

chapter IV

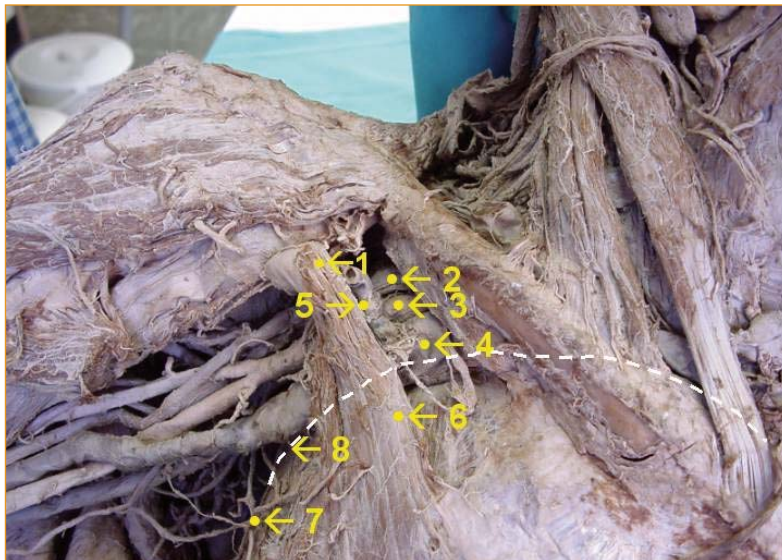
Continuous Infraclavicular Nerve Block (Brachial Plexus Cord Block)

Indications

The continuous infraclavicular block suited for the relief of post-operative pain following surgery to the elbow, arm and hand. This block is also used as sole anesthetic for elbow, arm and hand surgery.

Please see nerve damage **WARNING** on page 6.

Applied Anatomy



The coracoid process (1) can easily be felt in most patients. Medial to the coracoid process is a space that is usually presented in patients as a fossa—the deltopectoral groove, deep to which are the cords of the brachial plexus (2). Caudally and medially to the cords are the subclavian artery (3) in close relation to the subclavian vein (4). The cephalic vein (5) joins the subclavian vein and is situated in the groove between the deltoid muscle and the major pectoral muscle. The major pectoral muscle is cut away in this dissection and the minor pectoral muscle (6) is attached to the coracoid process. Note the position of the intercosto-brachial nerves (7) that innervate the skin of the medial aspect of the upper arm and the dome of the thoracic cavity (8), which is some distance from the cords of the brachial plexus.

Figure 4.1—Anatomy

Needle Placement

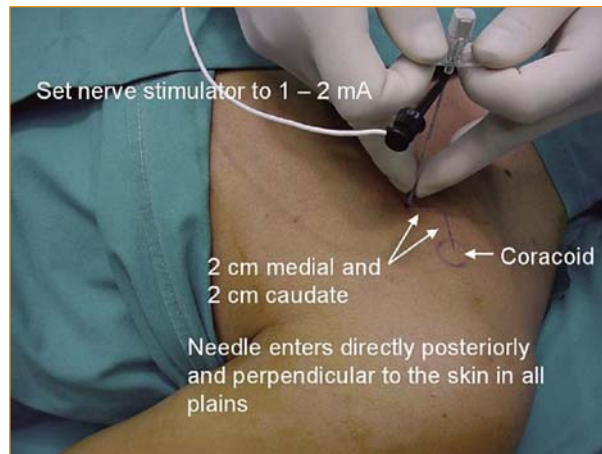


Figure 4.2—Needle entry

With the patient in the supine position and the head neutral, the needle enters the skin 2 cm medial and 2 cm caudal to the midpoint of the coracoid plexus. Another approach is in the center of the deltopectoral groove. Several other approaches have been described, but most are variations of the above approach. Most notably are the more medial to lateral approaches of Admir Hadzic and Alain Borgeat, the peri-coracoid approach of Curt Whiffler and the superior approach, which is fast becoming the preferred technique, which was described by Robert Raw. The peripheral nerve stimulator (set to 1–1.5 mA at 200 ms) is clipped to the shaft of the needle. The needle enters perpendicularly to the skin (Figure 4.2). Two distinct

