

Regional Anesthesia in Private Practice

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Introduction: During the past two decades, there has been a growing resurgence in the use of regional anesthesia techniques. The phenomenon can be directly credited to the introduction of ultrasound imaging to assist in the placement of needles and catheters. There are greater numbers of anesthesiologists interested in learning ultrasound imaging and greater numbers of surgeons and patients who are requesting anesthesiologists who are proficient with regional techniques. While not every anesthesiologist has to have a complete mastery of nerve blocks to enjoy a successful practice, there are some who are recognizing the utility of offering regional blocks to expand the marketability of their practice. Put another way, by possessing the skills to more effectively manage postoperative pain and its side-effects, an anesthesiologist may attract more referrals from surgeons and patients. Having the ability to execute a block is not enough. One must make the effort to be efficient with time and resources and produce a consistently effective block that lasts in duration to be clinically useful. It is this additional commitment that defines successful regional anesthesia in private practice. The focus of this lecture is to identify and discuss the aspects of ultrasound-guided peripheral nerve blocks that increase the efficiency of the process.

Ultrasound vs. Nerve Stimulation: This is still a personal choice. The body of emerging data does not conclusively support one technique over the other (1,2). There are studies that demonstrate improved quality, onset time, performance time and reduced volumes of local anesthetic with ultrasound versus nerve stimulation techniques, but they are sufficiently underpowered to make conclusive recommendations in favor of one technique (3-7). Regional complications are extremely rare which makes safety comparisons very difficult. While both technologies have excellent safety records, some propose that real-time imaging of the needle path to directly avoid nerve and vessel penetration have strong theoretic advantages. One recent study comparing ultrasound and nerve stimulation adverse outcomes of over 5400 patients reported seizures and nerve injuries in the nerve stimulator group with no complications in the ultrasound group (8). Despite this, compelling arguments support both sides and in summary, both techniques are excellent. I have chosen ultrasound as my method of choice for most peripheral blocks and catheters, except for the lumbar plexus. For me, ultrasound guidance helps me perform a block quicker, with longer block durations and eliminate failed blocks. Other practitioners may have the same speed and reliability with a nerve stimulator. I suggest you stick with what works best for you, your patients and surgeons.

Goals:

Efficiency – The key variable. I will present a number of considerations that can help the process move along expediently.

Block duration – Continuous catheter techniques demonstrate better outcomes compared to single-shot blocks due to a longer duration of pain relief (9,10). Single-shot blocks in the lower extremity last longer than ones in the upper extremity. Longer blocks minimize opiate side-effects and improve patient satisfaction (9,10).

Safety – We will discuss the role of lipid emulsion in regional anesthesia.

Cost Efficacy – Considerations that minimize resource utilization will be presented as well as billing issues.

Block Suites: This is a great idea, but very difficult to implement. Blocking a patient before entering the operating room while another case is being done is a tremendous time saver. However, to do this successfully, a second anesthesiologist is required as well as a suite with appropriate monitoring and resuscitation equipment. In addition, most pediatric situations require that the patient be under general anesthesia while a block is performed. Thus, an additional anesthesia machine is needed. Both private practice and academic settings may struggle to implement a successful block suite. If you have the resources available to do this, I highly recommend it.

Ultrasound: Tips to Optimize the Image.....Know your machine!

Frequency – higher frequency (10 – 13 MHz) for superficial blocks (interscalene) improves resolution, while lower frequency (8 – 10 MHz) for deep blocks (infragluteal sciatic) sacrifices resolution but improves the depth of penetration. Some machines allow you to adjust the frequency from the keyboard, while others require a probe change.

Gain and TGC – Optimal gain setting creates a contrast between echodense and echolucent structures that allow easy identification of key structures. Newer software will allow you to create “presets” that are best for nerve identification. Time Gain Compensation (TGC) manually adjusts the gain as the ultrasound wave amplitude is attenuated as it passes through deeper structures.

Focus – The best resolution is located at the interface between the near field and far field of the ultrasound beam. Near field is the nondivergent portion of the beam and the far field is diverging. The focal length of the probe is approximately the same as the diameter of the probe. A machine that allows the focus to be manually adjusted will shorten the beam diameter and bring the focal point closer to the probe.

Probe Pressure – A common mistake of budding ultrasound users is that too little pressure is applied on the skin by the probe. Greater pressure will compress the underlying tissue and greater tissue density will improve resolution. This also improves the contact between the skin and the probe, minimizing artifacts.

Probe Angle – Anisotropy is the phenomenon where the echodensity of a structure is dependent on the orientation of the probe. By contrast, an isotropic structure will not

change appearance as the probe angle is changed. Ninety degrees is optimal. Nerves, tendons and muscles all display this phenomenon but to varying degrees. By changing the angle of the probe (2-20 degrees caudad or cephalad) nerves will brighten. This is especially true of infraclavicular and lower extremity approaches.

