ISSN 2618-1584 Vol. 6, Issue 5: 54-59, DOI: 10.25236/FMSR.2024.060508

Ultrasound-guided Small Acupunture Combined with Local Closure in the Treatment of Stenosing Tenosynovitis of the Flexor Pollicis Longus Tendon

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Abstract: *To observe the efficacy of ultrasound-guided small acupuncture combined with local closure in the treatment of stenosing tenosynovitis of the flexor pollicis longus tendon. 66 cases of thumb stenosing tenosynovitis were treated. Ultrasound-guided acupuncture combined with block therapy was used. All patients were evaluated with preoperative and postoperative VAS scales for pain scores and efficacy. There were 42 recovered patients, accounting for 63.4%, 19 patients, accounting for 28.8%, effective patients, 4 patients accounting for 6.1%, and 1 ineffective patient, accounting for 5.1%, accounting for 94.9%. The use of ultrasound-guided small needle knife combined with local closure to treat stenosing tenosynovitis of the flexor pollicis longus tendon has accurate positioning, definite efficacy, low trauma, low cost and high safety. It is worthy of promotion and application in clinical practice.*

Keywords: *Stenosing tenosynovitis of the flexor pollicis longus tendon; Small needle knife; Local closure; Ultrasound guidance*

1. Introduction

Stenosis tenosynovitis of the finger flexor tendons is more common in women and people who work with their hands for a long time. It also occurs in some infants and young children. The thumb is the most common, followed by the ring finger and middle finger [1]. The onset of this disease is slow and the course is long, and gradually worsens. In the early stage, the fingers are locally swollen and painful, and the hand is stiff in the morning. The pain and tenderness gradually increase, and the induration can be picked. "Bounce" may occur during later activities. In severe cases, the flexion and extension activities of the affected finger are limited, and the affected finger cannot flex in the extended position, or cannot straighten in the flexed position. We use a small needle knife combined with local sealing and musculoskeletal ultrasound technology to accurately release tendon sheaths and achieve good results.

2. Materials and Methods

2.1. General Information

Our hospital treated 66 cases of stenosing tenosynovitis of the flexor pollicis longus tendon in the outpatient department from January 2022 to September 2023. There were 52 female cases, aged 50 to 72 years old, with an average age of (54.5) years, and an average disease duration. The duration of the disease was (1 to 12) months, 14 cases were male, the average age was 56.4 years old, and the disease duration was (1 to 6) months.

2.2. Diagnosis and Inclusion and Exclusion Criteria

Diagnostic standards: Refer to the 1994 "Standards for Diagnostic and Efficacy of Traditional Chinese Medicine Diseases and Syndromes" [1]. Patients who are clinically diagnosed with stenosing tenosynovitis of the flexor pollicis longus tendon are divided into three stages based on the presence or absence of entrapment according to the diagnostic criteria of Sun Kang et al. [2]: Stage I: Pain in the metacarpophalangeal joints of the fingers, without restriction of flexion and extension; No snap. Stage

ISSN 2618-1584 Vol. 6, Issue 5: 54-59, DOI: 10.25236/FMSR.2024.060508

II: Pain in the metacarpophalangeal joints, pinching or snapping during movement, and induration or bouncing sensation, and occasionally cross-linking of the joints, but flexion and extension can still be actively corrected; Stage III: The above symptoms worsen, and the fingers appear frequently Snapping, or fixed in flexion or extension, the tendons are interlocked and cannot correct themselves.

Inclusion criteria: (1) Meet the diagnostic criteria; (2) Select patients in stages II to III, whose symptoms are not relieved immediately after local closure or after previous local closure treatment.

Exclusion criteria: (1) Patients with poor physical condition and concurrent heart, brain, liver, and kidney diseases; (2) Previous history of fainting from blood and needles, anxiety disorder, mental illness, pregnant or lactating women, etc.

2.3. Method

Use a disposable beveled needle knife with a diameter of 1 mm and a length of 50 mm (Huayou brand needle knife produced by Jiangsu Medical Supplies Co., Ltd.). The ultrasonic diagnostic instrument uses Samsung (model RS85) color Doppler ultrasonic diagnostic instrument, and the linear array probe model is LA4-18B. First use syringe A (5 ml specification, No. 7 needle) to draw 2 ml of 2% lidocaine + 1 ml of normal saline, and then use syringe B (5 ml size, No. 7 needle) to draw 2 ml of 2% lidocaine + 1 ml betamethasone + 1ml saline for later use.