“pops” or “gives” can usually be felt when the needle first penetrates the fascia surrounding the major pectoral muscle and then that of the minor pectoral muscle. Immediately after these two muscles have been penetrated, the needle comes into contact with the cords of the brachial plexus. Contact with the lateral cord will cause pronation and flexion of the hand—the fifth digit or pinkie moves lateral. Contact with the medial cord will cause flexion and ulnar deviation of the hand—the pinkie moves medial, and contact with the posterior cord will cause extension of the hand. The pinkie moves posterior. It should therefore be clear that the pinkie moves towards the cord that is being stimulated. (See also Borene SC, Edwards JE, Boezaart AP. At the cords, the pinkie towards: Interpreting infraclavicular motor response to neurostimulation. *Reg Anesth Pain Med* 2004; 29: 125–129). All three cords can therefore be separately identified and the catheter placed near the most appropriate cord for the type of surgery done. Once the appropriate nerve has been identified, the current of the nerve stimulator is turned down. Brisk twitches should still be present at 0.5 mA.

Catheter Placement

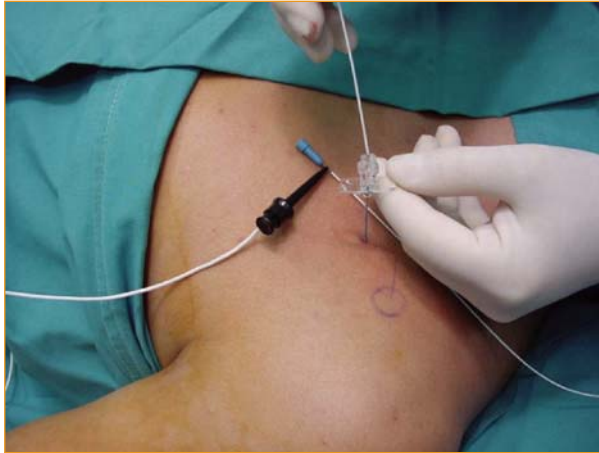


Figure 4.3—Catheter placement 1

Once the tip of the needle is at the cords of the brachial plexus, the needle is held steady. The nerve stimulator is then removed from the needle and clipped to the proximal end of the catheter (Figure 4.3). The distal catheter tip is then inserted into the needle and advanced to its tip. The muscle twitches are now exactly the same as they were when the nerve stimulator was clipped to the needle. Advance the catheter beyond the needle tip and make sure that the muscle twitches do not change during this process.

If the twitches do decrease or disappear, carefully withdraw the catheter tip back into the shaft of the needle. Make a slight adjustment to the needle (for example rotate it through 90 degrees clock- or anticlockwise) and advance the catheter again. Repeat this maneuver until the muscle twitches remain unchanged during catheter advancement. Remove the needle while holding the catheter in place and test the position of the catheter again by attaching the nerve stimulator to the proximal end of the catheter.

The tip of the catheter is now approximately 1 or 2 mm from the brachial plexus. Do not advance the catheter further than 5 cm down the sheath. Otherwise the catheter may curl around nerves and possibly injure them when the catheter is removed. The catheter will most likely fall out if left like this. It therefore requires subcutaneous tunneling for fixation.

Tunneling



Figure 4.4—Tunneling 2

Insert the needle some 5–10 cm from the catheter entry site.



Figure 4.6—Skin Bridge

Remove the needle and observe the skin bridge.

