

Ultrasound- guided injection of the knee

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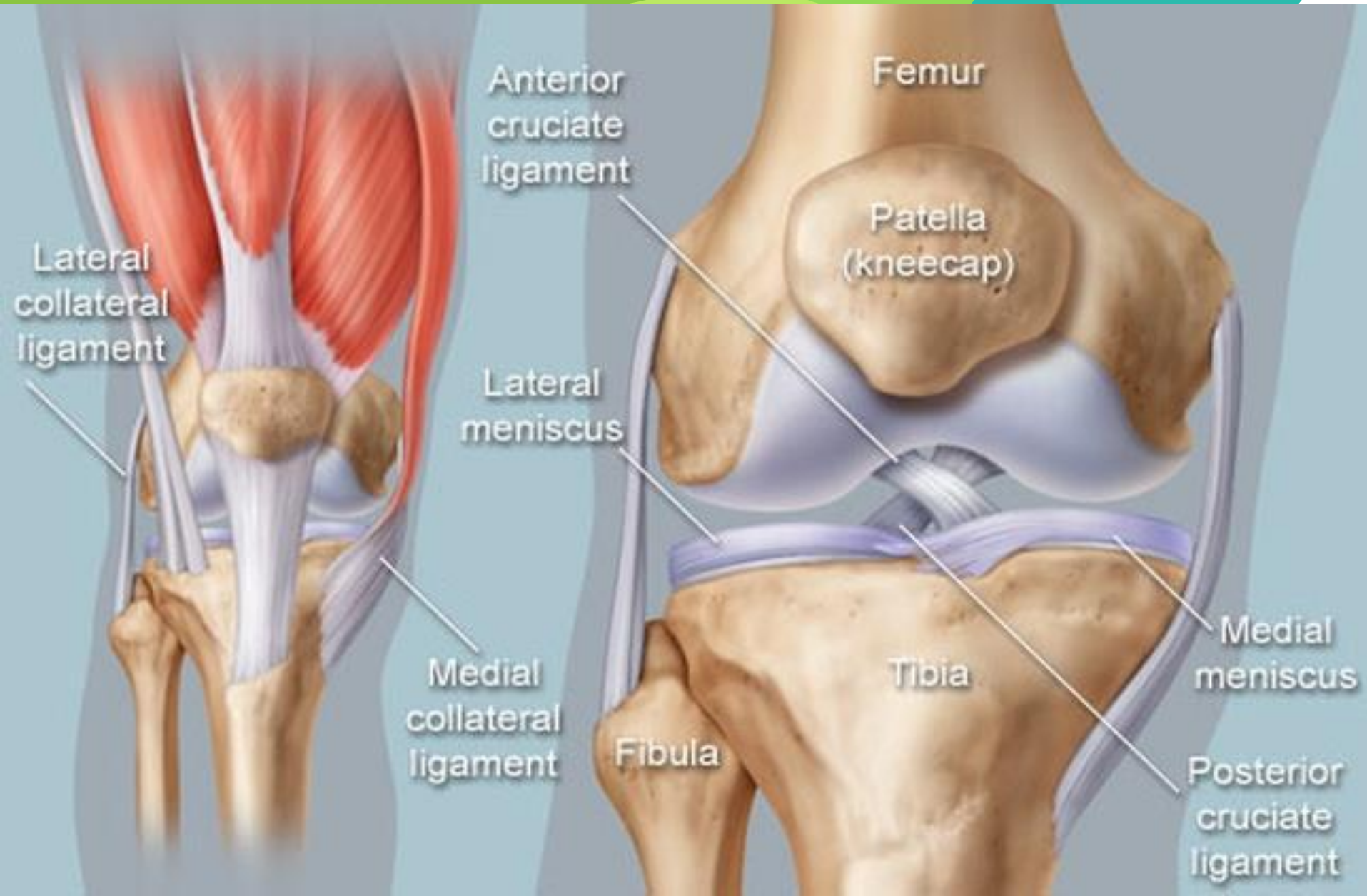
Ultrasound- guided injection of the knee

- Sono-anatomy of Knee joint.
- Different approaches for knee injections.

Overview

- The knee is one of the largest and most complex joints in the human body.
- Complex anatomy:
 - 4 Bones (femur, tibia, fibula and patella)
 - Two C-shaped pieces of cartilage, medial and lateral menisci (shock absorbers).
 - Muscles connect the knee bones to the leg muscles that move the knee joint.

Anatomy of the knee Joint



Anatomy of the knee Joint

Pes Anserine Bursitis

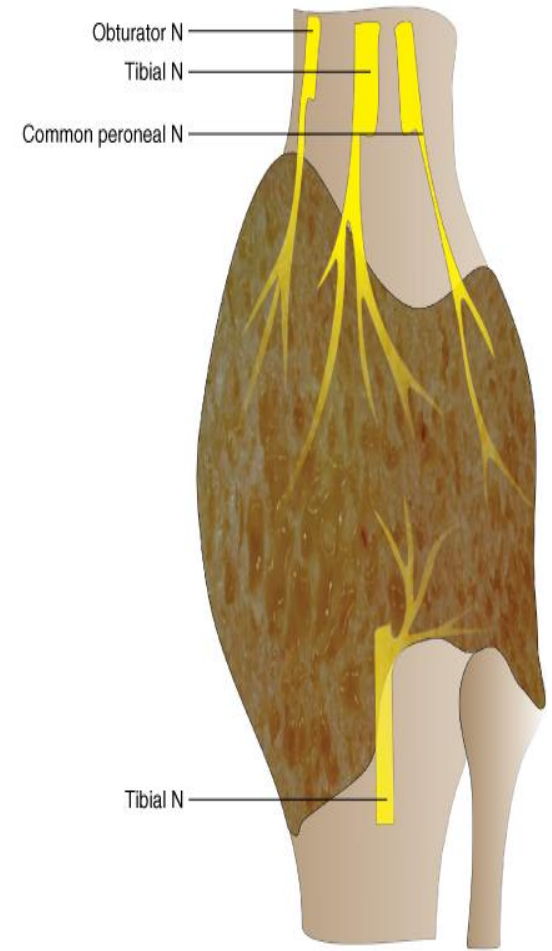
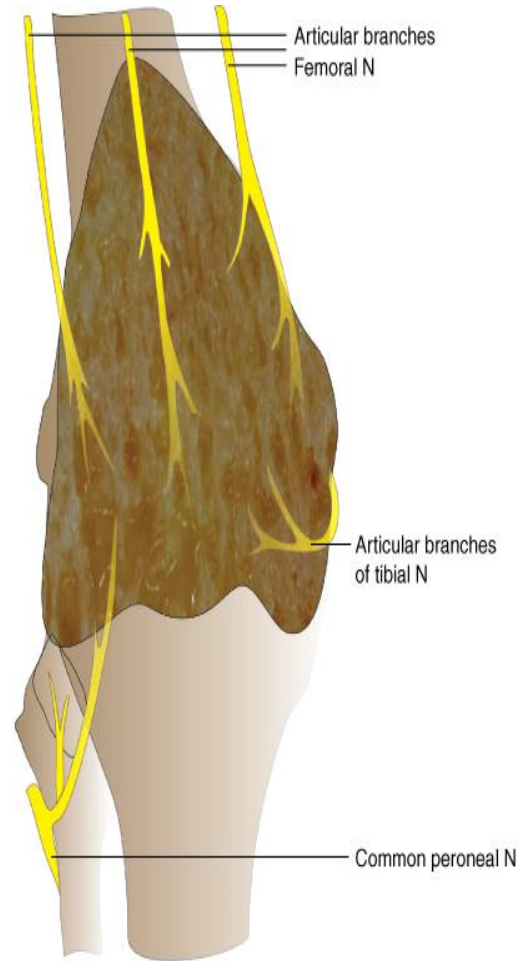


Causes of knee pain

- Knee : osteoarthritis, effusion, meniscal tear, Ligament strain or tear (ACL, PCL and MCL).
- Muscles: spasm and tendonitis.
- Bursae: Knee bursitis

NERVE SUPPLY TO THE KNEE

The nerves that run through the knee are the obturator, femoral, tibial. And common peroneal nerve.

