Minimally Invasive Anesthesia in Wide Awake Hand Surgery

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KEYWORDS

• Wide-awake • Epinephrine finger • WALANT • Tourniquet-free • Sedation-free

KEY POINTS

- The tourniquet is no longer required for hand surgery because of epinephrine hemostasis.
- Epinephrine in the finger is safe.
- Epinephrine vasoconstriction in the finger is reversible with phentolamine.
- Wide-awake flexor tendon repair has decreased tenolysis and rupture rates.
- Patients like the sedation-free approach for carpal tunnel and find it similar to dental surgery.

Videos of how to inject carpal tunnel with minimal pain for wide awake surgery; Field sterility for surgery; surgery; intraoperative patient advice; bandage; and typical patient impression after surgery accompany this article at http://www.hand.theclinics.com/

INTRODUCTION/NATURE OF THE PROBLEM

One of the most significant recent advances in hand surgery has been the movement away from tourniquet surgery, which often requires sedation or general anesthesia. The advent of epinephrine safety in the finger has led many to use this mode of hemostasis. This is providing a patient experience similar to a visit to the dentist; the patient comes in, rolls up his sleeve, gets the local anesthesia, has the hand surgery and goes home without preoperative testing or postoperative recovery time in the hospital or surgery center.

WHAT IS MINIMALLY INVASIVE ANESTHESIA FOR WIDE-AWAKE HAND SURGERY?

In wide-awake hand surgery, the only medications given to the patient are subcutaneous lidocaine and epinephrine. This mixture is infiltrated wherever surgical dissection, K wire insertion, or manipulation of fractured bones will occur. The concept behind this technique is that the local anesthetic results in an extravascular Bier block but only where it is needed. The other term that is frequently used to describe this approach is tumescent local anesthesia.

There are several advantages to this minimally invasive technique. If the local anesthesia is administered properly,[1] all that the patient feels is the first needle poke of a 27-gauge needle in the hand for most hand operations. The lack of any sedation means there is no need for preoperative testing, intravenous insertion, intraoperative monitoring, or the postoperative anesthetic care unit. The procedures can be performed without sedation, because epinephrine is used for hemostasis, which obviates the need of a painful tourniquet. Once exposed to this concept, the patients love it.[2] The patient experience of hand surgery using this technique becomes more on par with a visit to the dentist.

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INDICATIONS/CONTRAINDICATIONS

The author and colleagues believe that nearly every patient should be offered the wide-awake option. Most people who do not want sedation at the dentist are likely to prefer the wide-awake approach, because it is more convenient than going through the time-consuming process associated with sedation: preoperative testing, intravenous insertion, and postsedation recovery period. Patients with pre-existing medical problems such as renal dialysis, morbid obesity, and severe lung problems should be considered for this approach, as it is safer than the sedation/general anesthesia route.

Of course, some patients really are better served having sedation, and it should be given to them. Patients with high anxiety or severe posttraumatic stress disorder may not tolerate a wide-awake procedure. Also take care in offering this technique to non-native English speakers and those with cognitive impairments. Finally, not all surgeons enjoy interactive discussion with patients that can occur during operative procedures. This technique is not for those surgeons.

Epinephrine-induced cardiac ischemia is a possible but extremely rare event; even with high doses (1:1000 epinephrine).[3] The author and colleagues have not had this complication with over 2000 cases. However, if there is concern with epinephrine use because of cardiac disease, lowering the dose of epinephrine to 1:400,000 is an option the author and colleagues occasionally employ. Some have even found epinephrine 1:1,000,000 effective for hemostasis.[4]

TECHNIQUE

Anesthetic

It has been shown in liposuction patients that up 35 mg/kg of tumescent lidocaine with epinephrine injection can result in safe blood levels of lidocaine.[5] Nevertheless, the author and colleagues use the conservative upper limit of 7 mg/kg of lidocaine with epinephrine, as their patients are not monitored. In a 70 kg person, this means 49 cc of 1% lidocaine with 1:100,000 epinephrine.

For standard exposures, the author and colleagues inject up to 50 cc of subcutaneous 1% lidocaine with 1:100,000 epinephrine wherever surgical dissection, manipulation of fractured bones, or K wire insertion will occur. If a larger field needs to be anesthetized such as for larger operations such as spaghetti wrist or tendon transfer, the author and colleagues add up to 150 cc of saline to obtain more volume. This results in 0.25% lidocaine with 1:400,000, which is still effective for local anesthesia and hemostasis. However, this dilution does require a little longer to set up.[6] Even 1 in a million epinephrine provides effective hemostasis if a patient has a greatly unstable heart.[4]

For operations longer than 2 hours, the author and colleagues add up to 10 cc of 0.5% bupivacaine with 1:200,000 epinephrine to the infiltrate to make sure no top ups are required. The author and colleagues consider top ups to be a failure of the initial injection, and they should be avoided.

Anesthetic Technique

Patients are placed supine and injected in the holding area before entering the operating room. For this technique to be maximally effective, time must be allowed to let the medication take effect. It has been shown that maximal vasoconstriction occurs an average of 26 minutes after injection of 1:100,000 epinephrine beneath human skin.[7]

For short procedures, the patients are instructed at the time of the preoperative consultation that they should bring a book, as they will have to wait at least 30 minutes between the injection of the local anesthesia and the surgery. They are given the analogy of: “putting a cake in the oven and giving it time to bake.” The author and colleagues have developed a system to allow for efficient throughput in their surgical center. Their first 3 patients arrive at 8 AM; the surgeon completes their injection and paperwork. It takes an average of 5 minutes to inject a carpal tunnel patient in a consistently almost pain-free manner.[8] While the third patient is being injected, the nurse sets up the first patient in the operating room. After the first case, the nurse brings the second patient into the operating room and sets it up while the surgeon injects the fourth patient, and so on.

More thought is required when injecting larger areas such as multiple flexor tendons in the hand or for forearm cases. The key to success is that enough volume is injected into the most proximal area to be dissected so that the tissues become mildly indurated or blanched with local anesthesia.[9] Care must be taken when injecting near the nerves; eliciting paresthesias is unnecessary, as tumescent local anesthesia is effective without placing the needle so close to the nerve. In addition, the sharp bevel of the needle can lacerate nerve fascicles. With this technique, the local is injected 5 to 10 mm away from major nerves. Then time is given to allow diffusion of the local to the big nerves while epinephrine vasoconstriction sets in. After injection, there should be at least 1 cm of visible or palpable subcutaneous local anesthesia beyond any area of intended dissection.