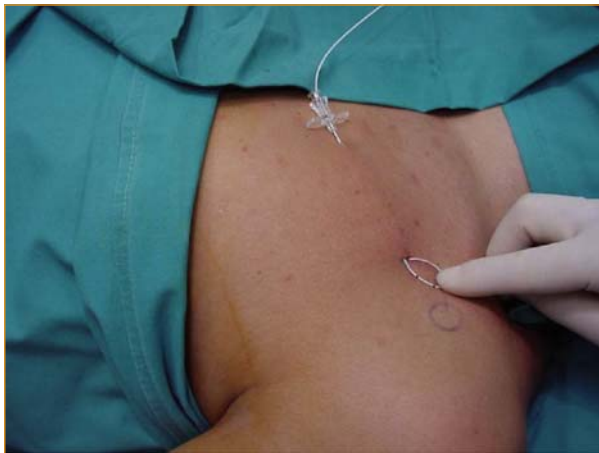


Figure 4.5—Tunneling 3

Feed the catheter back through the needle.

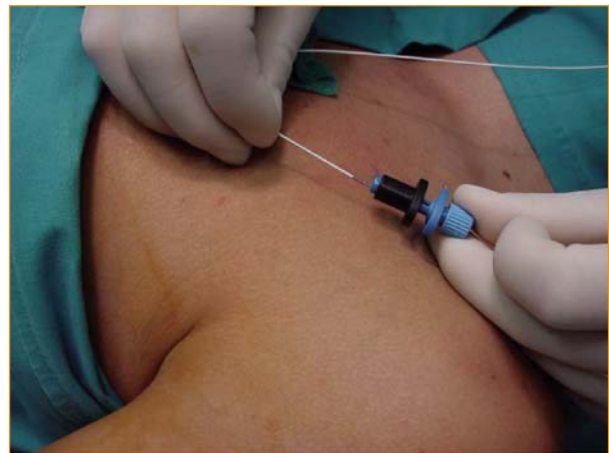


Figure 4.7—SnapLock

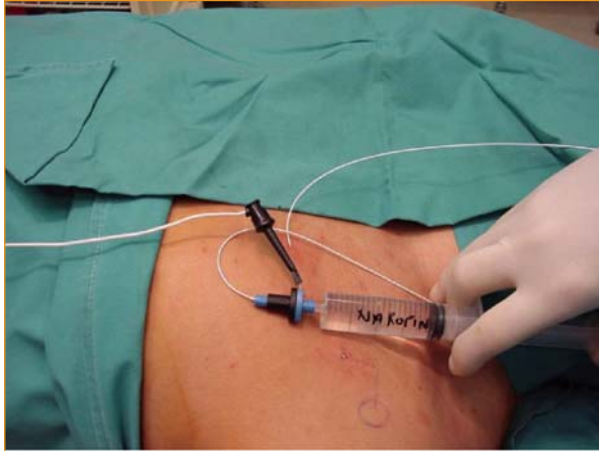


Figure 4.8—Raj test

Clip the nerve stimulator to the SnapLock and inject local anesthetic agent while stimulating the nerve via the catheter. Set the nerve stimulator to the lowest output that will still cause brisk muscle twitches and note that the twitches disappear immediately after the injection is started. This constitutes a positive Raj test, which provides additional assurance that the block will be successful.



Figure 4.9—StatLock®

Cover the catheter and the entry sites with a dressing and secure the catheter and SnapLock connection with the supplied StatLock® device.

Drugs

Bolus Dose and continuous infusion

If the infra-clavicular block is combined with general anesthesia, in adults 20 ml of 0.5% ropivacaine or 0.5% bupivacaine will provide excellent intra-operative analgesia. For children a bolus of 0.25 ml/kg is used. A continuous infusion of 0.1 ml/kg/hr will provide excellent post-operative analgesia.

If the infraclavicular block is used as sole anesthetic for elbow surgery, 0.5 ml/kg of 0.5% or 0.75% ropivacaine or 0.5% bupivacaine will give satisfactory intra-operative results. This is followed by 0.2% @ 5–10 ml per hour of the same local anesthetic agent. Patient controlled boluses of 10 ml and a lockout time of 30–60 minutes give excellent results and patient satisfaction.

Sedation

This is usually not required, but if sedation is preferred, it is recommended to give both remifentanyl 0.3 micrograms per kilogram plus midazolam 1–2 mg by intravenous injection one minute before the catheter is placed. Other opiates like fentanyl and alfentanil are also widely used.