The operation method is: the patient lies in a supine position, straightens the fingers, and identifies the tenderness point at the proximal root of the finger. First, make a mark C, and then follow the proximal 2.5cm of the tendon (a 5ml No. 7 needle with a length of 3ml can be used as (Comparison tool), mark another point D. From D to C is the direction line we intend to puncture. Carry out routine disinfection and spread sterile towels. Wrap the high-frequency probe coated with coupling agent in sterile gloves, and use 3M (Aihujia) as the coupling agent on the outside of the gloves. Use ultrasonic positioning and exploration to reconfirm the location of the thickened and narrowed tendon sheath. Insert the needle diagonally with local anesthetic at the marked point D. Inject the local anesthetic as you go. Carefully feel it. There will be a hollow feeling after the needle touches the tougher tissue. This is the sheath. After changing the needle B, apply a certain amount of pressure and slowly inject the drug. into the sheath (if the injection is correct, you can find that the skin on the ventral side of the distal finger is obviously swollen and white, and the fluid can also be clearly seen spreading and flowing along the tendon sheath under ultrasound). Use a sterile vascular forceps to slightly bend the front end of the vertical beveled needle tip 1.5cm away from the blade tip. Enter the beveled needle from D, apply the coupling agent directly to the proximal section of the thumb, and use the ultrasonic high-frequency probe to locate and probe again. Confirm the location of thickened and narrowed tendon sheaths. And guide the tip of the needle knife to the surface of the tendon, at the proximal edge of the A1 pulley. Rotate the ultrasound probe 90 degrees to the transverse axis of the tendon. Color Doppler ultrasound shows the blood flow beams on both sides of the fingers. Confirm that the needle knife is located above the tendon and away from the blood flow beams on both sides of the fingers. , after confirming that the needle tip is in a safe position between the tendon and the tendon sheath, carefully feel it, and make a longitudinal cut from the proximal end to the distal end to release the tendon sheath. If there is a feeling of hollowness, it means that the tendon sheath is completely cut. After the operation, it can be seen that the tendon slides freely without compression, snapping, incarceration, locking, etc. The affected finger can flex and extend freely. The sliding condition of the tendon in the tendon sheath is observed again under color ultrasound to confirm that the tendon sheath is completely released. After the operation, local pressure was punctured for 3 to 5 minutes and then wrapped with a sterile dressing. After the operation, the patient was instructed to perform active finger flexion and extension exercises, and the patient was instructed to keep clean and dry within 3 days.

Figure 1 shows the local anesthetic a and b prepared before surgery. Figure 2 shows the reference ratio of the needle and the puncture direction line dc. Figure 3 shows a slightly curved needle knife. Figures 4 and 5 are ultrasound images of the transverse and longitudinal axes of the flexor tendon sheath before surgery. Figures 6 and 7 are ultrasound images of the transverse and longitudinal axes of the flexor tendon sheath during surgery.

