

Ultrasound Guided Epidural Block

Objectives

- Indications for epidural block
- Benefits of ultrasound guidance for epidural blocks
- Spinal anatomy
- Ultrasound landmarks
- Scanning technique

Benefits Ultrasound Epidural Puncture

- Removes guesswork as to optimum approach to epidural space
- Increases accuracy in identify vertebral interspace
 - US correct 71%
 - Palpation 30%
- Gives an accurate estimate of depth for loss or resistance
- Shortens overall procedure time
- Increases accuracy for midline placement of catheter

Spinal vs. Epidural

- Spinal
 - anesthetic injected into subarachnoid space and CSF
- Epidural
 - Anesthetic injected into epidural space
 - Larger dose of anesthetic required
 - Onset of analgesia is slower
 - May be performed at cervical, thoracic or lumbar region if into sacral hiatus known as caudal block (caudal end of spinal cord)
 - Easier to achieve segmental analgesia
 - Indwelling catheter more commonly used
 - May be used in conjunction with general anesthesia

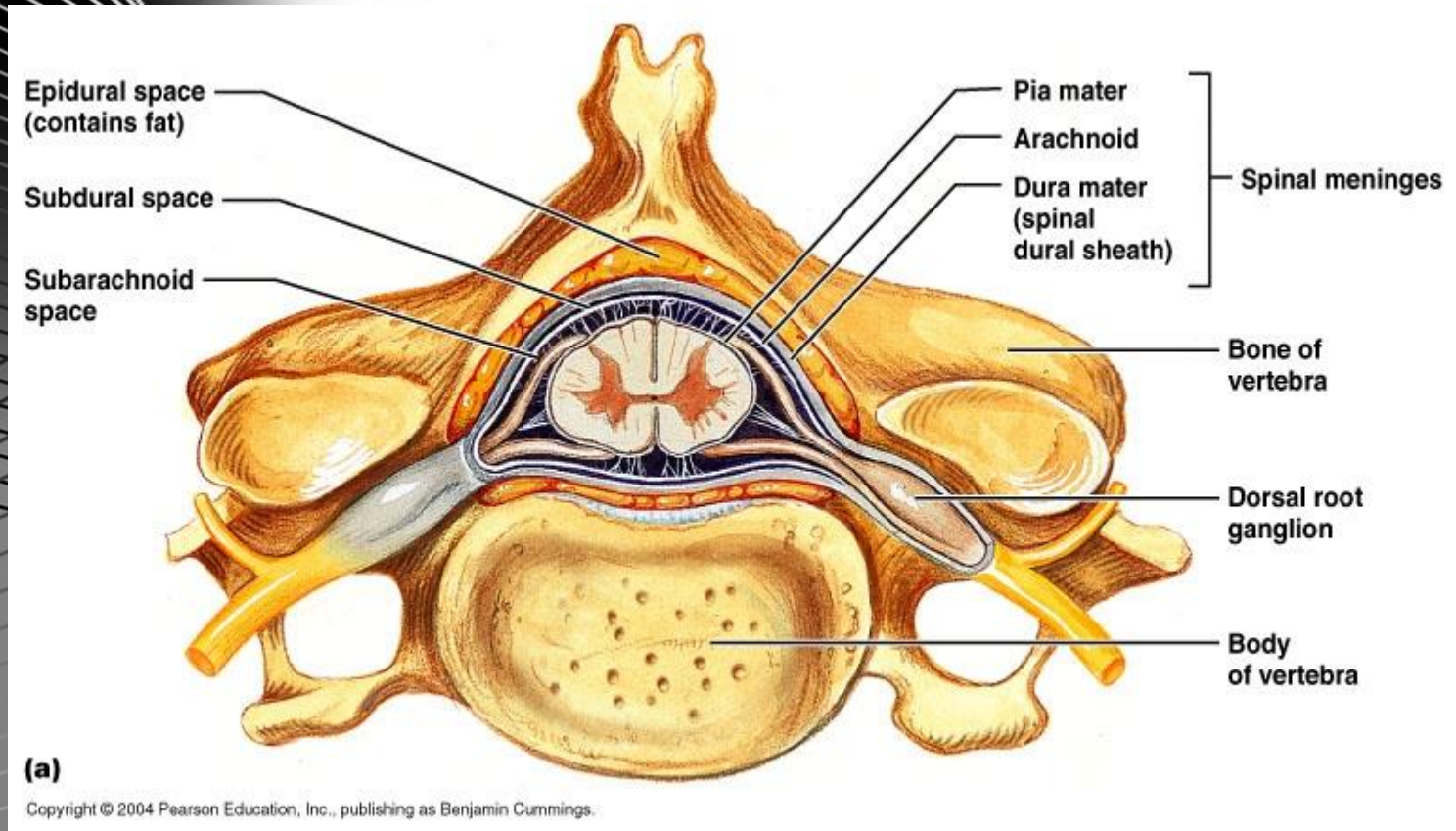
Indications for Epidural

- For analgesia without surgery (childbirth)
- Adjunct to general anesthesia to reduce need for opioids
 - Gynecological surgery (hysterectomy)
 - Orthopedic surgery (hip replacement)
 - General surgery (laparotomy)
 - Vascular surgery (aneurysm repair)
- Surgical anesthesia – Caesarean section
- Post-op analgesia (infusion pump)
- Treatment of back pain

