4 Arthroscopic Transverse Carpal Ligament Release for Carpal Tunnel Syndrome

Yu-jie Liu and Jing Xue

4.1 Introduction

The carpal tunnel is a semiannular tunnel surrounded by the carpal and transverse ligament of volar wrist. The carpal tunnel contains median nerve, flexor digitorum, superficial tendon, and flexor hallucis longus (Fig. 4.1).

Because these boundaries are very rigid, the carpal tunnel has little capacity to increase in size. Carpal tunnel syndrome occurs when the tunnel becomes narrowed or when tissues surrounding the flexor tendons swell, which lead to increased pressure and compression of the median nerve. Because the nerve tissue is very sensitive to ischemia and hypoxia, the axon can undergo demyelination. Clinical manifestations of numbness and motor dysfunction in the median nerve innervation. Cervical spondylosis should be excluded before diagnosis of this disease.

The traditional treatment of carpal tunnel syndrome is by open surgery; the incision is about 10 cm long (Fig. 4.2a). There is a risk of injury to the palmar nerve and palmar archery during surgery. Postoperative scar formation affects the sensation of palm (Fig. 4.2b). Under local anesthesia, and with small surgical incision, the author used arthroscopic transverse ligament release to treat this disease. It resulted minimize trauma and quick recovery. This technique was first described by Dr. James C.Y. Chow at 1989 [1]; we modified the procedure and introduced it into China [2].

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4.2 Clinical Features

Numbness, tingling, burning, and pain—primarily in the radial three fingers, weakness and clumsiness in the hand such as thumb-to-palm dysfunction (Fig. 4.3), and intrinsic muscle atrophy.

4.3 Portal Placement

The surgical portals should be clearly marked before surgery.

The volar portal: the patient is supine, the limb is abducted, the palm is flat, and the thumb is abducted 90°. A parallel line is drawn along the ulnar side of the first web of thumb to the ulnar side of the palm. Then a perpendicular is drawn from the radius side of ring finger. Ulnar and proximal move 1 mm from the intersection of the two lines as the distal volar portal (Fig. 4.4).

The wrist portal: 15 mm proximal and 15 mm lateral to the bean bone, that is, the intersection of the proximal transverse wrist crease and the ulnar side of palmaris longus (Fig. 4.4).

Routinely disinfection, laying sterile towels. Local infiltration anesthesia in the surgical incision and carpal tunnel. No tourniquets are needed.

4.4 Surgical Technique

4.4.1 Establish Surgical Access

Use a sharp knife to cut the skin 4 mm at the proximal wrist portal, separating the subcutaneous tissue (Fig. 4.5). During the whole procedure, the wrist joint should be kept hyperextended so that the nerves and tendons in the carpal tunnel can be tightly attached to the back side of the carpal tunnel to protect them from injured. Then a blunt tip trocar is inserted under transverse carpal ligament. The trocar is

