PHILIPS

Ultrasound

Quick guide

Ultrasound-facilitated lumbar puncture

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The more you see, the more you can do

Ultrasound-facilitated lumbar puncture is particularly useful when evaluating patients in whom palpation of anatomic landmarks is challenging or in whom anatomic approaches to lumbar puncture have failed. Indications for lumbar puncture include infection (meningitis/encephalitis), aneurysmal subarachnoid hemorrhage, or elevated intracranial pressure.

Ultrasound-facilitated lumbar puncture

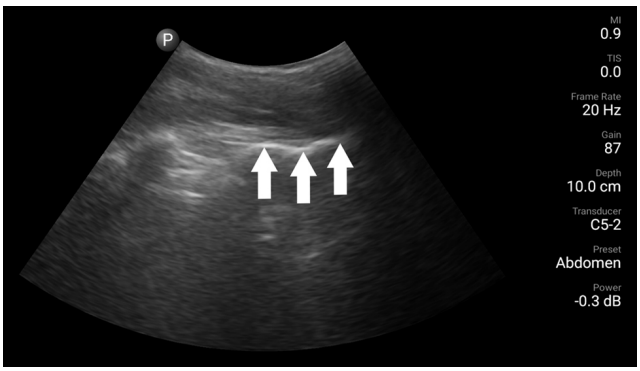
Patient positioning and transducer selection

- While the patient may be positioned in the lateral recumbent or upright position, the upright position is technically less challenging, and therefore the preferred position if the patient is able to tolerate sitting upright.
- A low-frequency curvilinear transducer's wider field of view and improved tissue penetration facilitates the identification of relevant structures. A high-frequency linear transducer can be used for smaller and pediatric patients.

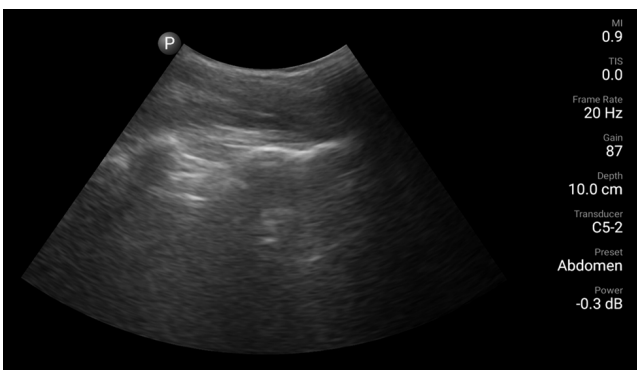
Pre-procedural examination (prior to sterile preparation)

- Place the low-frequency transducer in a sagittal plane over the sacrum with the directional indicator facing the patient's head.

- The sacrum will appear as a horizontal, hyperechoic line with shadowing deep to it.



Arrows = lumbar spines



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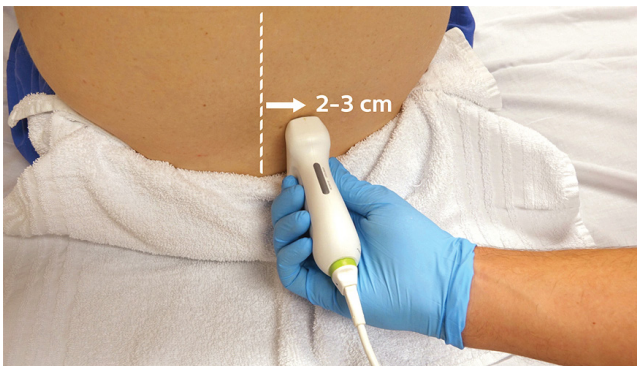
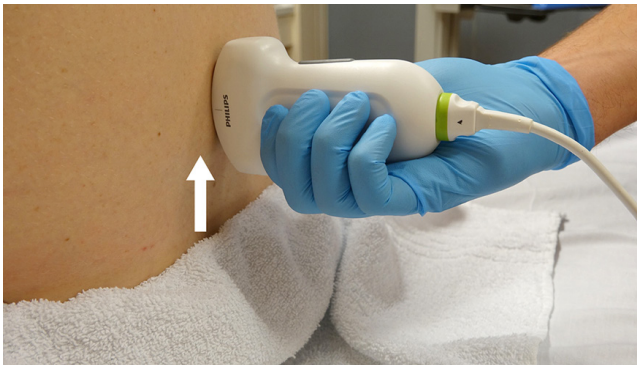
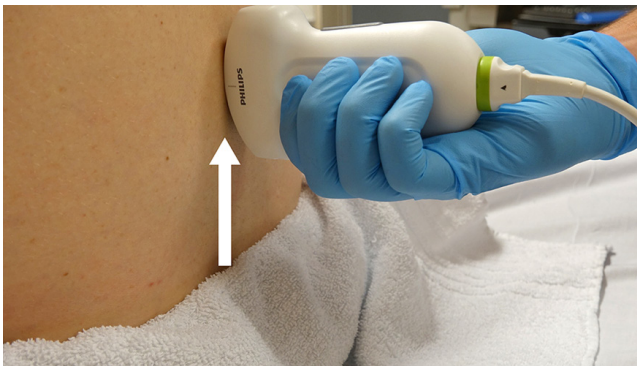
- Slide the transducer 2-3 centimeters away from midline while maintaining a parasagittal orientation, thus enabling continued visualization of the sacrum.



