

KNEE ULTRASOUND

Vanessa McGowan, MD MS

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Kaiser Permanente

Physical Medicine and Rehabilitation

Musculoskeletal Medicine

Spine

South Sacramento

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Indications

Include, but not limited to:

- Soft tissue injury
- Tendon and collateral ligament pathology
- Arthritis
- Soft tissue masses / swelling
- Loose intra-articular bodies
- Effusion
- Bone injury

Knee Exam - Approach

Comprehensive exam: includes 4 quadrants – exam tailored to clinical presentation

4 quadrants:

Anterior

Medial

Lateral

Posterior

Anterior Knee

- Patient supine, knee slightly flexed $\sim 30^\circ$
- Tenses extensor mechanism to reduce anisotropy
- Structures: quadriceps & patellar tendons, patellar retinaculum, suprapatellar recess, prepatellar / superficial & deep infrapatellar bursae, distal femoral trochlear cartilage (max flex), ACL insertion

Quad Tendon Probe Technique

Quad tendon

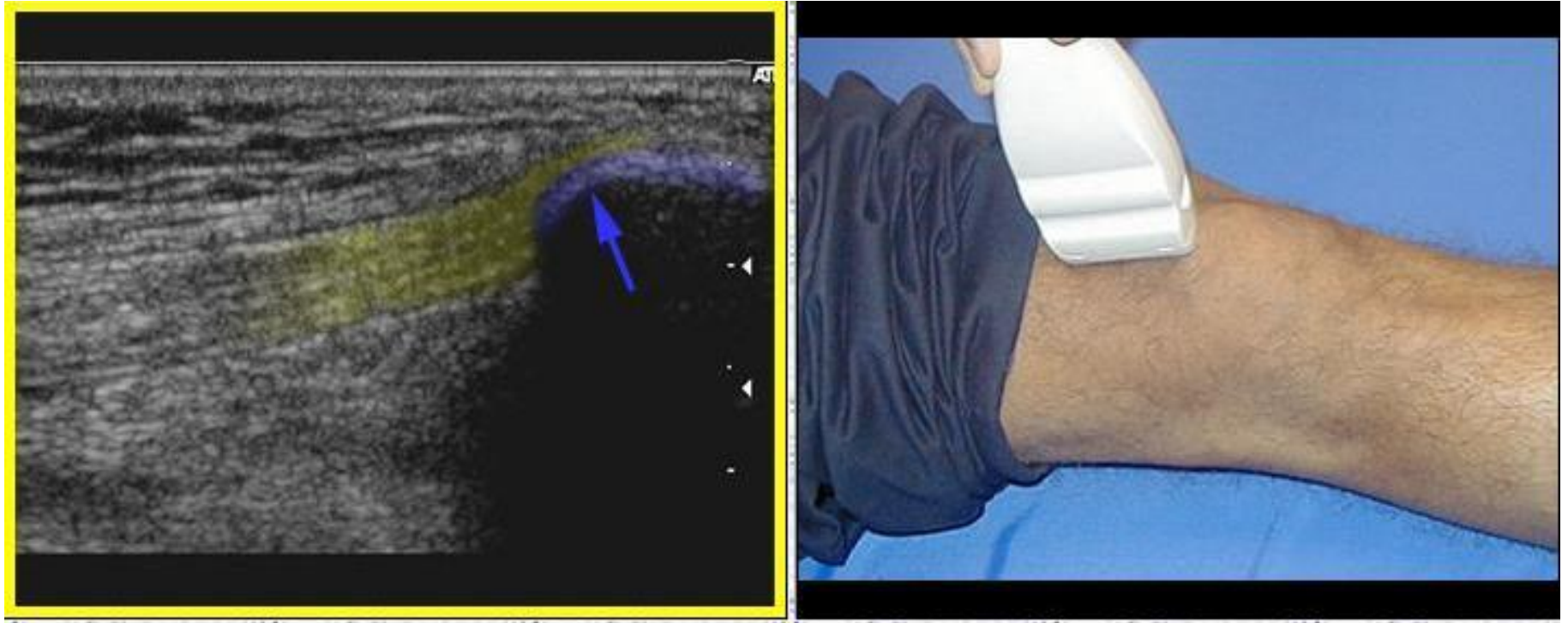


Longitudinal / Sagittal / (Long Axis)
(Short Axis)



Transverse / Axial /

Normal Quad Tendon

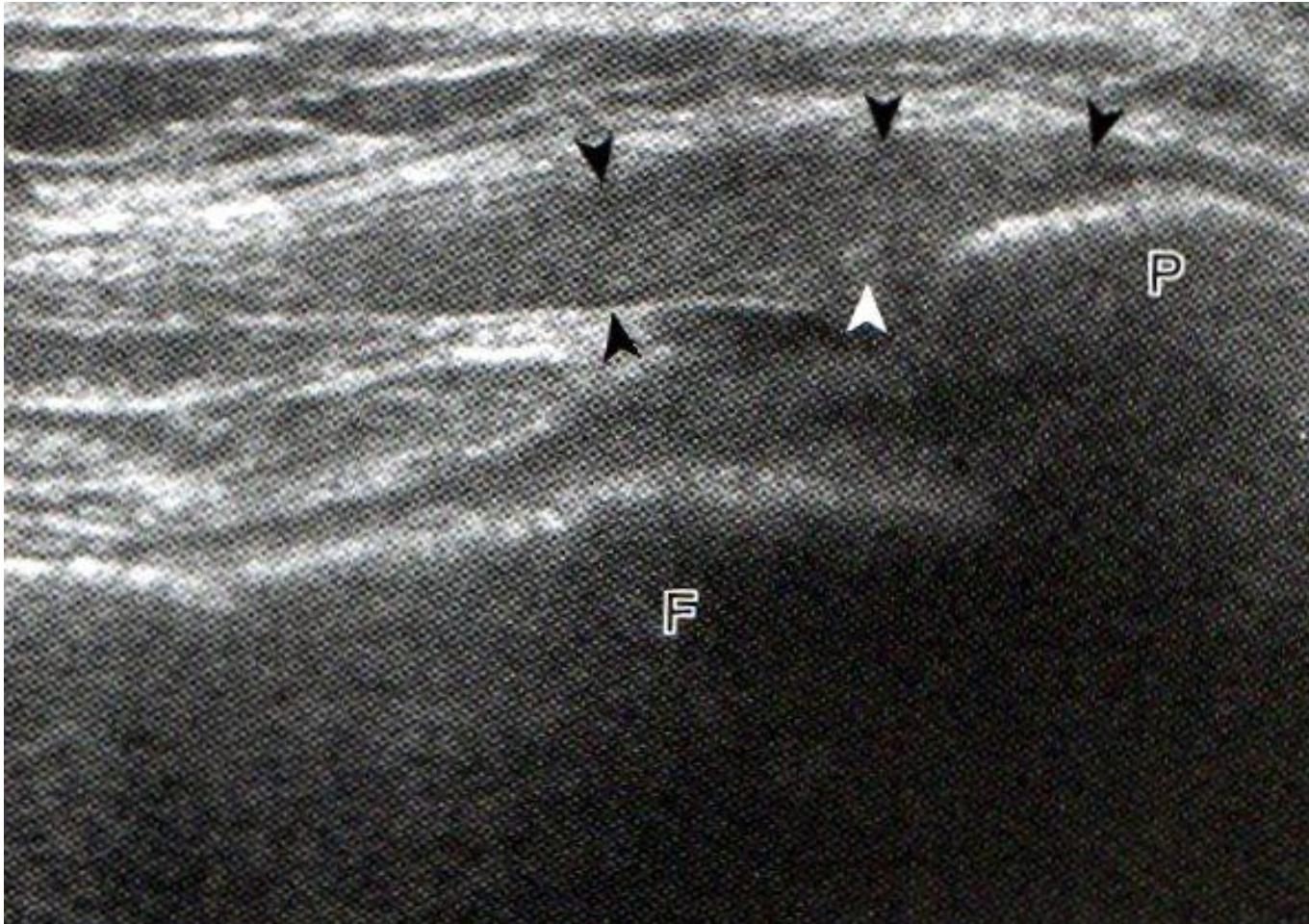


Left Image: Longitudinal sonogram of the distal quadriceps tendon (yellow shade) insertion on the patella (blue line/arrow).

Right Image: Corresponding longitudinal transducer position technique.

