

Wide-Awake Wrist Arthroscopy and Open TFCC Repair

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Abstract

The wide-awake approach to hand surgery entails the use of local infiltration anesthesia using lidocaine with epinephrine and no tourniquet. The technique provides practitioners with an option to perform advanced hand surgical care in an ambulatory setting, without the need for general or regional anesthetics. We present our results using wide-awake approach in wrist surgery, both open and arthroscopic. Between June and August 2011, the wide-awake approach was used in nine elective wrist surgery cases; three arthroscopic procedures, four open triangular fibrocartilage complex (TFCC) repairs, and two combined arthroscopy/open surgery (eight men/one woman). The arthroscopic patients were anesthetized using dorsal infiltration of lidocaine with epinephrine (20 mL) with an additional intra-articular 5 mL injection 30 minutes before surgery. The open surgery patients received 40 mL of lidocaine with epinephrine around the ulnar aspect of the forearm, from 8-cm proximal to 3-cm distal to the distal radioulnar joint. Standard diagnostic radio- and midcarpal arthroscopies were performed, where one patient had a loose body removed and two patients underwent TFCC debridements due to central TFCC tears. The six open cases were all due to TFCC foveal disruptions, which were reinserted using osteosutures in the distal ulna. Following placement of the ligament sutures, a preliminary knot allowed active and passive motion testing of pronosupination, to determine the adequate amount of tension in the ligaments. The wide-awake approach to wrist surgery is a plausible and reliable technique that eliminates the need for general anesthesia, removes the need of a tourniquet, and provides a cost-efficient and safe approach to wrist surgery. The ability to control ligament reconstructions using active motion may additionally enhance the rehabilitation of these patients, both through early proprioceptive awareness and adequate tensioning of soft tissues.

Keywords

- ▶ arthroscopy
- ▶ local anesthesia
- ▶ proprioception
- ▶ TFCC
- ▶ wide-awake surgery
- ▶ wrist

The wide-awake approach to hand surgery involves the subcutaneous and intra-articular injection of large volumes of diluted lidocaine and epinephrine in the forearm, wrist, hand, and fingers. Benefits include the deletion of the risks and inconveniences of general anesthesia and the ability to watch the patient take reconstructed hand tissues through an

active range of motion for adjustment of the reconstruction before the skin is closed.¹

Watching comfortable patient's active movement during the surgery has shown major benefit in allowing reduced rupture rates in flexor tendon repair,^{2–5} as well as improved tension setting in tendon transfers.⁶ Wide-awake surgery has

also been successfully used in the treatment of Dupuytren disease⁷ and digital surgery, including nerve repairs, ganglions, trigger fingers, and extensor tendon repairs.⁸ Only one study has reported the use of local anesthesia in wrist arthroscopic ganglionectomies.⁹

In this article, we report the first experience with wide-awake wrist arthroscopy and open TFCC repair.

Materials and Methods

Patients

Based on a combination of clinical examination and magnetic resonance imaging findings, a total of 15 patients were diagnosed with wrist pathology from June to October 2011, indicating a need for surgical intervention using wrist arthroscopy and/or open TFCC repair. After careful information of the planned surgical treatment, all patients were given the choice to undergo surgery in local or general anesthesia. Of the 15 patients, 9 elected to receive treatment in local infiltration anesthesia—henceforth, wide-awake surgery. These nine patients comprised eight men and one woman with a mean age of 47 years (range, 31 to 59 years). Of these nine patients, three were planned for wrist arthroscopy; two for wrist arthroscopy and possible open TFCC repair; three for open TFCC repair; and one for tenolysis of the extensor digiti minimi and open TFCC repair. All patients included in this series were previously healthy, with no history of cardiac, peripheral vascular, diabetic or renal diseases.