Epidural Block

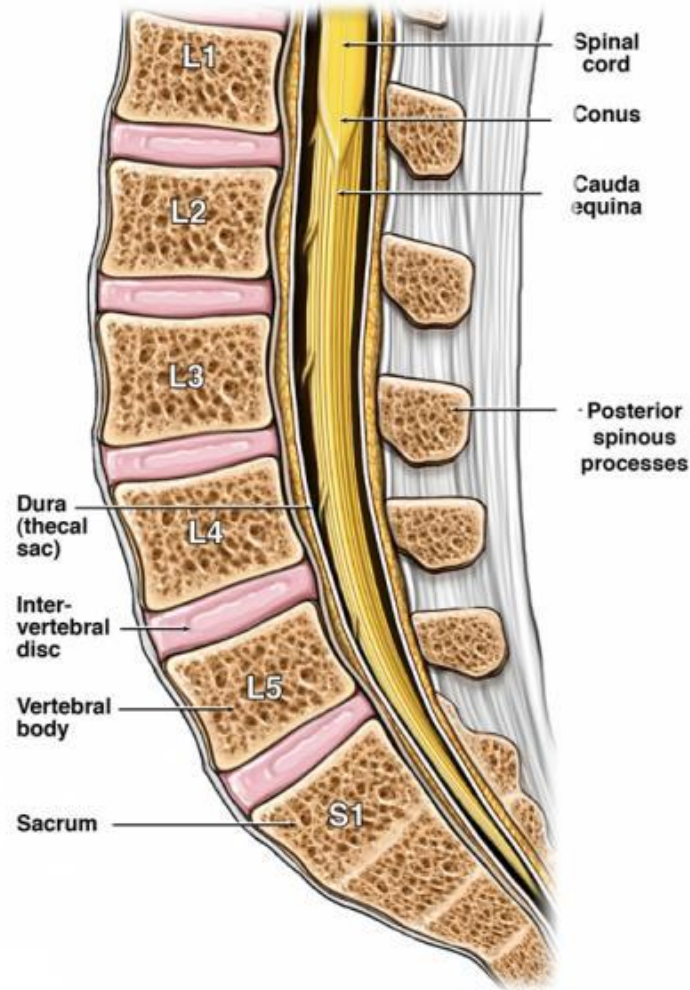
- Goal: Anesthetic injected between L3/4, L4/5, L5/S1 interspace into epidural space
- Technique: Ultrasound used to locate space and measure distance to ligamentum flavum
- Notes:
 - In adults spinal cord terminates at level of L1/2 below which is nerve bundle cauda equina
 - Lower level decreases risk of injury to spinal cord

