

EDITORIAL VIEW

USG or clinical judgment or both?

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ABSTRACT

Regional anesthesia, including central neuraxial block, peripheral nerve block and interventional pain injection is traditionally done with the help of the landmarks and clinical judgment. Today, injections are done with the help of ultrasound (USG). In this paper, two methods are compared and the value of both methods is evaluated. The superiority of USG is obvious, but these two techniques are truly along the same way and complement each other.

Key words: Anesthesia, regional; Nerve block; Epidural injections; Epidural Analgesia; Ultrasonography

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Regional anesthesia has been used by anesthetists for decades. Anesthesiologist performs central neuraxial block, peripheral nerve block and interventional pain injection as a procedure for anesthesia or acute or chronic pain control. Traditional regional anesthetic techniques usually is done by the help of the anatomical landmarks and clinical judgment. Anatomic landmarks are usually an anatomic sign on the skin of injection site which identified by palpation on the bony prominence or arterial pulse. It could be near bony prominence or arterial pulse or a few centimeters away from it, based on the passage of a nerve or nearby organ-specific. But many disadvantages like anatomical differences, small adjacent nerves and blood vessels, lungs, and other vital structures that lead to the failure of the injections and side effects and complications and also inaccuracy of epidural steroid injections performed with surface landmarks put the success of the landmark technique into question.¹⁻³

With the introduction of ultrasound (USG) in medicine by Dr. Karl Theo Dussik, an Austrian neurologist as a medical diagnostic tool,⁴ anesthetists tried to use it to increase the quality of injections. US is the first widely used imaging instrument in regional anesthesia practice because it is mobile, free of radiation risk and relatively inexpensive when compared to other imaging modalities (e.g. magnetic resonance imaging and computed tomography). Moreover, it is noninvasive, safe, easy to use, and can be quickly performed. So USG became a promising alternative to traditional

landmark-based techniques.⁵⁻⁶ But anesthesiologist were slow adopters of USG, because traditionally they had a culture of using surface landmarks for performance of the nerve blocks.⁷ Like any scientific work, the experts were looking for sonoanatomy, they tried to find evidence for injections with ultrasound and measure the distance from skin to the injection site to know for how many centimeters needle must pass to reach the maximum block point. Milestones that must be met during injection with the help of US are the familiarity with sonoanatomy and the correct identification of bone acoustic shadow, muscle layers, vessels and deposition of the local anesthetic in the correct site into the appropriate interfascial planes. US provide a cross-sectional view of anatomical structures and providing instantaneous visual guidance or real-time imaging that can help define the individual regional anatomy, guide needle advancement carefully and ensure the spread of local anesthetic, potentially optimizing nerve block efficacy and safety.⁸

Bogin and Stulin were the first to report the use of US for central neuraxial block in 1971.⁹ Porter et al in 1978 used US to image the sonoanatomy of lumbar spine.¹⁰ Cork et al used US to locate the landmarks relevant for epidural anesthesia in 1984.¹¹ US imaging has transformed the practice of regional anesthesia during the previous 10 years. USG has been associated with higher block success rates and lower volumes of local anesthetic solution required compared to landmark techniques. Studies have demonstrated that USG leads to faster and denser blocks, as well as a reduction in local anesthetic requirement, when

USG or clinical judgment or both?

compared to nerve stimulation guidance.^{1,2,6,12-14} Recent data suggest that USG reduces the number of needle passes required to perform interscalene block and that more consistent anesthesia of the lower trunk is possible with it.¹⁵⁻¹⁶ It is emerging as a reliable, effective technique for perineural catheter insertion too. It helps to place catheters in the vicinity of peripheral nerves for continuous infusion of drugs,¹⁷ but not improve the ease of insertion of labor epidural catheters in patients with easily palpable lumbar spines.¹⁸ Pain medicine practice guidelines recommend that almost all procedures perform by image guidance to enhance the accuracy, precision, safety, and diagnostic information derived from the procedure.¹⁹ Evidence suggests that USG improves the success rate of epidural space access on the first attempt,²⁰ decreases the number of attempts²¹ and improves patient comfort during the procedure.²² It is especially useful in patients with difficult epidural access like in morbidly obese patients or those with a history of difficult epidural access, kyphosis or scoliosis.²¹ USG decreases side effects and increases the quality of analgesia and patient satisfaction in obstetrics.²³

