

DES de base 2021

Bases de l'échographie musculo-squelettique

Dre Souad Acid

Dr Jacques Malghem, Bruno Vande Berg,
Frédéric Lecouvet, Thomas Kirchgesner,



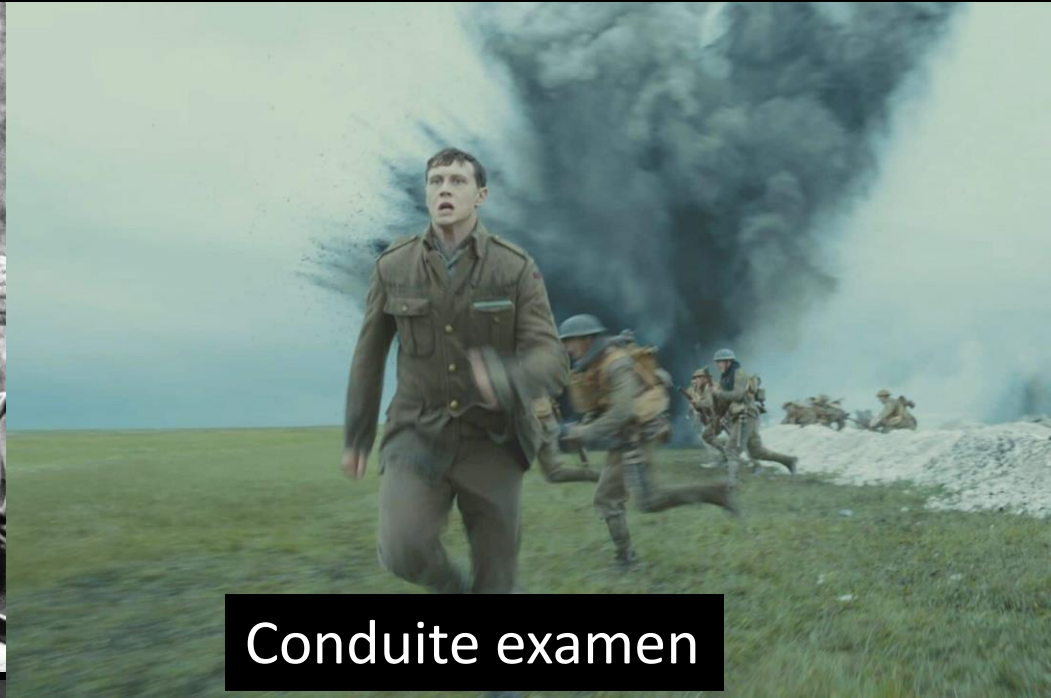
Cliniques universitaires
SAINT-LUC
UCL BRUSSELS

Se lancer en échographie MSK

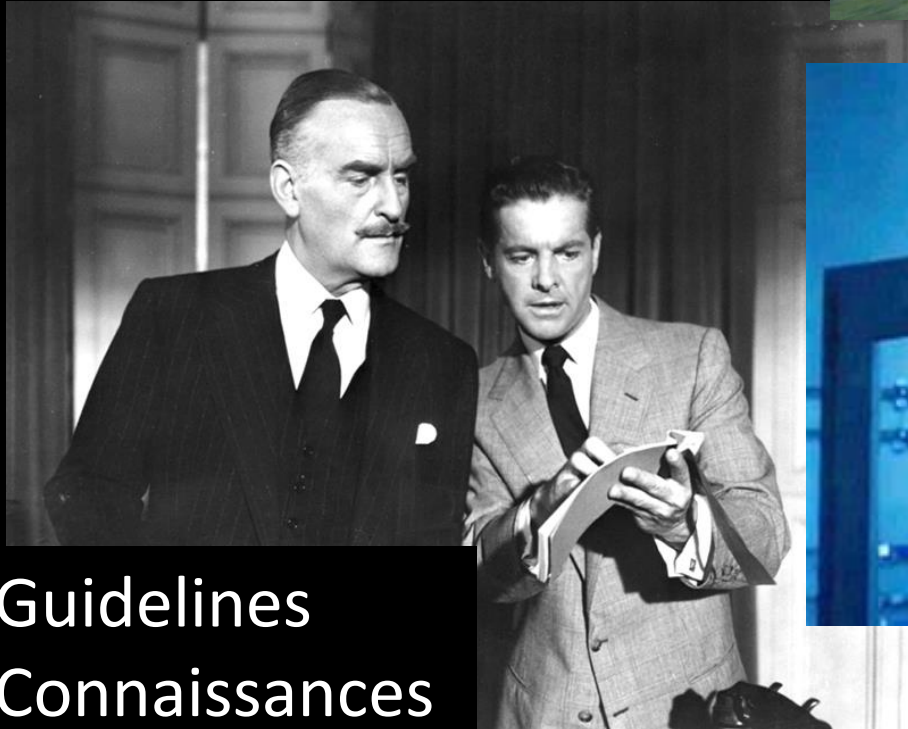
- Regain d'intérêt
- Technique performante: accessibilité/ coût
- Technique difficile



Radiologue compétent(e)
Matériel performant



Conduite examen



Guidelines
Connaissances



Limites à connaître!

Nous aborderons

- « Bonnes conditions matérielles »
- Optimisation image
- Déroulement examen-Transmission information
- Indications- **Limites**

Nous n'arborerons pas

- Aspect normal
- Pathologies
- Interventionnel
- Techniques: échographie de contraste-élastographie
- Pédiatrie

Bases de l'écho MSK

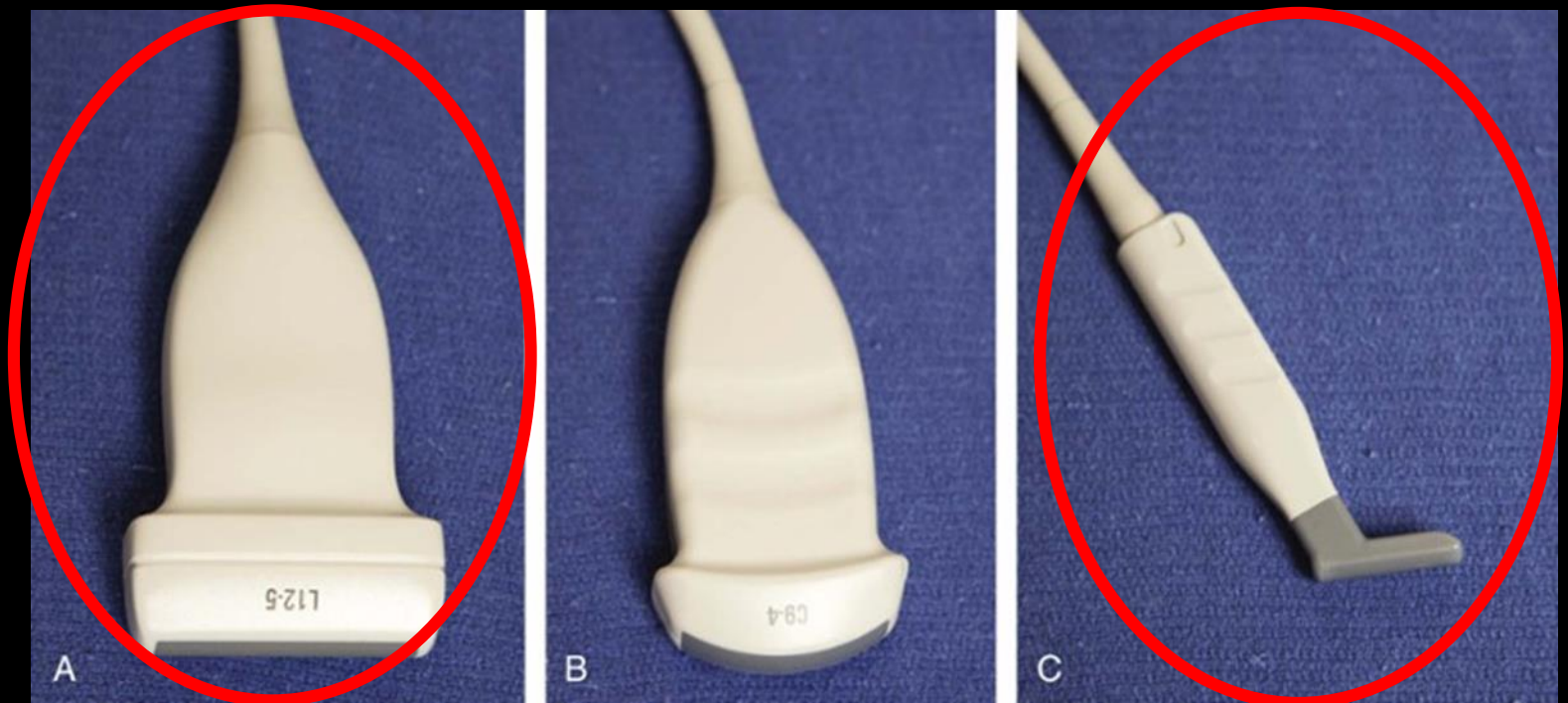
- Conditions matérielles optimales
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Bases de l'écho MSK

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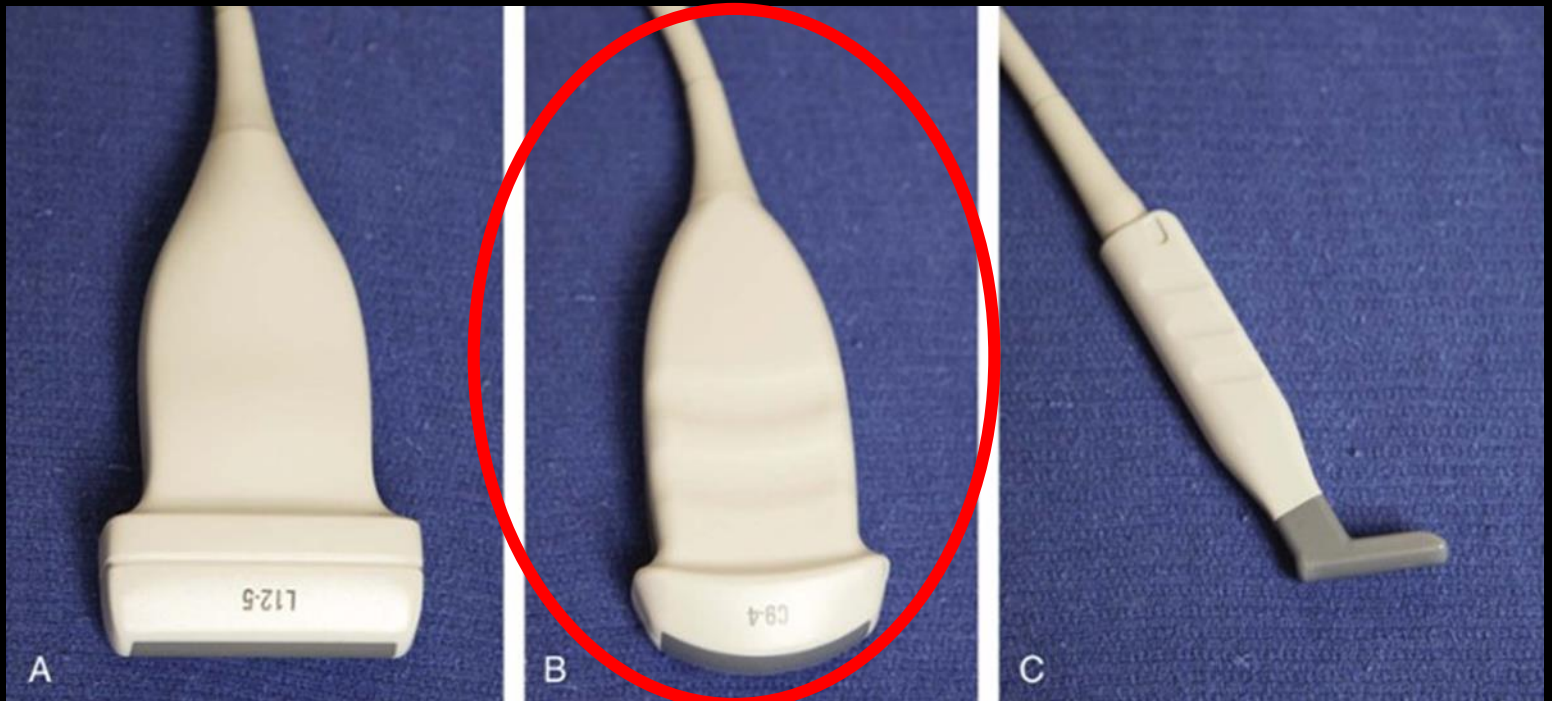
Matériel: Sondes

- Hautes fréquences
- Sondes linéaires/ Club de golf



Matériel: Sondes

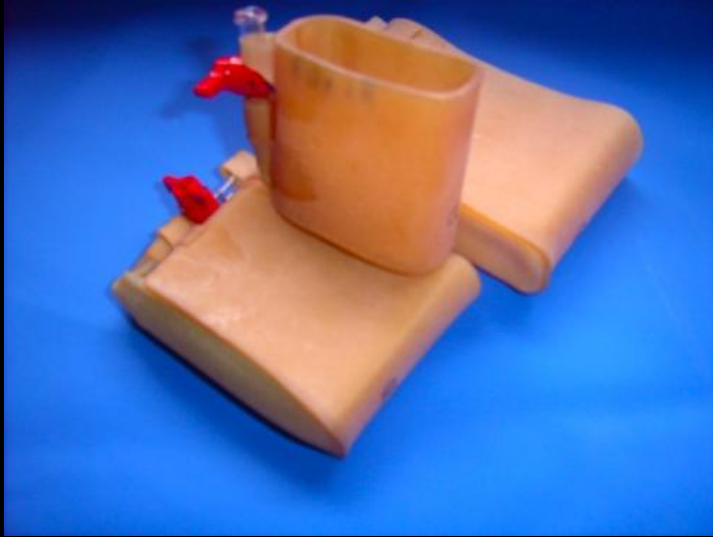
- Hautes fréquences
- Sondes linéaires/ Club de golf



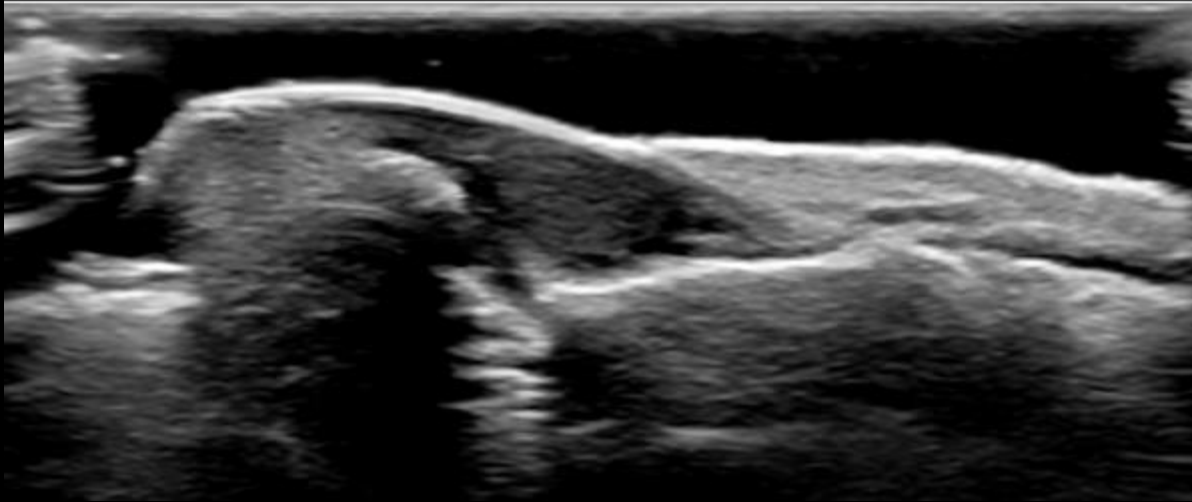
Matériel d'interposition

- Augmenter la surface de contact
- Majorer la largeur d'exploration en faisceau trapézoïdal
- Voir la profondeur de la lésion par rapport à la peau/étude peau
- Limite la compression par la sonde
- Focalisation plus facile

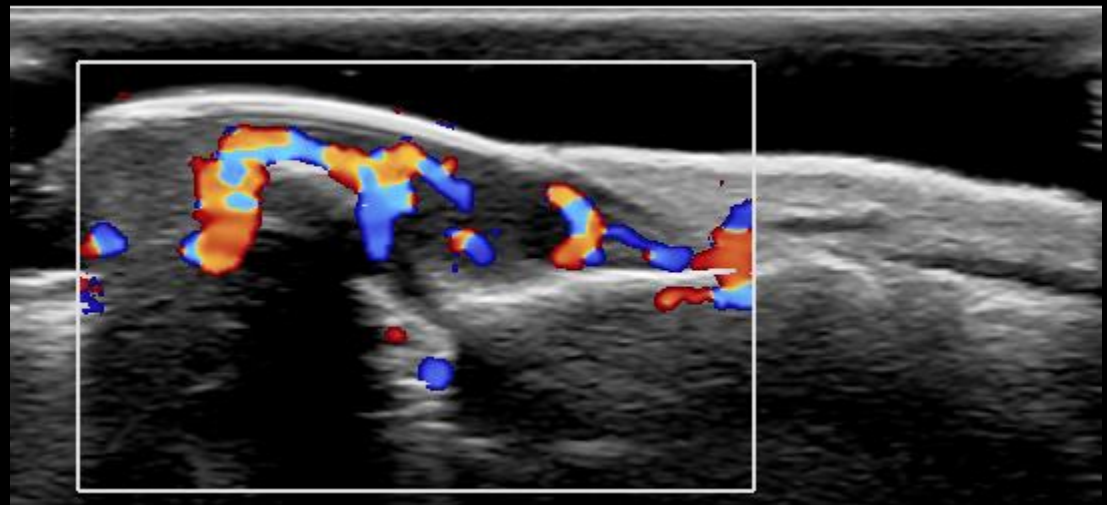
Matériel d'interposition



Augmentation surface d'échange: Extrémités

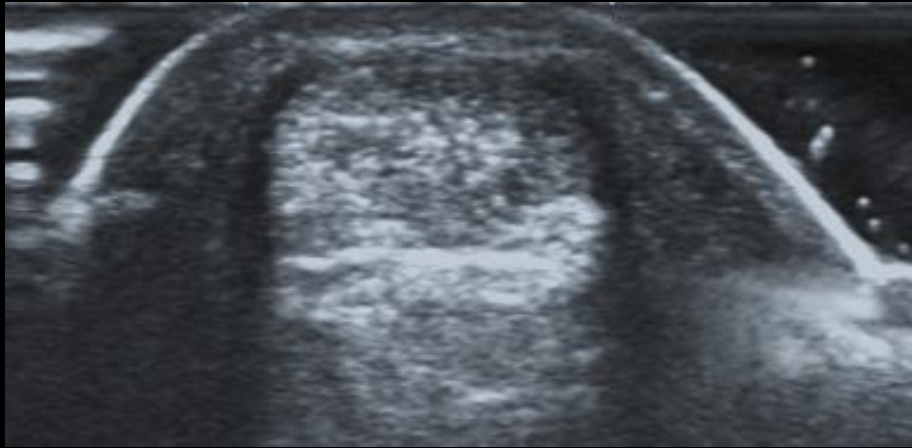


Doigt ongle



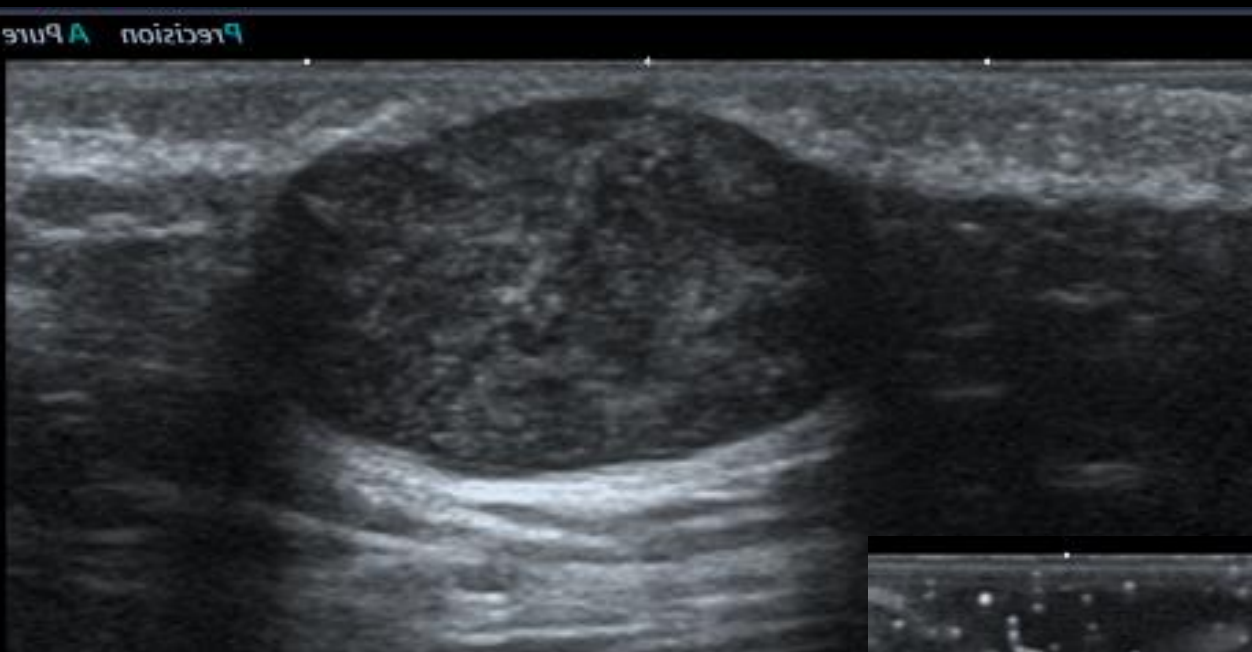
Augmentation surface d'échange

Surfaces convexes



Tendon d'Achille

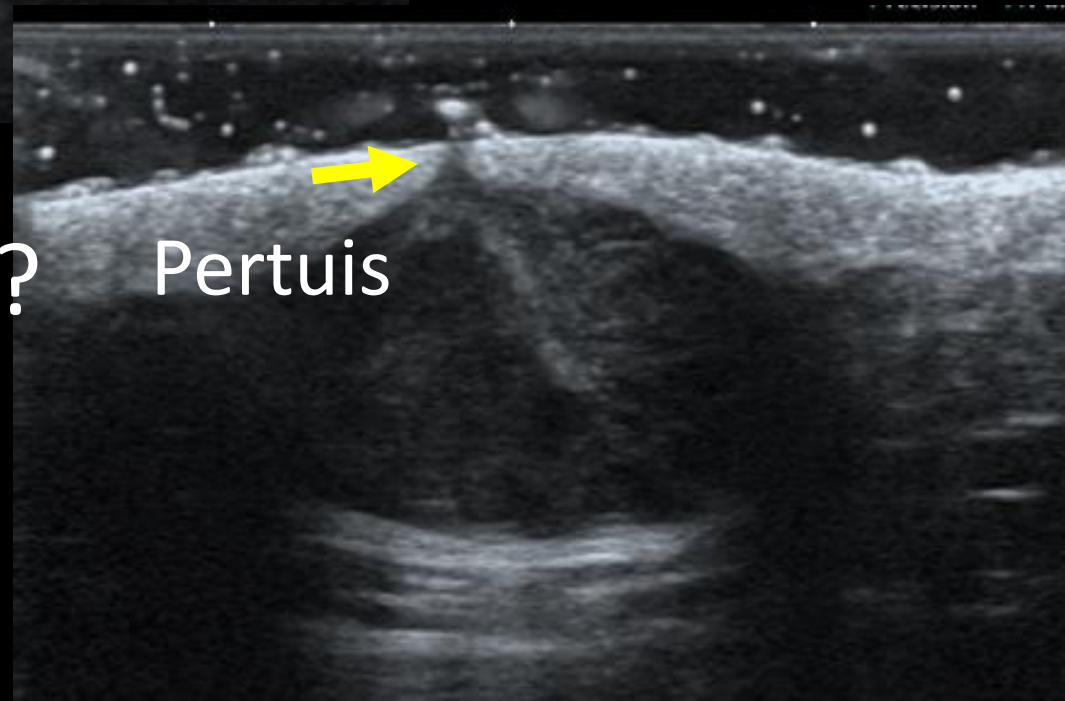
Etude de la peau



Derme

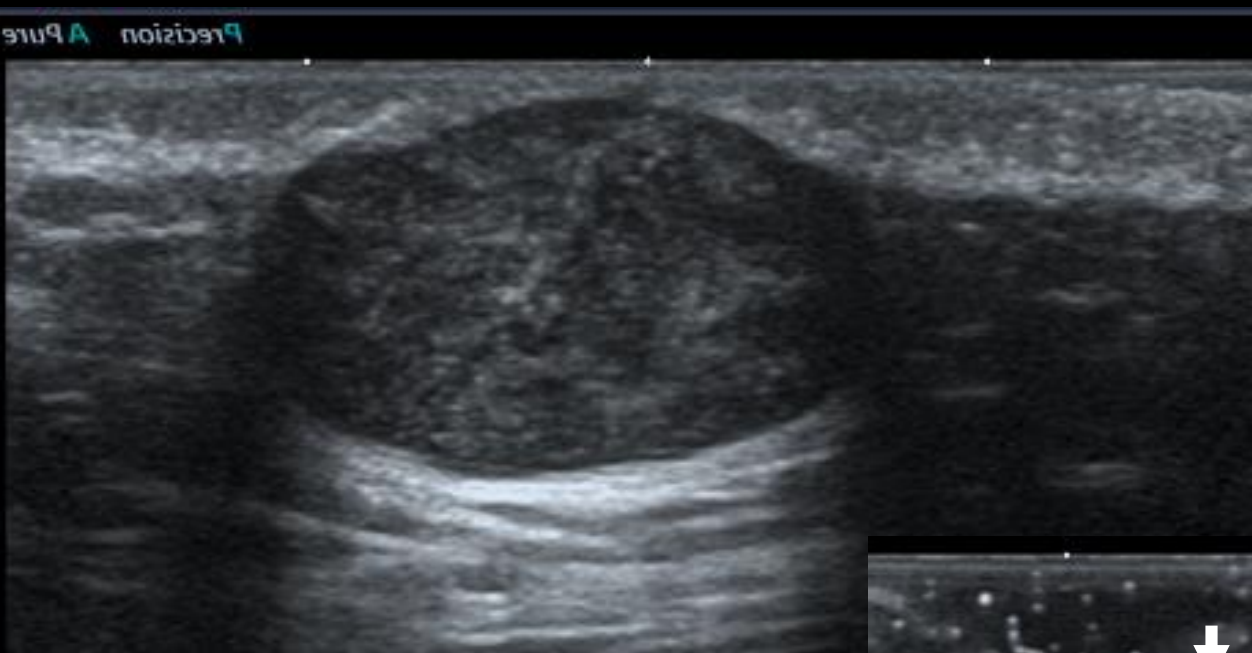
Hypoderme

Kyste épidermoïde ?