Spinal Column

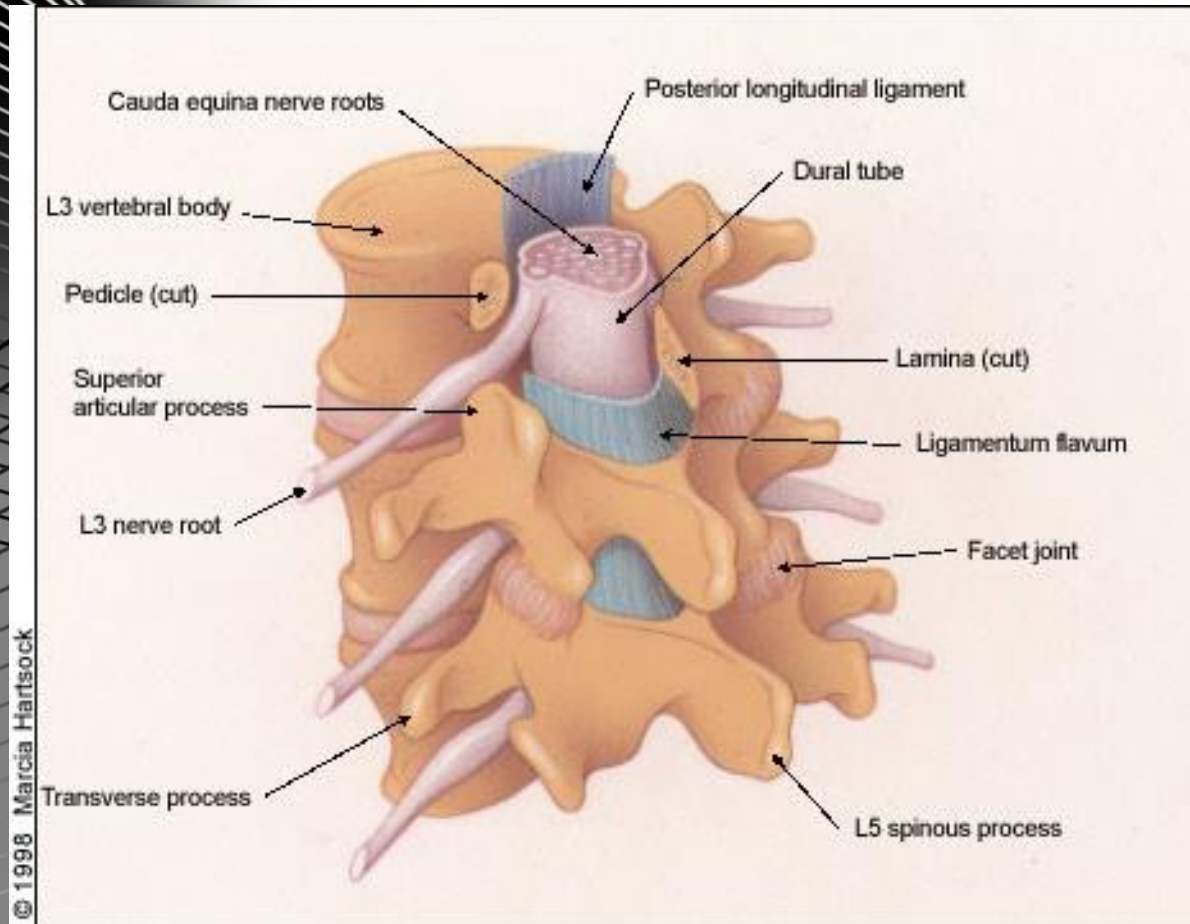


Spine Anatomy

Termination of Spinal Cord L1/2

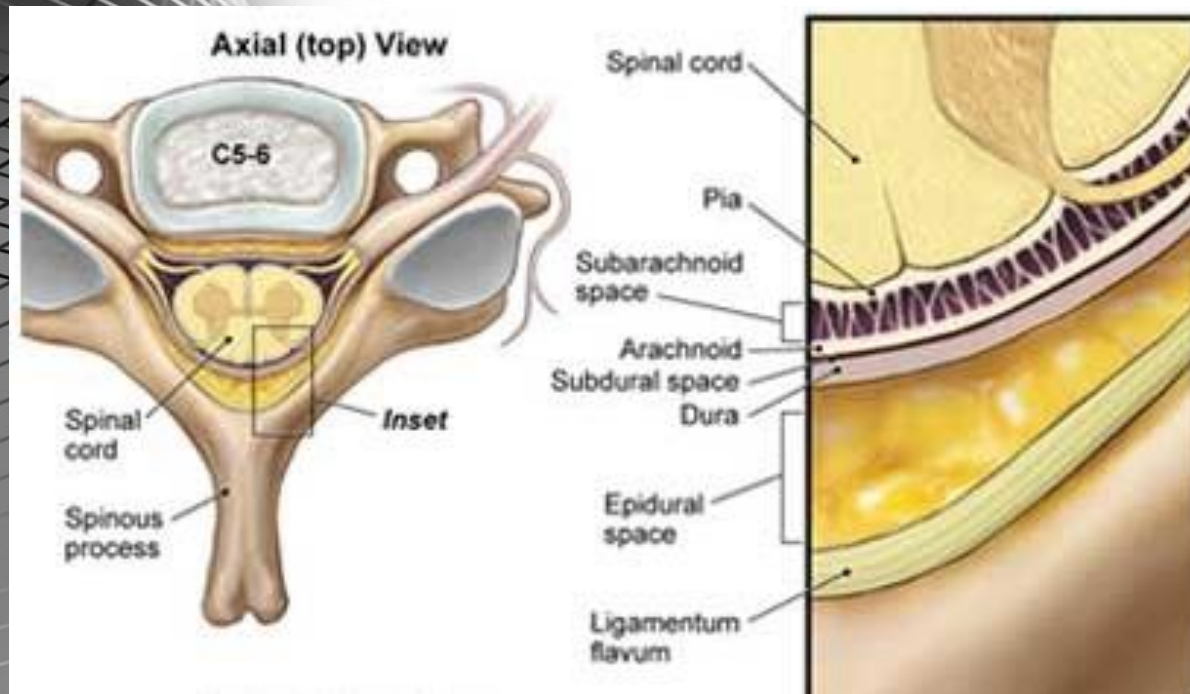


Spine Anatomy



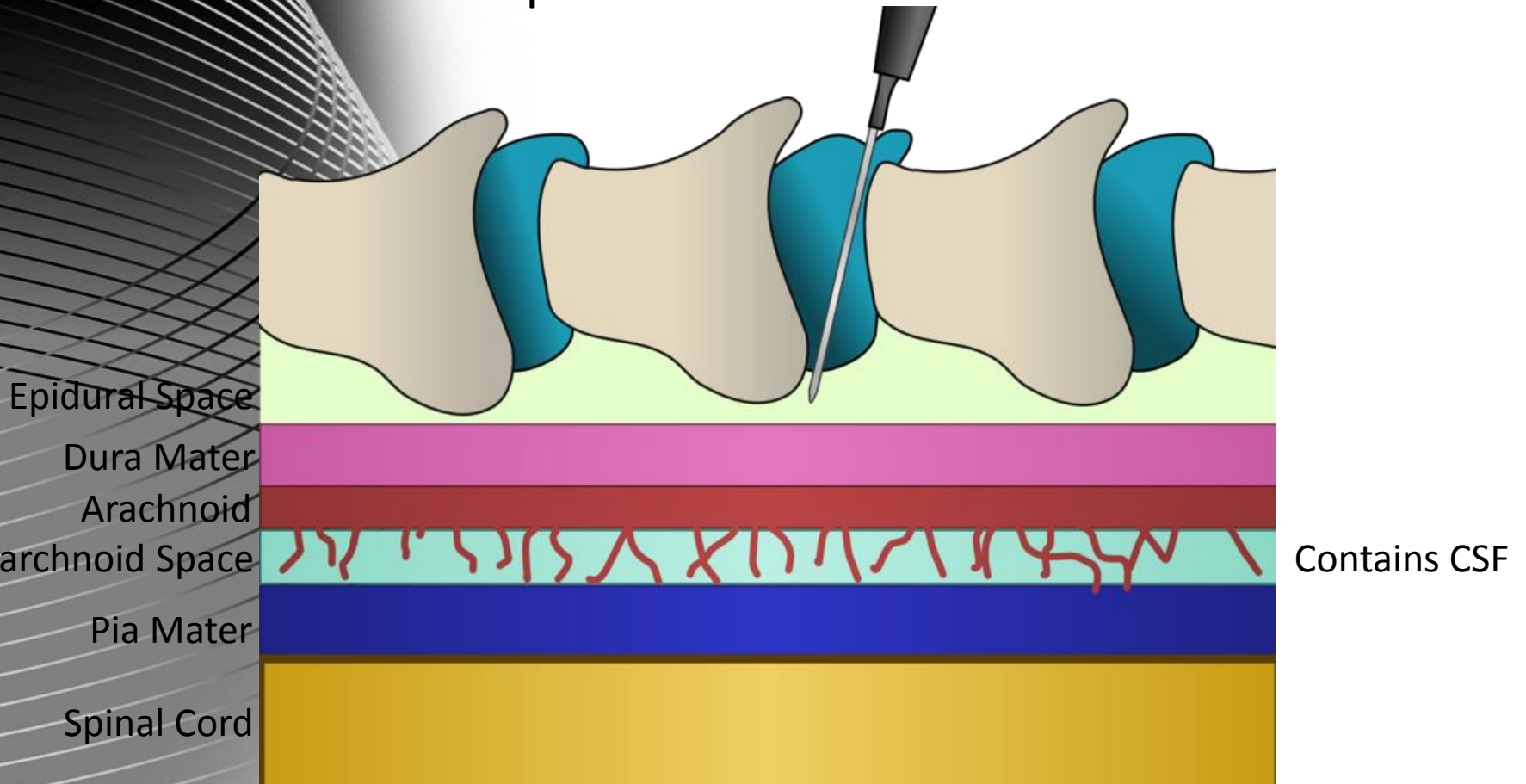
Epidural Potential Space

- Inside bony spinal canal just short of dura
- Space between ligamentum flavum and dura



