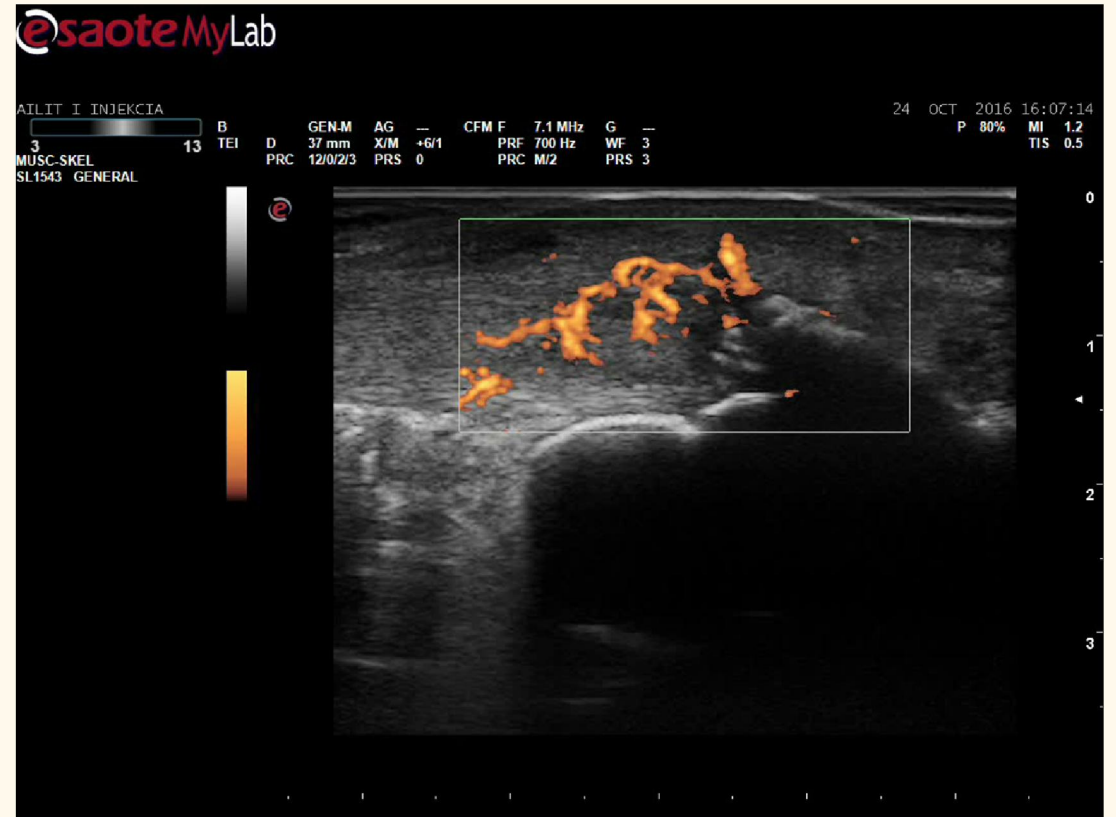
Enthesopathy: thickening, hypoechoic alteration of the fibrillar pattern or heteroechogenicity of the tendon at its bony insertion as compare to its body. There could be also accompanying calcification foci, anechoic zones, bursitis, PD signals and subentheseal bone irregularities.



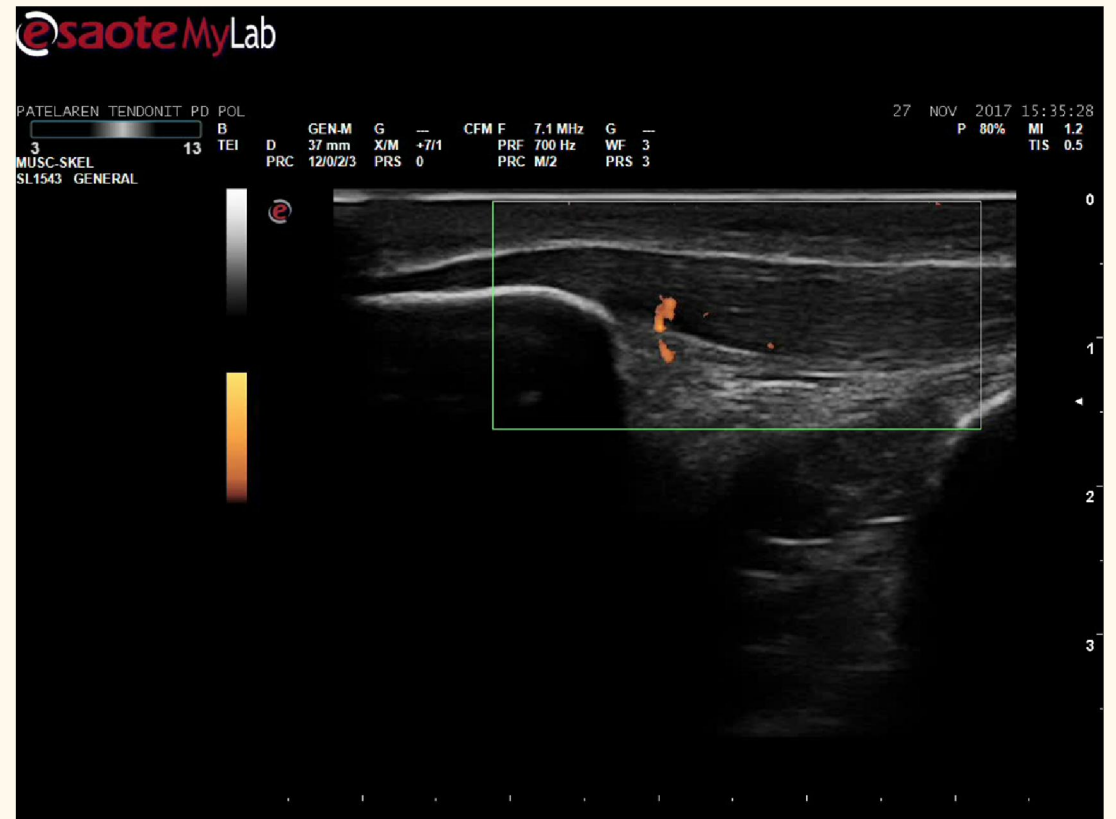
Tendon insertional sonopathology (2): *Enthesopathy*: some examples



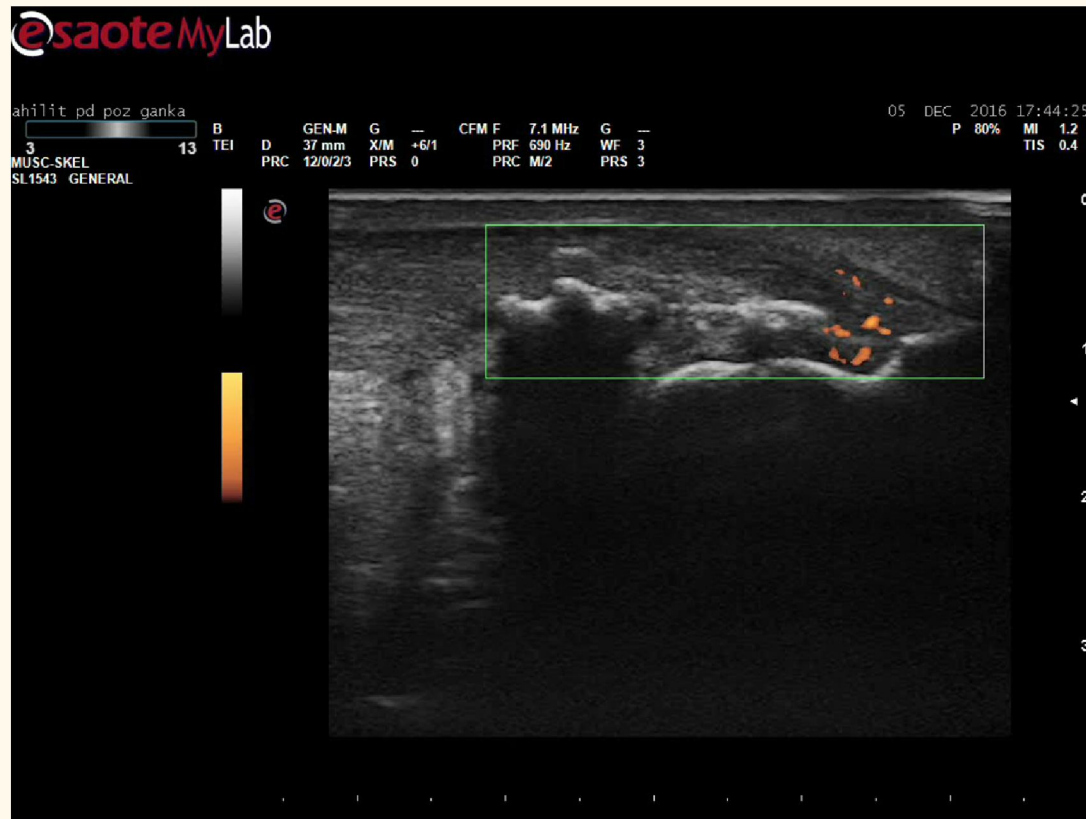
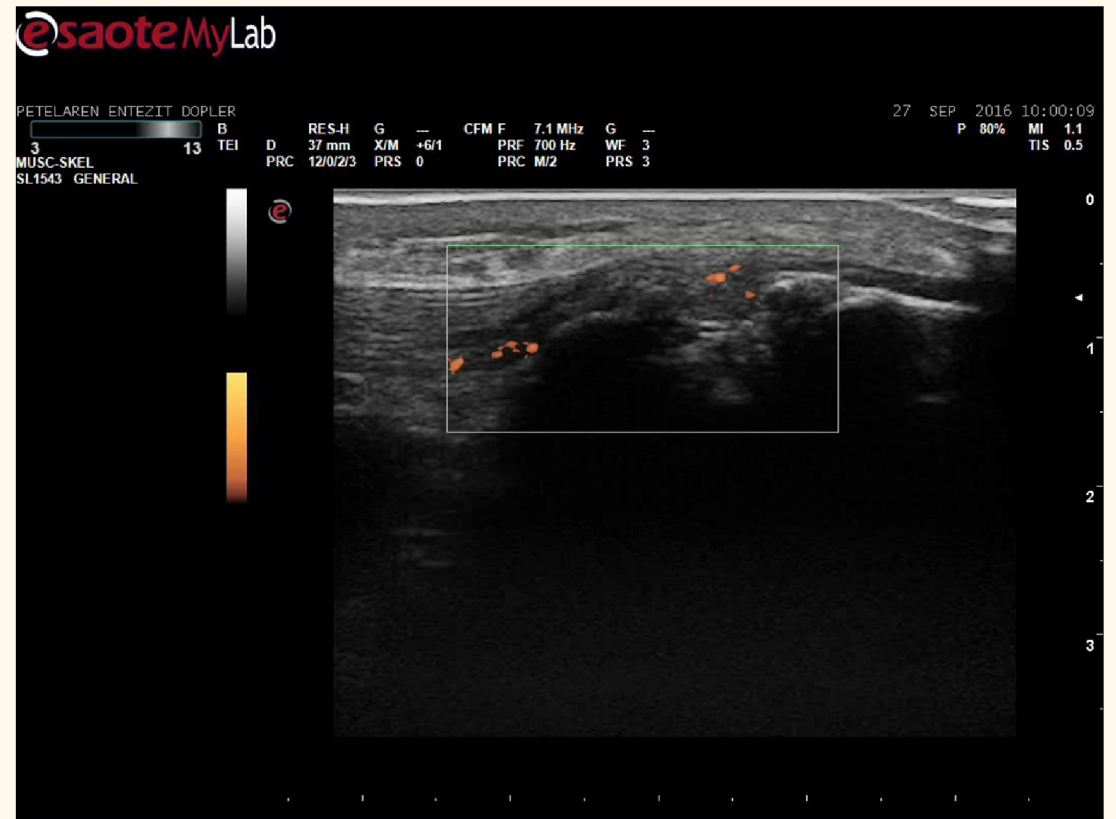
Tendon insertional sonopathology (3): *Enthesopathy*: more examples



