



# Tips & Tricks: Local Anesthetic Techniques for the Hand

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There are several techniques for providing anesthesia for hand procedures. While systemic administration of general anesthesia has long been the gold standard and a reliable option, it can lead to derangements of other organ systems. Regional and local anesthetic techniques are preferred for the management of upper extremity conditions<sup>1</sup>. Local anesthesia is especially well-suited for use in the emergency department setting for the management of acute hand injuries or infections as well as in the operating room setting for minor operations. Although regional anesthesia is typically administered by a trained anesthesiologist, local anesthetics can be administered by the surgeon.

Advantages of local anesthesia include less time spent during recovery, improved pain control, lower opiate consumption, less postoperative nausea and vomiting, and lower costs<sup>1,2</sup>. There are few absolute contraindications, which include patient refusal or active infection at the needle insertion site. Relative contraindications include the need for assessing postoperative nerve status or compartment syndrome and use in anticoagulated patients.

### *Choice of anesthetic:*

Lidocaine and bupivacaine are the two most common local anesthetics used. The effects of lidocaine typically lasts 1.5-3 hours in duration, while bupivacaine is longer acting and can last from 3-10 hours making it preferable for operations lasting more than 2.5-3 hours (Table 1). It is important to note the pain block provided by bupivacaine lasts about half as long (10 hours) as the return to normal sensation (20 hours) so it is worthwhile to inform patients pain sensation will return much sooner than numbness will resolve. With lidocaine, pain and sensation return simultaneously<sup>3</sup>.

### *Epinephrine in the finger:*

Epinephrine use for the finger and hand is now regarded to be safe when there is minimal concern for digital ischemia<sup>4,5</sup>. The typical dose

is 1mg (1:100,000) in 10 mL of 1% lidocaine. The maximal time to vasoconstriction after injection has been shown to occur 25 minutes after injection<sup>6</sup>. It is recommended that waiting approximately 30 minutes before incision will provide maximal hemostasis; thus, patients should ideally be blocked in the preoperative area prior to entering the operating room theatre.

### **Wide awake local anesthesia no tourniquet technique (WALANT)**

WALANT uses a combination of a local anesthetic such as lidocaine or bupivacaine and epinephrine to induce anesthesia and hemostasis in the area of the surgical procedure. The primary advantage is to avoid the use of a tourniquet subsequently reducing patient discomfort and avoiding the risk nerve and skin injury from the tourniquet. Intravenous access for sedation is typically not required as pain from tourniquet is obsolete and preoperative testing is typically not required. There is a high patient satisfaction and recovery is quick, with more >90% patients stating they would choose this anesthetic option again<sup>7</sup>.

Specific intraoperative use for WALANT includes tendon transfers to allow for appropriate tensioning and observation of the tendon transfer in action before definitive fixation. Soft tissue releases for trigger finger and De Quervain tenosynovitis can be confirmed intraoperatively with active motion. Flexor and extensor tendon repair can be immediately visualized to ensure that the tendon glides appropriately. Patient education and rehabilitation can begin immediately after surgery because active total motion is observed in the operating room<sup>7</sup>.

### *Authors preferred method:*

- For standard procedures with MAC anesthesia, we typically use 5 mL of 1% lidocaine and 5 mL of 0.5% bupivacaine in a 10 mL syringe.

**Table 1. Duration and maximal doses of common anesthetics used for hand procedures**

Anesthetic	Duration of Effect	Maximal Dose
Lidocaine	1.5-3 hours	7 mg/kg (50 mL in 150 lbs. patient)
Bupivacaine	3-10 hours	2.5 mg/kg (20 mL in 150 lbs. patient)

- For local procedures without tourniquet, we utilize 1% lidocaine with 1:100,000 epinephrine.

### Tips for administration

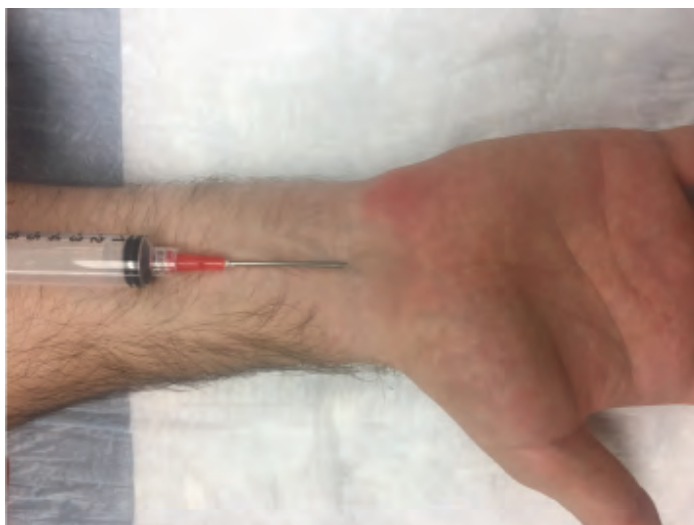
There are certain techniques that can be used to diminish pain during administration. We recommend use of a 27-gauge needle or smaller. Buffering the solution of lidocaine also helps relieve the burning sensation during administration. 1% with 1:100,000 epinephrine has a pH 4.2. Adding a 1:20 ratio of 8.4% sodium bicarbonate to lidocaine 1% with 1:100,000 epinephrine has a more physiologic pH 7.4 and will lead to less pain when administering<sup>8</sup>. Warming the solution also decreases pain at the injection site.