Good view to screen for joint effusion

Quad Tendinosis



- Hypoechoic thickening without disruption of fibers

Quad Full-Thickness Tear

- Curved arrow – bone avulsion
- Dynamic study – bone moves away with knee flexion
- Tendon may appear wavy

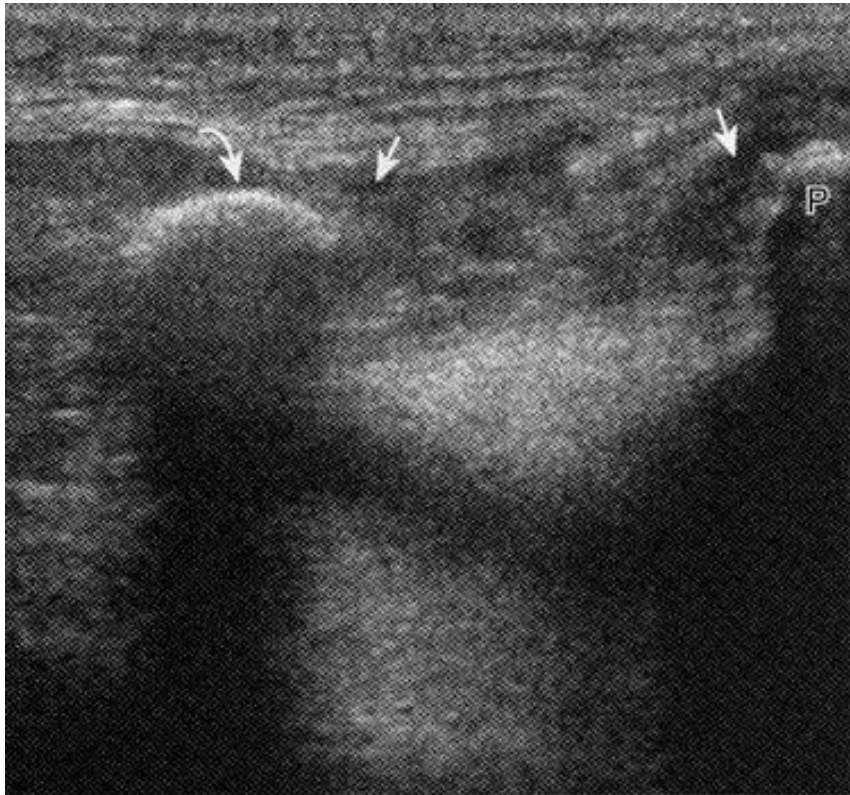
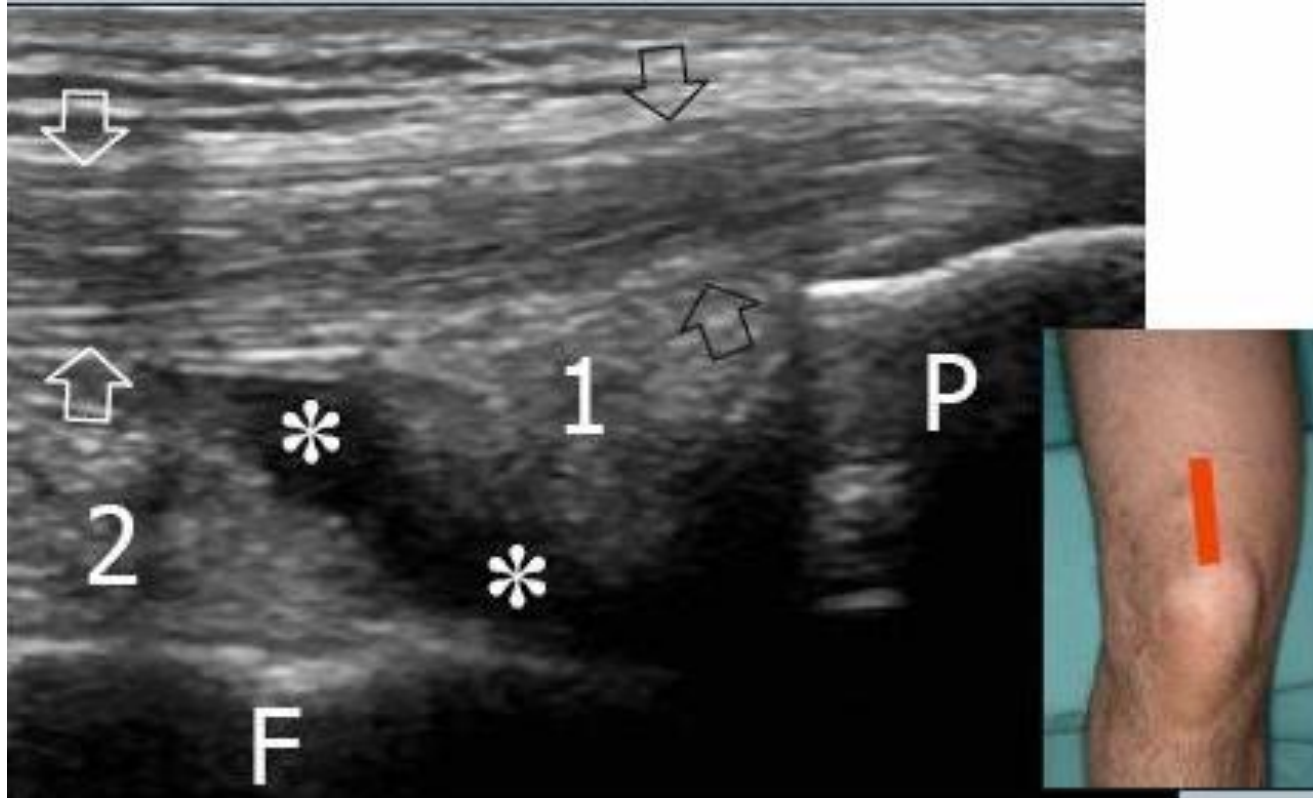


FIGURE 7-23 Quadriceps full-thickness tear. Longitudinal ultrasound image shows complete disruption of the quadriceps tendon (*arrows*) with superior patellar pole bone avulsion (*curved arrow*) (P, patella). The bone fragment moved away from the patella with passive flexion of the knee.

Suprapatellar Joint Recess: Effusion



*suprapatellar
synovial
recess with
small
EFFUSION

- Arrows – quad tendon
- 1 – suprapatellar /quadriceps fat pad
- 2 – prefemoral fat pad

Pre-Patellar Bursitis

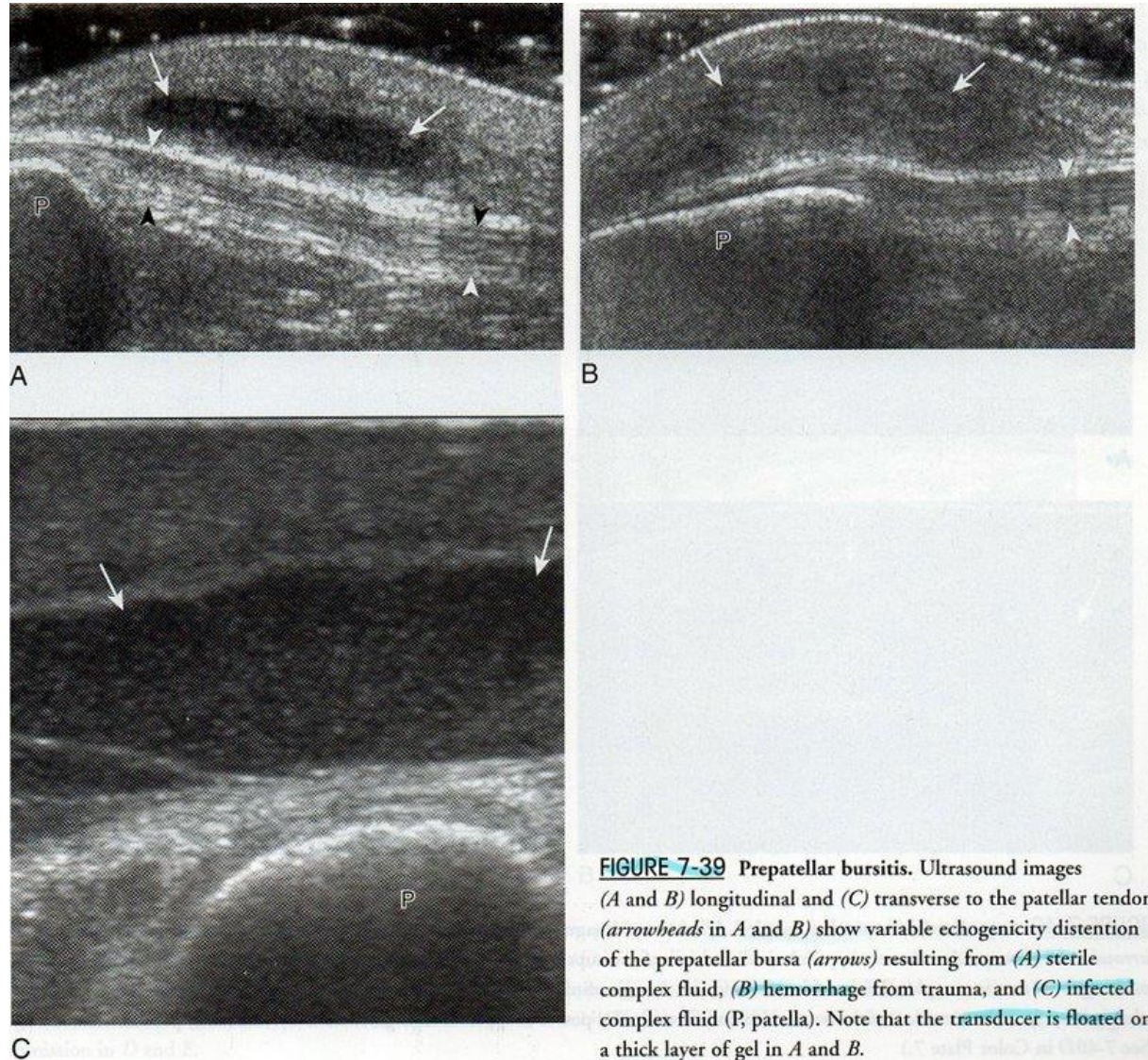


FIGURE 7-39 Prepatellar bursitis. Ultrasound images (A and B) longitudinal and (C) transverse to the patellar tendon (arrowheads in A and B) show variable echogenicity distention of the prepatellar bursa (arrows) resulting from (A) sterile complex fluid, (B) hemorrhage from trauma, and (C) infected complex fluid (P, patella). Note that the transducer is floated on a thick layer of gel in A and B.

