**The Knee**

MRI and Ultrasound are modalities of choice to evaluate the knee. MRI is preferred for chronic symptoms of internal derangement.

Ultrasound is the better choice when clinical presentation suggests tendon disease, bursal inflammation, ligament injury or capsular effusion.

---

**Quadriceps Tendon Longitudinal**

Identifying three interfaces is helpful in using supra-patellar pouch/bursa for intra-articular injections.

OA with minimal bursal effusion Ultrasound guidance adds increased accuracy

Check tendon pattern!


---

**Suprapatellar Bursa Measurement Lines**

Measurements

- Thickness: 2.5mm
- Length: 22.5mm

---

**Anterior Imaging**

Supine patient & LAX probe
A bolus for 30° flexion.
Landmarks: patella and femur

Quad Contraction enhances bursal interface

---
The Knee

Quadriceps Tendon Transverse

Three specific interfaces identified
Deep to Superficial

Quad Tendon

↑

Supra-patellar Bursa

↑

Femur

Needle advance:
Lateral to Medial
In-Plane

The Knee

Suprapatellar Bursal Aspiration

LAX
Pre-Aspiration

SAX
 Needle advanced

SAX
Post aspiration

The Knee

"Sunrise" View for Osteoarthritis

Supine patient with full flexion.
Supra-patellar ...
SAX Probe
Cortical outline of Femoral Trochlea and ANECHOIC hyaline cartilage should be smooth, homogeneous

The Knee

"Sunrise" View for Osteoarthritis

Cartilage Clarity/ Thickness

Sulcus Angle: ~ 130 degrees
Patello-Femoral joint conformation

Deeper (less than 130°) Early life
Flatter (more than 130°) Later life

US Data: Femoral Trochlea

Slide Courtesy
Victor Ibrahim, MD
US Data: Femoral Trochlea

Cartilage Clarity/ Thickness

Sulcus Angle: ~ 130 degrees
Patello-Femoral joint conformation

Deeper (less than 130°) Early life
Flatter (more than 130°) Later life

Slide Courtesy Victor Ibrahim, MD

Femoral Trochlea: Evaluation

- 20 Symptomatic
- 20 Asymptomatic

- No difference in thickness
- Positive Trend:
- Cartilage Clarity
- more indicative of OA

- Loss of clarity

The Knee
Patellar Ligament/Tendon Longitudinal

Two Subcutaneous bursae.
A = PRE patellar attached to patella
B = INFRA patellar Sub-Q. but distal.

one Deep Infrapatellar

The Knee
Patellar Tendon Longitudinal

Deep Intrapatellar Bursa

Deep to Patellar Ligament
Anterior to Tibia

Inflamed and painful
with Osgood-Schlatter' s

Panoramic View
Fat Pad & Joint Space

The Knee
Patellar Tendon Longitudinal

Panoramic View

* = Deep Intrapatellar bursa
3 Patellar Bursae

2 Subcutaneous (top of the tendon)
* Prepatellar - attached to patella
  Housemaid’s Knee
* Infrapatellar - distal on the tendon
  Vicar’s Knee

1 Deep Infrapatellar (beneath the tendon)
  Osgood-Schlatter’s disease

Pathologic due to a traction avulsion injury at the tendon insertion on the tibial tubercle.

Look Proximal... Distal... Above & Below the tendon.

The Knee
Sub - Q Pre-Patellar Bursal Effusion
Housemaid’s Knee

The Knee
Deep Infrapatellar Effusion
Osgood-Schlatter’s

The Knee
Patellar Tendon: “Jumper’s Knee”

Cause: repeated eccentric contraction of Quads... when landing from a jump.
Characterised as “tendinitis” of deep side proximal region of tendon

Doppler flow may be seen

US Data: Patellar Tendon

- **Thickmess**: 3.0-3.4 mm
- **Fibrillar Pattern**
- **Continuity of Fibers**

US low sensitivity MRI=US Specificity

The Knee
Lateral Imaging
The Knee
Lateral Collateral Ligament Longitudinal

The Biceps Femoris overlies the LCL. Both attach on the fibula. Imaging challenge is to not mistake BF for LCL.