ISSN 2618-1584 Vol. 6, Issue 5: 54-59, DOI: 10.25236/FMSR.2024.060508

Figure 1

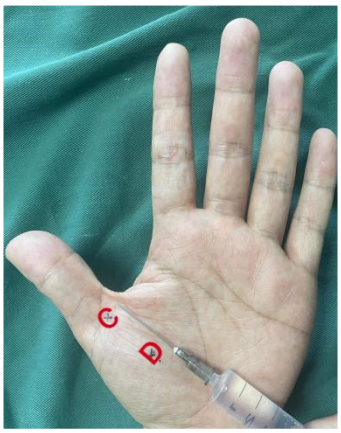

Figure 2

Figure 3

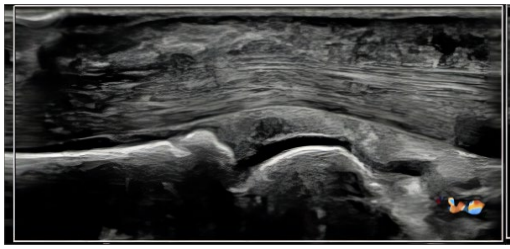

Figure 4

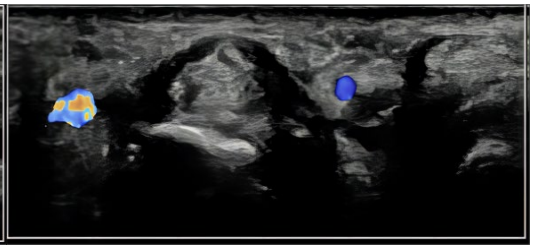

Figure 5

Figure 6

Figure 7

2.4. Efficacy evaluation criteria

Follow-up for 3-6 months after treatment, all patients will be evaluated on the preoperative and postoperative VAS scale for pain scores, based on the "Clinical Disease Diagnosis Criteria for Cure and Improvement" [3] and the Chinese Medical Association Hand Surgery Society Upper Limbs Some functional evaluation trial standards TAM evaluation [4] develop evaluation standards. It is divided into four levels: recovery, significant effect, effective and ineffective. Recovery: symptoms completely disappear, flexion and extension activities of the affected finger are normal, pain and discomfort in activities disappear, there is no snapping in activities, and functions return to normal. There was no recurrence of symptoms after a follow-up of 3 months to half a year; significant effect: the pain in the affected finger was significantly reduced, the pain when pressing was significantly reduced, the swelling completely disappeared, the function of the affected finger returned to normal, and there was no snapping when moving. After a follow-up of 3 months to half a year, some patients had no recurrence. Effective: The affected finger is accompanied by slight pain when moving, and there is slight difficulty in flexion and extension. The symptoms are improved, sometimes there is still snapping, and the movement is improved. Some patients have partial recurrence of symptoms during a follow-up of 3 months to half a year. Ineffective: Symptoms have not improved significantly after treatment, and there are still symptoms such as pain, snapping, or noose. The symptoms have not improved after 1 to 3 months of follow-up.

3. Results

After the treatment of 66 patients, the VAS scores of the patients after surgery were significantly

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better than those before surgery. There were 42 recovered patients, accounting for 63.4%, 19 markedly effective patients, accounting for 28.8%, 4 effective patients, accounting for 6.1%, and 1 ineffective patient, accounting for 5.1%, the total effective rate (total effective rate = recovery + markedly effective + effective total number of people) is 99.5%. There were no infections, nerve injuries, or painful scars after the operation. One of the ineffective patients underwent surgical incision and release, and the remaining 2 ineffective patients underwent acupuncture treatment again and their symptoms were relieved.

4. Conclusion

Finger stenosing tenosynovitis [5] is a common tendon sheath disease. When the hand moves, the long-term friction between the tendon and the tendon sheath causes fibrous degeneration, causing the tendon sheath to thicken and the inner cavity space to gradually narrow, while the tendon is in the tendon sheath. Internal compression deformation. When the fingers move, the tendon is compressed in the thickened area of the tendon sheath, causing noose, snapping, and limited movement. At present, the clinical treatment methods for stenosing tenosynovitis mainly include local immobilization, acupuncture, massage, hot compress, traditional Chinese medicine fumigation, oral non-steroidal anti-inflammatory drugs, closure treatment and surgical treatment.

Surgical treatment is generally divided into minimally invasive and open surgery [6-7]. Minimally invasive surgery includes percutaneous circumferential incision, homemade hook knife, push knife, small needle knife and ultrasound-guided needle knife release, etc. [7-11]. Open surgery includes microscopic incision, arthroscopic surgery and direct surgery. Cutting etc. [12-13]. Local immobilization, hot compresses, traditional Chinese medicine fumigation, and oral medications are not effective. Partial closure [14] has a certain effect on short-term and mild symptoms, but it is not effective in releasing tendon sheaths that have become obviously hyperplastic and narrow. Good, easy to relapse. Minimally invasive surgery under a microscope and arthroscope can remove the tendon sheath and relieve the compression. However, the equipment is expensive and the operation is cumbersome, which affects the implementation at the grassroots level. Surgical treatment has a clear surgical effect. Tendons and hyperplastic tendon sheaths can be observed under direct vision during the operation. The operation is relatively thorough, but the trauma is large, the cost is high, and the patient's acceptance is poor due to fear of surgery. In addition, some patients will have symptoms after the operation. Postoperative scar contracture or painful scars and weakened grip strength [15]. Acupotomy therapy is one of the minimally invasive treatment methods. A small acupotomy penetrates into the deep diseased area to cut, and peels off the thickened adhesion tissue to achieve the purpose of treatment. It not only can effectively treat stenosing tenosynovitis of the flexor tendon, but also has the advantages of less trauma, less bleeding, and quick recovery [16]. However, some patients still have incomplete cuts, and some patients still have entrapment after surgery, indicating that some patients still have incomplete cuts of the tendon sheath after acupuncture. In addition, in our clinical work, we have encountered many cases of patients with tendon rupture after acupuncture. It also explains that research has found that although acupotomy therapy is less invasive, blind incision based on body surface positioning method does have the possibility of damaging tendons, nerves, blood vessels, etc. [17]. Some authors have reported complications such as penetrating injuries of tendons and even tendon ruptures.