- A / B – longitudinal
- C – transverse
- Transducer is floated
- Housemaid or carpet layer

Patellar Tendon - Longitudinal view



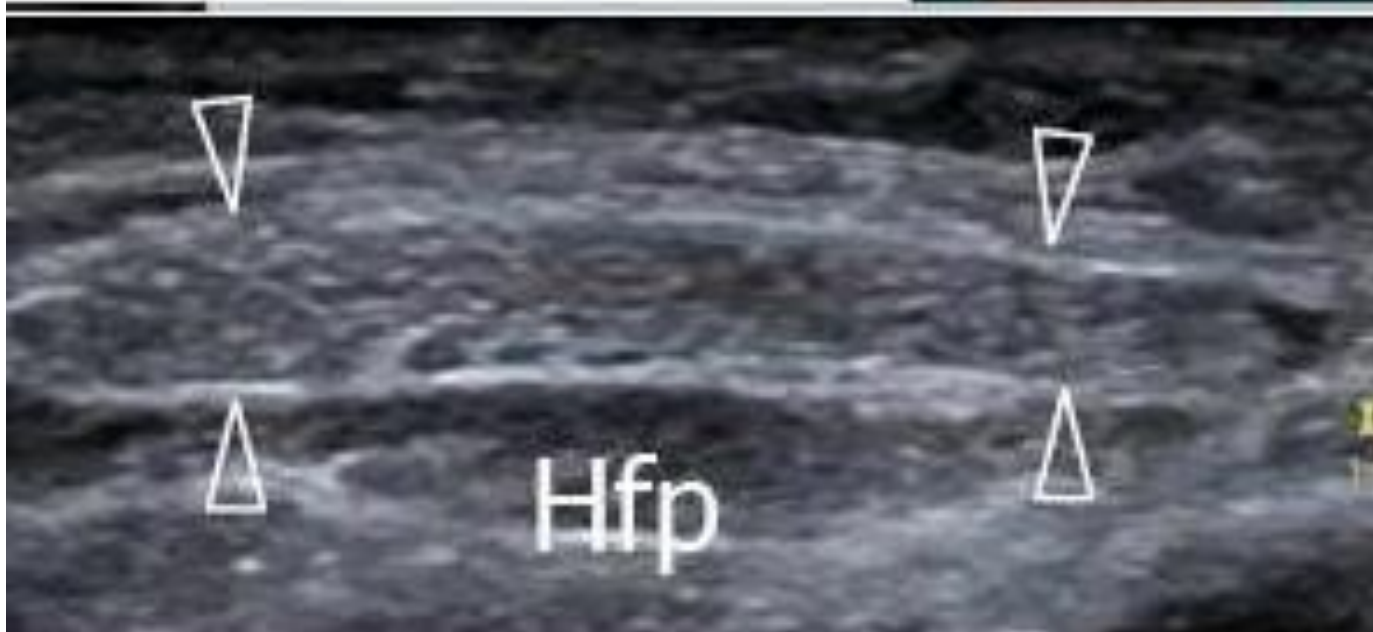
- A small deep infrapatellar bursa is normal



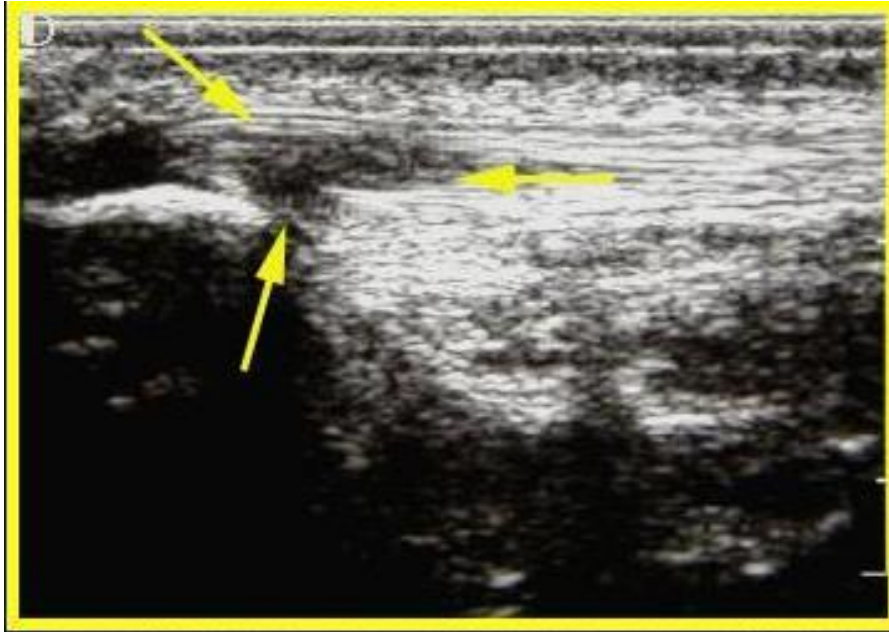
Legend: arrowheads, patellar tendon; arrow, deep infrapatellar bursa; Hfp, Hoffa fat pad; P, patella

Patellar Tendon - Transverse view

- Good for seeing partial tears or focal tendinosis



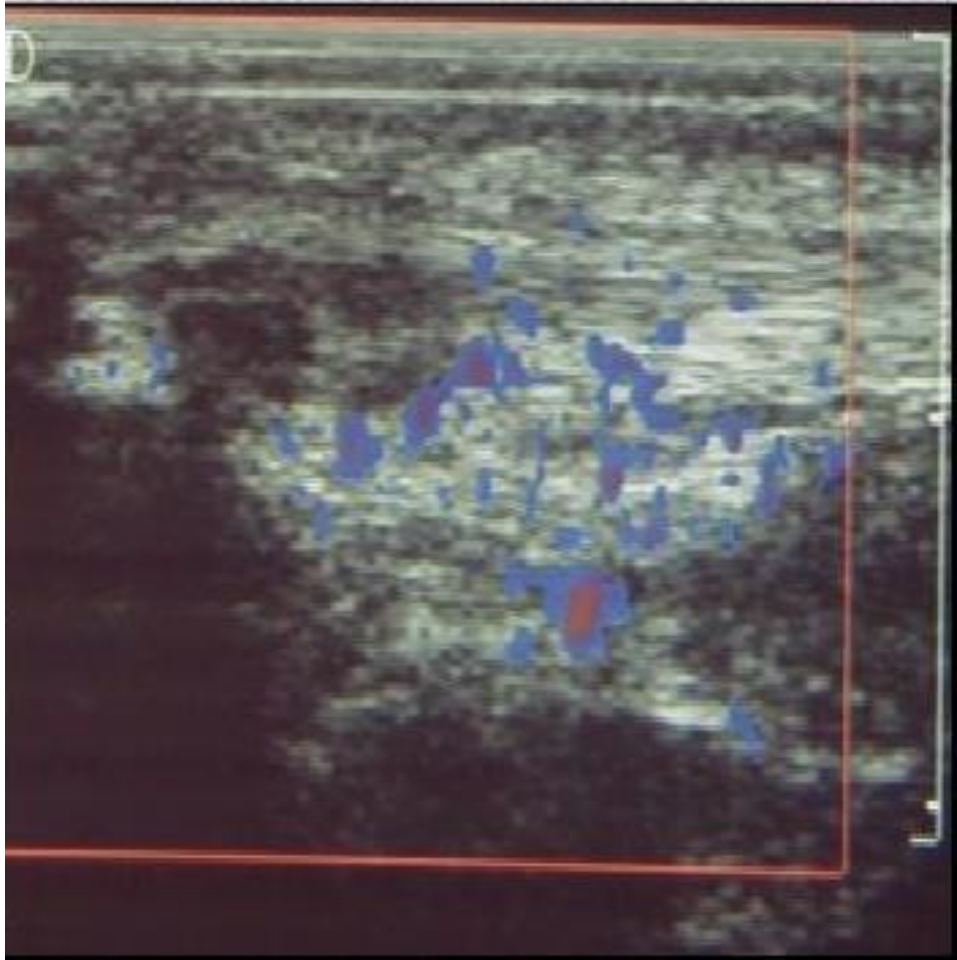
What is the Dx?