Anesthesia

The key to wide-awake wrist surgery lies in the combination of: (1) using lidocaine with epinephrine and (2) time to let the anesthesia settle before surgery. Consequently, all patients were anesthetized at minimum of 30 minutes before surgery (range, 30 to 50 minutes). As patients may have a vasovagal reaction to the injection and/or a temporary feeling of increased pulse as a result of the epinephrine, all patients were injected lying down to facilitate fast transfer to Trendelenburg position.¹ If an increase in pulse occurs, the effect will pass within 10 to 15 minutes.

For the arthroscopic patients, 20 mL of 1% lidocaine (10 mg/mL) with epinephrine (5 µg/mL) and 2 mL sodium bicarbonate (50 mg/mL) solution added, was slowly infiltrated (27-gauge needle) over the dorsal aspect of the wrist to block the sensory branches of the radial, ulnar, and posterior interosseous nerves. An additional 5 mL lidocaine with epinephrine was then injected intra-articularly into the radiocarpal joint, between the distal radius and the scaphoid (→Fig. 1).

For the open TFCC repairs, 40 mL of 1% lidocaine with epinephrine mixed with 4 mL sodium bicarbonate (dosage as described above) was similarly infiltrated around the ulnar and mid-aspects of the forearm, from 8 cm proximal to 3 cm distal to the distal radioulnar joint (DRUJ) (→Fig. 2). Finally, 5 mL lidocaine with epinephrine was injected in the ulnocarpal joint, with the needle inserted between the ulnar styloid and the triquetrum to allow deposition of the local anesthetic primarily around the TFCC complex.

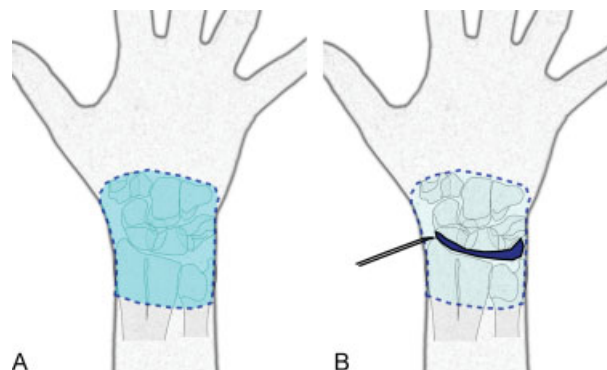


Figure 1 Schematic illustration of the infiltration anesthesia used for wide-awake wrist arthroscopy. (a) Subcutaneous infiltration (blue) of 20 mL of 1% lidocaine with epinephrine; (b) intra-articular injection (dark blue) into the radiocarpal joint, between the scaphoid and distal radius, 5 mL of 1% lidocaine-epinephrine.

Contraindications

The only absolute contraindications include: (1) known hypersensitivity to lidocaine and (2) poor peripheral circulation. A patient with poor digital circulation as evaluated by poor capillary refill or where the surgery is expected to greatly disrupt the blood supply to the finger, as can occur in recurrent Dupuytren disease, is not a candidate for wide-awake surgery using lidocaine with epinephrine.⁷

The presence of cardiac disease constitutes a relative contraindication, as the patient may be sensitive to epinephrine. In these instances, the concentration of epinephrine can be reduced to 1:400,000, which is still effective for hemostasis, but requires a little longer to generate vasoconstriction.¹

Surgical Technique

All surgeries were performed in a clinic-based surgical theater. No monitored anesthesia care (MAC), sedation, or anesthesia personnel were involved in the surgery.

All patients were placed supine with the shoulder abducted at 90 degrees, elbow flexed at 90 degrees, forearm pronated, and the hand elevated using finger traps and a Linvatec wrist traction tower (ConMed Linvatec Corp., Goleta, CA) with ~5 kg (10 lb) traction. No tourniquet was used.



Figure 2 Infiltration anesthesia applied to a patient planned for open triangular fibrocartilage complex repair. A solution of 40 mL of 1% lidocaine with epinephrine was administered subcutaneously 30 minutes preoperatively. The dotted lines mark the area of infiltration, where skin pallor can be seen as a result of the epinephrine vasoconstrictive effect. In addition, 5 mL lidocaine with epinephrine was injected into the ulnocarpal joint, between the ulnar styloid and the triquetrum.