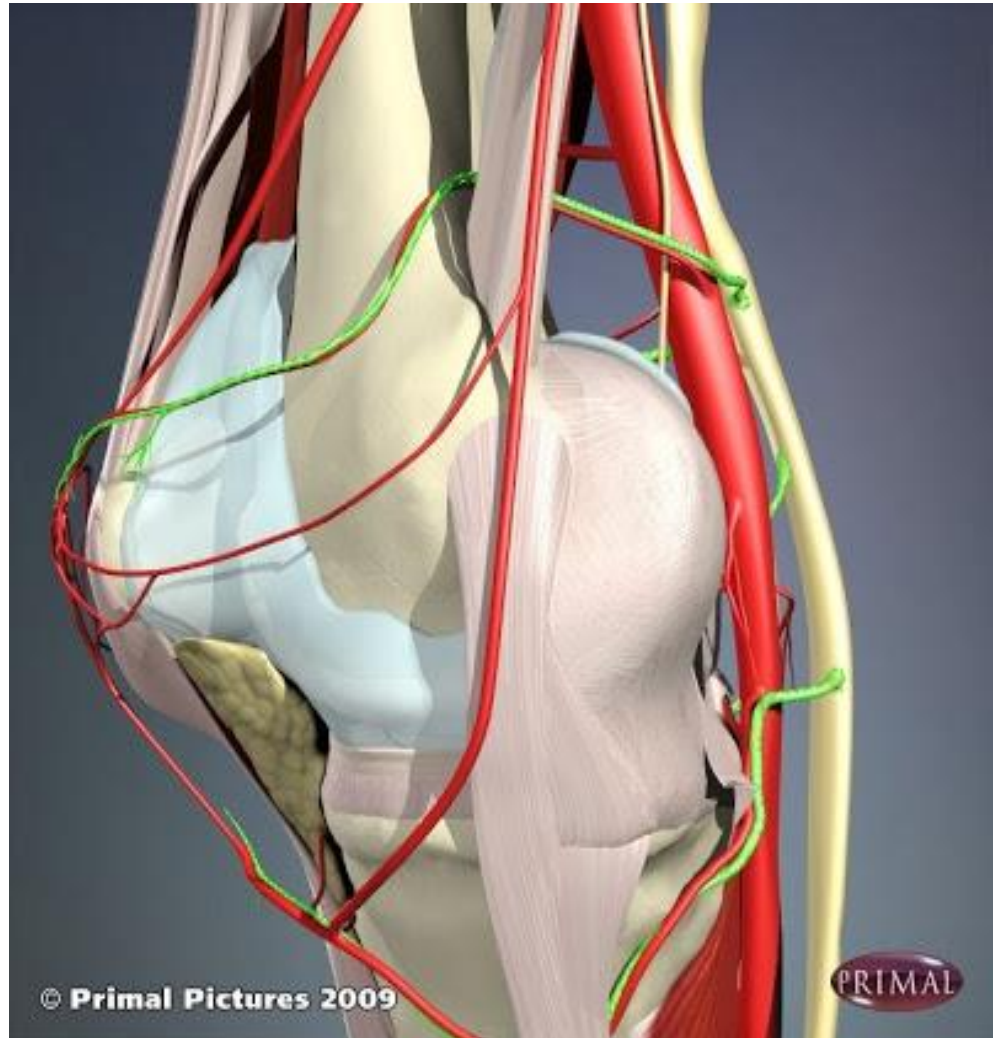


Source: Hadzic A: *Hadzic's Peripheral Nerve Blocks and Anatomy for Ultrasound-Guided Regional Anesthesia*, 2nd Edition: www.accessanesthesiology.com

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Genicular arteries and nerves

- Genicular nerves are sensory nerves and are branches of the tibial, common peroneal and obturator nerves.
- They supply the capsule of the knee joint as well as the intraarticular and extraarticular ligaments.
- They accompany the correspondingly named arteries.



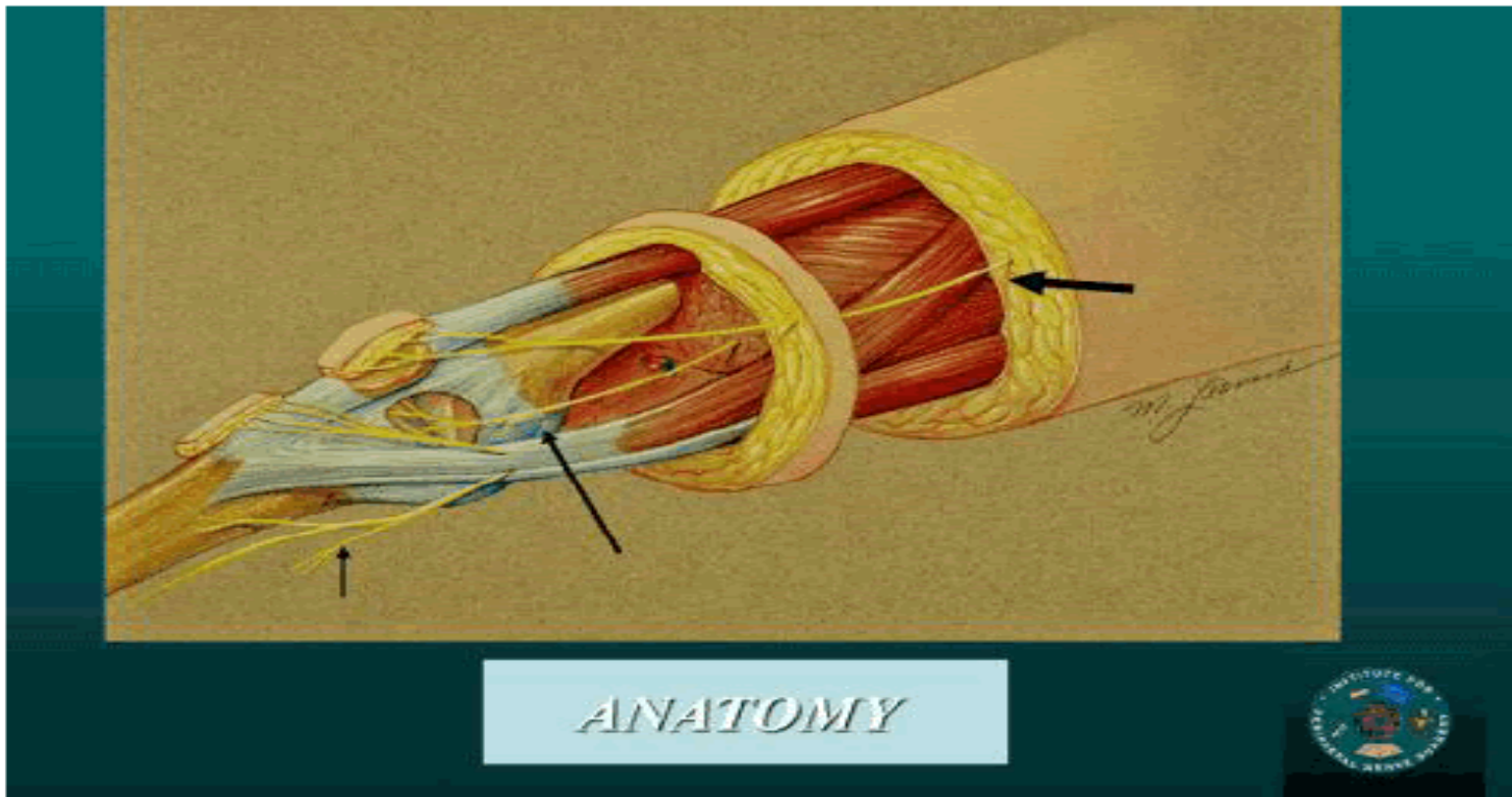


Figure 1: Medial view of the innervation of the knee. The skin overlying the patella is innervated by the medial cutaneous nerve of the thigh, a branch of the saphenous nerve (thick arrow). The medial joint structures are innervated by a branch of the femoral nerve, the medial retinacular nerve, which, after innervating the vastus medialis, continues distal and then anterior to this muscle, to enter the ligamentous structures of the knee joint (long thin arrow). This nerve lies superficial to the synovium and deep to the medial retinaculum. The saphenous nerve's infrapatellar and distal branches are shown in their most common variation (short thin arrow). The nerve to the patellar skin is from the medial cutaneous nerve of the thigh (short thick arrow) (With permission, Dellon.com).

