As a recent advance in the field of hand surgery, the wide-awake local anesthesia no tourniquet surgical technique—performed using an epinephrine-containing local anesthetic without a tourniquet while the patient is awake—has attracted attention. The WALANT technique has the following advantages: it prevents tourniquet-induced pain and numbness; it can be used to perform day surgery, unlike general anesthesia and surgery under sedation; and the surgical effect can be confirmed while talking with the patient, since active motion can be performed intraoperatively. Therefore, the technique is indicated for patients undergoing tendon transfer to evaluate the gliding and tension of the tendon. Courses regarding the WALANT technique were recently organized at the congress of hand surgery and have received worldwide attention. Moreover, I participated in a comprehensive wide-awake hand surgery course, which was held at the American Association for Hand Surgery meeting, and learned about the range of applications through the lectures.

Lalonde and Wong indicated the use of the WALANT technique not only for tendon surgery but also for surgeries for entrapment neuropathy, trigger release, and Dupuytren contracture, as well as thumb carpometacarpal (CMC) arthroplasty and ligament suture/ligamentoplasty. Furthermore, the technique can be used in various hand surgeries, such as arthroscopic surgery. The WALANT technique has been indicated for surgeries requiring intraoperative active motion confirmation. Herein, surgical procedures performed with the WALANT technique have been described; moreover, the indications and precautions of this technique have been reconsidered.

Addition of Local Anesthesia for Long Operative Surgery

It is necessary to add local anesthesia to the operation with a long operation time, for example, when the expansion has advanced to the palm side by the thumb CMC arthroplasty. One hundred and forty-eight patients (67 men and 81 women) who underwent hand surgery using a local anesthetic containing epinephrine (1% lidocaine with 1:100,000 epinephrine) without a tourniquet were evaluated. The mean operation time was 41.4 (range, 6–152) minutes. Most surgeries, such as trigger release, carpal tunnel release, and soft tissue tumor excision, were completed within 40 minutes. However, most tendon (tendon transfer, tendon suture, and tenolysis) and nerve (nerve transfer and neurolysis) surgeries lasted for more than 100 minutes (Fig. 1). In addition, 10 patients underwent local anesthetic addition (tendon transfer, 3; thumb CMC arthroplasty, 3; surgery for...
Dupuytren contracture, 2; tendon suture, 1; and Guyon canal release, 1) for intraoperative pain control. The mean operation time of these patients was significantly longer (92.3 minutes) than the 138 patients who did not require the addition of intraoperative local anesthetic (37.7 minutes) (Fig. 2). The WALANT technique decreases the turnover time in the operating room, as there is no time required for patients to wake up from deep sedation.

Lalonde and Wong\(^1\) stated that additional anesthesia may be avoided using a large amount of local anesthetic; nevertheless, it is necessary to inject at least 40 mL of the local anesthetic, depending on the surgical procedure.\(^1,5\) The domestic package insert recommends the use of at most 200 mg (20 mL, 1% solution) of lidocaine at a time. Thus, 40 mL of lidocaine should not be injected at a time. To reduce the risk of poisoning because of an injection of a large amount of local anesthetic, a small amount of local anesthetic can be used in combination with nerve blockade in the controlled area.\(^9\)

In addition, regarding precautions, besides the risk of toxicity, other adjuvants to increase the durability and safety of the procedure are bicarbonate, bupivacaine, and phentolamine. An optional 8.4% bicarbonate solution mixed in a 1 mL:10 mL fashion with the lidocaine-epinephrine solution functions well as a buffer solution to diminish lidocaine acidity during the injection.\(^10\) Bupivacaine can be added to the lidocaine-epinephrine mixture for cases with durations greater than 2.5 hours.\(^1\) Phentolamine reversal should always be available and administered as 1 gram diluted in 1–10 mL of 0.9% normal saline.\(^1,12\)

