Intervertebral level identification and image-guided epidural placement in parturient presenting post-trauma spinal instrumentation and scarring

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Background

- Conventional ultrasound has successfully displaced blind palpation for needle guidance procedures that include central venous access and peripheral nerve blockades. Additionally, the benefits of ultrasound guidance are increasingly clear for assessing and guiding neuraxial anesthesia placement particularly in patients with challenging anatomy.

- The efficacy of ultrasound image guidance for neuraxial anesthesia has been proven by over a decade of clinical trials when operated by highly trained expert users. Neuraxial ultrasound has been shown to accurately identify the correct intervertebral level more successfully than manual palpation (1-8). It also accurately predicts the needle insertion depth to the epidural space (9-15), reduces needle insertions and passes, and improves safety (16).

- Accuro® is a handheld spinal navigation device that utilizes medical ultrasound to automatically identify spinal landmark anatomy, such as the interlaminar space, in real time. A growing number of clinical studies and trials have demonstrated clinical benefits from Accuro that mirror those demonstrated by conventional ultrasound but with a very low, or non-existent, training burden (17-18). Benefits of neuraxial image guidance are particularly acute in patients with challenging anatomy, which may include a high BMI, patients with previous back surgery, and other presentations where the midline or spinous process is impalpable.

Case Study

A parturient with an ASA Classification of III received anesthesia consult at 25 weeks based on her obstetrician's recommendation. The patient presented with significant neurological deficits and morbidity secondary to spinal trauma suffered at a young age during a car accident. She had a history of traumatic L1 vertebrae fracture; the postoperative status showed a right L1 laminectomy and fusion of T11-12 to L2-3. Although the instrumentation ended at L 2-3, lateral X-ray demonstrated spaces below L 2-3 were significantly compressed **(Figure 1)**. The patient additionally reported severe chronic pain at the postsurgical scarring and adjacent area and palpation was therefore not practicable. Due to prior surgery and chronic pain, the patient reported significant anxiety concerning ineligibility of epidural placement.

"As an anesthesiologist performing epidurals and spinals, we're one of the few specialties not using imaging technology regularly to find the epidural space; this is an advancement that is due in our specialty."

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During the consult, the patient's lumbar spine was evaluated using the Accuro spinal navigation instrument. Based on the Accuro BoneEnhance® image and automated landmark indicators and measurements, an accessible intervertebral level for neuraxial anesthesia placement was successfully identified, presumably at the L3-L4 intervertebral level. Interlaminar space midline was identified by Accuro as substantially adjacent to postsurgical scarring **(shown Figure 2)**. Patient was informed during consult that, based on image guided evaluation from Accuro, successful epidural anesthesia would be possible during labor and delivery.

At 38 weeks, the parturient presented to labor and delivery at Saddleback Medical Center for intended vaginal birth. Consulting obstetric anesthesiologist re-assessed the same intervertebral level using Accuro with equivalent findings to those determined at the 25-week consult. The Accuro Locator needle guide was used to mark the needle insertion site, substantially adjacent to postsurgical scarring, and the automated epidural depth reading reported by Accuro was determined. Neuraxial anesthesia was placed successfully based on the indicated needle insertion site and depth from Accuro. Patient reported low levels of pain throughout remaining labor, and delivered a healthy 7-lbs., 7-oz. newborn.

Conclusion

Neuraxial image guidance using Accuro, at both 25-week consult and during labor and delivery, provided essential spinal landmark identification to aid successful neuraxial anesthesia placement in a parturient with postoperative spinal instrumentation and significant compression. The accessible (presumably L3-L4) intervertebral level was identified as a viable intervertebral level compared to other, more compressed or obscured, intervertebral levels with midline adjacent to postsurgical scarring. The implementation of Accuro at the pre-procedural anesthesia consult alleviated patient anxiety and predicted eligibility and placement location for the eventual neuraxial anesthesia placement.

Seasoned Obstetric Anesthesiologists may find Accuro to be effective during and after pre-procedural patient consultation to assess and guide neuraxial anesthesia placement, particularly in patients with challenging anatomy, including difficulties accompanying spinal instrumentation, a high BMI, or scoliosis.
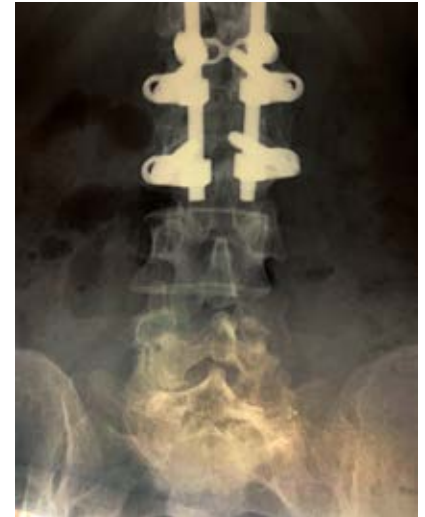

Figure 1. Postoperative X-ray imaging reveals a right L1 laminectomy and fusion of T11-12 to L2-3, with narrowed intervertebral spaces below.

Figure 2. During the 25-week consult, Accuro spinal navigation instrument identifies an accessible (presumably L3-L4) intervertebral level compared to other, more compressed or obscured, intervertebral levels with midline adjacent to postsurgical scarring (red circle).

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About Accuro®

Accuro is the world's first spinal navigation device designed to improve the safety, speed and efficiency of epidural and spinal anesthesia. Accuro's revolutionary image-guidance platform features SpineNav3D™, which automates measurements of the spinal midline, epidural depth and trajectory; and BoneEnhance®, a technology innovation designed to visualize bone landmarks, making it easier and faster (compared to conventional ultrasound) to interpret the underlying image. Accuro supports a sterile environment for optimal patient safety. For anesthesia providers, certainty can be effortless with Accuro.

For information about the easy-to-use Accuro or the medical-device company RIVANNA, please visit rivannamedical.com.

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