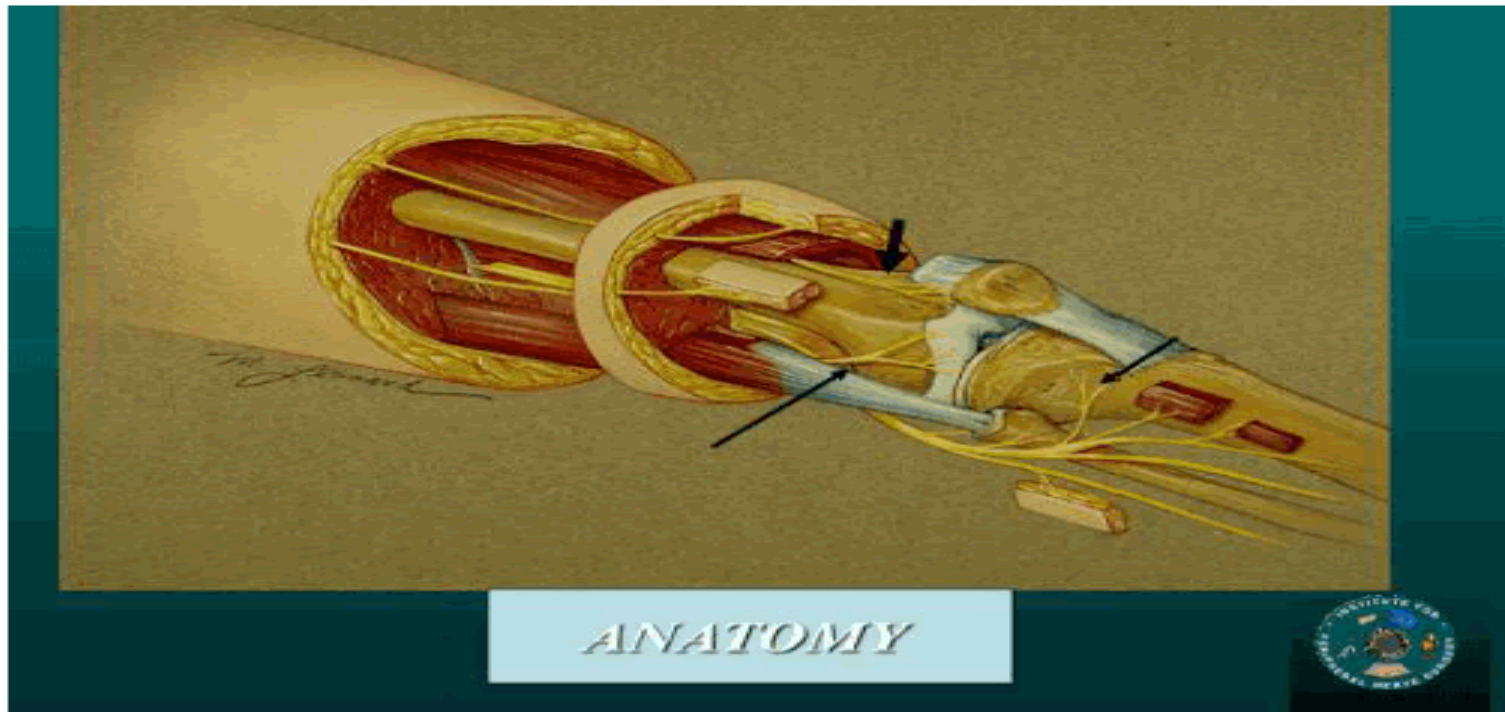


Figure 2: Lateral view of the innervation of the knee. The skin in this area represents the terminal branches of the lateral femoral cutaneous nerve. The lateral joint structures are innervated by a branch of the sciatic nerve that comes from the popliteal fossa, goes deep to the biceps tendon to enter the joint, the lateral retinacular nerve (long thin arrow). The nerve passes just distal to the vastus lateralis, and then lies superficial to the synovium and deep to the lateral retinaculum as it enters the joint. The branches of the sciatic nerve to the posterior knee joint capsule are shown next to the femur posteriorly. The branch to the pre-patellar bursa is shown on the anterior surface of the femur as it exists the vastus intermedius. The innervation of the proximal tibiofibular joint is shown as branches proximal and distal to the fibular head, arising from the common peroneal nerve (short arrow). The terminal branch of the nerve to the vastus intermedius innervates the prepatellar space (short thick arrow). (With permission, Dellon.com).