Tendinopathy vs *Enthesopathy*



Tendinopathy vs *Enthesopathy*



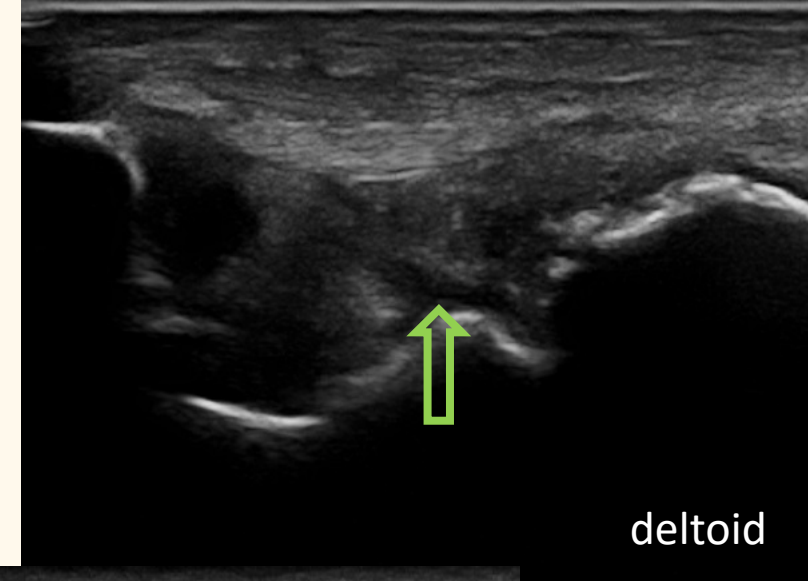
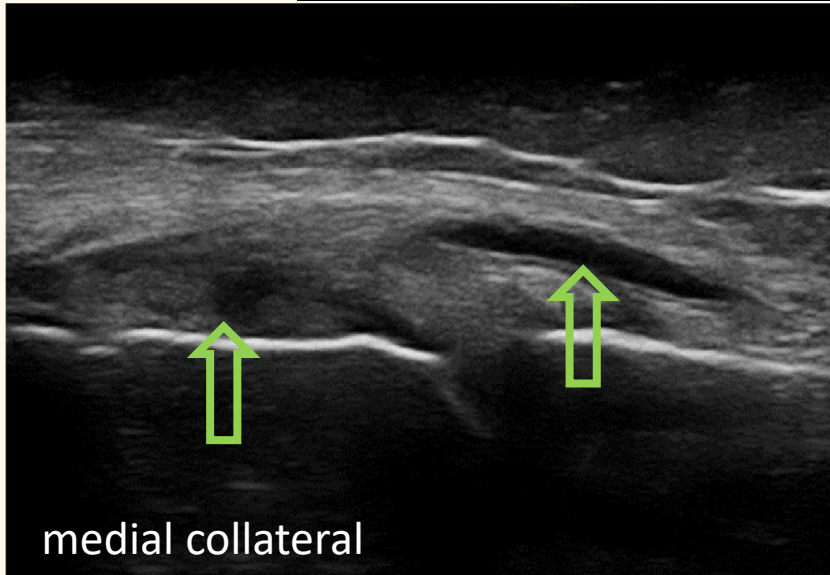
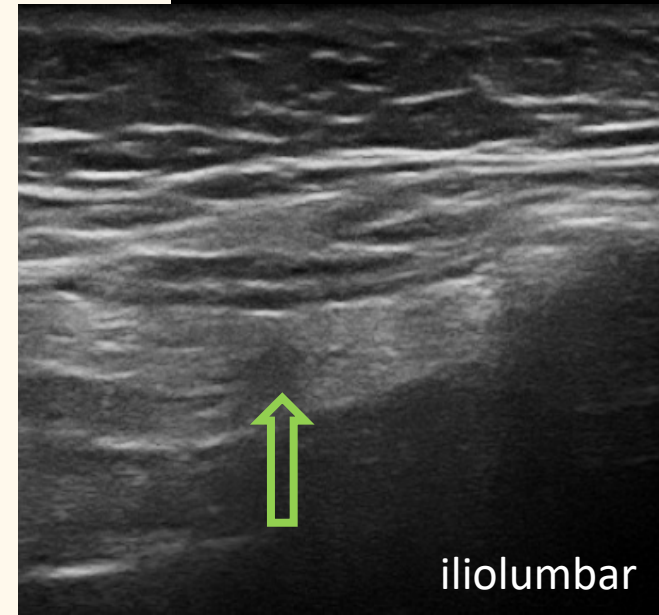
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Peritendinosis: hypoechoic, fusiform or with an irregular profile thickening of the peritendon in the long axis

Ligaments sonopathology (1):

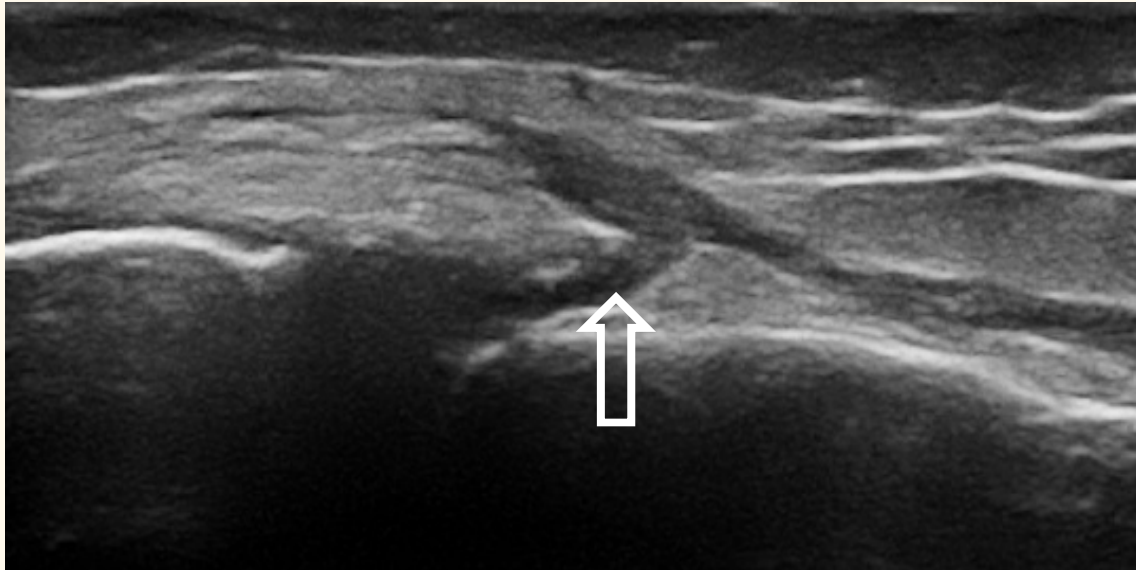
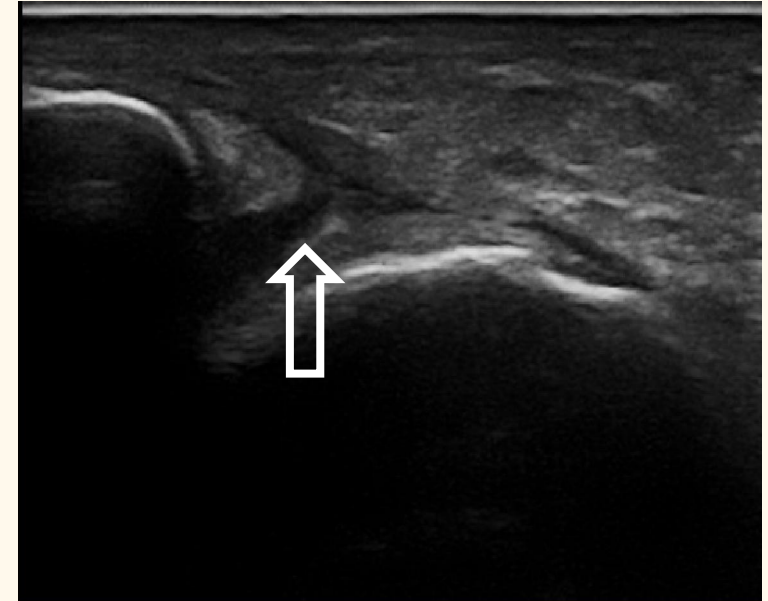
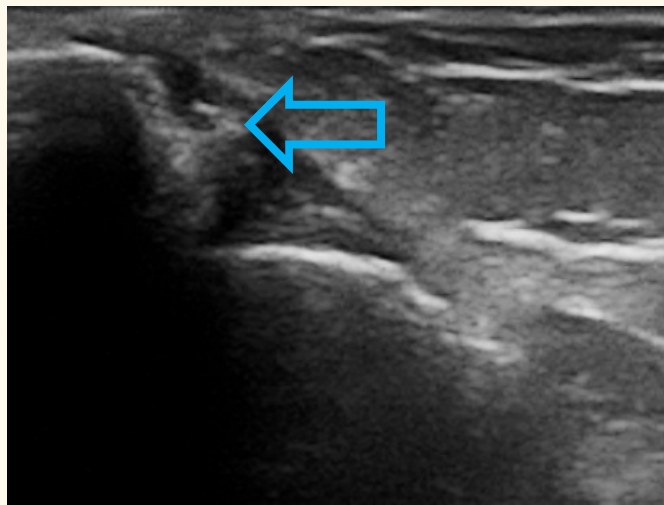
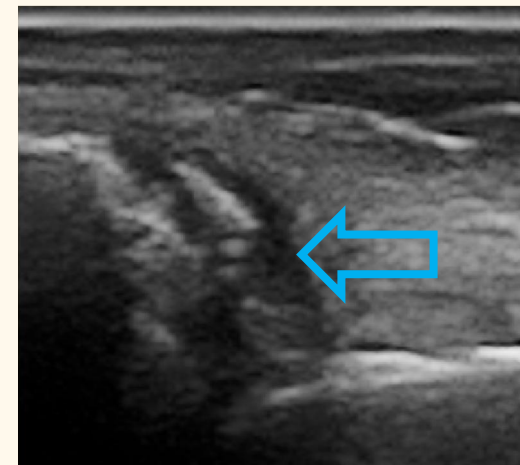
Thickened and/or hypoechoic – *strained*, or thickened and heteroechoic – *partially torn*.



Ligaments sonopathology (2):

Complete interruption of the fibrillar structure – *full-thickness tears*.

