Interscalene Brachial Plexus Block- How I do it.

Part 1 of a 2 part discussion on technique.

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Brachial plexus blockade within the interscalene groove involves local anesthetic blockade of the brachial plexus at the level of the roots and can produce complete anesthesia of the shoulder and clavicle. The brachial plexus is most often formed from the C5 to T1 nerve roots. There is a large physical distance between the C5 nerve root and T1 nerve root, resulting in ulnar sparing when local anesthetic is placed in the interscalene groove at the level of C5 or C6. With ulnar sparing, there will be intact motor function and sensation in the 4th and 5th digits. Therefore, the interscalene block is less useful for surgery distal to the mid-humerus.

Anatomy:
The interscalene block is performed at the level of the roots. At this level the plexus lies between two muscles: the anterior scalene muscle and middle scalene muscle (Figure 2.1). The most important roots to block for shoulder surgery include the C5, C6, and C7 nerve roots. The C5 and C6 roots form the superior trunk of the brachial plexus. The C7 nerve root forms the middle trunk.
There is a natural separation between the C6 and C7 nerve roots as they form the superior and middle trunks, respectively.

Each nerve root at this level can appear as a single hypoechoic circle or several hypoechoic circles. Often, novice ultrasound users have the mistaken belief that each individual dark circle is an individual nerve. However, a single nerve root can be comprised of several fascicles that appear as several dark circles per nerve root. In the interscalene groove, the C6 nerve root often appears as two fascicles (dark circles) and the C7 nerve root appears as three or more. Figure 2.2

The suprascapular nerve exits from the C5 nerve root or superior trunk. The suprascapular nerve supplies the some of the muscles of the rotator cuff and much of the sensory innervation of the shoulder joint. For shoulder surgery, it is important to place a nerve block proximal to the exiting of the suprascapular nerve along the brachial plexus when using small volumes or continuous catheter techniques. With large boluses of local anesthetic and more spread along the brachial plexus, the branching of the suprascapular nerve may be less important.

The phrenic nerve lies in close proximity to the brachial plexus, on the anterior scalene muscle. Most interscalene blocks, even with low volumes of local anesthetic, will result in ipsilateral hemi-diaphragmatic paralysis. Caution should be exercised when performing interscalene blocks on patients with restrictive or severe obstructive lung disease.

Clinical Applications
Blockade of the brachial plexus at the interscalene level can be used for shoulder surgeries including shoulder arthroscopies, rotator cuff repairs, procedures involving the mid to distal clavicle, shoulder manipulations and total shoulder arthroplasty. Continuous catheters can routinely be placed in the interscalene groove to extend analgesia for days.

**Technique**

**Monitors:** EKG, NIBP, Pulse Oximeter.

**Prep:** Chlorhexadine with alcohol

**Ultrasound Details:**

**Probe:** High frequency linear probe (10-15 MHz). Expected target depth in 80 kg adult 1-3 cm.

**Patient Position:** The patient is positioned in a sitting position of 45 degrees head up with a pillow under their head but moved away to expose the neck on the operative side. Rotate the patient’s face towards the contra-lateral side. Figure 2.3

**Local anesthetic choice.** Usually 10-30 ml of local anesthetic is usually required. For anesthesia and long acting analgesia ropivacaine or bupivacaine 0.5% is used. For short duration blocks mepivacaine 1.5% or lidocaine 2% may be employed. If the nerve block is only required for post operative analgesia a lower concentration of local anesthetic can be used e.g. ropivacaine 0.2%.
Needle: 100mm (4 inch) short bevel nerve block needle.

1. Use the supraclavicular ultrasound image to locate the brachial plexus. The close proximity of the plexus to a pulsating artery (subclavican artery) assists in locating the plexus at the supraclavicular level.

2. Place the probe behind the mid point of the clavicle.

3. The probe should be aimed acutely down the neck as if attempting to image deep into the thorax. Do not aim with the probe flat across the neck. Figure 2.4

4. Locate the pulsatile subclavian artery. The artery is a hypoechoic or black circle and will appear pulsatile. The artery sits on the hyperechoic line of the first rib or pleura. If the artery is not initially visible slide the probe parallel to the clavicle medially or laterally. Take caution not to mistake the carotid artery for the subclavian.

5. The nerves are located posterior / lateral to the artery or occasionally superior to the artery. The brachial plexus appears as “a bunch of grapes” hypoechoic circles encased in hyperechoic fascia.

6. Once the nerves in the supraclavicular fossa are located, place the nerves in the middle of the screen and slide the probe up the neck. As the probe is moved up the neck, it should tilt to stay almost perpendicular to the skin. The most superficial part of the brachial plexus should be followed on the ultrasound screen as the probe is moved cephalad up the neck. Figure 2.5
7. As the probe is moved cephalad, the subclavian artery should drop away. The superior part of the brachial plexus should initially appear as many small dark circles (multifascicular) and then, as the interscalene groove is formed, it should appear as three dark circles. These circles are usually aligned between the anterior scalene anteriorly, and the middle scalene posteriorly. Figure 2.6

8. Stop sliding the probe when the brachial plexus appears as the three dark circles surrounded by bright, hyperechoic fascia. The three dark circles, from superior to inferior, are the C5 root, C6 fascicle and the C6 fascicle.

9. Usually, the perfect image of the interscalene groove appears only a few centimeters up the neck from the supraclavicular view. Do not be concerned that the probe may not be very far up the neck. Perform the block where the ultrasound image gives the best representation of the three dark circles within the interscalene groove.

10. Insert the needle in plane starting lateral / posterior and aim medial /anterior. Figure 2.7

11. Advance the needle aiming for the plexus, either to the most superficial part of the plexus (C5 nerve root) or the deepest part of the plexus (C6 fascicle). Figure 2.8

12. For safety, there is no need to use the needle to puncture between any of the hypoechoic fascicles of the brachial plexus at this level.
13. Ideal spread of local anesthetic for a single injection is anywhere close to the brachial plexus (three circles). Simply deposit the local anesthetic above, posterior, or deep to the three circles. Figure 2.9

14. The needle can be redirected if spread around the plexus is not deemed adequate. The final objective is to have the plexus next to the local anesthetic. There is no need to place local anesthetic on both on the anterior and posterior sides.

Alternative techniques

Out of plane approaches have been described with the probe in this same position as described above for the interscalene block. For out-of-plane needle insertion, place the interscalene groove with brachial plexus in the middle of the ultrasound image. Then advance the needle using the techniques described in Section 1.2, starting in the middle of the ultrasound probe (Figure 2.10)

Catheters
Catheter placement can follow the same steps as above but will involve sterile technique, a larger gauged needle, and both placement and securing of the catheter. For catheters, place the tip of the needle either above C5 or below C6. (Figure 2.11) Again, the needle does not penetrate between the three circles of the interscalene groove. The catheter is then fed within the interscalene groove.
Because this area of the body is mobile premature catheter failure can be frequent. Securing the catheter well with surgical glue and well placed dressings will improve longevity. (Figure 2.12)