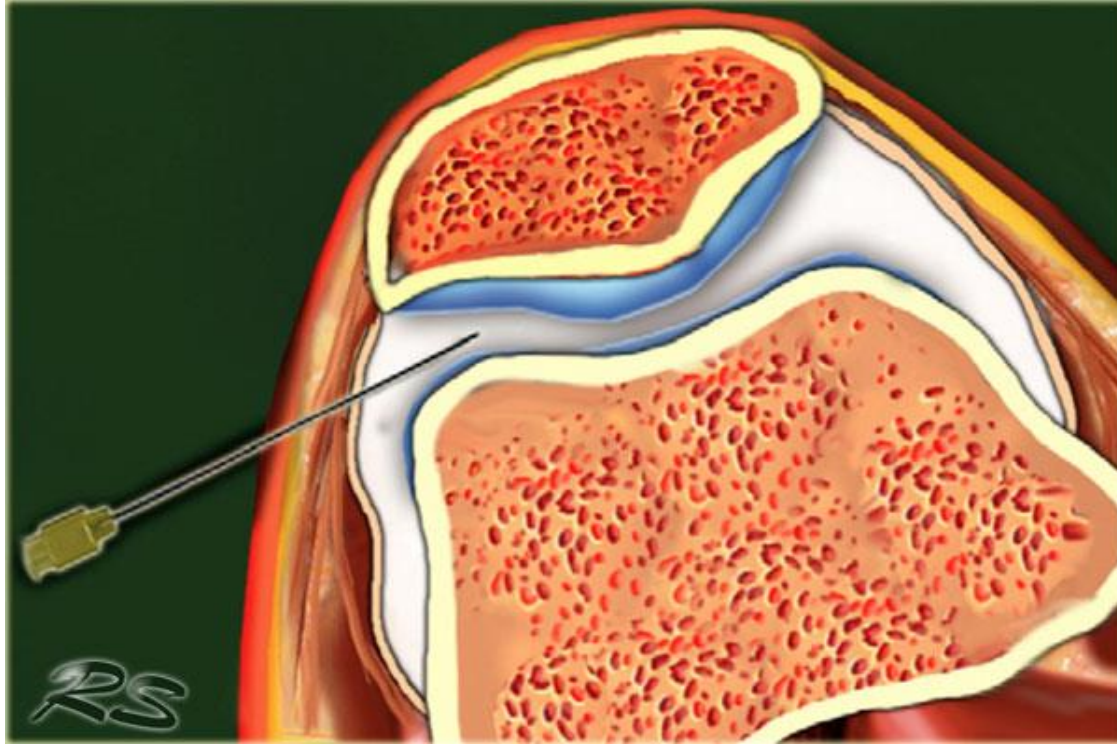
**lateral
retinacular
nerve**



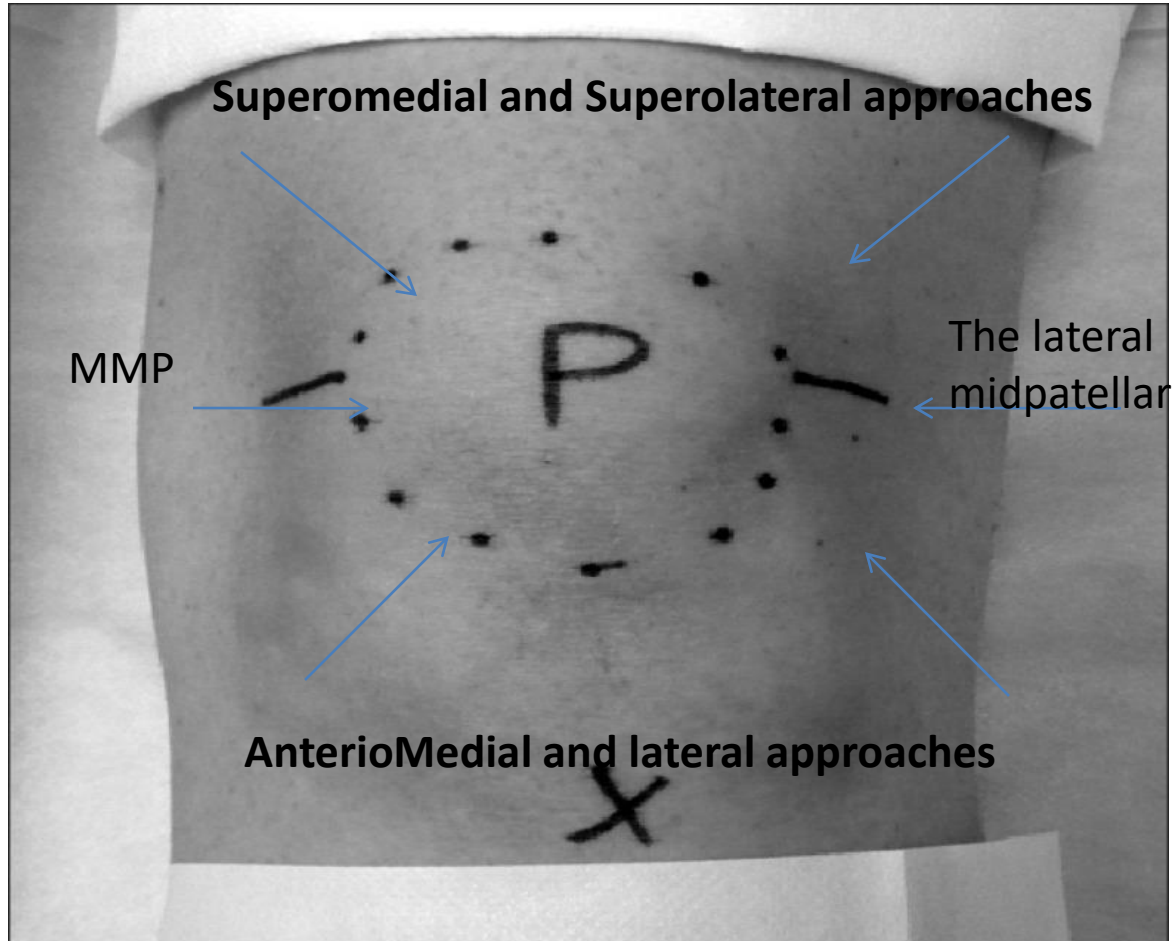
**medial
retinacular
nerve**

Figure 3: Demonstration of the sites to palpate a tender medial and lateral retinacular nerve in the patient with joint pain. Shaded areas are areas of cutaneous dysesthesia representing the medial cutaneous nerve of the thigh at the patella and the infrapatellar branch of the saphenous nerve laterally. The red areas are the sites to palpate for tenderness of the medial and the lateral retinacular nerves, and will be the sites for the nerve blocks.

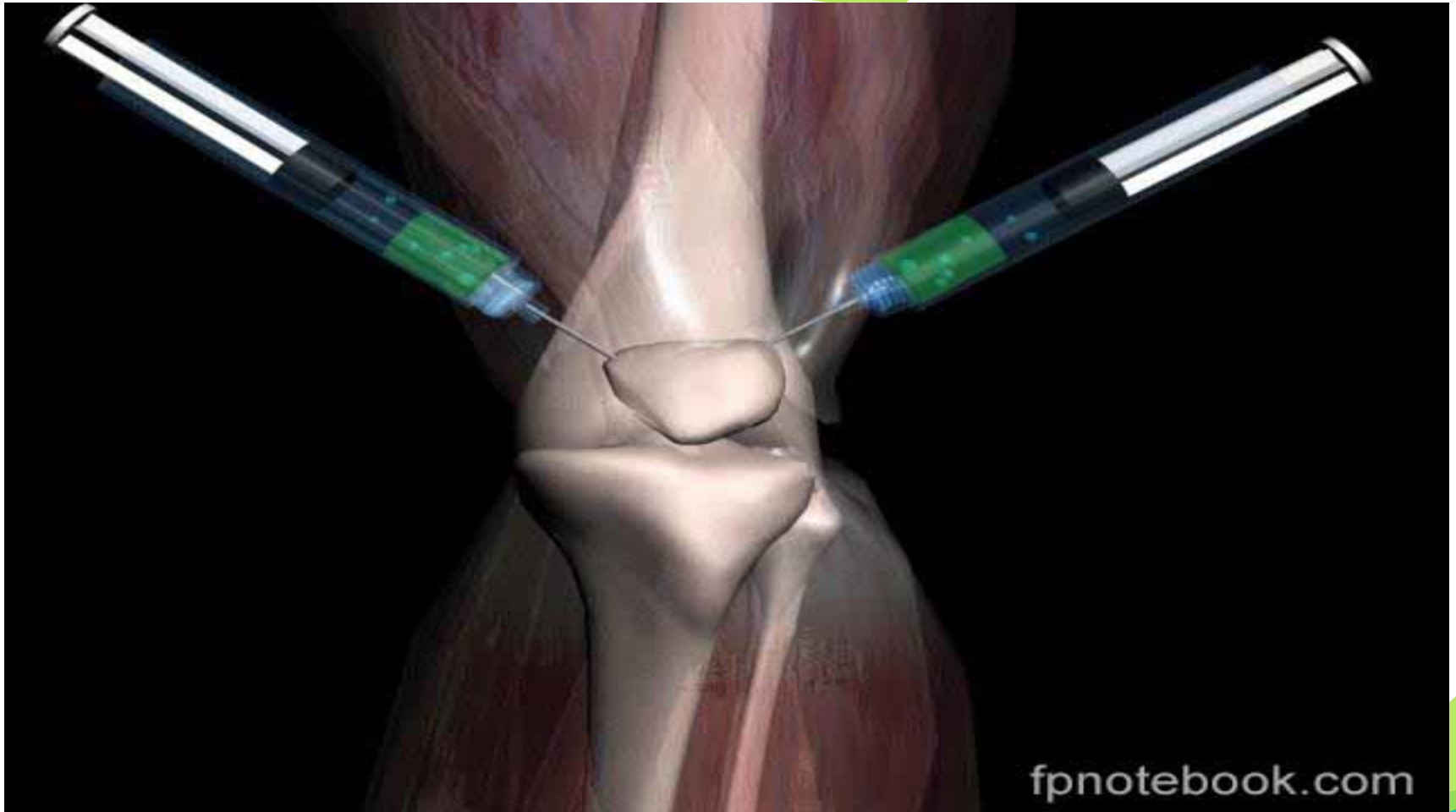
Approaches for intra articular injection



Sono-anatomy of intra-articular knee injection



Superolateral and Superomedial approaches



Patient's preparation

Patient preparations:



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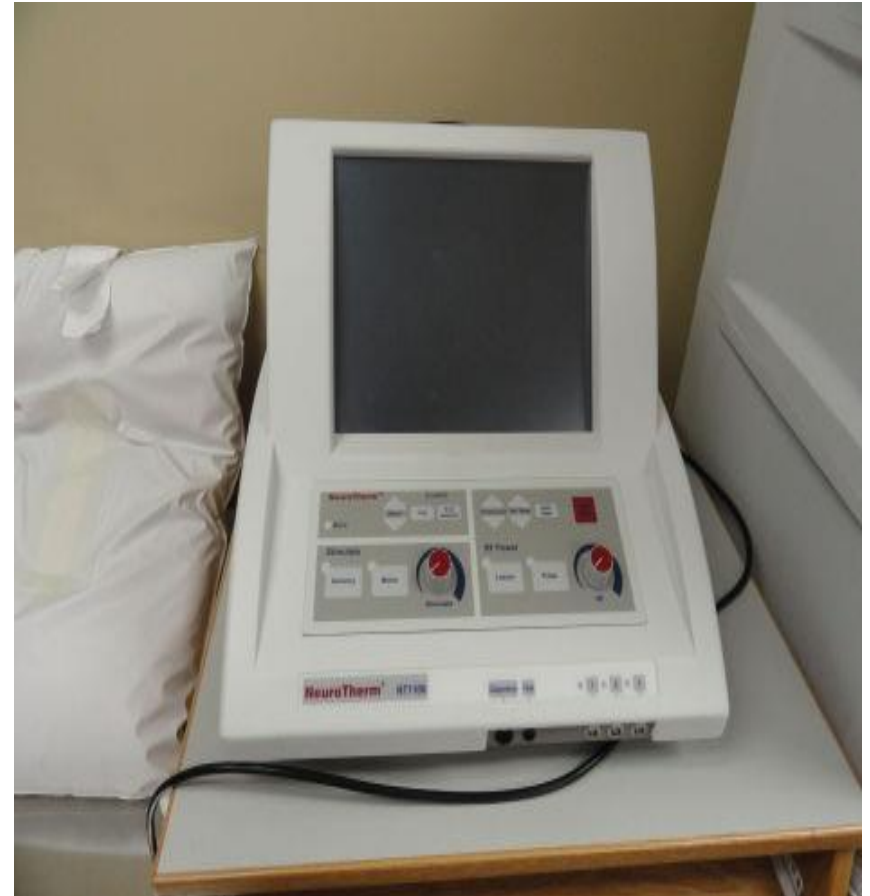


Intra-articular injection



Intra-articular injection

- A3-5 ml LA with corticosteroid is injected to relieve joint pain
- Or PRF 5 cm curved cannula is applied with 42°C temperature and a pulse width of 20 milliseconds for 15 minutes.

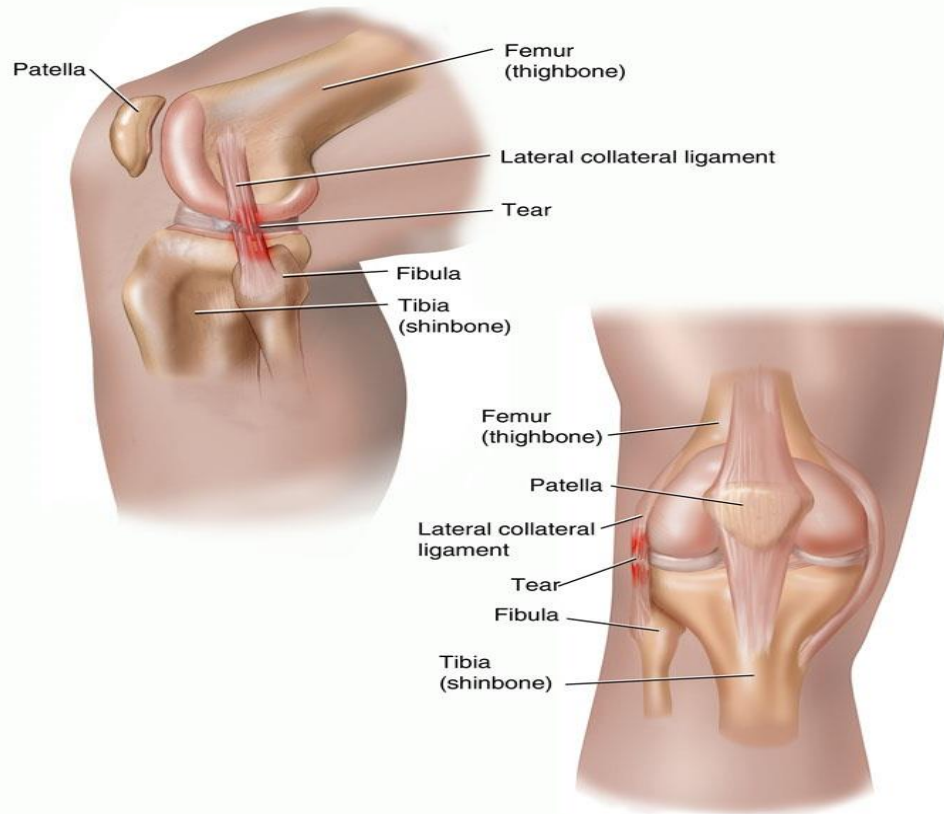


Sonoanatomy of genicular nerves block

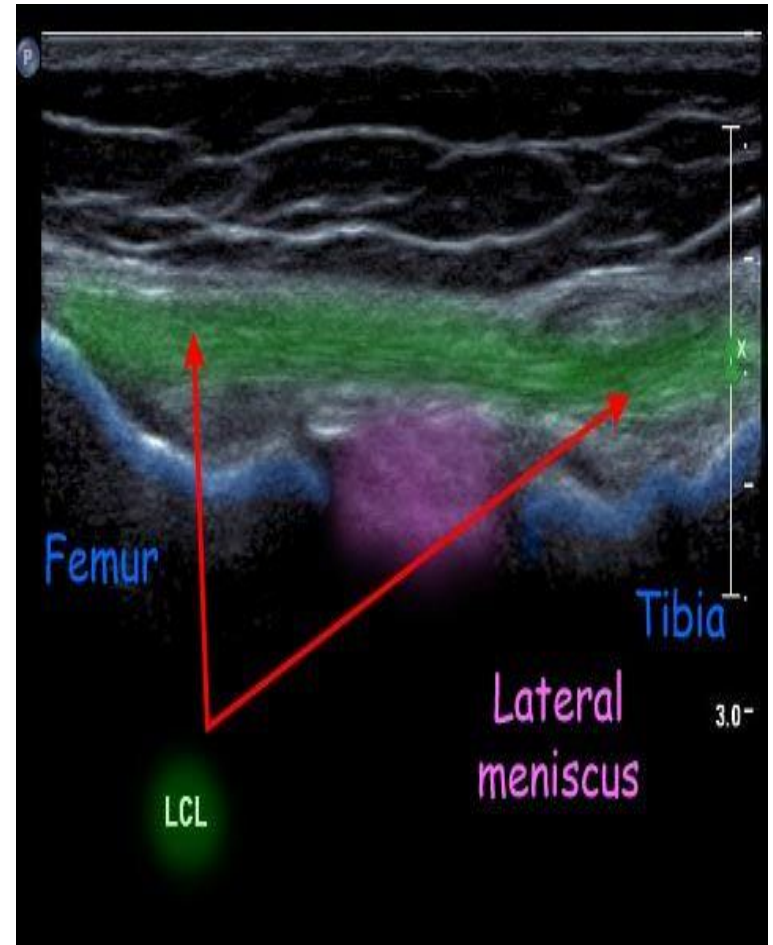
Patients
position:
supine with
pillow under
knee.

Linear US
probe

Lateral Collateral Ligament Tear



Sonoanatomy of knee injection



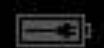
US guided genicular nerves block

Move linear probe more up and anterior and search for arteries at the junction between shaft of femur and lateral/ medial condyle.