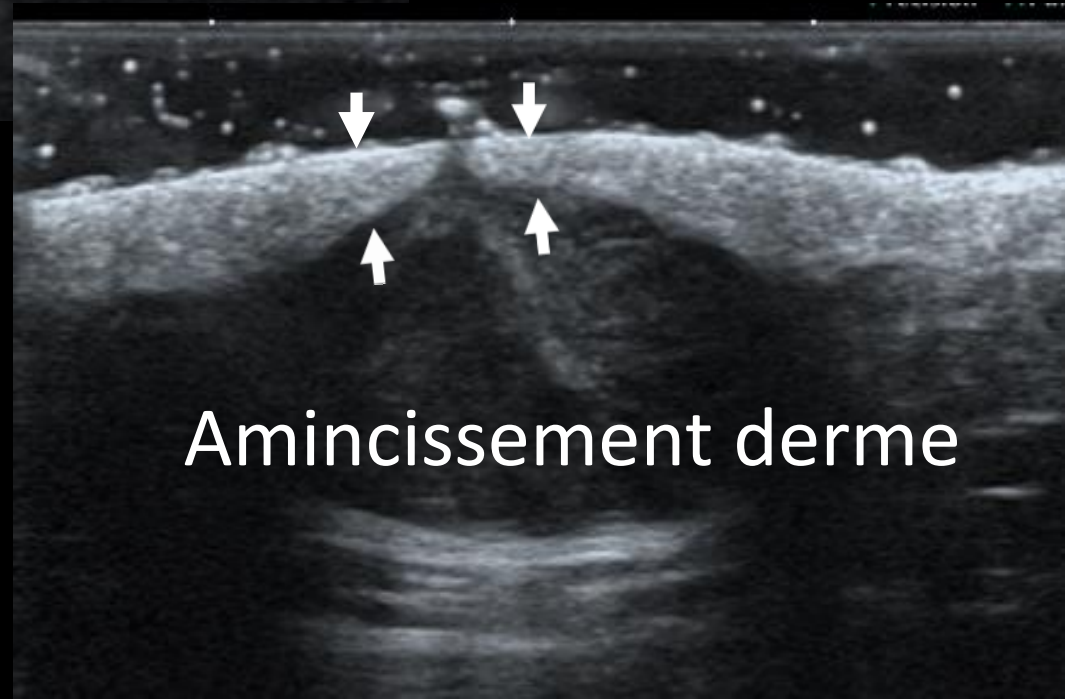


Pertuis

Etude de la peau



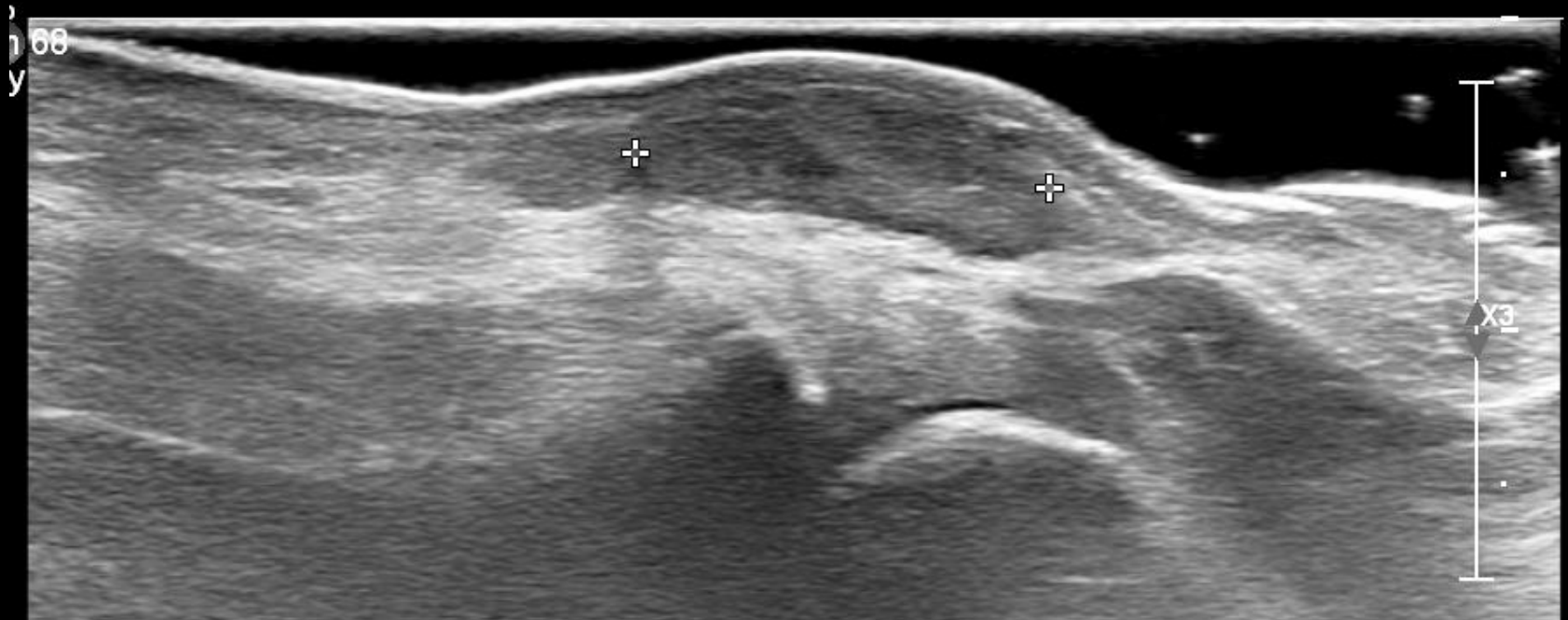
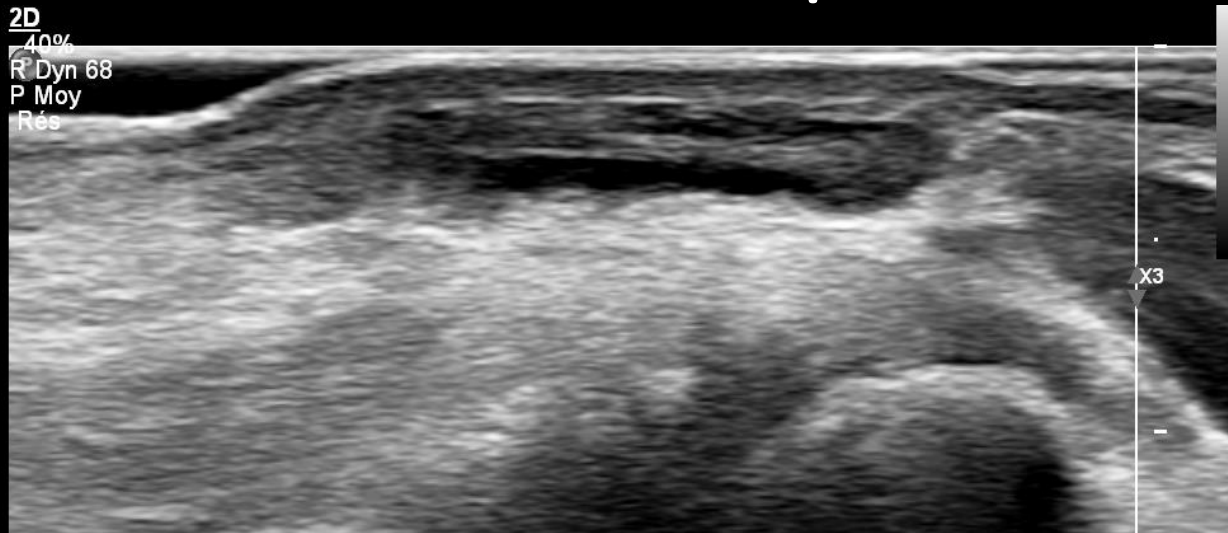
Kyste épidermoïde



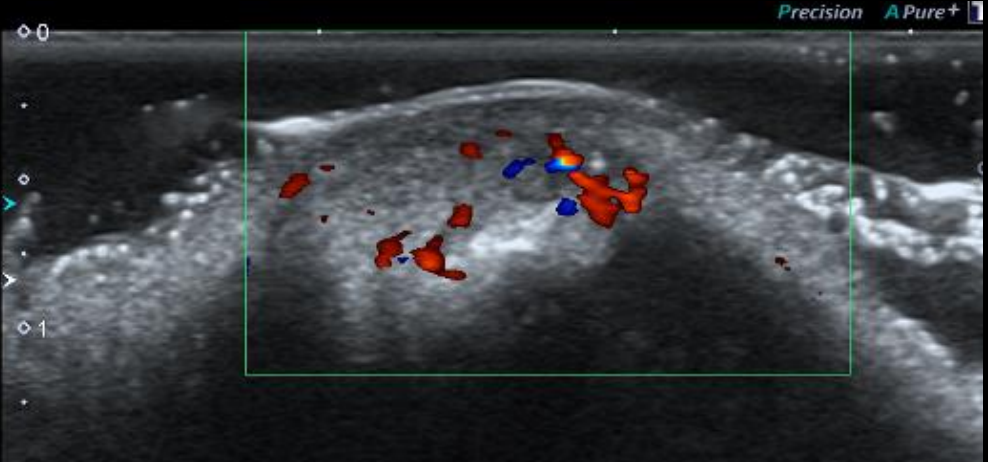
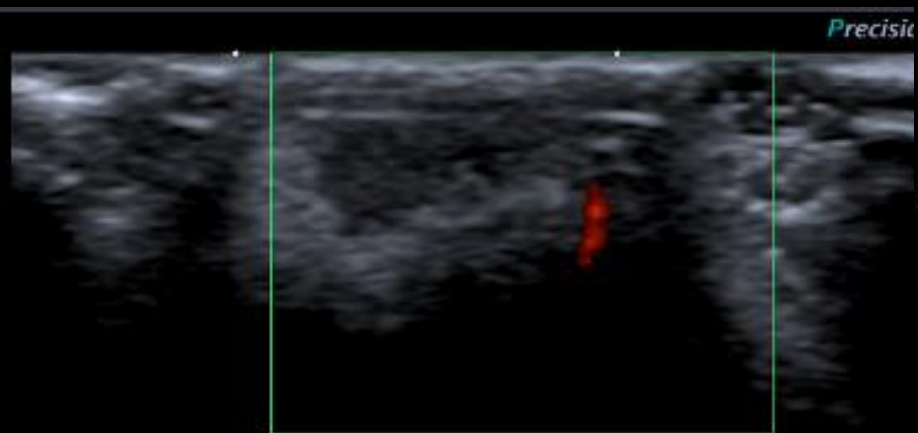
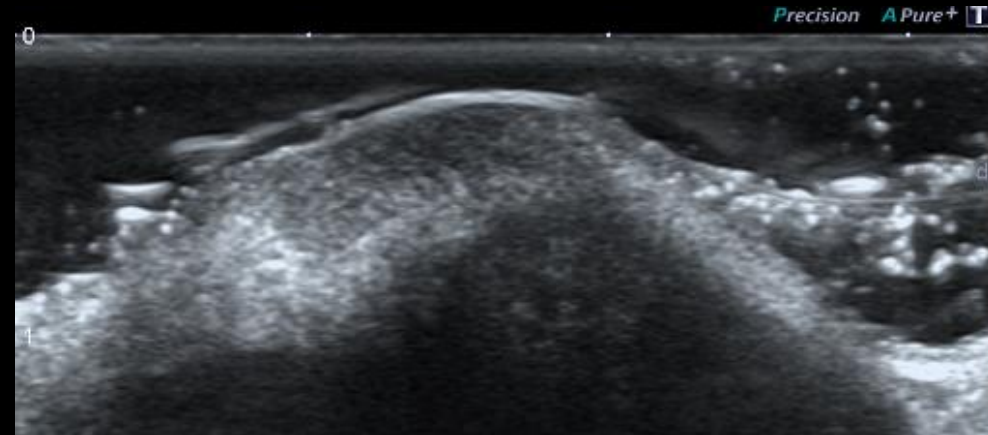
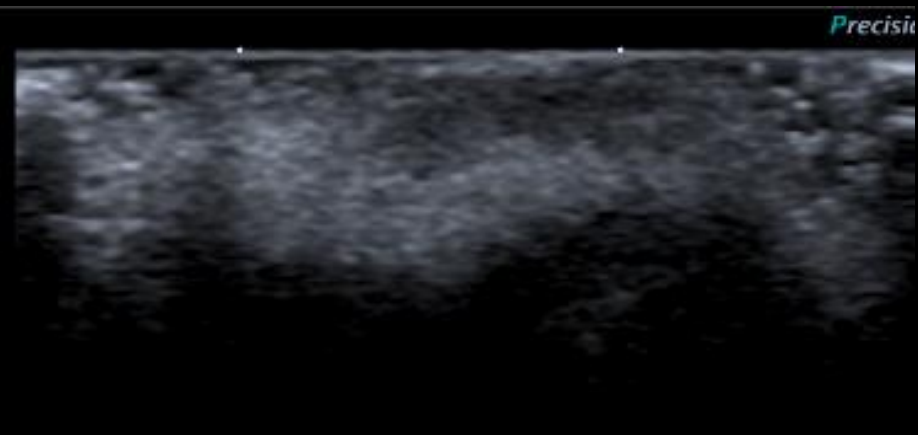
Amincissement derme

Diminuer la compression

MAV

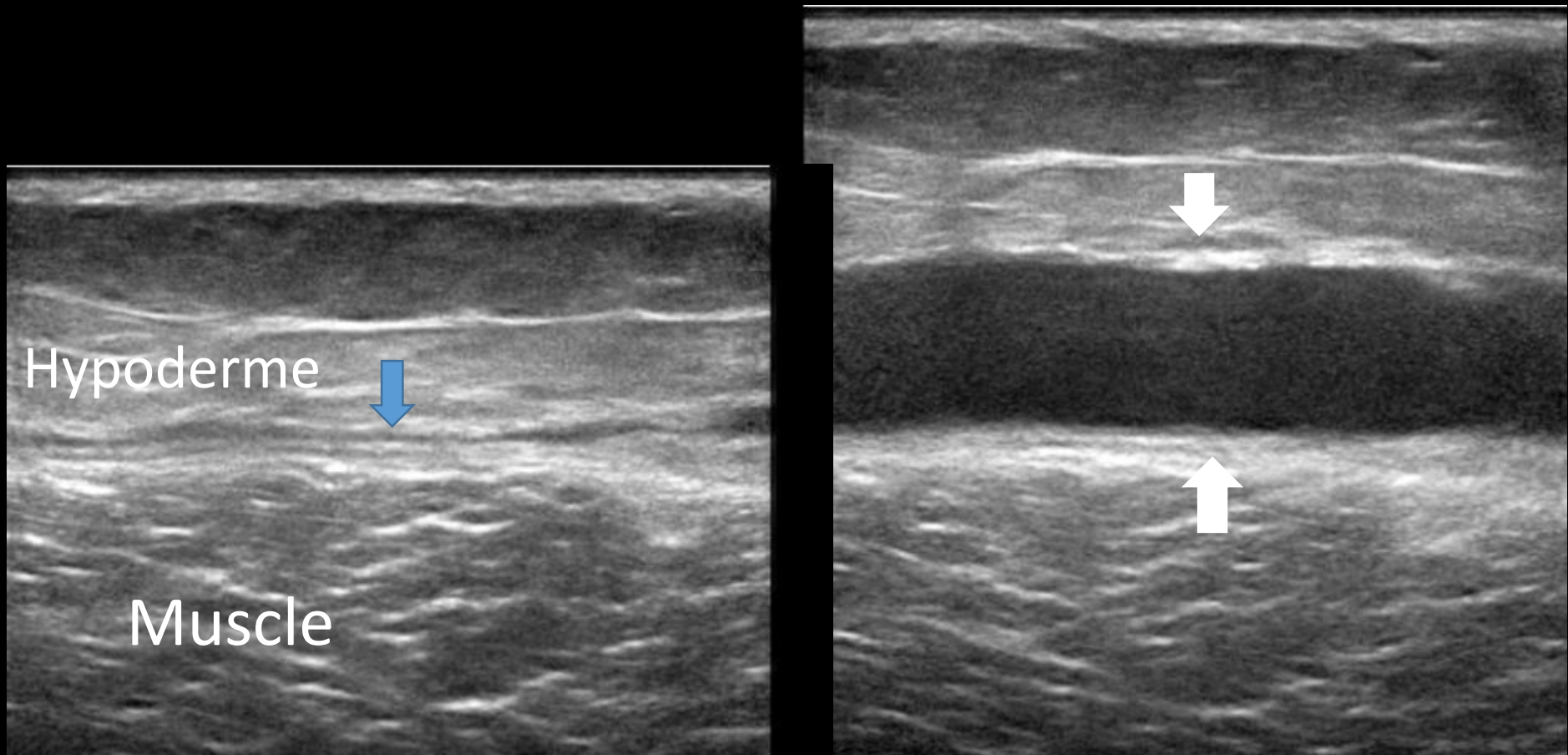


Diminuer la compression



Lésion de type Morel Lavallé?

Diminution compression



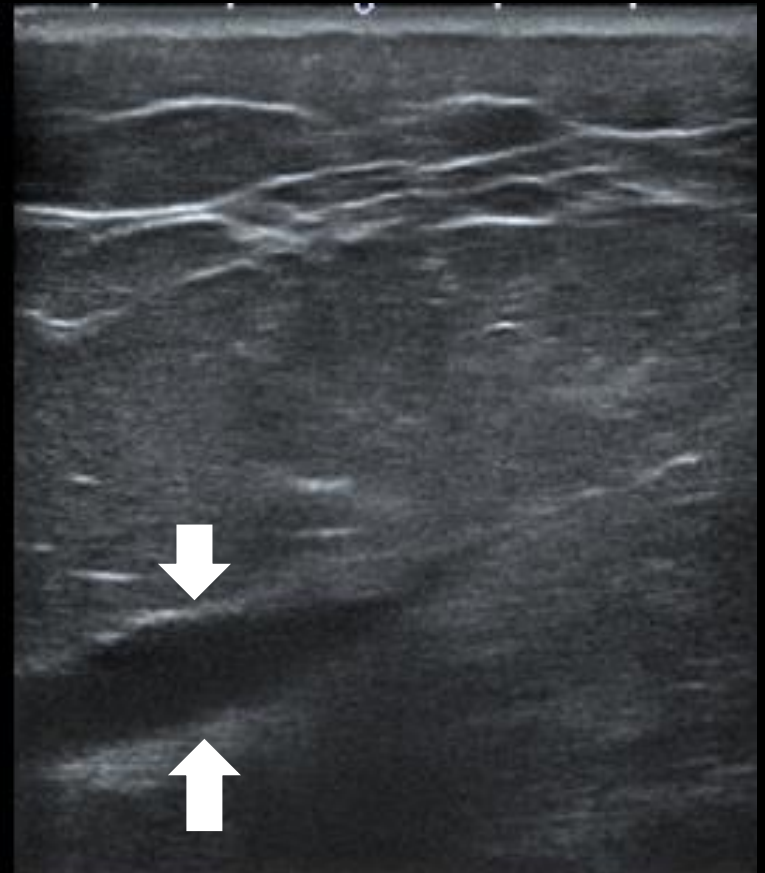
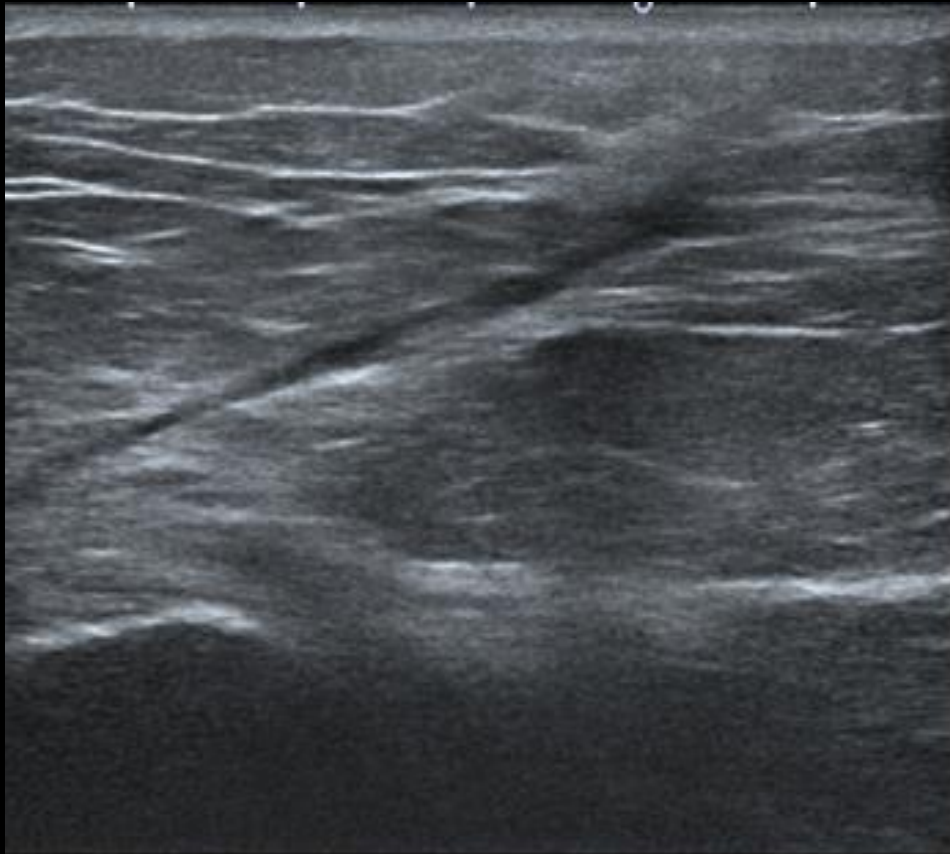
Positionnement

- Environnement de travail
- Examen dynamique



Morel Lavallé? Collection?

Debout



Positionnement: patient

- Positionnement membre
- Guidelines
 - Épaule
 - Cheville
 - Coude
 - Genou
 - Hanche poignet



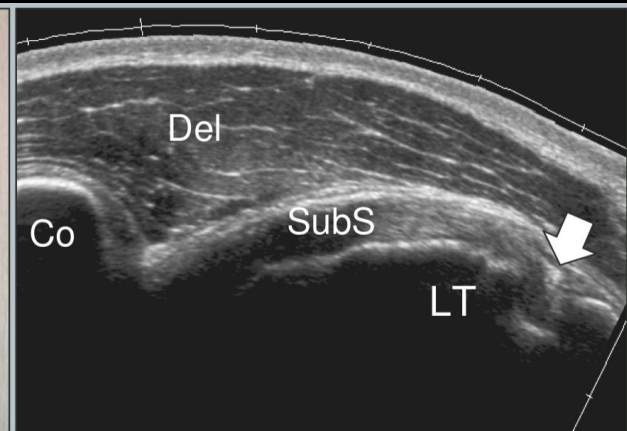
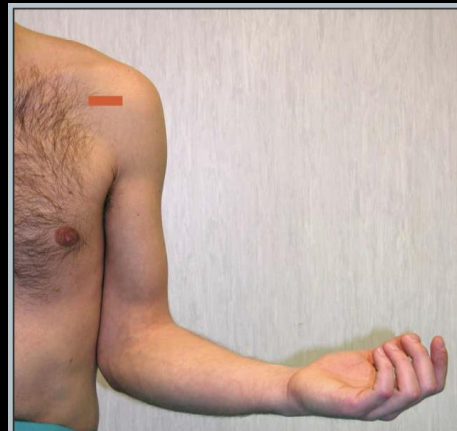
European Society of
MusculoSkeletal Radiology

Musculoskeletal Ultrasound Technical Guidelines

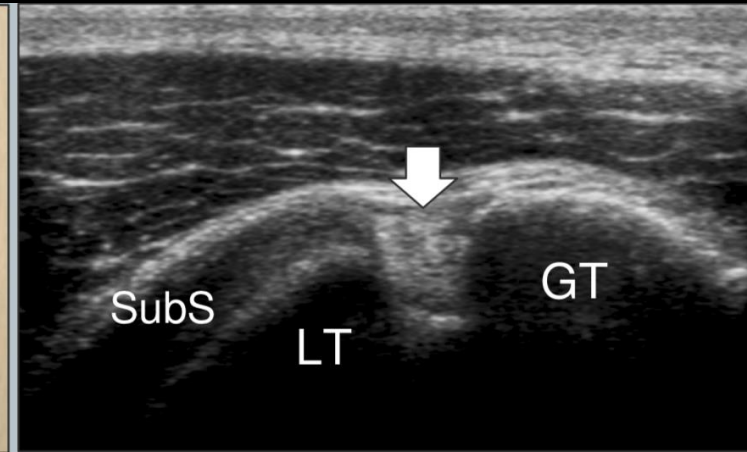
I. Shoulder

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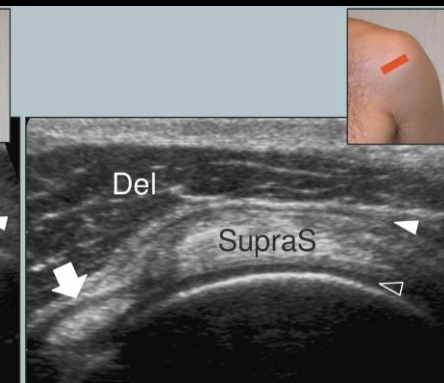
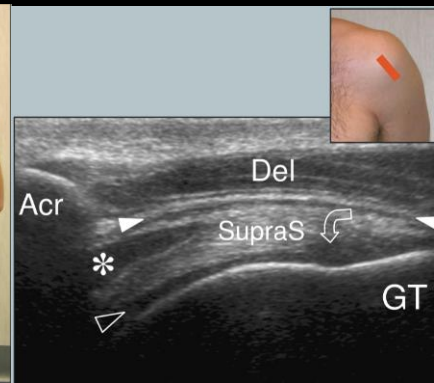
Tendon long biceps



Tendon sous scapulaire



T supra épineux



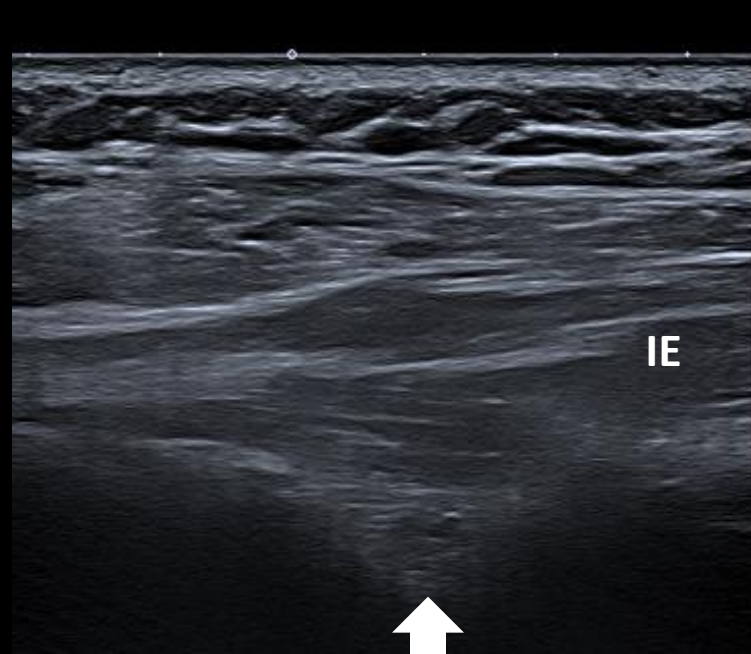
Bases de l'écho MSK

- Conditions matérielles optimales
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Optimisation de l'image

- Fréquence/type sonde
- Gain (pré sets...)
- Harmonique
- Profondeur/ focale
- Zoom
- Images à champs de vue élargi
- Doppler couleur/puissance
- Examen « dynamique »

