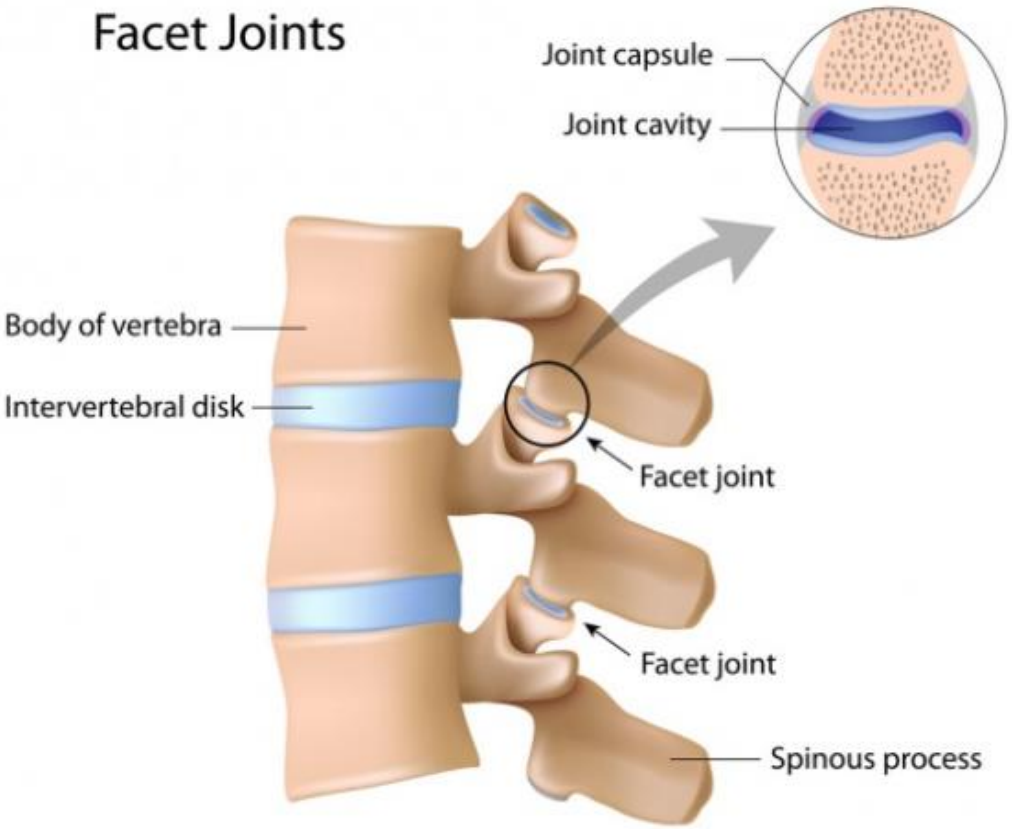
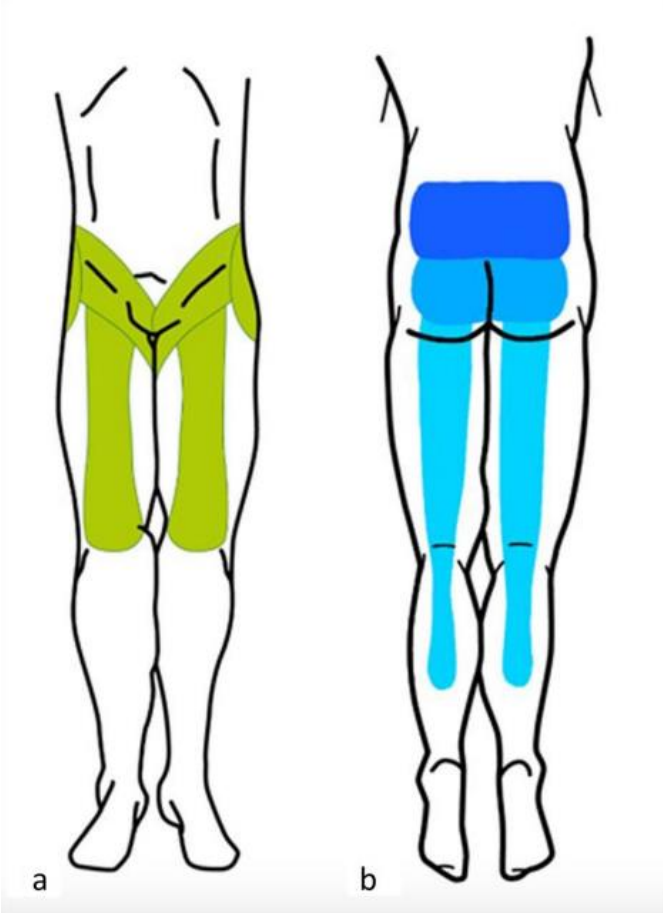
하지와 체간부위의 신경차단술

전남대학교병원 재활의학과
임상조교수 박형규

Facet Joint Syndrome





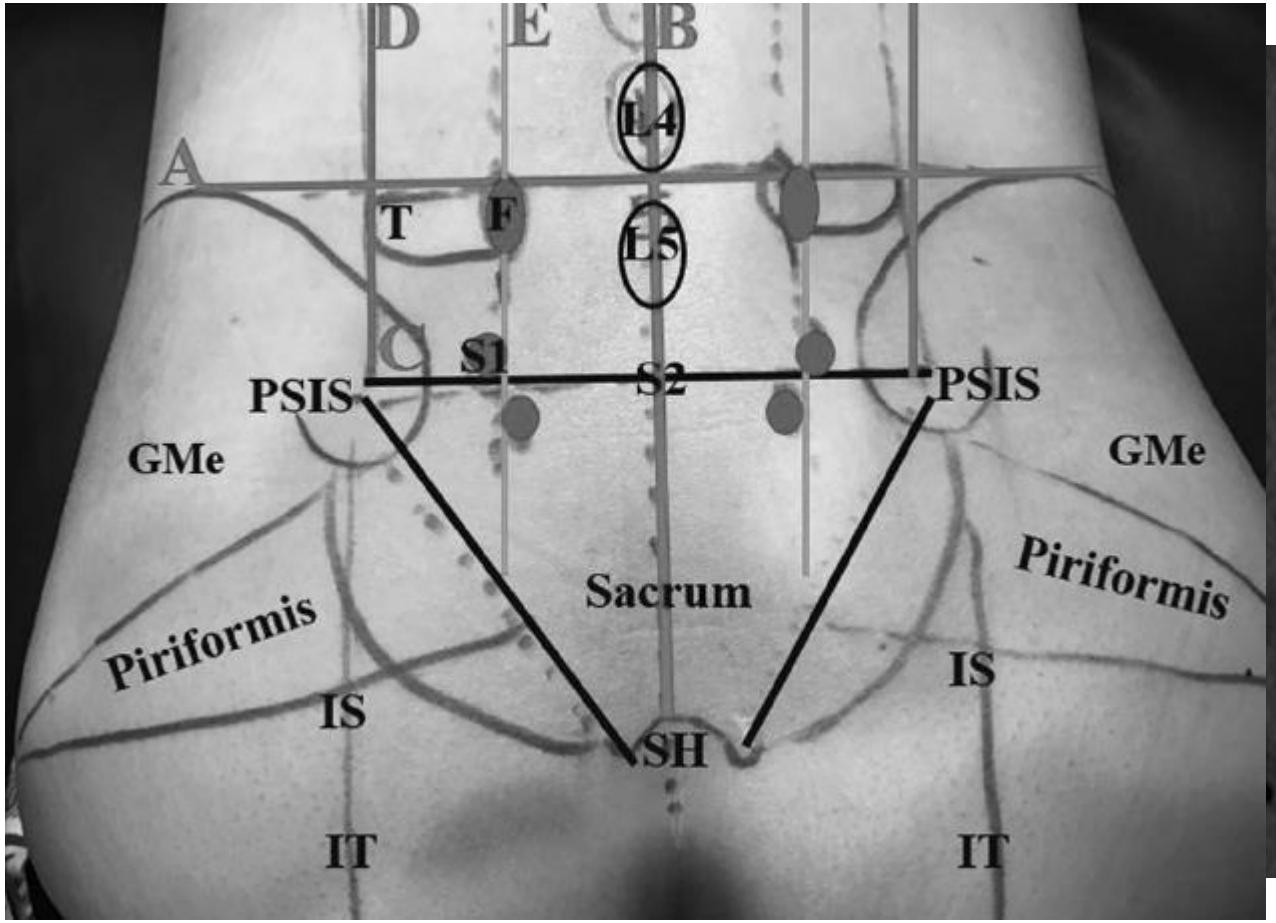
Facet joint syndrome: from diagnosis to interventional management. Insights into Imaging, 2018

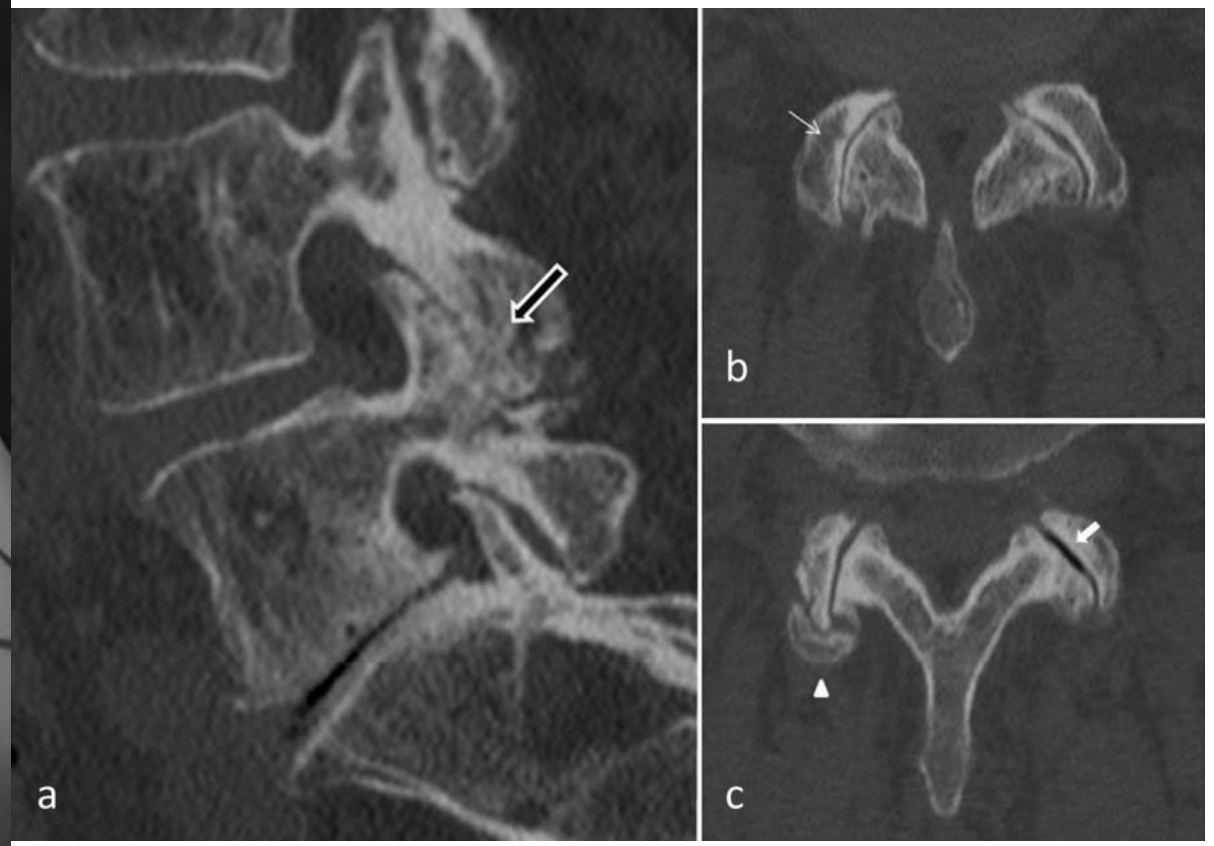
Facet Joint

- Only Synovial joint in the spine
- Hyaline cartilage
- Capacity of 1-2 mL
- L1 to L4, FJ innervated by the medial branch of the dorsal rami
  - Emerges from the inter transversal ligament

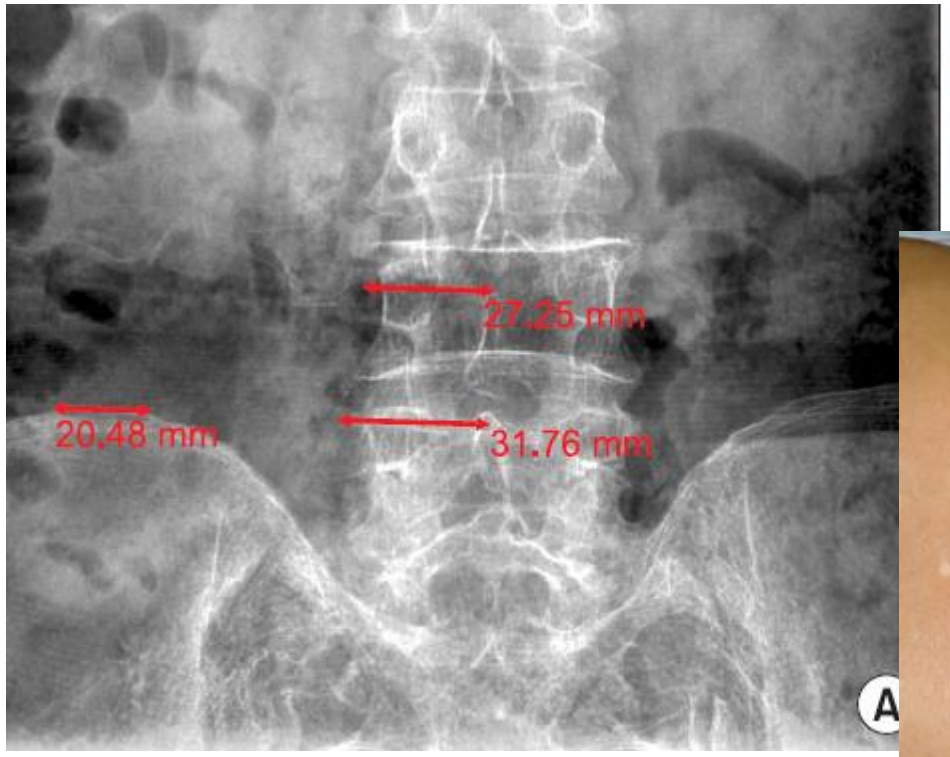
Facet Joint Syndrome

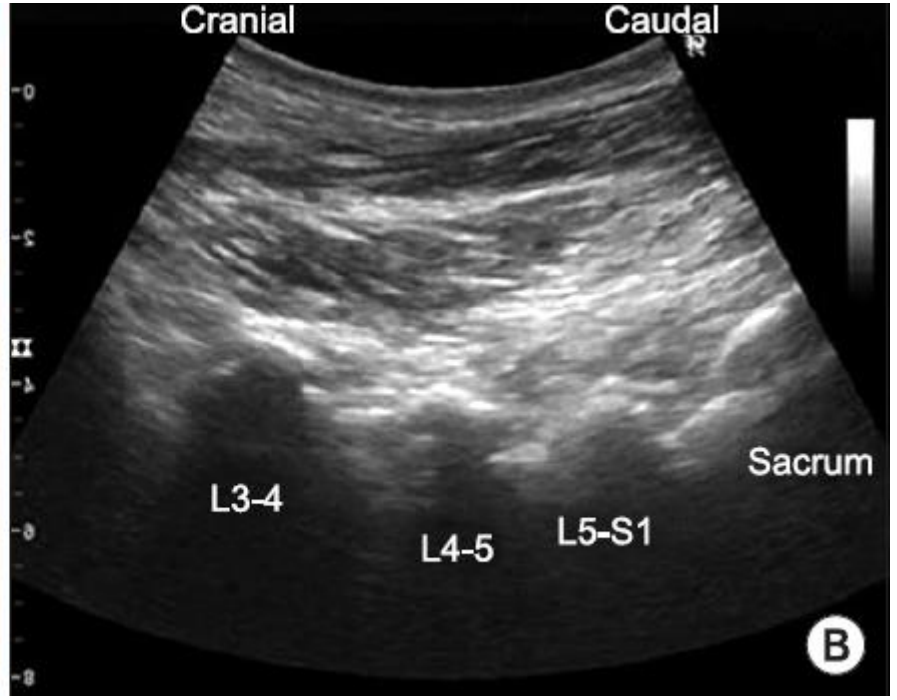
- Lumbar facet joint : 15-45% of LBP
- Facet joint degenerative osteoarthritis is the most frequent form of facet joint pain
- Facet joint block : diagnostic / therapeutic
- Clinical facet joint syndrome
  - Unilateral or bilateral back pain
  - Pain radiating to one or both buttocks, sides of the groin, and thighs
  - Pain stopping above the knee



