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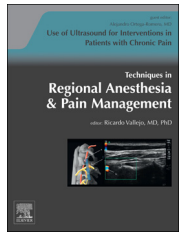

# Ultrasound-guided interventional procedures for lumbar pain

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ABSTRACT

The possibility of performing the majority of the pain-control interventions in the lumbar spine without using fluoroscopy is a very promising alternative. A clear description of the most relevant sonoanatomy of the lumbar spine and the proposal for a systematic approach to perform principal lumbar spine blocks may help those that are beginning to use ultrasound and increase the interest of professionals that normally perform these blocks with x-rays. Therefore, the structures that are easily identifiable by ultrasound from the muscular blocks and the facet joints are first described.



## Introduction

In daily medical practice, interventional techniques are used to treat lumbar pain, which are the most prevalent pathologies in pain clinics.[1] This causes the need to be in surgery and in permanent contact with the fluoroscope or x-ray equipment.

The interest in learning these blocks using ultrasound is hampered by the difficulties in ultrasound visibility of the vertebral spine at the lumbar level. Low-frequency probes must be used that have a much lower resolution than linear probes. These limitations are directly proportionate to body mass index (BMI), where the higher the BMI, the more visibility difficulty is encountered. Obesity is the principal limiting factor in using ultrasound for lumbar spine blocks, owing to the incapacity to see the intravascular or epidural diffusion of the substances administered.

Recent systematic reviews of the principal studies conducted on ultrasound-guided blocks in the lumbar spine clearly demonstrate these limitations and encourage others to conduct further studies that support the efficacy and safety of ultrasound-guided techniques.[2-4]

A clear description of the most relevant sonoanatomy of the lumbar spine and the proposal for a systematic approach to perform principal lumbar spine blocks may help those that are beginning to use ultrasound. The ultrasound guide and fluoroscope are complementary, especially when learning and interpreting ultrasound images of the lumbar spine.

For all spinal blocks, the 3 basic orientations of the ultrasound probe and beam must be mastered: transverse or axial, paramedian sagittal (PS), and paramedian sagittal oblique (PSo) (Figure 1). The steps described by Chin et al[5] to perform neuroaxial blocks guided by ultrasound are applicable to the interventional techniques that are mainly used to treat lumbar pain (Figure 2). For all ultrasound-guided neuroaxial lumbar blocks, the identification technique to mark intervertebral levels must be mastered. To do so, locating the lumbosacral junction must be done with the probe oriented in the PSo view showing the lamina. The probe is then moved in a caudal direction until a continuous hyperechoic line

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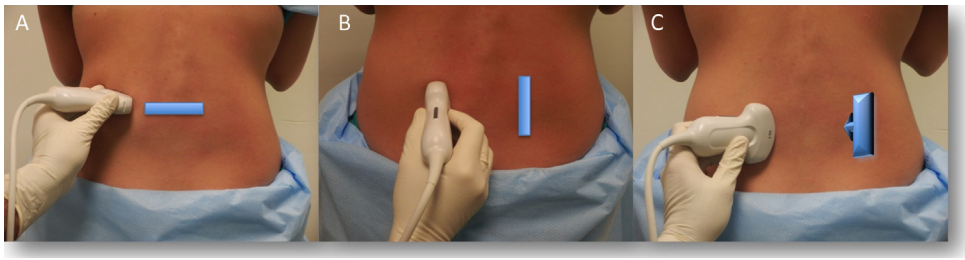


**Fig. 1 – Probe orientations for spinal blocks: (A) transverse or axial; (B) paramedian sagittal (PS); and (C) paramedian sagittal oblique (PSo).**

(the sacrum) and a short hyperechoic line (lamina L5) are identified. A space should be visible between these 2 lines. Once the L5-S1 space is located in the PSo view, the probe is moved in the cephalic direction, and the skin is marked at the midpoint of the probe that corresponds with each of the L5-L1 lamina. Marking the skin at the different lumbar levels in the PSo helps to avoid erroneous identification of the level while exploring the transverse view (Figure 3).