Focale



Echancrure spino glénoidienne

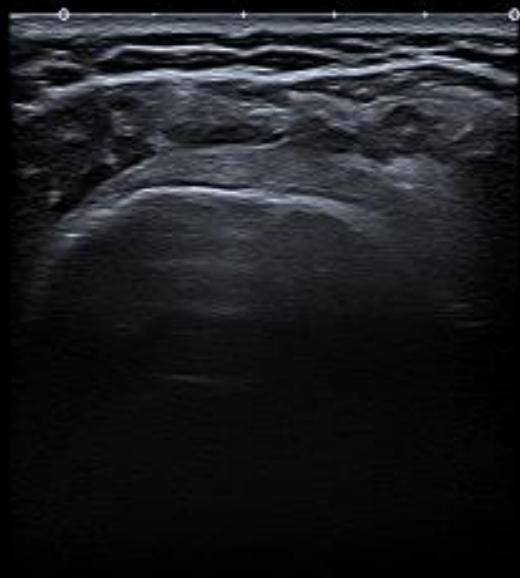


Echancrure spino glénoidienne

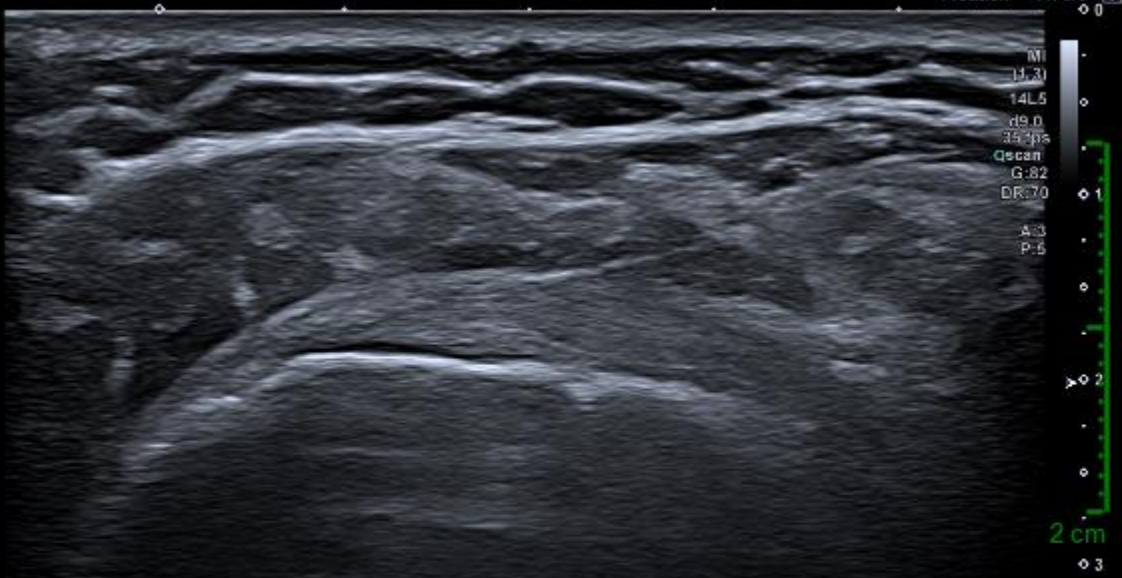


14 MZ

Zoom



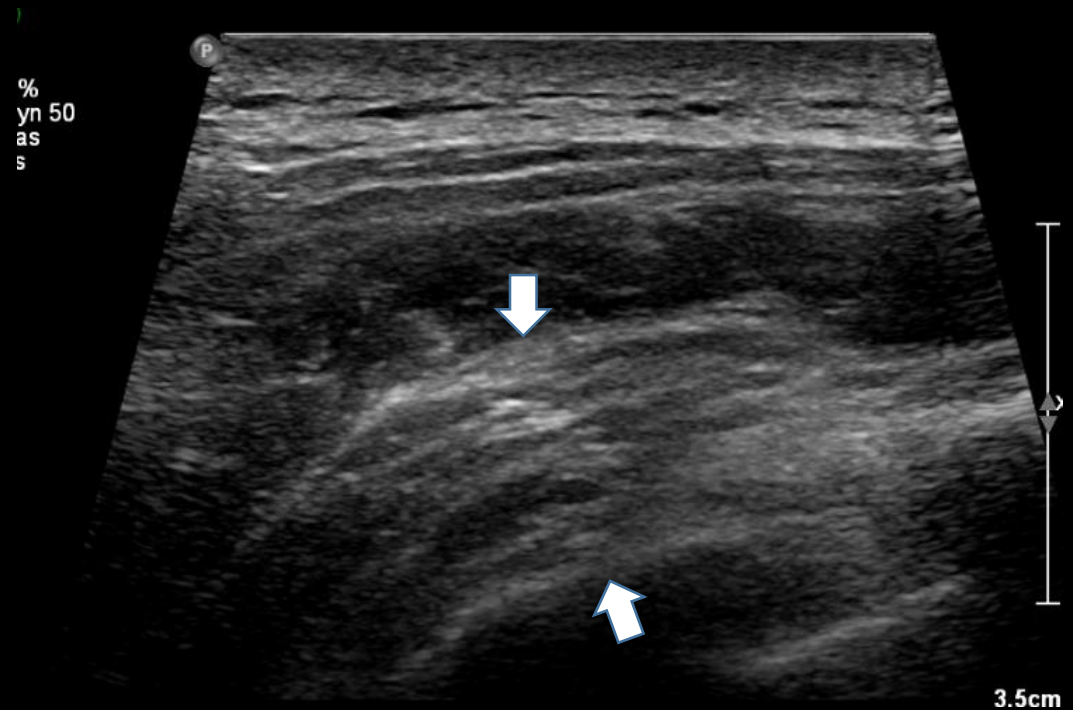
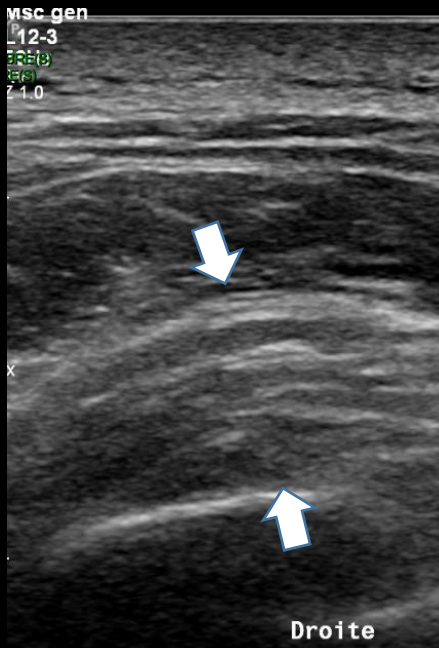
INFRA-EPINEUX



INFRA-EPINEUX



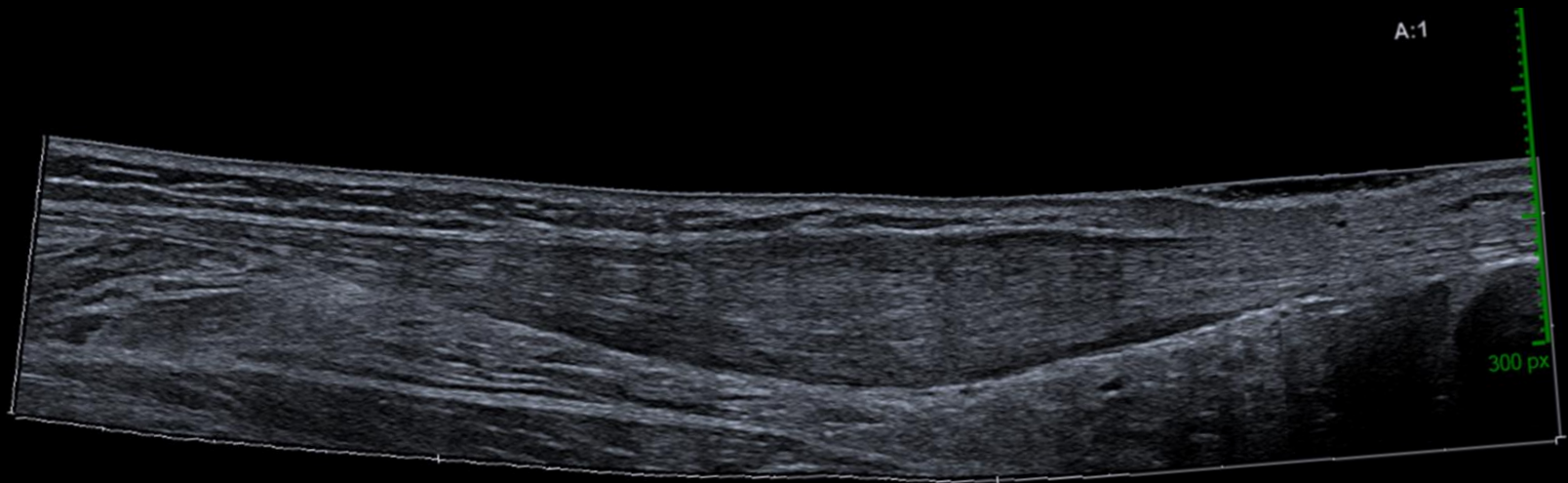
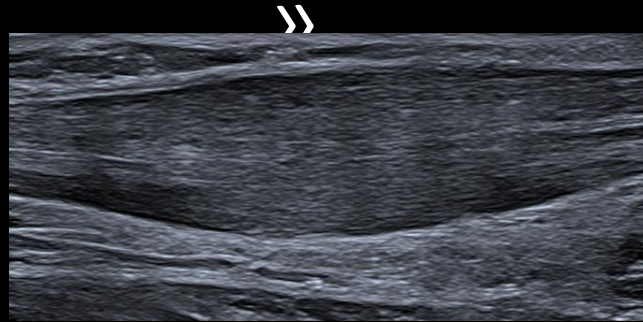
Images à champ de vue élargi: Virtual convex

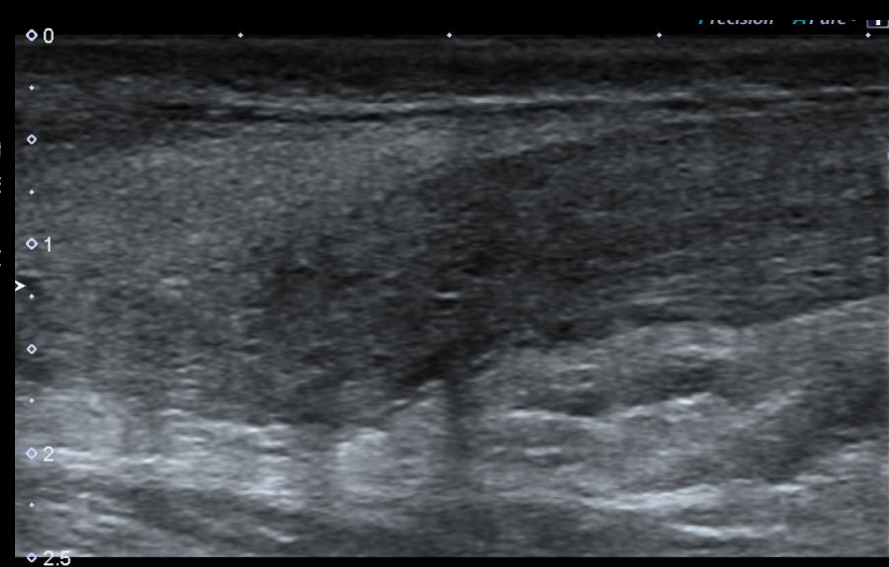
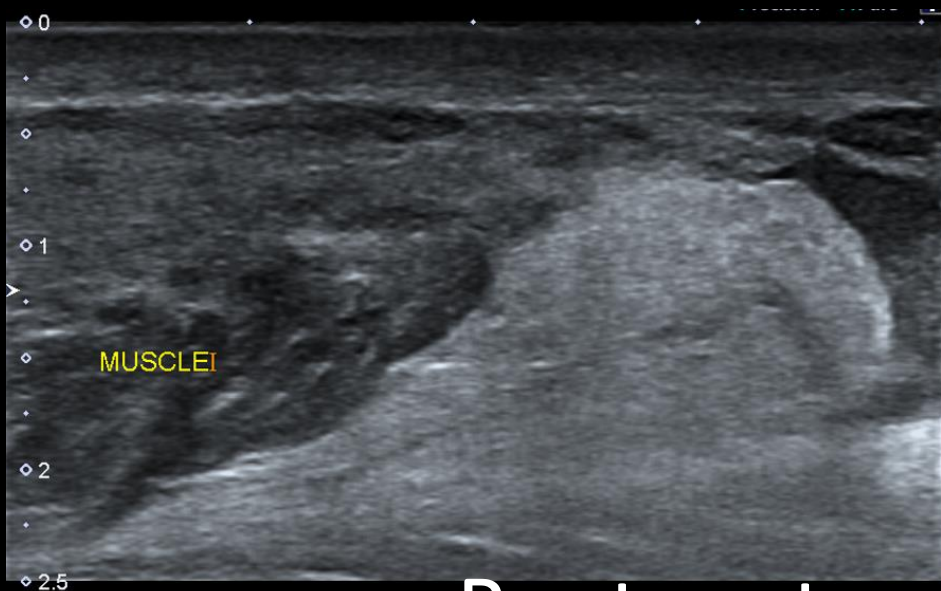


ELASTOFIBROME

Images à champ de vue élargi:
extended field-of-view FOV

Tendinopathie
calcanéenne





Rupture tendon calcanéen



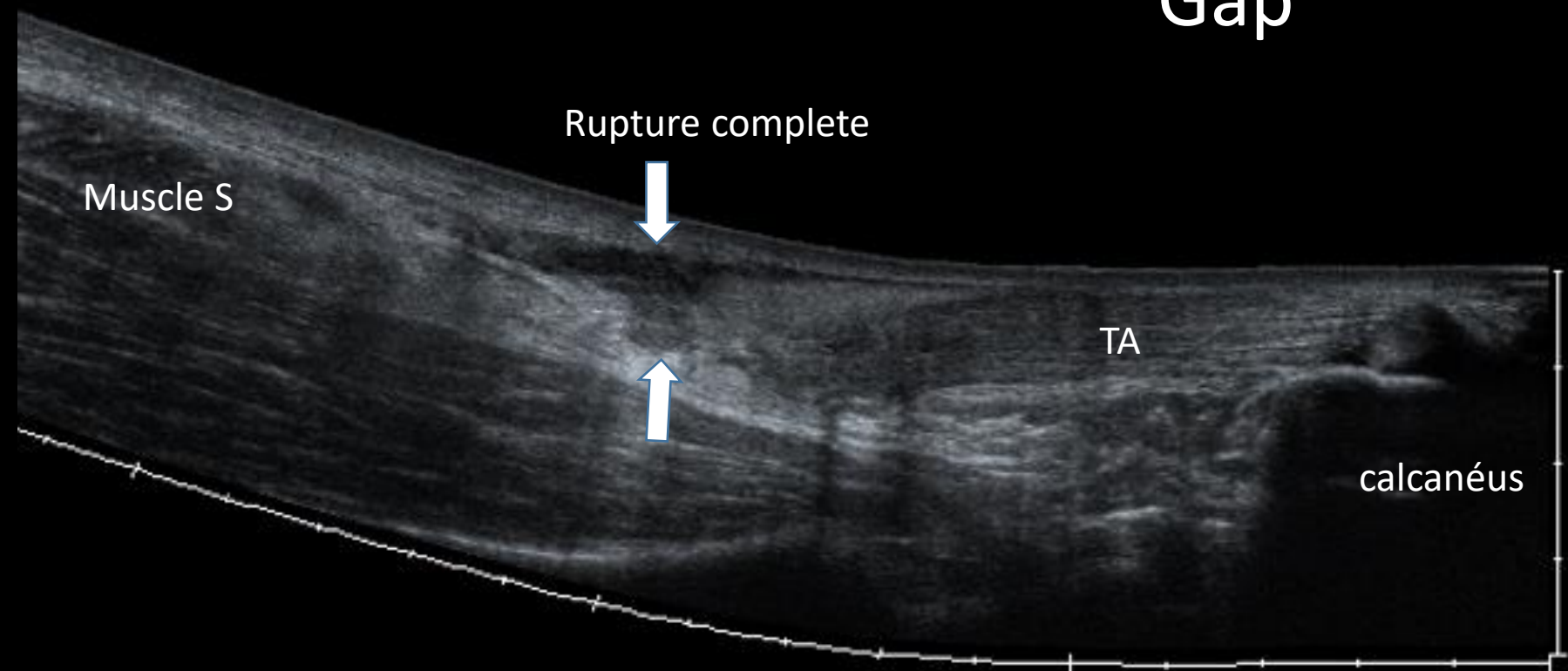
Position Gap

Rupture complete

Muscle S

TA

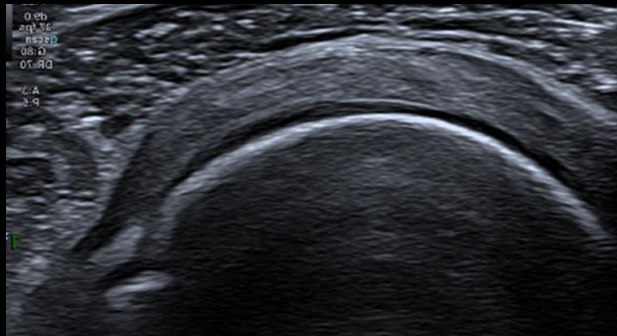
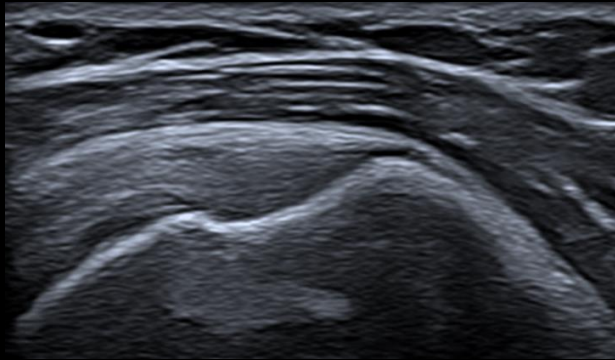
calcanéus



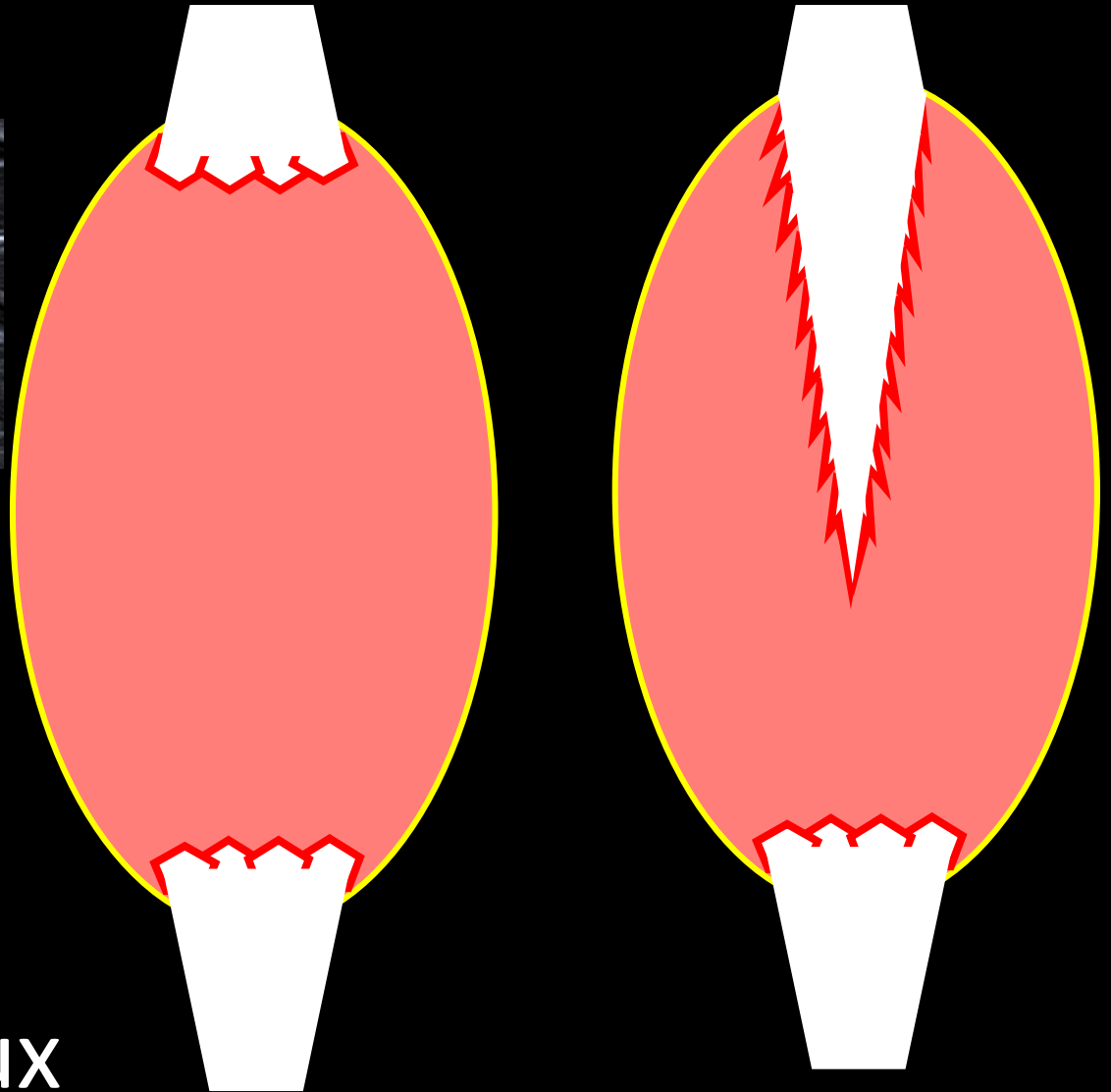
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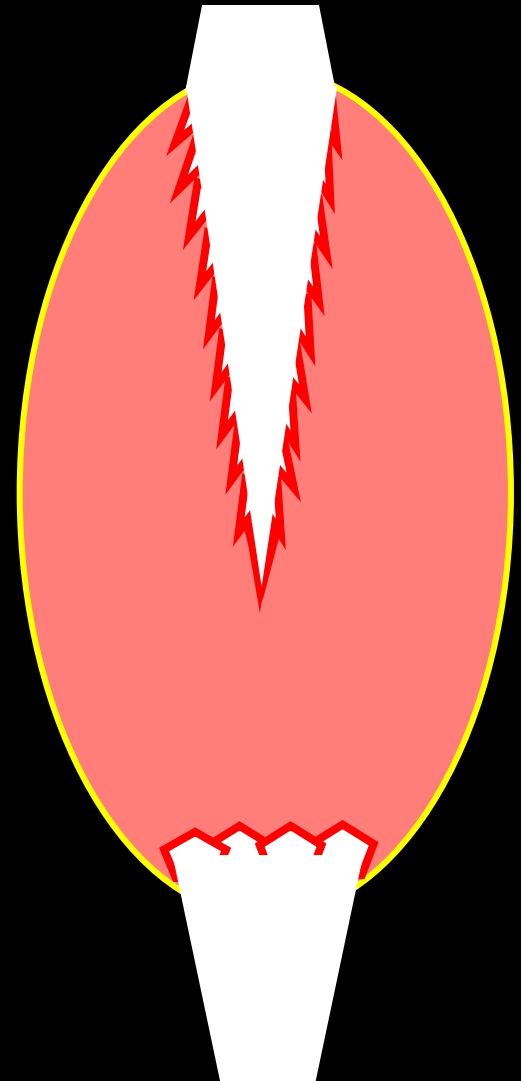
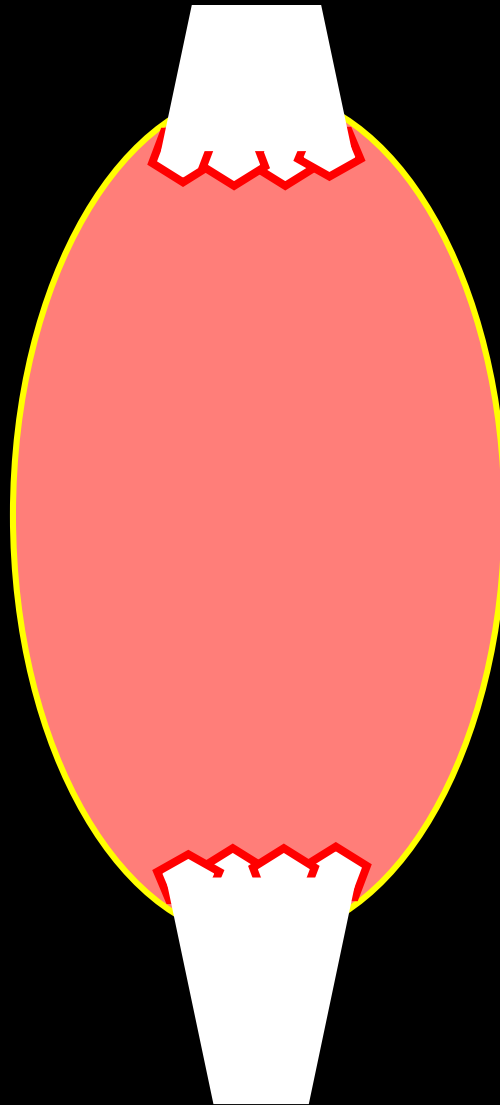
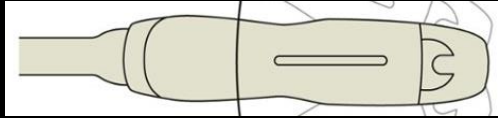
Technique de scanning



T supra épineux

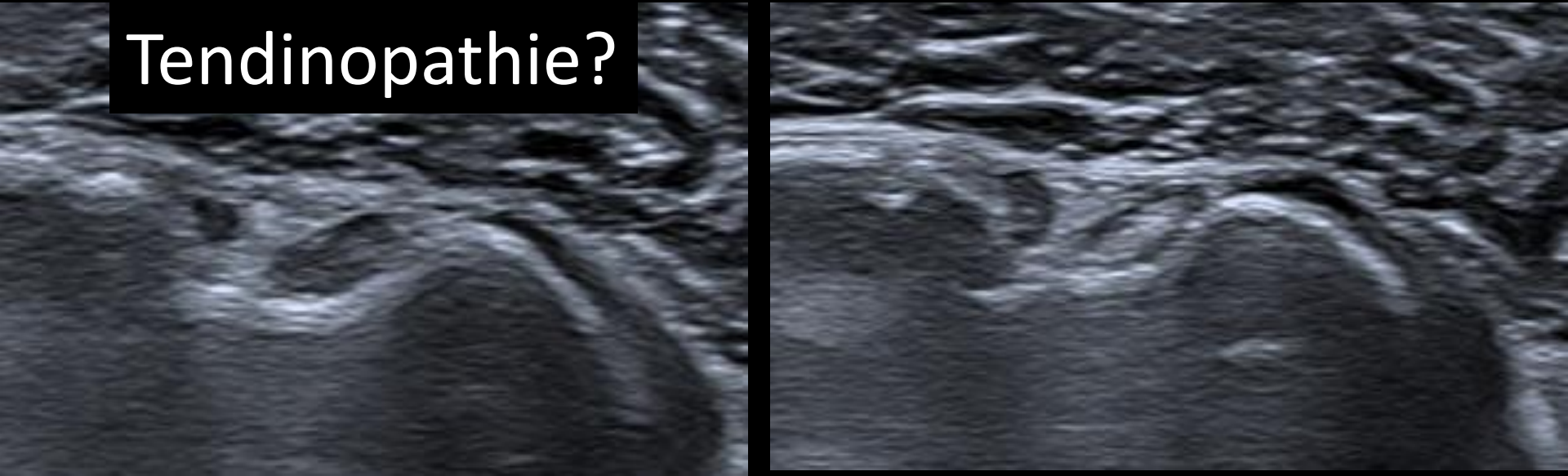


Technique de scanning « Technique de l'ascenseur »



Anisotropie

Tendinopathie?