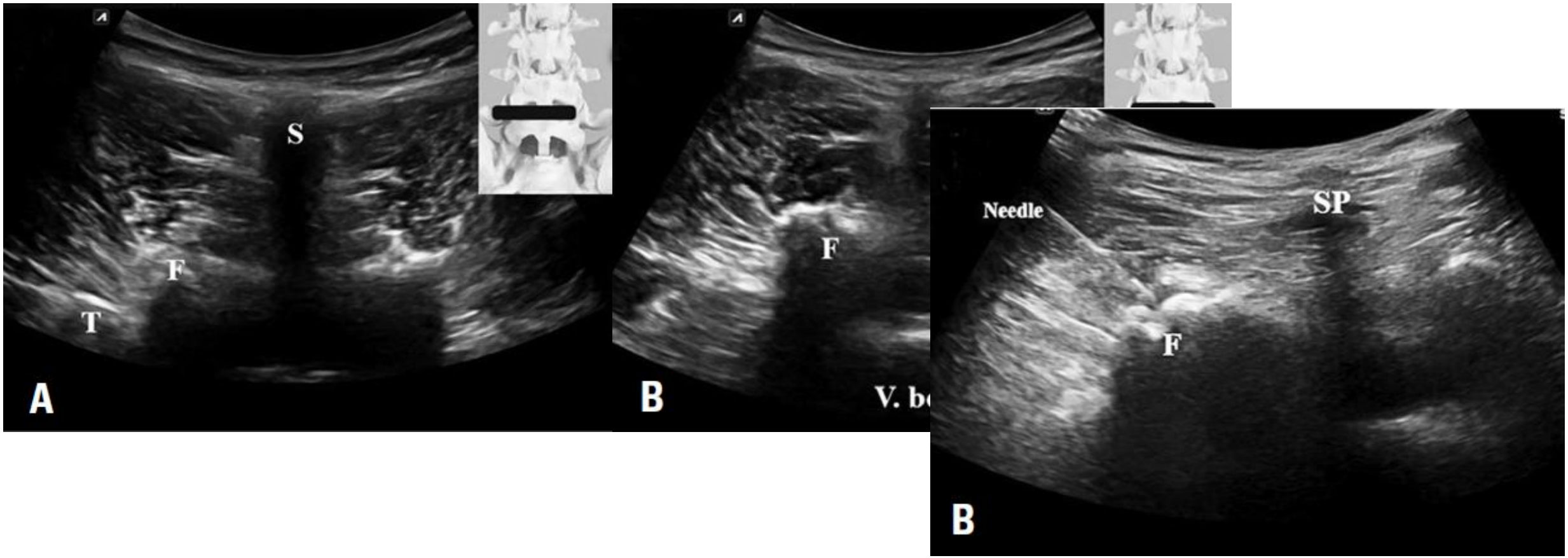


Journal of Korean Society of Spine Surgery. 2018





Clinics in Orthopedic Surgery 2013



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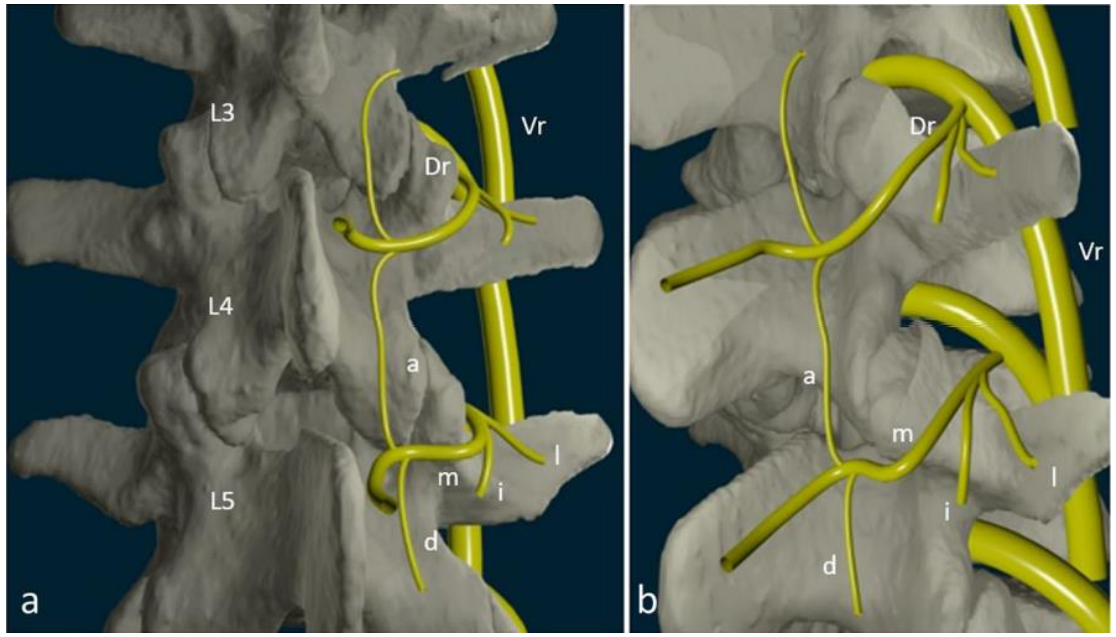
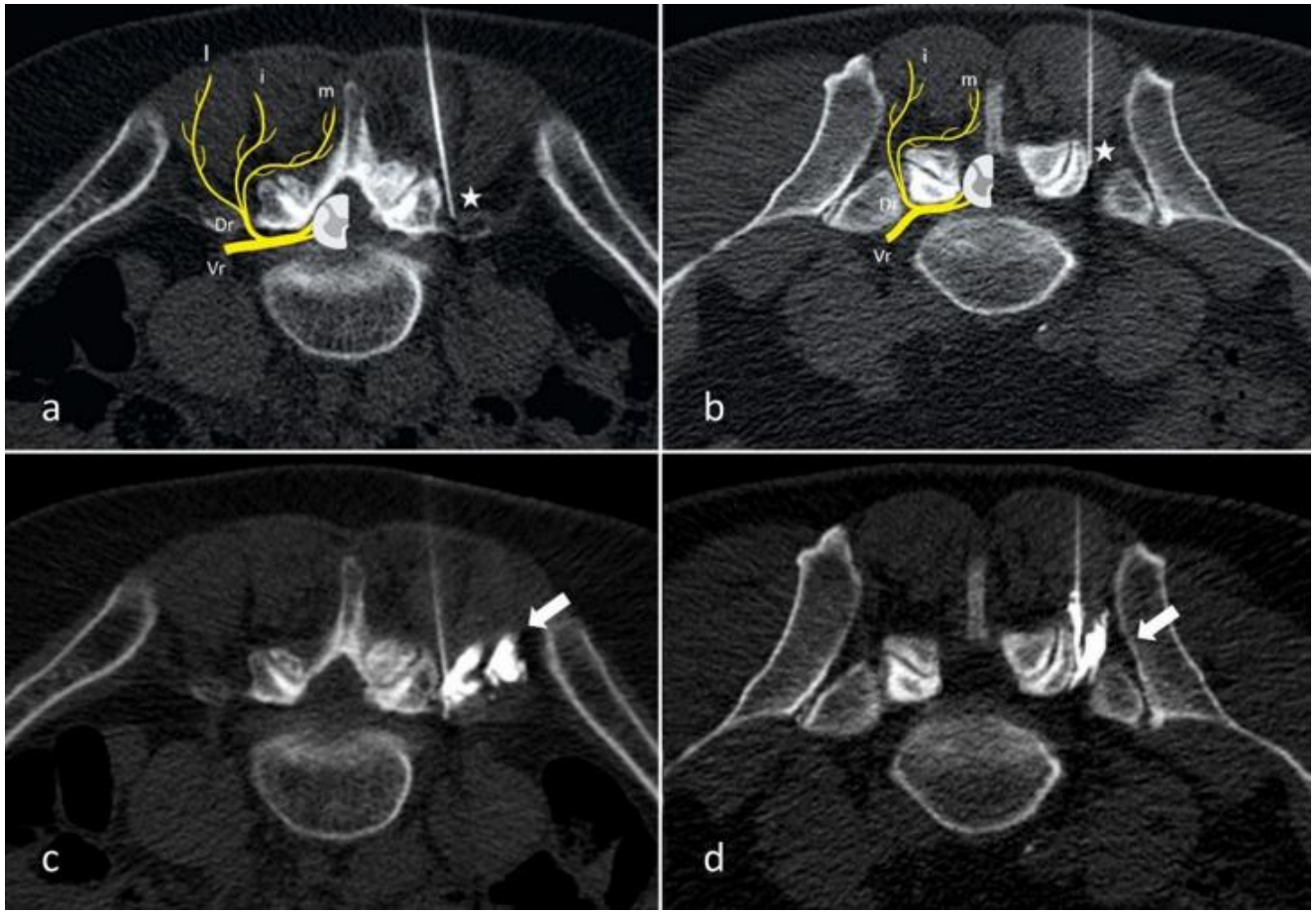
Selective Nerve Root Block (SNRB)

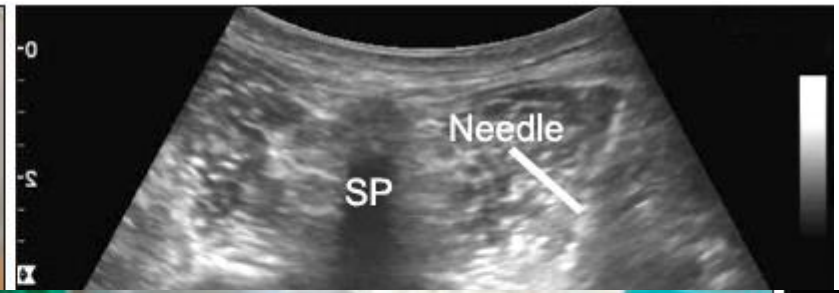
- Lower back pain accompanied by sciatica
- Prone position
- Surface landmark of the spinous process, iliac crest line
- The needle for the medial branch block inserted about 30 degree to the skin in plane approach

- Fluoroscopy 를 사용한 것과 큰 차이 없다고 보고





Clinics in Orthopedic Surgery 2013


Needle
SP


A

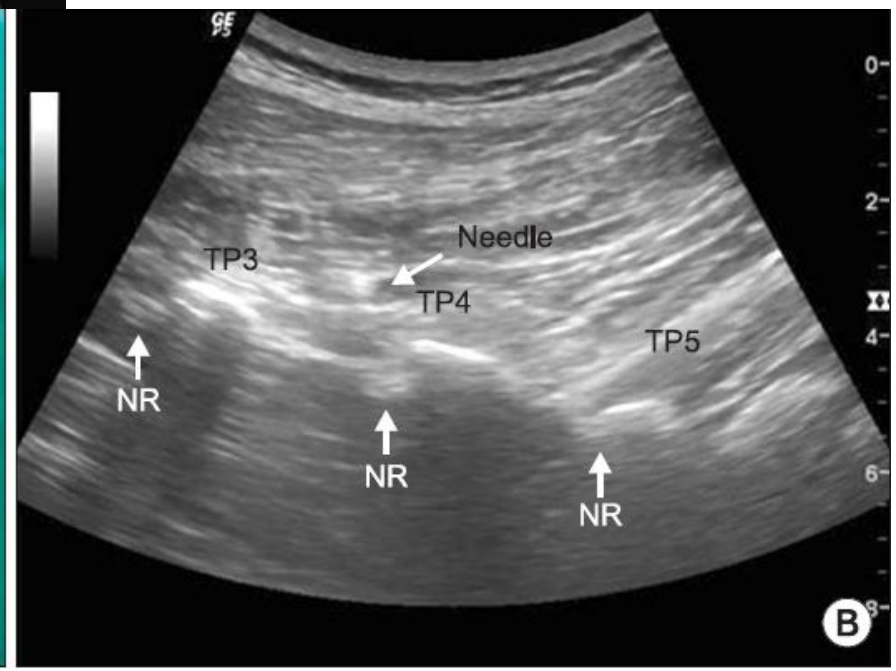

Needle
TP3
TP4
TP5
NR
NR
NR
B

Table 1 Main imaging findings in various imaging modalities

X-ray imaging		MRI	SPECT
Radiographs	CT		
AP, lateral (isthmus profile) and oblique views ("Scottie dog")	Highest contrast between bony structures and adjacent soft tissue	Active synovial inflammation, Adjacent bone edema Fat saturation technique ± Gadolinium injection	99mTc labelled bisphosphonates Osteoblastic activity Hyperemia associated with bone remodelling
Joint space narrowing Subchondral sclerosis and erosions Cartilage thinning Calcification of the joint capsule Hypertrophy of articular processes Vacuum joint phenomenon joint effusion		Facet joint effusion Subchondral bone edema Enhancement of the FJ rim (synovitis) Wraparound bumper osteophyte formation	Increased uptake (nonspecific)

Facet joint syndrome: from diagnosis to interventional management. Insights into Imaging, 2018

Lumbar Epidural Injection

- Indication :
  - No effect
    - Pain medication
    - Physiotherapy
      - Pain modality, Exercise, Activity modification
- Severe symptoms > 2weeks
- Mild to moderate persisting symptoms
- Responded to the epidural injection

Lumbar Epidural Injection

- Trans foraminal
- Interlaminar
- Caudal

Epidural Injection

- Drug
  - Particulate / nonparticulate corticosteroid
  - Number of injection
    - 2-3회

Lumbar epidural steroid injection

- 신경근성 통증을 동반한 추간판 탈출증 환자에서 경막외 주사치료는 임상적 효과가 있으므로 권고할 수 있다
  - 근거수준 높음, 권고강도 강
- 경막외 스테로이드 주입술은 추간판 탈출증 또는 척추 신경근병증이 없는 척추관 협착증, 추간판성 통증에 의한 요통 환자에 대한 치료 효과는 제한적이다.
  - 근거수준 IIb or III, 권고수준 C

대한재활의학회 임상진료지침위원회, 2018

Lumbar epidural steroid injection

- 신경근성 통증의 추간판 탈출증 환자에서 경추간공 (Transforaminal approach) epidural injection 이 경추궁간 (Interlaminar approach)에 비하여 우월한 임상적 효과가 있으므로 권고할 수 있다
  - 증거수준 중간, 권고강도 약