For the arthroscopy, standard dorsal portals (3/4; 4/5) were used for arthroscopy of the radio and ulnocarpal joints, as well as of the midcarpal joint (ulnar/radial).¹⁰ No volar or DRUJ portals were used in this series.

For the open TFCC repair, a dorsal zigzag incision over the fifth extensor compartment was used. Using the dorsoulnar nerve-sparing approach to the DRUJ,¹¹ the foveal tears of the TFCC could be easily identified. In five patients, the radioulnar ligament complex was reinserted using osteosutures and in one patient a primary ligament suture was done as there were foveal remnants allowing direct repair.

After placement of the primary suture, before completing the knot, the hand was removed from the traction tower, and the patient allowed to actively and freely pronosupinate the wrist. The active motion allowed adequate tensioning of the TFCC repair to allow stability of the DRUJ, while maintaining full range of motion in wrist rotation (►Video 1).

Results

Preoperative Observations

One patient reported an elevated heart rate before surgery, just after administration of lidocaine with epinephrine. Control of pulse and blood pressure disclosed no abnormality and the sensation passed within 10 minutes as it was a transitory effect of the epinephrine.

Observations during Surgery

No adverse events occurred during surgery, no anesthesiologist was present, no MAC was administered and no tourniquet was used in any of the cases. No intra-articular bleeding was noticed during the wrist arthroscopies. Only minor bleeding, primarily from the skin edges, occurred in the open TFCC repairs. This was controlled through standard bipolar cautery.

The time of surgery varied between 30 to 100 minutes, the shortest time was for the wrist arthroscopies and the longest for the combined open TFCC repair and tenolysis. As no tourniquet was used, the patients had no discomfort in the arm or hand, not even from the finger traps.

Postoperative Observations

Following completion of the surgery, all patients received 1 g paracetamol and 50 mg diclofenac as pain prophylaxis. No other analgesia was required as the epinephrine added to lidocaine provides a prolonged anesthetic effect due to vasoconstriction.

Patient Evaluation

Following the completion of surgery, all patients were asked three questions:

1. Was the injection painful? (visual analogue scale [VAS] 0 to 10)
2. Was the surgery painful? (VAS 0 to 10)
3. Should a similar procedure be needed in the future, would you choose local or general anesthesia?

One patient found the intra-articular injection to be painful, but manageable (VAS 4 to 5); others reported that

Video 1

The video illustrates the wide-awake technique in open reconstruction of a foveal triangular fibrocartilage complex injury. This technique entails the use of large quantities of diluted lidocaine with epinephrine, using no tourniquet and no additional sedation. In this particular patient, a total of 40 mL of 1% lidocaine (10 mg/mL) with epinephrine (5 µg/mL) was infiltrated slowly in the subcutaneous tissues around the ulnar and mid aspects of the forearm, starting approximately 8 cm proximal to the distal radioulnar joint (DRUJ) to 3 cm distal to the DRUJ. Finally, 5 mL lidocaine–epinephrine was injected in the ulnocarpal joint. To allow for optimal vasoconstrictive effect, the anesthesia should be administered at least 30 minutes preoperatively.

With the hand suspended in a traction tower, a dorsal zigzag approach to the DRUJ revealed the complete foveal tear, which was consequently reinserted using osteosutures passed through the fovea and into the distal ulna. Before tensioning of the sutures, the hand was removed from the traction tower and active pronosupination performed to determine adequate motion and stability in the reconstructed radioulnar ligament.

The wide-awake approach to wrist surgery provides a reliable, ambulatory, and cost-efficient treatment. Active patient participation enhances the ability to adequately tension the reconstructed ligament and evaluate actual joint motion and stability following repair.

Online content including video sequences viewable at: www.thieme-connect.com/ejournals/html/jws/doi/s-0032-1312045

the first poke of the needle was felt but no pain after that (VAS 0 to 1). No patient described the surgical procedure as painful (VAS 0 to 1) and none required additional sedation or analgesia. All the nine patients said that they would choose local anesthesia again.

