



VIRGINIA ULTRASOUND  
Regional Anesthesia + Vascular Access Training

# Basic Ultrasound-Guided Lower Extremity Blocks

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# Objectives

- Discuss the patient and surgical indications for ultrasound-guided regional anesthesia (UGRA) of the lower extremity
- Describe specific ultrasound landmarks for each of the lower extremity blocks
- Review the transducer axis, needle insertion plane, and local anesthetic requirements for each of the lower extremity blocks
- Explain potential side-effects and complications related to regional anesthesia

# Indications

- The choice to use UGRA is determined by many factors such as patient comorbidities, suitability of the technique for the proposed surgery, provider comfort in performing the procedure, as well the mental status of the patient. UGRA has many indications, including:
  - Primary anesthetic
  - Pain Management
  - History of severe PONV or risk of MH
  - Patient is too ill for general anesthesia
  - Physician (surgeon) preference

# Contraindications

- There are certain instances where under no circumstances should regional anesthesia be considered. These are known as **absolute** contraindications. They include:
  - Patient refusal
  - Local infection at the site of the proposed block
  - Active bleeding an anticoagulated patient
  - Proven allergy to a local anesthetic

# Contraindications

- Most contraindications to regional anesthesia are **relative**. The provider must determine the risk vs. benefit before proposing any procedure.
  - Respiratory compromise
  - Inability to cooperate/understand procedure
  - An anesthetized patient (adult population)
  - Bleeding diathesis secondary to an anticoagulant or genetic defect
  - Bloodstream infection
  - Preexisting peripheral neuropathy

# Complications

- Although uncommon, regional anesthesia can result in complications such as:
  - Local anesthetic toxicity
  - Intra-arterial injection
  - Respiratory compromise
  - Parathesias and nerve damage
- Prior to performing any regional anesthetic, the risks and benefits should be discussed with the patient, allowing them to make an informed decision.

# Prior to any procedure...

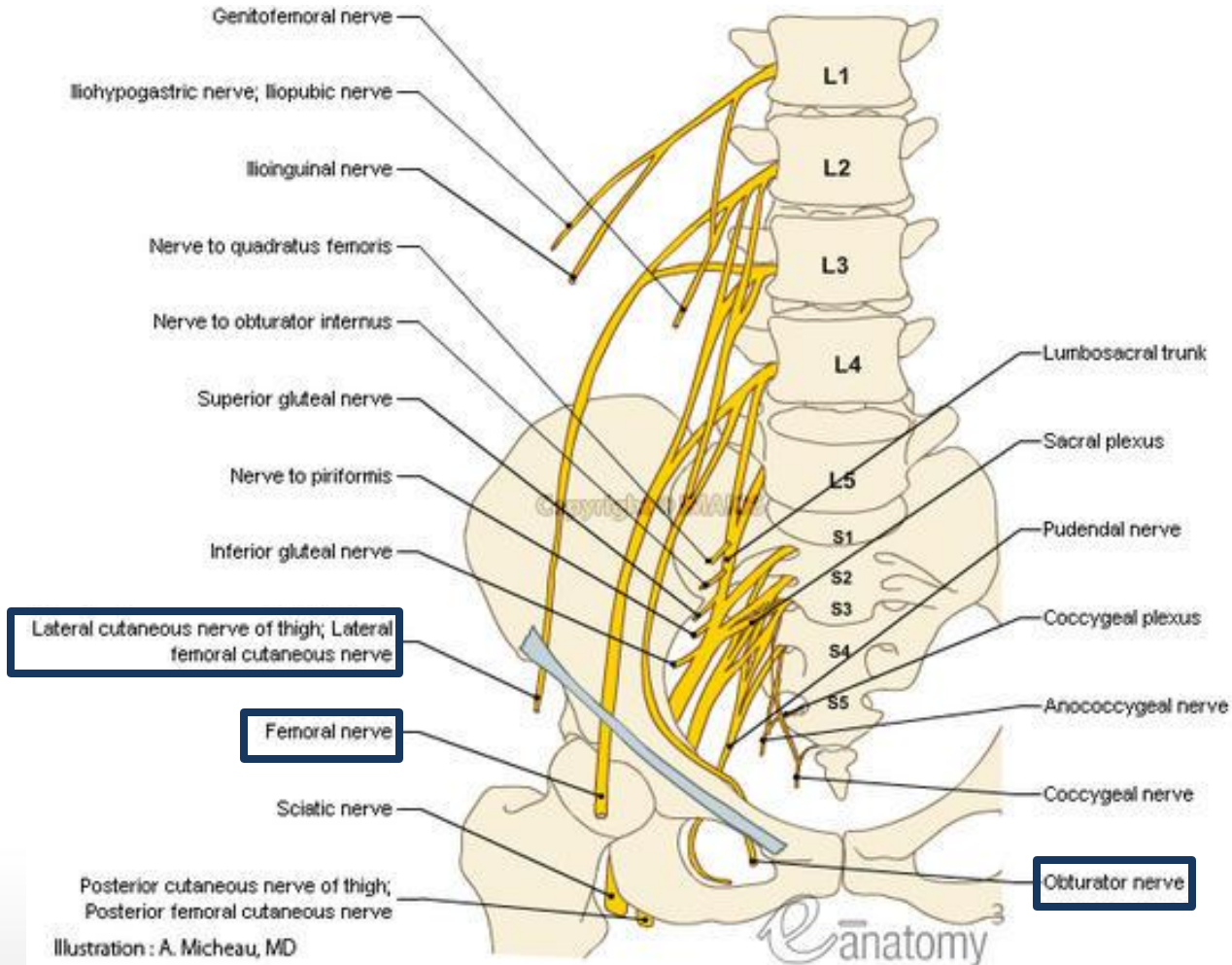
- Verify the correct patient
- Obtain informed consent
- Verify the correct procedure
- Verify the correct extremity
- Gather all necessary equipment
- Obtain baseline vital signs and monitor patient throughout the procedure
- Administer adequate sedation

# Lumbar and Lumbosacral Plexi

- The lumbar and lumbosacral plexi supply the majority of nerve innervation to the lower extremity
- The lumbar plexus, derived from L1-4, and occasionally T12, forms the lateral femoral cutaneous, femoral and obturator nerves that innervate the anterior lower extremity
- The lumbosacral plexus is derived from L4-5 and S1-3, and primarily forms the sciatic nerve that innervates the posterior aspect of the lower extremity and foot