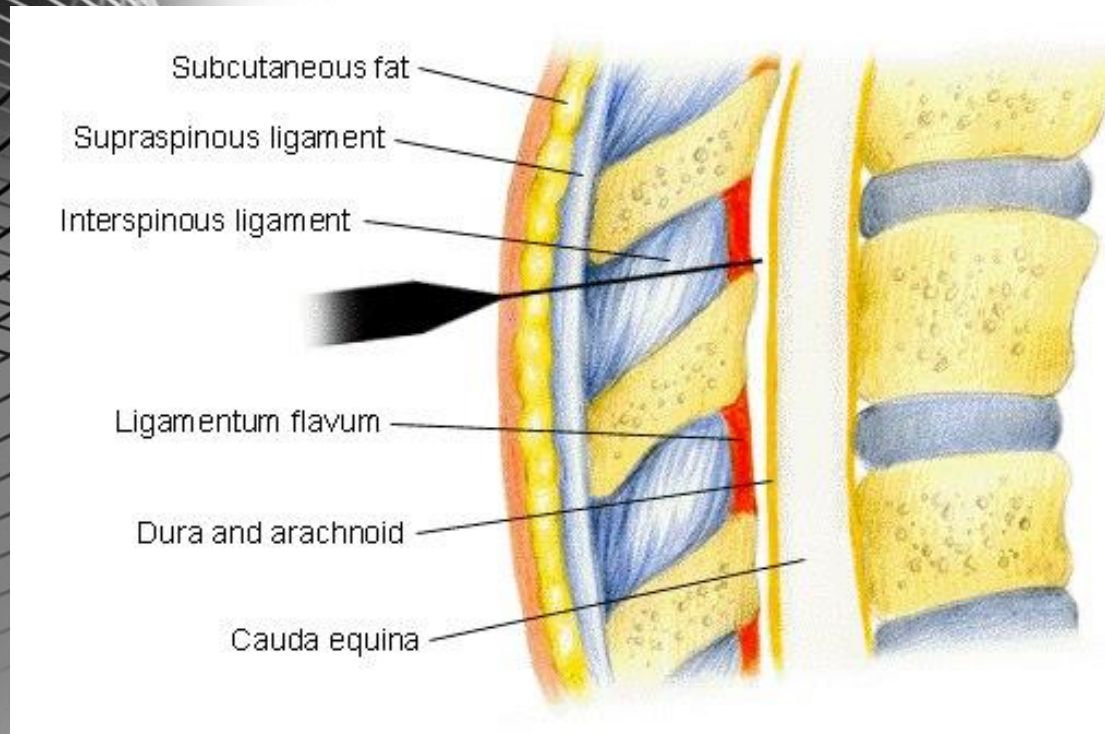
Epidural Injection

Sagittal Section of Spinal Column



Epidural Block Injection

Epidural space between ligamentum flavum and dura



Patient Position

Sitting or lying on their side with curled up posture to open intervertebral spaces