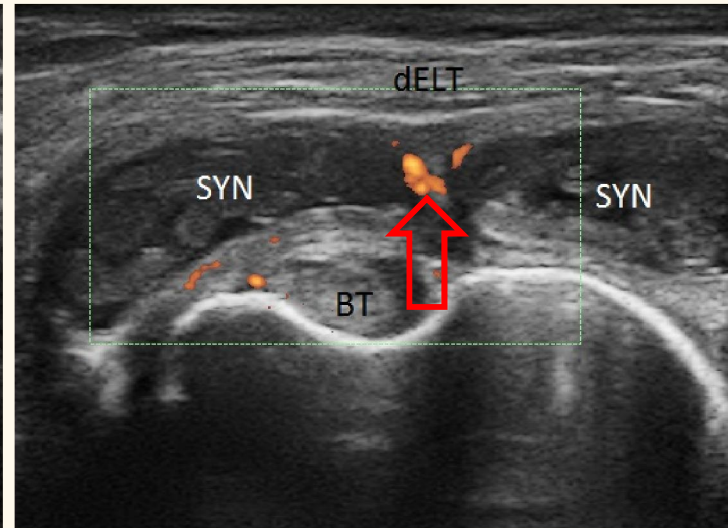
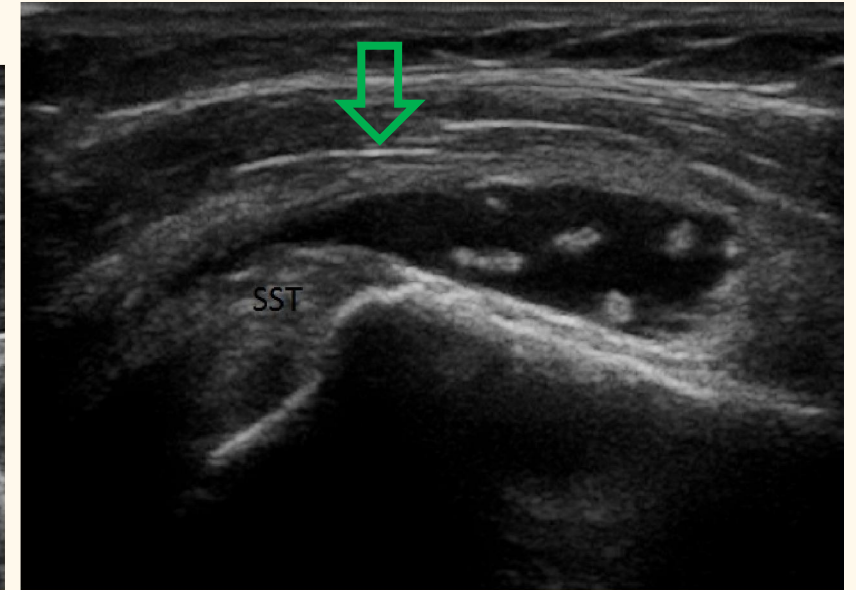
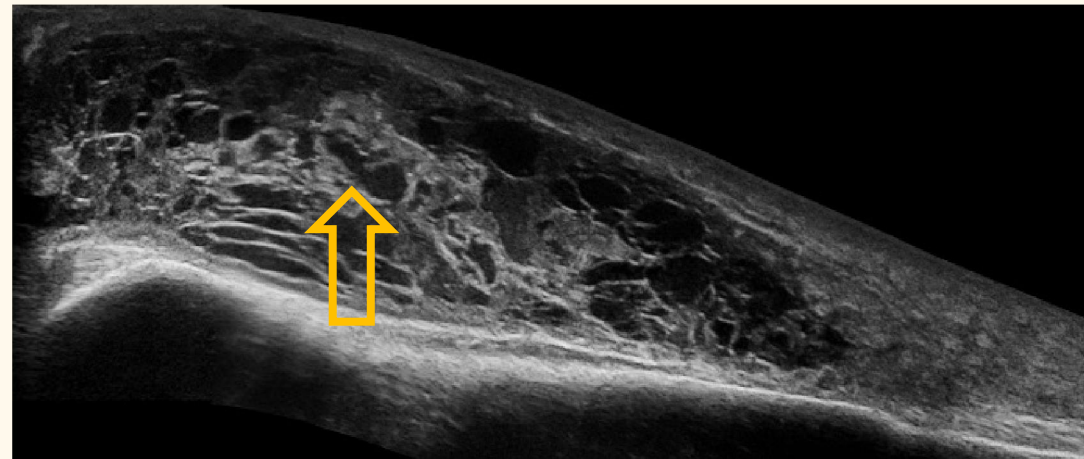
There could be: visible **avulsed bony fragments**, hypoechoic cysts (hematoma) or increases range of motion of the bones that ligament connects (dynamic maneuvers).



Bursa sonopathology (1):

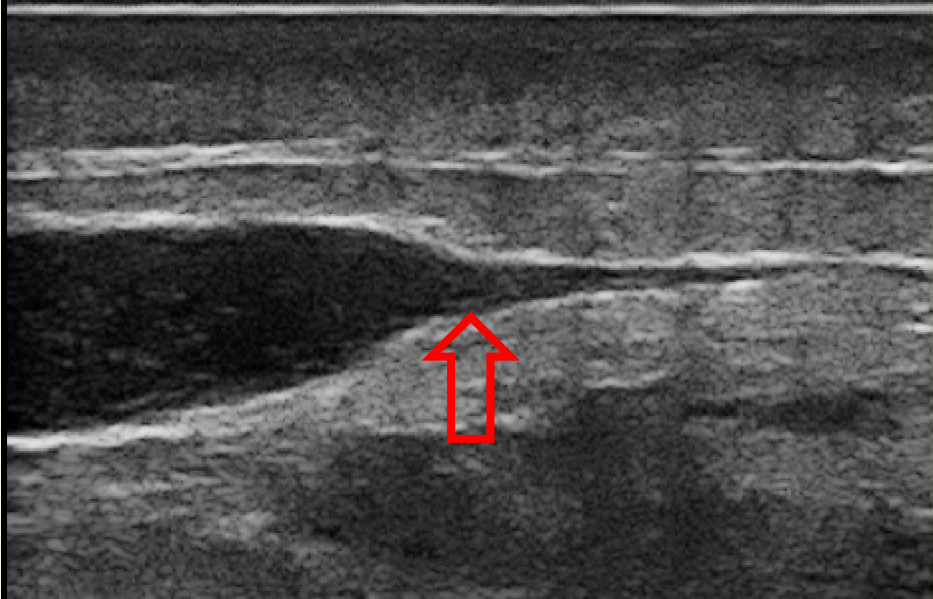
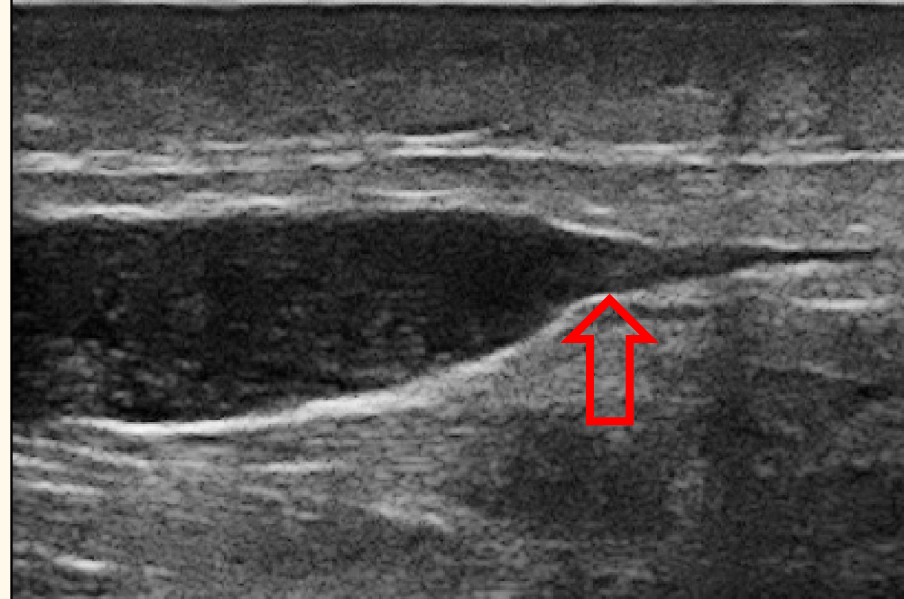
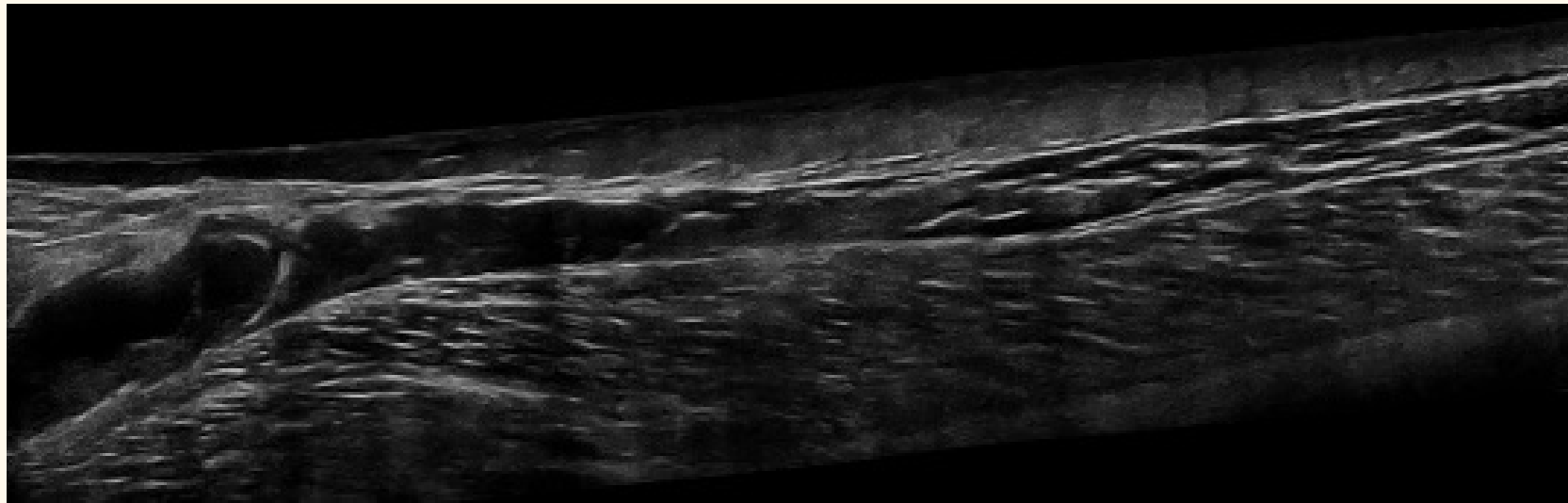
Increased content of the bursa with PD signal or without PD signal. There are alterations in the bursa normal form and compressibility.

Chronic – thickened bursa wall, heteroechoic content.