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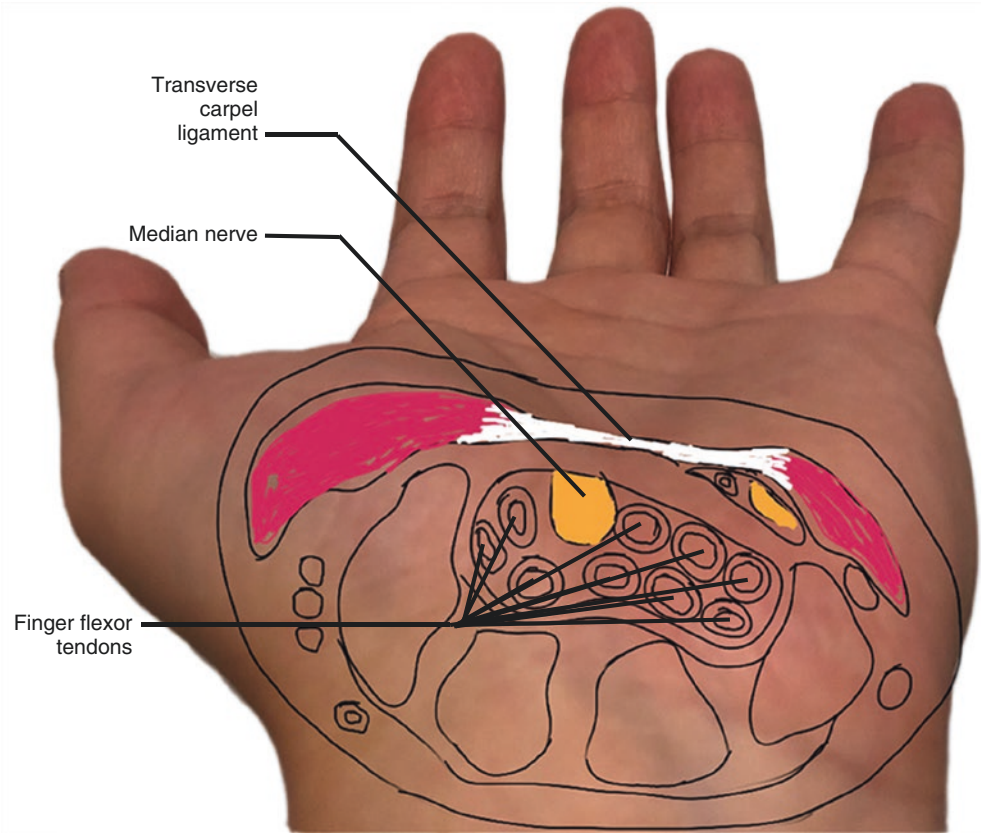

