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Ultrasound Guidance for Central Neuraxial Anesthesia and Analgesia

James Edward Johnson, MBBS, FANZCA,
Anahi Perlas, MD, FRCPC,
Ki Jinn Chin, MBBS, MMed, FANZCA, FRCPC*

Department of Anesthesia, Toronto Western Hospital, University of Toronto, 399 Bathurst Street, McL 2-405, Toronto, Ontario M5T 2S8, Canada

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Key points

- Detailed knowledge of the bony contours of spine is essential for interpretation of neuraxial ultrasound scan.
- Preprocedural ultrasound imaging can reduce the technical difficulty of neuraxial blockade by identifying the presence and location of interlaminar and interspinous soft-tissue windows.
- Both transverse midline and parasagittal oblique ultrasound views should be obtained, as they provide complementary information.
- Ultrasound-guided neuraxial blockade is an advanced technique that is of particular value in patients whose surface anatomic landmarks are obscured, altered, or absent; however, we recommend that practitioners accumulate experience with the technique in normal individuals.

INTRODUCTION

The primary technical challenge in neuraxial blockade is accurate identification of a soft-tissue window into the vertebral canal. This is usually inferred from palpation of the spinous processes and tactile feedback from the needle as it is inserted. However, difficulty can be encountered if surface landmarks are obscured, altered, or absent or if the interlaminar or interspinous spaces are

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*Corresponding author. *E-mail address*: gasgenie@gmail.com

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narrowed by age-related changes. Technical difficulty and multiple needle insertion attempts are not only associated with patient discomfort but also with serious complications including spinal hematoma and neurologic injury [1–3]. Ultrasound guidance assists with identification of anatomy and target structures, which permits more accurate planning of needle insertion, trajectory, and depth and, in turn, improves technical ease of performance.

Ultrasound guidance in this context generally refers to the performance of a preprocedural scan that delineates the spinal anatomy, following which spinal or epidural needle insertion occurs in the usual manner. Real-time ultrasound-guided neuraxial blockade, however, refers to needle insertion under direct ultrasonographic visualization.

ANATOMY AND SONOANATOMY OF THE LUMBAR SPINE

Knowledge of the gross bony anatomy of the spine is essential for interpretation of neuraxial ultrasound scan. It is particularly important to appreciate the contours of the posterior bony surfaces of the spine (Fig. 1), as these are responsible for the characteristic shapes of the acoustic dropout shadows seen on ultrasound scan, which, in turn, are key to recognition of anatomic structures.

A curvilinear low-frequency ultrasound probe (transducer) with its wider field of view and better beam penetration is recommended for use in all adult patients. Two imaging planes and probe orientations are commonly used to image the spine (Fig. 2), transverse (or axial) and parasagittal (or longitudinal).

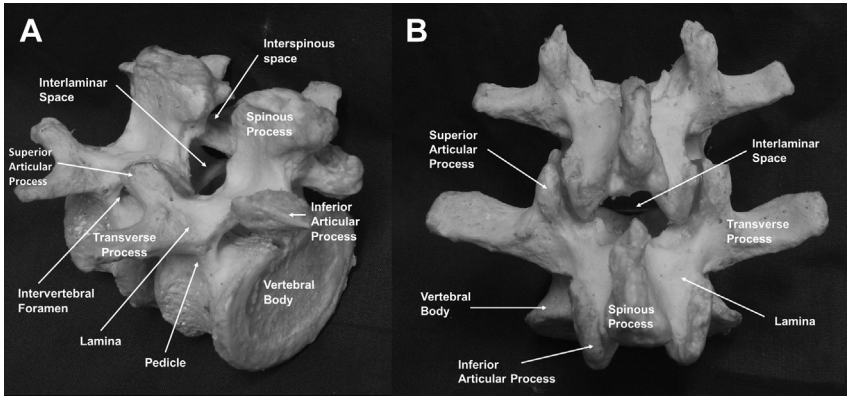

Fig. 1. Three-quarter oblique view (*A*) and posterior view (*B*) of adjacent lumbar vertebrae. The interlaminar space is located posteriorly and is bounded by the bases of the spinous processes, the laminae, and the inferior articular processes. It is roofed over by the ligamentum flavum. The interspinous space lies in the midline and is filled by the supraspinous and interspinous ligaments. The intervertebral foramina are located laterally and are bounded by the pedicles, the vertebral body, the laminae, and the superior and inferior articular processes and contain the spinal nerve roots and their accompanying blood vessels. (*Courtesy of* www.usra.ca; with permission.)