- Slowly slide the transducer towards the patient's head.





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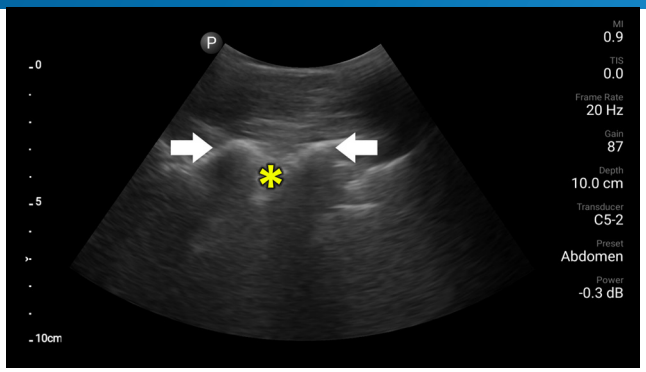
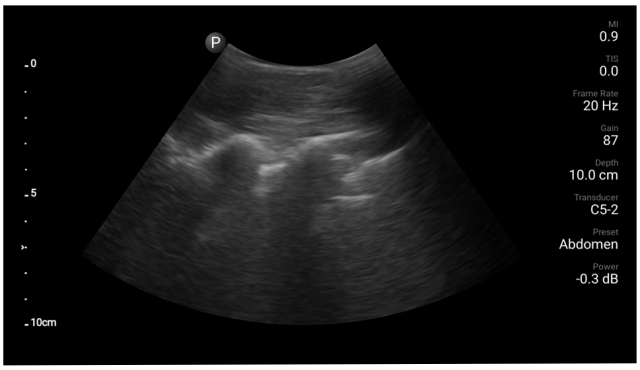
- Note the hyperechoic curvilinear structures with their associated shadows located just cephalad to the sacrum. These are the posterior elements (laminae and facet joints) of the lumbar vertebrae.

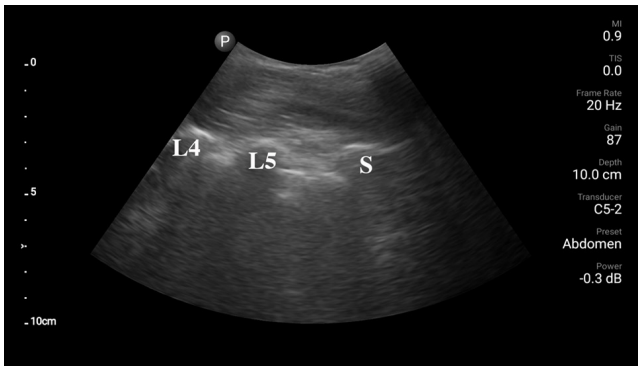


Asterisk = dura mater **Arrows = posterior elements**

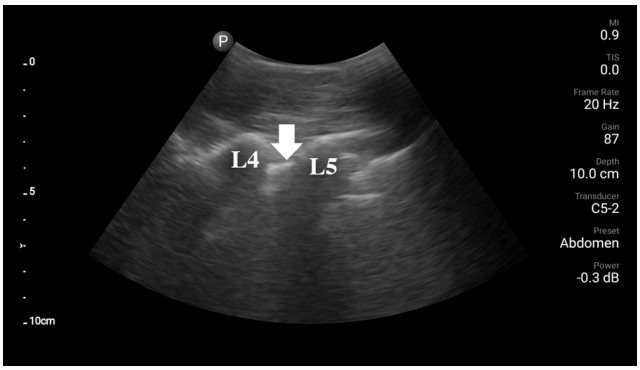
- The thecal sac, with its anechoic cerebrospinal fluid, can often be visualized between these vertebrae just deep to the hyperechoic horizontal line representing the dura mater.



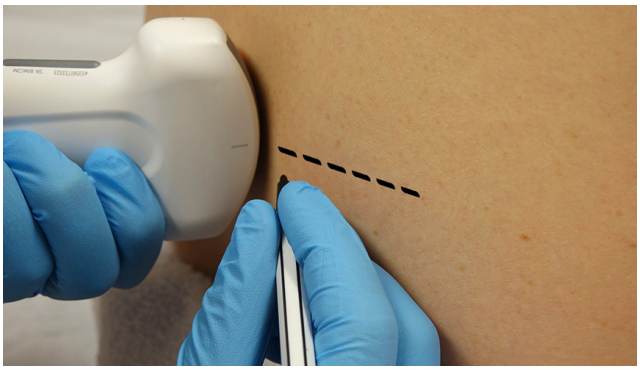
- Identify the L3/L4 interspace, or the L4/L5 interspace by counting in a stepwise fashion starting at the sacrum.