Discussion

In this article, we report on the use of wide-awake surgery in treating patients with wrist arthroscopy and/or open TFCC repair, using local anesthesia with lidocaine with epinephrine and no tourniquet. No adverse events were reported and all patients claimed to choose a similar anesthetic again, should future surgery be needed. The advantages of wide-awake surgery are: (1) monitoring active wrist motion during surgery, (2) minimizing patient discomfort through the use of only local anesthetics, and (3) reducing the cost and improving the efficacy of surgery.

It used to be believed that epinephrine injection was contraindicated in the finger, and therefore surgeons were concerned about its use in the hand. This myth has now been dispelled by four major studies.^{8,12–14} Now that epinephrine vasoconstriction can be safely used in the finger the need for the tourniquet and sedation are no longer essential.

One of the main deterrents of local anesthesia is the pain of injection. When injected properly,¹⁵ (watch wide-awake hand surgery video 4 in ref.¹⁶) the patient only feels the first poke of a 27-gauge needle, which has eliminated the necessity for the tourniquet and MAC in several hand surgeries. Similarly, in our experience with wide-awake wrist surgery, the majority of patients only felt the first poke and no additional sedation was needed.

As no sedation is needed, no anesthesiology personnel are needed. Deleting the cost of preanesthetic testing, anesthesiology personnel and supplies, as well as postanesthetic monitoring, decreases both the expense and the total duration of the surgery. The benefits of cost and efficiency using local anesthetics and arthroscopy has been evaluated in several knee arthroscopy studies, which all show a significant decrease in cost and high patient satisfaction.^{17,18}

In the field of hand surgery, the economic advantages of clinic-based surgery has been demonstrated in carpal tunnel surgery (CTS) in the United States and Canada, where the total cost of open CTS in an outpatient clinic was four times less than that in a formal operating room (OR).^{19,20} Furthermore, although most hospitals in the United States are able to offer the patient fast access to OR time, the situation is radically different in other parts of the world, for instance in Canada and Sweden, where the waiting time for surgery can be long and quite a disadvantage to both the individual and society as a whole. In Canada, more than 70% of CTS is now performed with some variation of wide-awake, tourniquet-free, and lidocaine with epinephrine anesthesia.^{20,21}

Although cost–benefits are important, we believe that the greatest advantage of wide-awake wrist surgery lies in the ability to monitor active wrist motion in the patient. In the case of a diagnostic wrist arthroscopy, the active motion will provide the surgeon with an opportunity to actually evaluate if a ligament injury is static or dynamic, rather than solely evaluating the degree of carpal bone separation based on the Geissler classification.²² Similarly, central TFCC tears can be evaluated with regard to ulnar impaction; chondral eburnations on the involvement of articular surfaces; and synovial reactions with regard to possible articular impingement. The wide-awake approach thus facilitates both diagnosis and treatment of several wrist disorders, and the indications include:

- Scapholunate/lunotriquetral ligament injuries
- Midcarpal instabilities
- Ulnotriquetral/TFCC tears
- Loose articular bodies
- Arthroscopic release of wrist contracture

The wide-awake approach in wrist surgery also provides the surgeon with the ability to adequately pull a ligament reconstruction while monitoring both active and passive motion and stability. For the patient, a participation in treatment and early visual and motion input of the repaired wrist provides immediate proprioception awareness²³ of the treated hand and wrist. Proprioception awareness—the conscious appreciation of joint motion, position, and function—has been linked to

increased cortical control²⁴ and enhancement of both conscious and unconscious joint stability.²⁵ The use of proprioception awareness constitutes one of the key elements in the protocol for wrist proprioception rehabilitation.²⁶ Future studies in our group will examine the role of wide-awake surgery and early proprioception awareness in postoperative rehabilitation and return to normal function, as compared with TFCC repairs performed under general anesthesia.

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