Res
S

MB

Nrv
L25

79%

MI
0.8

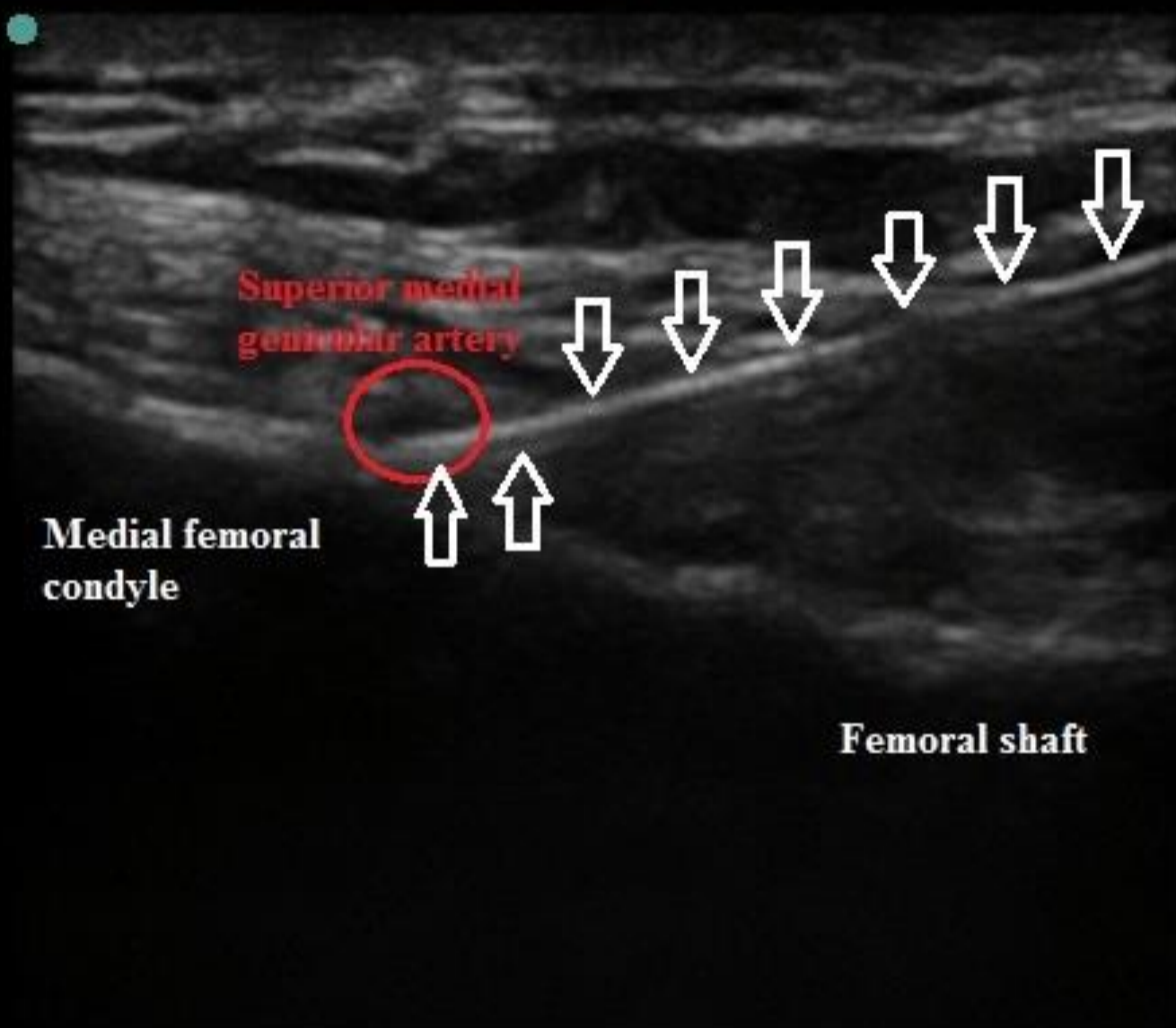
Patient

Exam

Clip

Auto Gain

Page 1/3



4.8



Gain



Depth



Freeze



Save



Color

Ultrasound Guided RF Genicular Nerve Block:

- After confirming the positive response to sensory and negative motor stimulation, PRF was applied at 42°C and a pulse width of 20 milliseconds for 8 minutes for each genicular nerve.



Us guided adductor canal block

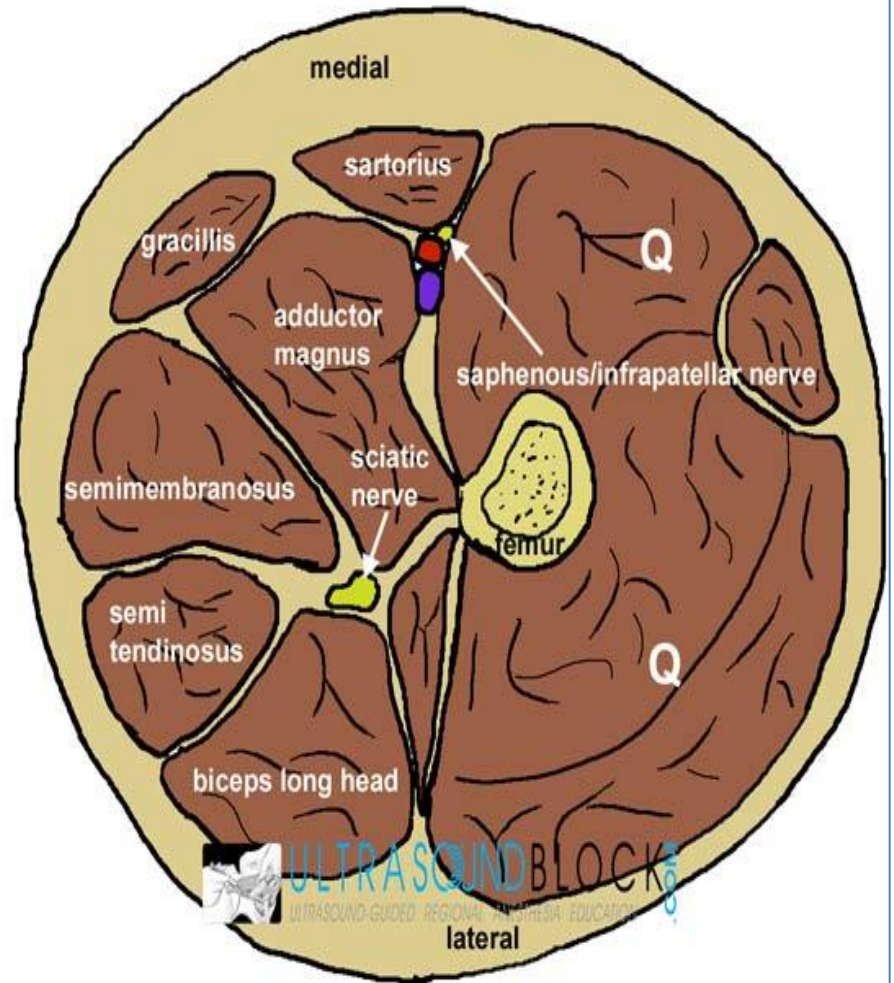
- Analgesia for knee pain
- Relieve spasm of vastus medialis muscle.

ANATOMY

Content:

- *Femoral artery,
- *Femoral vein,
- *The posterior branch of the obturator nerve,
- *Branches of the femoral nerve; Saphenous nerve and nerve to vastus medialis

- ✗ The adductor canal block involves injection of local anaesthetic into the adductor canal deep to the sartorius muscle.