Biceps Femoris
LCL Bursa
LCL

Semi-Decubitus patient with bolus on medial aspect of knee
Slight flexion “folds” the Biceps Femoris downward/posteriorward

The Knee
Lateral Collateral Ligament Longitudinal

Visualize fibular attachment where most LCL pathology occurs.

LCL is extra-capsular
Deep to LCL: Popliteus (a) ...Popliteal-Lat Fem Condyle bursa (b)...
Menisco-Femoral ligament (c)

The Knee
Peroneal Nerve

SAX probe at postero-lateral Fibula demonstrates PN
Smaller of the two terminal branches of the Sciatic nerve.

SN= Sciatic Nrv  TN= Tibial Nrv  PN= Peroneal Nrv

The Knee
Medial Imaging

A flat band-like ligament nearly 9cm in length
Anterior and posterior portions give it a “tri-laminar” appearance, best seen at it’s proximal portion
Sartorius is adjacent posteriorly to MCL in LAX
The Knee
Medial Collateral Ligament Longitudinal

Supine patient with external rotation
Trace the ligament proximally and distally
MCL is “tendon-like”...fibrillar
Dynamic valgus stress may reveal defects

Multiple defects in MCL
Menisco-femoral portion and Tibial side

The Knee
US Data: Medial Knee

- Medial Collateral Ligament
  - Proximal Thickness: 3.5mm
  - Distal Thickness: 2.0mm

- Pes Anserine Bursa: 2mm
- Medial Meniscus: Homogeneity/Stability

The Knee
MCL Longitudinal Distal Attachment
Not to be confused with the overlying Pes Anserinus Tendon

Deep
Superficial

Pes Anserine Bursa Interface
Linear band superior to MCL

Pes Anserine Bursal Effusion

Pes Tendon
Longitudinal View
Short Axis View
The Knee
Periosteal Reaction/Inflammation
Anterior Tibia

Longitudinal View

Short Axis View

The Knee
Medial Plica Syndrome

Young Adolescents
30° Flexion
Translate Patella Medially
Loss of retro-patellar cartilage

A ribbon-like fold of synovium
Embryologic remnant
Accumulation is retro-patellar

The Knee
Medial Plica Syndrome

The Knee
Medial Patello-Femoral Ligament

A crucial medial stabilizer.
Traverses from supero-medial patella to adductor tubercle of femur

The Knee
Medial Patello-Femoral Ligament

Axial probe placement at supero-medial patella,
abruptly oriented onto adductor tubercle.

MPFL is the hyperechoic middle portion of Medial patellar retinaculum

The Knee
Medial Patello-Femoral Ligament

Medial Meniscus Longitudinal

From a postero-medial approach scan through superficial muscles to homogenously echogenic triangle of the deeper MM.
The Knee

Medial Meniscus Longitudinal

Patient supine
External rotation of leg
LAX probe

MCL is superficial to MM
Dynamic valgus stress
may demonstrate meniscal excursion beyond joint margin

The Knee

Posterior Imaging

The Knee

Popliteal Fossa in Cross-section

Baker's cysts have a "tell-tale" conformation by displaying a unique neck of origin.
As effusion enlarges between the Medial Gastrocnemius and Semi-Membranosus tendon

The Knee

Popliteal Fossa : Baker's Cyst

True Baker's cyst ...
* is INTER-MUSCULAR
* originates on medial side
* has a distinct neck of origin

What is this lump on my knee?

Prone patient position
SAX probe @ crease scanning thru the joint space.

The Knee

Popliteal Fossa : Baker's Cyst

The medial Gastroc is seen in cross-section. The Nerve...Vein...Artery in a "Stack" formation
Popliteal Fossa: Neuro-Vascular Bundle
The Nerve – Vein – Artery “Stack”

Sonopalpation allows localization of the...
HYPER-echoic Tibial nerve
Compressible Popliteal vein
Non-compressible ... Pulsatile Popliteal artery

Deep Vein Thrombosis
Formation of a clot in a deep vein.
US Findings: Non-compressible... Popliteal Vein

Thank you!