Ultrasound Technique

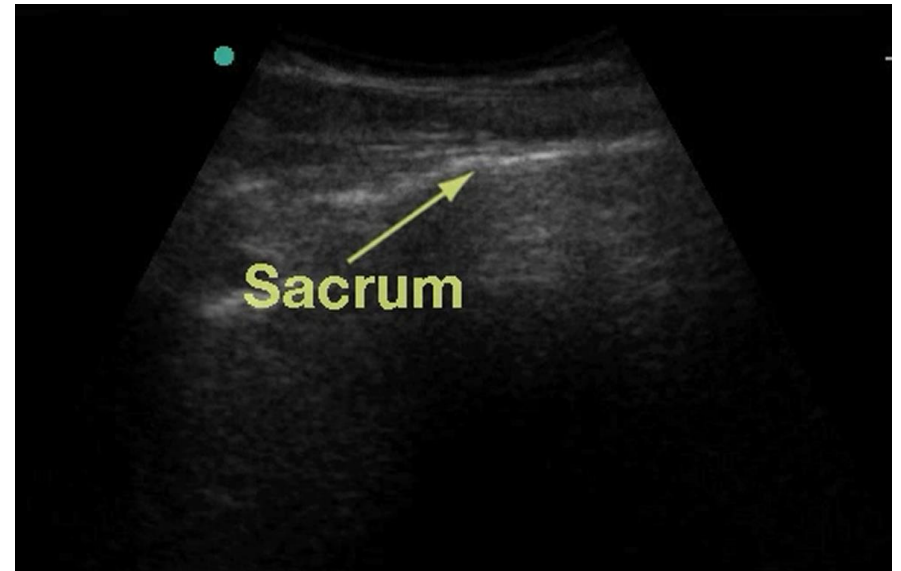
- Determining midline and levels
 - Identify spinous process
 - Scan up and down so shadow disappears when there is no superficial reflection this is the interspace
 - Scan up and down to mark vertebral levels
 - Count up from sacrum

Ultrasound Technique

- Start at sacrum in midline
- Long axis plane
- Orientation marker at patient's head



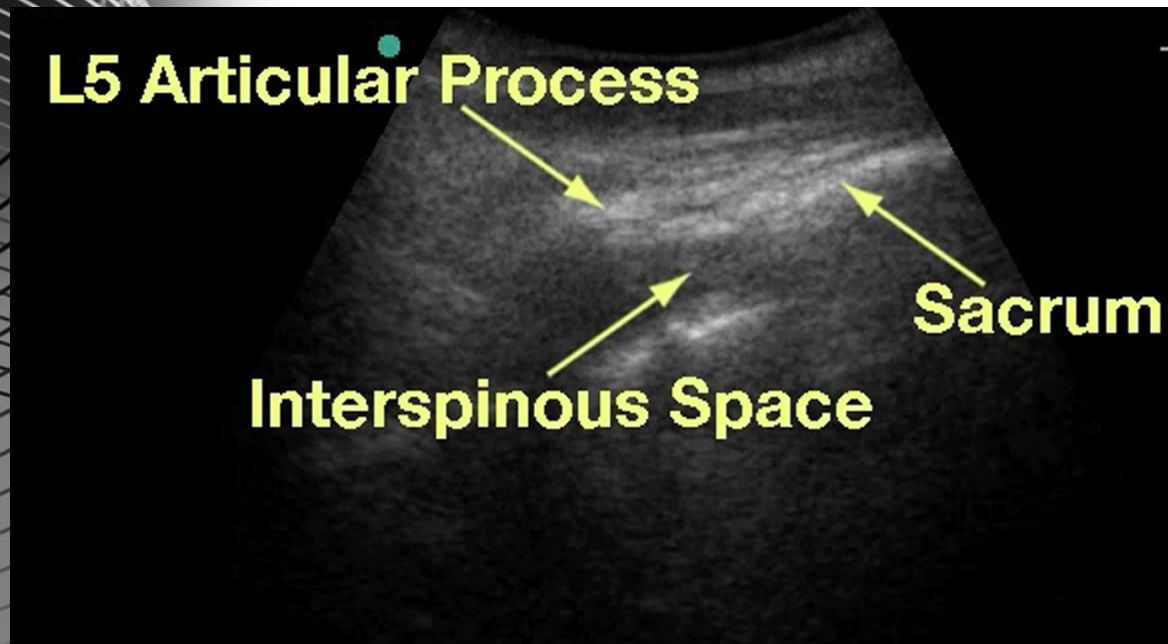
Ultrasound Technique



Sacrum identified as linear hyperechoic structure with distal shadowing

Ultrasound Technique

- Move transducer superiorly to L5/Sacrum



Ultrasound Technique

- Moving up from sacrum each interspinous space level is marked
- Counting up from sacrum the 3rd space is L3/L4

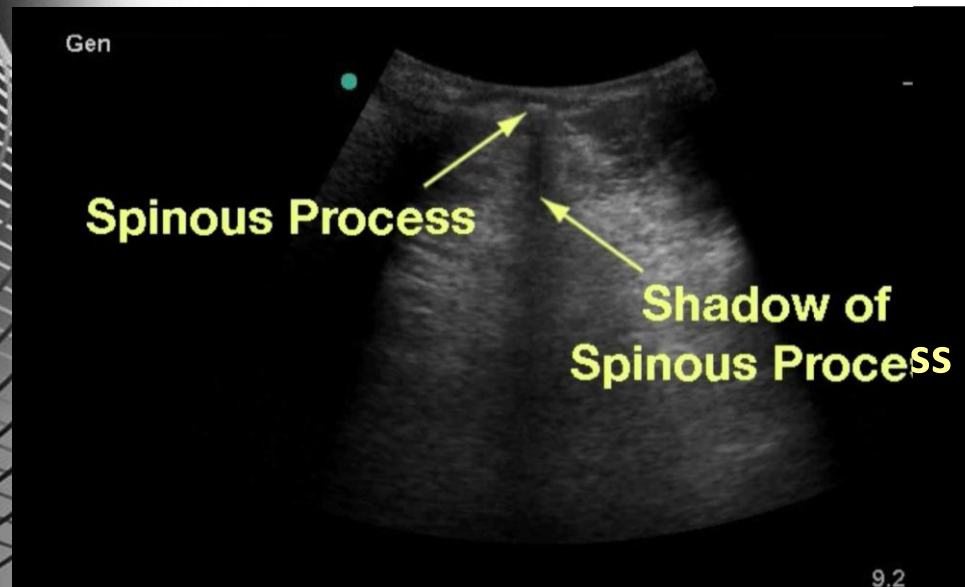


Ultrasound Technique

- At target level turn transducer transversely
- Orientation marker to patient's right