Left Image: Longitudinal sonogram of the proximal patella tendon at the origin from the patella (yellow arrows) shows an ill-defined hypoechoic and thickened region.

Right Image: Corresponding longitudinal transducer position technique.

You turn on Doppler and see...



Increased flow –
hyperemia / increased
vascularity (not really
inflammation)

Dx: Patellar tendinosis
AKA Jumper's knee

Medial Knee

- Patient remains supine, slight flexion of knee ($\sim 30^\circ$), hip with slight external rotation

OR

- Patient in lateral decubitus position, legs scissored
- Structures: joint space, medial / tibial collateral ligament, pes anserine tendons (sartorius, gracilis, semitendinosus) / bursa, medial patellar retinaculum, medial meniscus (valgus stress)

Technique

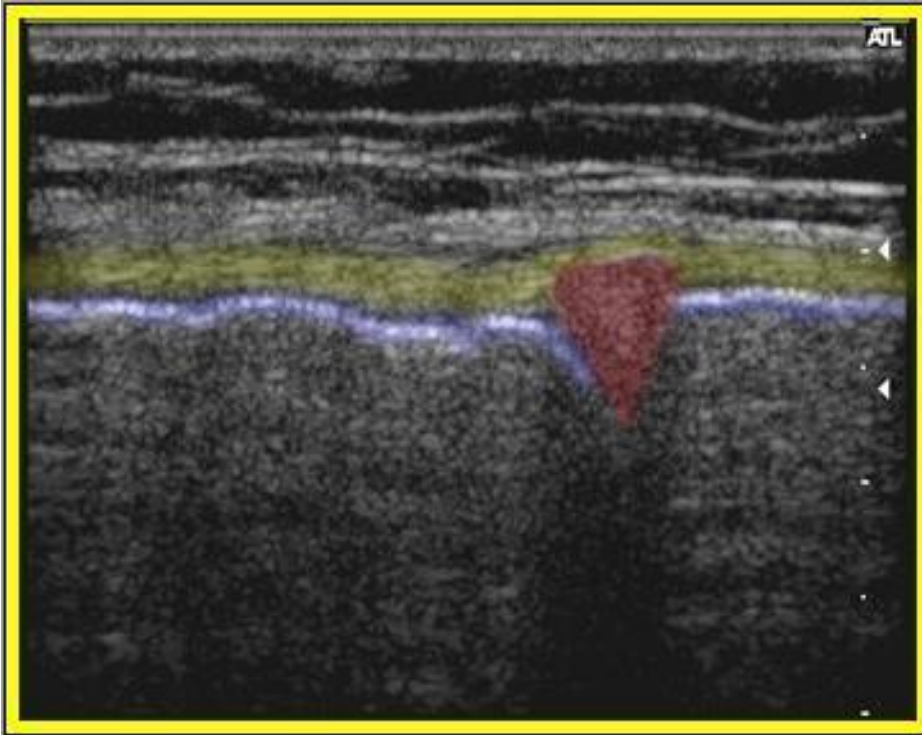


Medial knee



Lateral knee

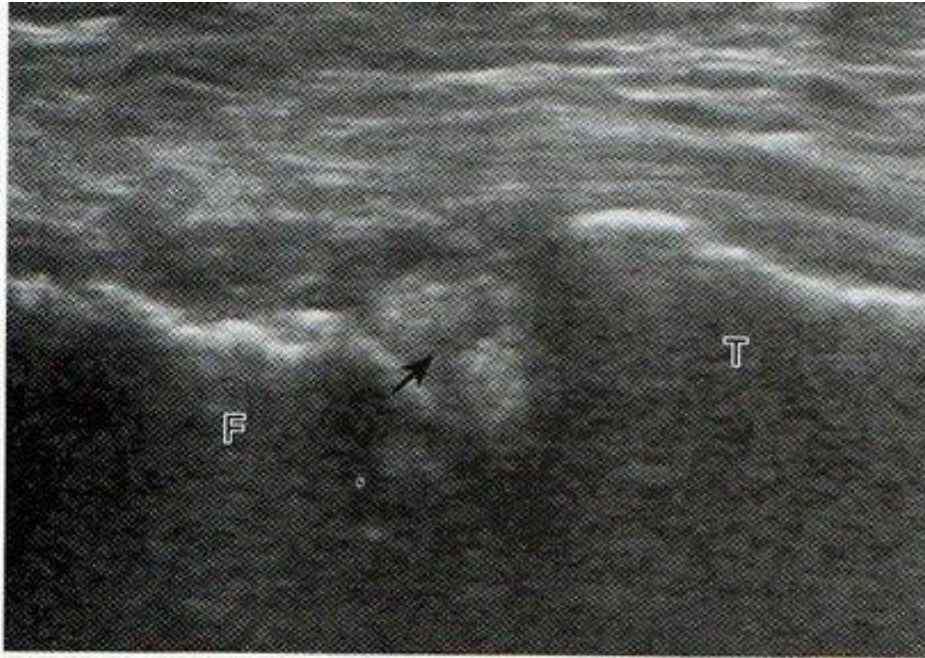
Normal Views



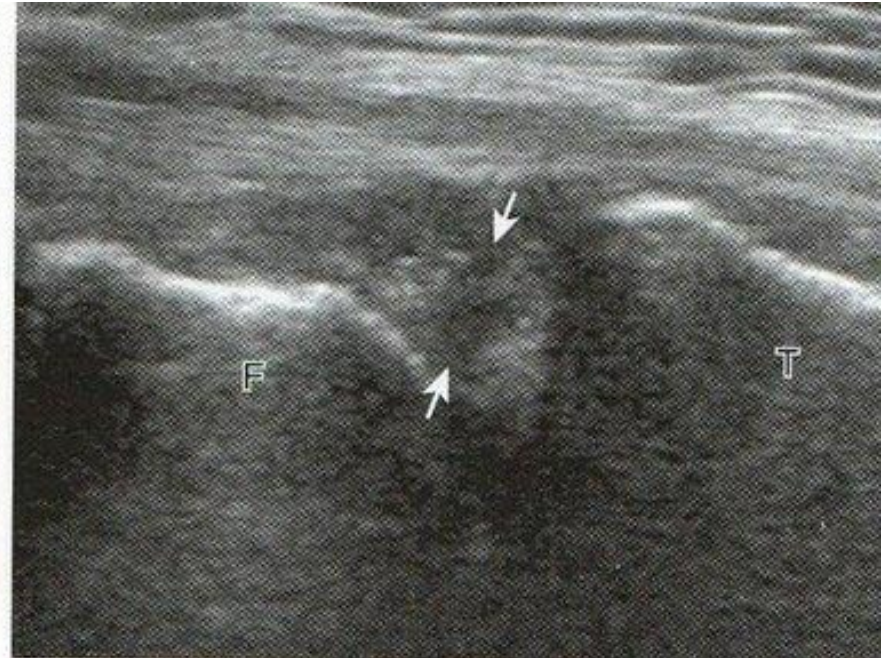
Left Image: Longitudinal sonogram of the medial collateral ligament (yellow shade). Note the distal femur and proximal tibial cortices medially (blue lines) and the medial meniscus (red shade).

Right Image: Corresponding longitudinal transducer position technique.