- Once the target interspace has been identified, slide the transducer cephalad/caudad so that the interspace occupies the center of the imaging field.



- Using a marking pen, mark the skin indicating the appropriate cephalad-caudad location for lumbar puncture.



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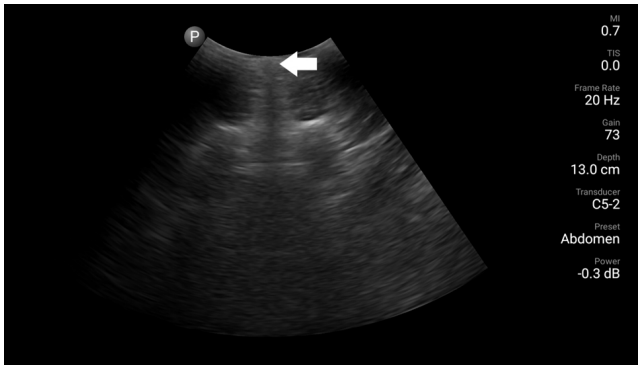
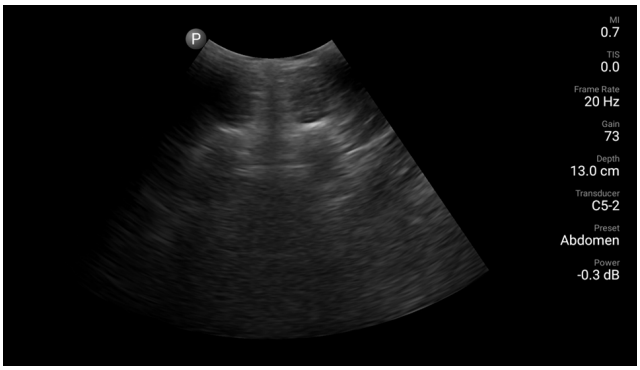
- Now reapply the transducer in a transverse plane in the patient's midline with the directional indicator toward the patient's right.



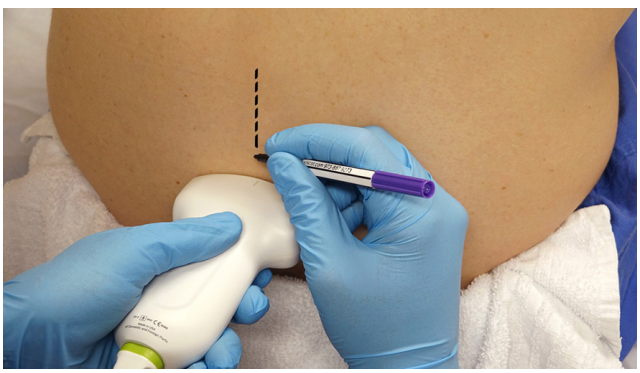
Arrow = spinous process with shadow

- Midline can be identified by visualizing a hyperechoic near-field structure with shadowing deep to it, corresponding to the spinous process.

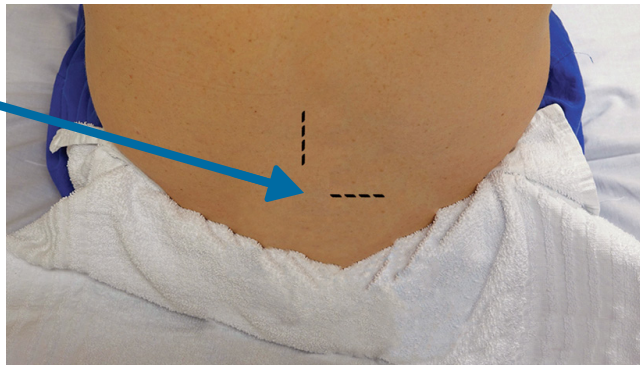


- Subtle sliding and tilting of the transducer at this location will allow visualization of the interspinous space and the thecal sac.

- When midline has been confidently identified, use the marking pen to mark the skin indicating midline.



• The intersection of the two marks represents the insertion site for lumbar puncture.



It is critical that the patient remain in the same position to ensure that the skin markings accurately indicate the appropriate site for needle placement.

Procedural guidance

After using an alcohol wipe (prior to full sterile preparation), place a superficial skin wheal of local anesthetic solution at the intersection of the two marks. The clinician can then proceed to prepare the area using sterile technique, and then proceed with the lumbar puncture at the site of skin wheal placement.

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