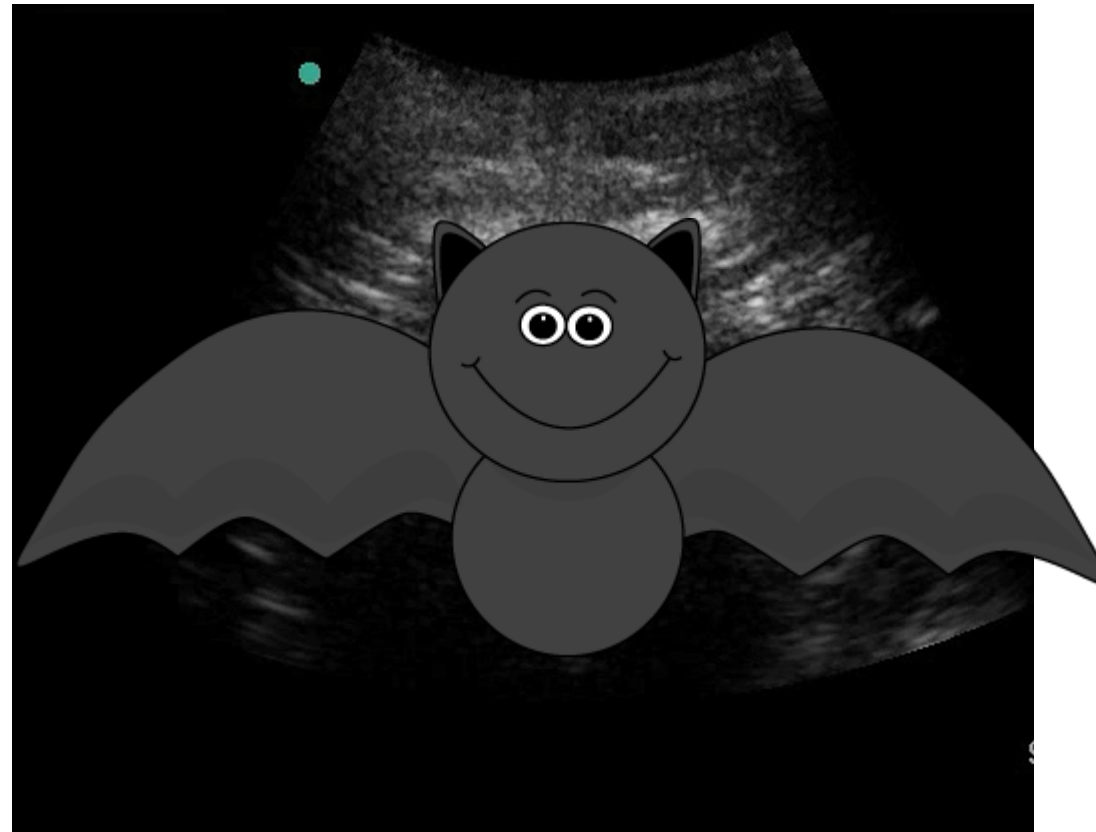
Ultrasound Landmarks



If you see the spinous process
you are not in intervertebral
space, spinal process shadow
used to identify midline of spine

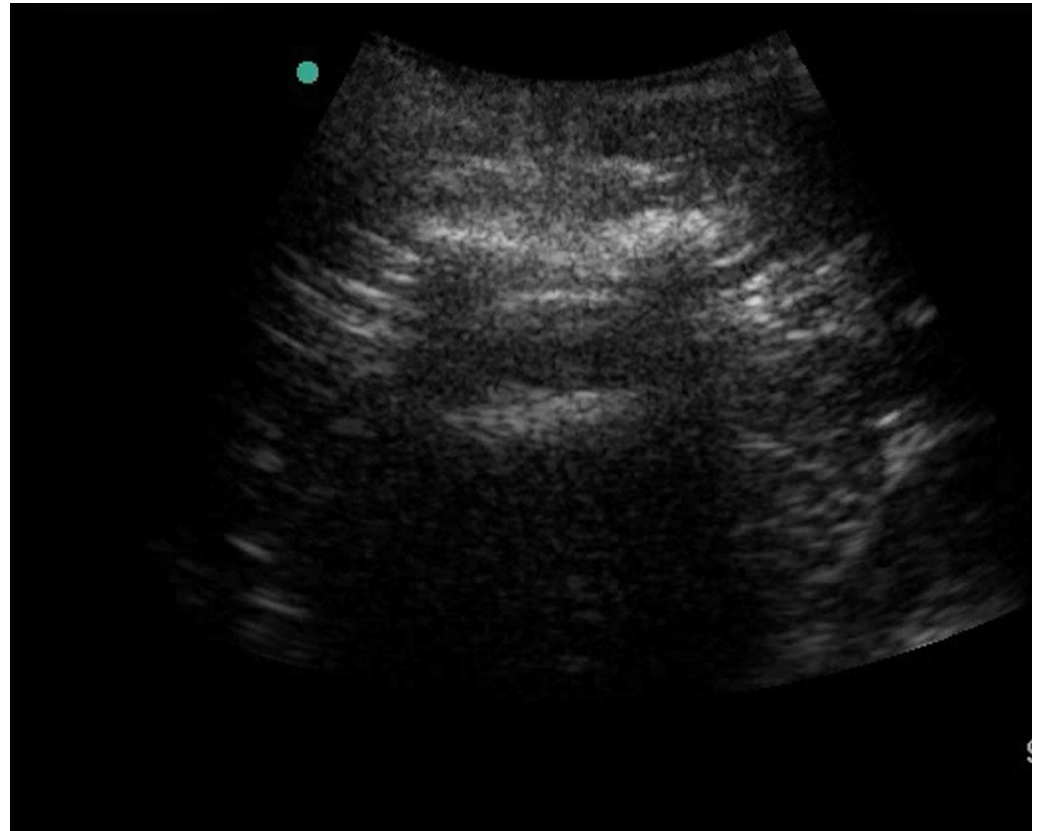
Bat Sign

Transverse Process = wings
Articular Process = ears
Ligamentum flavum = head
Vertebral Body = nose