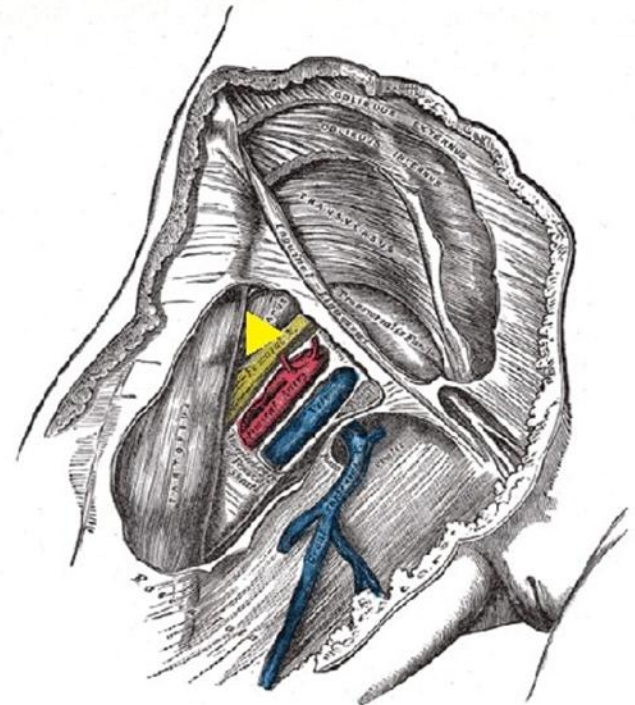
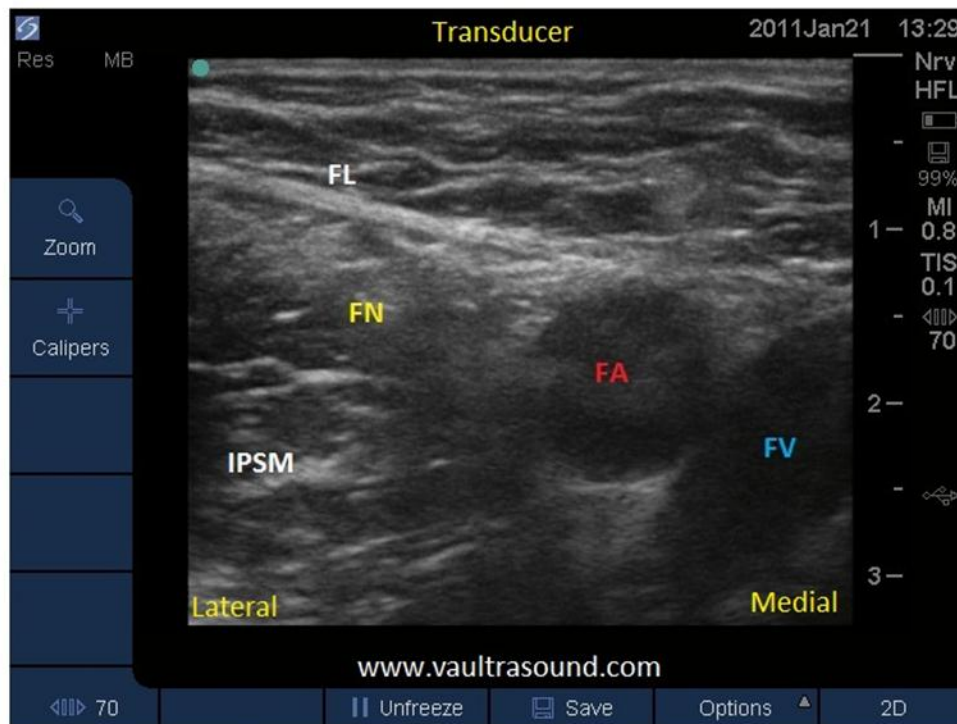
# Lumbar Plexus



# Femoral Nerve Block

- The femoral nerve block targets one of the major branches of the lumbar plexus
- It is used to provide anesthesia to the anterior thigh, knee and a small part of the lower leg
- The femoral nerve lies lateral to the femoral artery and deep to the fascia lata and iliaca, and superior to the ilopsoas muscle
- The lateral approach is the most common method when using ultrasound

# Femoral Nerve Block



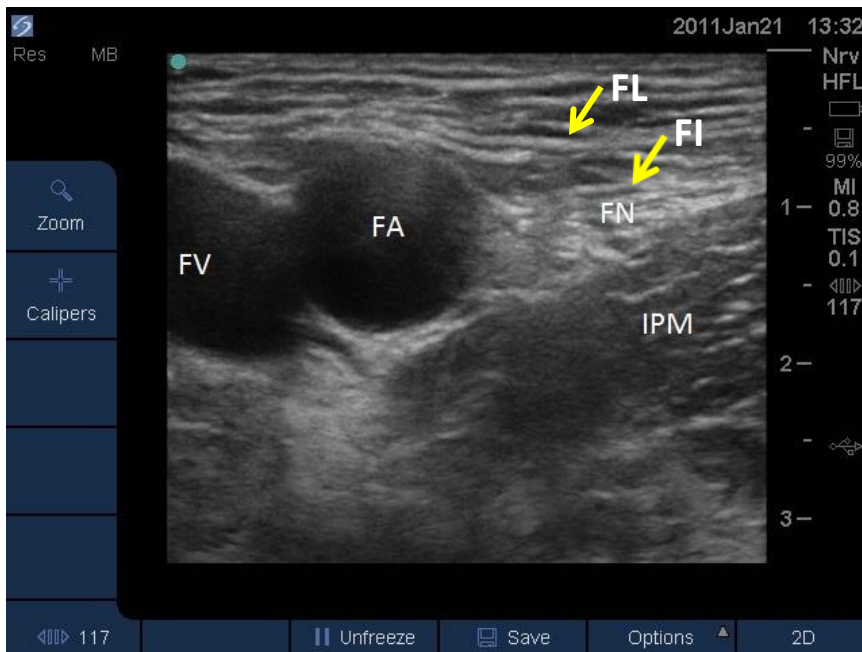
# Femoral Nerve Block

- Pt. is supine with lower extremity slightly abducted
- Transducer is placed just distal the inguinal ligament, lateral to the femoral pulse
- Transducer frequency is dependent on body habitus
- Short-axis, in-plane image
- Femoral nerve is a hyper-echoic circle that lies lateral to the femoral artery
- 5 cm needle is used
- 20 – 30 cc's of local anesthetic injected

# Femoral Nerve Block



# Femoral Nerve Block



- The needle approach is lateral to medial
- A nerve stimulator can be used in conjunction with ultrasound to elicit a “patellar snap”
- The major benefit of real-time imaging is visualizing needle placement and local anesthetic spread

# Femoral Nerve Block

- If more than one artery is visible on the screen, scan proximally to visualize the femoral artery before it bifurcates
- Doppler can always be used to verify the femoral vessels
- Experience suggests that if the needle and the local anesthetic are placed below the fascia iliaca and lateral the artery, successful blocks will occur despite the lack of twitches