USG is commonly used in acute pain and chronic pain procedures for both diagnostic as well as therapeutic blocks. More common procedures being performed with its help include nerve blocks e.g. brachial or lumbar plexus, more distal branches of the plexus, or at least common locations such as proximity to sites of trauma or entrapment or neuroma formation, blockade of various small sensory or mixed nerves, such as the suprascapular,²⁴ pudendal,²⁵ intercostal,²⁶ genitofemoral,²⁷ ilioinguinal and iliohypogastric,²⁸ lateral femoral cutaneous LFCN,²⁹ greater occipital and third occipital nerve blocks³¹ as well as various other sites. Almost all spinal procedures, including epidurals, selective spinal nerve blocks,³¹ facet joint or medial branch blocks^{33,34} can be done by US. Many advanced pain management procedures including sympathetic blocks, e.g. stellate ganglion,³⁴ celiac plexus block,³⁵ superior hypogastric plexus block³⁶ and ganglion impar block³⁷ can easily be performed with its help. Many other pain procedures, e.g. injection into interfascial planes like transversus abdominus plane (TAP) block, rectus sheath block plus myofascial injection, joint injection, bursitis and tendonitis injections can also be performed by USG, although the outcome of intra-articular procedures is not specifically known.³⁸⁻³⁹ Finally, it is possible to place peripheral neuromodulation electrodes or to fill the intrathecal pump with USG.^{40,42}

US faces many challenges such as difficulty in visualization of thin needles, a poor image quality in obese patients, and the need to invest much time and money in training. However, the advantages make it a very attractive option, and with ongoing research and training, it has evolved as a standard of care in pain management and regional anesthesia.

Although superiority of USG to landmark injection techniques is obvious, however, the later may sometimes be the base of USG techniques, for example LFCN injection is done at 2 cm medial and 2 cm inferior to the anterior superior iliac spine (ASIS) and this site is the same where you put the linear probe for injection,²⁹ or in sacroiliac joint (SIJ) injection, in which the landmark for injection is *one thumb* inferior to posterior superior iliac spine (PSIS),⁴² the same point where you put the curved probe for injection, or in caudal block, in which you enter the needle according to landmark by palpation and identification of sacral hiatus method and put the curved probe at the same site. However, landmark may be different from USG; for example in ilioinguinal and iliohypogastric nerve block landmarks are 2 inch medial and 2 inch inferior to the ASIS and 1 inch medial and 1 inch inferior to the ASIS respectively, where the site of injection in USG block is between internal abdominal muscles and transversus abdominus muscle and linear probe must put in the distance of ASIS and umbilicus and block both nerves simultaneously,²⁸ or the site of injection for TAP block according to landmark is at the ilio-lumbar triangle of Petit, a small triangle above iliac crest, but USG help you to do injection on many site of anterior abdominal wall between internal oblique muscles and transversus abdominus muscle³⁸.

For novice practitioner learning of landmarks is helpful because the basics of every ultrasound injection are; familiarity with the anatomy of the injection site, identification of the landmarks, study of the sonoanatomy and finally injection technique. So, the landmark helps the novice to put their probe correctly on the site of injection.

The author predicts that as ultrasound technology continues to improve and as anesthesiologists and pain specialists interested in this technology and skill level necessary to perform USG injection increases, USG will undoubtedly progress and will become the standard of care even in the developing countries. However, the landmark technique opens the door to the emergence of USG and should not be forgotten.

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USG or clinical judgment or both?

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“All Birds find shelter during a rain. But Eagle avoids rain by flying above the Clouds.”

Dr. A.P.J Abdul Kalam