Fig. 4.1 Carpal tunnel and its contents

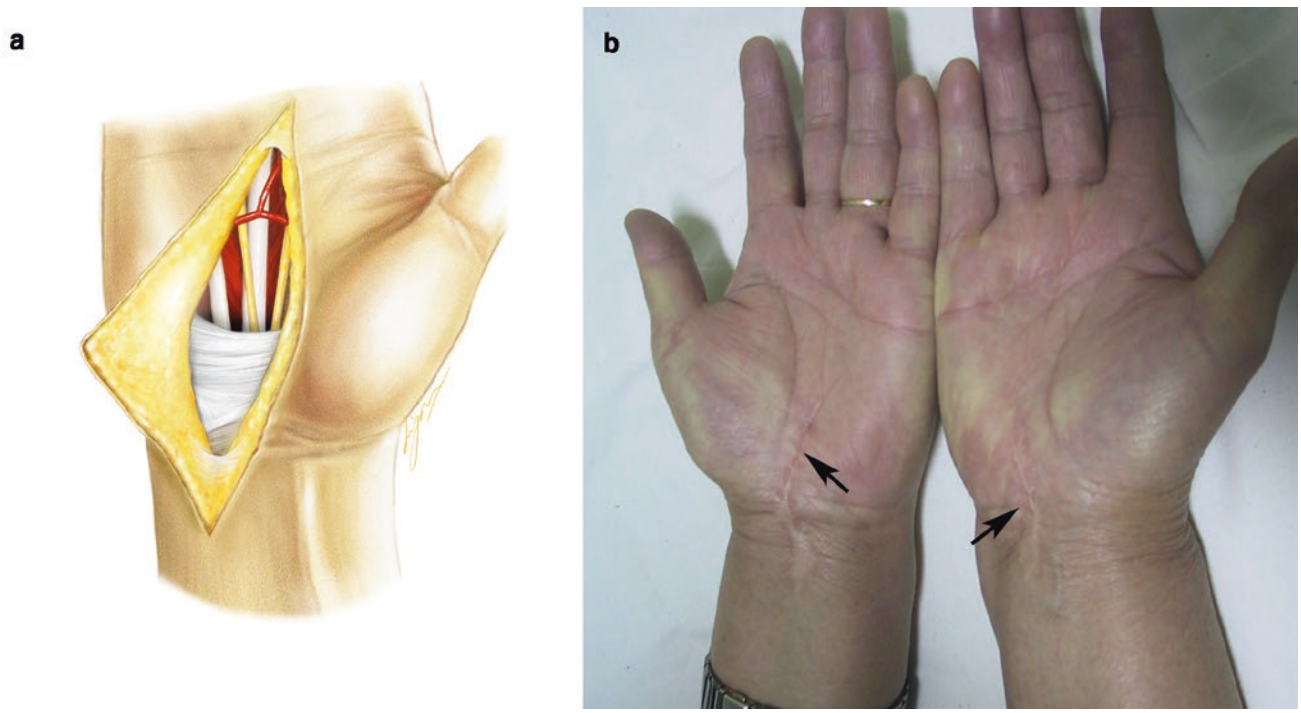

Fig. 4.2 Surgical incision (**a**) and scars (**b**) of open surgery of carpal tunnel syndrome

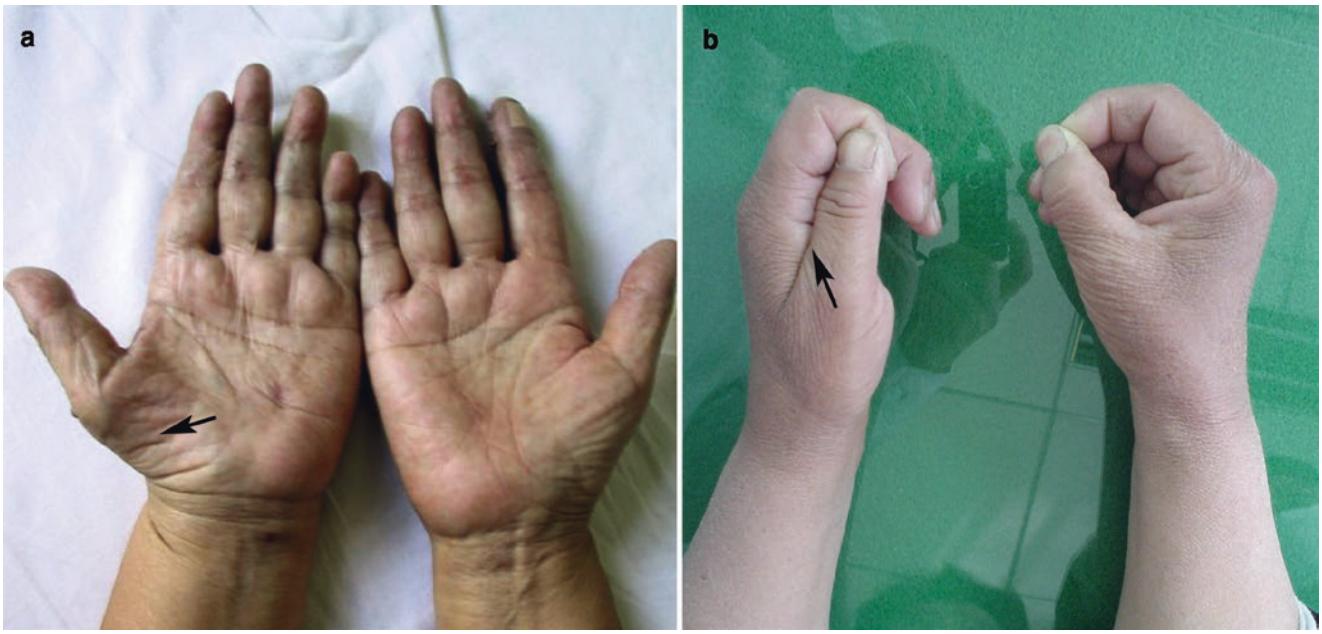

Fig. 4.3 Intrinsic muscle atrophy (**a**); thumb-to-palm dysfunction (**b**)