**Hemostasis**

Intraoperative hemostasis can be achieved physically (via a tourniquet) and chemically (with epinephrine use). Five of 148 patients required tourniquet use (tendon transfer, 2; tenolysis, 1; surgery for Dupuytren contracture, 1; thumb CMC arthroplasty, 1) for hemostasis control.\(^1\) Furthermore, the mean operation time of these patients was significantly longer (98.3 minutes) than that of the 143 patients who did not require tourniquet use (39.8 minutes) (Fig. 3).\(^6\)

McKee et al\(^13\) reported that the greatest hemostatic effect is obtained 25 minutes after epinephrine injection.\(^14,15\) Five out of 148 patients required tourniquet use for bleeding control.\(^1\) However, patients may complain of arm pain during tourniquet compression. Although a small amount of bleeding does not affect the surgical outcome, meticulous diathermizing of bleeding capillaries, use of adrenaline-soaked gauze, or continuous compression for 10 minutes is also required when performing a more atraumatic surgical procedure.

**Indications and Precautions of the WALANT Technique**

The application of the WALANT technique with the presentation of actual cases has been considered.

**Tendon suture (identification of the proximal stump)**

In patients with multiple tendon ruptures, it is relatively feasible to identify the proximal tendon stump on the distal side, such as the proper finger or palm level. In contrast, it is difficult to identify this stump on the proximal side, such as the proximal forearm level. Distal stumps are easily identifiable if the tendons are pulled, whereas proximal stumps are difficult to identify, except in sharp, fresh injuries. However, the proximal stump contracts if the patient can move the hand intraoperatively, thereby facilitating its identification.

Videos 1 to 3 (available on the Journal’s website at www.jhsgo.org) show the case of a patient with ruptures of the flexor carpi radialis (FCR) and flexor digitorum superficialis tendons of the index and long fingers at the center level of the forearm. The tendon stump can be easily identified by hanging it on a nylon thread and pulling the distal stump (Fig. 4A; Video 1). However, it is difficult to
identify the proximal stump based on the shape and positional relationship of the fascia and tendon stumps (Fig. 4B). Therefore, when the wrist is flexed [arrow 1], the FCR muscle contracts [arrow 2] on both the proximal and distal stumps. Thus, the proximal and distal stumps can be identified using active motions [arrow 3]. After suture placement, the smooth movement of the muscles can also be confirmed [arrow 4] (reprinted from Takagi15 with permission). FDS, flexor digitorum superficialis.

**Figure 4.** The case of a patient with ruptures of the FCR and flexor digitorum superficialis tendons of the index and long fingers at the center level of the forearm. A The tendon stump can be easily identified by hanging it on a nylon thread and pulling the distal stump. B However, it is difficult to identify the proximal stump based on the shape and positional relationship of the fascia and tendon stumps. C Therefore, when the wrist is flexed [arrow 1], the FCR muscle contracts [arrow 2] on both the proximal and distal stumps. D Thus, the proximal and distal stumps can be identified using active motions [arrow 3]. After suture placement, the smooth movement of the muscles can also be confirmed [arrow 4] (reprinted from Takagi15 with permission). FDS, flexor digitorum superficialis.

identify the proximal stump based on the shape and positional relationship of the fascia and tendon stumps (Fig. 4B). Therefore, when the wrist is flexed, the FCR muscle contracts on both the proximal and distal stumps (Fig. 4C; Video 1), thereby facilitating the identification of both stumps of the FCR muscle. Similarly, if the index and long fingers are flexed, the corresponding finger tendons of the flexor digitorum superficialis contract (Video 2). Thus, the proximal and distal stumps can be identified using active motions. After suture placement, the smooth movement of the muscles can also be confirmed (Fig. 4D, Video 3).15

**de Quervain tenosynovitis**

Surgery for de Quervain tendonitis is generally performed after an incision on the first dorsal compartment.16 However, bow-stringing or redislocation of tendons can occur. As a method for preventing it, the tendon sheaths are loosely sewn together in a crank shape to enlarge the tendon sheath cavity. Moreover, the tendon sheath is reconstructed to prevent tendon rising and subluxation.