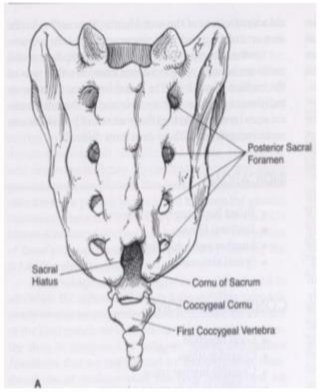
- 신경근성 통증을 동반한 추간판 탈출증 환자에서 Transforaminal approach 가 caudal approach 에 비하여 우월한 임상적 효과가 있으므로 권고할 수 있다
  - 증거수준 중간, 권고강도 강

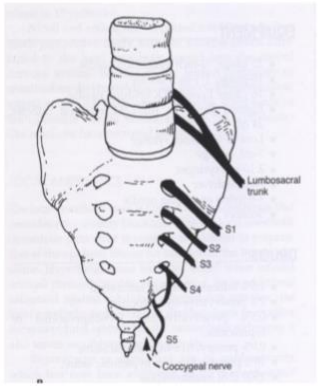
- 신경근성 통증을 동반한 추간판 탈출증 환자에서 epidural injection 시에 스테로이드를 투여하는 것이 투여하지 않은 경우에 비하여 우월한 임상적 효과가 있으므로 권고할 수 있다.
  - 증거수준 낮음, 권고강도 약

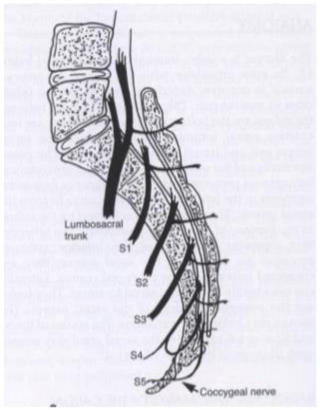
- No major complication
- Minor complication : 9.6% per injection
  - Transient nonpositional headaches : 3.1%
  - Increased back pain : 2.4%
  - Increased leg pain : 0.6%
  - Facial flushing : 1.2%
  - Vasovagal reaction : 0.3%
  - Increased blood sugar : 0.3%
  - Intraoperative hypertension : 0.3%

Botwin, K.P.et al.(2000). Arch phys med rehab 81(8): 1045-1050

Technique







Landmark: hiatus(1) & inferior iliac spine(2)

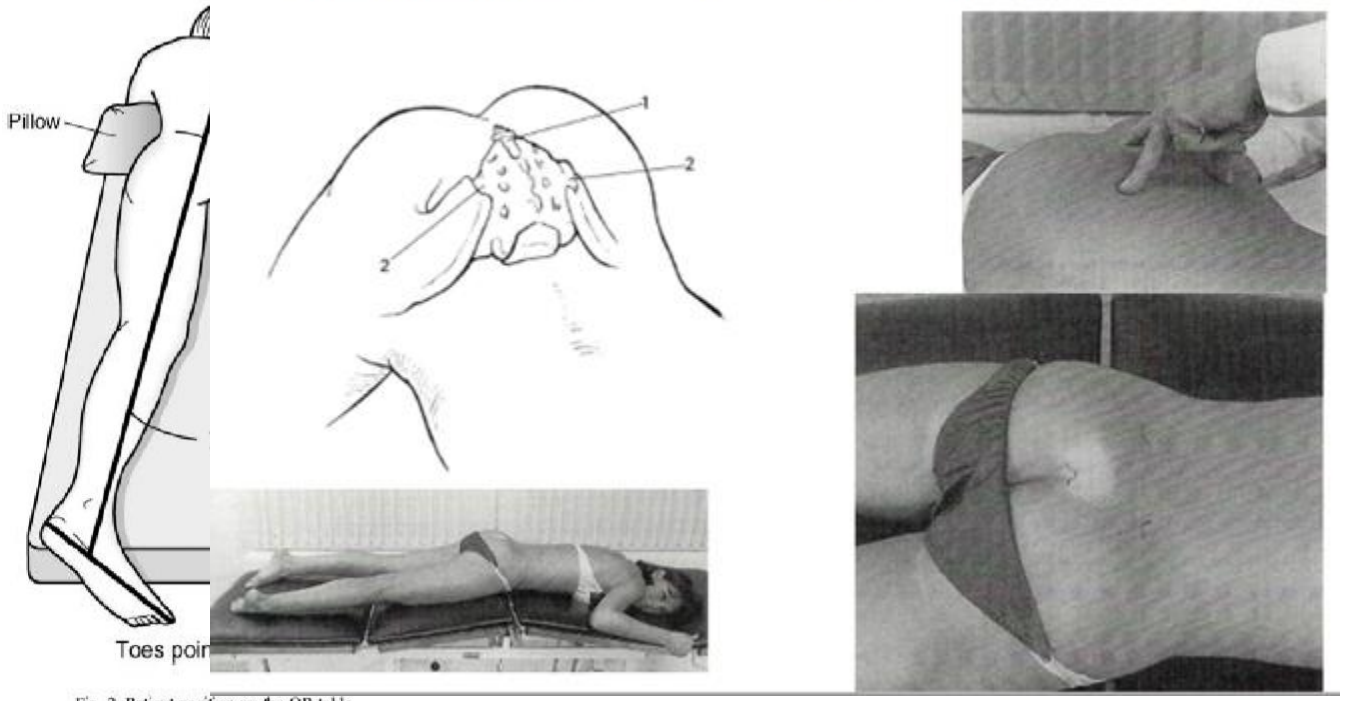
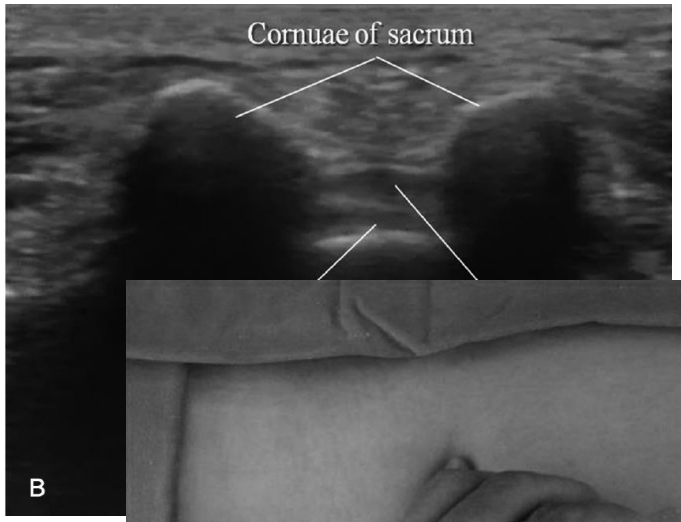
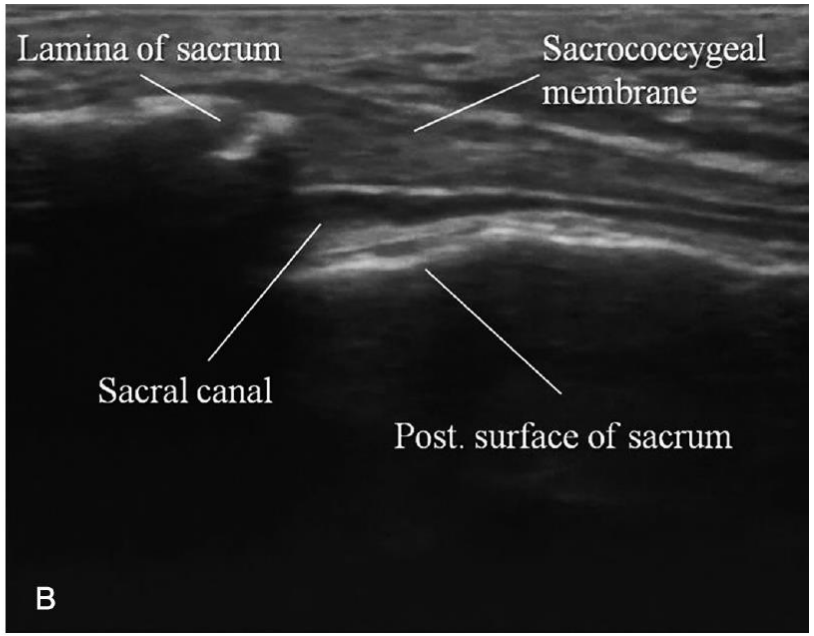


Fig. 2. Patient position on the OR table.





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Intercostal Nerve Block

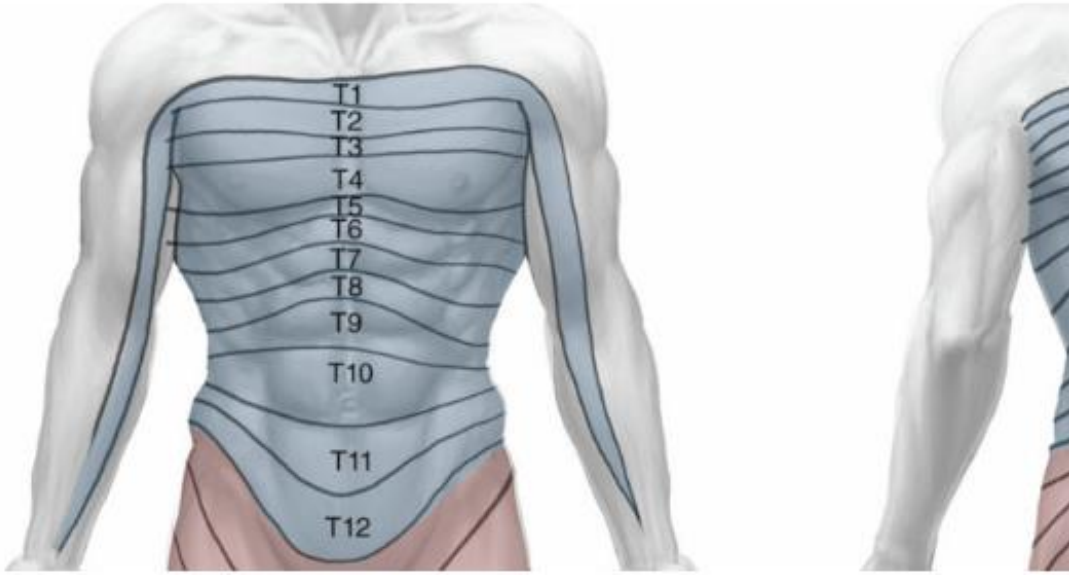


Figure 2 . Dermatomal distribution of the intercostal nerves.

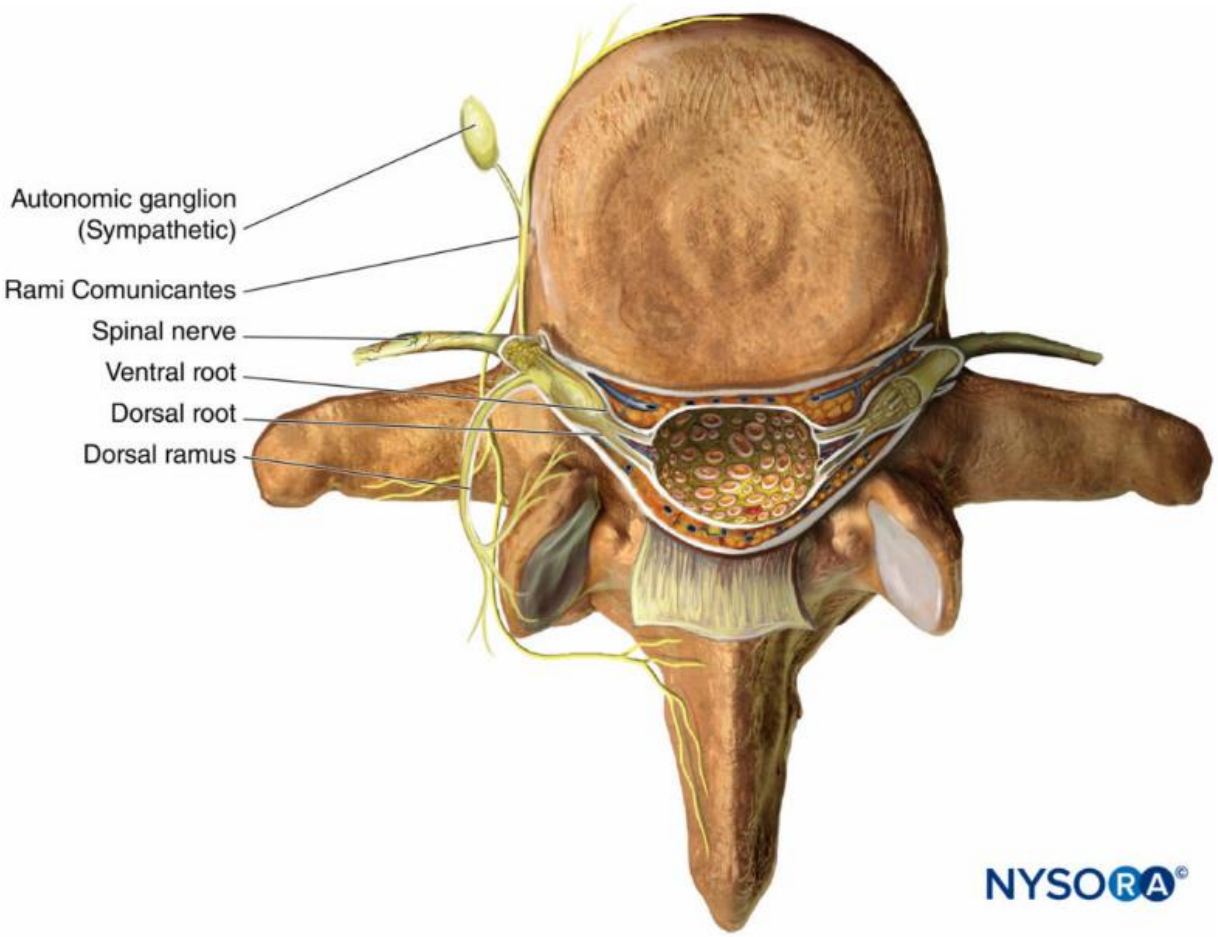


Figure 1 . Anatomy of the spinal nerve.