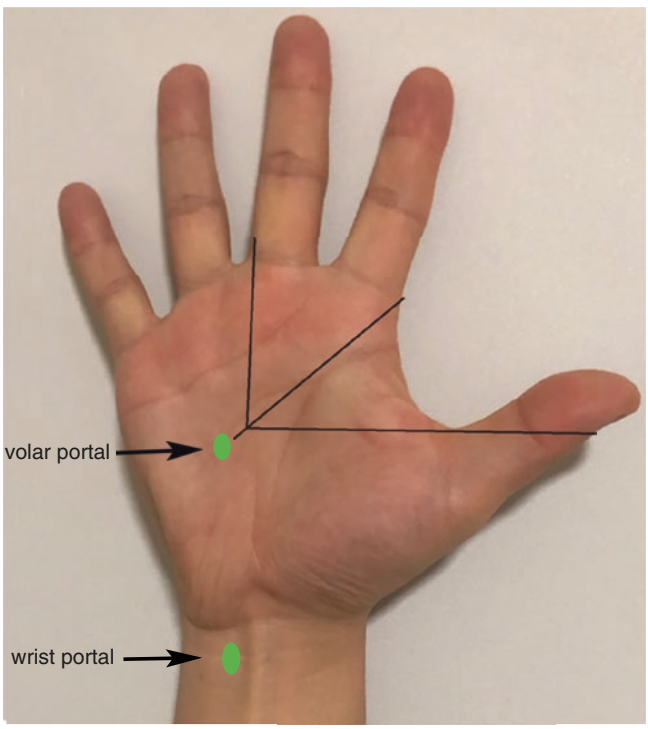

Fig. 4.4 Placement of volar portal and wrist portal

placed strictly against the wall of the carpal tunnel and then advanced toward the volar portal, reaching the subcutaneous tissue, and a second 4 mm skin incision is made so that the trocar can penetrate out (Fig. 4.6). Then a special arthroscopy sheath is inserted from distal to proximal. The groove of the sheath is turned toward the transverse carpal tunnel (Fig. 4.7). Place the arthroscope from the distal end of the cannula for observation (Fig.4.8). Carefully probe and make sure the entire carpal ligament is under vision and no other tissue is caught between the trocar and the carpal ligament.

4.4.2 Arthroscopic Transverse Carpal Ligament Release

Thickened wrist transverse ligament is milky white under the view of arthroscopy (Fig. 4.9). A hook knife is inserted from proximal portal to upward cut the carpal ligament, and the carpal ligament fibers are released until it is completely released (Fig. 4.10). The releasement can also be done by a retrograde knife (Fig. 4.11). As the transverse ligament is cut, fat tissue protrudes into the cannula (Fig. 4.12).

