Endoscopic Release of the Carpal Tunnel: A 2-portal-modified Technique

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Abstract: Endoscopic carpal tunnel release has been popularized since 1989 when Okutsu described it for the first time. Several surgeons have followed his principles and described their own techniques. These were developed in an attempt to decrease the well-known complications related to the open technique. Single and 2-portal techniques have been described. Indications include patients with moderate Carpal tunnel syndrome (CTS) and failed conservative treatment. A modified Tsai 2-portal technique is used creating a "fixed surgical tunnel" for decompression and a custom made plastic tube is used to check the quality of release. A specific instrumentation is needed (A.M. Surgical, Smithtown, NY). Few complications are associated, finding it a reliable technique for the decompression of the carpal tunnel.

Key Words: carpal tunnel syndrome, endoscopic release, complications, Tsai technique, 2-portal

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HISTORICAL PERSPECTIVE

Endoscopic release of the carpal tunnel has progressively gained popularity since Okutsu et al[1] first described the technique in 1989. In their description, a translucent tube was advanced from proximal to distal into the carpal tunnel to view the sectioning of the transverse ligament through the endoscope.

Chow[2] then report his endoscopic release technique in 1990, using a 2-portal technique. In his description, endoscopic and cutting device are introduced into the carpal tunnel and the ligament is transected under endoscopic vision. In 1992 Agee et al[3] described a single-portal technique were the ligament is cut in a retrograde fashion. Both cutting device and endoscope are introduced from proximal to distal. In 1995 Tsai et al[4] introduced a new 1-portal endoscopic decompression technique. This is conducted through a distal approach.

Endoscopic release of the carpal tunnel was developed in an attempt to decrease the complications associated with the standard open release including pain in the scar, thenar and hypothenar (pillar) pain, and weakness of pinch and grip.[1,3,5–7]

Complications such as incomplete release, neurovascular, and tendon injuries have been reported with the endoscopic technique. It involves a steep learning curve and extra cost in operative equipment.

Even though, it has been shown to have equivalent clinical efficacy, more rapid recovery, with a 2-week to 3-week earlier return to work and fewer complications than the open decompression.[3,5,8] A randomized double-blind study evaluated open and endoscopic techniques in 25 patients with bilateral carpal tunnel syndrome.[9] The outcome measurements at 3 months showed no significant differences between treatment groups. However, overall satisfaction was lower in the endoscopic patients secondary to a 5% rate of revision surgery.

Endoscopic treatment of CTS has now become the standard operative treatment at specialized clinics.[2,3,5,10,11] The morbidity as quoted in the literature is very low. The rate of complications remained low when this technique is performed by a specialist on an outpatient basis and make this surgical technique an efficient and cost efficient way of treating CTS.

INDICATIONS

The history and physical examination are essential in the diagnosis of CTS. Patients report nocturnal pain, numbness, and tingling in the thumb and one or more radial fingers. Daytime paresthesias are often elicited with some activities. Shaking and wringing of the hands may alleviate symptoms. Atypical presentation includes radial paresthesias with radiating pain along the median nerve to the elbow and shoulder. Ulnar nerve dysesthesias does not rule out CTS. Chronic findings include numb sensation in digits, grip and pinch weakness, and diminished fingers dexterity. Physical exam includes skin and muscle atrophy assessment. Manual muscle strength testing is conducted. Grip and pinch measurements are recorded. Range of motion of all joints including hand, upper extremity and neck is checked as well. Static 2-point discrimination is used for sensory testing.

Provocative maneuvers used in our exam include Tinel, Phalen, and Durkan compression test.[12]

Adson costoclavicular and Wright test are used to rule out thoracic outlet compression syndrome which may mimic CTS. Cervical exam including Spurling test, is essential to exclude cervical radiculopathy. Percussion of all mayor peripheral nerves may lead us to an unsuspected area of compression.

A nerve conduction and electromyography study are conducted. These help us to confirm the diagnosis of CTS and to exclude other pathology.[13]

Baseline radiographs of the wrist are obtained and are useful in detecting unsuspected pathology. A carpal tunnel projection is routinely included.

The presented technique is indicated for patients where conservative treatment has failed and with a NCS/EMG study reporting mild-to-moderate syndrome.

Relative contraindications include patients with chronic and severe CTS with evidence of muscle atrophy, earlier surgical treatment of the CTS, significant loss of wrist extension, proliferative synovitis and lesions that invades the carpal tunnel.