At the ADDUCTOR HIATUS



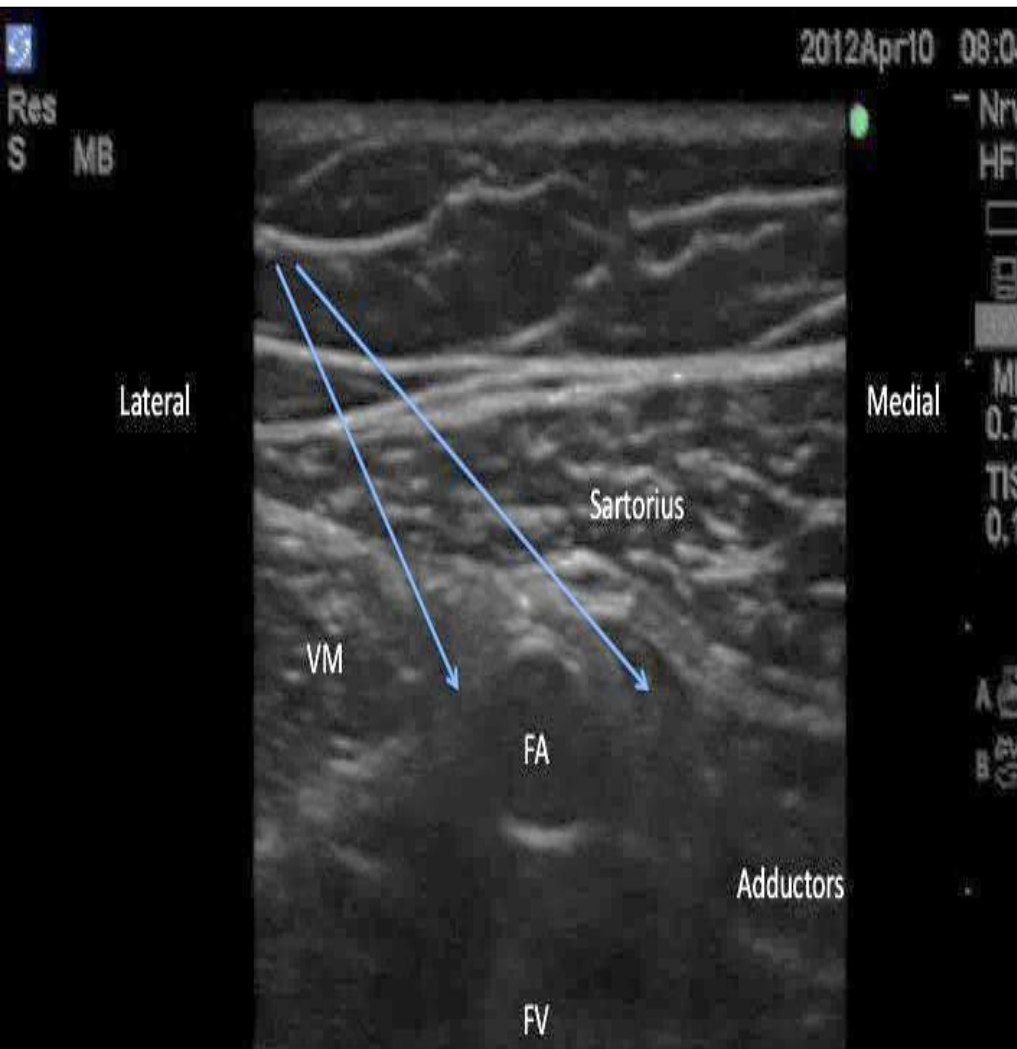
**FEMORAL
ARTERY**



POPLITEAL ARTERY

- *Sudden change in depth that is a useful indicator of the canals distal limit.*

Optimal level to form the (sub-sartorial) block.



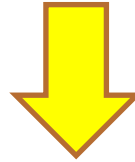
**Saphenous nerve
crosses the anterior
surface of the
superficial femoral
artery to become
medial to the vessel**

**Daniela Ghisia, Laurent Delaunayb, and Andrea Fanellic.
Use of ultrasound for lower extremity.**

Curr Opin Anesthesiol 2014, 27:528–537

TRANSARTORIAL APPROACH

- **It is important to recognize that the nerve to the vastus medialis also lies in the proximal portion of the adductor canal possibly**



undesired motor weakness when a more proximal approach to the saphenous nerve is preferred.

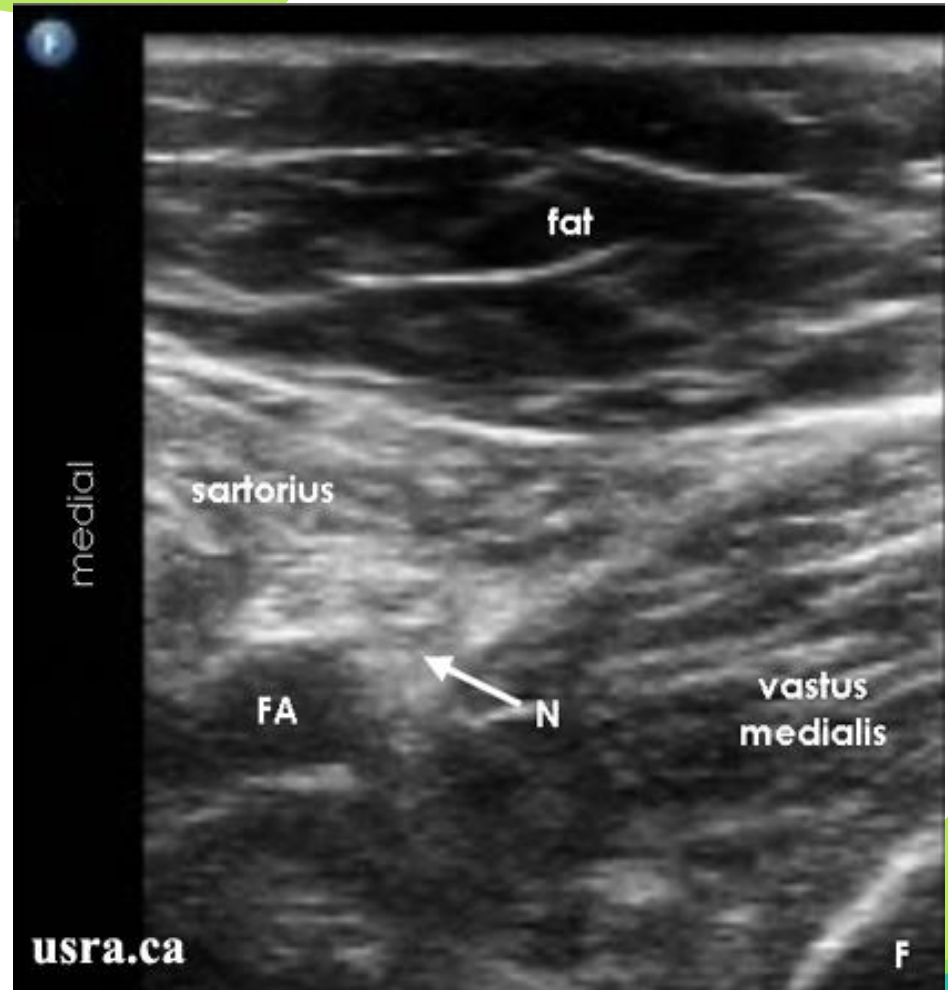
SCANNING TECHNIQUE

- Supine position with the leg slightly externally rotated.
- Expose the lower part of the thigh, knee and upper leg.
- High frequency probe (10-12 MHz) is starting in the proximal thigh and scan distally to the knee. The saphenous nerve can be blocked reliably in the distal 1/3 of the thigh.