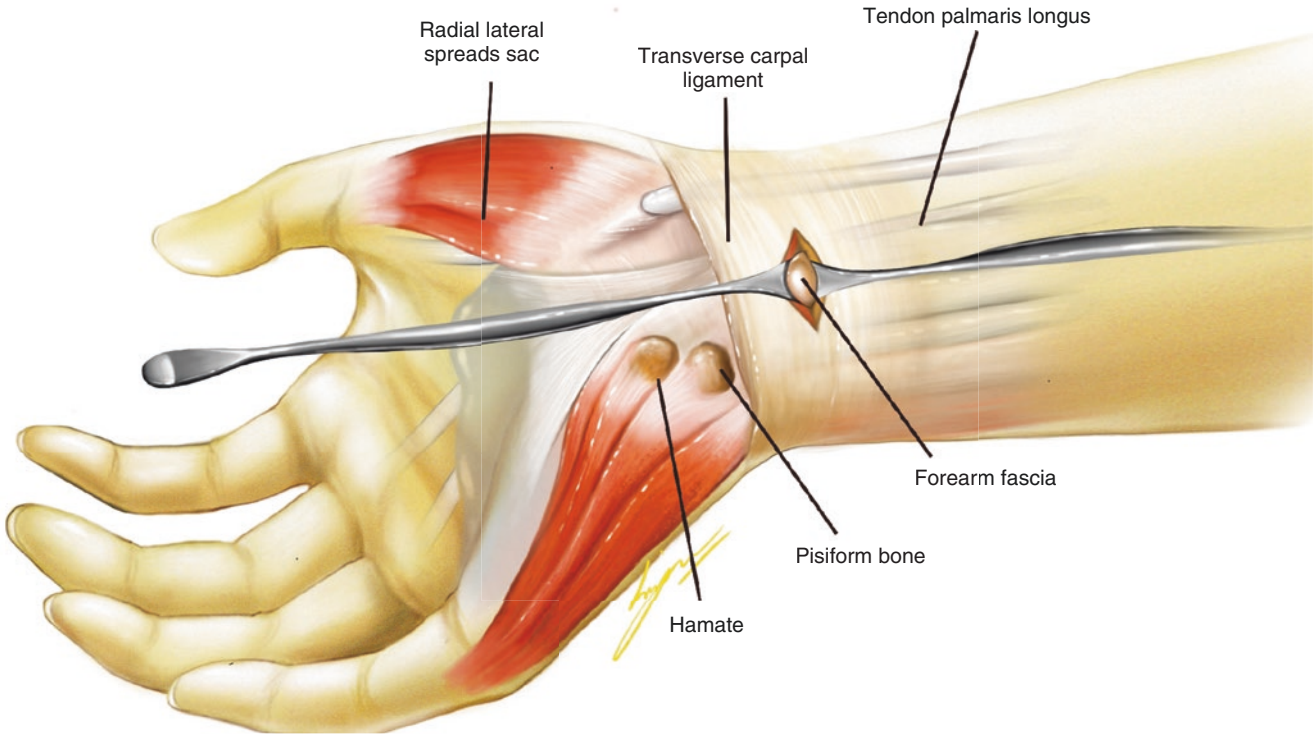

Fig. 4.5 Use a sharp knife to cut the skin 4 mm at the proximal wrist portal, separating the subcutaneous tissue

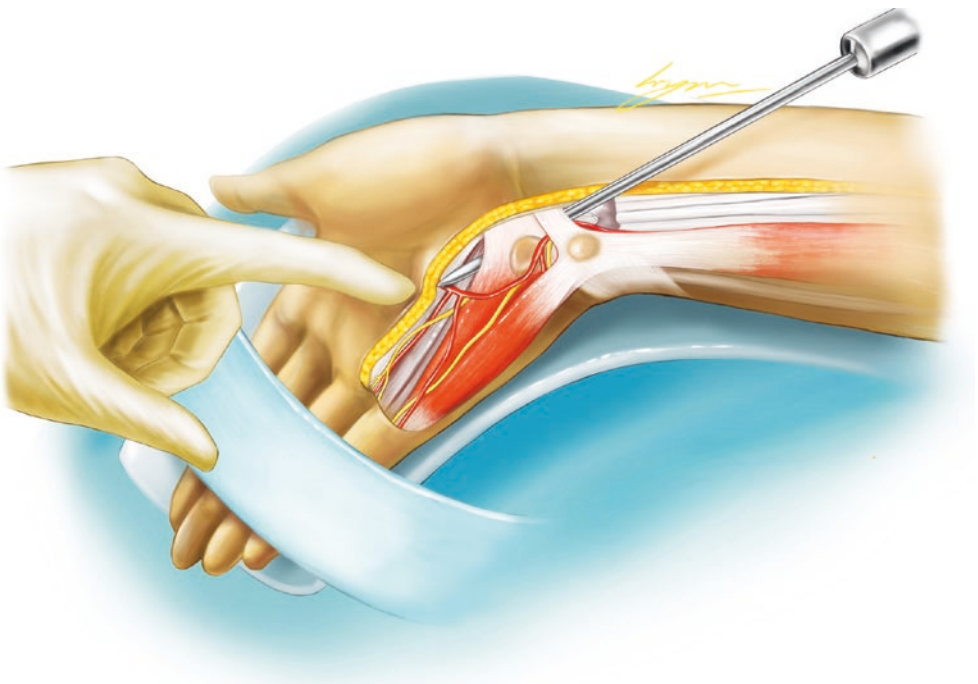

Fig. 4.6 The trocar is placed strictly against the wall of the carpal tunneland then advanced toward the volar portal, reaching the subcutaneous tissue, and a second 4 mm skin incision is made so that the trocar can penetrate out

Use the probe to explore the incision of the transverse ligament (Fig. 4.12). If there is no abnormality, pull out the sheath; the incision is no need of suture. Pressure bandaging with gauze and the cold bag is used to stop bleeding after operation.