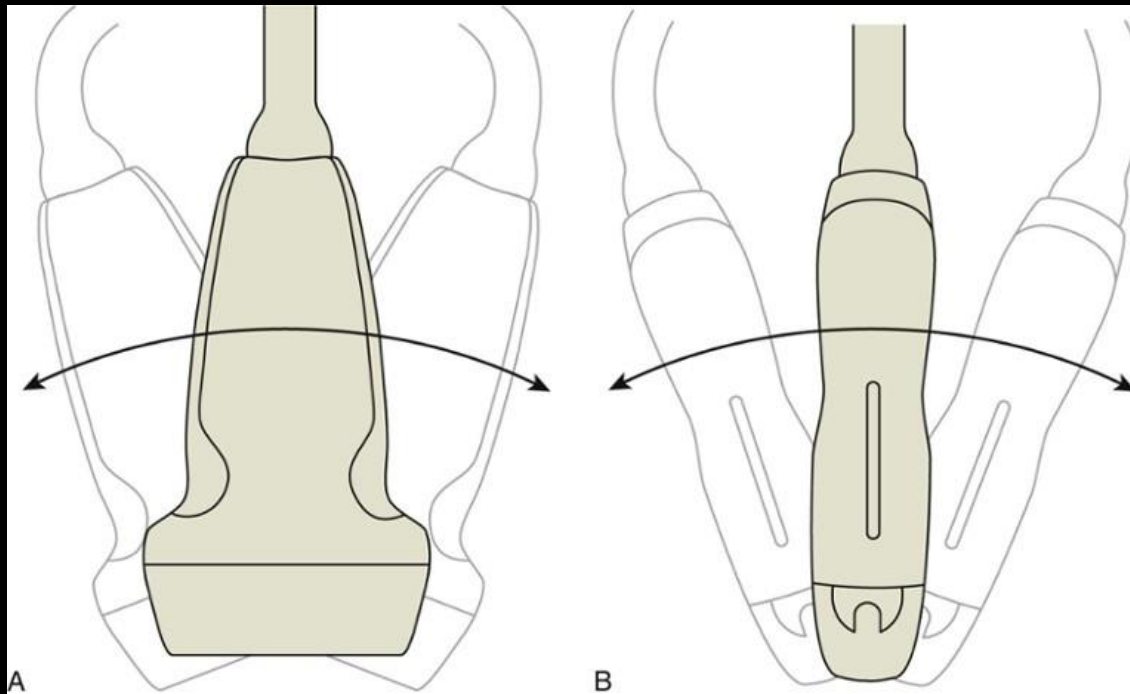
Tendon long biceps (coupe axiale)

Anisotropie



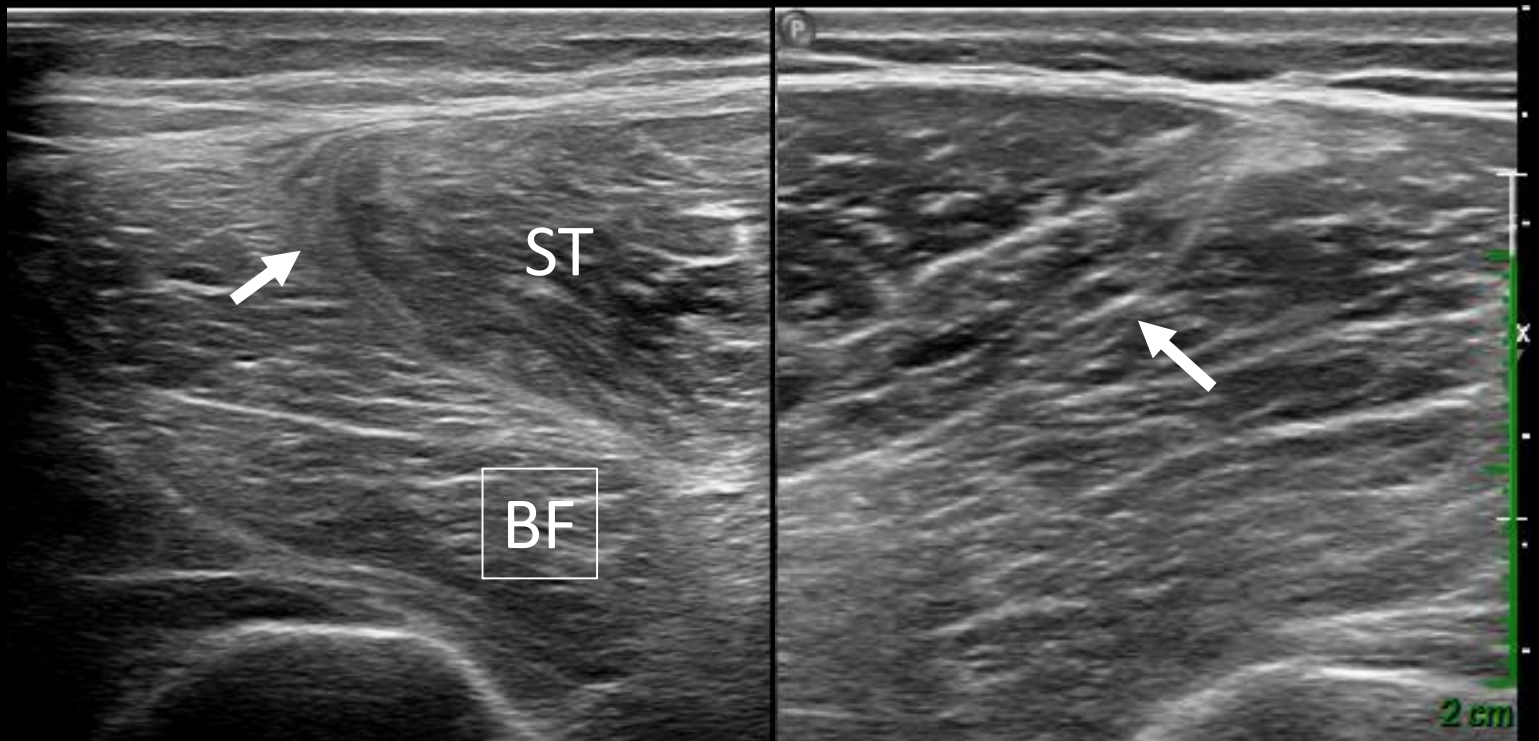
Tendon long biceps (coupe axiale)

Technique de scanning



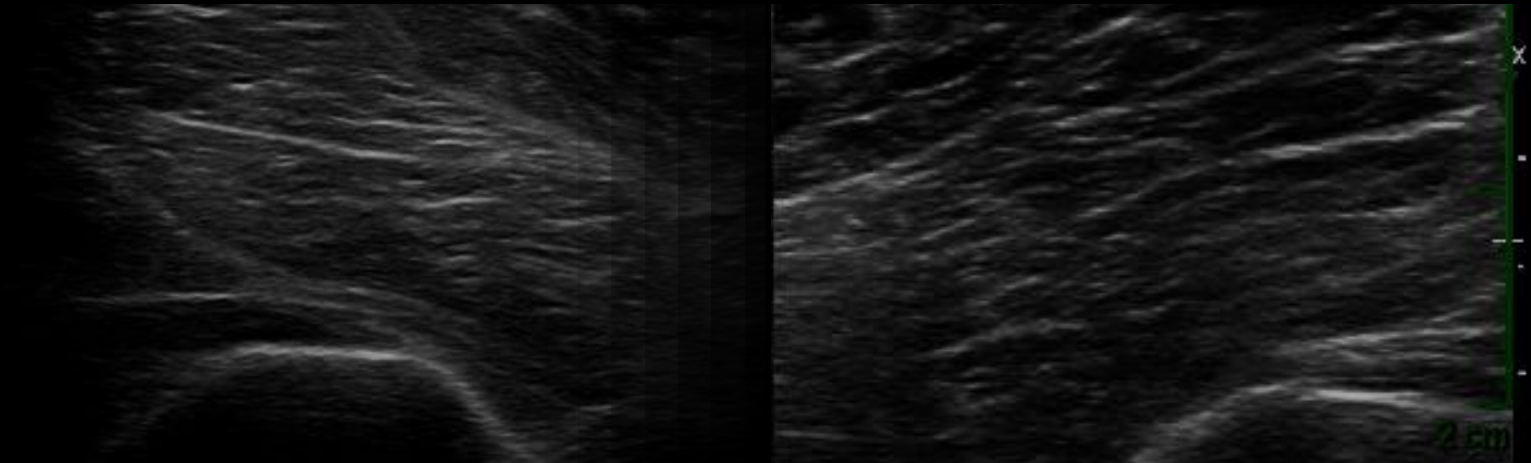
Lésion des IJ?

Côté controlatéral=normal

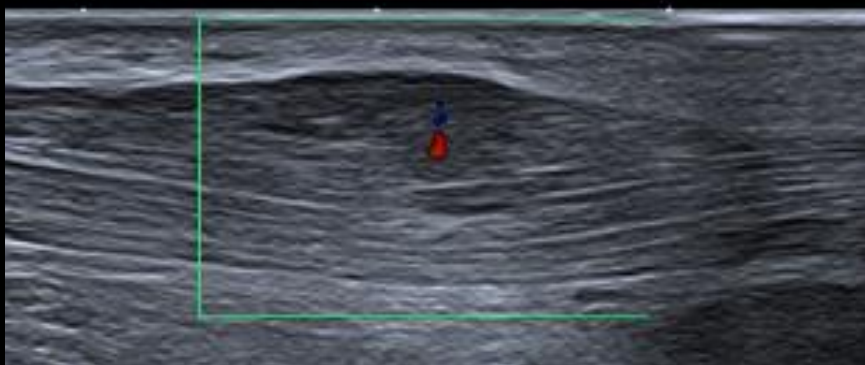


Lésion de l'AD

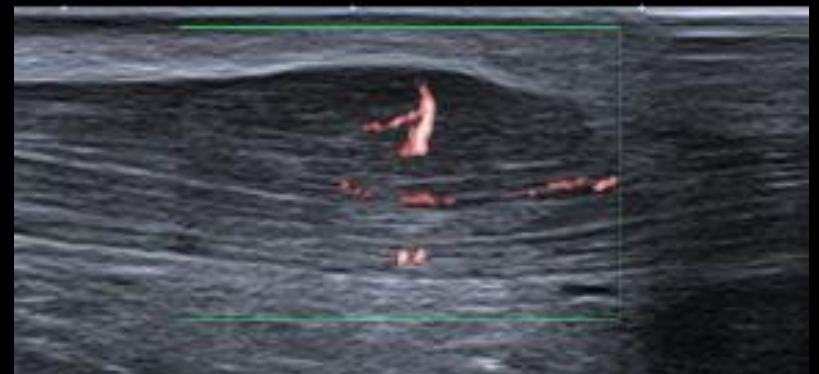
Examen comparatif



Doppler



Doppler couleur



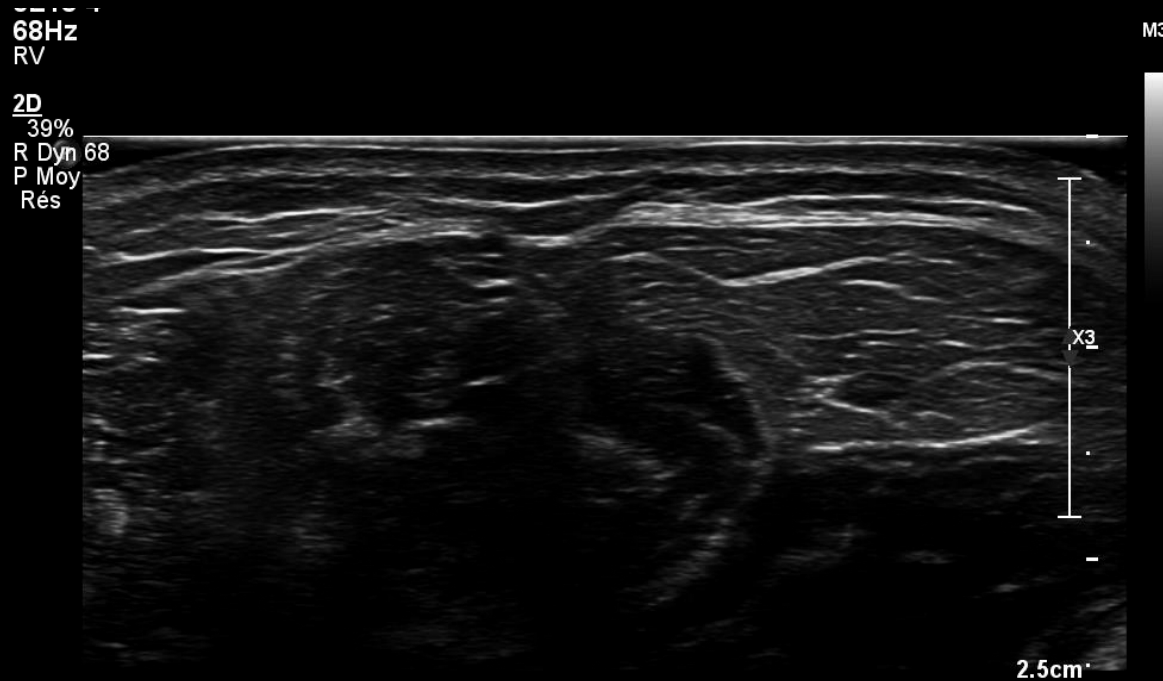
Doppler puissance

Etude dynamique

- Recherche des désinsertions musculaires
- Recherche des luxations et subluxations tendineuses
- Étude du glissement du tendon dans sa gaine
- Recherche d'une distension ligamentaire
- Échoscopie des zones douloureuses/lésionnelles

Echographie dynamique

Boule de la cuisse apparaissant à la contraction



Hernie musculaire

Conduite examen

- Examen systématique: Guidelines



European Society of
MusculoSkeletal Radiology

Musculoskeletal Ultrasound Technical Guidelines

VI. Ankle

Ian Beggs, UK
Stefano Bianchi, Switzerland
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Michel Court-Payen, Denmark
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Shoulder

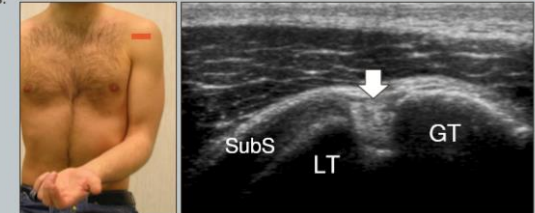
1

Although patient's positioning for shoulder US varies widely across different Countries and Institutions reflecting multifaceted opinions and experiences of different examiners, we strongly recommend to examine the patient while seated on a revolving stool. This position allows the examiner to reach the anterior, lateral and posterior aspects of the shoulder with the probe by simply asking the patient to rotate on the chair.

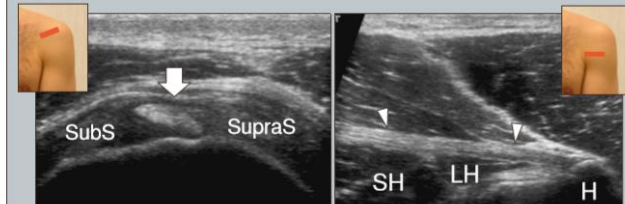
2

long head of the biceps tendon

Place the arm in slight internal rotation (directed towards the contralateral knee) with the elbow flexed 90°, palm up. Start by finding the long biceps tendon in between the greater and lesser tuberosities – Use short and long (more limited utility) axis planes to examine the biceps.

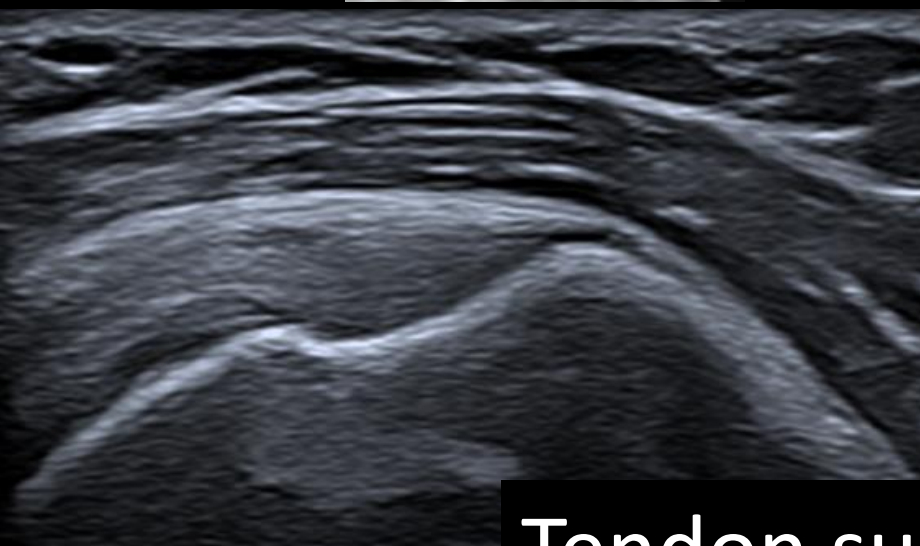


Shift the probe up to examine the biceps in its intraarticular course and down to reach the myotendinous junction (level of the pectoralis major tendon).



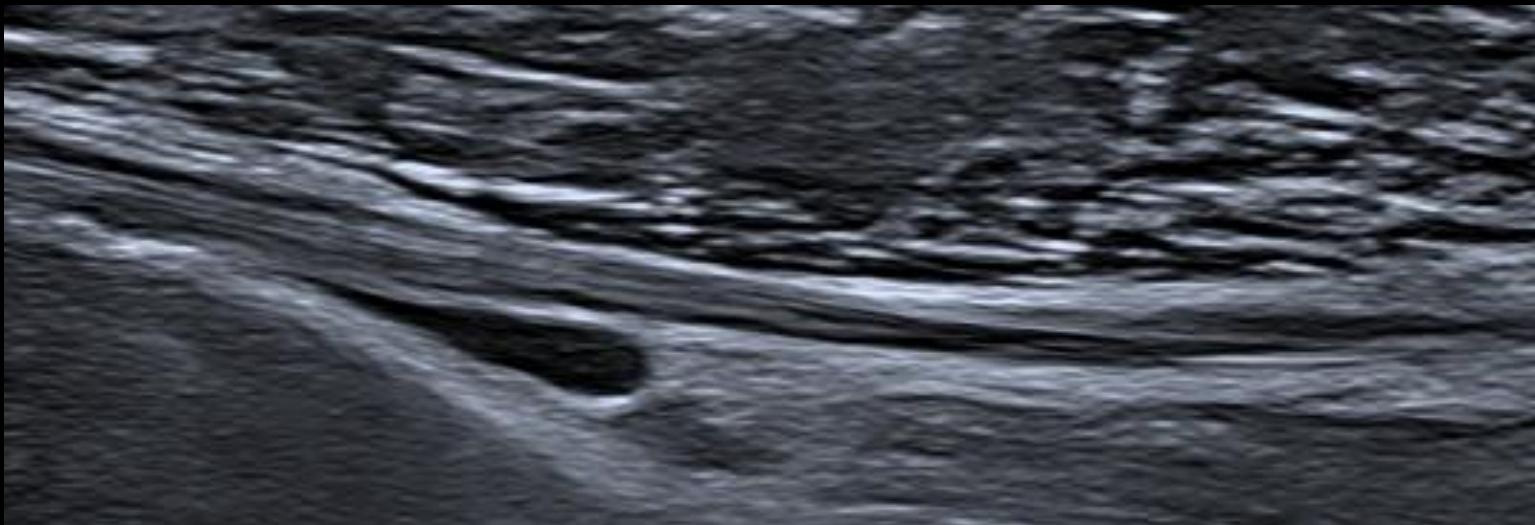
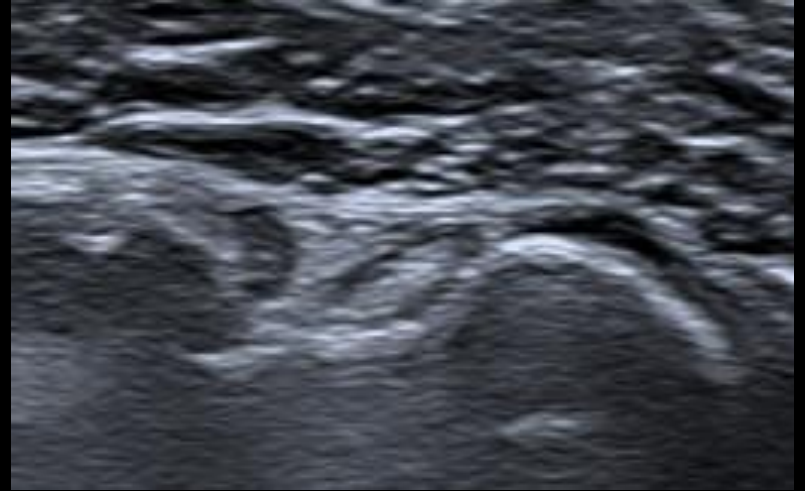
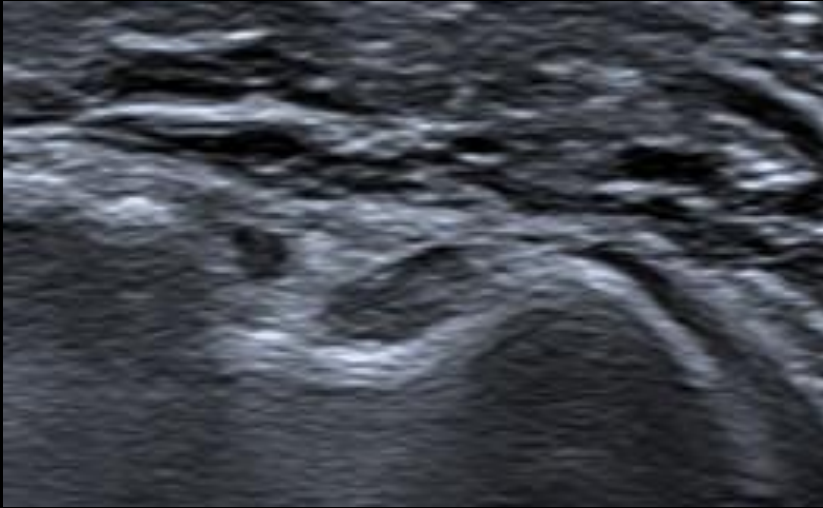
Legend: SubS, subscapularis tendon; SupraS, supraspinatus tendon; Arrow, long head of the biceps tendon; LT, lesser tuberosity; GT, greater tuberosity; SH, short head of the biceps; LH, long head of the biceps; H, humeral shaft; Arrowheads, pectoralis major tendon