- Intercostal Nerve Block – Landmarks and Nerve Stimulator Technique

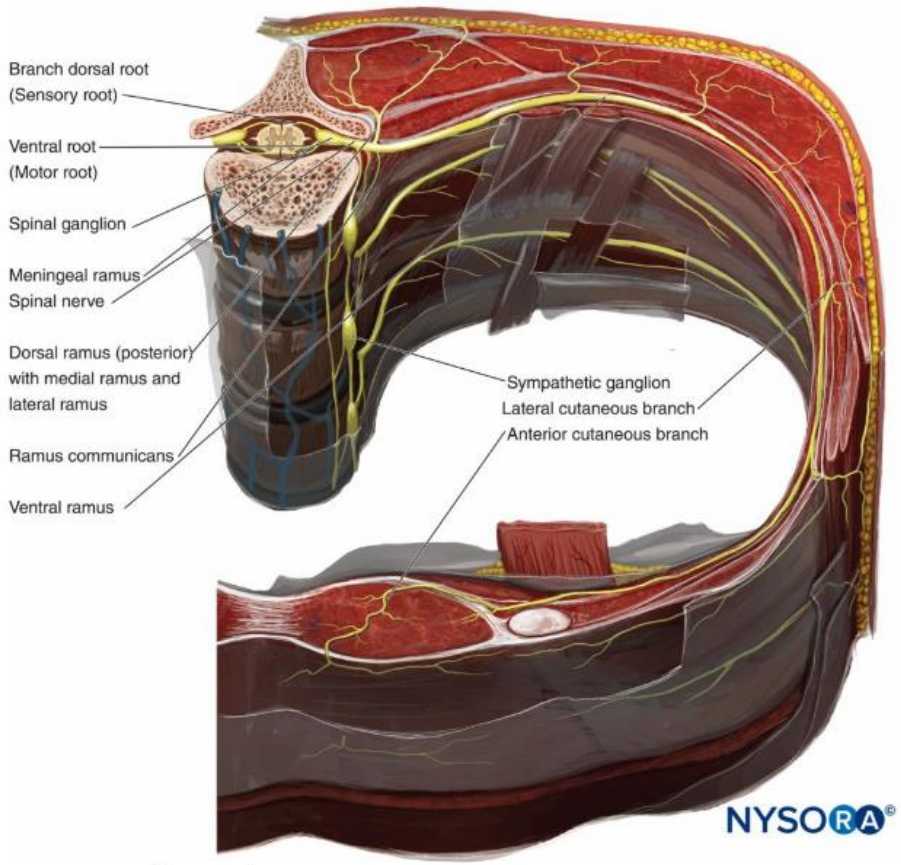


Figure 4 . Anatomy of the intercostal nerve.

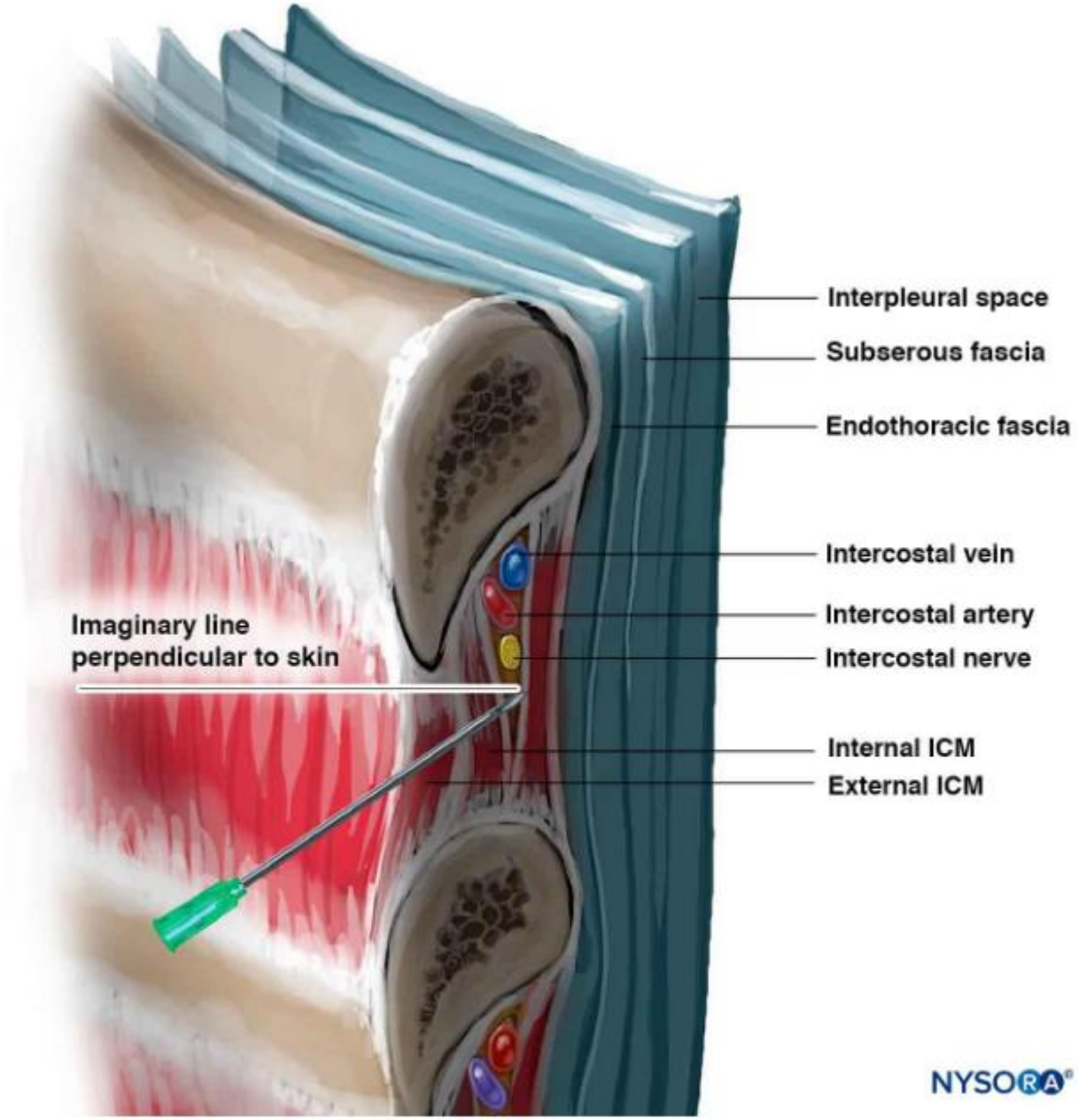


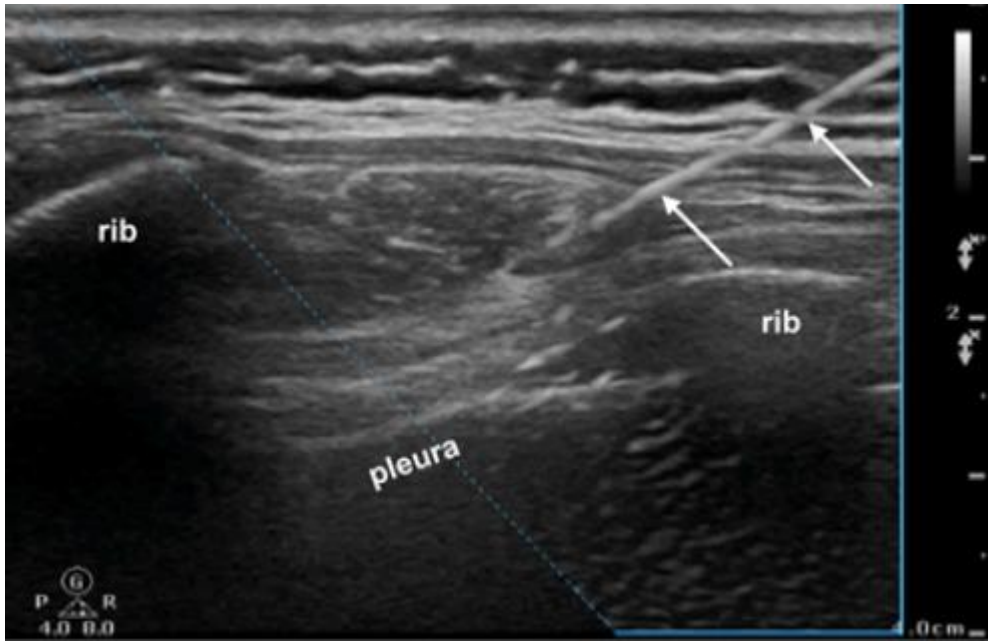
Figure 6 . Needle angle required to enter intercostal sulcus. Note the relationship of the intercostal vessels to the nerve.

- Thoracic spinal nerves from T1 to T11 all have anterior rami corresponding with intercostal nerves.
- Intercostal nerves are associated with the somatic nerve system
- Collateral, lateral cutaneous, rami communicantes, anterior cutaneous, muscular, pleural, peritoneal sensory
- 1-6th intercoatal nerves usually supply parietal pleura, skin, serratus posterior, levatores costarum, intercostal muscles
- 7-11th intercostal nerves supply to parietal peritoneum, skin int/ext. oblique, rectus, transversus muscle

- Ultrasound-Guided Intercostal Nerve Block

- Indications
  - Postoperative pain control
  - Multiple rib fractures
  - Sternal fractures
  - Analgesia for chest tubes
  - Analgesia for costochondritis
  - Analgesia in thoracic blunt trauma
  - Treat pain caused by shingles or postherpetic neuralgia
  - Pain located in the thoracic spine
  - Diagnostic nerve block for chest wall pain

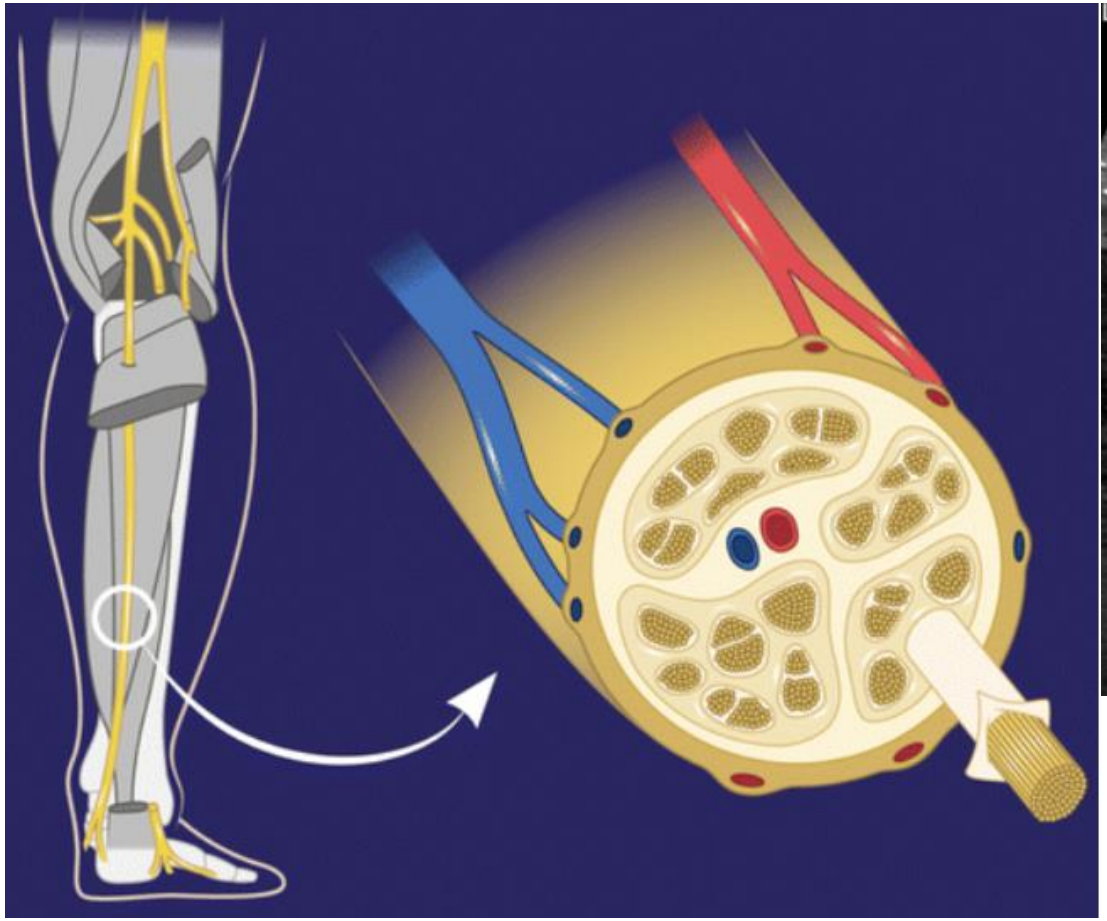

lateral
cephalad
caudal

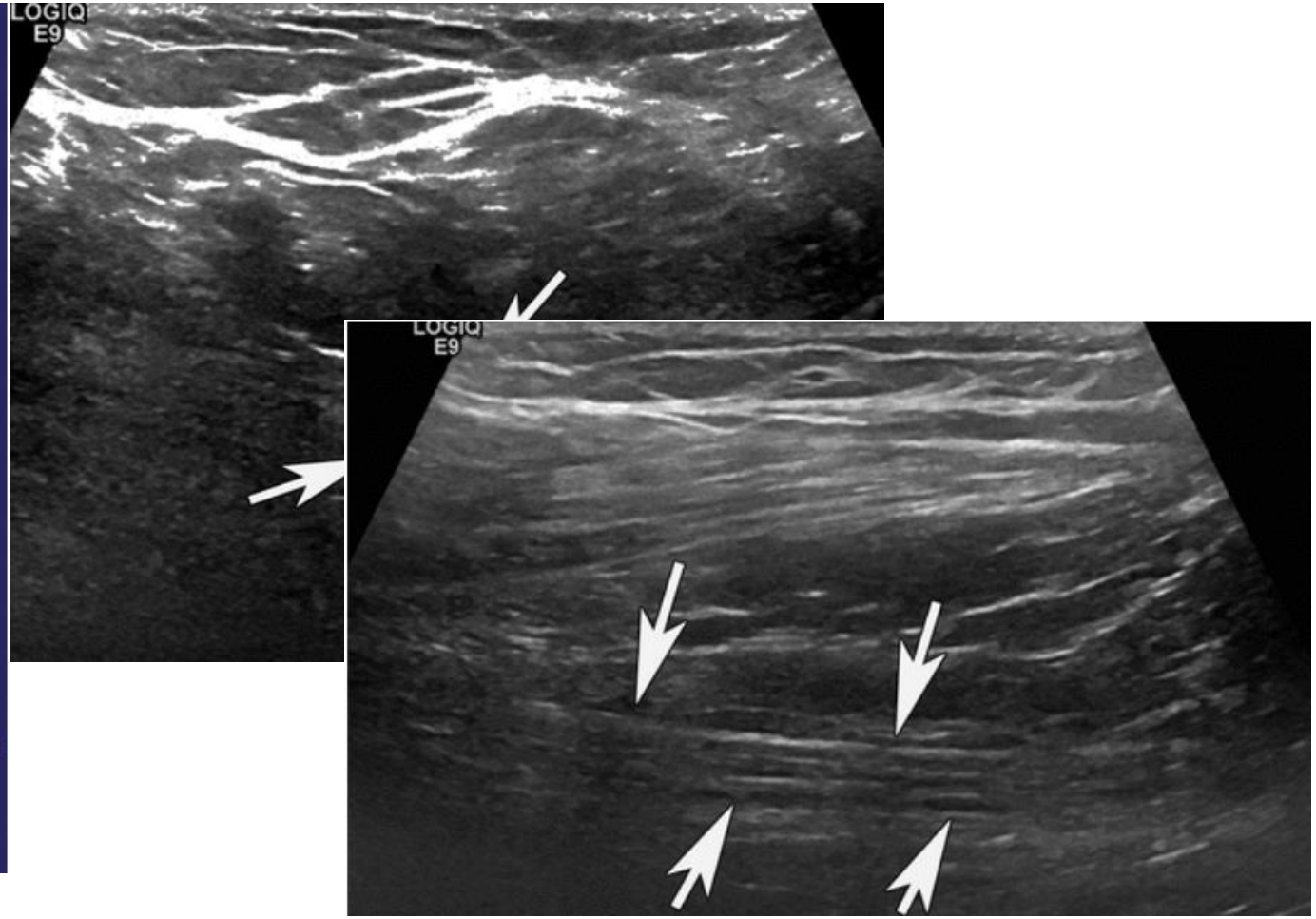

rib
rib
pleura

Peripheral Nerves of Lower Extremity

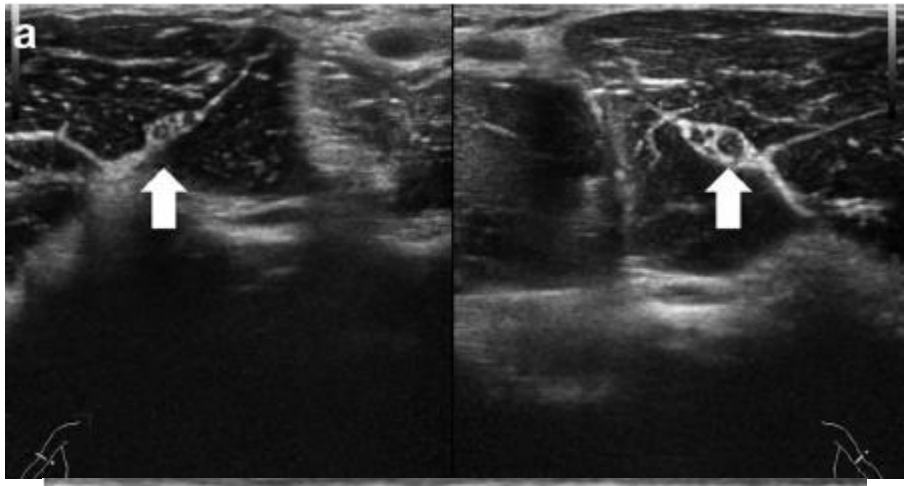
- US had greater sensitivity than MR for peripheral nerve
- MR is standard for the lumbosacral plexus
- US is cheaper, faster, free position, realtime dynamic image