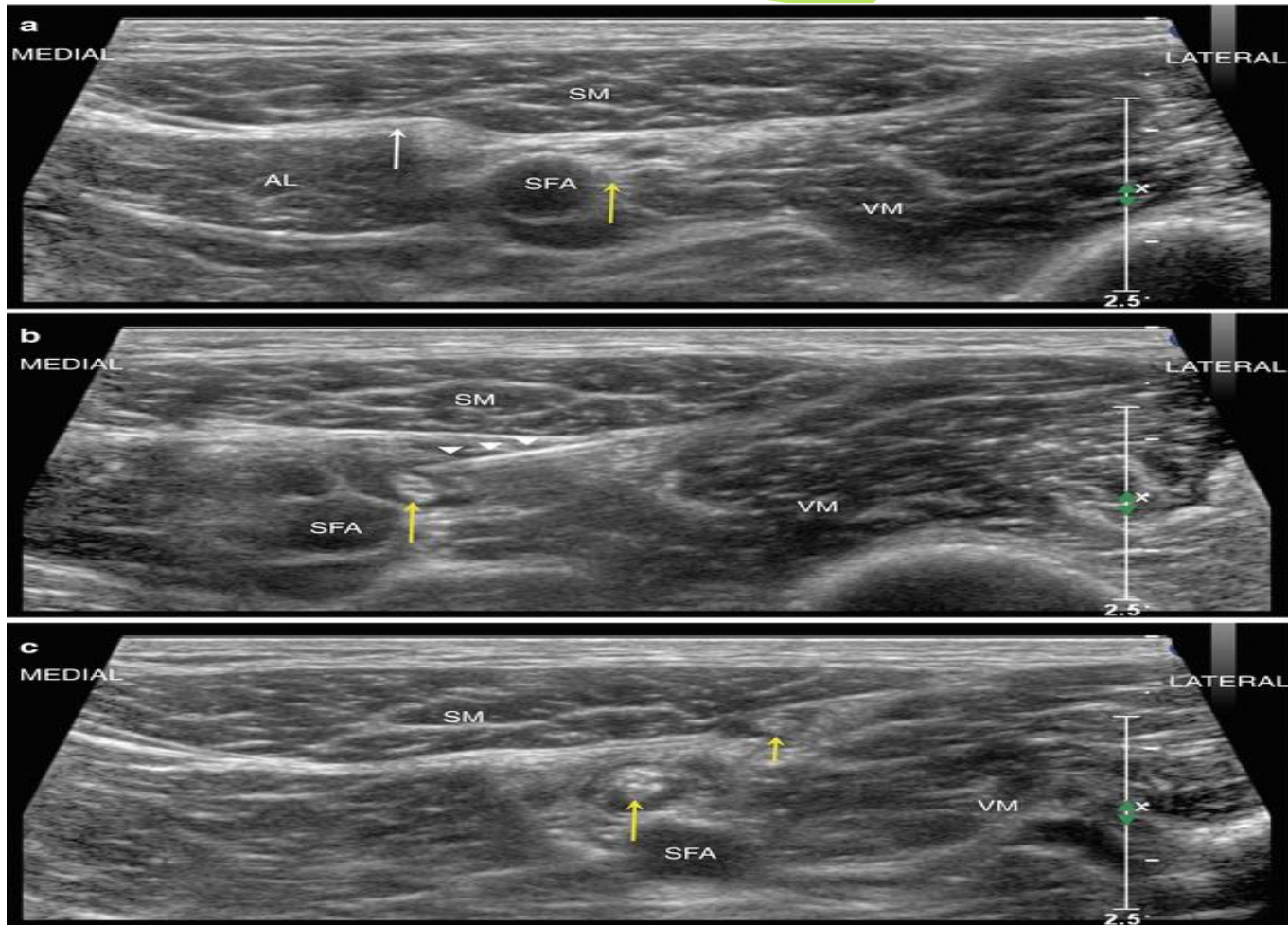


NERVE LOCALIZATION

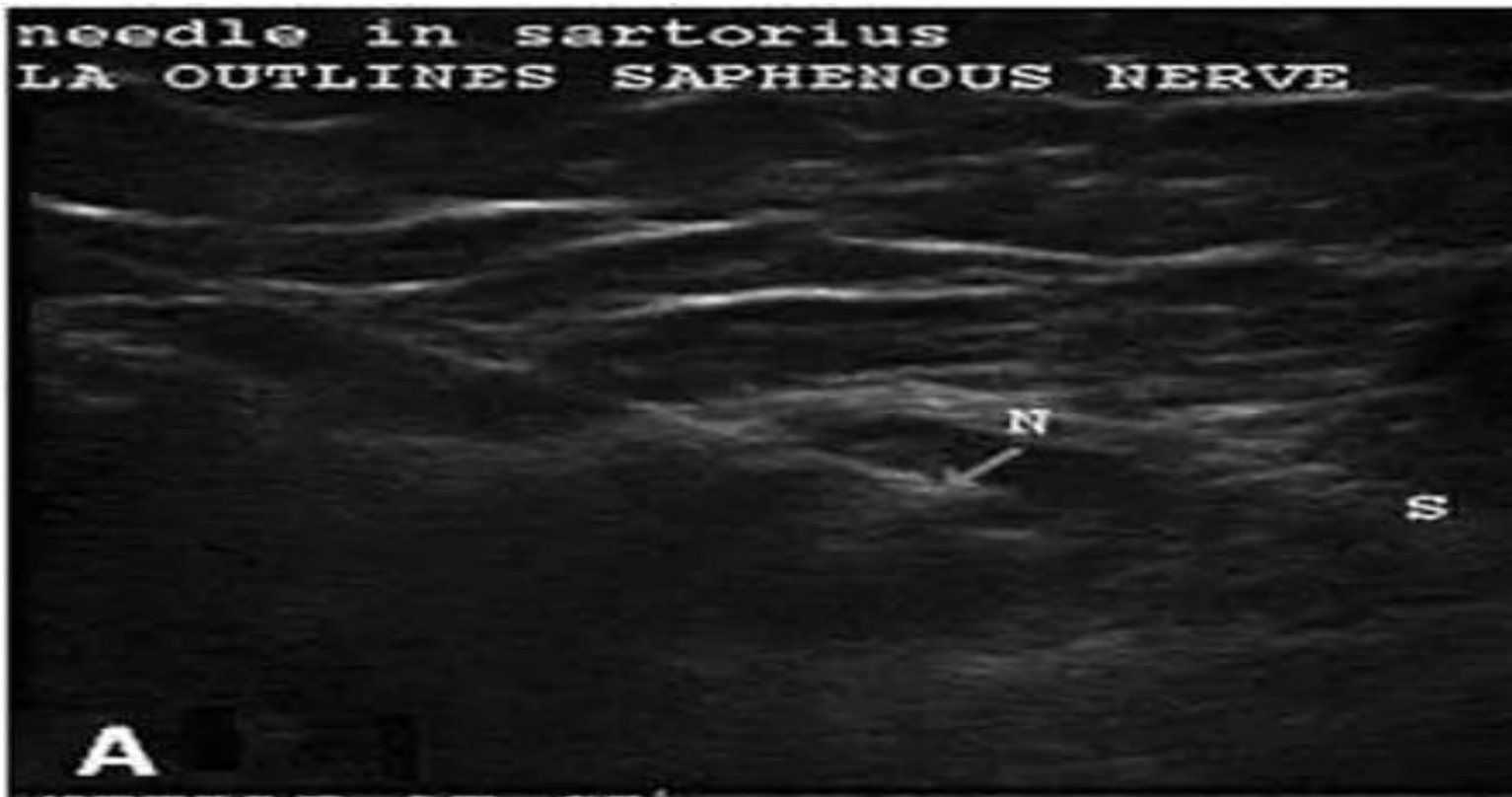
- Perform a systematic anatomical survey
- In the distal thigh, the saphenous nerve is often located deep (posterior) to the sartorius muscle in the subsartorial compartment. The nerve lies next to the femoral artery which eventually descends deep into the adductor canal.
- More distally in the thigh, the saphenous nerve becomes superficial and can be found in the fascial plane between the vastus medialis and the sartorius muscles.



NERVE LOCALIZATION AND INJECTION



SAPHENOUS NERVE AT THE LEVEL OF UPPER PATELLA



USG guided saphenous nerve lower end of medial thigh in line with the upper end of patella;

Home message

- Knee joint has numerous innervations.
- US is an useful tool to guide intra-articular or genicular nerve radiofrequency.
- US guided adductor canal block is a single technique used to suppress acute knee pain and enhances rehabilitation.

THANKS