Meniscus Tear



C



D

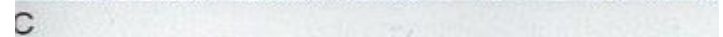
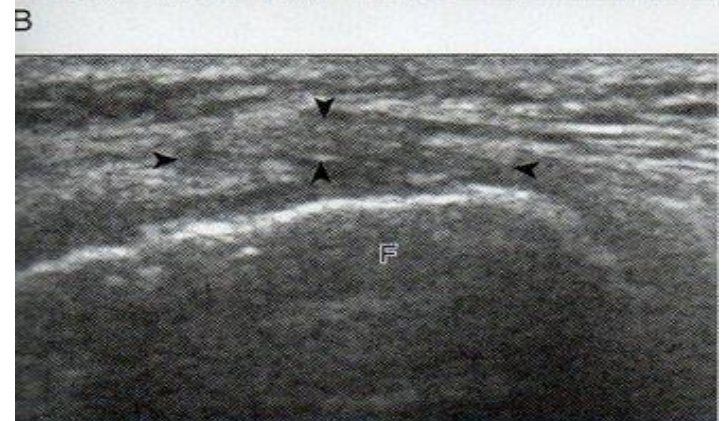
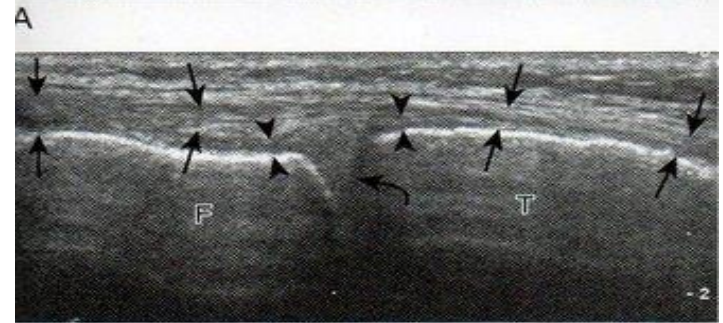
- Hypoechoic cleft
- ✓ Posterior horn medial meniscus most common tear location

MCL

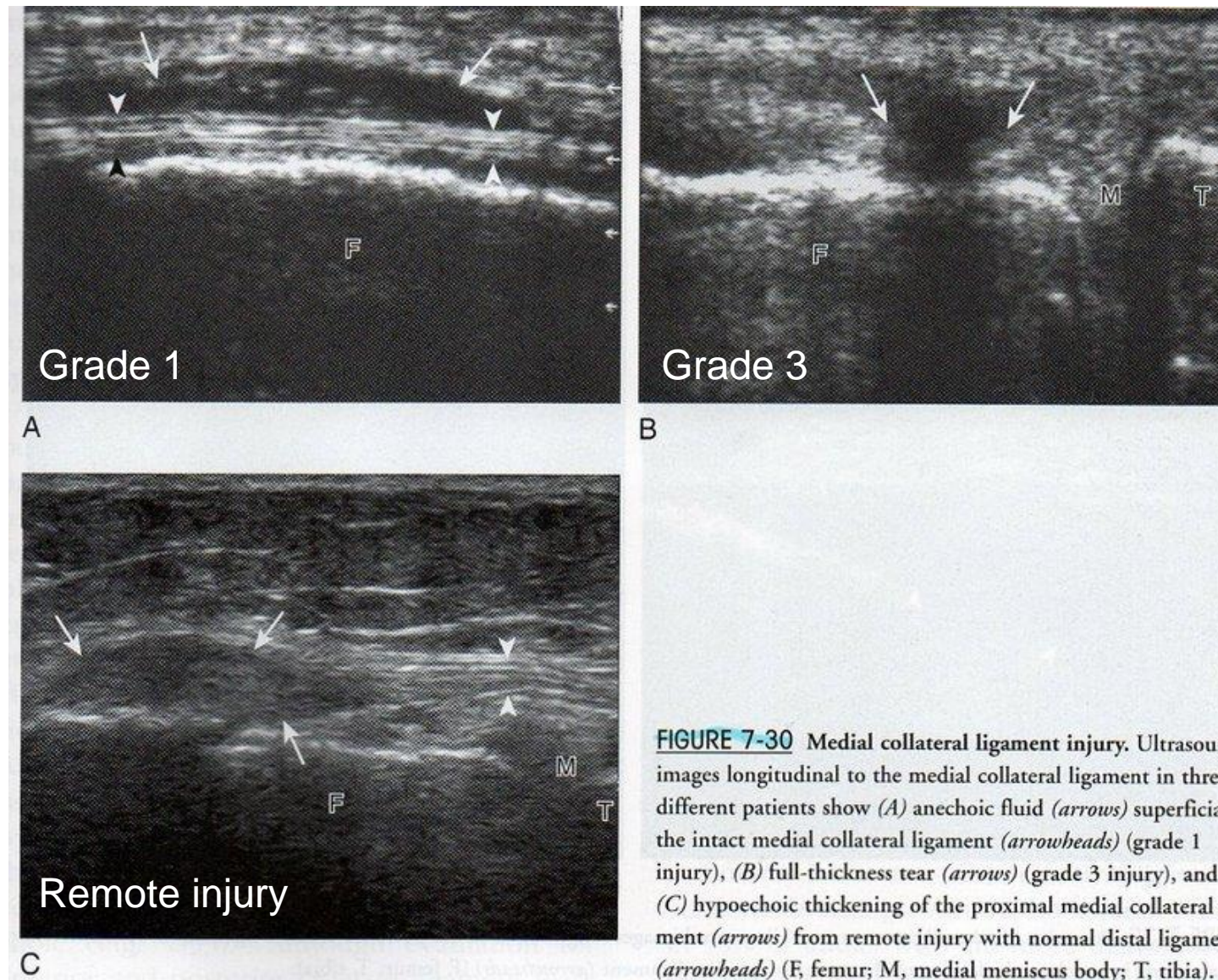
A – Technique

B – Arrows: superficial layer,
arrowheads: deep layer,
curved arrow: medial
meniscus

C – focus on this area for
tears...close to origin



MCL Injury

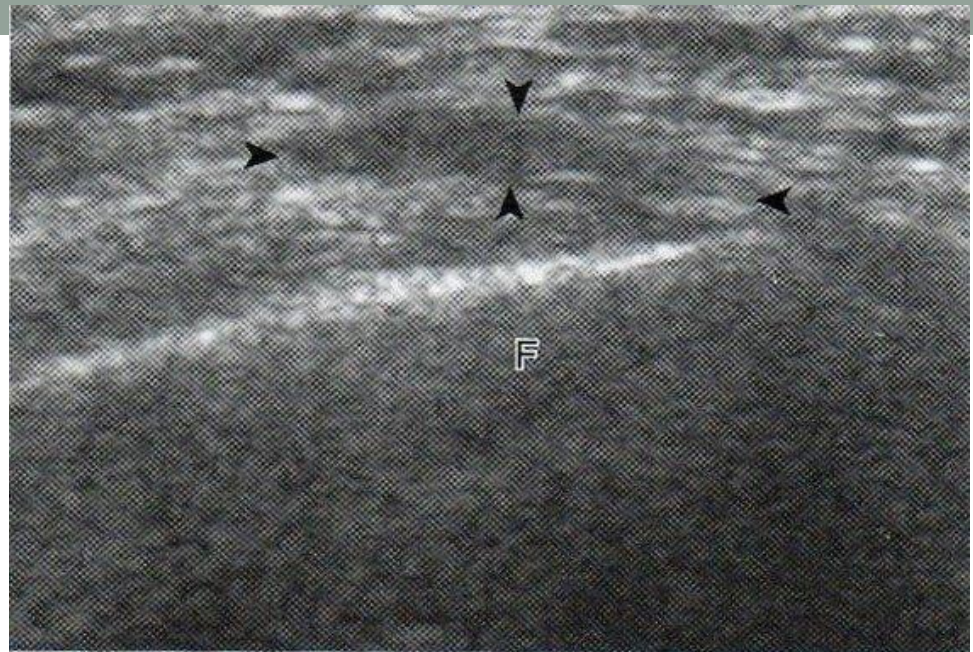


MCL / Pes Anserine

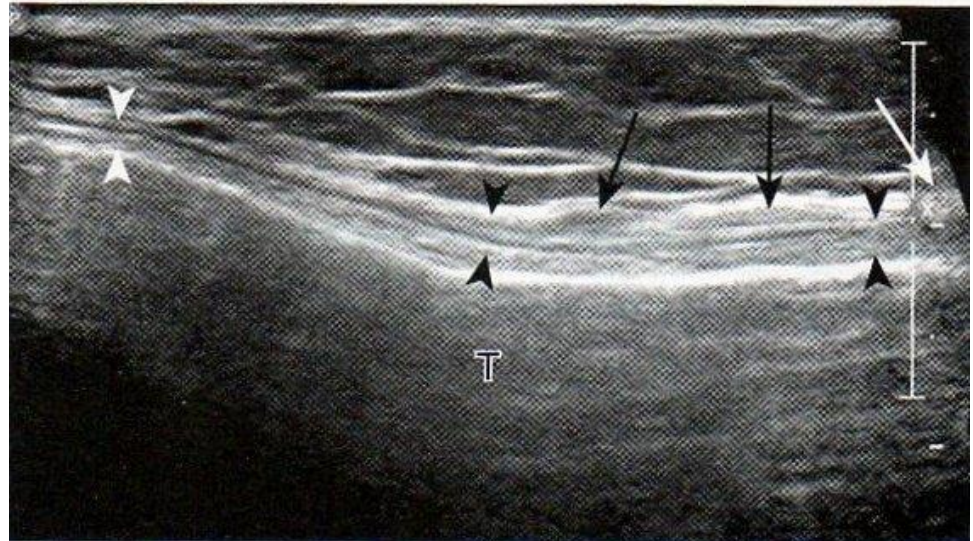
D – MCL anisotropy

E – Insertion

arrowheads:
superficial MCL
(inserts 4-5 cm
below joint line),
arrows: pes
anserine tendons
superficial to MCL