2 plans orthogonaux

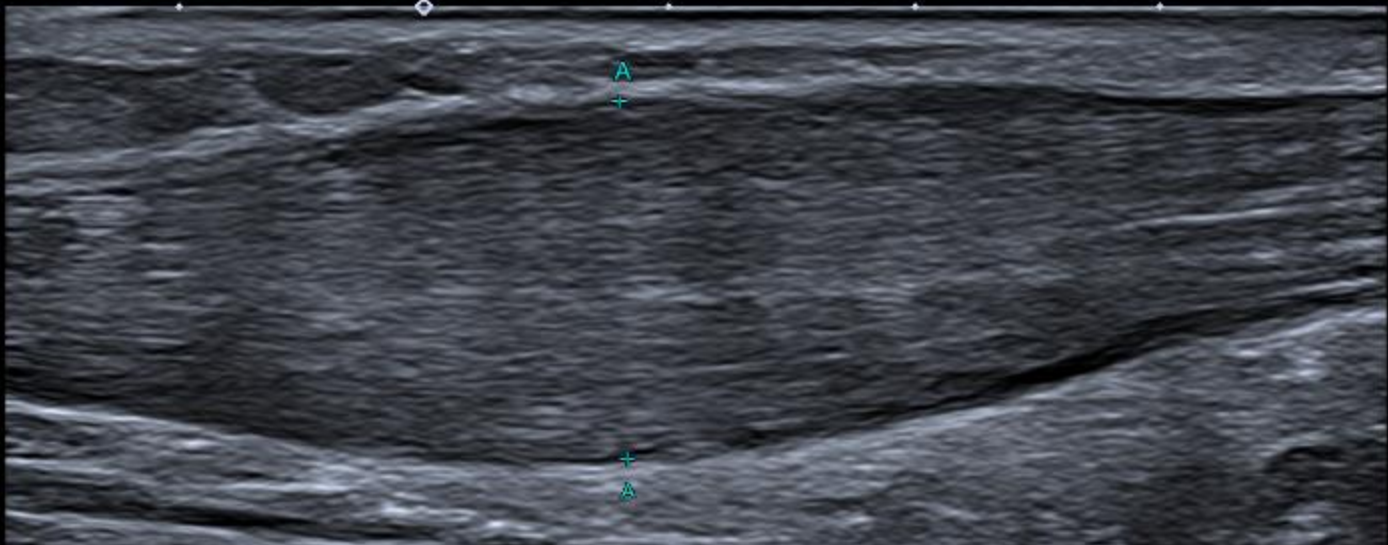


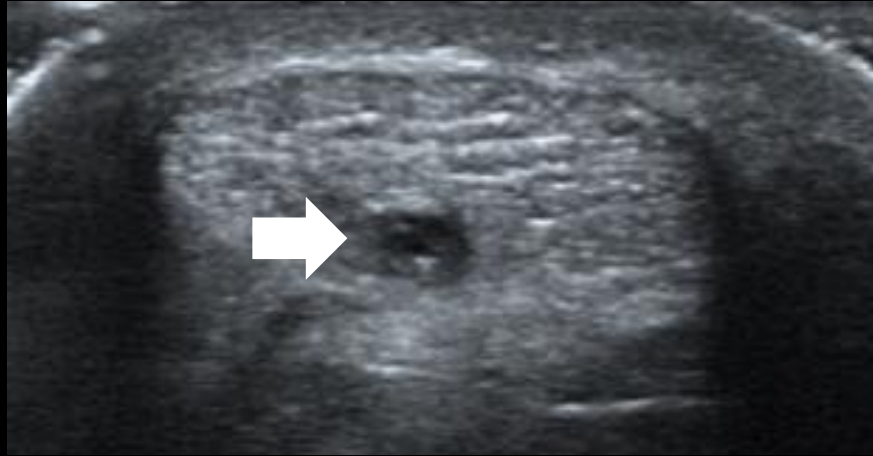
Tendon supra épineux

Anisotropie

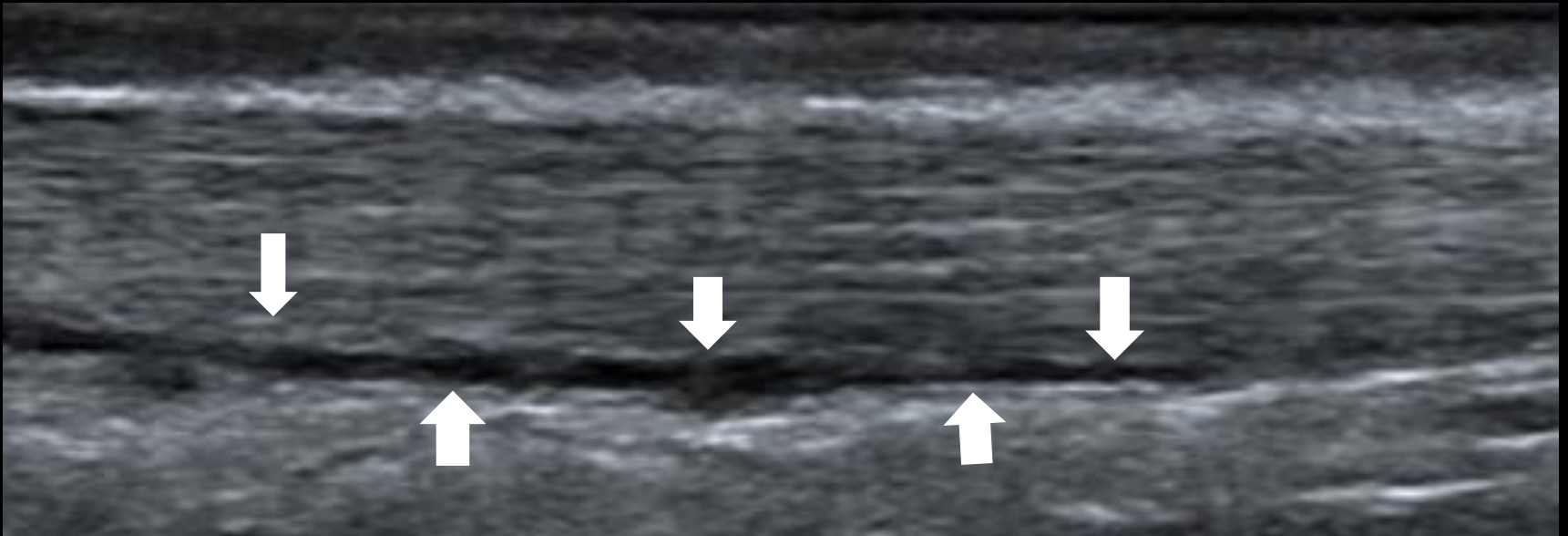


- Tendinopathie
achilléenne
fusiforme

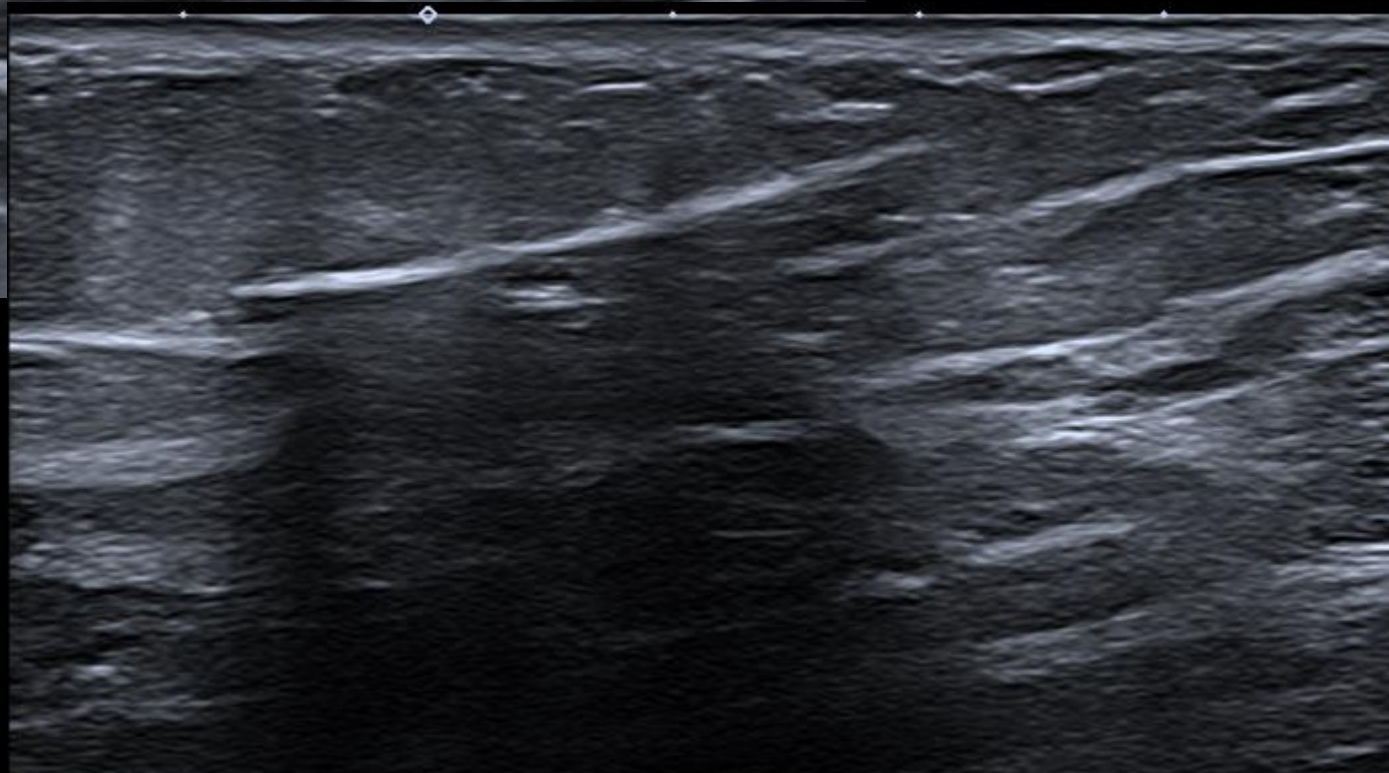
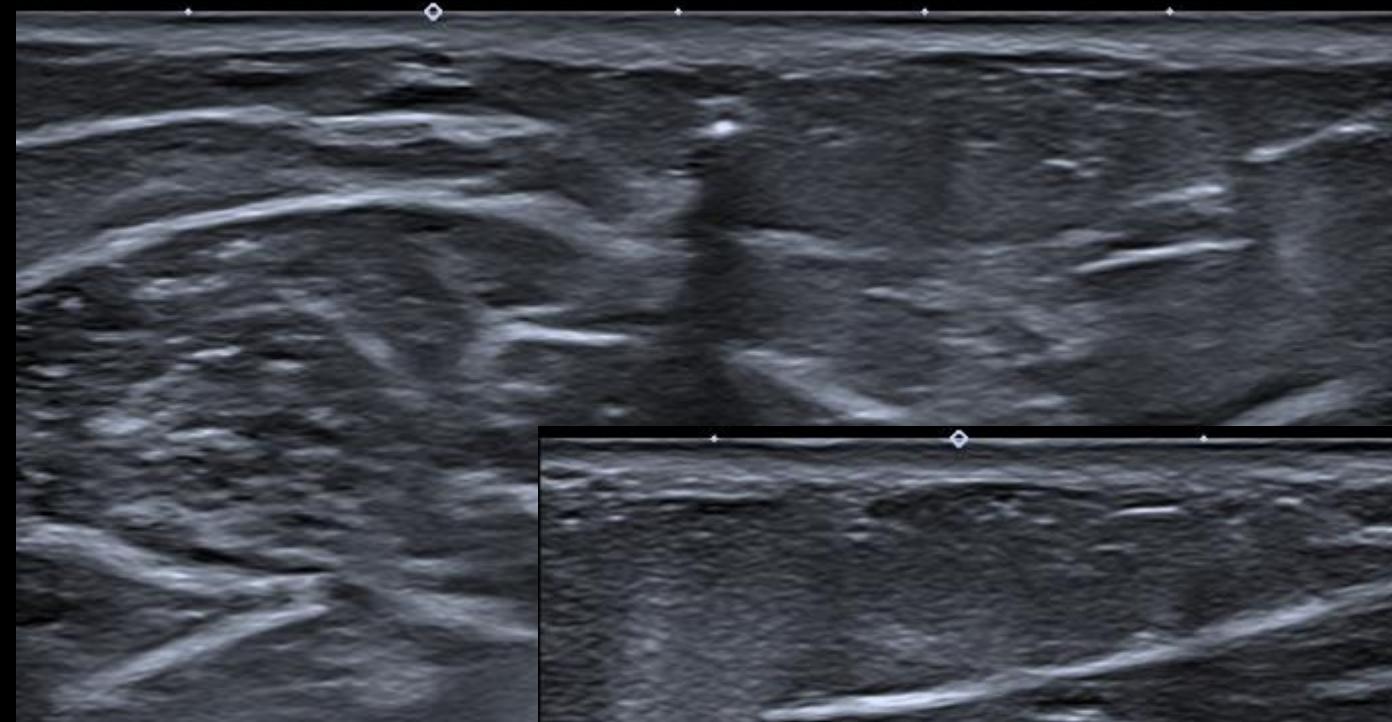




Fissure longitudinale



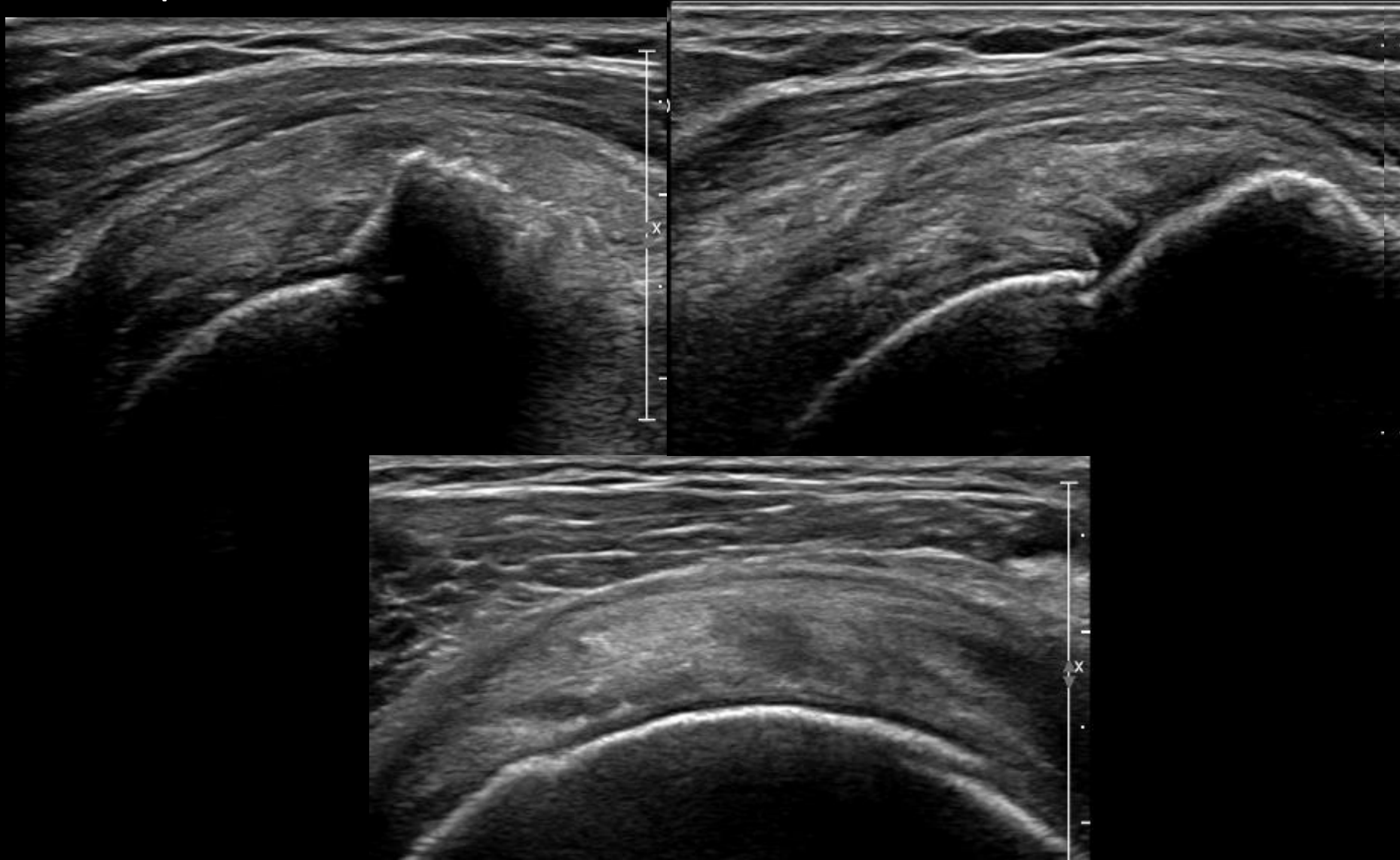
Recherche implanon



H 77 ans

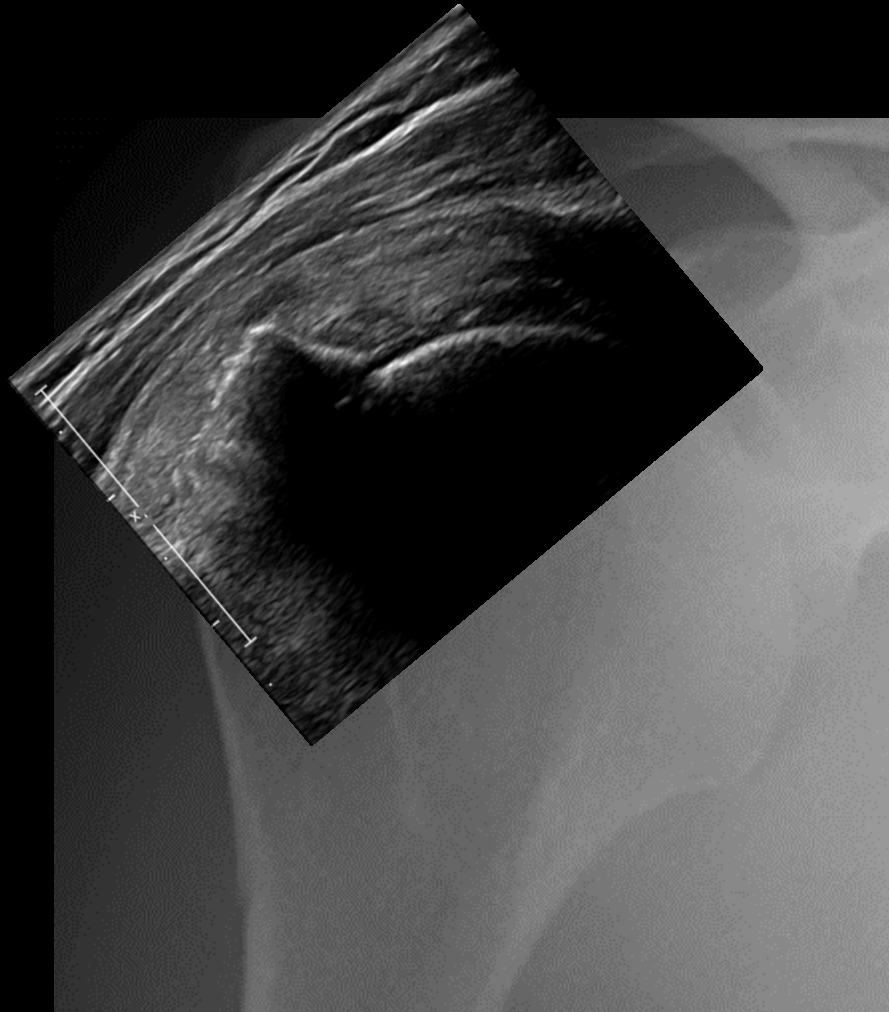
Chute il y a 4 semaines

Suspicion lésion tendon de coiffe



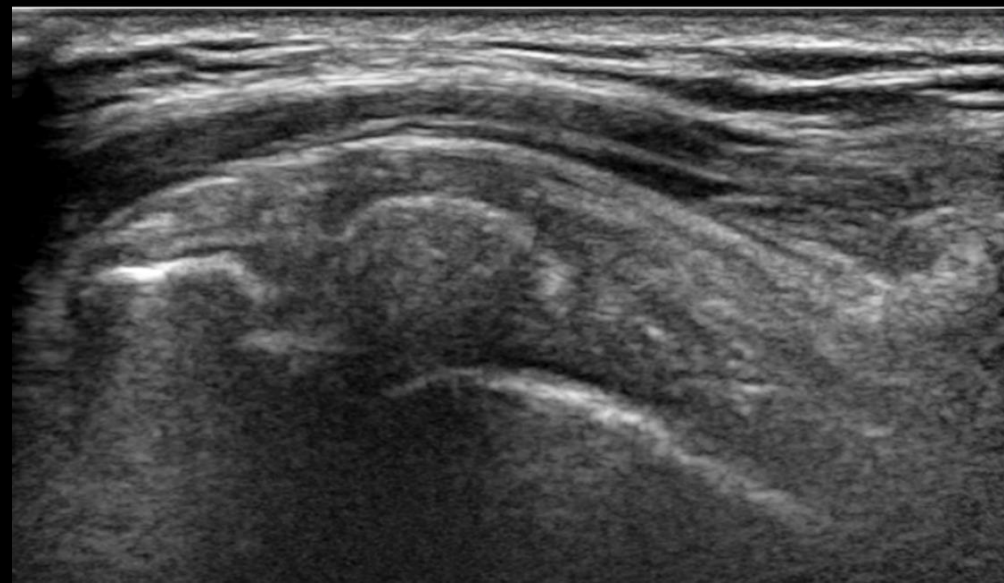


Couple Echo+RX



Complémentarité

Tendinopathie calcifiante



Transmission de l'information (Dr JL Brasseur)

- « Images claires, de grandes tailles, annotées (Dt, Gh,)
- Il faut être capable de refaire son compte rendu en regardant les clichés une semaine après l'examen
- Si on demande une autre technique, mentionner les éléments supplémentaires que cela peut apporter et pourquoi ils sont nécessaires
- Être clair dans le degré de certitude de sa conclusion (certain, très vraisemblable, possible, pas de conclusion possible) »

Images clef annotées

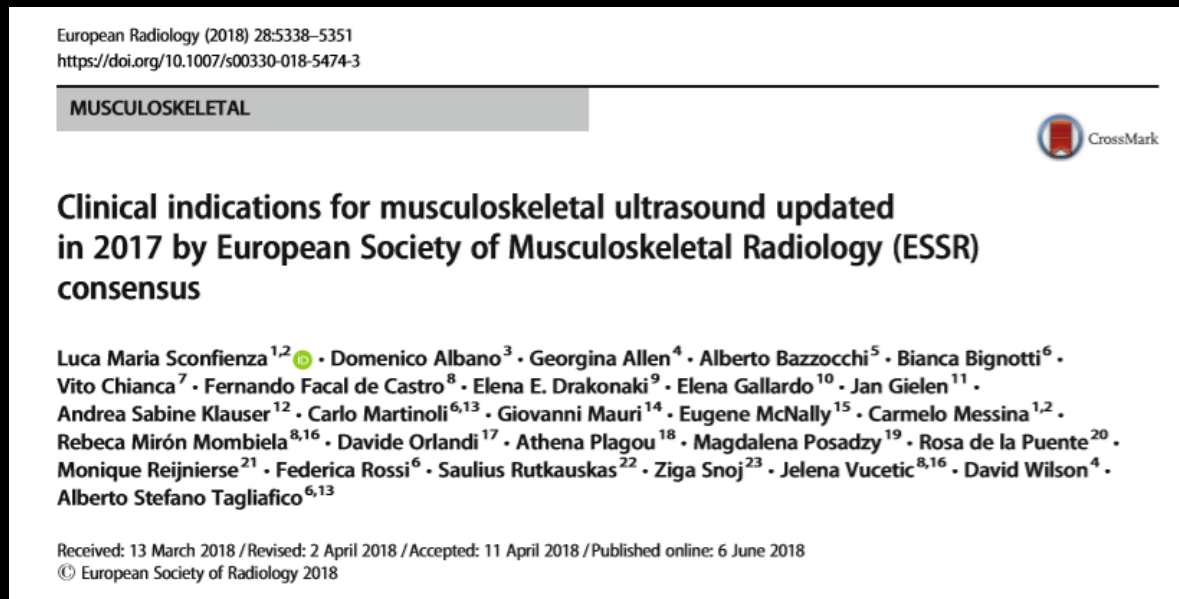
- Bonne taille



Bases de l'écho MSK

- Conditions matérielles optimales
- Optimisation image
- Déroulement examen-Transmission information
- Indications- Limites

Indications



- Epaule, coude, main-poignet, hanche, genou et cheville- pied

	Indications de premier choix	Indications relatives ou réserves	Non-indications
Epaule	- Tumeur articulaire - Bursite - Tendons de la coiffe, fissures - Long biceps, poulie	- Conflit sous-acromial - Fracture occulte - Tendinopathies non rompues - Articulation acromio-claviculaire	- Trophicité musculaire, involution (subscapulaire) - Os - Articulation gléno-humérale - Labrum - Instabilités
Coude	- Tumeur articulaire - Bursite olécranienne - Tendons (épicondyles, triceps) - Nerfs (ulnaire : neuropathie, subluxation ; médian ; radial)	- Tendon biceps distal	- Os, fractures occultes (adulte) - Ligaments - Cartilages
Poignet - Doigts	- Synovite - Ténosynovite - Tendinopathies (fléchisseurs, extenseur ulnaire...) - Nerfs - Tendons digitaux (poules, bandelettes sagittales, plaque palmaire..) - Ligaments collatéraux		- Os, fractures occultes (adulte) - Ligaments - Cartilages

Tableau 3 : Niveau d'indication de l'échographie, Membre inférieur

	Indications de premier choix	Indications relatives ou réserves	Non-indications
Hanche	- Tumeur articulaire - Tendons superficiels (psoas, segment antérieur) - Nerfs superficiels (fémora, fémoro-cutané) - Ressaut extra-articulaire - Décollement de Morel-Lavallée	- Bursite - Tendons ischio-jambiers	- Os - Pathologie articulaire, y.c. coxarthrose - Tendons profonds (psoas distal) - Nerfs profonds (sciatique haut) - Ressaut intra-articulaire - Lésions labrales
Genou	- Tumeur articulaire - Tendons - Nerfs - Ligament collatéral médial	- Ligament collatéral latéral et complexe stabilisateur postéro-latéral - Syndrome de friction (essuie-glace)	- Os - Surfaces ostéochondrales - Ménisques - Ligaments croisés - Syndrome de friction antérieur (Hoffa)
Cheville-pied	- Tumeur articulaire ou ténosynoviale - Tendons - Nerfs - Faisceaux ant. et moy. du ligament collatéral latéral - Kyste arthro-synovial - Aponévrose plantaire (fibromatose, inflammation, rupture) - Morton	- Distalité du tendon tibial postérieur et du long fibulaire - Enthésite d'insertion de l'aponévrose plantaire	- Os (avulsions, souris) - Surfaces ostéochondrales - Faisceau post. du ligament collatéral latéral - Ligament deltoïde - Ligaments du sinus du tarse - Conflits postérieurs - Synostoses



- Tuméfaction articulaire
- Tendons/ligaments/nerfs/masse superficiels



- OS
- Articulation: cartilage/labrum...
- Tendons/ligaments/nerfs/masse profondes

Limites de l'échographie

- Détection

- ✓ Limites intrinsèques à l'échographie

- ✓ Lésions profondes

- ✓ Barrières anatomiques

- ✓ Faible résolution contraste

- ✓ Barrières liées pathologies:

- ✓ œdème

- ✓ gaz

- ✓ os

- Caractérisation

- ✓ Masses

- ✓ Pathologies infectieuses

- ✓ Hématome

Limites de l'échographie

- **Détection**

- ✓ **Limites intrinsèques à l'échographie**

- ✓ **Lésions profondes**

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- **Caractérisation**

- ✓ **Masses**

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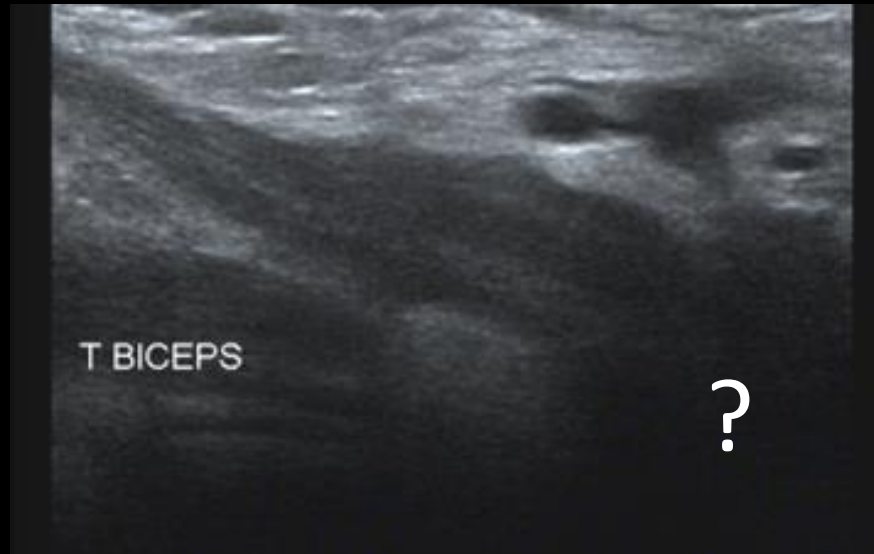
Lésions profondes

F 72 ans douleurs cuisse
post chute, ATCD FA



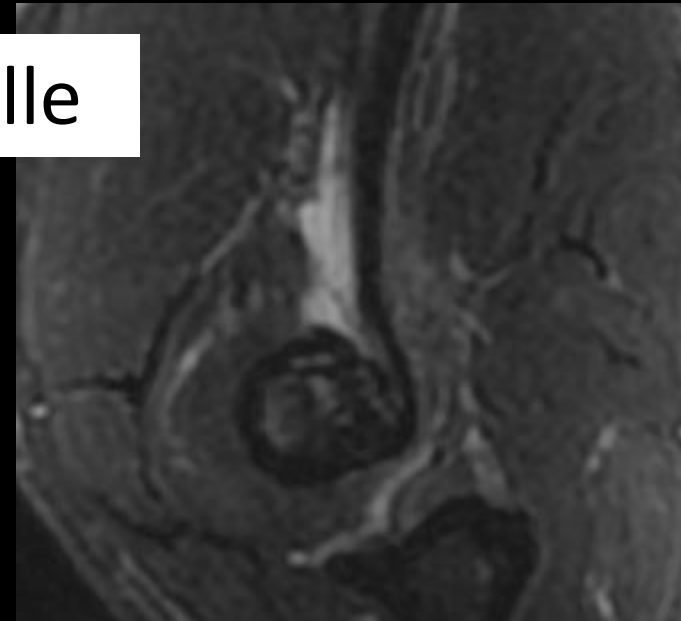
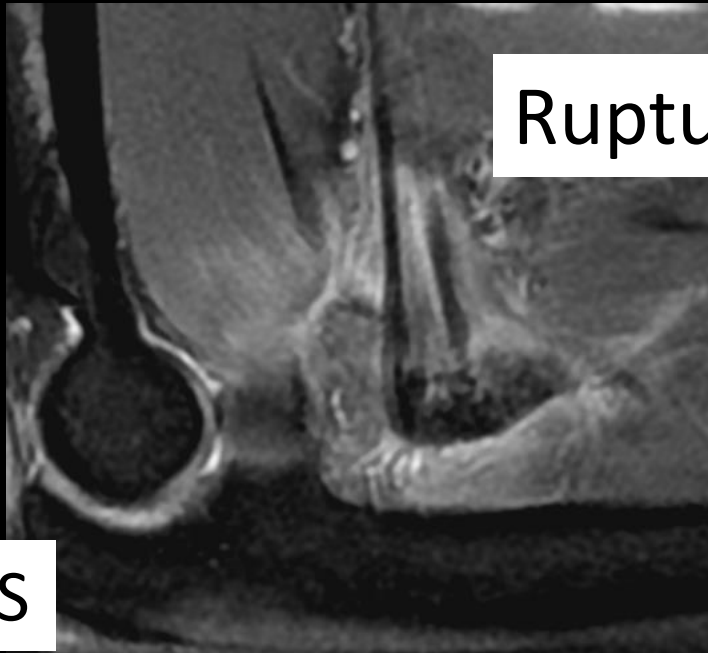
Barrières anatomiques: TENDON BICEPS DISTAL

H 42 ans,
rupture?