## Lumbar muscles (quadratus lumborum and psoas muscle)

### *Anatomy and sonoanatomy*

Professionals who only perform fluoroscope-guided interventional techniques may first be interested in identifying muscular structures surrounding the lumbar spine. Dysfunction of the lumbar muscles may cause acute and long-term lumbar pain, as well as a target point in the multidisciplinary treatment of lumbar pain.[6] The quadratus lumborum muscles and the psoas muscles are the only muscles of the spine with a moderate level of evidence for reproducing painful points and reflective pain.[7,8] They are also the only spinal muscles where a fluoroscope-guided infiltration procedure has been described, and where ultrasound could be used as an alternative. Myofascial pain derived from the quadratus lumborum or psoas muscles or both is a frequent and underdiagnosed cause of nonspecific lumbar pain.[9] In fact, these muscles together with the erector spinae muscles participate synergistically with the vertebrae to stabilize the vertebral spine.

In patients with chronic lumbago, atrophy of the psoas and the paravertebral musculature has been documented by computed tomography as well as with asymmetrical images of the quadratus lumborum muscle.[10,11]

Identifying the erector spinae muscles, quadratus lumborum muscle, and psoas muscle may be the first step in understanding all of the lumbar spine sonoanatomy.

Anatomical knowledge of the quadratus lumborum muscle insertions and its integrated relationship with the peritoneum are the primary sonoanatomical references in locating the quadratus lumborum and psoas muscles.

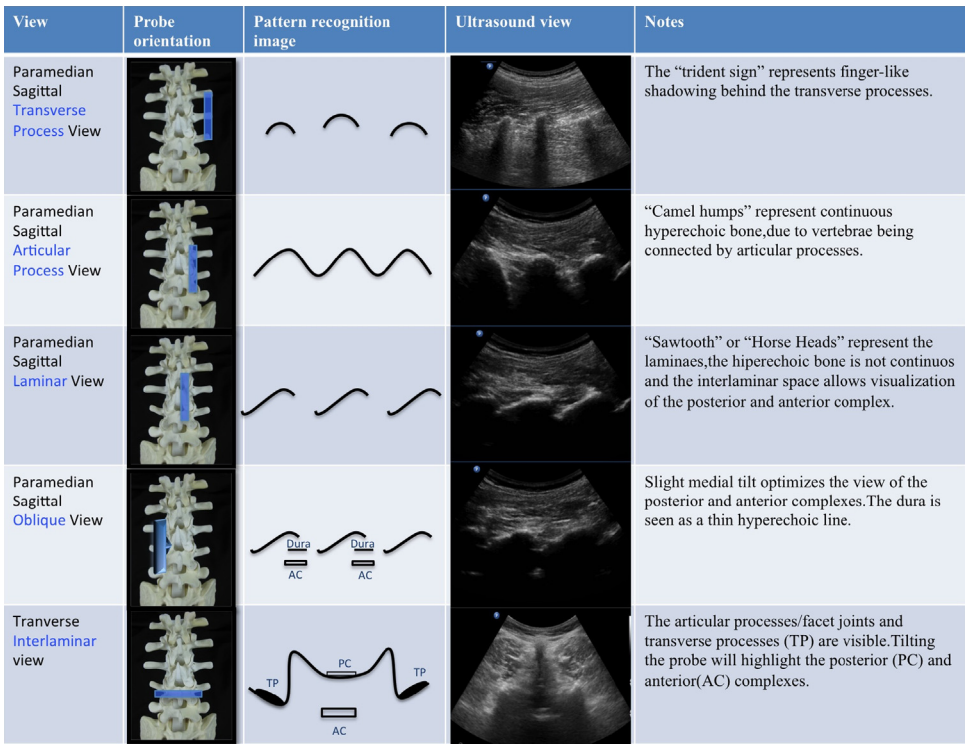


**Fig. 2 – Neuraxial ultrasound. Five sonographic views of the neuraxial spine.**