Therefore, we draw on the advantages of other companies and use the long-acting anti-inflammatory effect of compound betamethasone, combined with the minimally invasive operation of the needle knife, and the guidance effect of ultrasound, which can well make up for the shortcomings of the traditional blind puncture operation and reduce the occurrence of postoperative complications.

4.1. Advantages of Using Ultrasound-guided Acupotomy Combined with Localized Treatment

We accurately inject the mixed drug of anesthesia and compound betamethasone under the tendon sheath under ultrasound guidance. The advantages are: ① The sheath is mechanically expanded through the injection of water pressure. ② Local anesthesia creates a certain liquid gap between the tendon and the tendon sheath, which facilitates the penetration of the small needle knife and reduces interference and damage to the tendon. ③ Under ultrasonic dynamic monitoring, the needle insertion depth and direction of the small needle knife can be accurately positioned to avoid blood vessels and nerves. After surgery, ultrasound can also be used to evaluate whether the tendon release is complete. ④The compound betamethasone in the injection can exert a sustained and long-lasting effect on inhibiting local inflammation in the sheath and enhance the therapeutic effect. ⑤ We insert the needle 2.5cm away from

ISSN 2618-1584 Vol. 6, Issue 5: 54-59, DOI: 10.25236/FMSR.2024.060508

the tendon sheath. By slightly bending the needle knife, we can more conveniently observe and adjust the puncture direction of the needle knife under ultrasound, reducing iatrogenic cutting and stabbing injuries to the flexor tendon. At the same time, the puncture point is far away. Operating area, surgery is safer.

4.2. Selection of Surgical Indications

We generally use step-by-step treatment to select surgical options. For stage I or stage II patients, we perform conservative or local sealing treatment according to the patient's first choice. If local sealing is ineffective, ultrasound-guided acupuncture treatment can be performed immediately or in the second stage. For patients who have undergone multiple acupuncture surgeries, it is recommended that they undergo open surgery directly. Avoid unnecessary disputes caused by tendon rupture after surgery.

4.3. Precautions for Ultrasonic Operation

① For the frequency and position of the probe, we choose the high-frequency linear array probe model LA4-18B. The probe is placed on the palm or side of the finger. The nerves and blood vessels around the tendon can be observed in the cross section, and the tendon sheath compression can be observed. The location and the effect of the incision. The depth of the needle knife and the length of the tendon sheath stenosis can be observed in the longitudinal section. ② We choose to wrap the high-frequency probe coated with coupling agent in sterile gloves, and use 3M (Aihujia) as the coupling agent on the outside of the gloves. This can ensure the sterility requirements around the incision without affecting the operation and image clarity. ③ Pay attention to the flexible and practical cooperation between hands and ultrasound when operating by hand. During the operation, it can be adjusted to transverse or longitudinal incision at any time according to the needs of the operation to determine the depth and direction of the needle knife. Direct or control acupuncture treatment. ④Our usage experience: holding the ultrasonic probe in one hand and the needle knife in the other hand, the operation is still relatively cumbersome, but after a period of cooperative practice, the operation can still be completed better and faster. In addition, the surgical feel is also important. In addition, although ultrasound can reduce the cutting of the flexor tendon, it still cannot completely avoid the cutting damage to the tendon. We think it can also be improved by improving the shape of the needle knife, such as using a V-shaped or Y-shaped needle knife. Reduce cutting damage to flexor tendons. This needs to be studied in our next step.

4.4. Postoperative Precautions

We still need to pay attention to keeping the wound dry and clean after surgery, especially in the hot summer, as sweating can easily cause infection. Patients should be guided to perform functional exercises after surgery to prevent tendon adhesion and functional limitation.

We believe that the ultrasonic-guided small needle knife combined with local closure for the treatment of stenosing tenosynovitis of the digital flexor tendon has precise positioning, accurate efficacy, small trauma, less bleeding, low cost, and high safety. It is worthy of promotion and application in clinical practice.

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ISSN 2618-1584 Vol. 6, Issue 5: 54-59, DOI: 10.25236/FMSR.2024.060508

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