Rupture partielle

DPFS

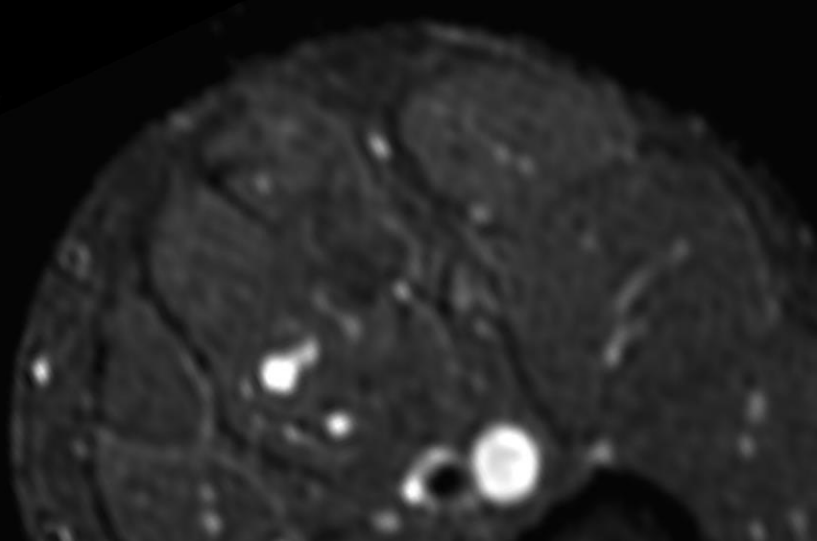
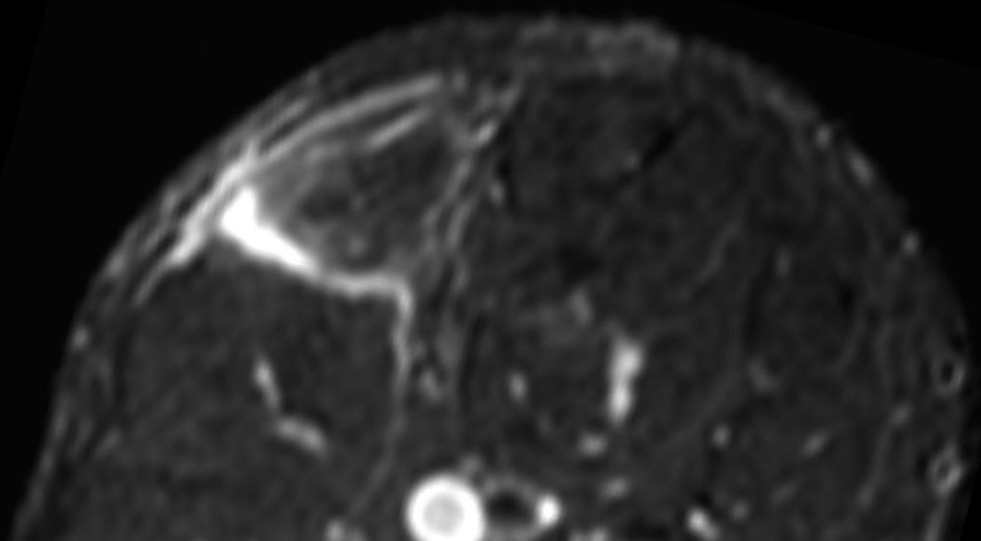
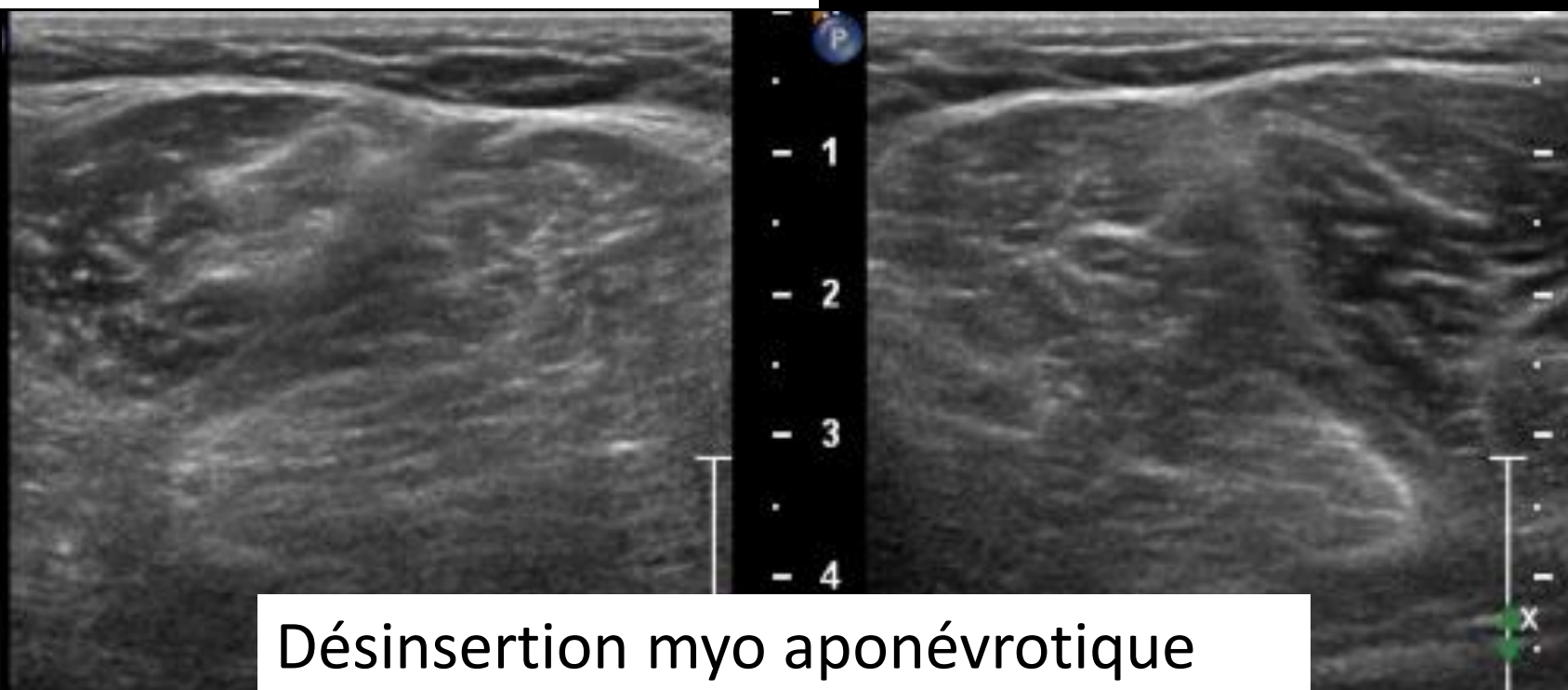


Résolution contraste

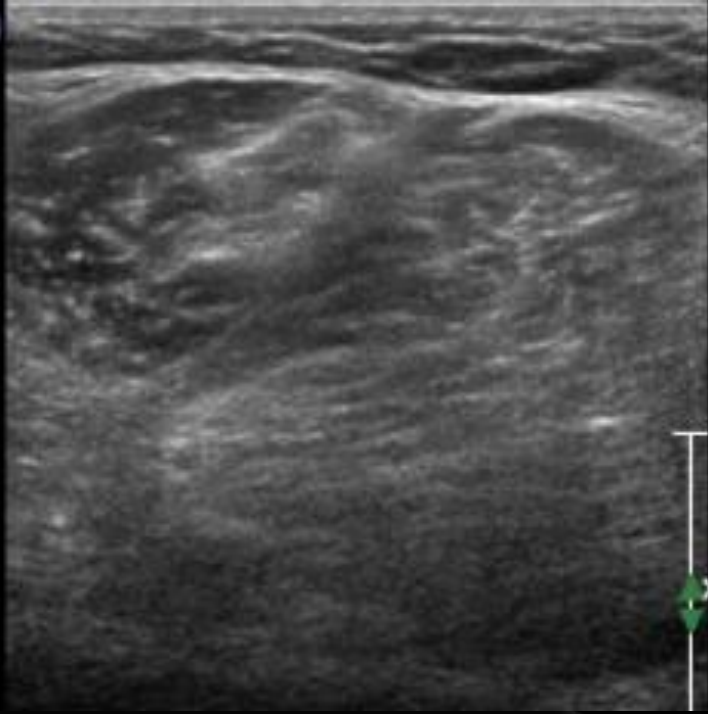
- Difficultés à visualiser/délimiter lésion d'échostructure similaire à son environnement
- Graisse/muscle
- Œdème/muscle



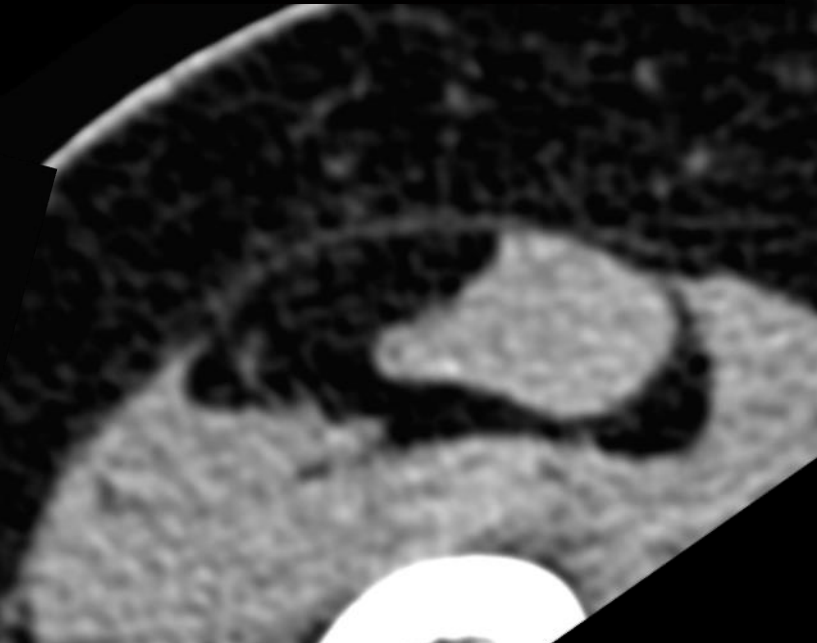
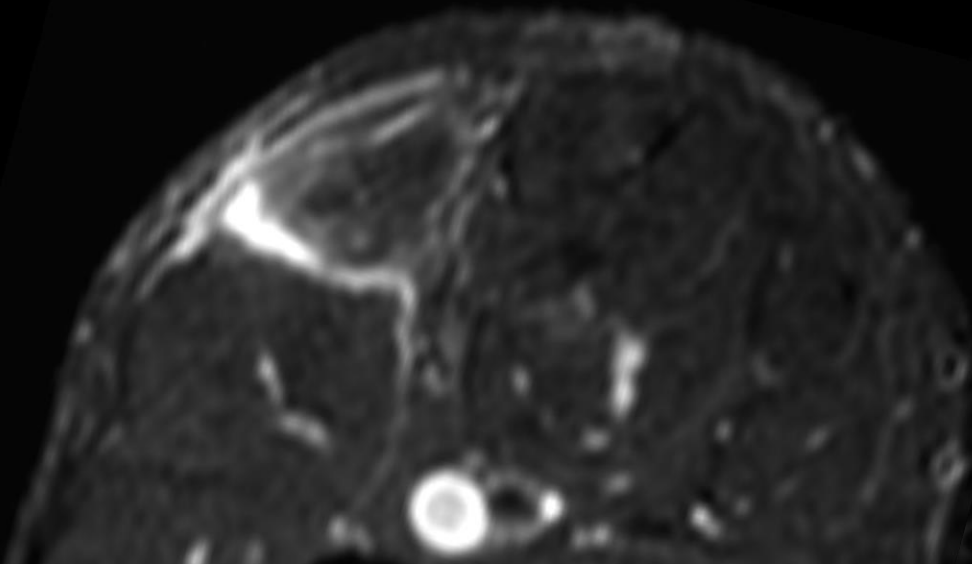
H 35 ans douleurs brutales-foot



Désinsertion myo aponévrotique



Lipome



Limites de l'échographie

- **Détection**

- ✓ Limites intrinsèques à l'échographie

- ✓ Lésions profondes

- ✓ Barrières anatomiques

- ✓ Faible résolution contraste

- ✓ **Barrières liées pathologies:**

- ✓ **œdème**

- ✓ **gaz**

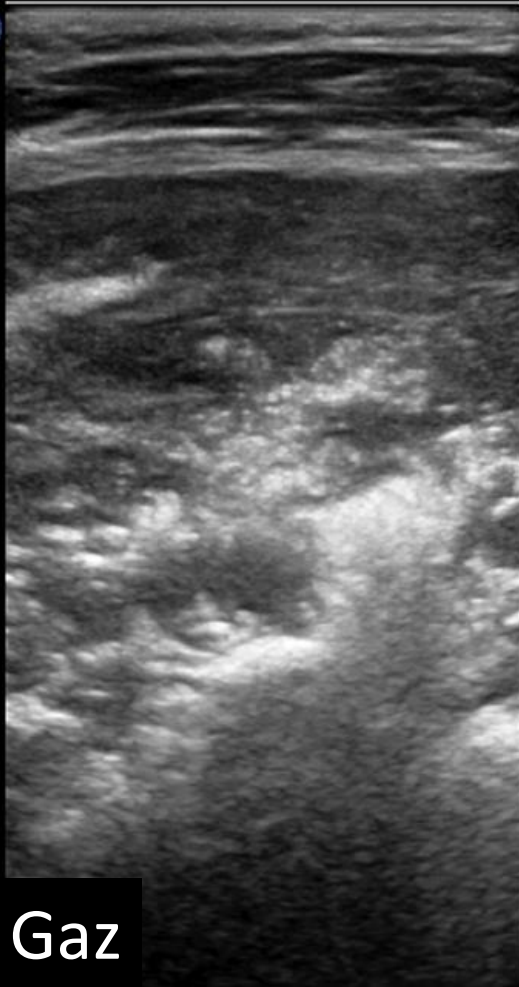
- ✓ **os**

- **Caractérisation**

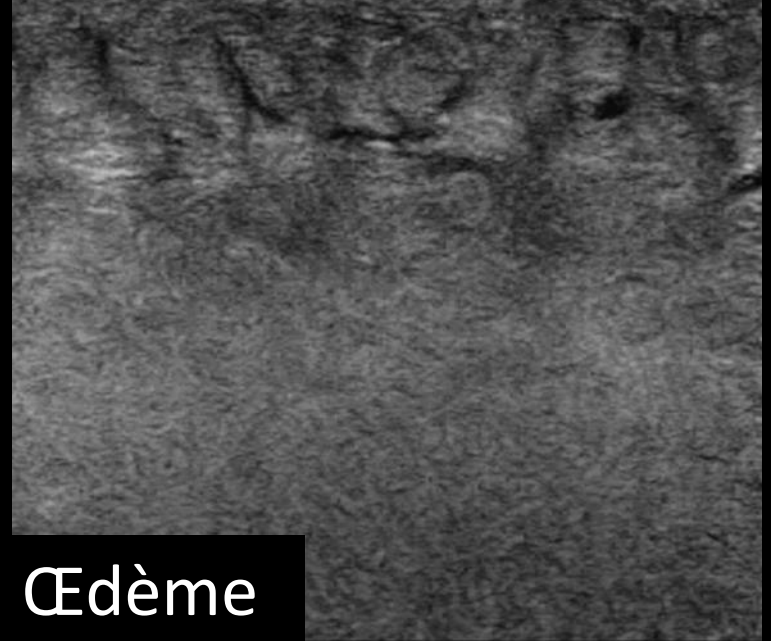
- ✓ Masses

- ✓ Pathologies infectieuses

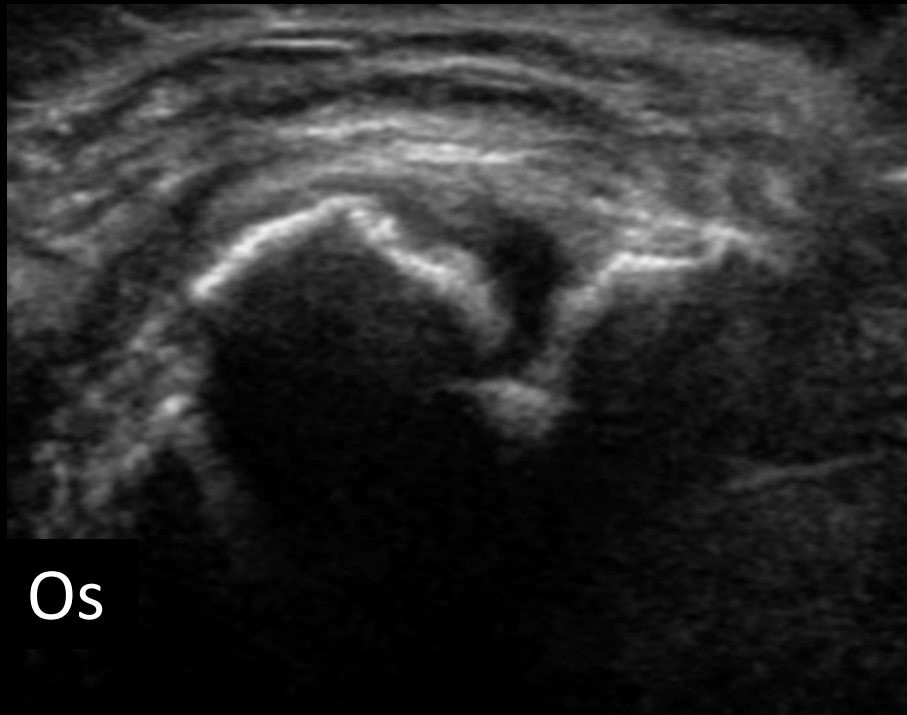
- ✓ Hématome



Gaz



Œdème



Os

Œdème



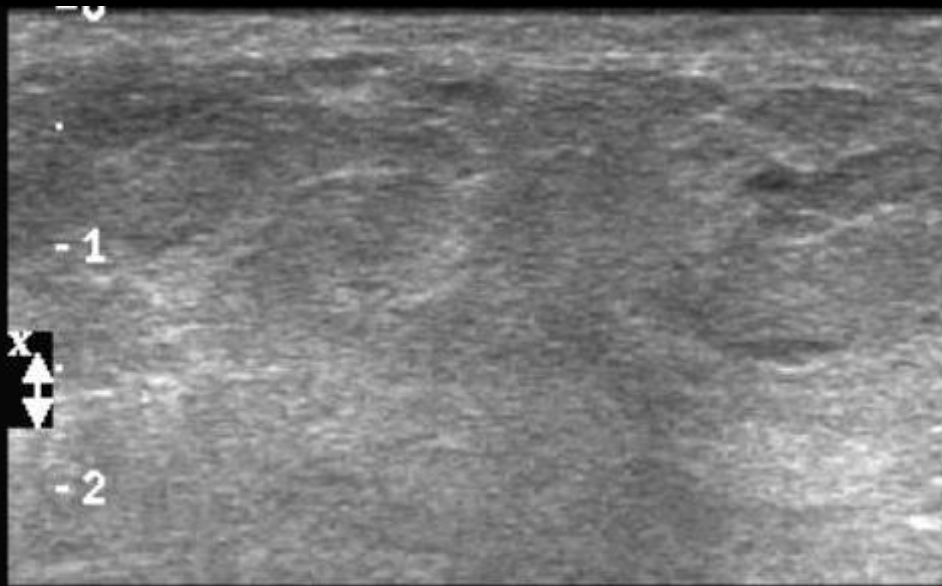
Gaz

©NEILPROVO.COM

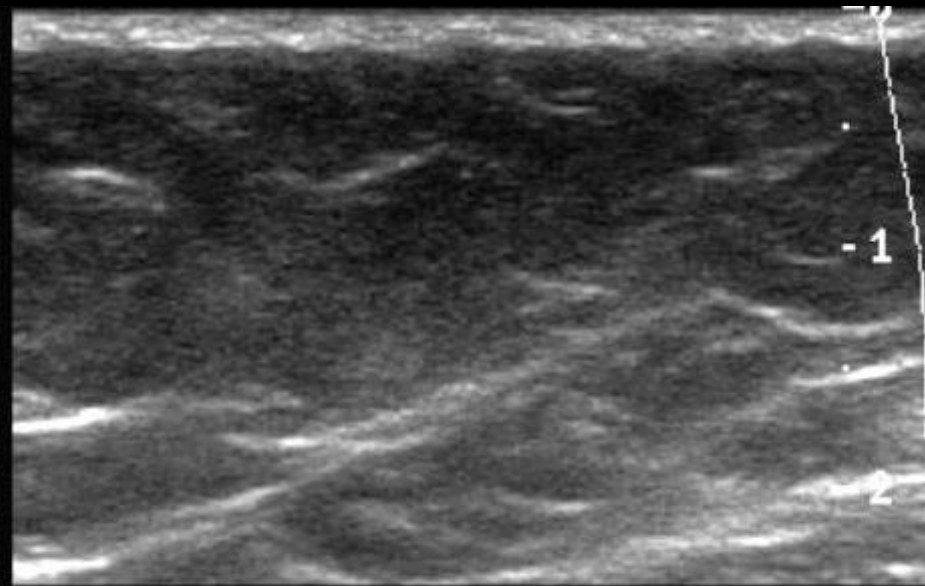


Os

F 40 ans œdème cuisse fièvre: cellulite?

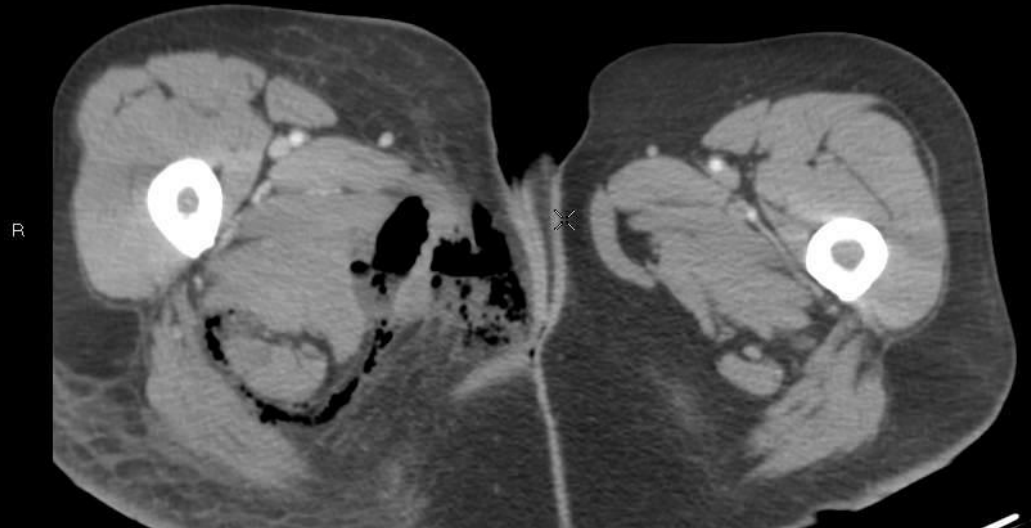


Cellulite

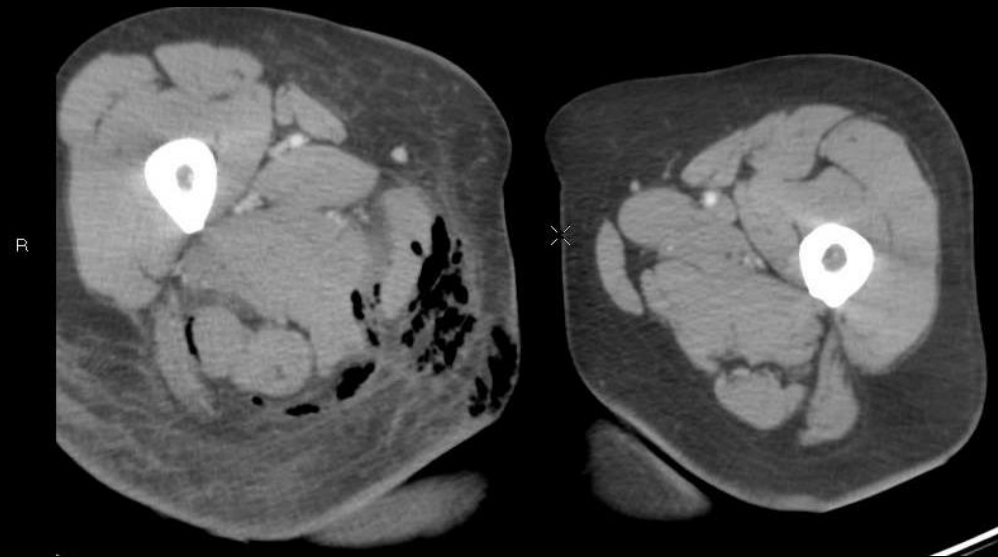


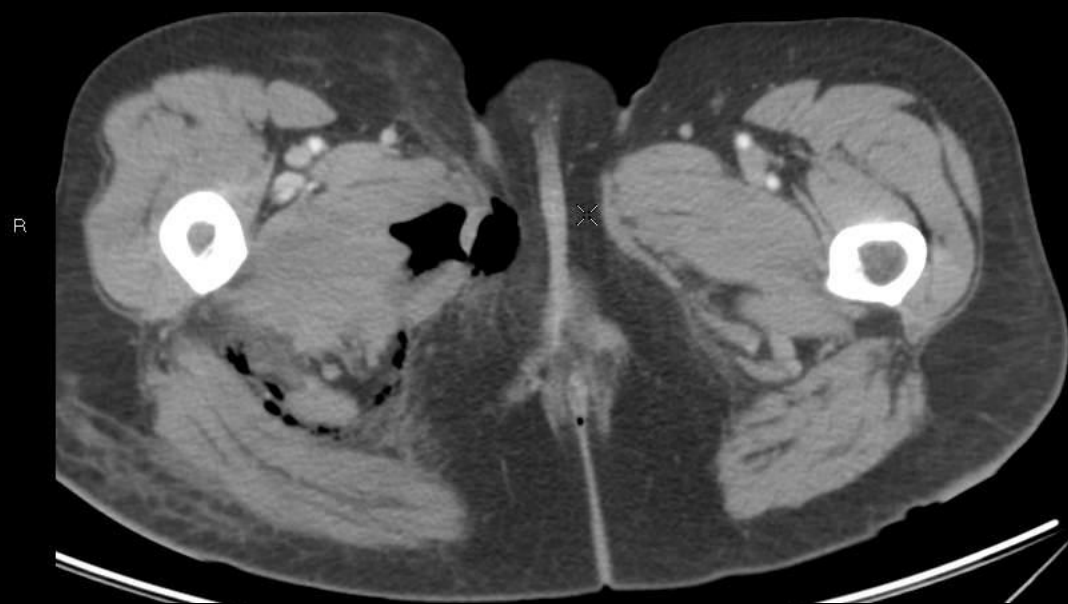
Côté controlatéral

CT réalisé quelques heures plus tard....