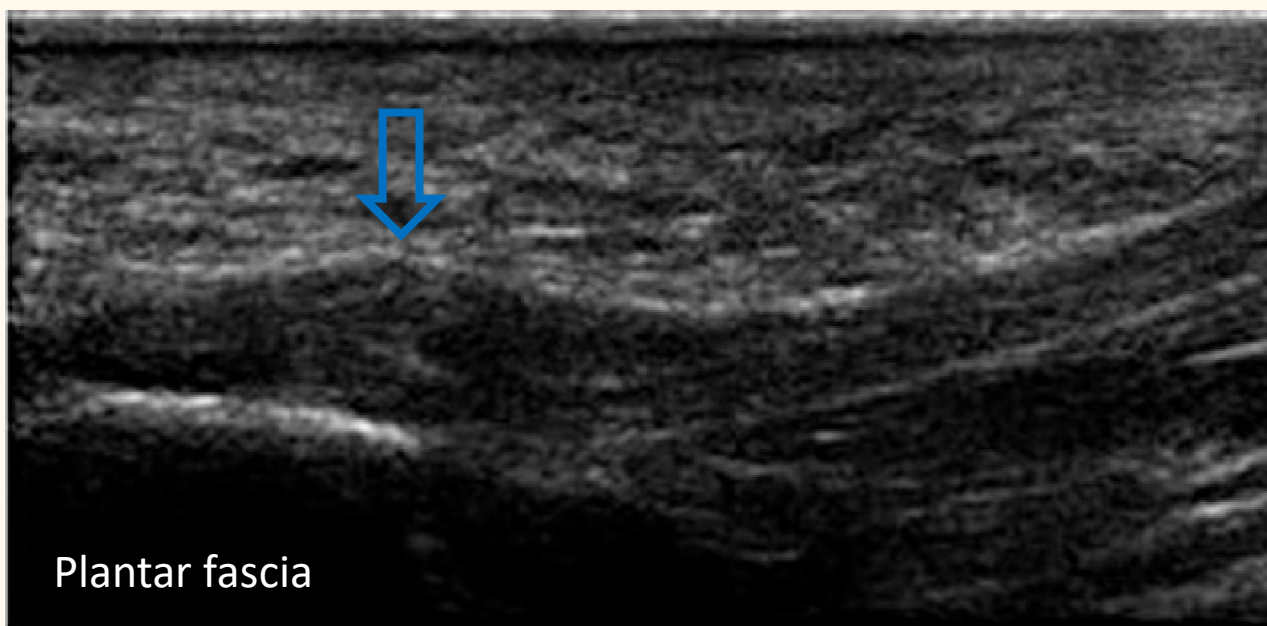
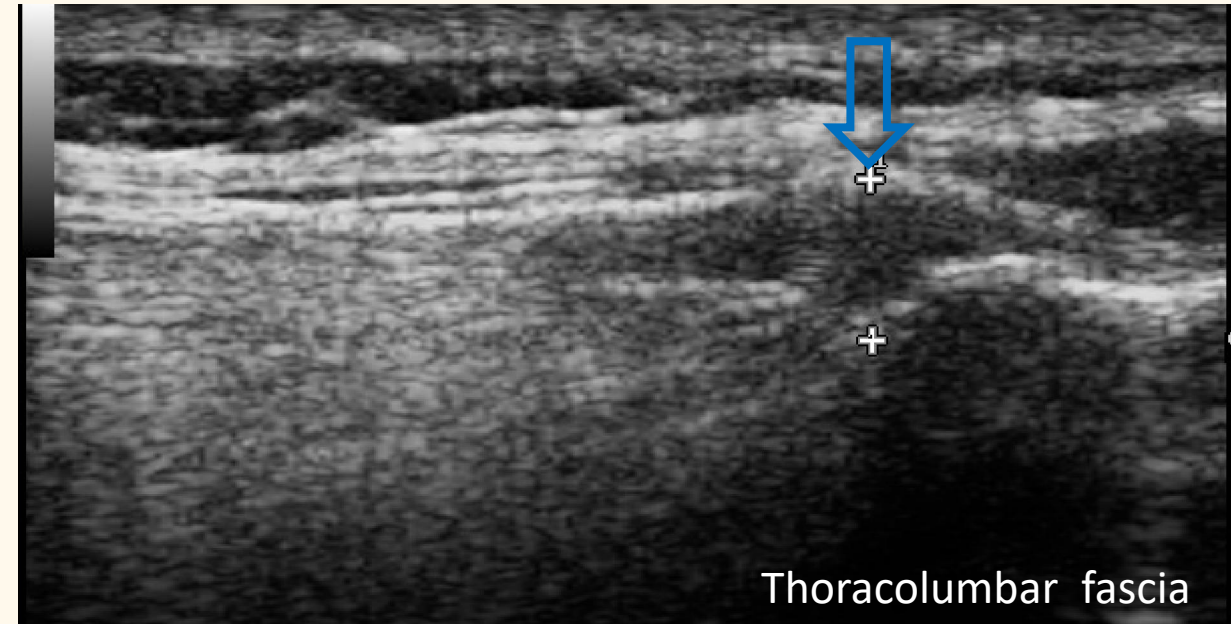
Bursa sonopathology (2):

rupture: **sharpen** instead of the normally curved **bursa contour**
(historically the first application of msk US)



Fascia sonopathology (1):

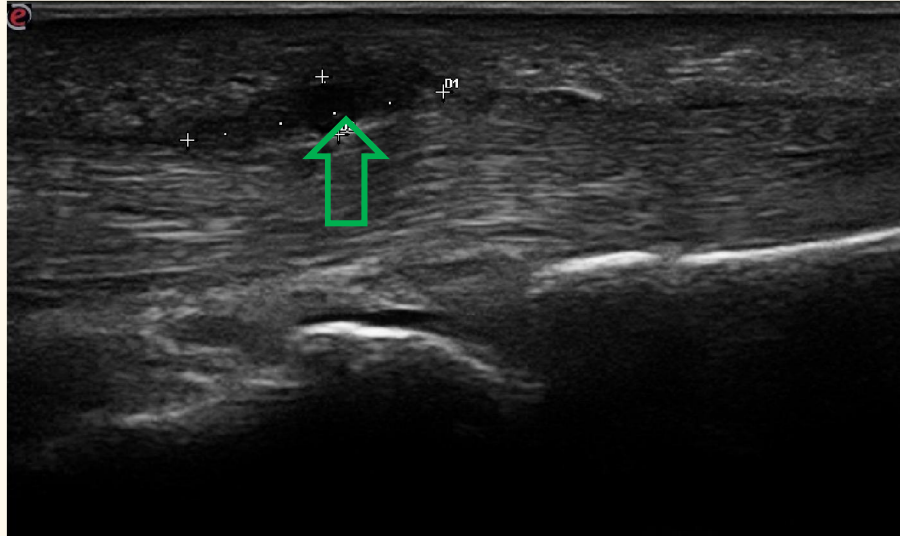
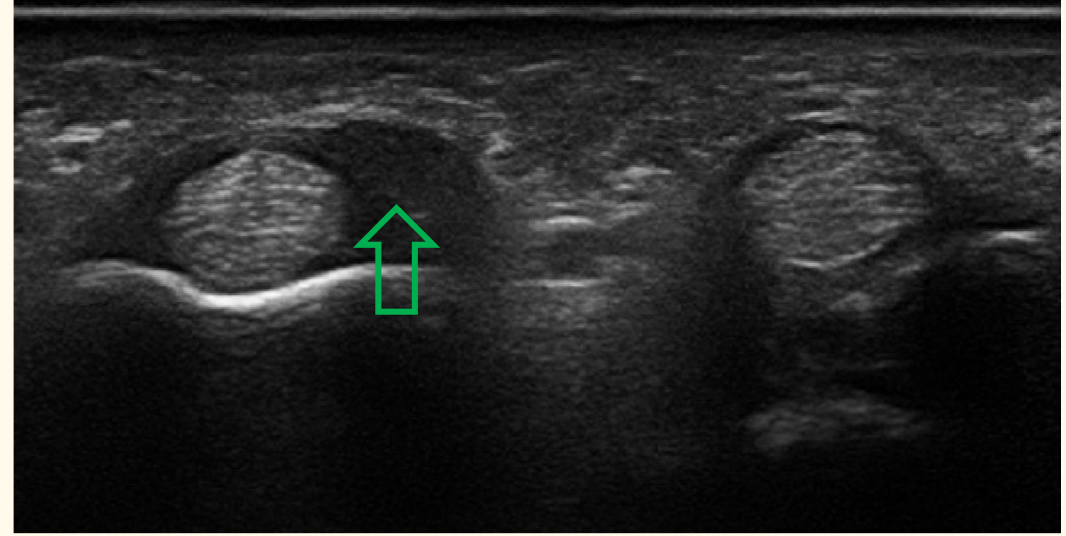
Hypoechoic thickening usually with convex contour and altered fibrillar pattern, sometimes also a surrounding perifascial edema and secondary signs of compression upon neighboring structures.



Fascia sonopathology (2):

Retinaculum: specialized fascia holding long sliding tendons.

Retinaculopathia: thickening of the retinaculum with compression and prevention of the tendon gliding



PART II

**Some general principals for the pragmatic use of
US in soft tissues rheumatism**

1...Look for the most common indicators of a sonopathology

“Thicken”

The screenshot shows a search interface with the term "thick" entered in the search bar. The results list includes various medical conditions and their descriptions, with the word "thickening" highlighted in yellow in several entries.

thick

11 резултата

with altered fibrillar structure, focal **thickening** or thinning, presence of hyperechoic foci

) around the tendon, Doppler signal in/around, retraction and tendon stump in full-**thickness** tears.

with or without PD signal or visible synovial **thickening**. In chronic stages a non-compressible

thickening. In chronic stages a non-compressible **thickening** of the synovial sheath is present.

Tendonitis/tendopathy: hypoechoic, locally **thickened** tendon with altered fibrillar structure.

Peritendinosis: hypoechoic, fusiform **thickening** of the peritendon in the long axis (ring like in short axis), or cheteroechoic with irregular profile, frequently with accompanying bursitis.

Tendons

Sonopathology: A different stages of hypoechogenicity with altered fibrillar structure, focal **thickening** or thinning, presence of hyperechoic foci or hypoechoic zones into the tendon substance, different amount of liquid (anechoic material) around the tendon, Doppler signal in/around, retraction and tendon stump in full-**thickness** tears.

Tenosynovitis: the presence of concentric an/hypoechoic compressible halo around the tendon body, with or without PD signal or visible synovial **thickening**. In chronic stages a non-compressible **thickening** of the synovial sheath is present.

Tendonitis/tendopathy: hypoechoic, locally **thickened** tendon with altered fibrillar structure. Tendon echoic heterogeneity is an indicator of poor outcome. Of importance are the so call “critical zones”: site of tears/calcifications.

Peritendinosis: hypoechoic, fusiform **thickening** of the peritendon in the long axis (ring like in short axis), or cheteroechoic with irregular profile, frequently with accompanying bursitis.

Enthesopathy: **thickening** hypoechoic alteration of the fibrillar pattern and heteroechogenicity of the tendon at its bony insertion as compare to its body. There could be also accompanying calcification foci, anechoic zones and subentheseal bone irregularities.