D



E

Lateral Knee

- Patient supine with ipsilateral hip internally rotated

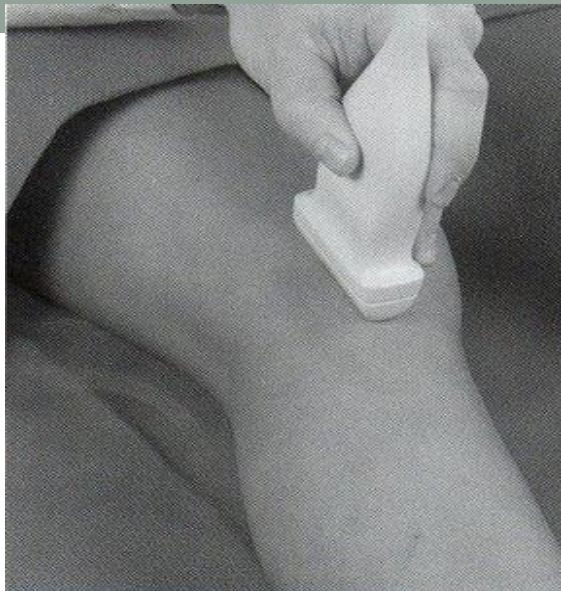
OR

- Patient in lateral decubitus position, pillow may be placed between knees for comfort
- Structures (post to ant): popliteus tendon, biceps femoris tendon, lateral / fibular collateral ligament, iliotibial band / bursa, lateral patellar retinaculum, lateral meniscus (varus stress)

Coronal view technique

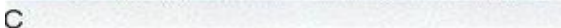
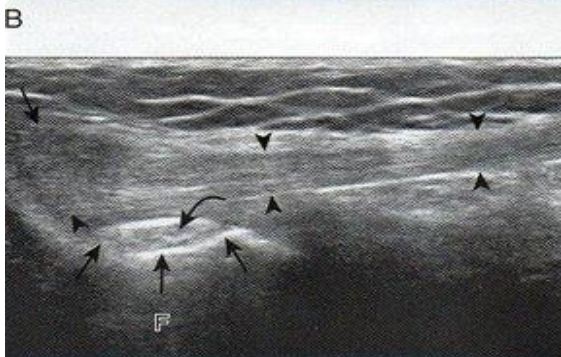
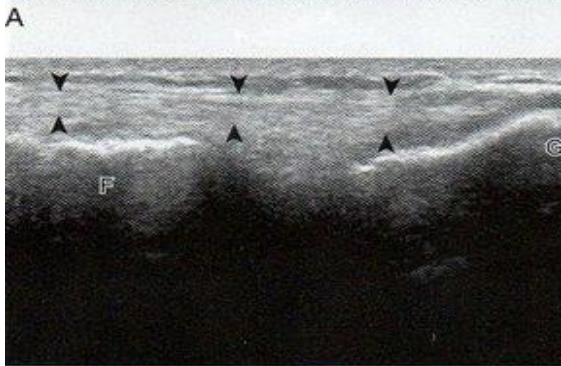


Normal coronal views



B: ITB - anterior to joint line, ITB, landing on Gerdy's tubercle

C: LCL - Rotate distal transducer posteriorly toward fibula to see proximal LCL, with popliteus origin deep to it. Sits in a sulcus that can be useful landmark



* In this position, may get valgus knee angulation, making LCL look wavy, with anisotropy. Consider putting support underneath, i.e. other leg

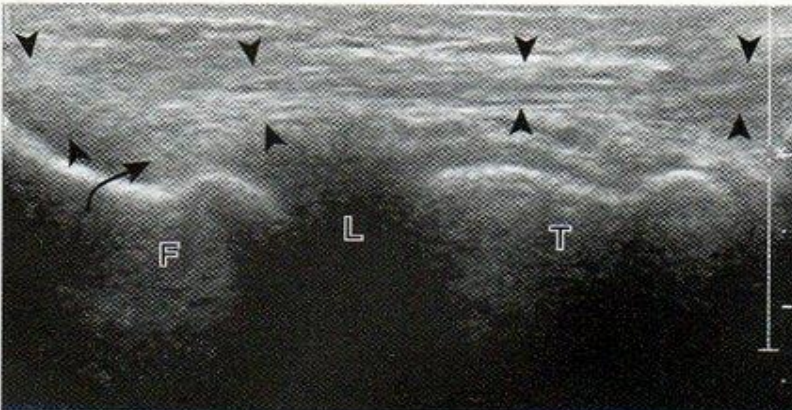
LCL

Coronal oblique view

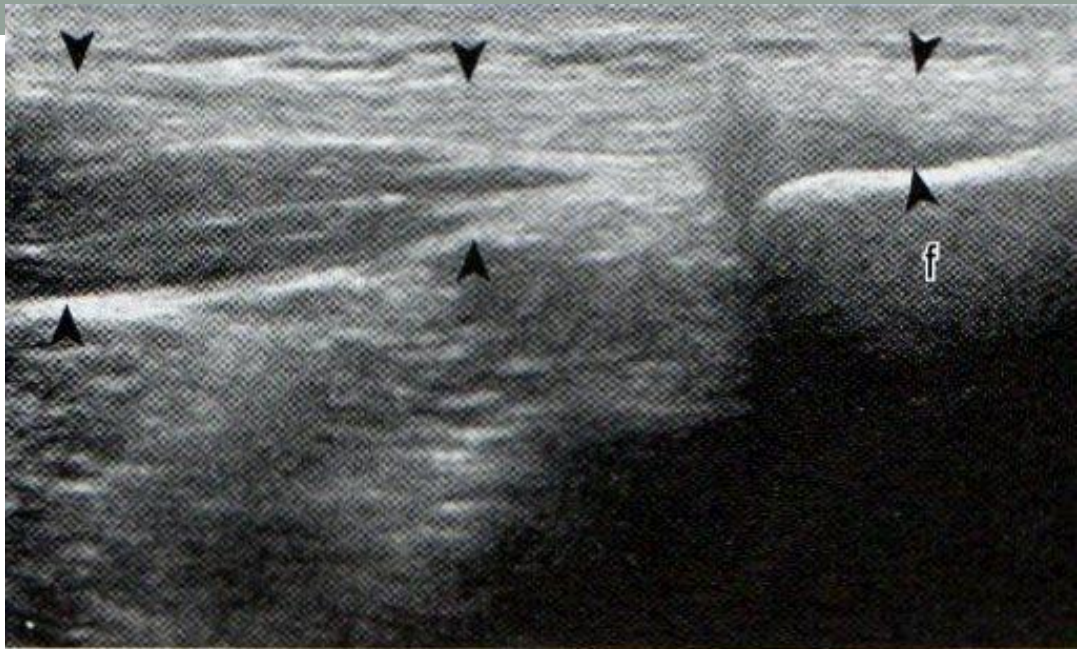


D

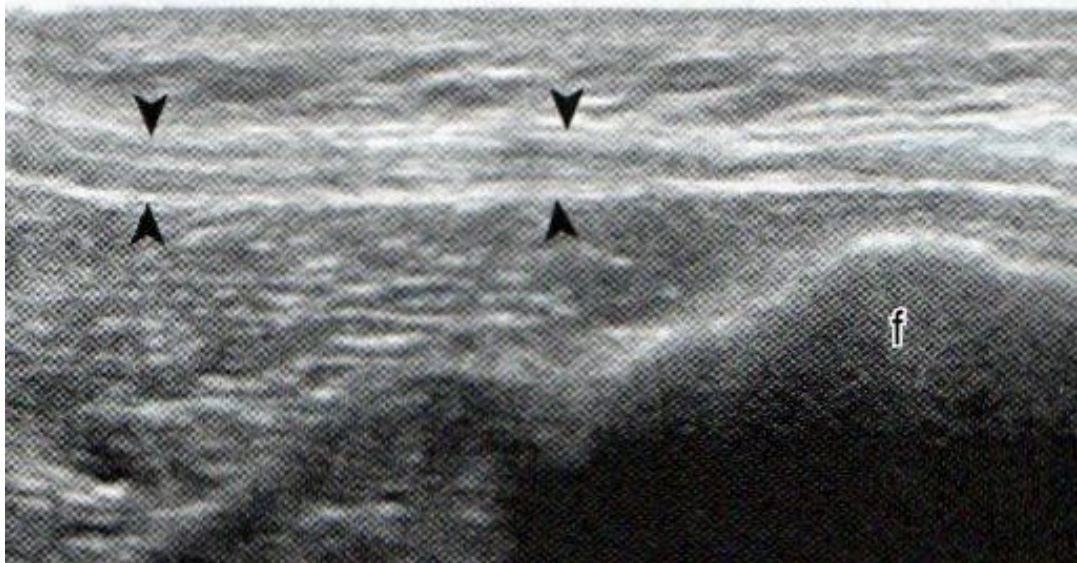
E: LCL, with popliteus origin deep to it on femur, L – lat meniscus, T – tibia, fibula on right edge of screen



E



G



Biceps Femoris:
Rotate superior
transducer
posteriorly...