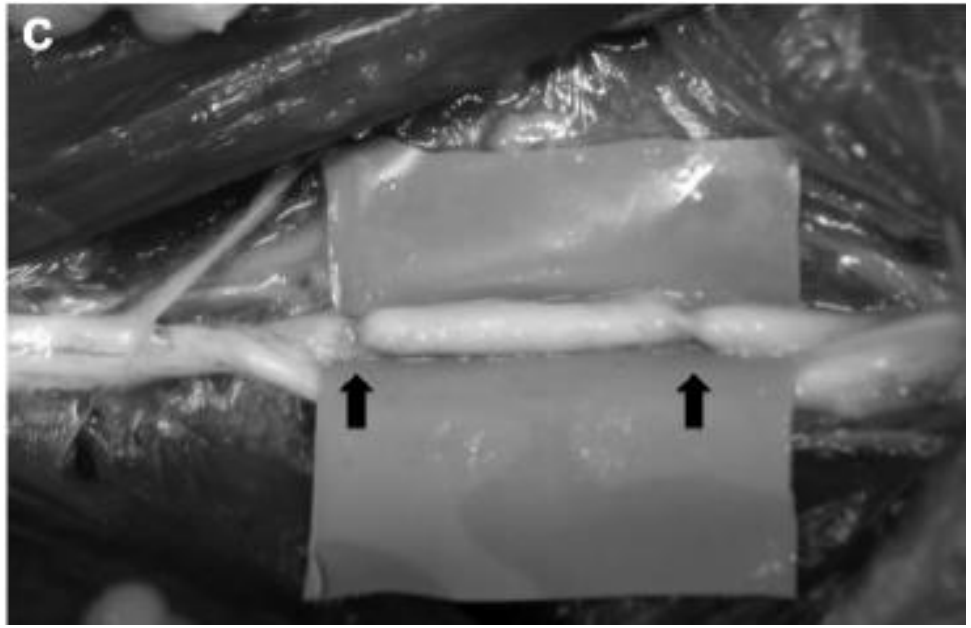
- 17-5 MHz linear-array transducer : superficial nerve
- 12-5 MHz transducer : deeper nerve
- 5-9 MHz curved transducer : posterior thigh in larger patients
- ‘hockey stick’ transducer : most superficial digital nerve





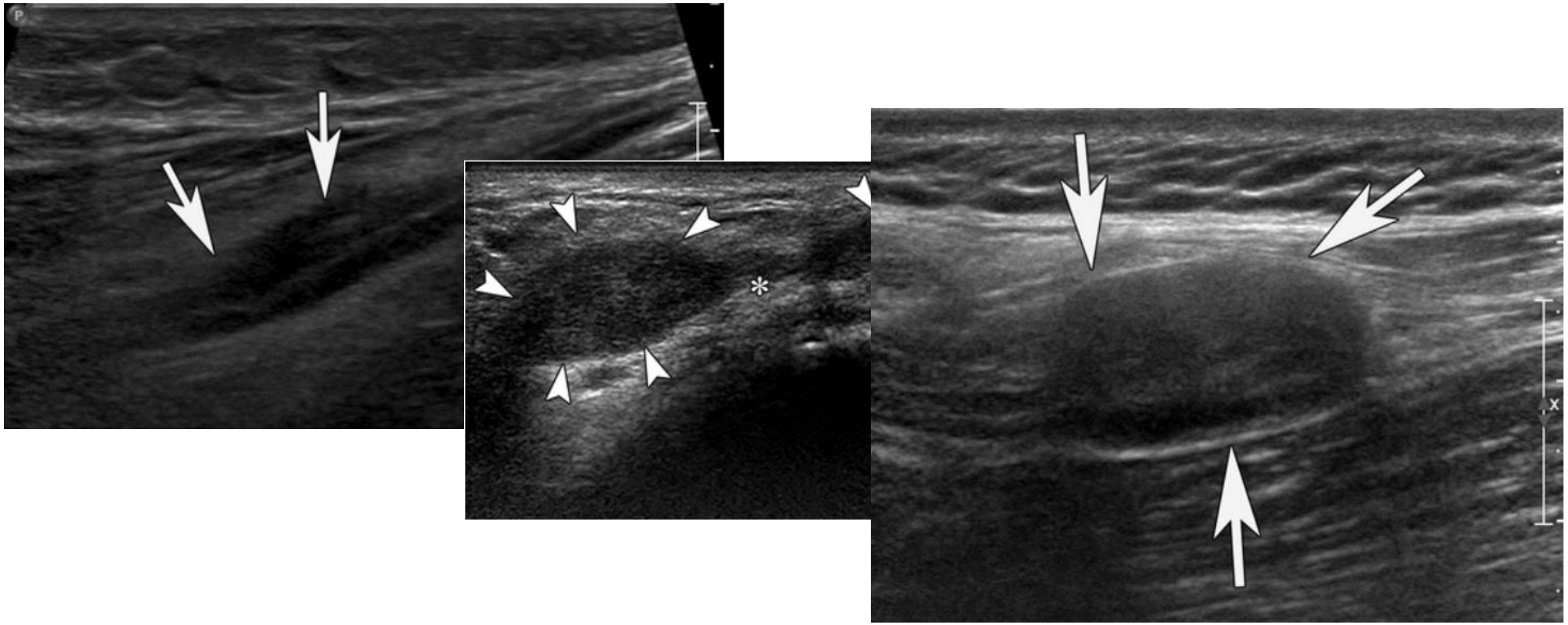
US of the Peripheral Nerves of the Lower Extremity: A Landmark Approach-Radiographics





- Ultrasound in Medicine & Biology

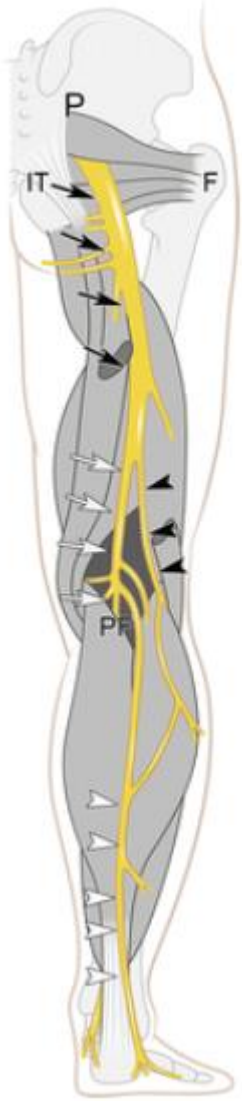
- Muscles are normally hypoechoic with thin echogenic internal septa
- When muscle is denervated, muscle becomes echogenic and reduced in size, consistent with atrophy and fatty infiltration
- Abnormal nerve appears swollen and hypoechoic proximal to the level of the entrapment
- With transection or laceration, the nerve may appear focally discontinuous, with hypoechoic swelling of the retracted ends
- Neuroma appears as focal hypoechoic swelling of the nerve end

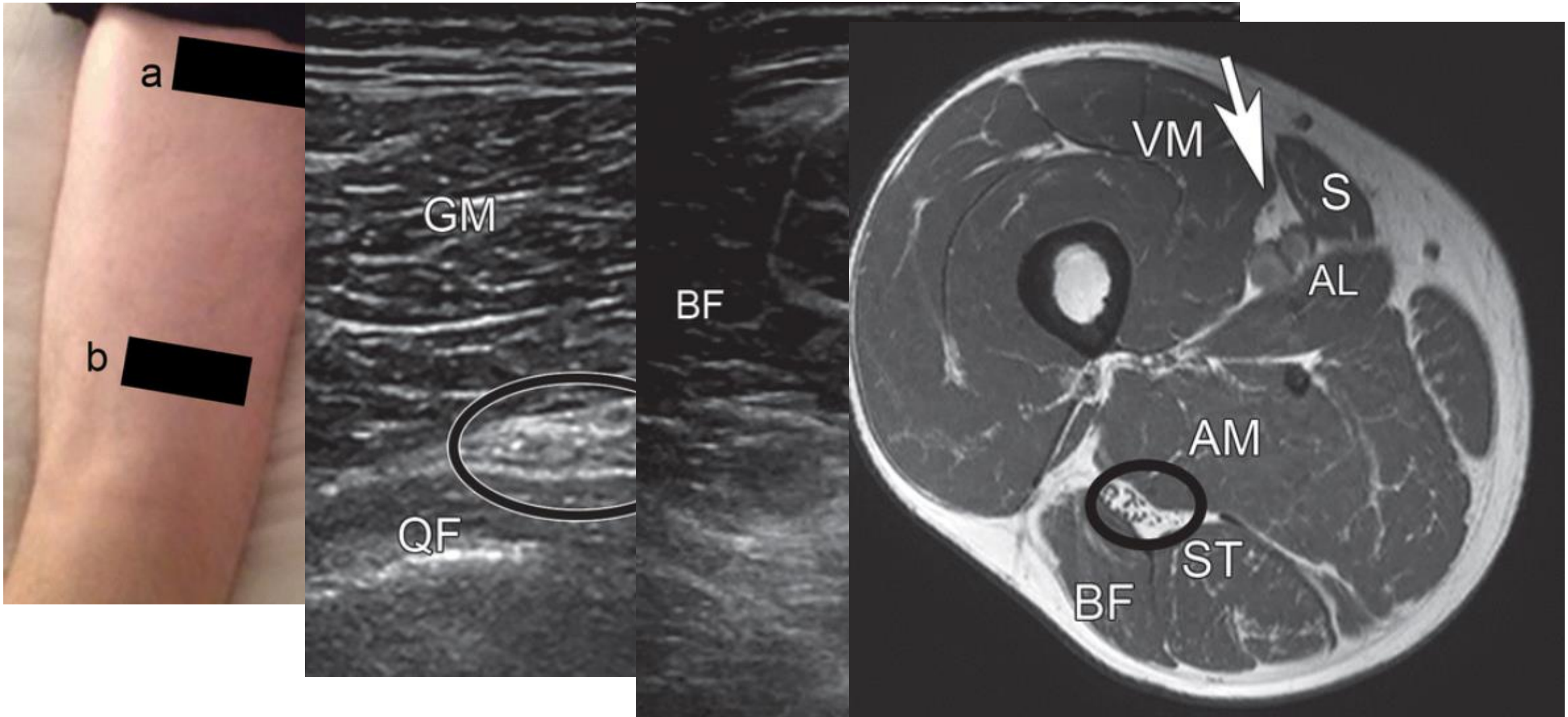


US of the Peripheral Nerves of the Lower Extremity: A Landmark Approach-Radiographics

Sciatic nerve

- Sciatic Nerve
  - Largest nerve in the body
  - L4-S3 nerve roots
  - Motor innervation to the m. of the posterior thigh, lower leg, foot and sensory innervation to the leg.
  - Divides in the posterior mid thigh into the ant. division, supplying the tibial n. and the posterior division, supplying the common peroneal nerve



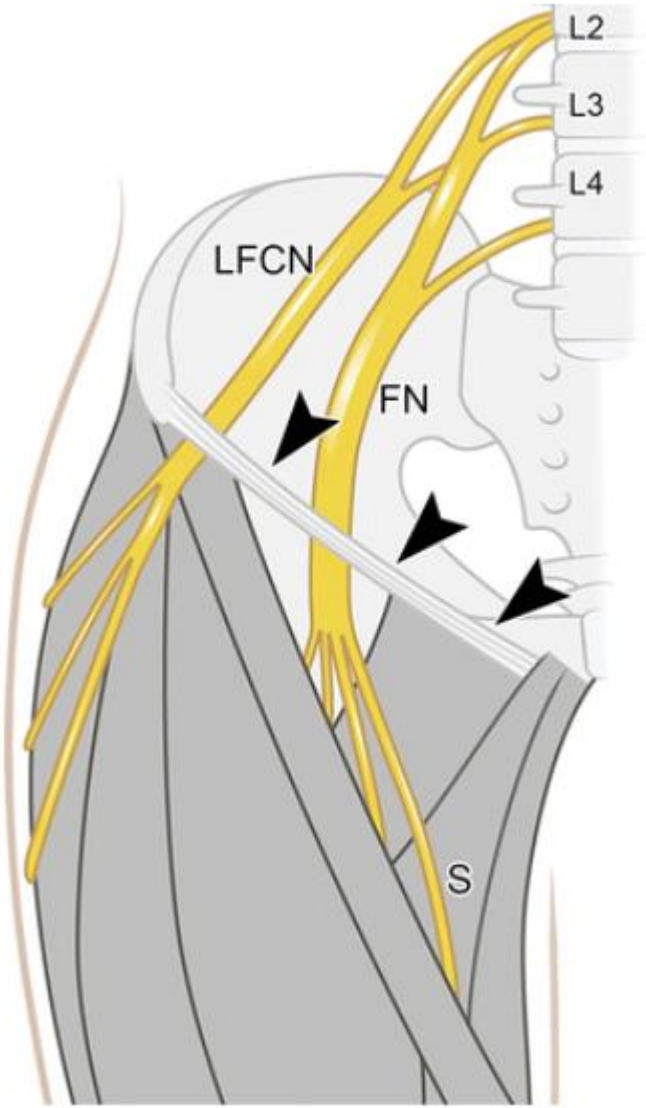

a
b
GM
QF
BF
VM
S
AL
AM
ST
BF

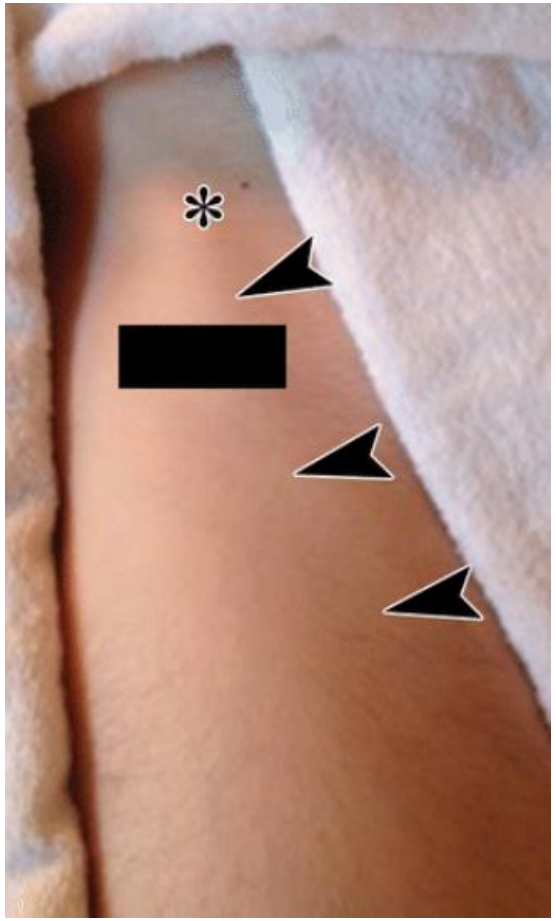
- Sciatic nerve injury
  - Femoral or acetabular fx.
  - Post. Femoral dislocation
  - Hamstring avulsion or injury with hematoma
  - Piriformis syndrome
    - Hypertrophy of the piriformis muscle can cause impingement on the sciatic n.
  - Tumors
  - Sciatic neuroma at the site of nerve transection
    - Avove or below knee amputation
  - Peroneal division is more superficial and more injuried than tibial division