# Femoral Nerve Block

Too Low

Just Right





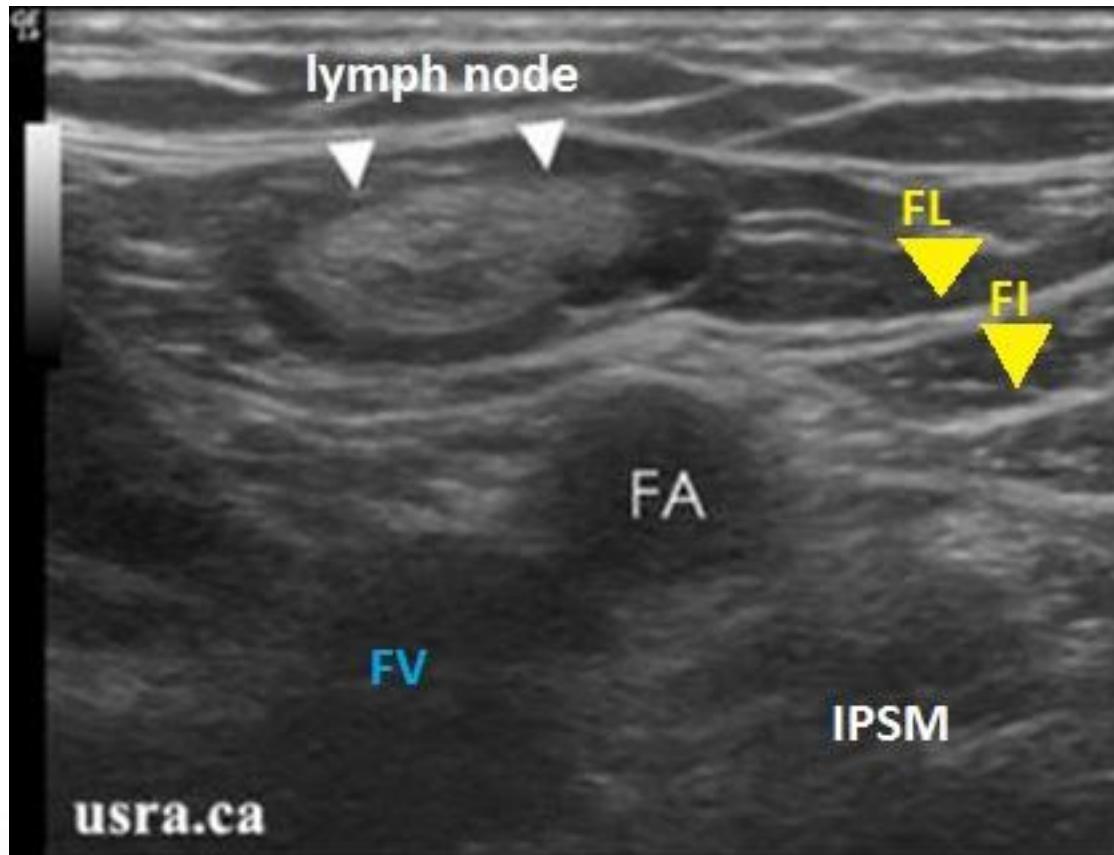
# Femoral Nerve Block



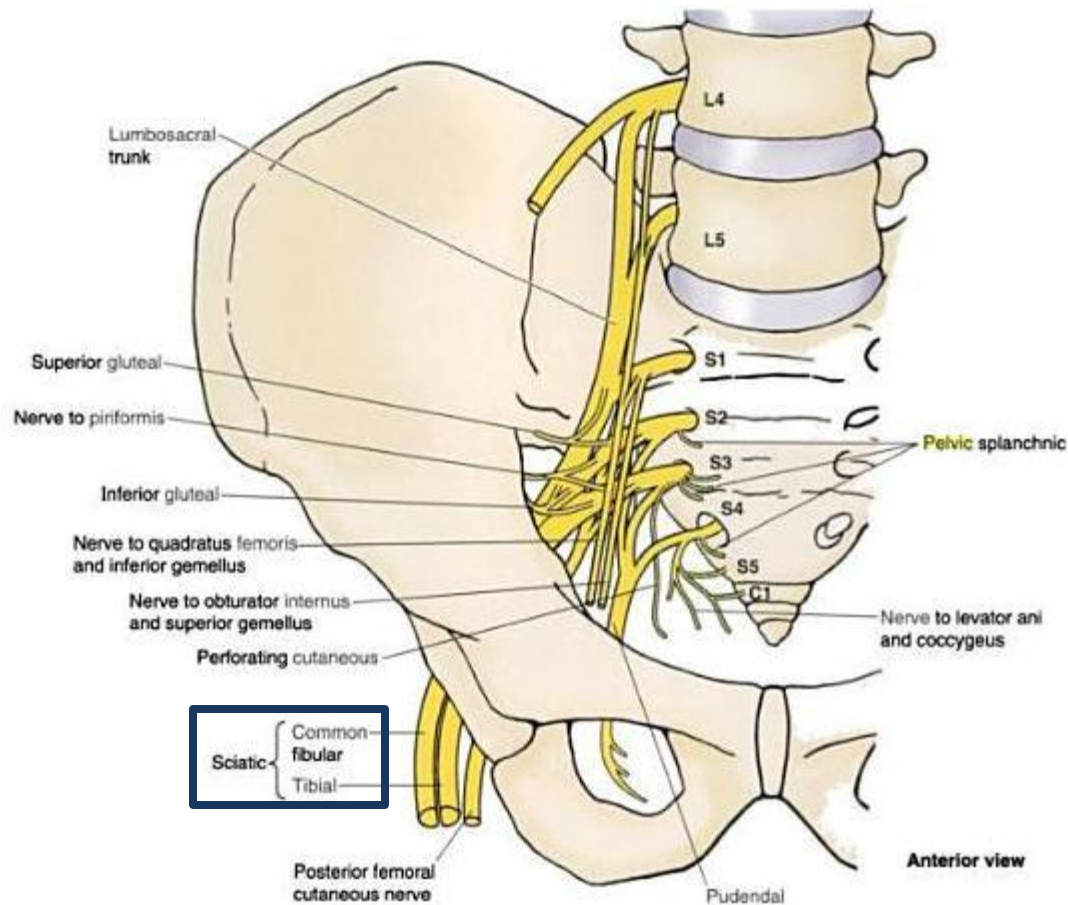
# Femoral Nerve Block

- Complications such as vascular puncture and local anesthetic injection are best avoided by observing the needle tip throughout the procedure
- Lymph nodes in the groin can be confused as “nerves”; scanning proximal and distal will help distinguish the two as lymph nodes are not continuous, and can be seen only at specific locations