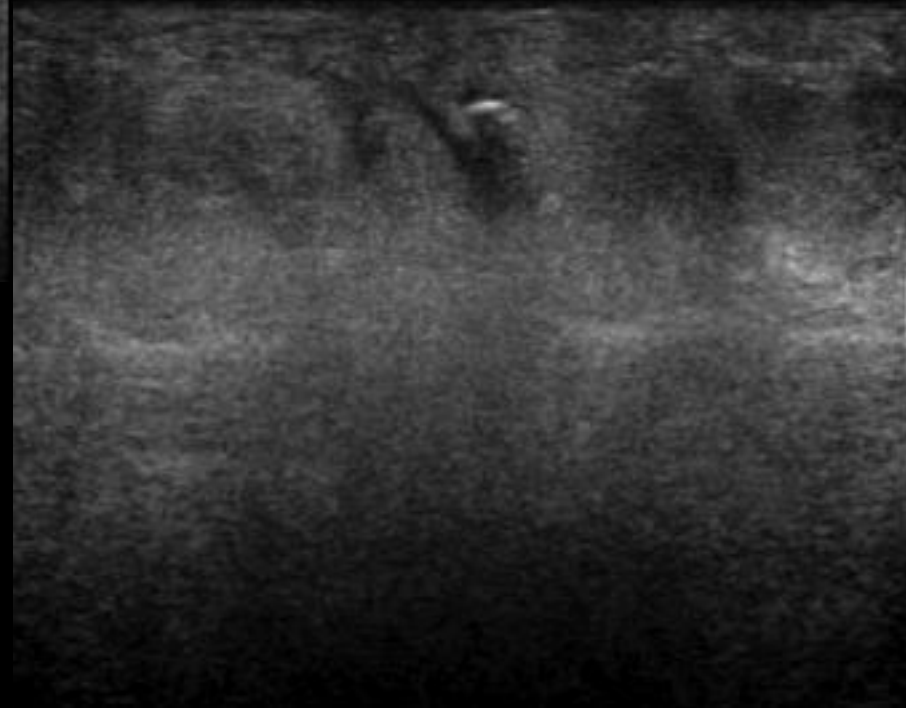
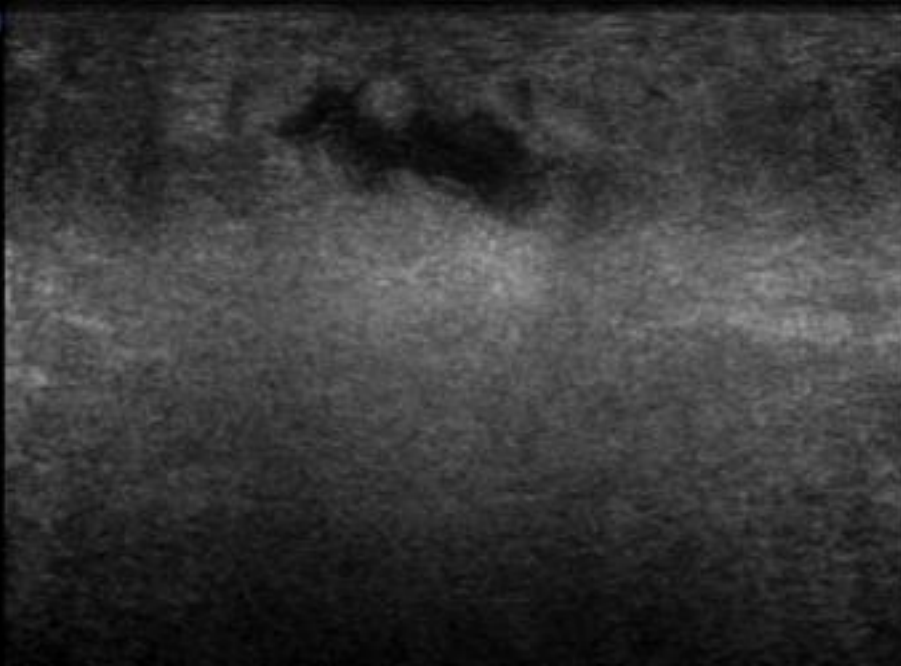


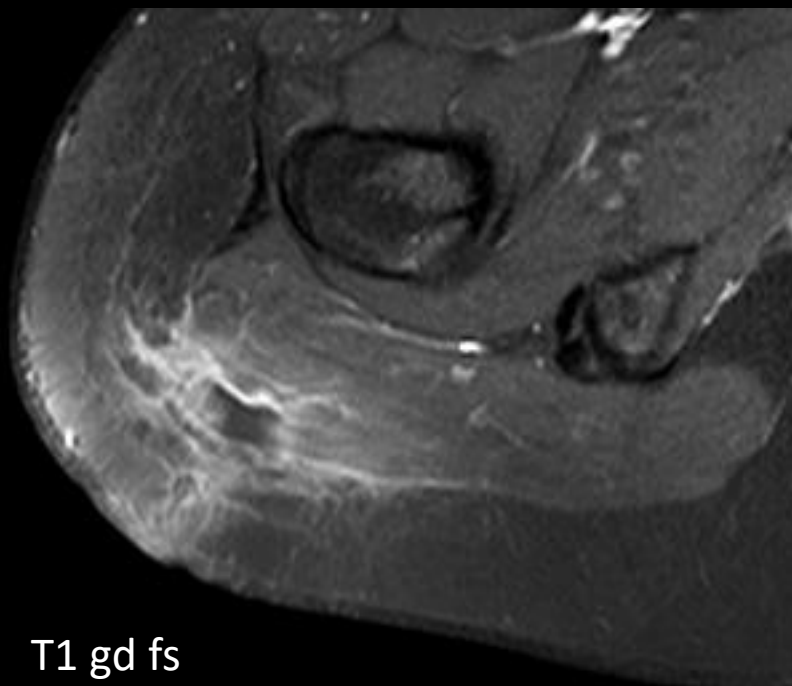
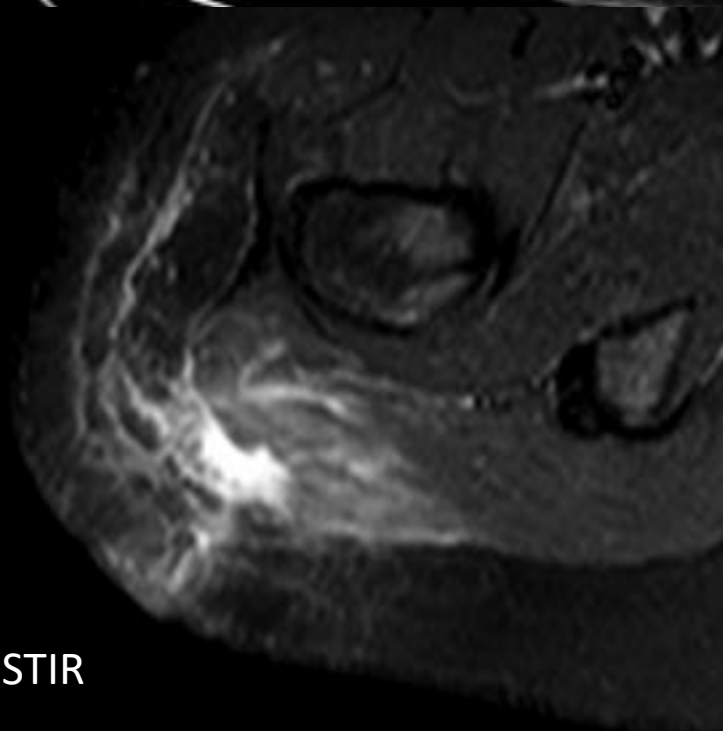
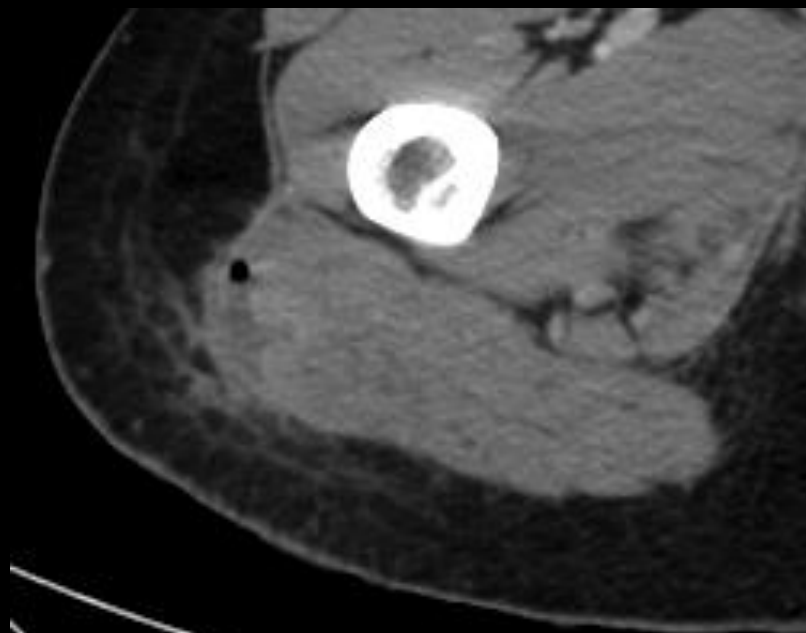
Gangrène de Fournier





Cellulite?
Fasciite nécrosante?

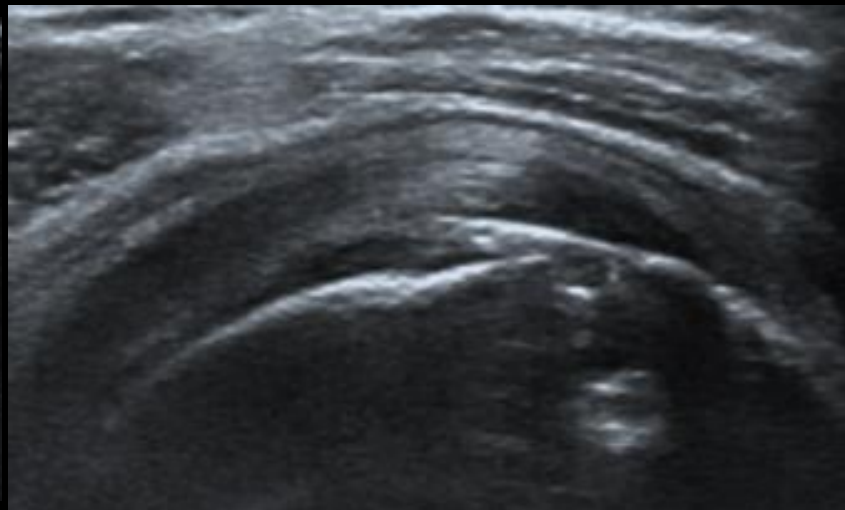
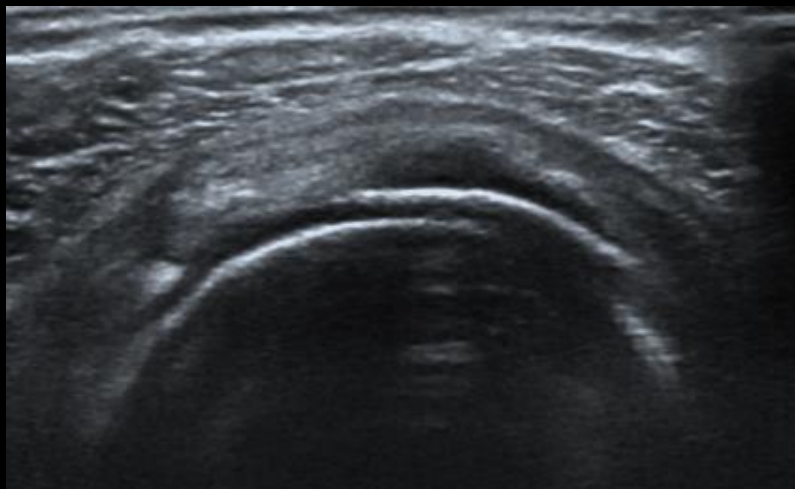




STIR

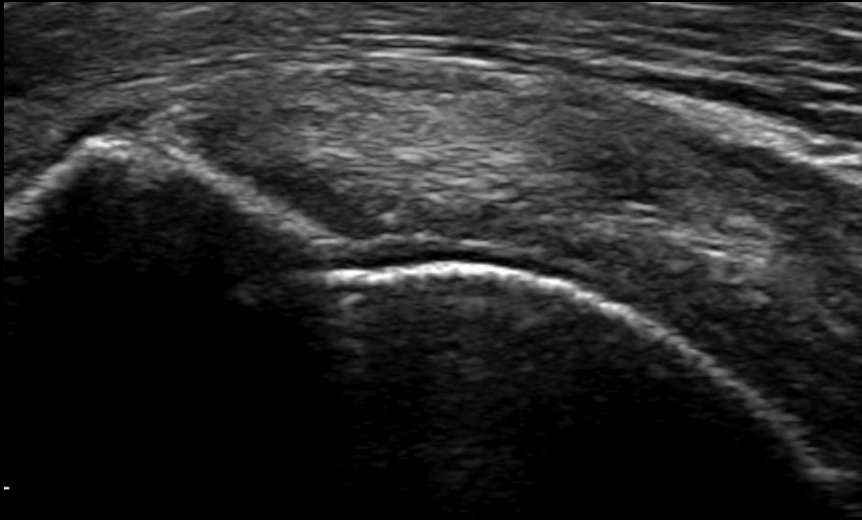
T1 gd fs

Dépistage fracture à l'échographie: anecdotique



F 50 ans, douleurs post
chute, recherche lésion
de la coiffe des
rotateurs

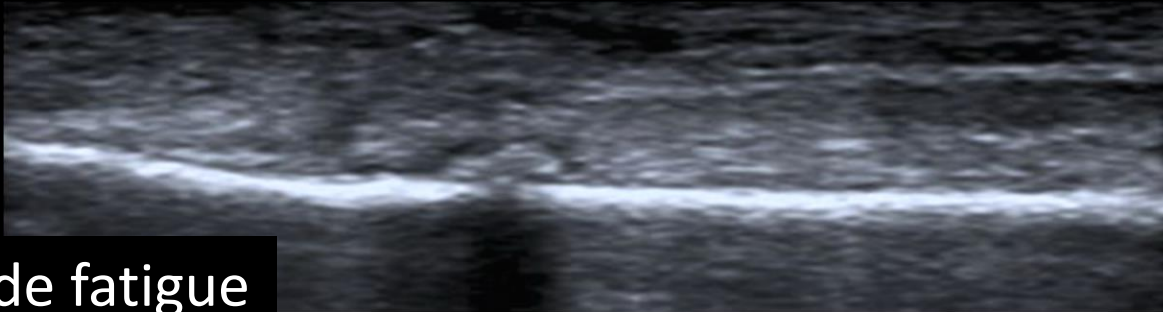




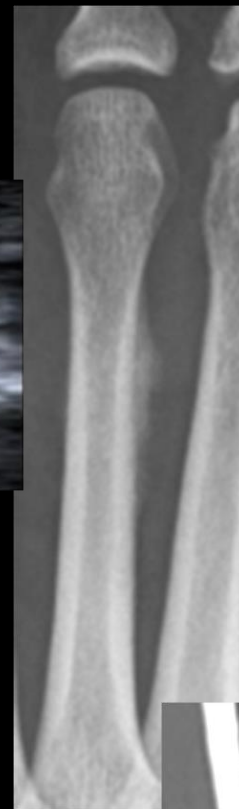
Extension!



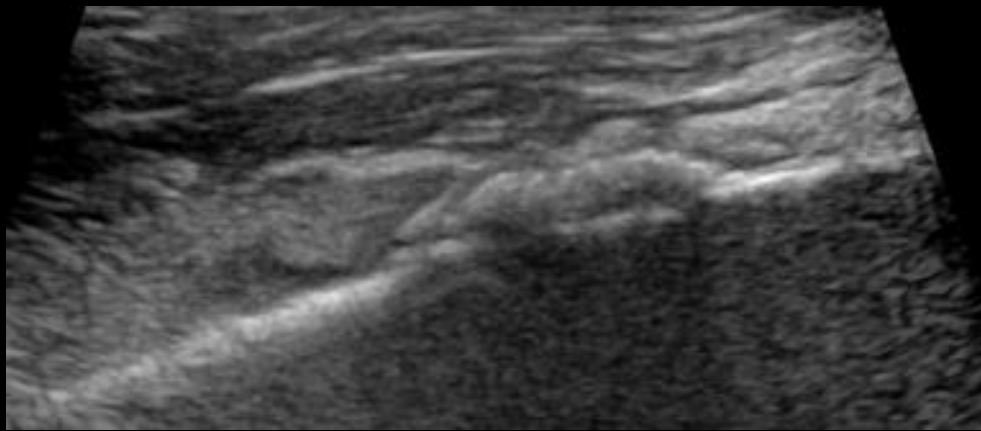
F 55 ans, douleurs métatarsiennes



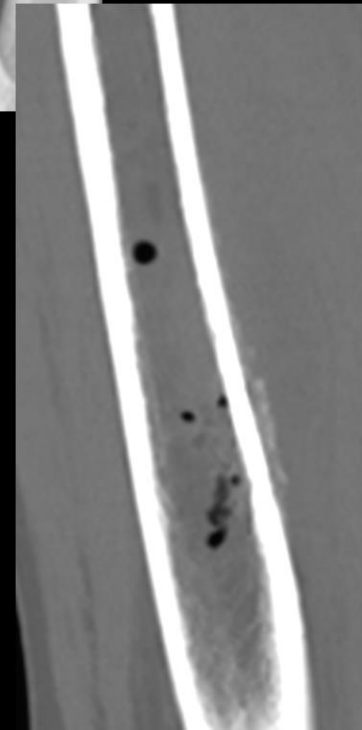
Fracture de fatigue



F 40 ans, douleurs cuisse,
suspicion déchirure
musculaire



Ostéomyélite



Limites de l'échographie

- Détection

- ✓ Limites intrinsèques à l'échographie

- ✓ Lésions profondes

- ✓ Barrières anatomiques

- ✓ Faible résolution contraste

- ✓ Barrières liées pathologies:

- ✓ œdème

- ✓ gaz

- ✓ os

- **Caractérisation**

- ✓ **Masses**

- ✓ **Pathologies infectieuses**

- ✓ **Hématome**

Limites de l'échographie

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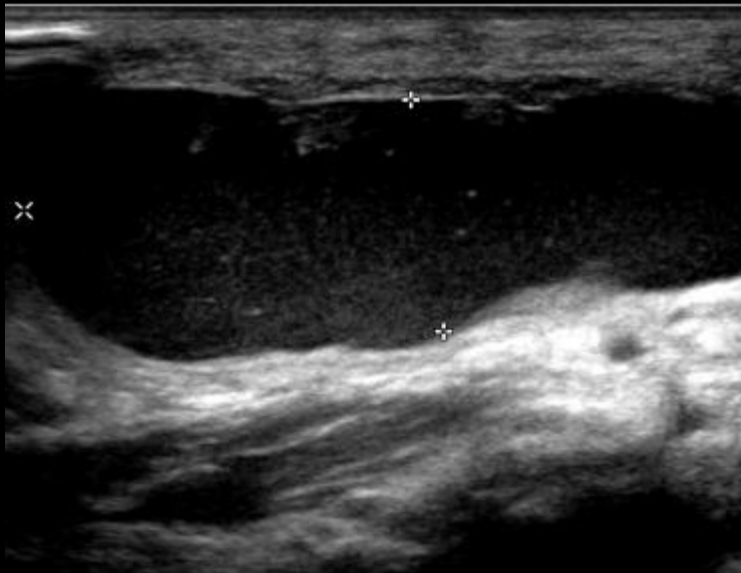
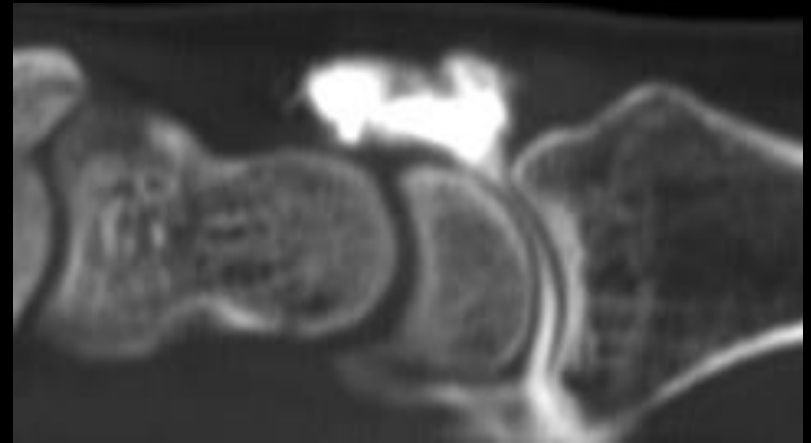
- ✓ Hématome

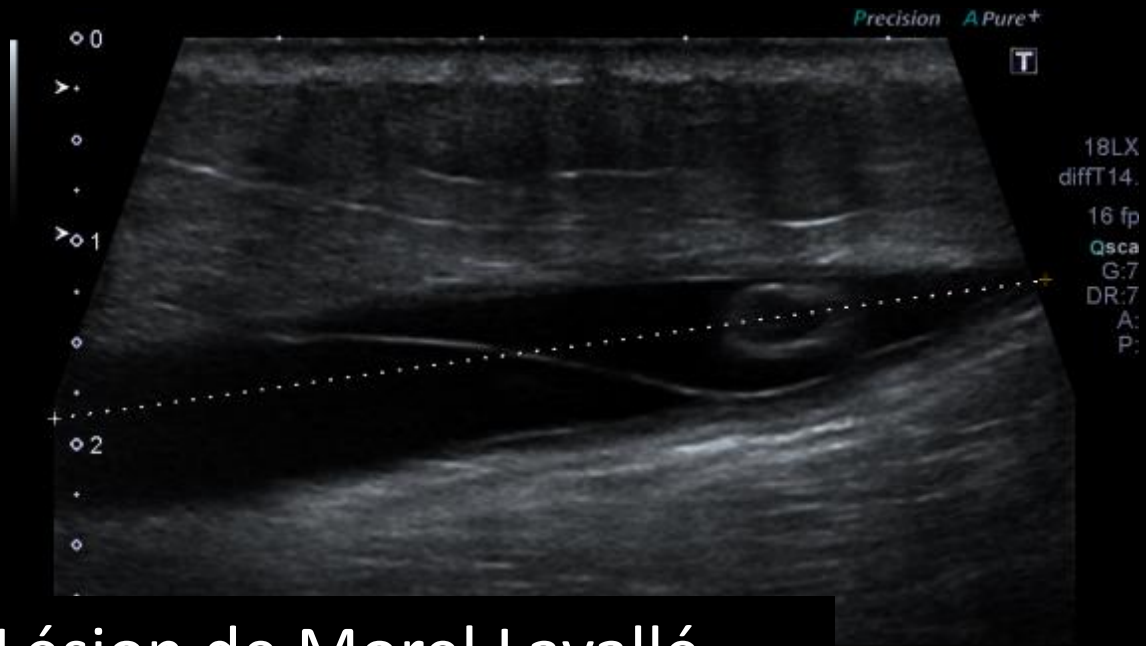
Pathologies tumorales

- Boules d'eau et boules de graisse

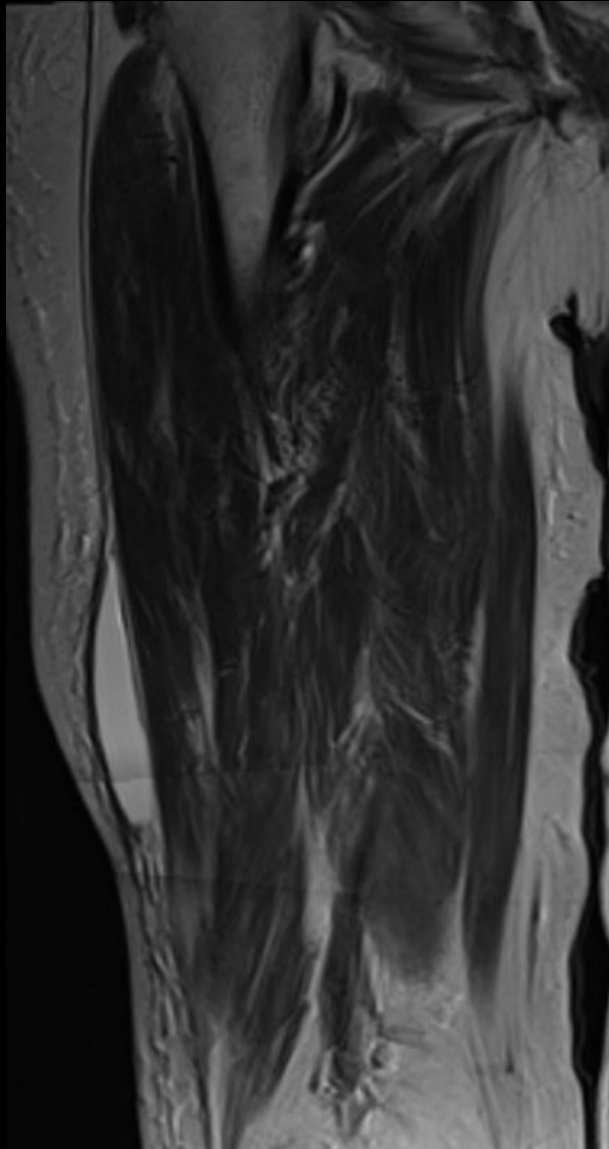
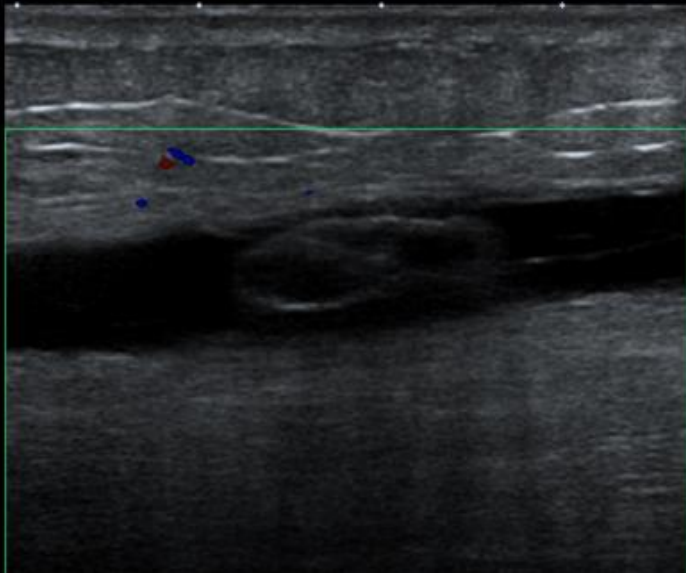


- En dehors: suspicion clinique mais attention!