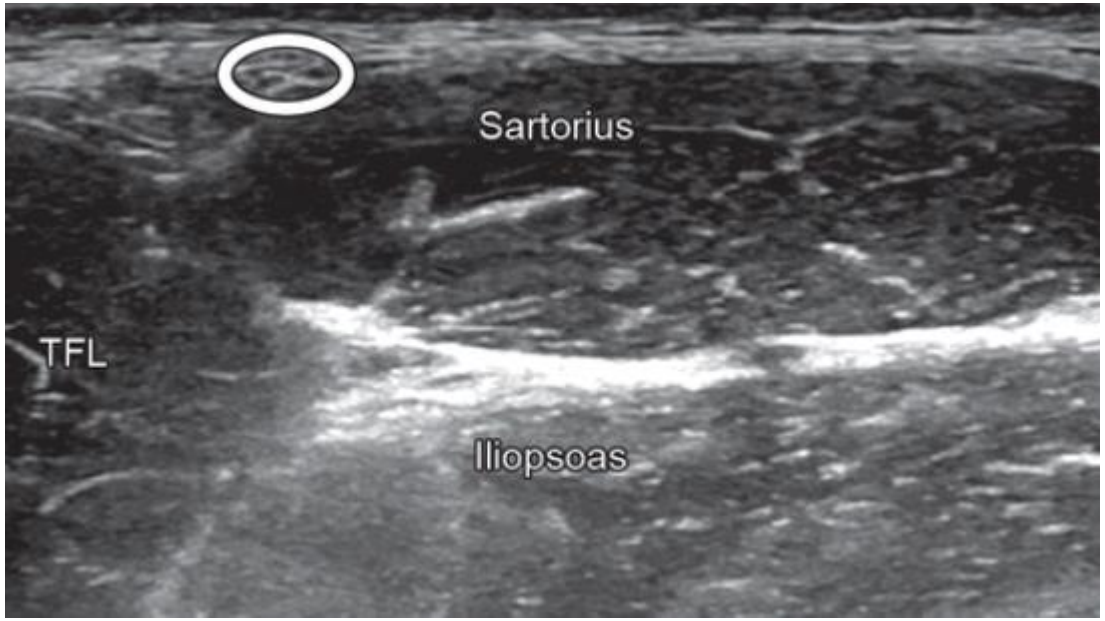
Lateral Femoral Cutaneous Nerve

- From L2 and L3 nerve roots
- Ant. Compartment of the thigh
- Sensory innervation to the anterior and lateral aspect of the thigh
- Located superficial to the sartorius muscle just distal to the ant. Sup. Iliac spine

- Meralgia paresthetica (LFCN neuropathy)
  - Compression can cause (clothing, belts, obesity, pregnancy…)
  - Numbness ant tingling of the ant. Lateral thigh

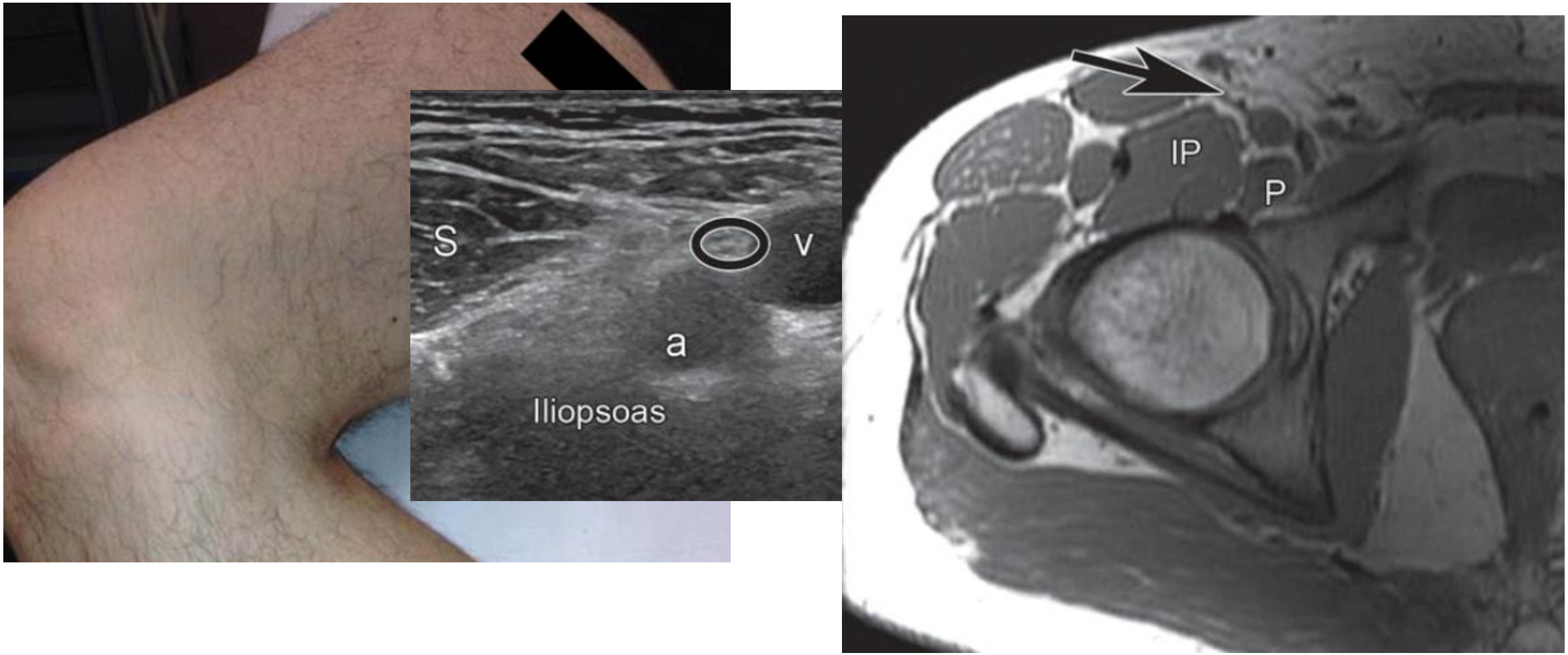





Sartorius
TFL
Iliopsoas

Femoral nerve

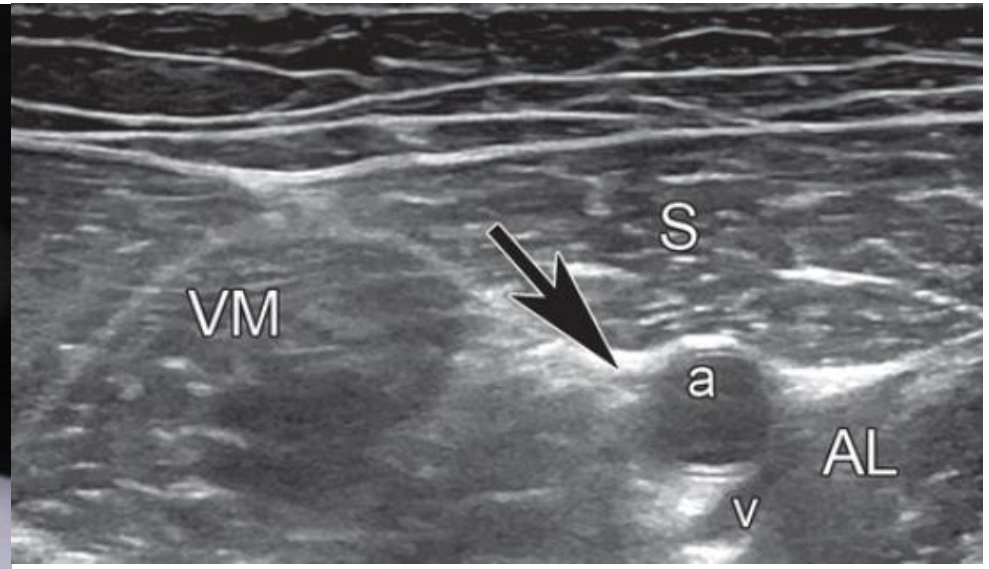
- From L2 – L4 nerve roots
- Arise deep to and traverses through the psoas muscle
- Innervation both psoas and iliacus muscle
- Divides in to anterior and posterior division at proximal thigh
  - Ant. Division innervates the pectineus and Sartorius
  - Post. Division supplies the quadriceps muscle
- Sensory innervation to anteromedial thigh, knee, and medial leg
- Compression neuropathy
  - Direct trauma, mass effect by tumor or hematoma, total hip arthroplasty….
- Femoral neuropathy proximal to the inguinal ligament
  - Weak hip flexion and knee extension
  - Sensory deficits in the anteromedial thigh, knee, and medial leg


S
v
a
Iliopsoas
IP
P

Sapheous nerve

- From L2-4 nerve roots
- Terminal cutaneous branch of the femoral nerve
- Sensory innervation to the ant. And med. Distal thigh, anteromedial knee, med. Lower leg
- No motor innervation

- Saphenous neuropathy
  - Level of injury, numbness and tingling in the med. And ant. Knee, med. Calf,
  - Purely sensory, no motor deficits are present


S
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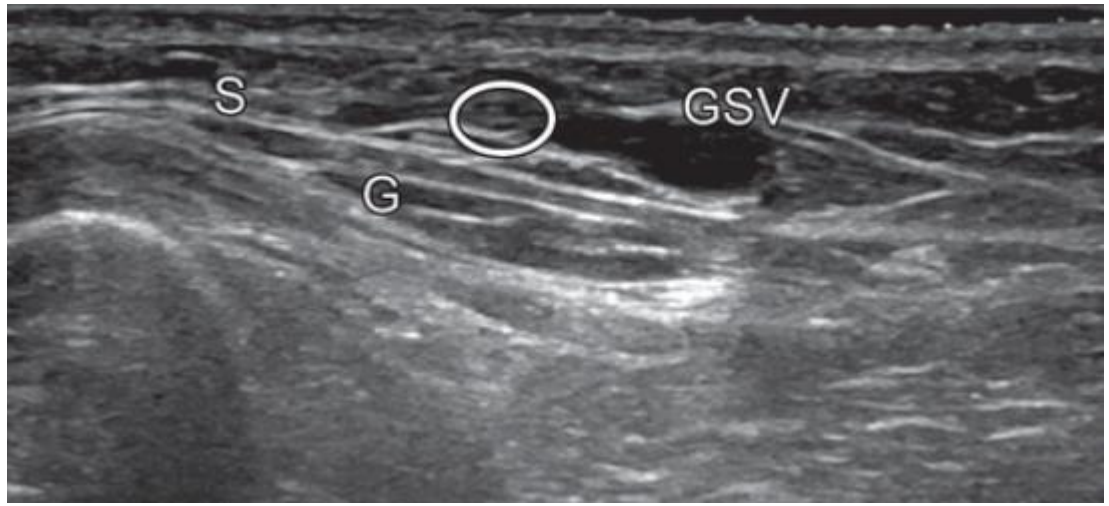
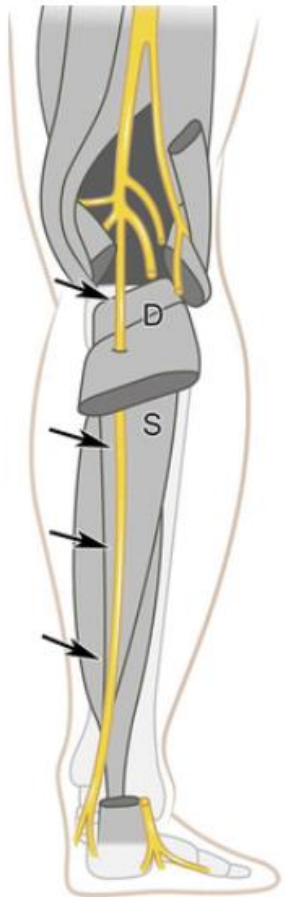
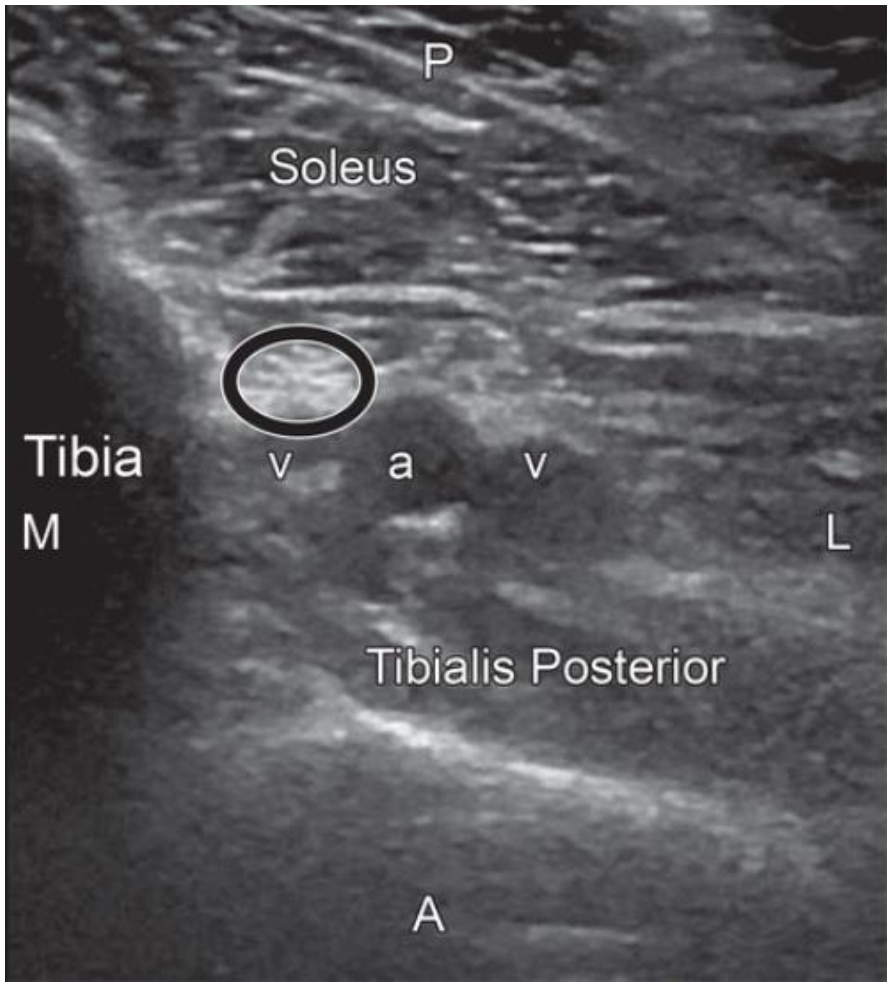

S
GSV
G

Tibial nerve

- L4-S3 nerve roots
- Motor innervation to superf. And deep compartment of leg
- Superf. Component : GCM, soleus, plantaris muscle
- Deep component : popliteus and flexor muscle
- Sensory innervation to the knee through articular br., posterolat. Leg through medial sural nerve.