# Femoral Nerve Block



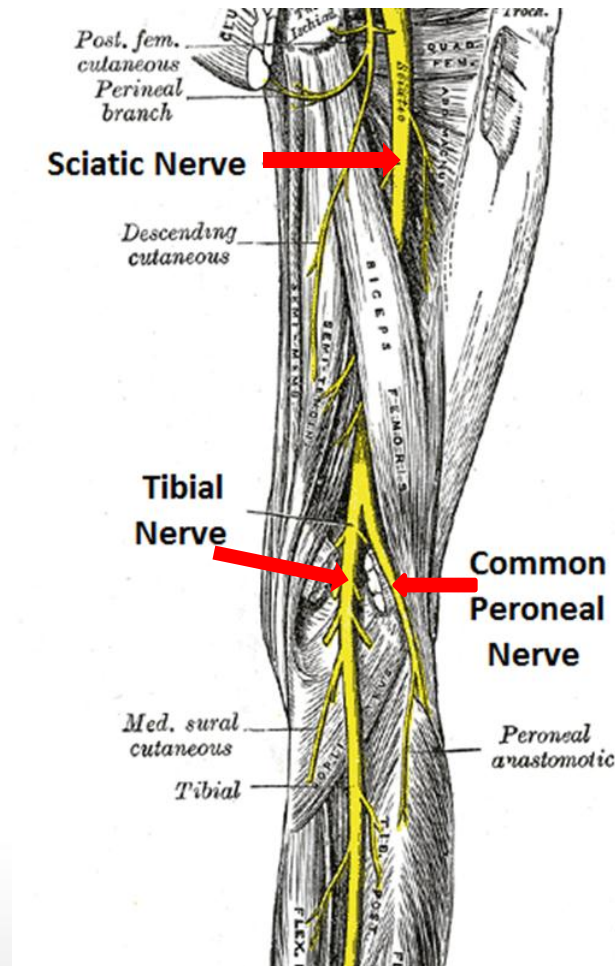
# Lumbosacral Plexus



# Popliteal Nerve Block

- The popliteal block targets the **sciatic** nerve at the level of the knee
- It is used to provide anesthesia for procedures involving the foot and ankle
- In the popliteal fossa, the sciatic is bordered superiorly and medially by the semi-tendinosus and semi-membranosus muscles and superiorly and laterally by the biceps femoris muscle
- This block can be performed with the patient either supine, lateral, or prone

# Popliteal Nerve Block



# Popliteal Nerve Block

- Pt. can be either prone, supine, or lateral
- High frequency linear array transducer
- Transducer is placed in the popliteal crease
- Short-axis, either in-plane or out-of-plane
- The sciatic nerve divides into the tibial and peroneal nerves. The tibial nerve is superior to the popliteal artery and vein, and the peroneal courses laterally
- 5 – 10 cm needle is used, and inserted laterally
- 20 – 30 cc's of local anesthetic injected