G: Biceps femoris
inserting on fibula
(muscle more
hypoechoic than
ligament)

Bottom: move a little
more posterior to
see common
fibular nerve

Posterior Knee

- Patient prone, leg extended
- Consider dropping transducer frequency
- Structures: popliteal fossa, popliteal artery / vein, semimembranosus, medial / lateral gastroc muscles / tendons / bursae, sciatic / tibial / fibular nerves, posterior meniscal horns, PCL, intercondylar region and ACL

Technique



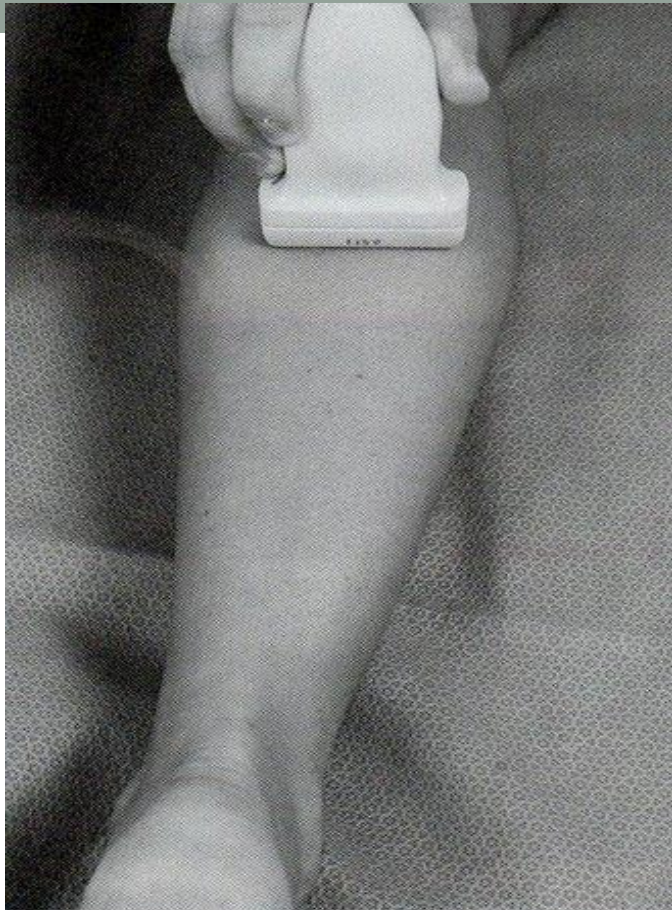
Longitudinal / Sagittal / (Long Axis)
(Short Axis)



Transverse / Axial /

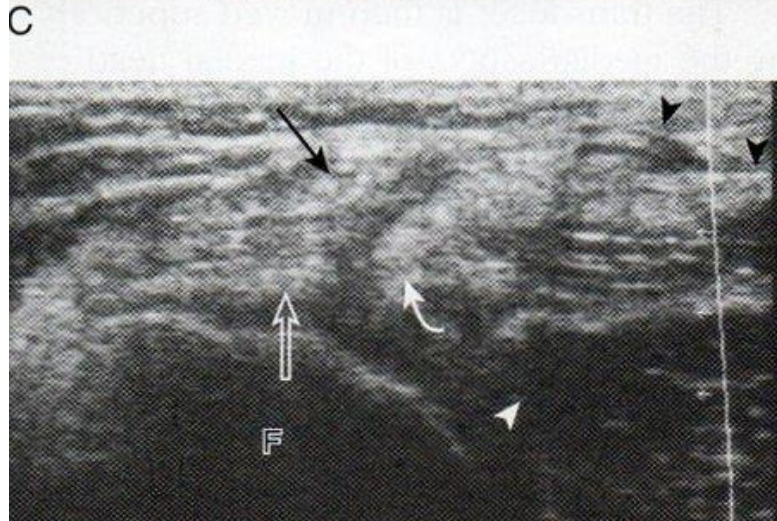
Posterior Calf

Medial gastroc, Lat gastroc
and Soleus

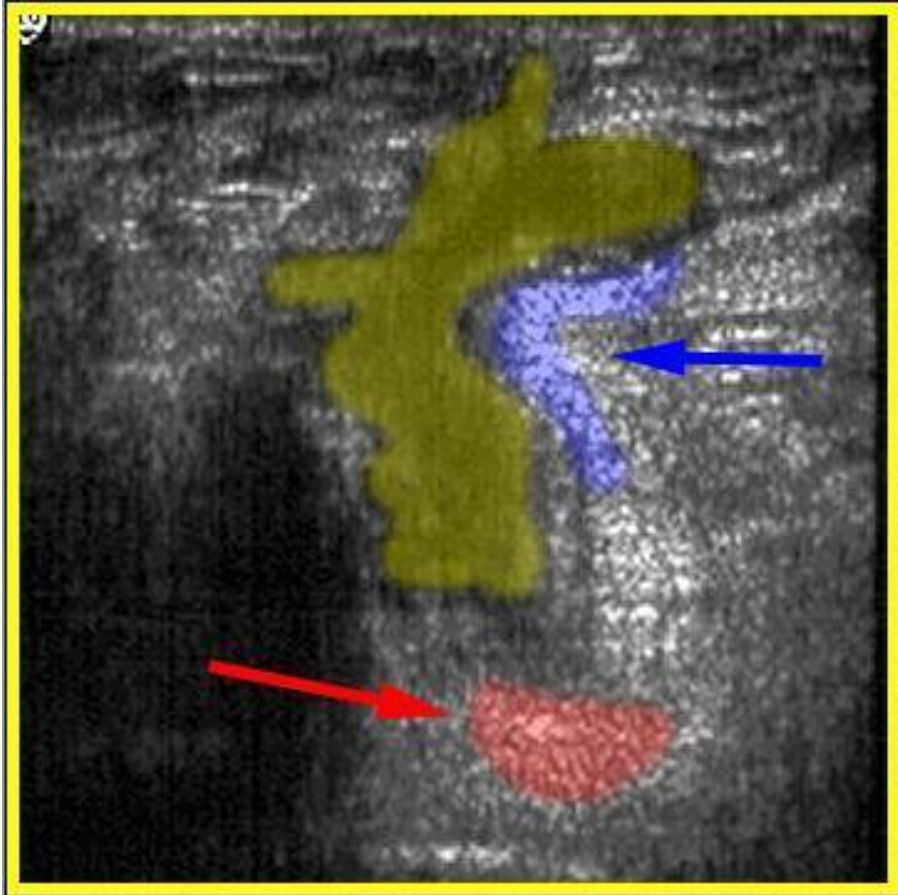


Medial popliteal fossa, transverse view

Right = lateral, F – femur,
black arrow –
semitendinosus, open
arrow –
semimembranosus,
arrowheads – med
gastroc, tendon is curved
arrow. Center of picture –
look for **BAKER'S CYST**
here



Transverse view



Left Image: Transverse sonogram of the posteromedial knee reveals a cystic lesion (yellow shade) extending between the medial head of the gastrocnemius tendon (blue shade/arrow) and the semimembranosus tendon (red shade/arrow).

Right Image: Corresponding transverse transducer position technique.