- Tibial plateu fx., post. Knee dislocation, Baker or ganglion cyst, mass
  - Entrapment may cause weakness of the plantar flexor and invertor muscle
  - Sensory loss in the proximal posterolateral leg via medial sural nerve.

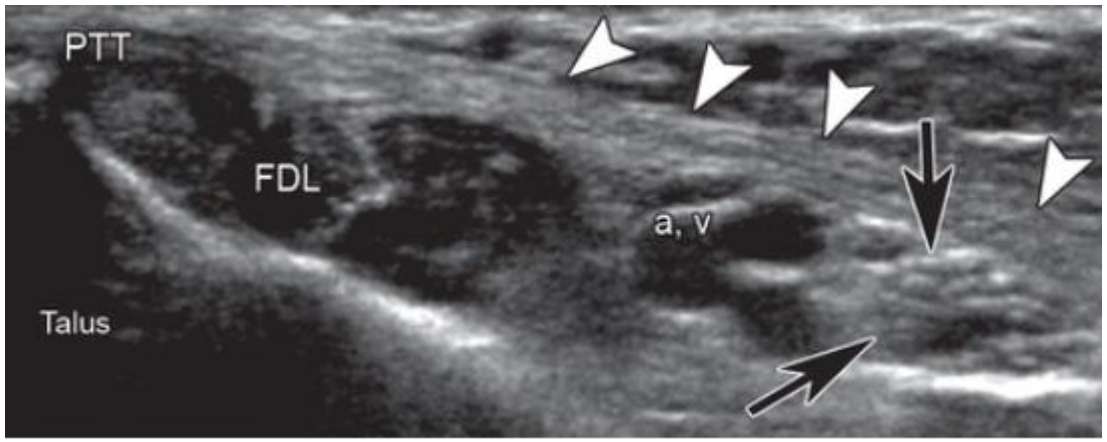

D
S

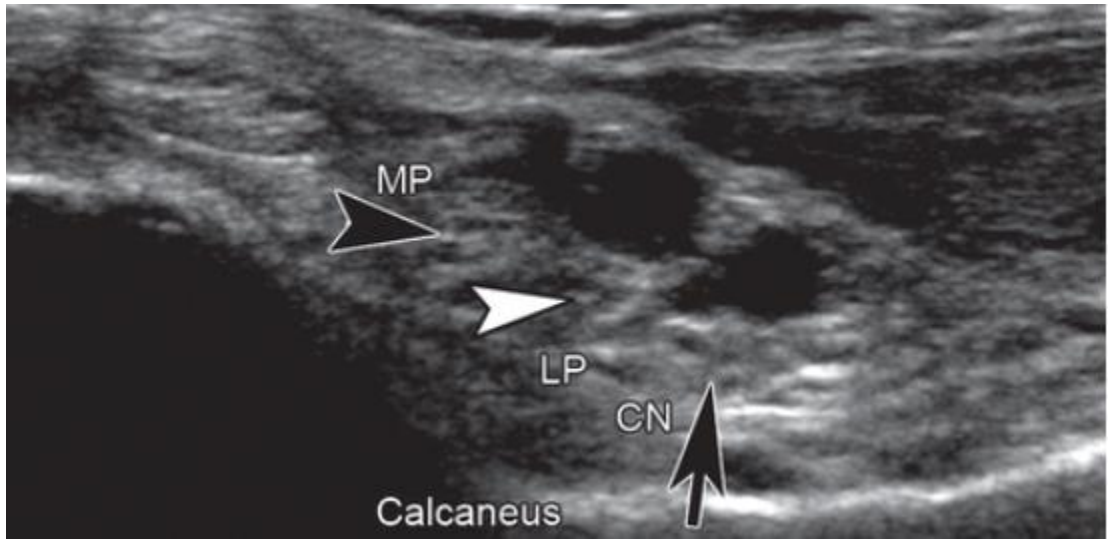

P
Soleus
Tibia
v
a
v
M
L
Tibialis Posterior
A

Tibial nerve - Ankle

- Posterior to med. Malleolus with post. Tibial a. and v.
- Distal to the med. Malleolus, tibial n. enters the tarsal tunnel

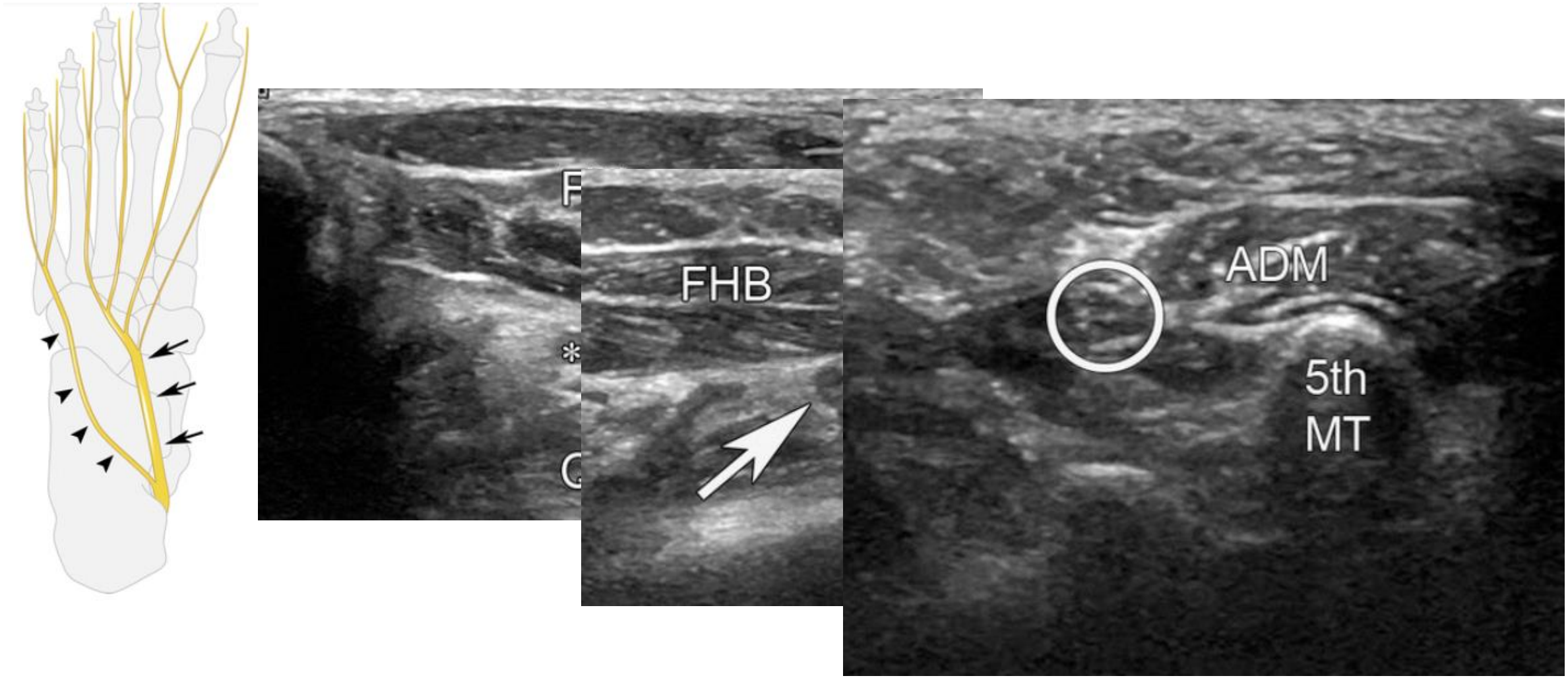
- Compression at tarsal tunnel
  - Intric sources
    - Osteophytes, retinacular hypertrophy, tendinopathy or tenosynovitis, mass, ganglion cysts, varices
  - Extrinsic sources
    - Direct trauma, fibrosis, inflammatory arthropathy
  - Pain behind the medial malleolus, radiating into the plantar arch
  - Pain and paresthesias along the plantar aspect of the foot and toes


PTT
FDL
a, v
Talus


MP
LP
CN
Calcaneus

Plantar nerve

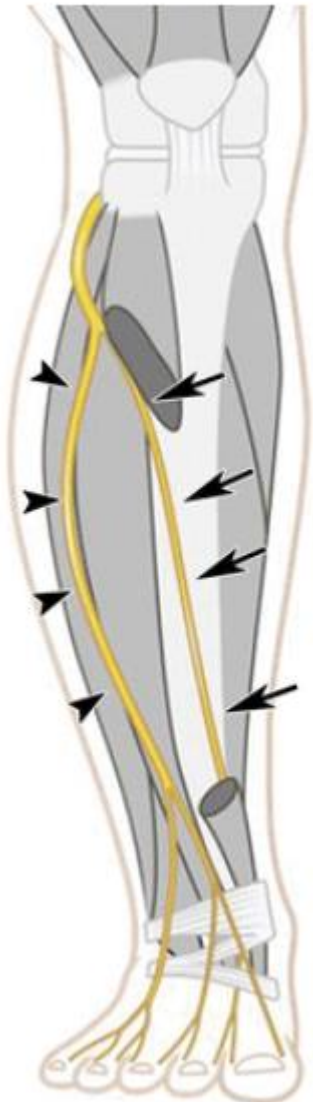
- Medial plantar nerve
  - Motor innervation to the flexor digitorum brevis, abductor halluces longus, flexor halluces brevis, medial lumbricals
  - Medial aspect of the great toe via digital nerve
  - Medial digital muscles of the 2-4 digits
  - Sensory innervation to the medial plantar foot and toes
  - Compression may cause entrapment > medial foot and arch pain and numbness
- Lateral plantar nerve
  - Motor innervation to plantar surface of the foot (quadratus plantae, flexor digiti minimi brevis, adductor digiti minimi, lateral lumbricals, interosseous muscle)
  - Compression by abd. Hallucis longus, hypertrophied abductor hallucic, pronated foot in runners
  - Plantar fasciitis with calcaneal spur
  - Numbness and pain in the lat. Plantar aspect.

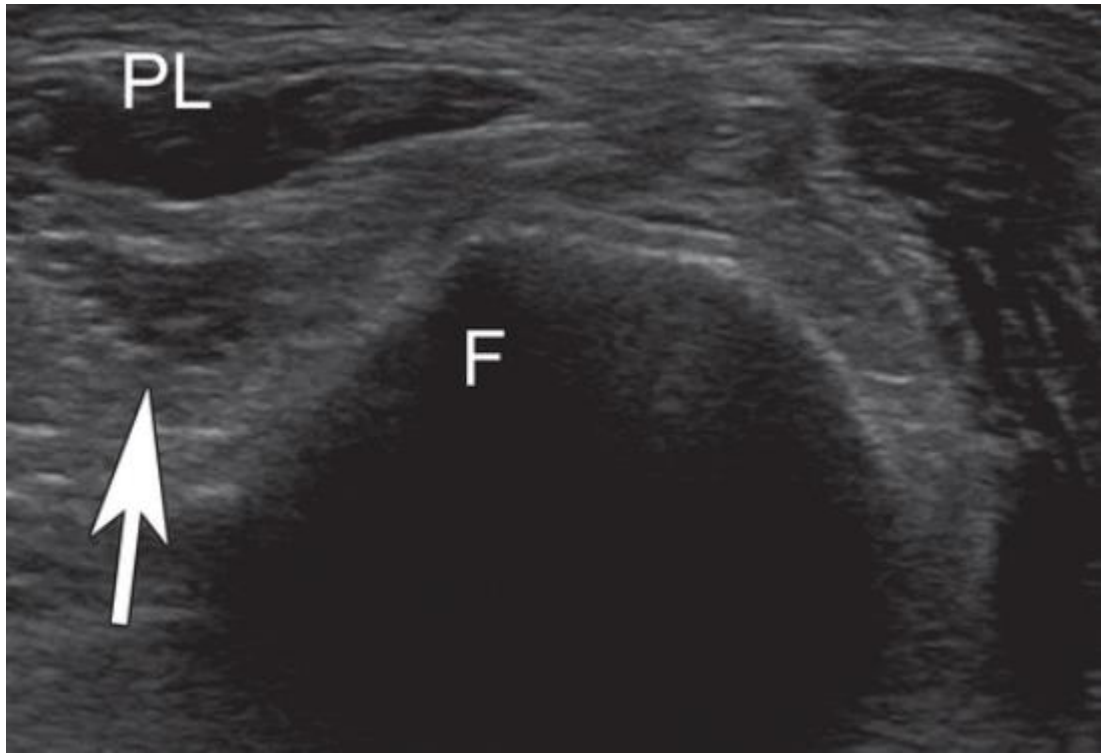

FHB
ADM
5th
MT

Common peroneal nerve

- L4-S2 nerve root
- At fibular tunnel (fibular head level)
  - Deep peroneal n., superficial peroneal n., recurrent articular br.