# Popliteal Nerve Block

Supine



Prone

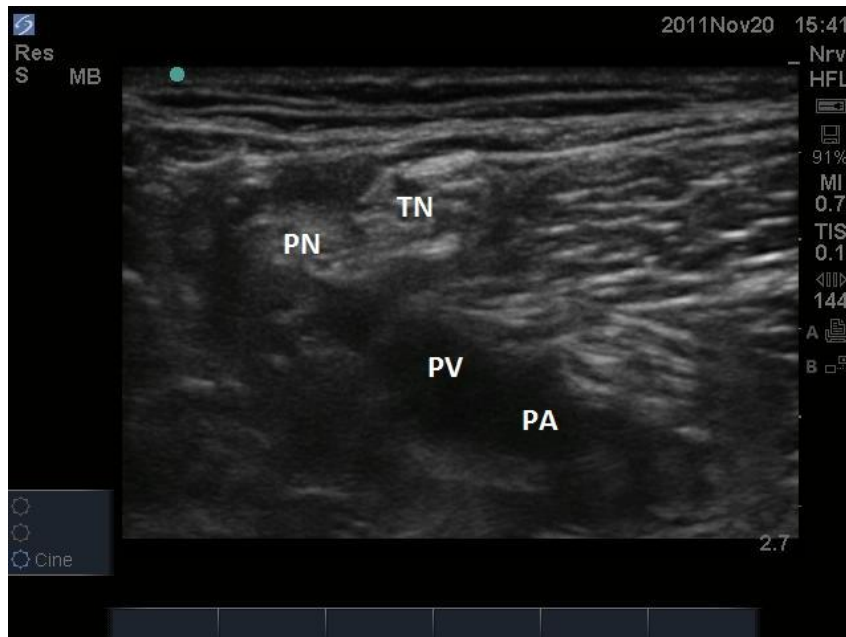




# Popliteal Nerve Block

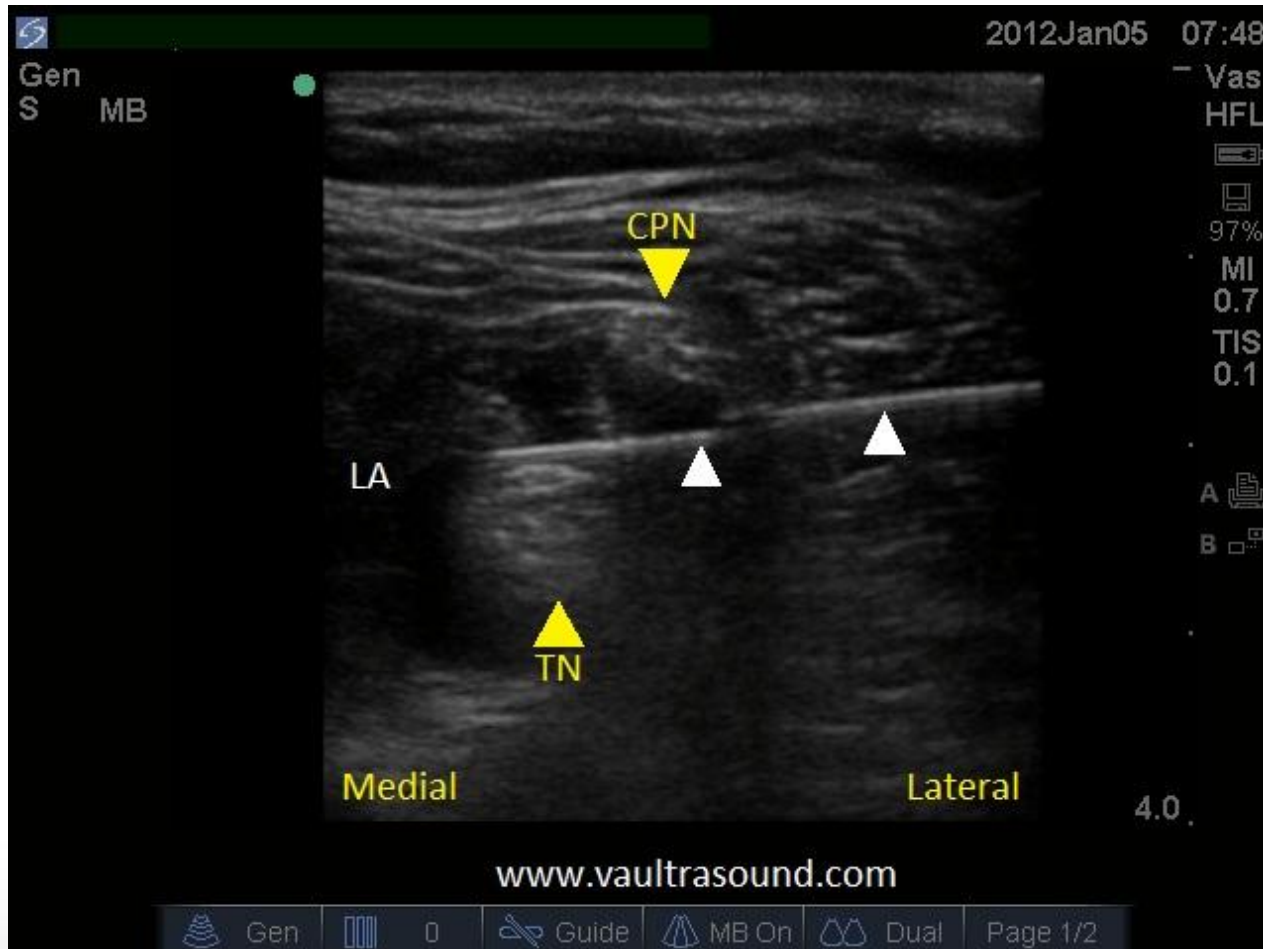


# Popliteal Nerve Block



- It is important to scan proximally and distally to appreciate the anatomy
- The transducer may have to be angled toward to the foot to better image the nerves (anisotropy)
- Circumferential spread around the nerve usually ensures a dense block

# Popliteal Nerve Block



# Popliteal Nerve Block



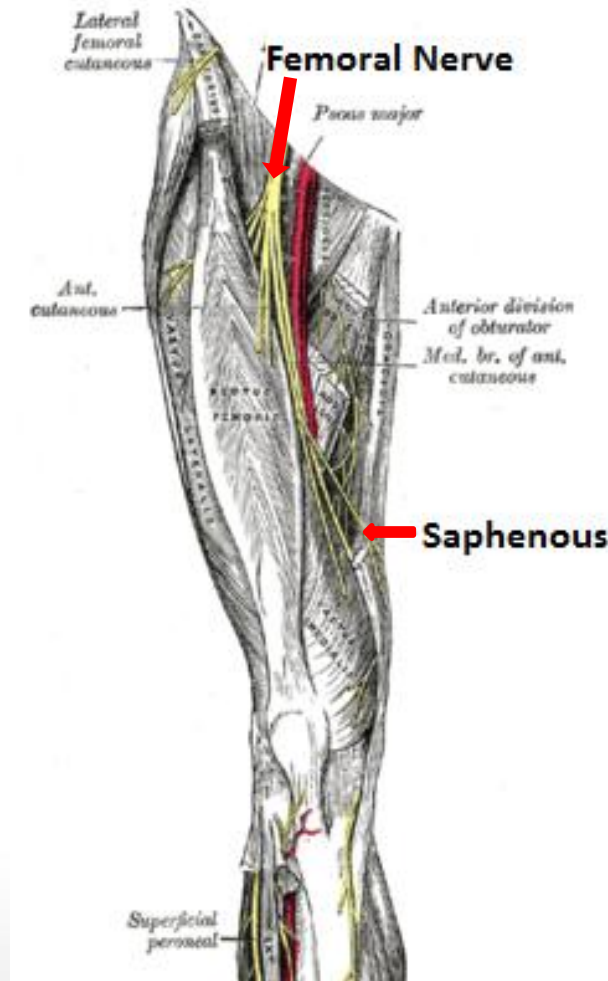
# Popliteal Nerve Block

- Ultrasound greatly reduces the traditional complications of intravascular and intra-neural injections
- Accurate needle identification is key to preventing complications and ensuring adequate spread of local anesthetic

# Saphenous Block (thigh level)

- The saphenous block at the thigh is used as an adjunct to a popliteal block for lower extremity surgery
- The two most common methods of identifying the saphenous are by either first identifying the superficial femoral artery or the femur

# Saphenous Block (thigh level)

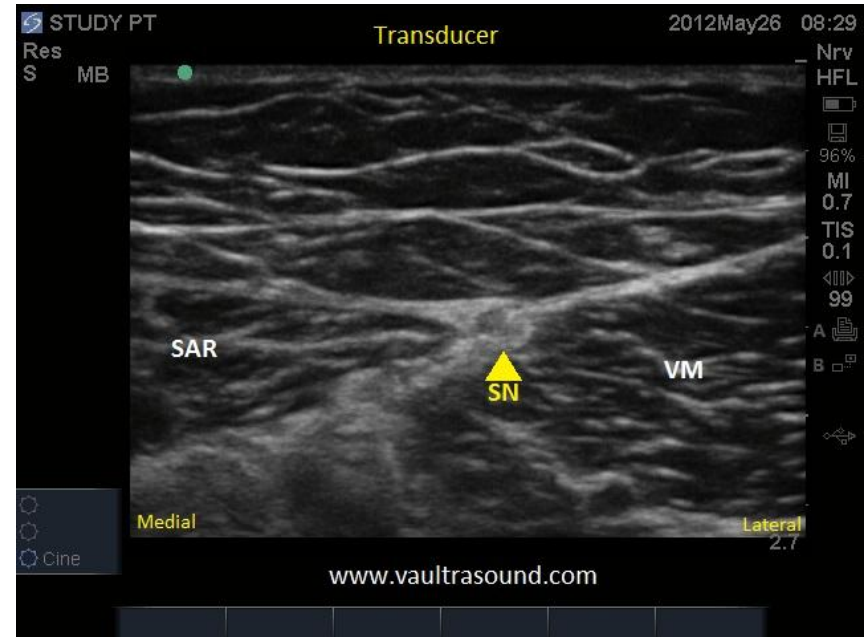


# Saphenous Block (thigh level)

- Pt is supine with lower extremity slightly abducted
- Transducer placement is dependent on the method used to identify the nerve
- High frequency transducer
- SAX in-plane image
- Saphenous nerve is a hyperechoic circle that lies in the fascial plane between the sartorius and vastus medialis muscles
- 5 – 10cm needle is used
- 10cc's of local anesthetic injected