Ligaments:

Sonopathology: **Thickened**, hypoechoic (strained) or heteroechoic (partially torn), or with full

“Hypoechoic”

The screenshot shows a search interface with the term "hypoechoic" entered in the search bar. The results list includes various medical conditions and their descriptions, with the word "hypoechoic" highlighted in yellow in several entries.

hypoechoic

10 резултата

or thinning, presence of hyperechoic foci or **hypoechoic** zones into the tendon substance, different

Tenosynovitis: the presence of concentric an/**hypoechoic** compressible halo around the tendon body,

Tendonitis/tendopathy: **hypoechoic**, locally thickened tendon with altered fibrillar structure.

Peritendinosis: **hypoechoic**, fusiform thickening of the peritendon in the long axis (ring like in short axis), or cheteroechoic with irregular profile, frequently with accompanying bursitis.

Enthesopathy: thickening **hypoechoic** alteration of the fibrillar pattern and heteroechogenicity of the tendon at its bony insertion as compare to its body. There could be also accompanying calcification foci, anechoic zones and subentheseal bone irregularities.

Sonopathology: Thickened, **hypoechoic** (strained) or heteroechoic (partially torn), or with full

Tendons

Sonopathology: A different stages of hypoechogenicity with altered fibrillar structure, focal thickening or thinning, presence of hyperechoic foci or **hypoechoic** zones into the tendon substance, different amount of liquid (anechoic material) around the tendon, Doppler signal in/around, retraction and tendon stump in full-thickness tears.

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Ligaments:

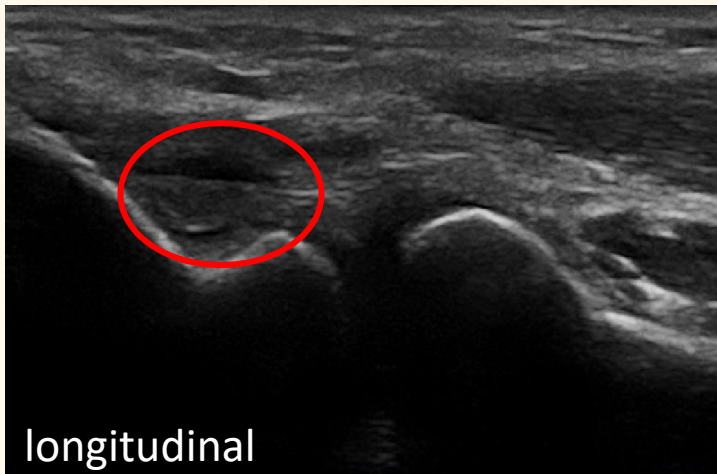
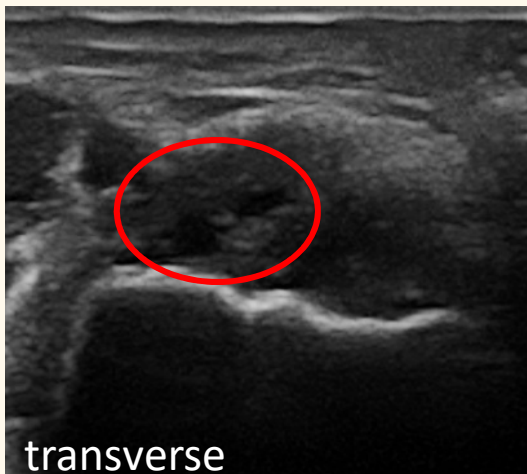
Sonopathology: Thickened, **hypoechoic** (strained) or heteroechoic (partially torn), or with full

2,3 and 4

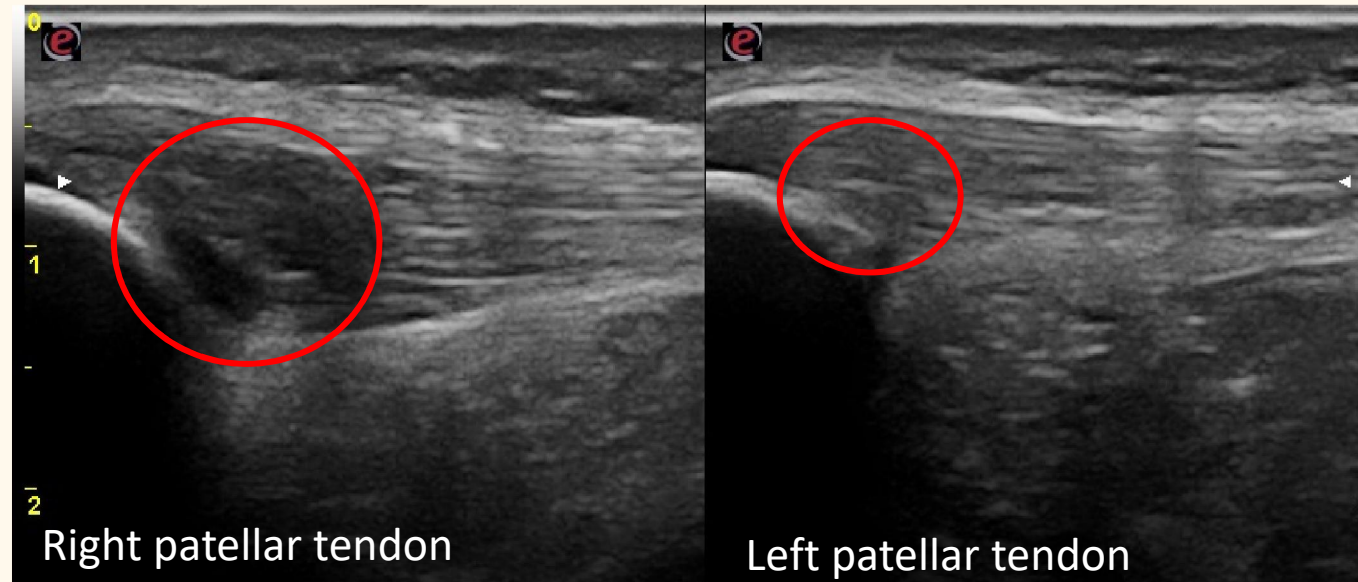
- **The area of US investigation is dictated by the clinical symptoms and the available acoustic windows.**
- **A thorough knowledge of the anatomy of the investigated area is required.**
- **The US scanning should be performed in a systematic way**

5 and 6

Assess the structure in two perpendicular planes



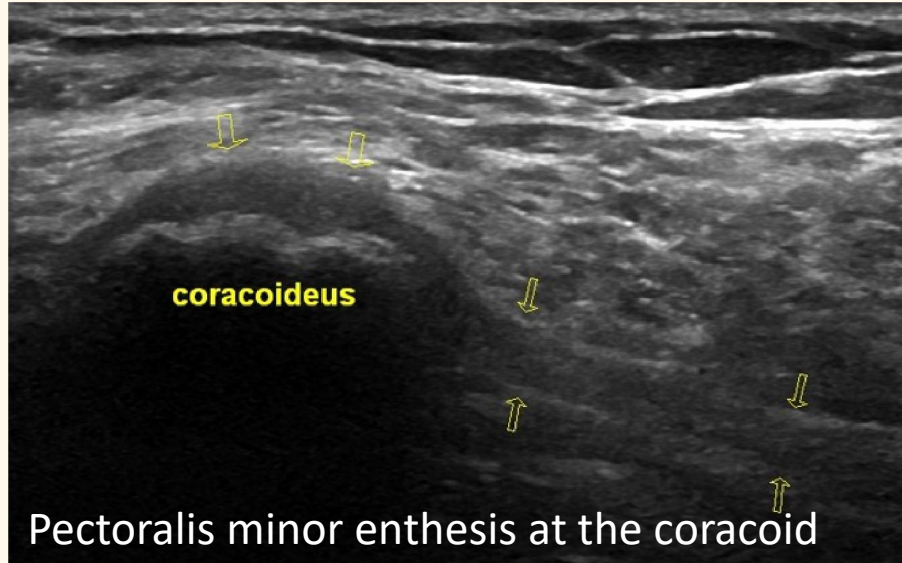
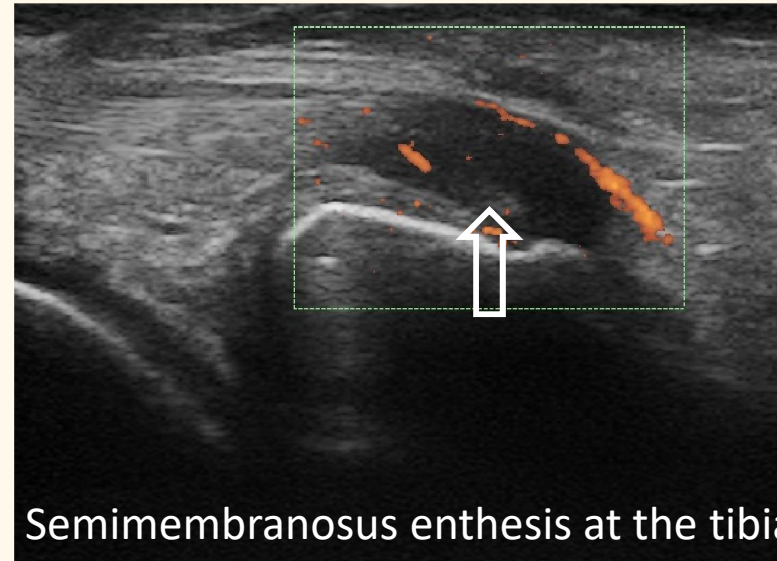
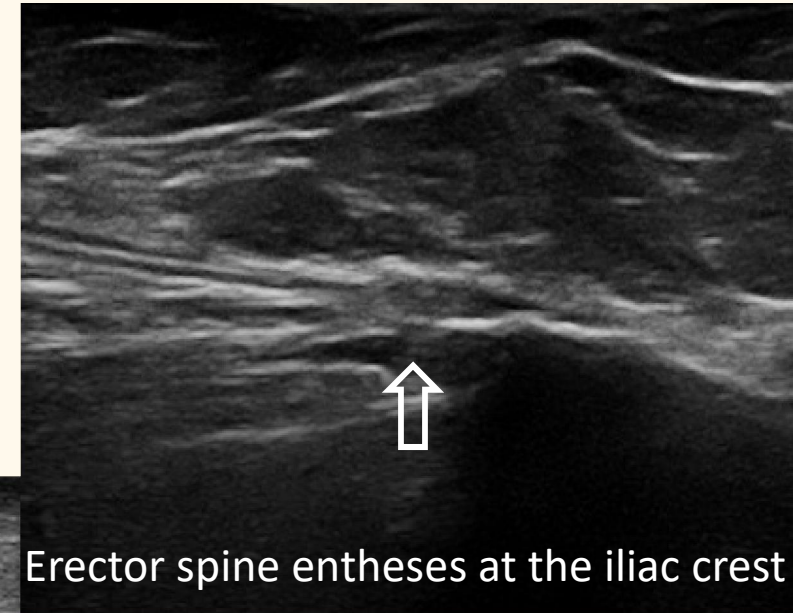
Comparison with the uninvolved side might be helpful



7..Sonopalpation: the application of pressure with the probe over specific visualized anatomical structures within the painful region: the probe is like an extension of the physician's fingers. (i.e. more than a stethoscope?). This technique is of paramount importance when STR is assessed.