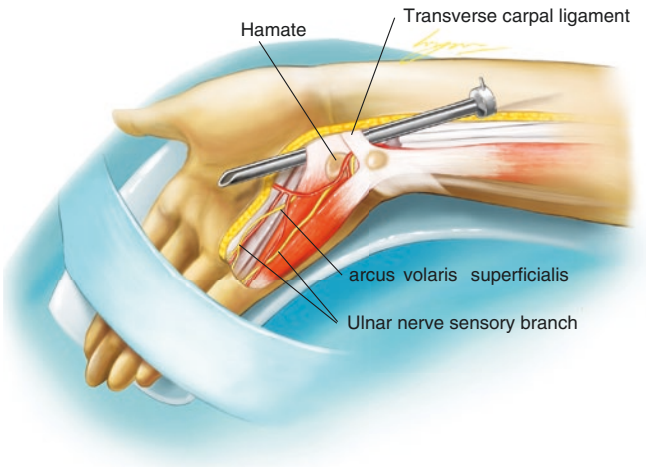

Fig. 4.7 The groove of the sheath is turned toward the transverse carpal tunnel

4.4.3 Postoperative Treatment

Patients should be encouraged to perform gripping activities after surgery to prevent adhesions.

Arthroscopic "two-portal" technique is an effective surgical procedure for transverse carpal ligament release with minimal incision (Fig. 4.13), less tissue trauma, and shorter operation time. The effect is satisfying (Fig. 4.14).

4.5 Critical Points

1. Carpal tunnel syndrome should be differentiated from cervical spondylosis. The disease is characterized by a loss of sensory area in the distal median nerve branch below the wrist joint, and a positive Tinel's sign on the volar side of the wrist. Cervical MRI or limb electromyography should be performed if necessary.
2. Strict selection of surgical indications, if there is median nerve recurrent branch entrapment syndrome (RMNES), and there is serious muscle atrophy of thenar, muscle strength 0–1, EMG shows denervation potential, and it is difficult to restore postoperatively.

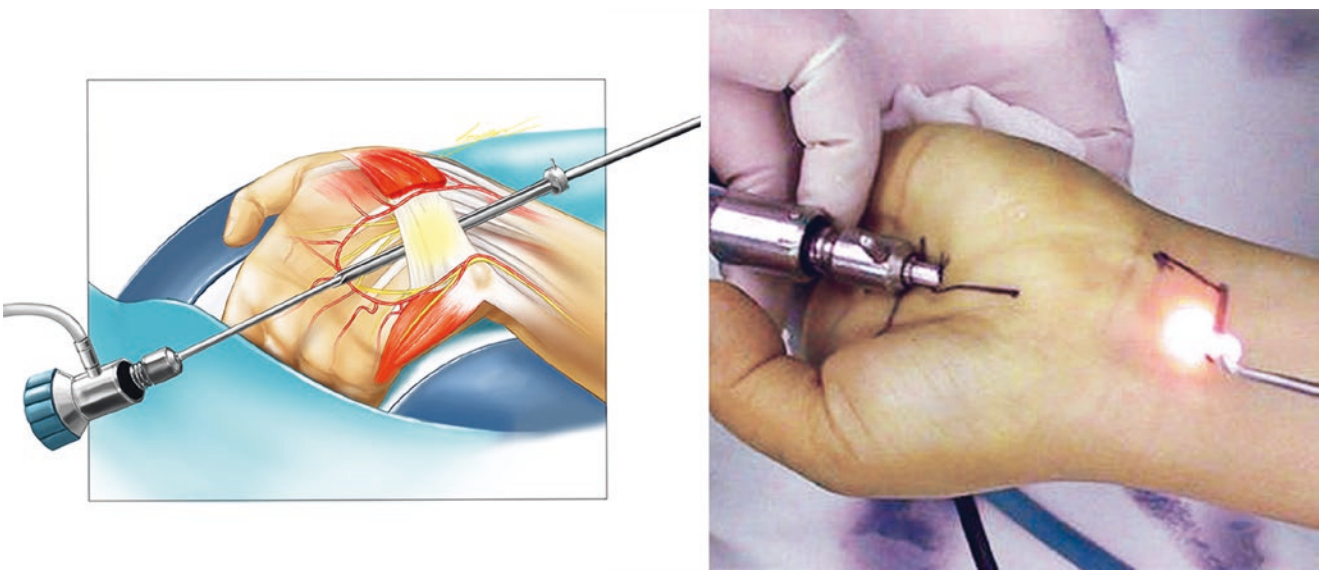

Fig. 4.8 Place the arthroscope from the distal end of the cannula for observation