# Saphenous Block (thigh level)



# Saphenous Block (thigh level)

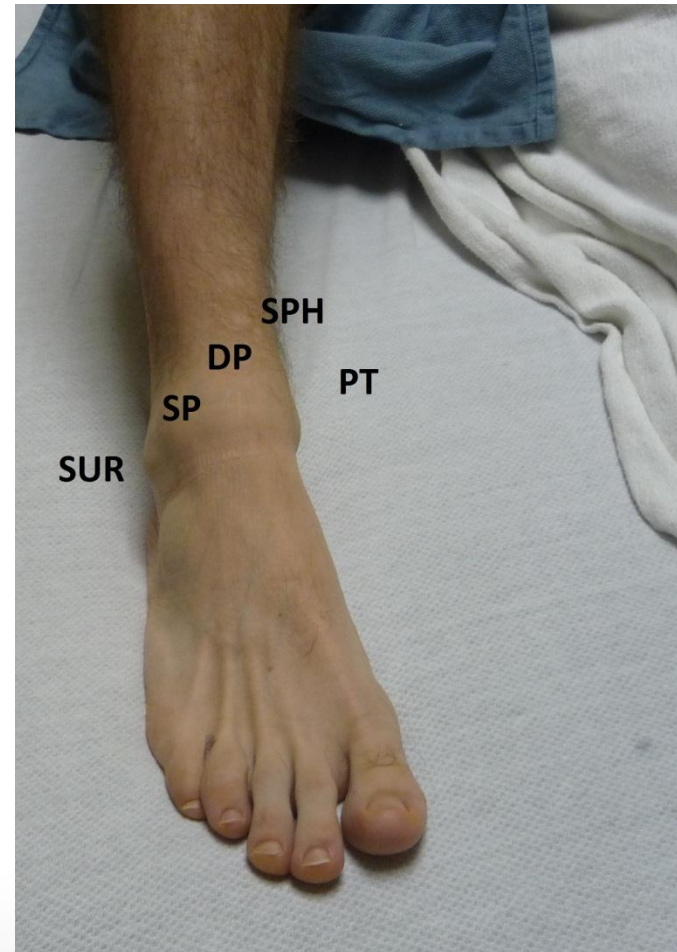


# Saphenous Block (thigh level)



# Ankle Blocks

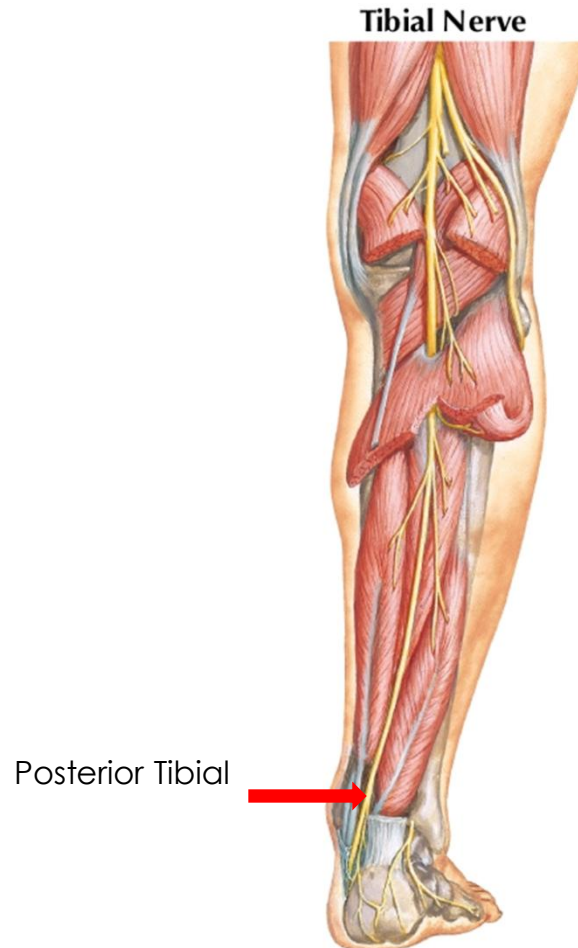
- The ankle block is useful for foot specific surgery
- Five nerves are targeted in the ankle region. Four are terminal branches of the sciatic nerve (tibial, sural, and the deep and superficial peroneal nerves), while one is the terminal branch of the femoral nerve (saphenous)



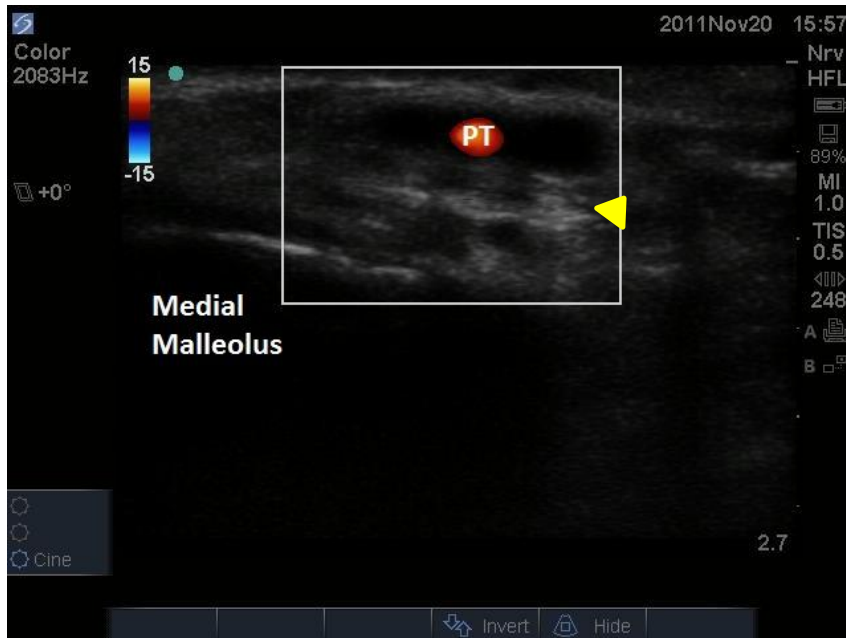
# Ankle Block

- Pt. supine with foot elevated on a booster
- High frequency linear array transducer
- Transducer position varies according to the nerve to be blocked
- Short-axis, in-plane image
- Multiple injections are required to perform an adequate ankle block
- 5cm needle is used, and inserted laterally
- 5 – 8cc's of local anesthetic injected at each nerve