After tendon sheaths are released, the thumb is rotated actively; tendons glide differently between the abductor pollicis longus (APL) and extensor pollicis brevis. Therefore, both tendons can be easily identified using active motion (Fig. 5A). After the tendon sheath reconstruction, tendon subluxation can also be confirmed (Fig. 5B).15,16

**Figure 5.** Surgery for de Quervain tendonitis. A Both tendons of the APL and extensor pollicis brevis can be easily identified using active motion. B After tendon sheath reconstruction, tendon subluxation can also be confirmed (reprinted from Takagi15 with permission). Arrow head, APL tendon; arrow, extensor pollicis brevis tendon; *, reconstruction ligament.

**Ligament reconstruction for ulnar collateral ligament injury of thumb metacarpophalangeal joint**

Various methods, such as palmaris longus tendon transplantation, have been devised to reconstruct ulnar collateral ligament injuries of the thumb metacarpophalangeal joint; however, most of these methods require complicated procedures. We previously devised and reported a simpler method for ligament reconstruction using the adductor pollicis tendon.17 The adductor
operative active motion. After suture, check the resting position of the thumb CMC joint.

In particular, patients are instructed to check whether the thumb reaches the high metacarpophalangeal joint of the small finger (Kapandji score, 10). Therefore, it is possible to maintain an appropriate confrontational position.

In addition, some studies have reported that an amount of anesthetic is required for trapezium resection for thumb CMC arthropathy (an injection of at least 40 mL of 0.5% xylocaine). The domestic package insert recommends the use of at most 200 mg (20 mL of 1% solution) of xylocaine at a time; thus, 40 mL of xylocaine should not be injected at a time. To reduce the risk of poisoning because of an injection of a large amount of local anesthetic, a small amount of local anesthetic can be used along with nerve blockade in the controlled area. In addition, only surface infiltration anesthesia could be added during skin infiltration and deployment. Therefore, it is essential to consider various anesthesia methods.

This operation is routinely performed from the dorsal side. The thumb CMC joint is innervated by the superficial branch of the radial nerve, volar branch/anticircular branch of the median nerve, and lateral forearm cutaneous nerve. By selectively blocking not only the side but also the palm side, it is possible to keep the 1% xylocaine injection containing 100,000 times epinephrine within 10 mL. In patients who do not require active movement confirmation, general anesthesia and/or axillary block with tourniquet use should be considered to enhance bleeding and pain control effects. The WALANT technique is advantageous in that active movement can be evaluated intraoperatively. Furthermore, it is indicated for patients at risk of poor outcomes after general anesthesia or patients for whom tourniquet use is contraindicated, such as patients undergoing dialysis.

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Even though various ideas have been reported for arthroplasty for thumb CMC arthropathy, it is said that there is no decisive difference in the superiority or inferiority of the results depending on the surgical procedure. Thus, a surgical procedure that is feasible and reliable is preferred. On the basis of this idea, a suture was placed between the APL and FCR tendons after trapezium resection arthroplasty (suture suspension arthroplasty), which was adopted in these papers. This method is not only simple but also has the advantage of strengthening the suture between the APL and FCR tendons, thereby maintaining the abduction confrontation position of the thumb CMC joint, causing adduction contracture.

However, if this suture is made too strong, the tension of abduction increases and the tip of the thumb may not reach the little finger side. Therefore, by performing this procedure with the WALANT technique, it is possible to perform the surgery while confirming an appropriate degree of suture tension via intraoperative active motion. After suturing the thumb CMC joint, the pinching movement between the thumb and fingertips of each finger has been confirmed. In particular, patients are instructed to check whether the tip of the thumb reaches the high metacarpophalangeal joint of the small finger (Kapandji score, 10). Therefore, it is possible to maintain an appropriate confrontational position.

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