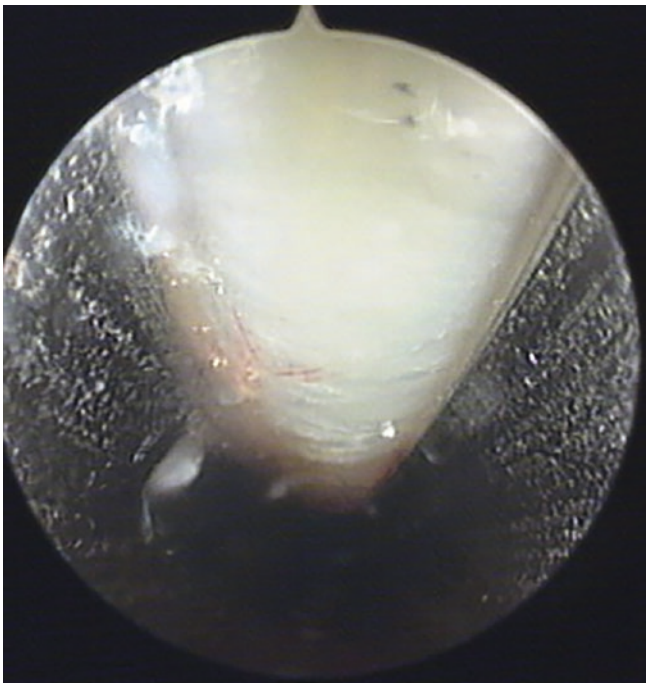

Fig. 4.9 Thickened wrist transverse ligament is milky white under the view of arthroscopy