# Ankle Block (Posterior Tibial)

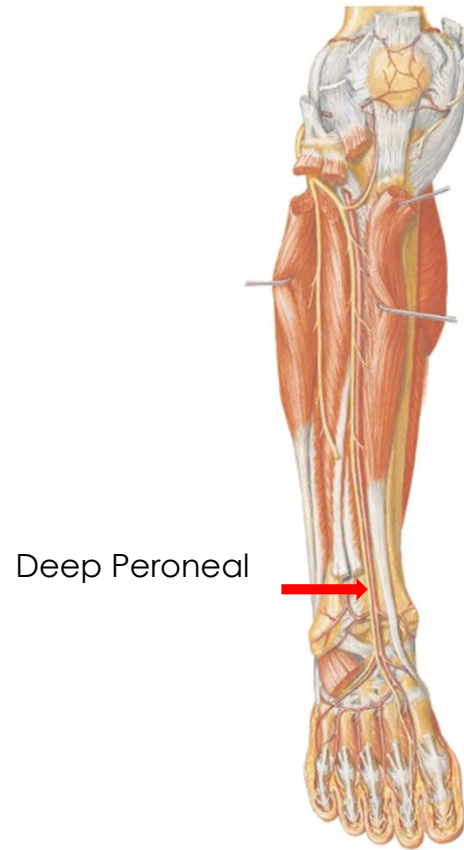


# Ankle Block (Posterior Tibial)



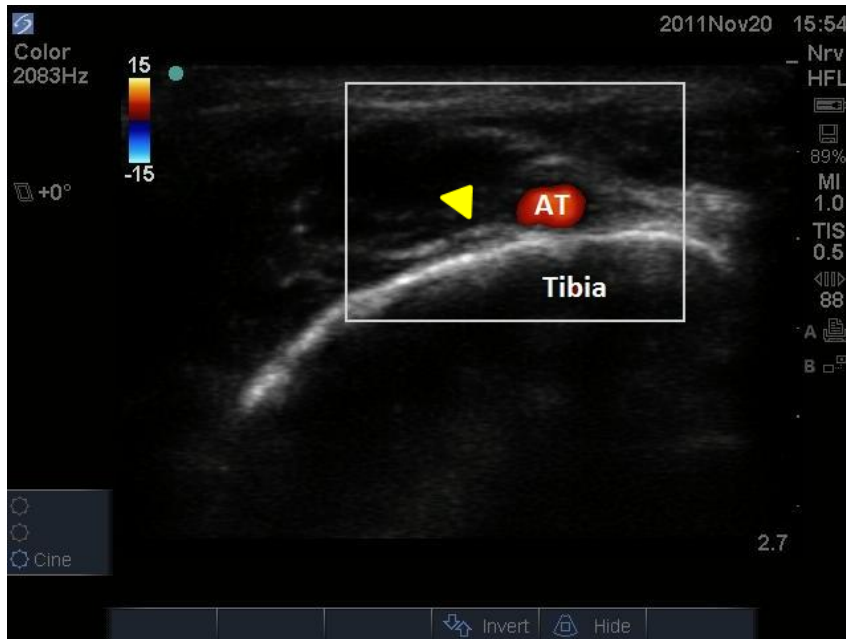
# Ankle Block (Deep Peroneal)

Muscles of Leg (Deep Dissection)  
Anterior View



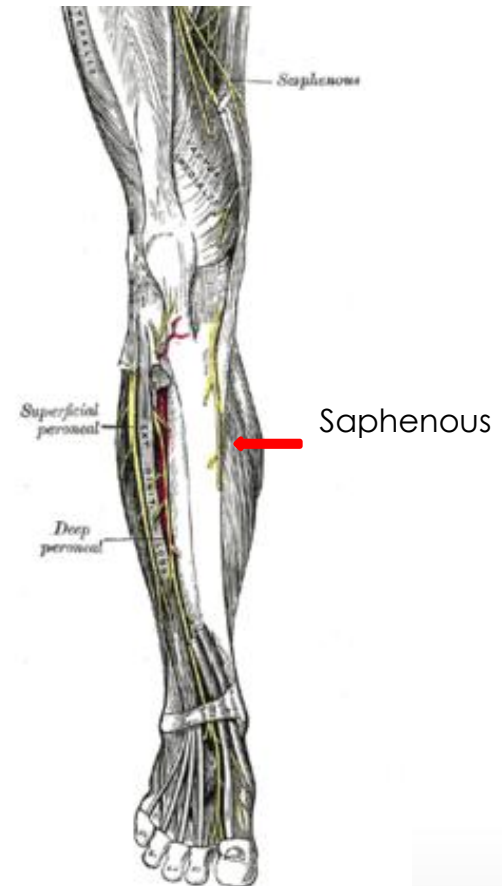


# Ankle Block (Deep Peroneal)

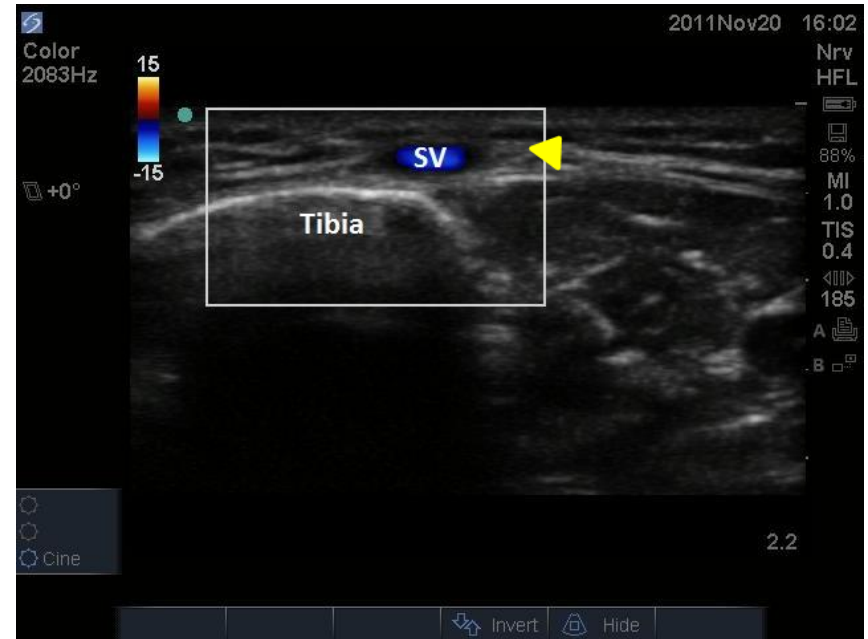


# Ankle Block (Saphenous)

- Below the knee, the saphenous nerve courses medial and posterior to the saphenous vein