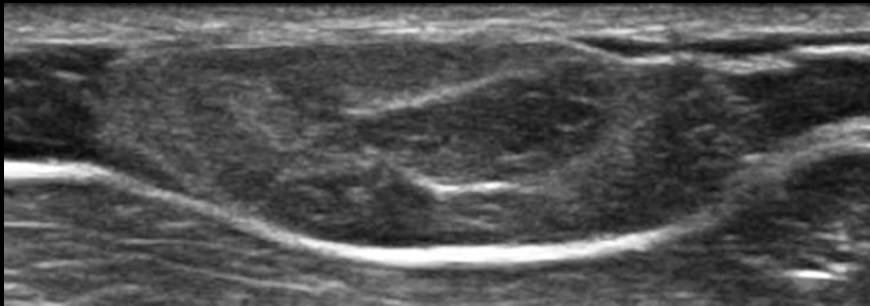
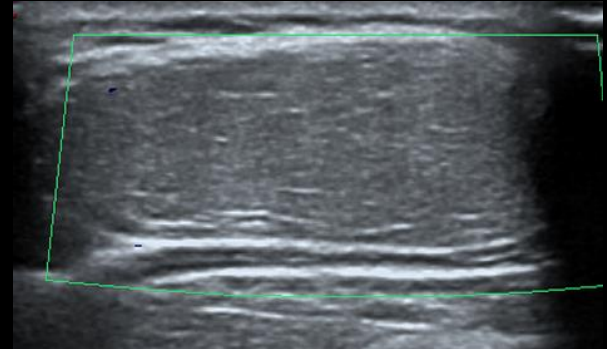
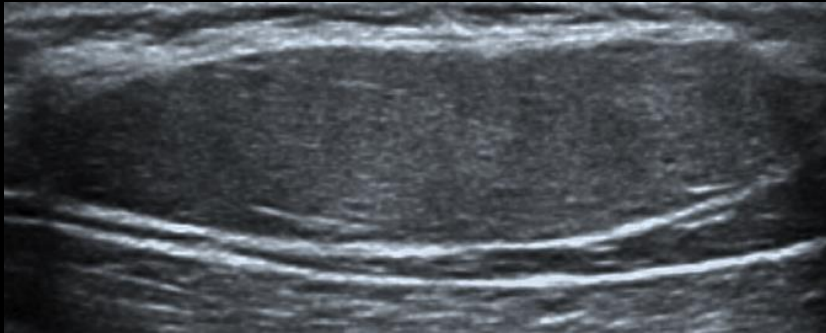


Lésion de Morel Lavallé



LIPOME

- Lésion typique: iso/hyperéchogène, superficiel, doppler-



- Mais grande variabilité
- IRM/CT si atypie: clinique taille localisation doppler+.....

Quelques lésions stéréotypées (topo, aspect)

- Observations anatomiques ou pathologiques

Ganglion lymphatique

Elastofibrome dorsal

Névrome de Morton

Fibromatose palmaire /plantaire (Dupuytren / Ledderhose)

Kystes épidermoïdes

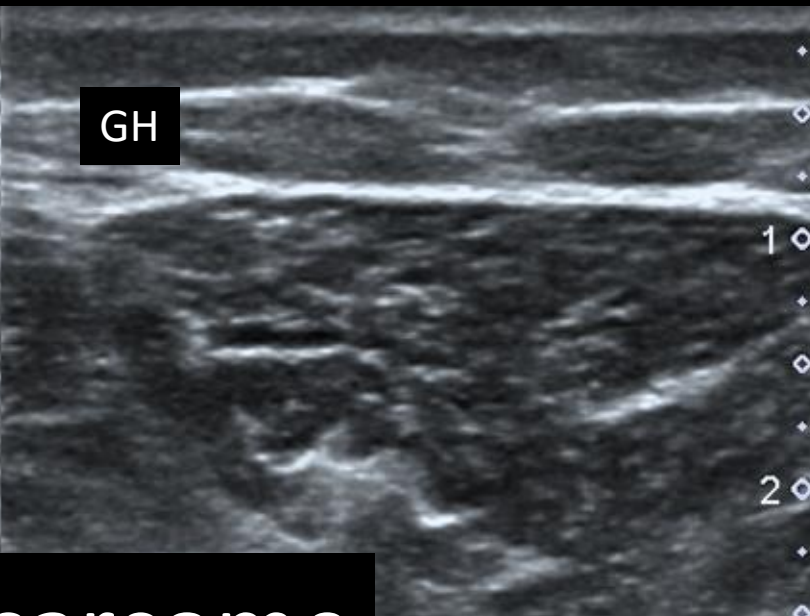
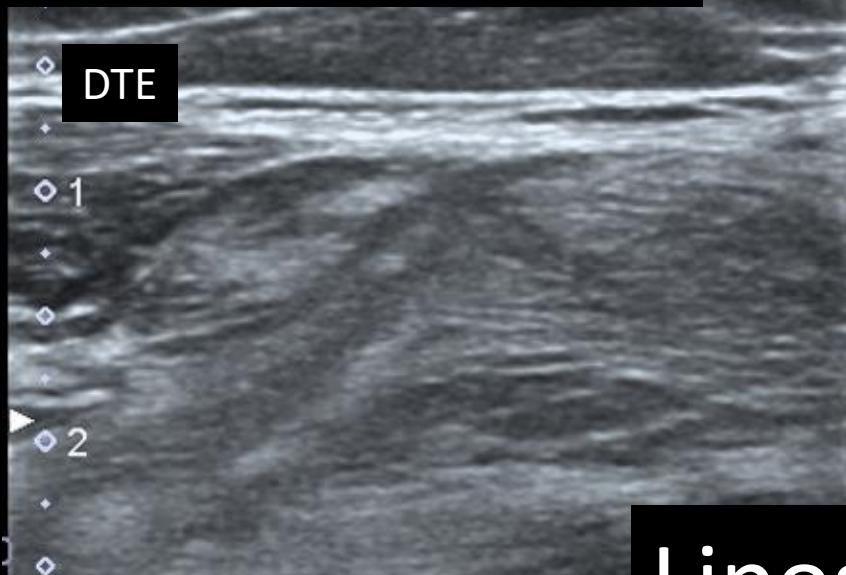
Certaines tumeurs de gaines nerveuses, schwannome
(!raccord avec structure tubulaire amont aval).

Certains anévrismes ou pseudo-anévrismes vasculaires
(!communication avec un vaisseau)

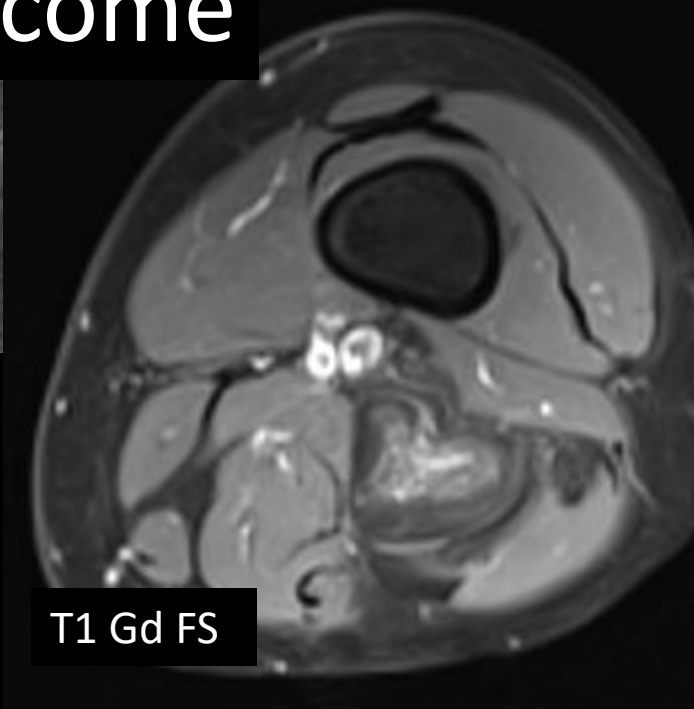
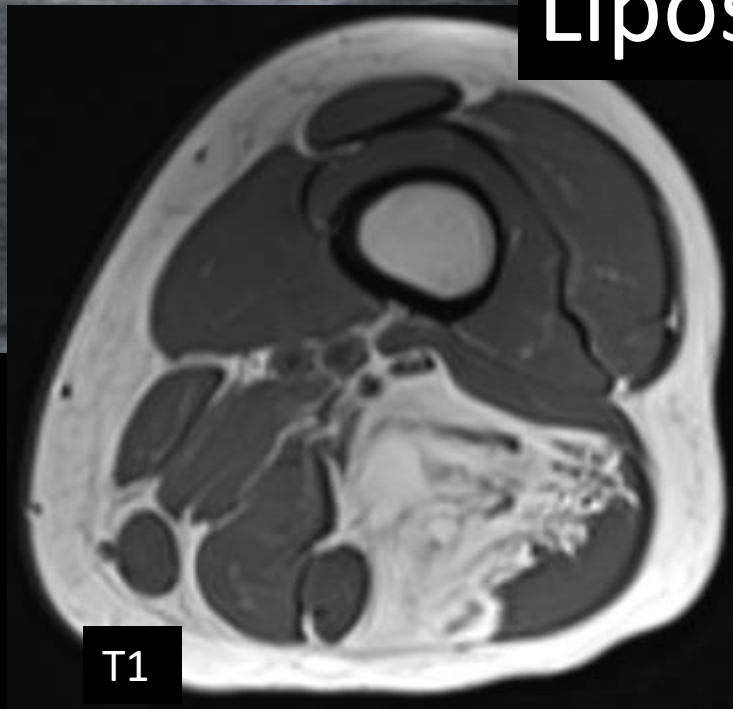
**EN DEHORS DES LESIONS LIPOMATEUSES/ KYSTIQUES TYPIQUES
ATTENTION!!!**

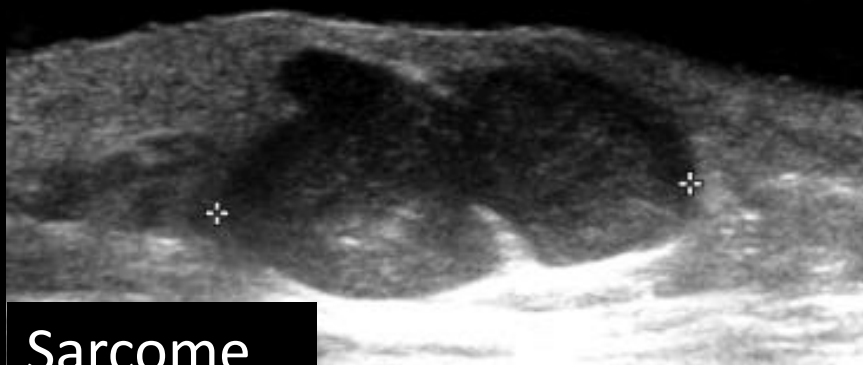


F 70 ans masse depuis 20 ans

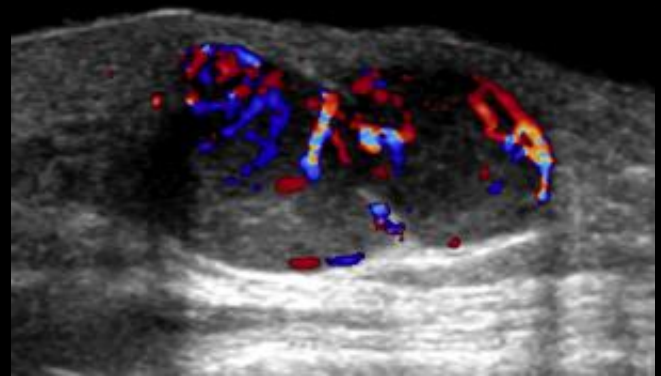


Liposarcome

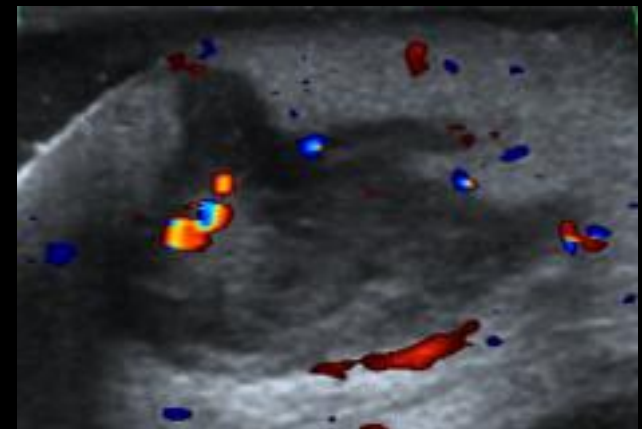




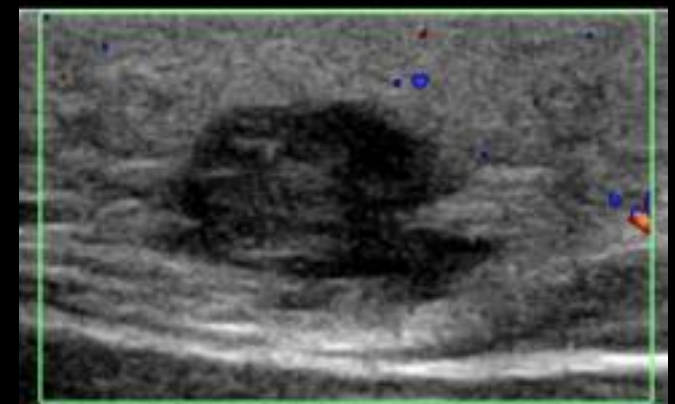
Sarcome



Kyste épidermoïde infecté



Fibrosarcome

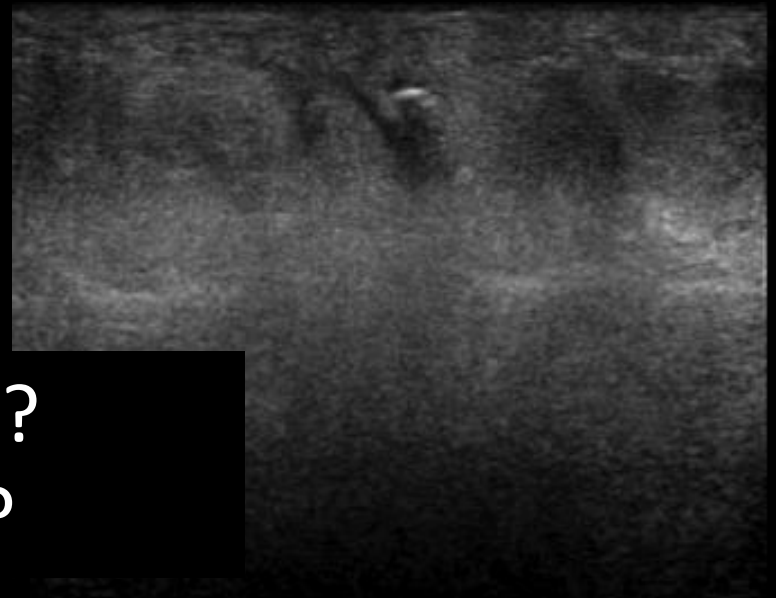
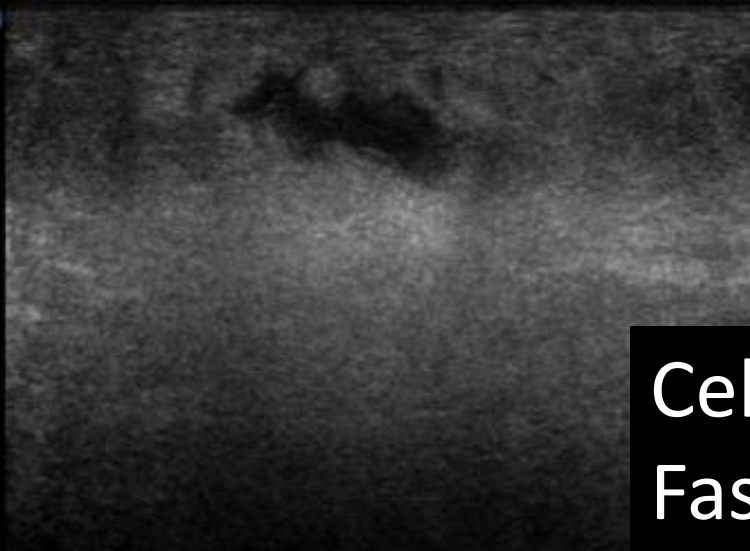
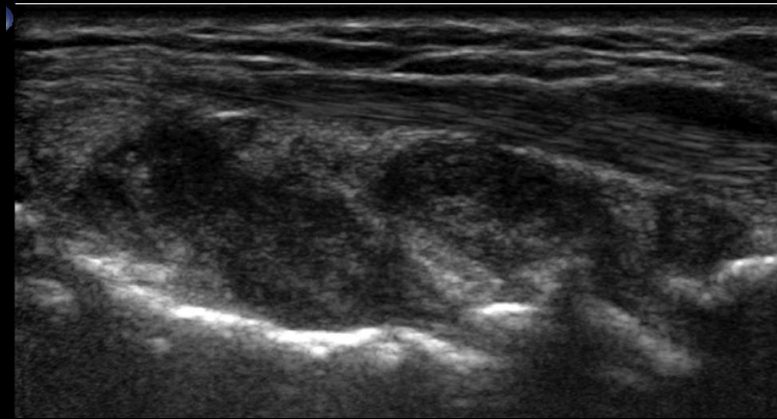


Limites de l'échographie

- Détection
 - ✓ Limites intrinsèques à l'échographie
 - ✓ Lésions profondes
 - ✓ Barrières anatomiques
 - ✓ Faible résolution contraste
 - ✓ Barrières liées pathologies:
 - ✓ œdème
 - ✓ gaz
 - ✓ os
- **Caractérisation**
 - ✓ **Masses**
 - ✓ **Pathologies infectieuses**
 - ✓ **Hématome**

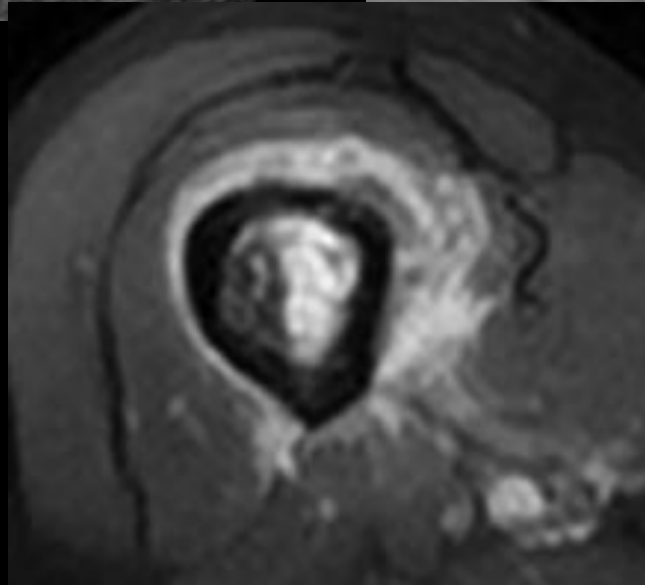
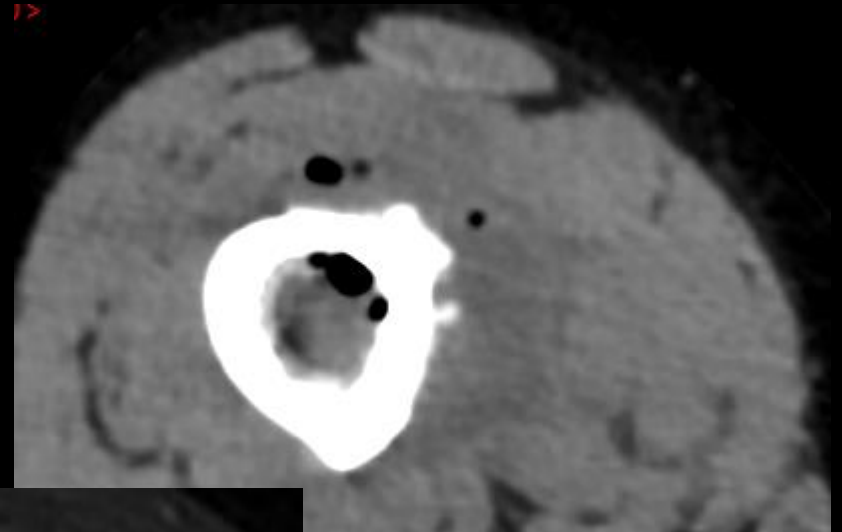
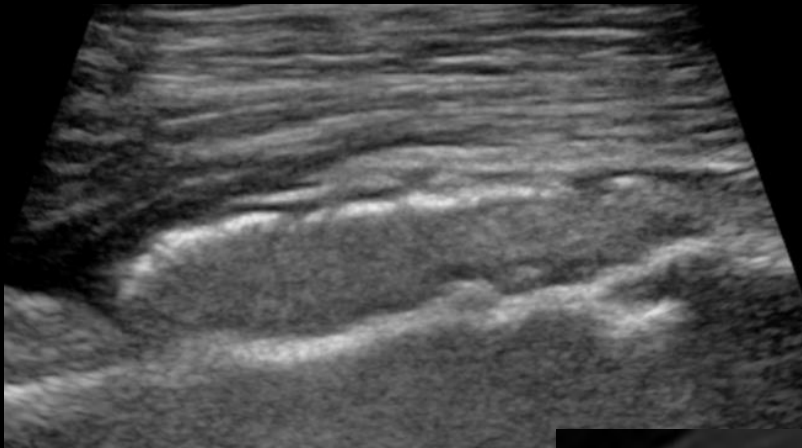
Pathologie infectieuse

- Tuméfaction articulaire
manque de spécificité
- Oedème



Cellulite?
Fasciite?

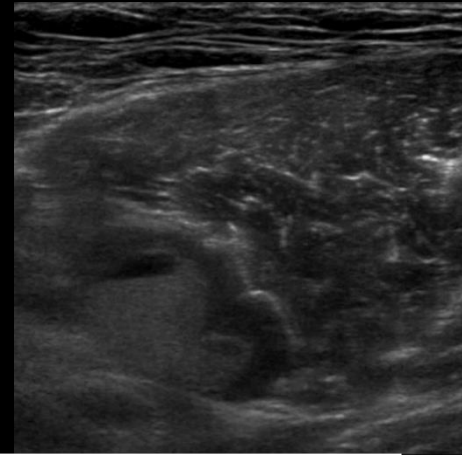
Lésion péri osseuse: CT/IRM



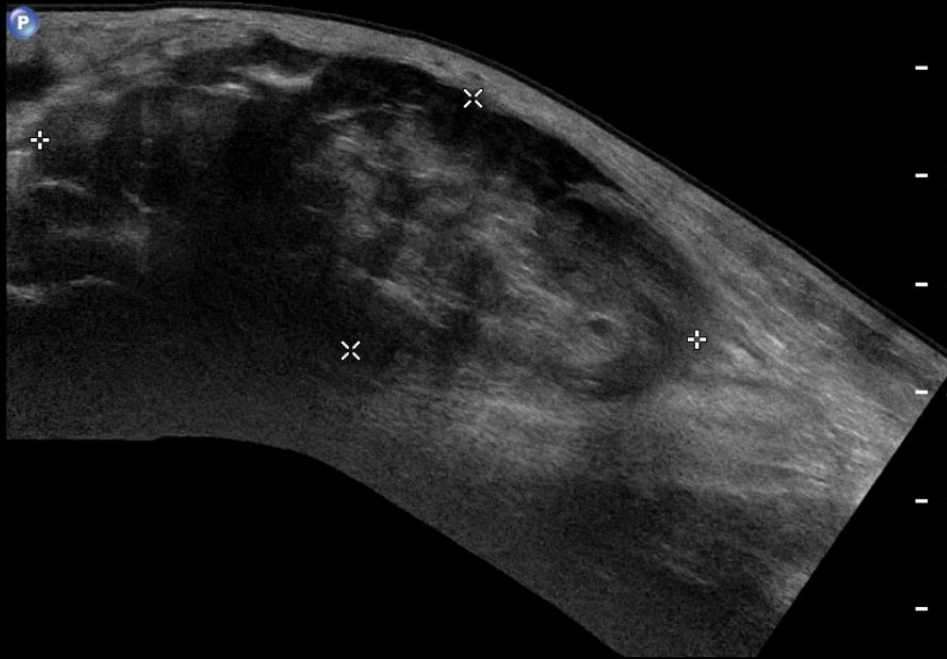
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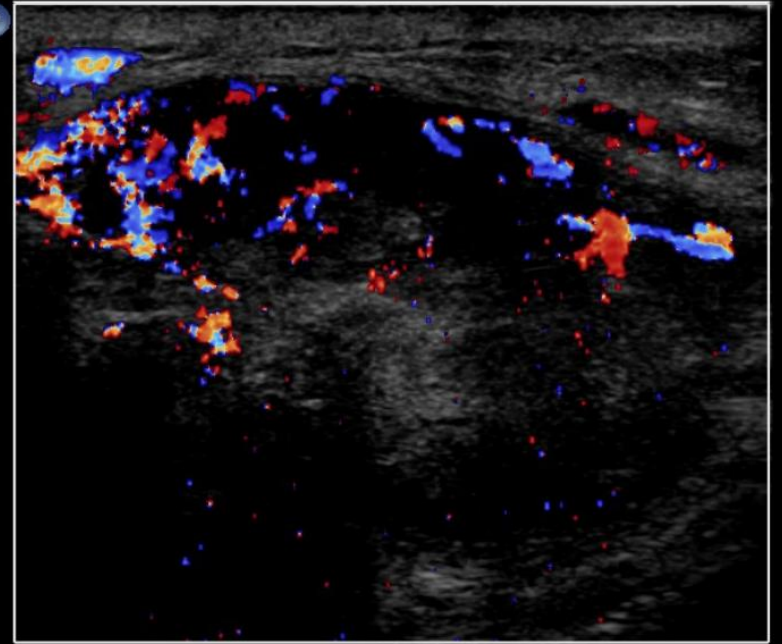
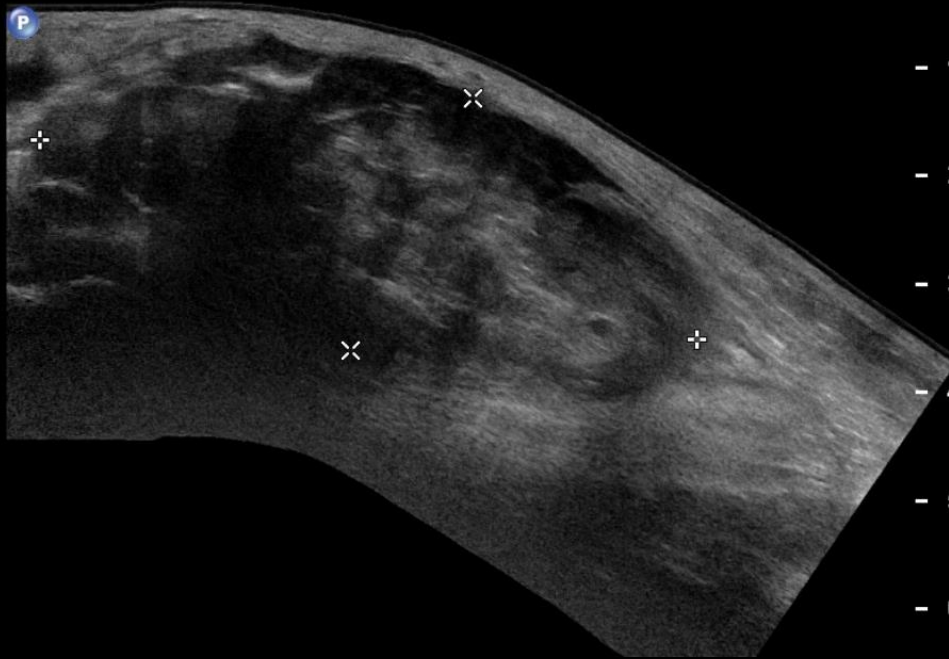
Hématomes = aspect variable



*Van der Woude HJ, Vanderschueren G. Ultrasound in musculoskeletal tumors with emphasis on its role in tumor follow-up. Radiol Clin North Am 1999; 37:753-766.



Sarcoma



Conclusion

- Technique accessible
- Bonnes conditions matérielles
- Bonne connaissance
 - Théoriques: anatomiques, pathologies.....
 - Bonnes indications
 - Limites

Quelques références

- « On peut toujours faire mieux: optimiser mes images échographiques », Mourad C, Vande Berg B,. Lille Bruxelles 2017
- Journées d'échographie ostéoarticulaire. JL Brasseur, SIMS, Paris
- ESSR US Guidelines



European Radiology (2018) 28:5338–5351
<https://doi.org/10.1007/s00330-018-5474-3>

MUSCULOSKELETAL



Clinical indications for musculoskeletal ultrasound updated in 2017 by European Society of Musculoskeletal Radiology (ESSR) consensus

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