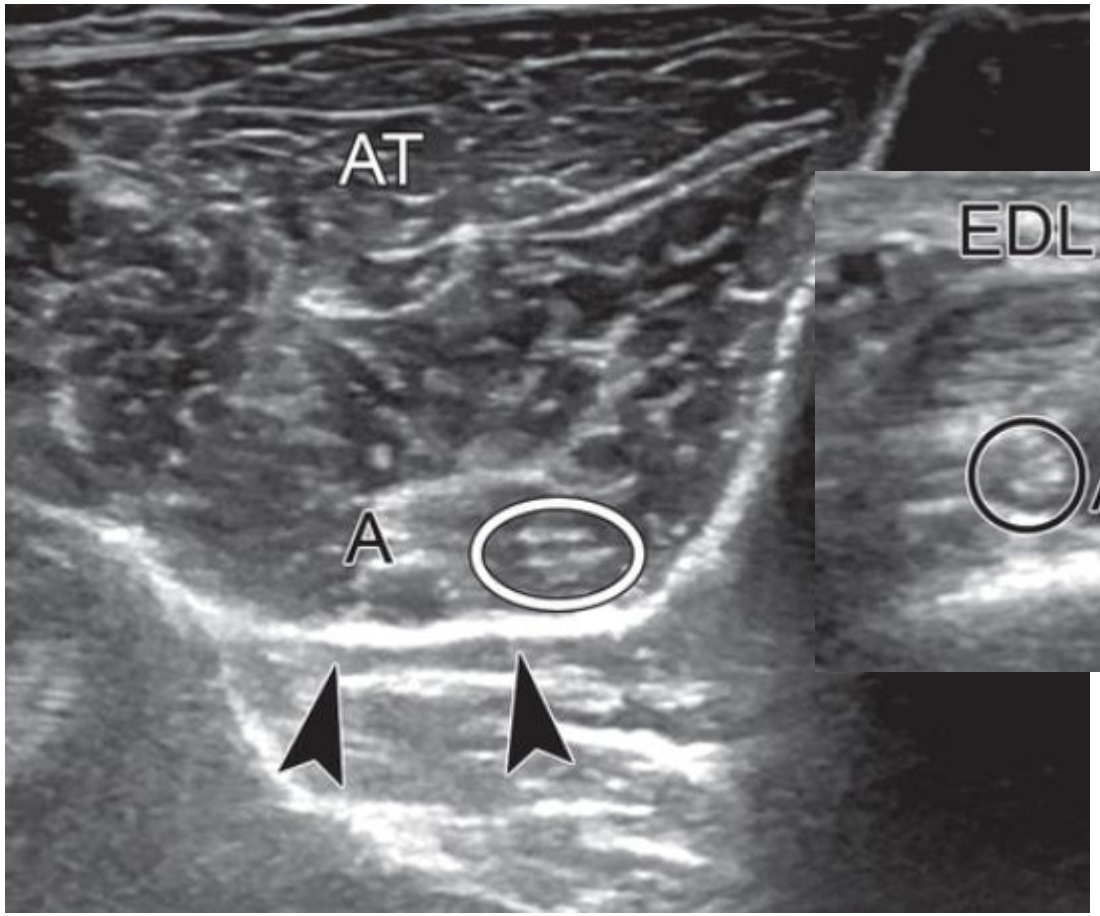
- Common peroneal neuropathy
  - Fibular head is a common site of compression or entrapment
  - Trauma, crush injury, post. Knee dislocation, laceration…
  - Habitual knee crossing, prolonged immobilization during surgery, lithotomy position, overdose, prolonged inebriation, wearing of cast or leg brace, soft tissue mass, cyst, ganglion
  - Partial or complete foot drop and weakness of the ankle dF , evertors
  - Sensory deficits in the anterolateral lower leg and dorsum of the foot

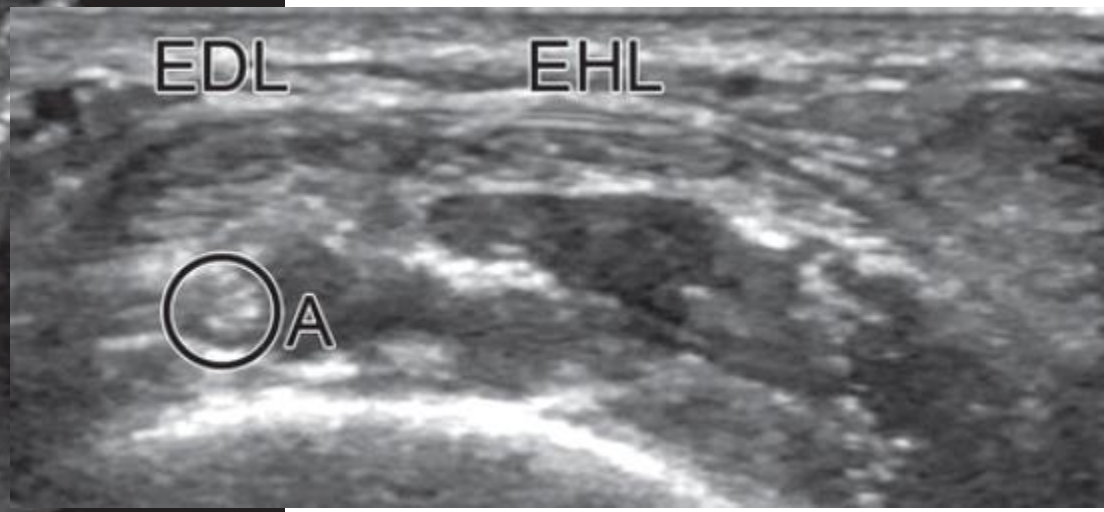



PL
F

Deep peroneal nerve

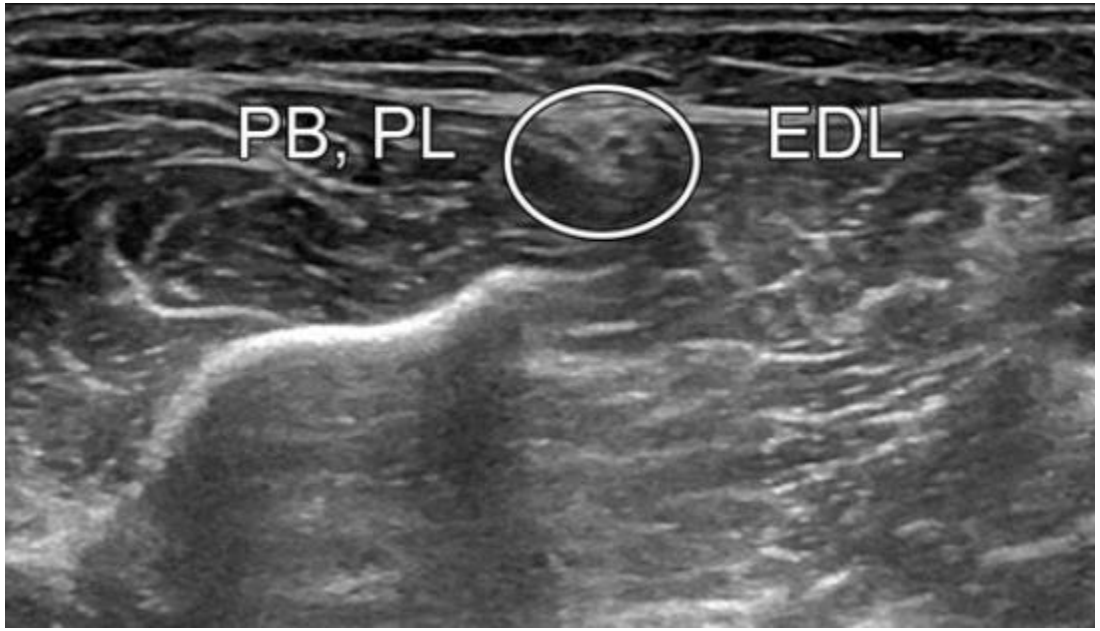
- Motor innervation to the muscles of the ant. Compartment of the leg
  - Tibialis ant., extensor halluces longus, extensor digitorum longus and peroneus tertius muscle
  - No sensory innervation to the leg
  - Sensory to the first web space
  - Motor branch to the extensor digitorum brevis, 2-4 metatarsophalangeal joint
  - Compression
    - Tight footwear, dorsal osteophytes, ganglion cyst, dancing en pointe
    - Pain and tingling at the dorsum of the foot, weak extension of the great toe


AT
A


EDL
EHL
A

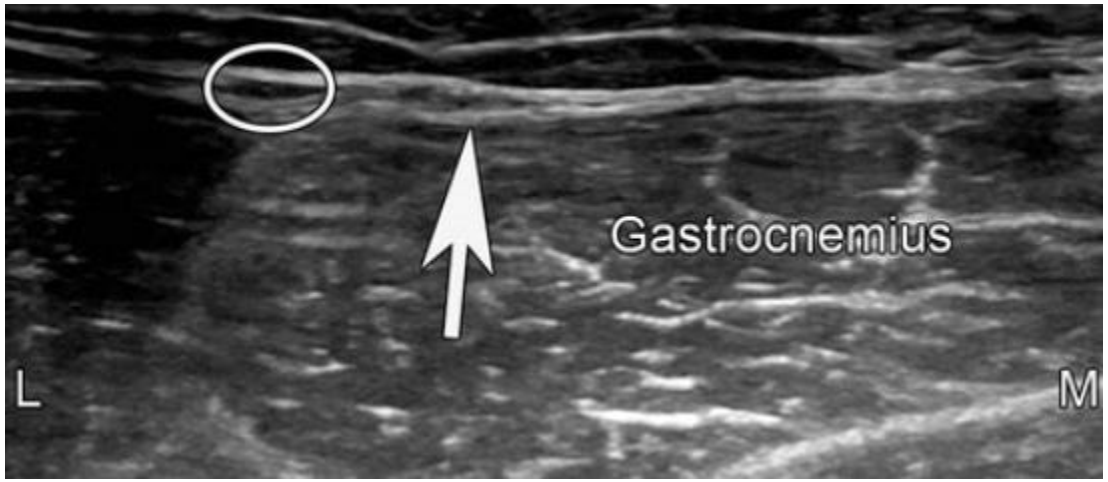
Superficial peroneal nerve

- Travels in the lat. Compartment of the leg
- Motor to the peroneus longus, peroneus brevis
- Sensory innervation to the lat. Aspect of the leg, dorsal surface of the foot
- Entrapment by traumatic stretching during ankle inversion and plantar flexion, lateral fascial thickening, muscle herniation
- Numbness and tingling along the lateral aspect of the lower leg and dorsum of the foot


PB, PL
EDL

Sural nerve

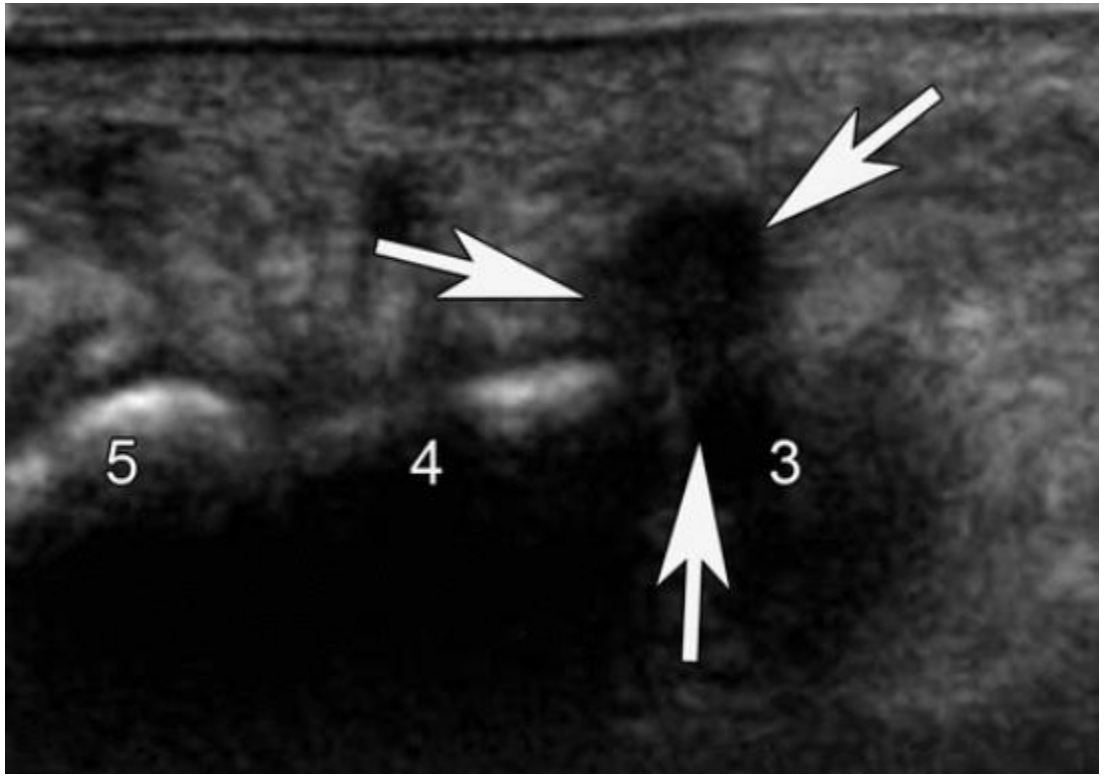
- Purely sensory to the posterolateral leg
- Supplied by both tibial and common peroneal nerve
- Divides at the level of base of 5^{th} metatarsal into lateral nad medial branches
- Injury by trauma, fx., recurrent ankle sprain, laceration

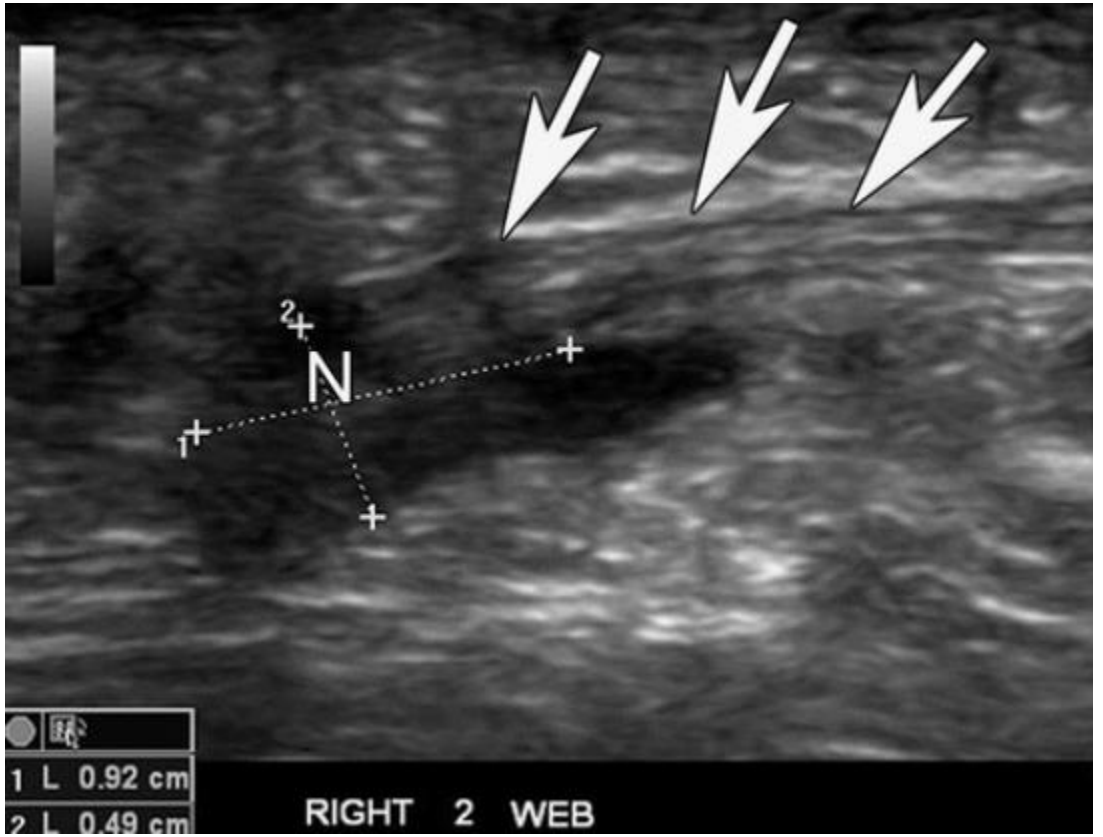

Gastrocnemius
L
M


A
LSV

Digital nerve

- Compression by tight foot wear, high heels, repetitive trauma, Morton neuroma (m/c at 3rd metatarsal interspace)
- Complain of lancinating pain at the plantar aspect of the metatarsal interspace when walking
- Morton neuroma
  - Plantar surface of the foot at the level of the metatarsal heads
  - Mulder maneuver is useful to assess


5
4
3


2
N
1
1 L 0.92 cm
2 L 0.49 cm
RIGHT 2 WEB

Ultrasound-Guided Peripheral Nerve Injection Techniques

- Ultrasound
  - Sensitive and specific in the diagnosis of peripheral neuropathy
  - Dynamic imaging techniques, sonopalpation, ease of contralateral side imaging for comparison
  - Improve accuracy of nerve inj. Comparing nerve stimulation or blind technique
  - Decreases the amount of injectant > reducing risk of local anesthesia induced toxicity

  - 1% lidocaine is used for local anesthesia
  - Adjacent to the echogenic epineurium of the nerve
  - Bevel of the needle should be rotated to face the nerve
  - Pain may indicate intraneural positioning of the nerve >> reposition

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감사합니다