Probe Covers – The greater number, thickness and density of phases through which the ultrasound beam must pass will attenuate the beam amplitude and potentially create artifacts. Keep it simple. A probe covered with a single sterile transparent adhesive dressing is appropriate for single-shot blocks. For catheter techniques that require a greater sterile field, commercial probe covers are a good choice but add a second gel phase for isonation. If a probe surface is covered with an adhesive dressing, and the remainder of the probe and cord is covered with a sleeve with an adhesive aperture, the second gel phase can be eliminated.

Ultrasound: Tips to Optimize Needle Visualization

Needle Size – larger gauge (18 ga.) needles are easier to visualize but can cause patient discomfort. They are required for catheter placement and penetration of deeper blocks. Smaller gauge needles (21- 25 ga.) can be used for all other blocks. Practice makes perfect. Use a larger gauge needle as your experience grows then switch to smaller needles. Practicing probe/needle coordination using a gel block model commercially available will shorten the learning curve.

Echogenic Needles – Needles that are specifically designed for enhanced brightness of the tip are commercially available. They possess a patented technology called corner cube reflectors (CCR™) which are multiple-angled surfaces that maximize the reflection of the tip despite the angle of the needle. The cost is less than that of Touhy-type and stimulating needles. Some authors have described manually etching the tip of any regular block needle for the same purpose. This is not a recommended practice as tissue injury may result.

Needle Angle: Parallel to the Probe - As the angle of the needle diverges away from the probe, the brightness of the tip attenuates. To prevent this, choose an entry point on the skin that will keep your needle parallel to the probe while maintaining a vector toward the target nerve. The natural tendency is to enter the skin near the probe and angle the needle toward the nerve. By entering the skin farther from the probe and minimizing the angle of the needle, better needle visualization is seen. This can be done for both “in-plane” and “out-of-plane” approaches.

“In-Plane” vs. “Out of Plane” Approaches: The “in-plane” approach allows you to see the entire path of the needle and tip. It is easier to teach and learn this approach. It is also more reassuring to the ultrasonographer that the tip is correctly identified and vital structures are not penetrated. All blocks can be done with this approach, including catheters. The “out-of-plane” approach is more difficult to learn. One can easily become disoriented and misidentify the needle tip. The entire path of the needle is outside the visualized field and penetration of important structures can occur. Applying the

Pythagorean Theorem ($a^2 + b^2 = c^2$) to a triangle created by the nerve, probe and needle insertion site simplifies this process. All blocks can be done with this approach, but catheters can be more difficult to place. The greatest advantage of the “out-of-plane” approach is that a catheter can be threaded along the path of the nerve which some prefer. I have found no difference in catheter function or dislodgement when I use either approach.

Local Anesthetics and Adjuvants: Long-acting local anesthetics are preferred as they provide pain relief further into the postoperative period (11). Ropivacaine and Levobupivacaine are preferred as they have associated toxicity (11). A number of adjuvant medications have been studied in blocks, but data is inconclusive regarding their ability to improve block performance (11,12). Epinephrine at a 1:200,000 concentration has enjoyed a long record of increasing block duration, and providing a means of detecting intravascular injection (13). Its use in patients with cardiac disease and diabetes mellitus should be considered carefully as arrhythmias, cardiac ischemia and decreased nerve perfusion have all been reported.

Single-Shot Technique: A visual demonstration of single-shot technique.

Catheter Technique: A visual demonstration of catheter placement.

Disposable Pumps: Several studies in adults and children have demonstrated the feasibility in sending patients home with peripheral nerve catheters and disposable local anesthetic pumps (14,15). The result is greater patient satisfaction and shorter hospital stays.

Lipid Emulsion: There is a rapidly growing body of information lauding the use of 20% lipid emulsion to treat local anesthetic toxicity in patients who are unresponsive to first-line ACLS. Promising data is emerging, but consensus has not been reached. Balancing risks and benefits, lipid emulsion should be readily at hand for any block location. Of note, a recent article suggested that its concomitant use with higher resuscitation doses of epinephrine may diminish its efficacy (16). Similar results have been shown with vasopressin (17). Go to www.lipidrescue.org for more details.

Billing Issues: In addition to the block itself, one can submit a charge for the use of the ultrasound machine to perform the block. Private insurance, Medicare and Medicaid will reimburse for the charge, but certain criteria must be met. The following statements must be documented: “(blank) block/catheter was placed by surgeon request for postoperative pain control. Ultrasound guidance was used. Relevant structures (nerves, vessels, muscles and needle/tip) identified. Good spread of local anesthetic visualized around the nerve. Vascular puncture avoided. Ultrasound image of the block included in the medical record.” An image of the block (depicting the needle, nerve, local around the nerve with patient ID and block type) can be included into the medical record or scanned into an electronic medical record. The ASA RVG code for the use of ultrasound is 76942. There is no unit value, but “I.C.” is listed indicating “individual consideration”. The dollar value varies. Check with your billing staff to determine the value.

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