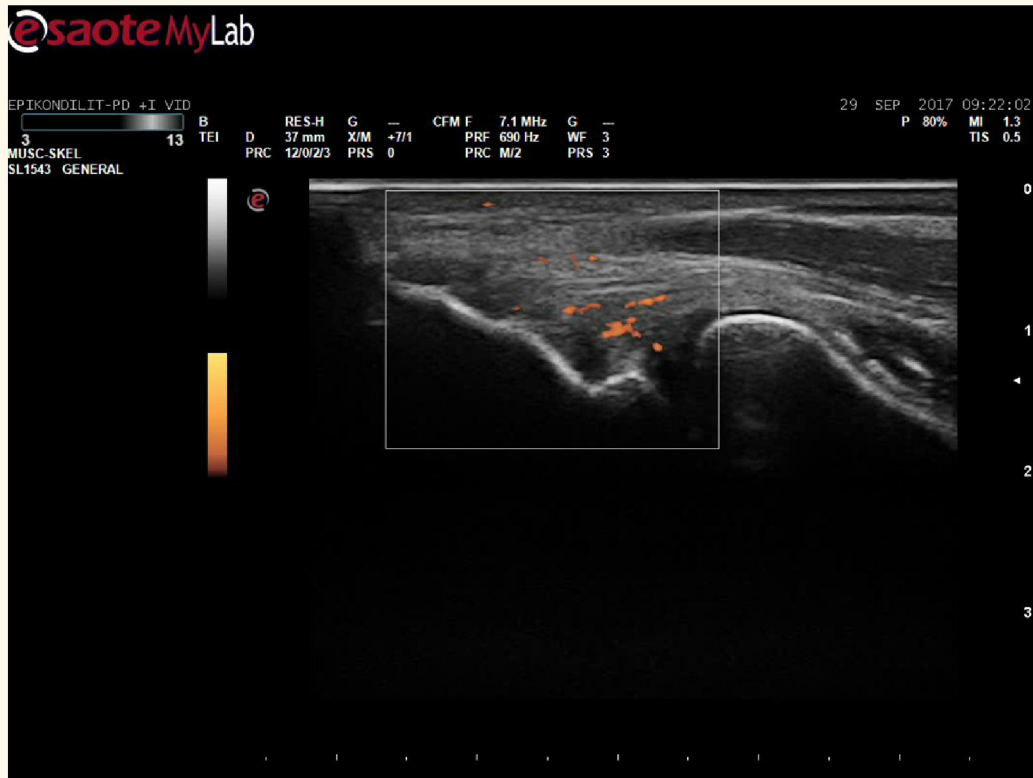


8.. *Tendinopathy or enthesopathy* with or without bursitis is a particularly common finding in US examination in RPS.
Always try to identify and assess the tendon and enthesis in the painful region.

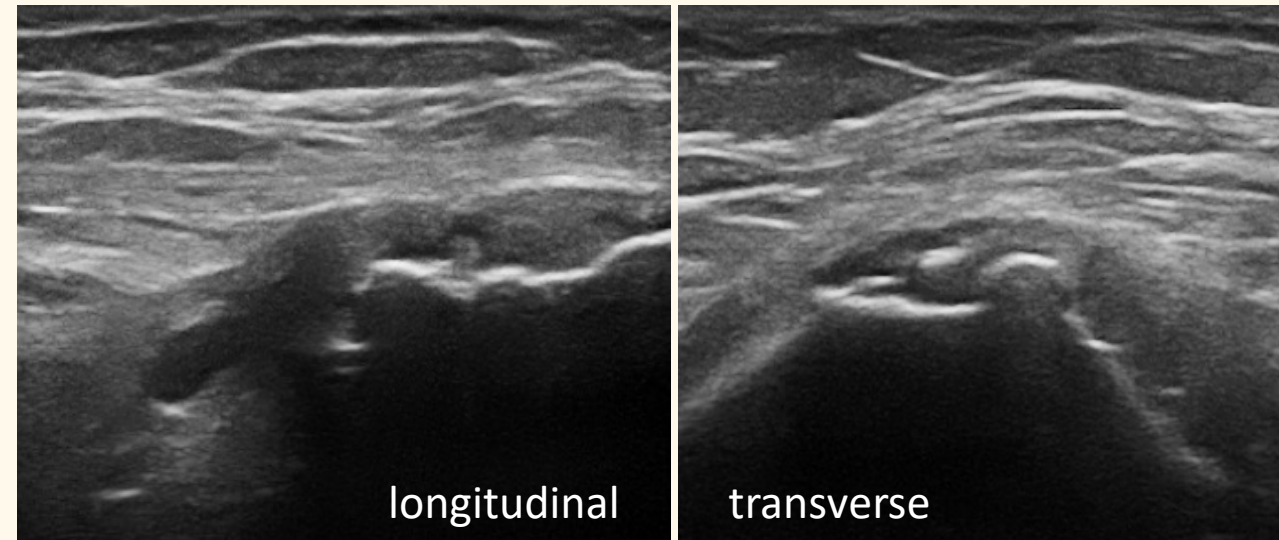


9...Regional pain is especially common *at sites of multitendon entheses.*

the lateral epicondyle of the humerus
(wrist extensor)



the great trochanter of the femur
(glutei)



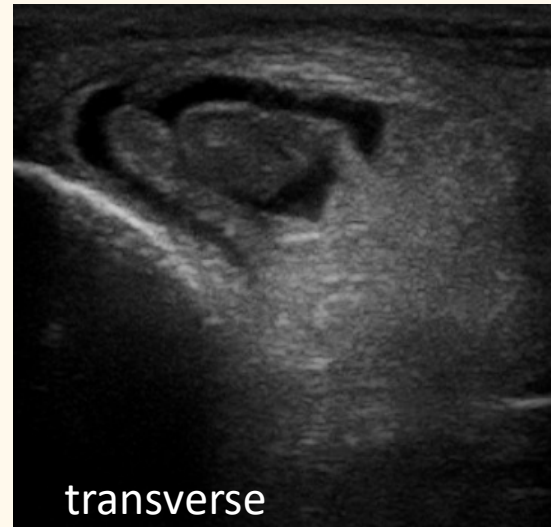
At these sites, the sonologist needs to alter probe orientation to follow the individual tendon elements to avoid anisotropy.

10...RPS are especially common where *synovial tendons wrap around bony prominences*.

Peroneal tendons around the lateral malleolus



transverse



transverse

Tibialis posterior tendon around the medial malleolus



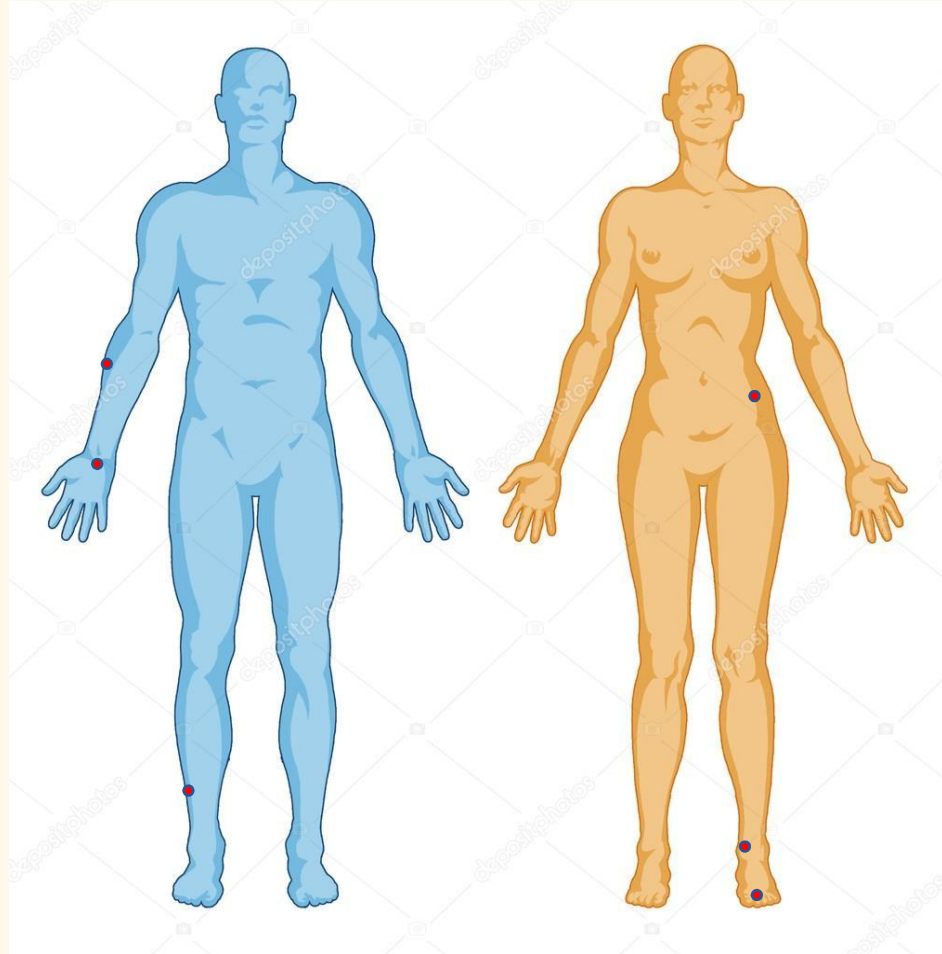
To assess “functional entheses”, the characteristic bony landmarks should be known and used.

11...*At proper anatomical location* look for US signs of *nerve entrapment*.