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SURGICAL TECHNIQUE

A modified Tsai technique using 2-portals is described. Using 2 portals, we create "fixed surgical tunnel" finding the technique more reliable and the injury of the superficial carpal arch less likely.

A specific instrumentation is used (A.M. Surgical, Smithtown, NY, USA) including a scope mounting blade with its locking device, obturator, elevator, rasp, and a slotted cannula. Custom-made plastic tubes are used for visualization.

The patient is place supine in the operating room table. We recommend a Bier regional block as anesthesia. The upper extremity to be operated is placed on a hand table. The incisions are drawn at this time. For the distal incision 2 lines are drawn in the palm: one longitudinal and in line with the third web space; the other, transversely across from the fully abducted thumb. The 1.5-cm incision is outlined 0.5-cm proximal to the intersection of these 2 lines, preferably in a palmar skin crease. The proximal incision is drawn after the proximal edge of the pisiform bone, 1 to 2-cm radial ward, and always ulnar to the Palmaris Longus tendon. The 1-cm incision is drawn in a transverse fashion (Fig. 1).

If Bier block is not used as anesthesia method, the upper extremity is exanguinated. The hand is held in position with an aluminum hand. The incisions are made with a no.15 blade. Proximal incision blunt dissection is carried down through the fascia to the identification of the proximal edge of the transverse carpal ligament (TCL). Distally, blunt dissection is carried down through the superficial palmar fascia and an Alm retractor is placed. The wrist is place in hyperextension using a towel bump. The elevator is introduced beneath the TCL to verify the correct anatomical position. The slotted cannula/obturator is introduced beneath the TCL. A 4 mm, 30-degree endoscope, oriented toward the slot, is then introduced into the cannula to visualize the transverse fibers of the TCL. A variable amount of synovial tissue is usually present and is removed using the rasp. Do not use the rasp if the nerve or tendons are visible. If the transverse fibers of the TCL are not clearly seen, the cannula must be removed using the obturator and the procedure repeated. If the rasp is used, a second inspection of the TCL is convenient. The median nerve is brought into view by rotating the cannula. The flexor tendons may also be visualized. Once the proper placement of the cannula is verified, rotate the cannula slightly so that the transverse fibers of the TCL are again visualized. With a clear view of the transverse fibers and no other intervening structures the endoscope is then removed from the cannula. The scope-mounting blade is attached to the endoscope using the locking device, with the viewing angle of the endoscope oriented toward the blade (Fig. 2A). The scope-mounted blade is introduced into the cannula and, as the surgeon observes the monitor, the TCL is divided by advancing the scope-mounted blade through the cannula in a distal direction (Figs. 2B, C). The scope and cannula are removed. A custom-made plastic tube is introduced and inspection of the released ligament is conducted (Fig. 3A). The median nerve and flexor tendons are also visualized (Fig. 3B). If an incomplete transection of the TCL is observed, the procedure is repeated as previously described. Tourniquet is let down and coagulation is conducted with a bipolar. The wound is irrigated and then closed using a no. 5.0 nylon suture for the skin. A soft noncompressive dressing is applied, which is removed 7 to 10 days after the surgery.

The patient is encouraged to carry out finger range-of motion exercises postoperatively.

COMPLICATIONS

Few complications are associated with this technique. Incomplete release of the carpal tunnel and neurovascular

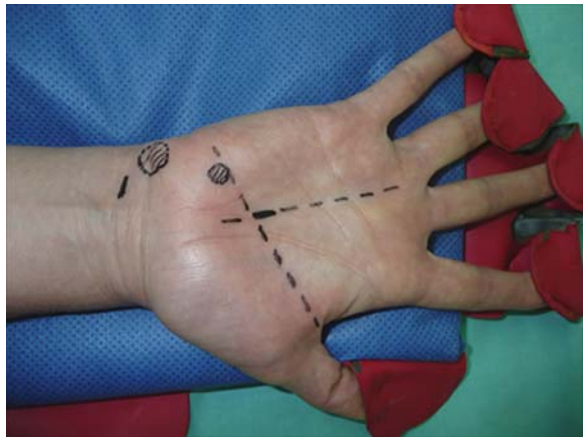

FIGURE 1. Distal and proximal incisions.