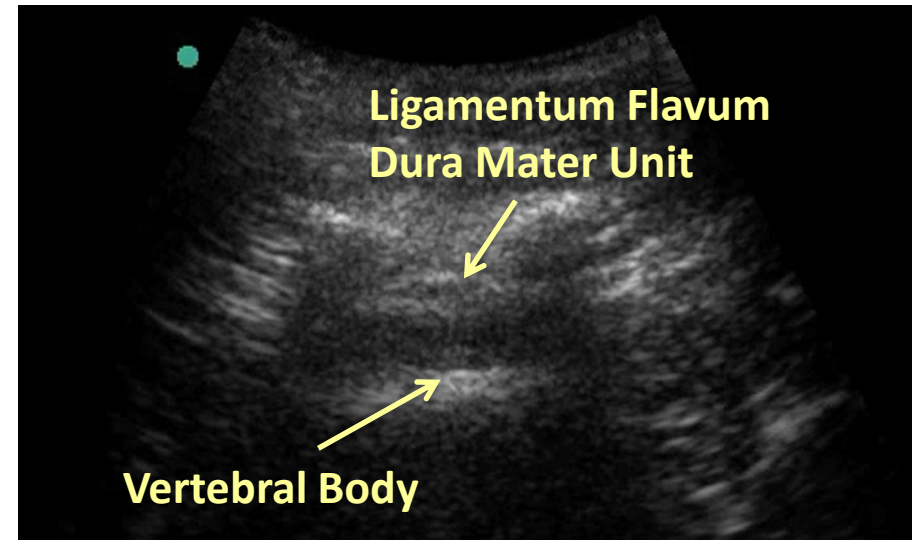
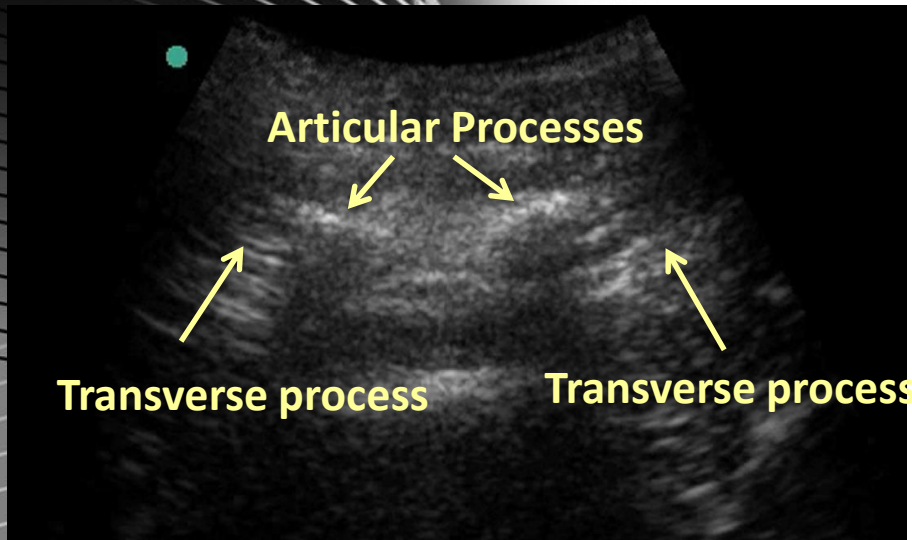


Bat Sign

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Ultrasound Landmarks



Structures in Intervertebral Space

- Ligamentum flavum ~ 4-6mm thick
 - Slightly bright perpendicular band
 - This reflection includes the dorsal dura
 - May be able to see dark gap of thecal space and bright reflection of the ventral dura
- Epidural space ~3-5mm deep