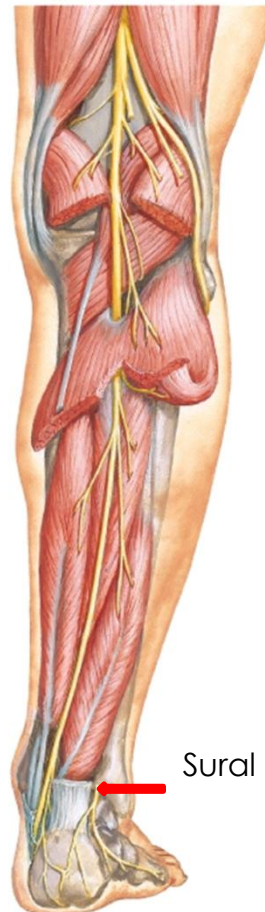


# Ankle Block (Saphenous)



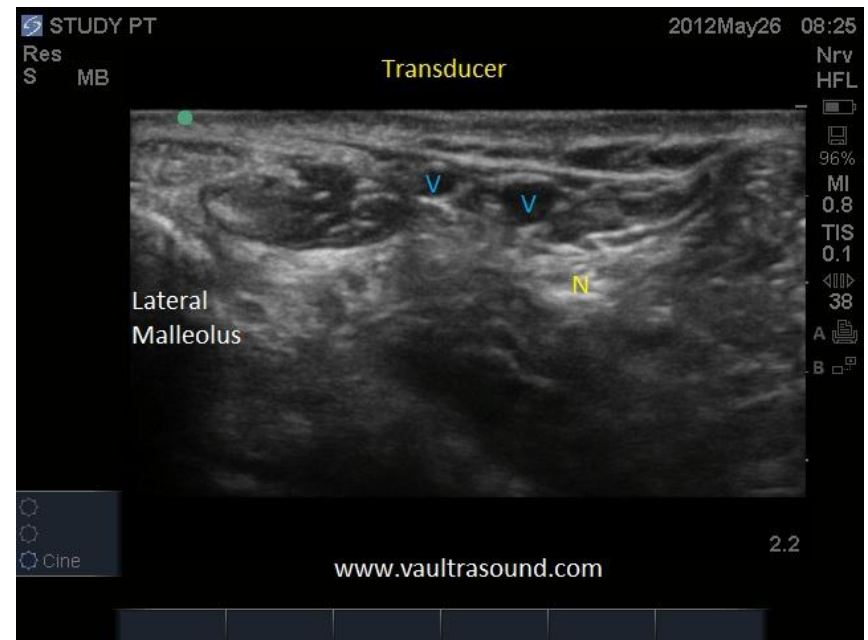
# Ankle Block (Sural)

Tibial Nerve



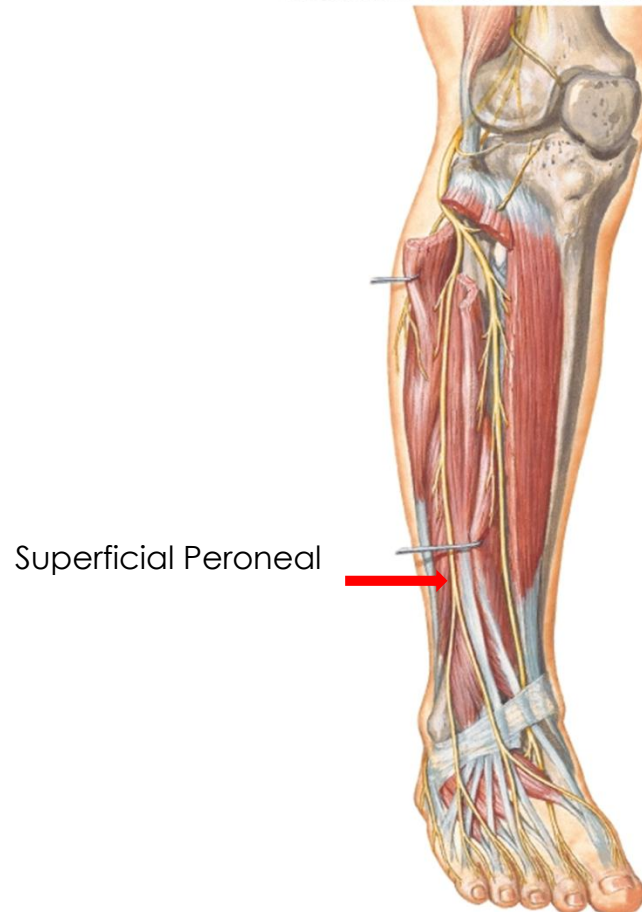
Sural Nerve

# Ankle Block (Sural)

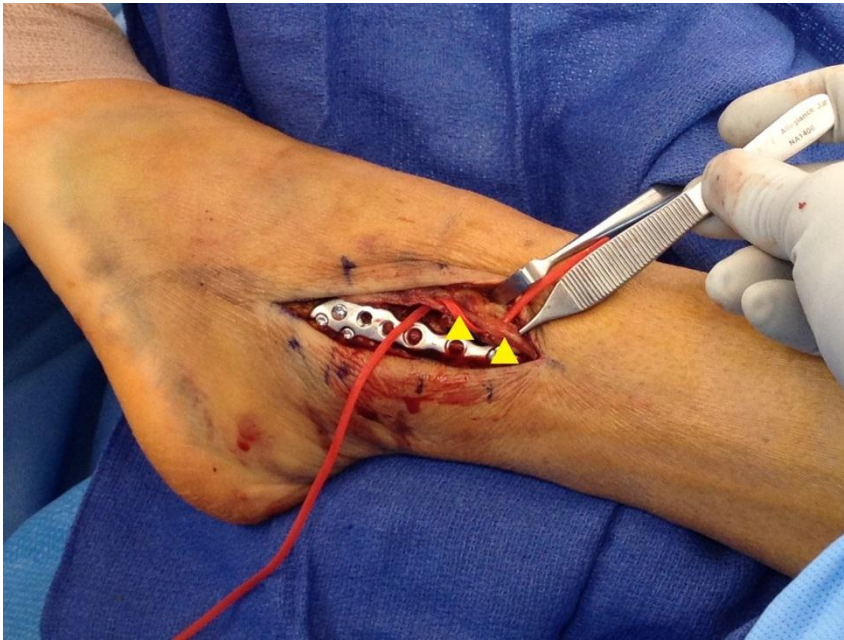


# Ankle (Superficial Peroneal)

Common Fibular (Peroneal) Nerve



# Ankle (Superficial Peroneal)



- The superficial peroneal nerve is very difficult to locate with ultrasound because of its small size and lack of other identifying structures

# Ankle Block

- Aggressive injections of large volumes of local anesthetic may cause hydrostatic damage to small nerves such as the posterior tibial because it is enclosed in ligamentous spaces



# Questions?

# References

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