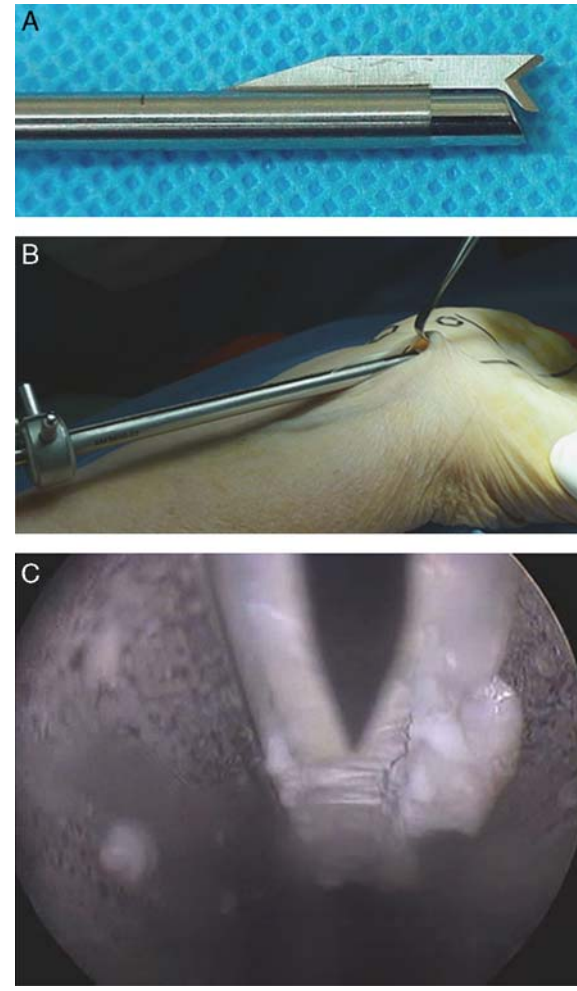

FIGURE 2. The scope-mounted blade is introduced into the cannula (A). TCL is divided by advancing the scope-mounted blade through the cannula in a distal direction (B). The surgeon observes the monitor (C).

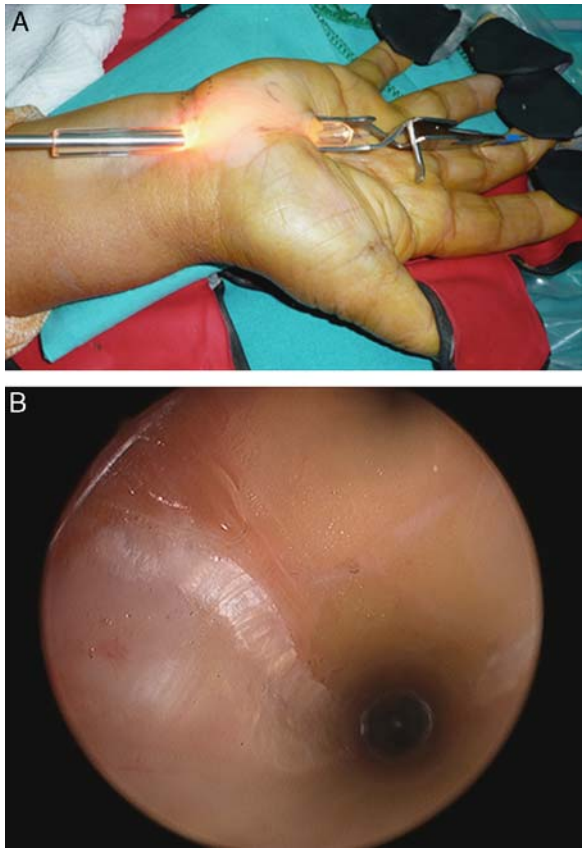

FIGURE 3. After checking with the cannula, a custom-made plastic tube is introduced and inspection of the released ligament is conducted (A). The median nerve and flexor tendons are also visualized (B).

injury such as common digital nerve laceration, have been described.[2,3,5,8]

In 45 cases of CTS operated with the described technique between May 2006 and December 2008, the authors have encountered 2 cases of neuropraxia of the third common digital nerve, one superficial infection of the proximal skin incision and three persistent scar related pain, being the last 2 types of complications, nontechnique dependent.

Even though this was not part of our evaluation, we encountered 5 cases in our series where incomplete release of the TCL was visualized through the plastic clear tube. Therefore, the procedure was repeated ensuring the complete decompression of the tunnel.

The use of a custom-made plastic tube gives this technique the unique advantage to explore all the anatomical structures postdecompression, and avoids an important complication such as the incomplete release of the TCL.

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