Posterior
interosseous
nerve

Median
nerve

Superficial
peroneal
nerve

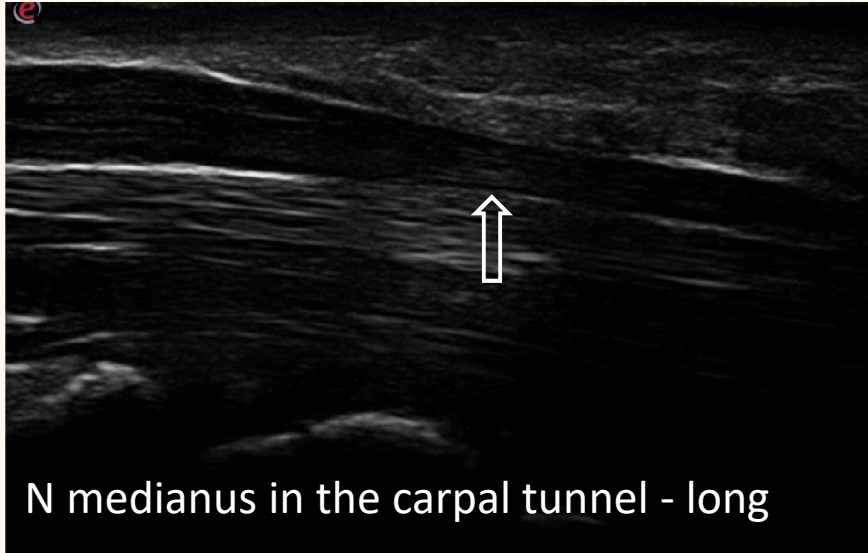
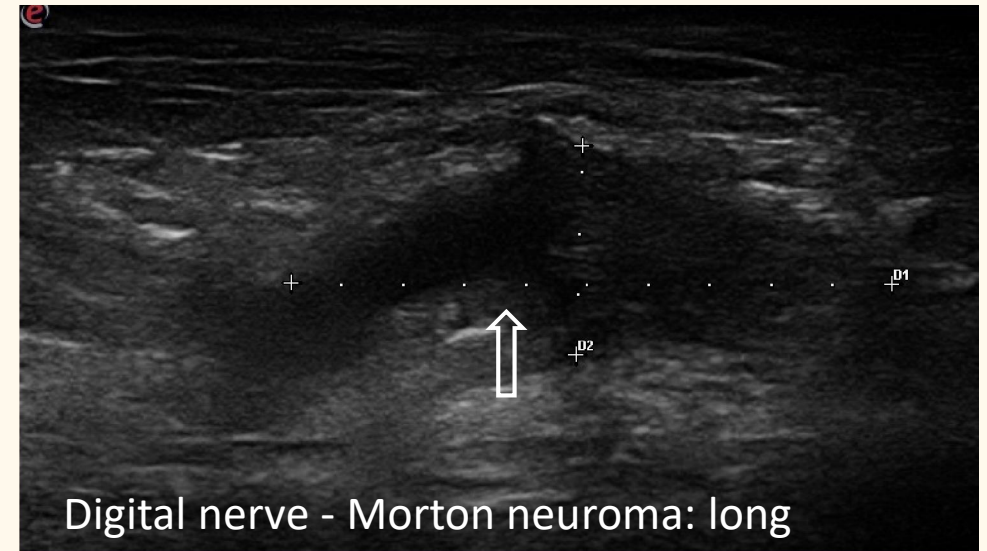
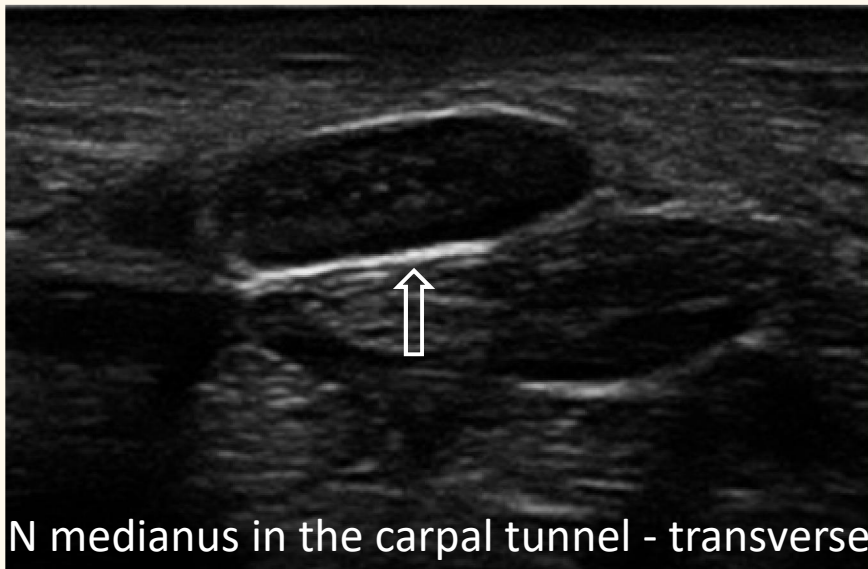


Cutaneous
femoris
lateralis

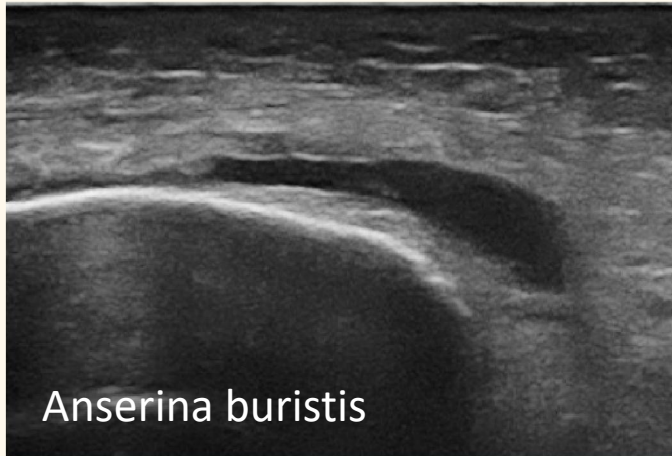
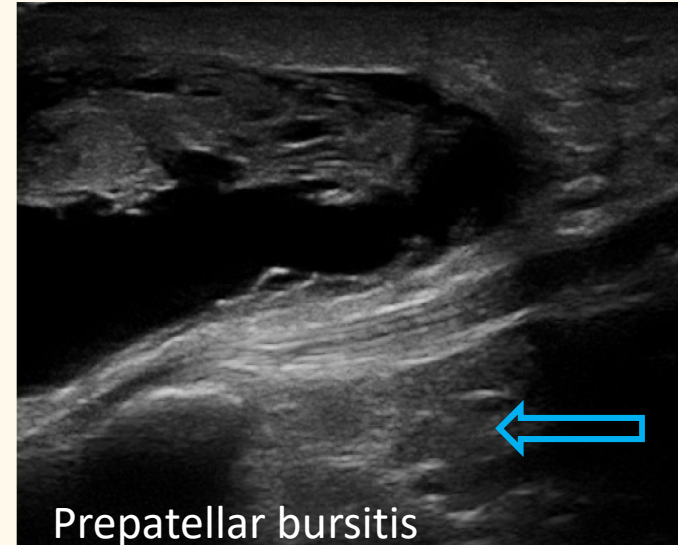
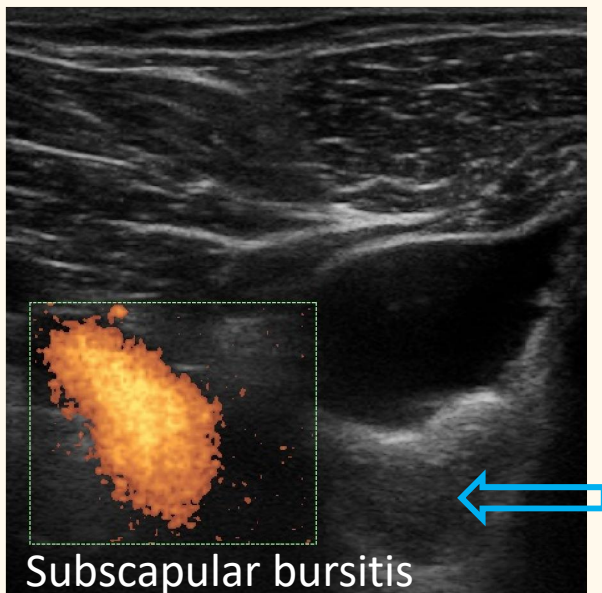
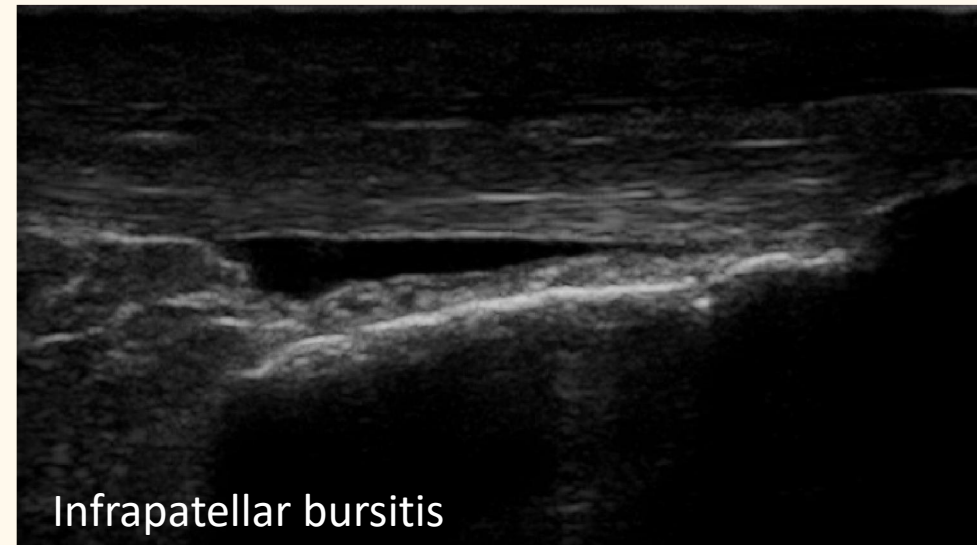
Posterior
tibial
nerve

Plantar
digital
nerve

11...nerve entrapment: *localized thinning of the nerve with a proximal to it hypoechoic swelling in the longitudinal plane.*
In the transverse plane: *enlarged diameter of the nerve, hypoechoic fascicles.*

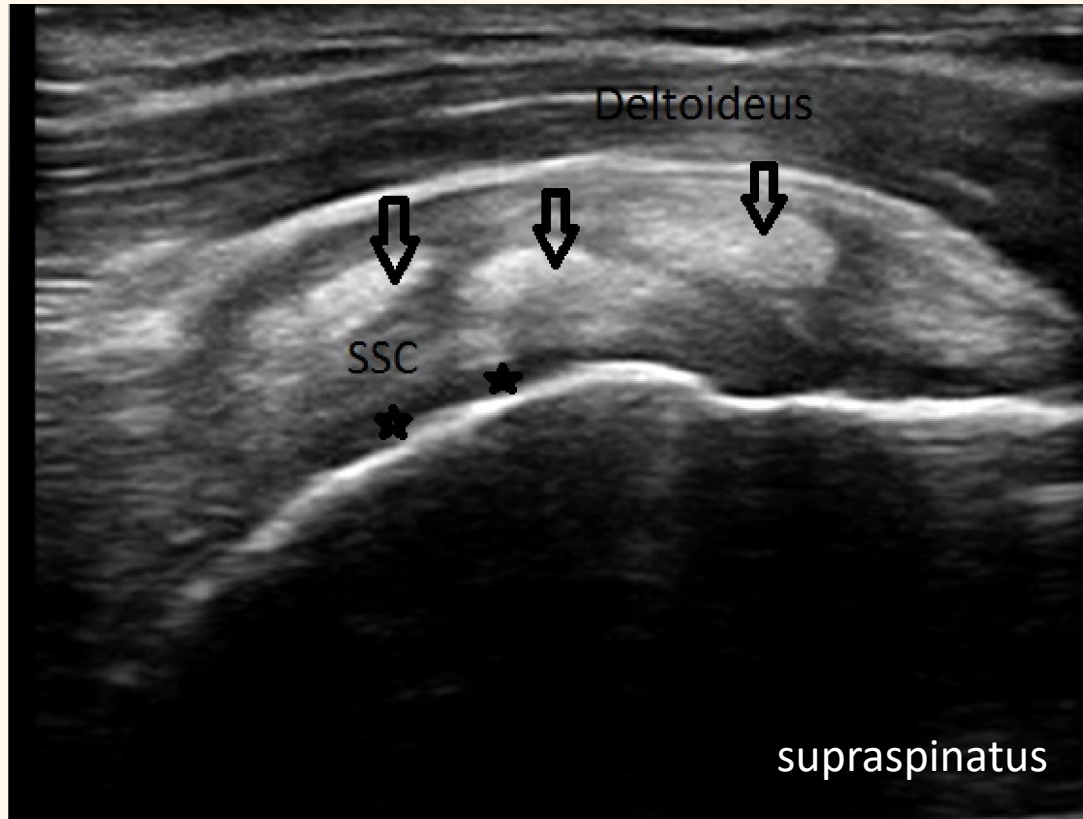


12...Look also for *bursitis*: a structure with hypoechoic or heteroechoic content and hyperechoic well-defined walls, that could produce posterior echantment:

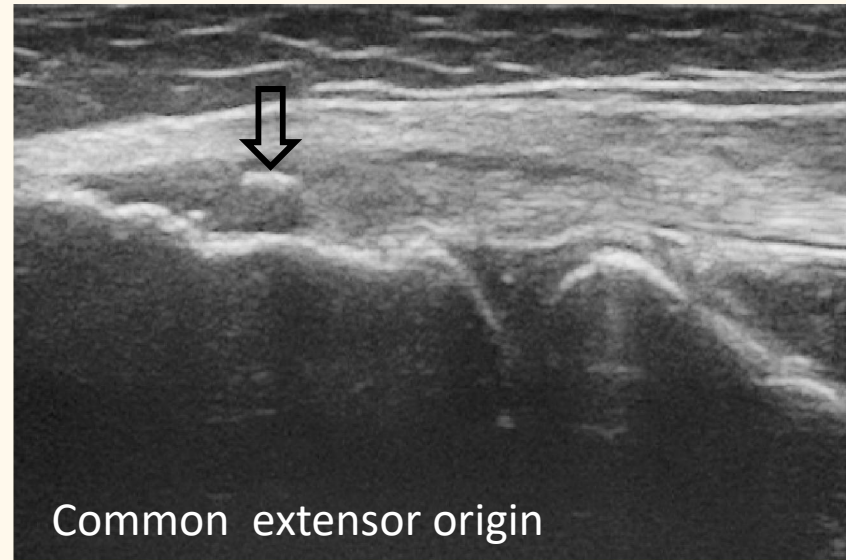
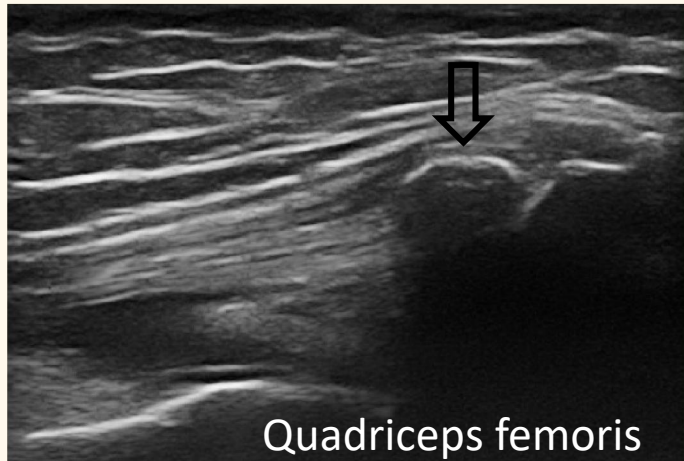
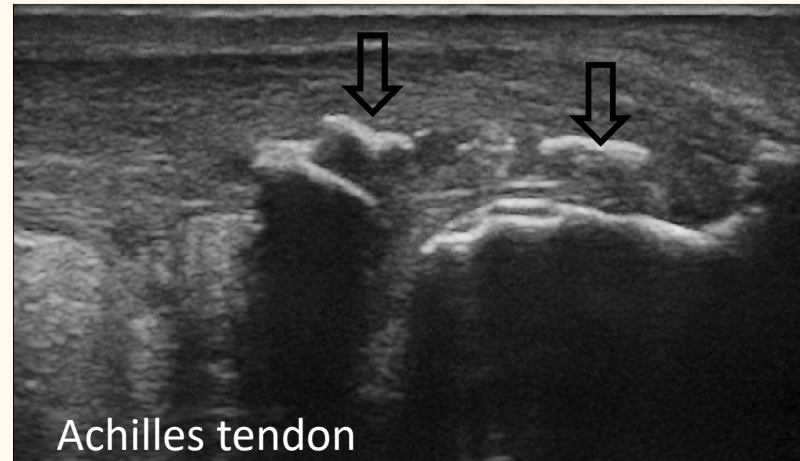


13...US plays a *major role in the diagnosis of calcific tendonitis* – a frequent etiology for RPS.

Look *for bright foci* in the tendons' substance that could have or no posterior shadow.



Calcific tendonitis can affect many tendons. Look for bright foci in the tendons' substance that could have or no posterior shadow.



Three phases of calcification:

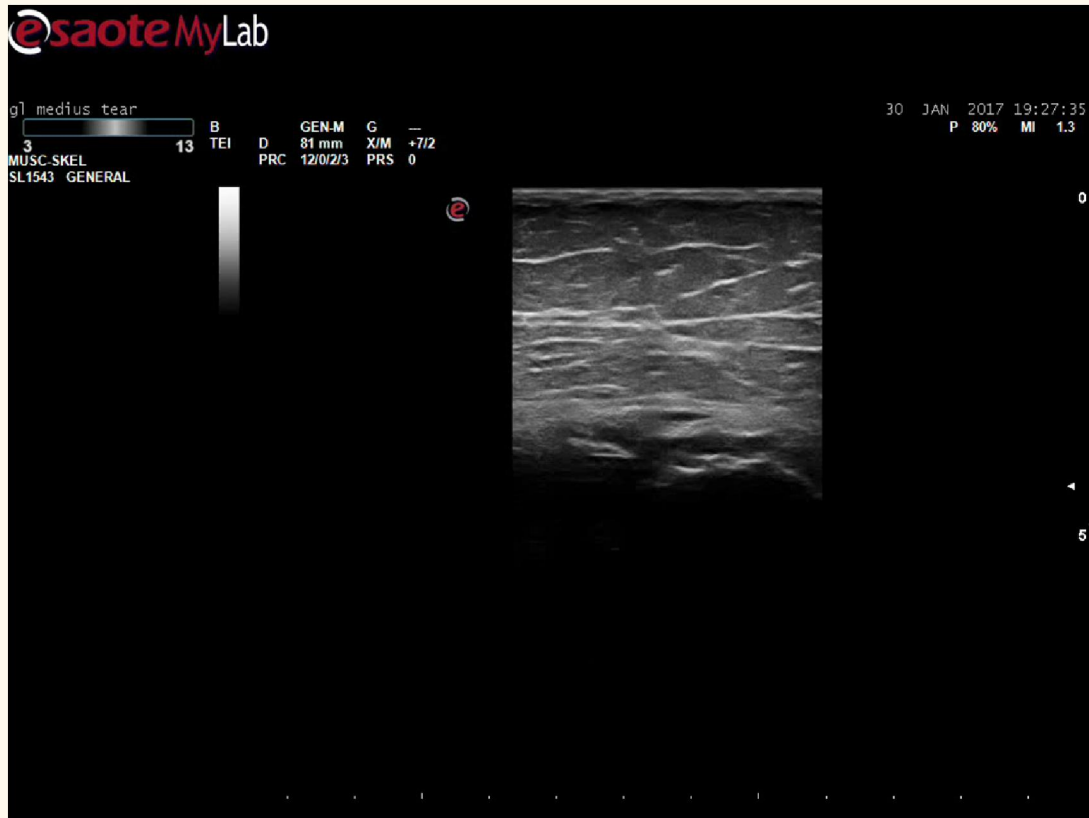
1. Formative phase: Calcifications are seen mainly as hyperechoic structures with marked acoustic shadow.

2. Resting phase: Calcium deposits are thicker, more nodular but often without acoustic shadow.

3. Resorpting phase: Deposits show bold echogenic wall surrounding more hypoechogenic area.

14...Dynamic evaluation is important to optimize tendon and ligamentous visualization and to assess functional impact of the pathology.

Gluteus medius tendon partial tear



Gluteus medius tendopathy/enthesopathy



In conclusion: soft tissue rheumatic pain syndromes are common....

- The total prevalence in an epidemiological study was **5%**. Different RPS frequency was as follows:

rotator cuff disease (2.4%), plantar fasciitis (0.6%), lateral epicondylalgia (0.6%), medial epicondylalgia (0.5%), trigger finger (0.4%), carpal tunnel syndrome (0.4%), anserine bursitis (0.3%), de Quervain's syndrome (0.3%), shoulder bicipital tendinopathy (0.3%), trochanteric syndrome (0.1%) and Achilles tendinopathy (0.1%).

(Alvarez-Nemegyei J et al. Prevalence of rheumatic regional pain syndromes in adults from Mexico: a community survey using COPCORD for screening and syndrome-specific diagnostics criteria. J Rheumatol 2011;86:1520)

...so always look for them

Thank you for your attention!

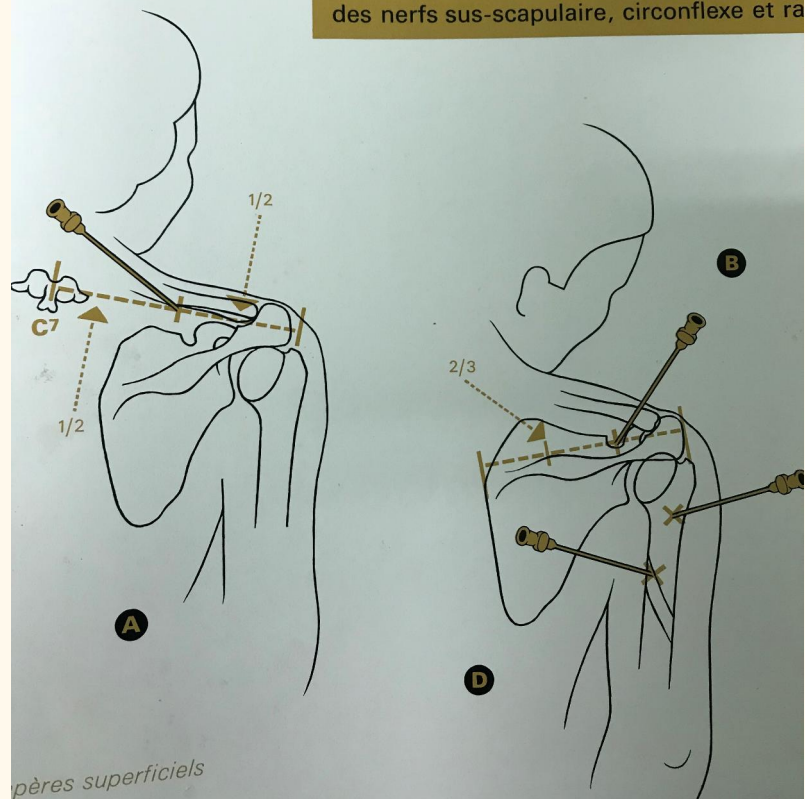
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- 2. Wakefield RJ, D'Ágostino MA. Essential applications of musculoskeletal ultrasound in rheumatology, 1st ed., Elsevier, 2010.
- 3. Bruyn G, Moller I, Klauser A, Martinoli C: Soft tissue pathology: regional pain syndromes, nerves and ligaments, Rheumatology 2012;51:22-25.
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atlas pratique des ponctions et des infiltrations

ÉPAULE

infiltrations plexuales
des nerfs sus-scapulaire, circonflexe et ra



nerfs superficiels

atlas pratique des ponctions et des infiltrations

6

POIGNET-MAIN

infiltration du canal carpien,
de l'articulation trapézo-métacarpienne du pouce