Ultrasound Technique

Mark midline and level of interspinous space with marker

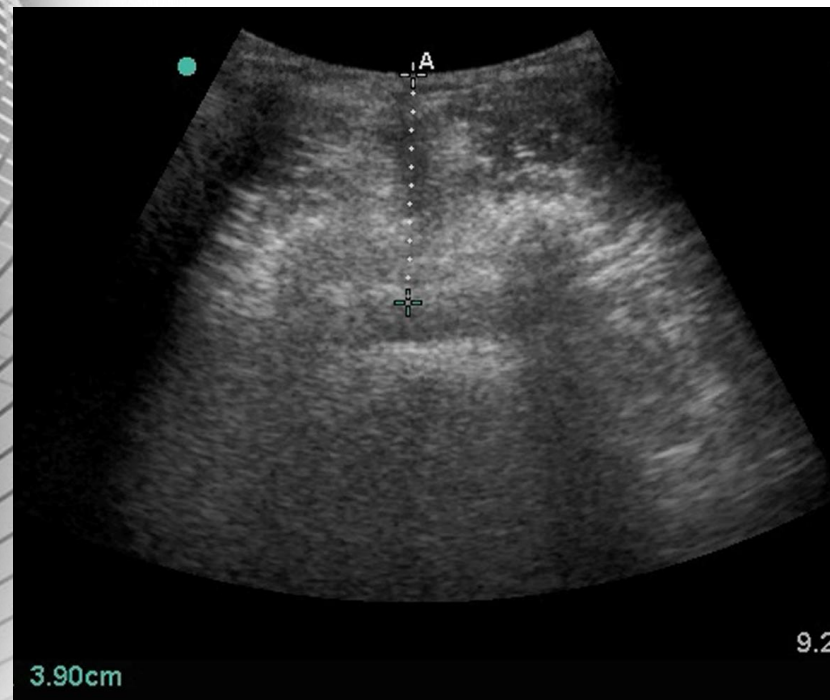


Mark intersection point with blunt end of free needle

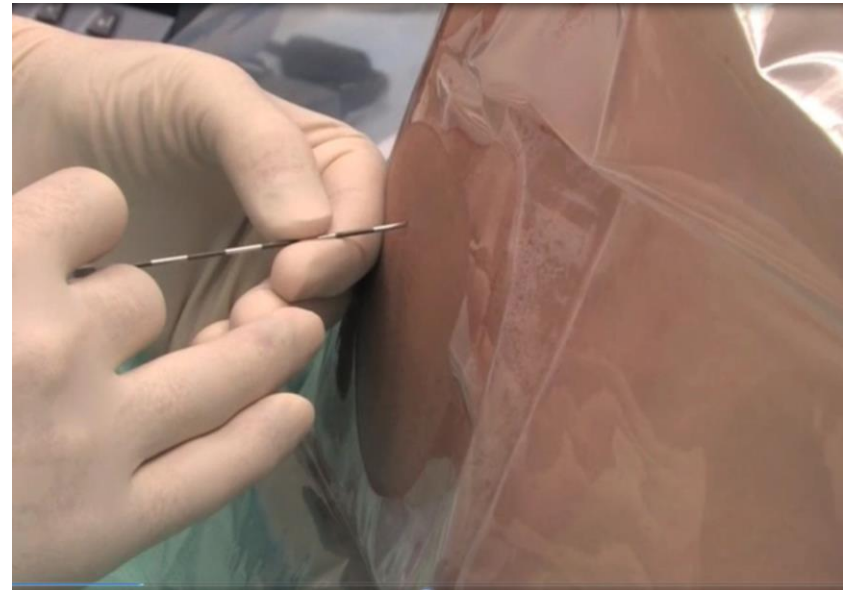


Ultrasound Technique

- Measure from skin to inner aspect of ligamentum flavum dura mater unit



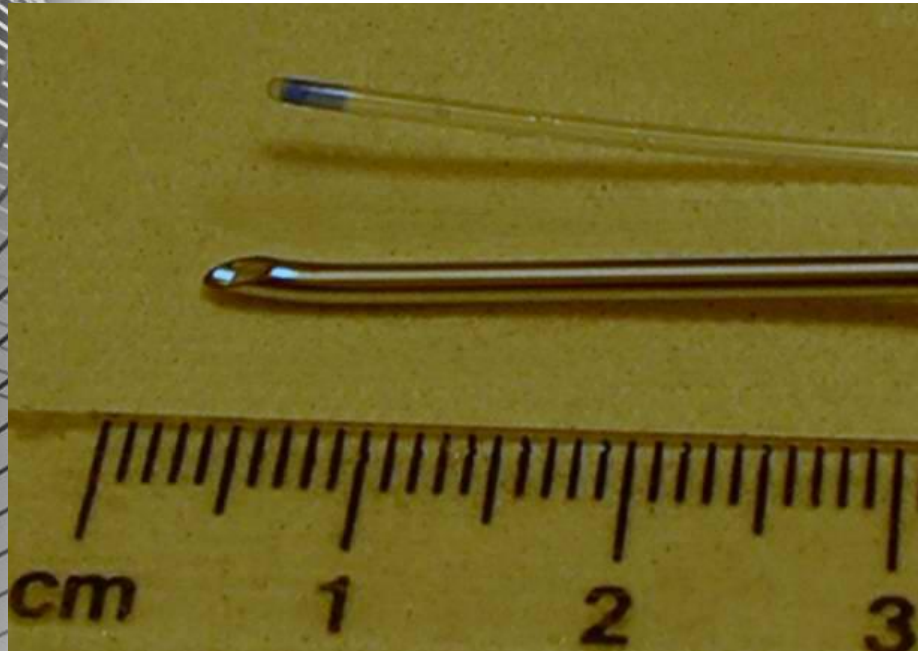
Patient Prep for Procedure



Needle is inserted into epidural space without US guidance
Used to identify space and measure distance to dura mater

Injection Technique

- Epidural needles are designed with a curved tip to prevent puncture of dural membrane



Tuohy Needle and epidural catheter

Epidural Block Complications

- Accidental dural puncture with headache, CSF leaks into epidural space (1 in 100)
- Bloody tap – injure an epidural vein
- Catheter misplace into epidural vein (1 in 300) or subarachnoid space (<1 in 1000) and anesthetic is injected intravenously can cause seizure or cardiac arrest (1 in 10,000 injections)
- Anatomical variants and spinal abnormalities such as lordosis or spina bifida can result in failed blocks

Summary

Benefits of Ultrasound Guided Epidural Blocks

- Accurately identifies midline structures and intervertebral space
- Determine depth of epidural space
- Reduces risk of complications