Postero-medial Knee: Baker's Cyst AKA semimembranosus – medial gastroc bursa

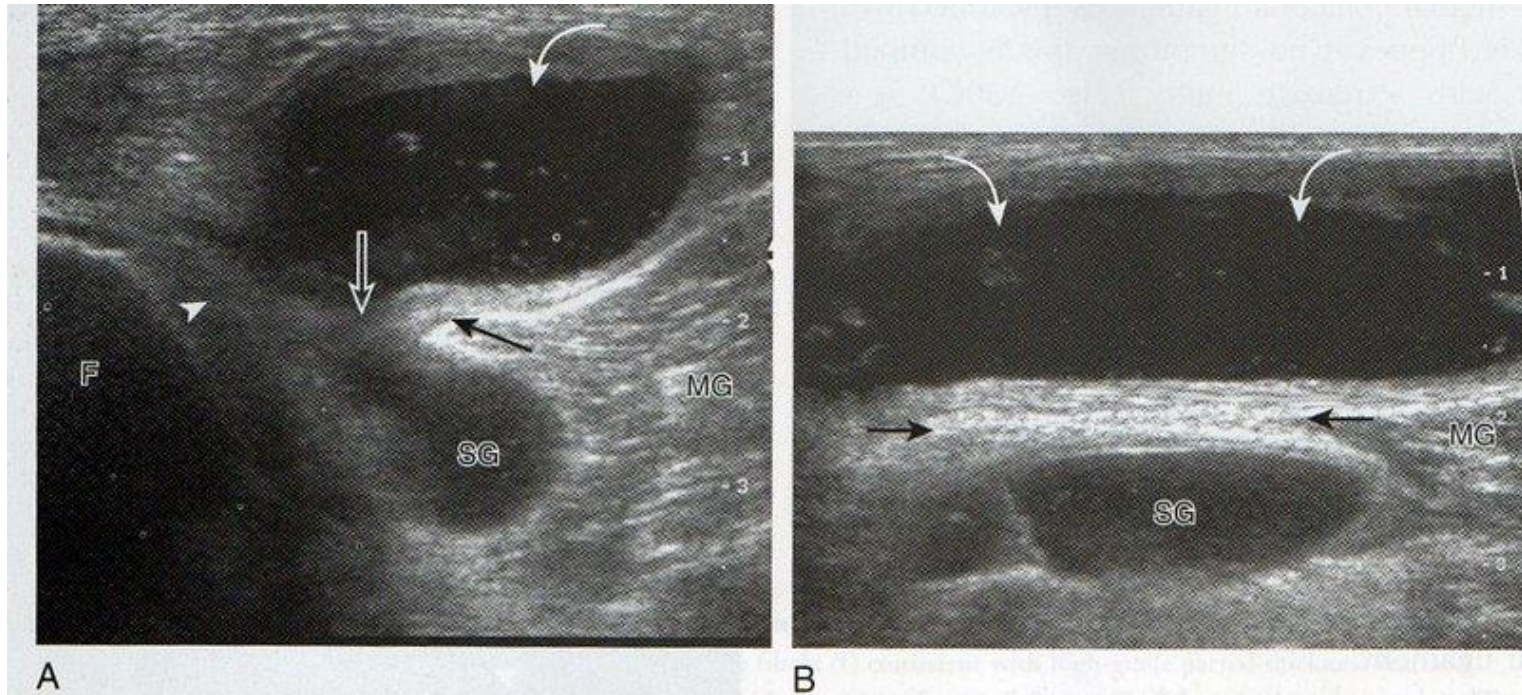
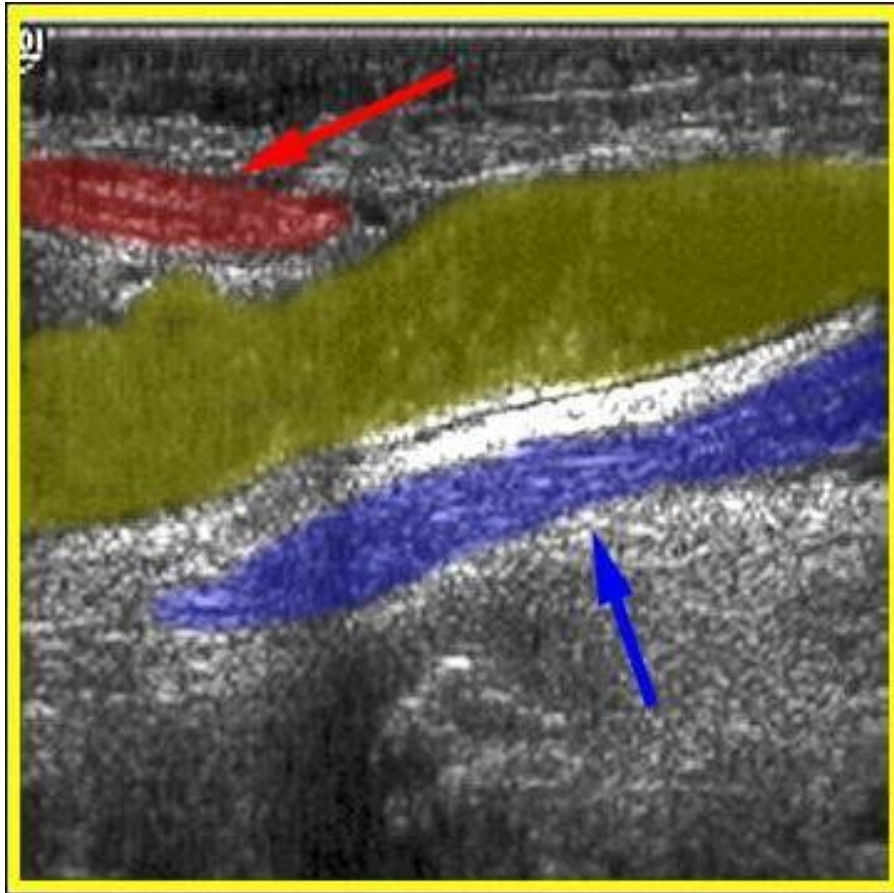


FIGURE 7-34 Baker's cyst. Ultrasound images transverse (A) and sagittal (B) over the posterior medial knee show predominately anechoic distention of the semimembranosus-medial gastrocnemius bursa (curved arrows). Note the communication to the knee joint (open arrow) between the semimembranosus tendon (arrowhead) and the medial head of the gastrocnemius tendon (arrows) and muscle (MG) via the subgastrocnemius bursa (SG) (F, medial femoral condyle).

Transverse on left, longitudinal on right. Open arrow – communication to knee joint via sub-gastrocnemius (SG) bursa (50% communicate to joint), black arrow – SM tendon

Longitudinal View



Left Image: Longitudinal sonogram of the posteromedial knee shows the large cystic lesion (yellow shade) again interposed between the medial head of the gastrocnemius tendon (blue shade/arrow) and the semimembranosus tendon (red shade/arrow).

Postero-medial Knee: Baker's Cyst AKA semimembranosus – medial gastroc bursa

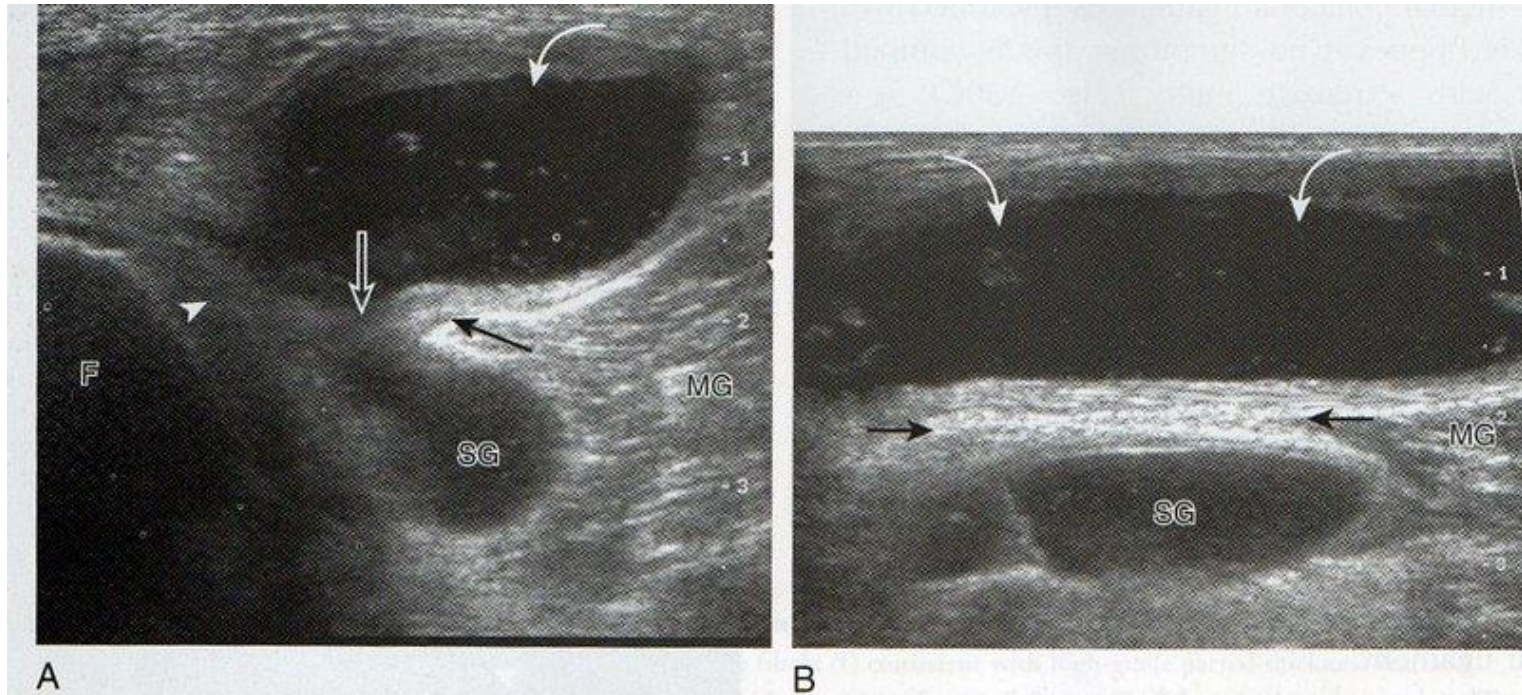


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