Choosing the correct angle for needle insertion is critical. Needles oriented at 90 degrees to the skin are shown to be significantly less painful than those with needles oriented at 45 degrees<sup>8</sup>. Injecting the solution under the dermis (subdermal) produces less pain than intradermal injections. There should always be at least 5 mm of firm palpable local anesthesia in the skin ahead of the needle tip so the needle tip never penetrates an area that is not anesthetized except for the first poke of the first needle penetration. Injecting slowly also allows the lidocaine to work ahead of the needle tip.

### Types of Local Blocks

#### *Median nerve wrist block*

Anesthetic is injected between the palmaris longus and flexor carpi radialis (FCR) tendons. The needle is inserted at the level of the proximal wrist crease (Figure 1). The needle is advanced through the flexor retinaculum at a depth of approximately 1 cm and 5 mL of local anesthetic is injected. Injecting 1 mL of local anesthetic above the retinaculum as the needle is withdrawn can block the superficial palmar branch supplying the skin over the thenar eminence.



**Figure 1.** Median nerve block being performed with needle entry ulnar to the FCR tendon at the level of the distal wrist crease.



**Figure 2.** Ulnar nerve block being performed with needle entry ulnar to the FCU tendon at the level of the distal ulna.

#### *Ulnar nerve wrist block*

Anesthetic is injected on either the radial or ulnar side of the flexor carpi ulnaris (FCU) tendon. The ulnar approach is preferred so as to avoid intravascular injection, given the location of the ulnar artery on the radial side of the tendon. At the level of the distal ulna, the needle is introduced on the dorsal ulnar side of the FCU (Figure 2). 5 mL of local anesthetic is injected under the FCU. Additional subcutaneous infiltration of the dorsal ulnar area of the wrist ensures adequate blockade of the dorsal cutaneous branch of the ulnar nerve.

#### *Radial nerve wrist block*

The radial nerve is superficial and divided into branches running in the subcutaneous fat at the level of the radial styloid. 5-10 mL of local anesthetic is injected in a subcutaneous field block at the level of the radial styloid. Initial injection is made using 2-3 mL of local anesthetic just lateral to the radial artery at the level of the proximal wrist crease. Needle can then be redirected and advanced with subcutaneous injection across the proximal border of the snuffbox to the midpoint of the dorsal wrist.

#### *Digital nerve block*

There are three main approaches for performing a digital nerve block—transthecal, transmetacarpal, and subcutaneous. The transthecal digital nerve block uses the flexor tendon sheath for anesthetic infusion. While effective, we recommend against this technique as it may lead to rupture of sheath and continued pain along the tendon sheath<sup>9</sup>. A subcutaneous block is typically preferred and accomplished with injection just distal to the distal palmar crease. The needle is inserted superficially and perpendicular to the direction of the digit (Figure 3). A wheal is created superficial to the flexor tendon sheath using 1-2 mL to block the volar digital nerve as they enter the digit. This process is repeated on the dorsal aspect of the hand. It is unnecessary to guide the needle toward the web space as this can lead to iatrogenic nerve penetration. A



**Figure 3.** Index finger digital nerve block being performed with a subcutaneous technique showing needle entry superficial to the flexor tendon sheath.

circumferential ring block along the base of the digit is also not recommended because the subsequent pressure can result in gangrene. An additional option includes the transmetacarpal digital nerve block, which is accomplished at the level of the distal palmar crease with the injection site being 1 cm

proximal to the MCP joint on the volar aspect of the hand. 2 mL are injected on either side of the metacarpal neck to block the common digital nerve.

## References

1. Green, David P, and Scott W. Wolfe. *Green's Operative Hand Surgery*. Philadelphia: Elsevier/Churchill Livingstone, 2011. Print.
2. Foster BD, Sivasundaram L, Heckmann N, et al. Surgical Approach and Anesthetic Modality for Carpal Tunnel Release: A Nationwide Database Study With Health Care Cost Implications. *Hand (N Y)*. 2017;12(2):162-7.
3. Hustedt JW, Chung A, Bohl DD, et al. Comparison of Postoperative Complications Associated With Anesthetic Choice for Surgery of the Hand. *J Hand Surg Am*. 2017;42(1):1-8 e5.
4. Vinycomb TI, Sahhar LJ. Comparison of local anesthetics for digital nerve blocks: a systematic review. *J Hand Surg Am*. 2014;39(4):744-51 e5.
5. Lalonde D, Martin A. Epinephrine in local anesthesia in finger and hand surgery: the case for wide-awake anesthesia. *J Am Acad Orthop Surg*. 2013;21(8):443-7.
6. Lalonde D, Bell M, Benoit P, et al. A multicenter prospective study of 3,110 consecutive cases of elective epinephrine use in the fingers and hand: the Dalhousie Project clinical phase. *J Hand Surg Am*. 2005;30(5):1061-7.
7. Steiner MM, Calandruccio JH. Use of Wide-awake Local Anesthesia No Tourniquet in Hand and Wrist Surgery. *Orthop Clin North Am*. 2018;49(1):63-8.
8. Strazar AR, Leynes PG, Lalonde DH. Minimizing the pain of local anesthesia injection. *Plast Reconstr Surg*. 2013;132(3):675-84.
9. Low CK, Vartany A, Diao E. Comparison of transthecal and subcutaneous single-injection digital block techniques in cadaver hands. *J Hand Surg Am*. 1997;22(5):897-900.