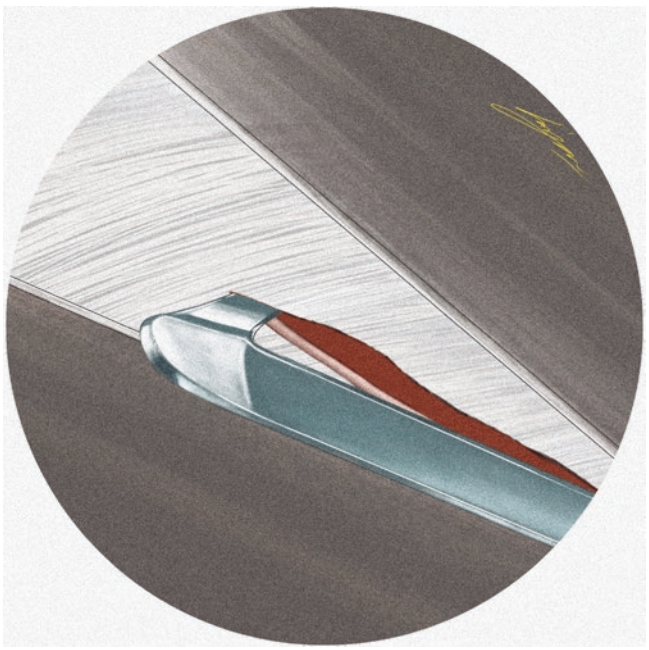

Fig. 4.11 The releasement can also be done by a retrograde knife

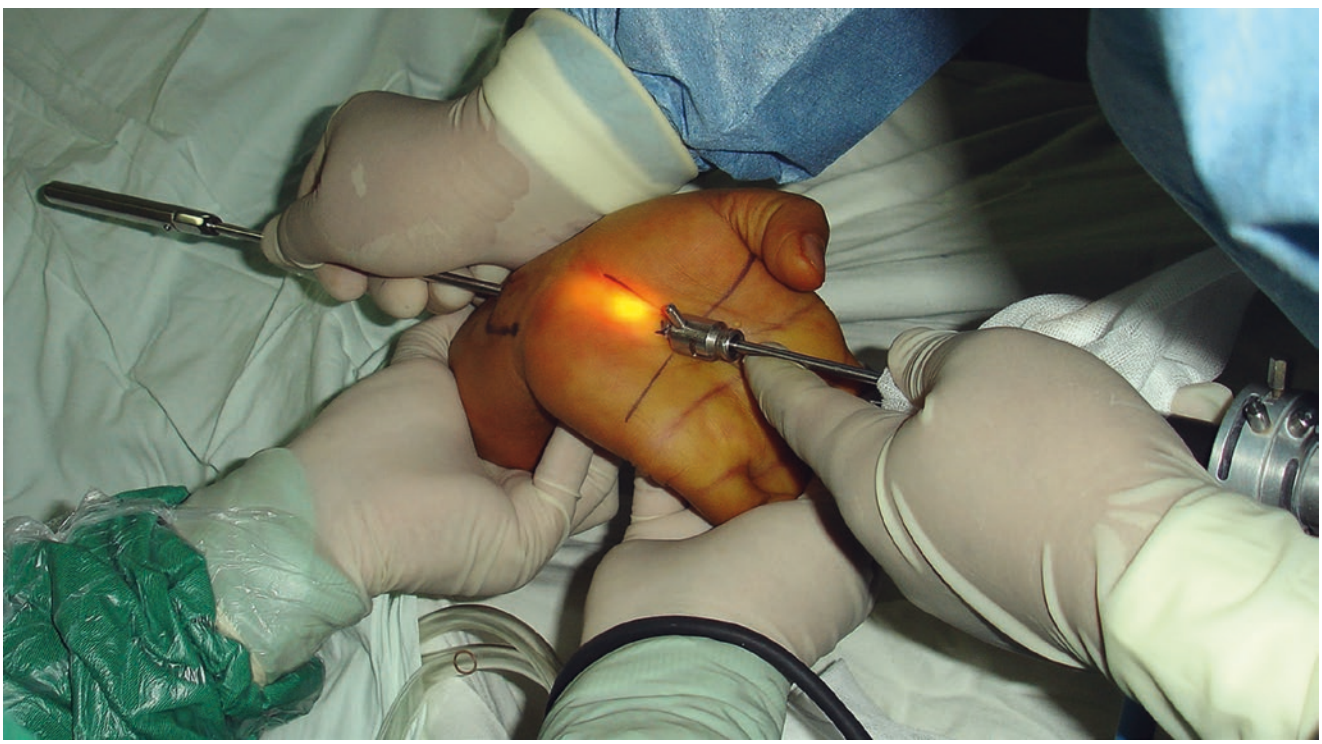

Fig. 4.10 A hook knife is inserted from proximal portal to upward cut the carpal ligament, and the carpal ligament fibers are released until it is completely released

Fig. 4.12 As the transverse ligament is cut, fat tissue protrudes into the cannula

Fig. 4.13 Small surgical scar after arthroscopic transverse carpal ligament release

Fig. 4.14 The patient was satisfied with result of the operation

3. If the carpal tunnel syndrome is caused by the angular deformity of a Colles' fracture. The deformity should be corrected first, for it is difficult to solve the compression only by release the transverse carpal ligament.
4. During the operation, the wrist joint should be kept hyperextended so that the nerves and tendons in the carpal tunnel can be tightly attached to the back side of the carpal tunnel to protect them from injured.
5. Do not move the hook knife out of the sheath, taking care not to damage the superficial palmar venous arch.

References

1. Chow JC. Endoscopic release of the carpal ligament: a new technique for carpal tunnel syndrome. Arthroscopy. 1989;5(1):19–24. https://doi.org/10.1016/0749-8063(89)90085-6.
2. 刘玉杰，陈继营，王志刚，李众利，张文涛，王岩, et al. 关节镜镜视下行腕横韧带切开术. 中华手外科杂志. 2002(03):30–1.