



Over a decade of clinical data and more than thirty peer-reviewed publications show that ultrasound technology can help you more accurately identify a given lumbar intervertebral space when administering an epidural or spinal anesthesia.

Research shows that ultrasound reduces the number of needle sticks and improves efficacy and safety. That's good news for your practice and especially comforting news for your patients.

The following publications prove the efficacy of ultrasound-guided spinal anesthesia in terms of detecting epidural location and depth, reducing the number of needle sticks, and improving patient safety:

**CLAIM: Identifies a given lumbar intervertebral space**

Furness G, et al. An evaluation of ultrasound imaging for identification of lumbar intervertebral level. *Anesthesia*. 57:277-280, 2002.

Halpern S, et al. The use of ultrasound for lumbar spinous process identification: a pilot study. *Can J Anaesth*. 57:817-22, 2010.

Lee A, et al. Ultrasound assessment of the vertebral level of the intercrystal line in pregnancy. *Anesth Analg*. 113:559-564, 2011.

Locks G, et al. Use of the ultrasound to determine the level of lumbar puncture in pregnant women. *Rev Bras Anesthesiol*. 60:13-10, 2010.

Schlotterbeck H, et al. Ultrasonographic control of the puncture level for lumbar neuraxial block in obstetric anesthesia. *Br J Anesth*. 100:230-234, 2008.

Watson M, et al. Could ultrasonography be used by an anaesthetist to identify a specified lumbar interspace before spinal anaesthesia? *Br J Anaesth*. 90:509-511, 2003.

Whitty R, et al. Identification of the lumbar interspinous spaces: palpation versus ultrasound. *Anesth Analg*. 106:538-540, 2008.

Duniec L, et al. Anatomical landmarks based assessment of intravertebral space level for lumbar puncture is misleading in more than 30%. *Anaesthesiol Intensive Ther*. 45: 1-6, 2013.

**CLAIM: Predicts needle insertion depth required to reach the epidural space**

Arzola, C, et al. Ultrasound using the transverse approach to the lumbar spine provides reliable landmarks for labor epidurals. *Anesth Analg*. 104:1188-1192, 2007.

Balki M, et al. Ultrasound imaging of the lumbar spine in the transverse plane: the correlation between estimated and actual depth to the epidural space in obese parturients. *Anesth Analg*. 108: 1876-1881, 2009.

Chin K, et al. An ultrasound-assisted approach facilitates spinal anesthesia for total joint arthroplasty. *Can J Anesth*. 56:643-650, 2009.

Cork R, et al. Ultrasonic localization of the lumbar epidural space. *Anesthesiology*. 52: 513-516, 1980.

Currie J. Measurement of the depth to the extradural space using ultrasound. *Br J Anaesth*. 56:345-347, 1984.

Ferre R and Weeney T. Emergency physicians can easily obtain ultrasound images of anatomical landmarks relevant to lumbar puncture. *Am J Emerg Med*. 25:291-296, 2007.

Gnaho A, et al. Assessing the depth of the subarachnoid space by ultrasound. *Rev Bras Anesthesiol*. 2:520-530, 2012.

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## CLINICAL EVIDENCE

Grau T, et al. Ultrasound control for presumed difficult epidural puncture. Acta Anaesthesiol Scand. 45:766-771, 2001.

Grau T, et al. Ultrasound imaging facilitates localization of the epidural space during combined spinal and epidural anesthesia. Reg Anesth Pain Med. 26:64-67, 2001.

Grau T, et al. Efficacy of ultrasound imaging in obstetric epidural anesthesia. J Clin Anesth. 14:169-175, 2002.

Helayel P, et al. Evaluating the depth of the epidural space with the use of ultrasound. 60:376-382, 2010.

Tran D, et al. Preinsertion paramedian ultrasound guidance for epidural anesthesia. Anesth Analg. 109:661-667, 2009.

Vallejo M, et al. Ultrasound decreases the failed labor epidural rate in resident trainees. Int J Obstet Anesth. 19:373-378, 2010.

**CLAIM: Improves success of spinal anesthesia, reduces number of needle sticks, improves safety**

Grau T, et al. Ultrasound control for presumed difficult epidural puncture. Acta Anaesthesiol Scand. 45:766-771, 2001.

Grau T, et al. Ultrasound imaging facilitates localization of the epidural space during combined spinal and epidural anesthesia. Reg Anesth Pain Med. 26:64-67, 2001.

Grau T, et al. Efficacy of ultrasound imaging in obstetric epidural anesthesia. J Clin Anesth. 14:169-175, 2002.

Vallejo M, et al. Ultrasound decreases the failed labor epidural rate in resident trainees. Int J Obstet Anesth. 19:373-378, 2010.

Chin K, et al. Ultrasound imaging facilitates spinal anesthesia in adults with difficult surface anatomic landmarks. Anesthesiology. 115:94-101, 2011.

Grau T, et al. Real-time ultrasonic observation of combined spinal-epidural anaesthesia. Eur J Anaesthesiol. 21:25-31, 2004.

Nomura J, et al. A randomized controlled trial of ultrasound-assisted lumbar puncture. J Ultrasound Med. 26:1341-1348, 2007.

Wang Q, et al. Ultrasound facilitates identification of combined spinal-epidural puncture in obese parturients. Chin Med J (Engl). 125:3840-3843, 2012.

Ansari T, et al. Ultrasound-guided spinal anesthesia in obstetrics: is there an advantage over the landmark technique in patients with easily palpable spines? Int J Obstet Anesth. 23:213-216, 2014.

Lim Y, et al. A randomized controlled trial of ultrasound-assisted spinal anesthesia. Anaesth Intensive Care. 42:191-198, 2014.

Mofidi M, et al. Ultrasound guided lumbar puncture in emergency department: time saving and less complications. J Res Med Sci. 18:303-307, 2013.

Sahin T, et al. A randomized controlled trial of preinsertion ultrasound guidance for spinal anesthesia in pregnancy: outcomes among obese and lean parturients: ultrasound for spinal anesthesia in pregnancy. J Anesth. 28:413-419, 2014.

Perlas A, et al. Lumbar neuraxial ultrasound for spinal and epidural anesthesia: a systematic review and meta-analysis. Reg Anesth and Pain Med. 40, 2015.

**CLAIM: Provides same efficacy as fluoroscopy in guiding lumbar epidural anesthesia**

Evansa I, et al. Ultrasound versus fluoroscopic-guided epidural steroid injections in patients with degenerative spinal diseases: A randomized study. Eur J Anaesthesiol 32: 262-268, 2015.

**CLAIM: Automates epidural space identification, midline, and depth with high accuracy\***

M. Tiouririne, A.J. Dixon, K. Owen, F. W. Mauldin, Jr. Dedicated handheld ultrasound system for spinal and epidural placement. American Society of Anesthesiologists. San Diego, CA, October 27, 2015.

\*94% epidural identification success rate within 5 seconds of imaging

\*Error of epidural depth and midline was less than 3 mm