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Title: A Standardized Acupotomy Protocol for the Treatment of Tenosynovitis of Hand Flexor Tendons in Human Patients

Authors and Affiliations:

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Author Questionnaire

- 1. Microscopy:** Does your protocol require the use of a dissecting or stereomicroscope for performing a complex dissection, microinjection technique, or something similar? **No**
- 2. Software:** Does the part of your protocol being filmed include step-by-step descriptions of software usage? **No**
- 3. Filming location:** Will the filming need to take place in multiple locations? **No**
- 4. Testimonials (optional):** Would you be open to filming two short testimonial statements **live during your JoVE shoot**? These will **not appear in your JoVE video** but may be used in JoVE's promotional materials. **No**

Current Protocol Length

Number of Steps: 19

Number of Shots: 37; (4 LAB MEDIA shots)

Interviews

Videographer: Obtain headshots for all authors available at the filming location.

Authors: Please note that **the questions will not appear on screen**. Please answer in **stand-alone full sentence with sufficient context**

Note: The statements have been edited for length and clarity

INTRODUCTION:

~~REQUIRED: Summarize your research focus and the main questions it aims to answer.~~

- 1.1. **Li Xu:** Our study defines a standardized acupotomy protocol for flexor tenosynovitis to enhance safety, recovery and therapeutic efficacy.

1.1.1. INTERVIEW: Named talent says the statement above in an interview-style shot, looking slightly off-camera.

~~Describe the research gap or limitation in existing methods and how this protocol addresses them.~~

- 1.2. **Li Xu:** Conventional treatments are limited by poor outcomes or high invasiveness; our protocol offers standardized minimally invasive stenotic tendon sheath release.

1.2.1. INTERVIEW: Named talent says the statement above in an interview-style shot, looking slightly off-camera.

CONCLUSION:

~~What does this protocol allow researchers to study or measure?~~

- 1.3. **Li Xu:** This protocol evaluates clinical outcomes of acupotomy for trigger finger by measuring VAS pain scores and Quinnell functional grades.

1.3.1. INTERVIEW: Named talent says the statement above in an interview-style shot, looking slightly off-camera.

~~Describe the most important consideration or challenge when performing this protocol.~~

- 1.4. **Li Xu:** The key challenge is precise localization of the A1 pulley and strict adherence to anatomy to prevent injury.

1.4.1. INTERVIEW: Named talent says the statement above in an interview-style shot, looking slightly off-camera.

~~How can future studies build on this work? Describe the questions or research directions that can be investigated next.~~

1.5. **Li Xu:** Future studies can carry out standardized multicenter randomized controlled trials to verify long-term efficacy and safety.

1.5.1. INTERVIEW: Named talent says the statement above in an interview-style shot, looking slightly off-camera.

Videographer: Obtain headshots for all authors available at the filming location.

Ethics Title Card

This research has been approved by the Medical Research Ethics Committee of Hubei University of Chinese Medicine

Protocol

Videographer: Please always record an audio slate while filming each shot mentioned in the shotlist.

2. Preoperative Evaluation of Trigger Finger

Demonstrator: Yixuan Luo

- 2.1. To begin the physical evaluation, instruct the patient to flex and extend the affected finger independently to evaluate active range of motion [1]. Record the maximum flexion and extension angles [2].
 - 2.1.1. WIDE: Talent standing beside the patient and instructing the patient to move the affected finger. *Videographer: Please obtain CU shot as well for this shot.*
 - 2.1.2. Talent recording the maximum flexion and extension angles.
- 2.2. Gently flex and extend the patient's affected finger to evaluate passive range of motion [1]. Record the angles at which triggering or locking occurs [2].
 - 2.2.1. Talent gently flexing and extending the patient's affected finger.
 - 2.2.2. Talent recording the angles at which triggering or locking occurs.
- 2.3. Identify tender points by applying gradual pressure to the palmar aspect of the metacarpophalangeal, or MCP (M-C-P) joint [1]. Mark the most tender location using a marker pen [2].
 - 2.3.1. Talent applying gradual pressure to the palmar aspect of the MCP joint.
 - 2.3.2. Talent marking the most tender location with a marker pen.
- 2.4. Palpate along the flexor tendon in the proximal to distal direction to identify tendon sheath thickening or nodular changes [1]. Record the size and hardness of any palpable induration [2]. Determine patient eligibility for the acupotomy procedure, based on clinical symptoms, physical examination, and ultrasound findings [3].
 - 2.4.1. Talent examining the flexor tendon from proximal to distal to identify tendon sheath thickening or nodular changes.
 - 2.4.2. Talent recording the size and hardness of palpable induration.
 - 2.4.3. Talent checking the patient's records containing information about clinical symptoms, physical examination and ultrasound findings.

3. Pre-operative Preparation of Patient

- 3.1. First disinfect and clean the treatment table and surrounding area [1]. Cover the surface with a sterile drape [2]. Arrange all required materials on the clean, disinfected treatment table in the procedural sequence [3].
 - 3.1.1. Talent cleaning the treatment table and surrounding area.

- 3.1.2. Talent covering the surface with a sterile drape.
- 3.1.3. Talent arranging all required materials on the treatment table in procedural order.
- 3.2. To identify the treatment site, instruct the patient to flex the affected finger to 90 degrees at the MCP joint [1]. Palpate the nodule on the palmar aspect of the joint [2]. Using a marker pen, mark the identified location [3].
 - 3.2.1. Talent instructing the patient to flex the affected finger to 90 degrees.
 - 3.2.2. Talent palpating the nodule on the palmar aspect of the joint.
 - 3.2.3. Talent marking the identified location with a marker pen.
- 3.3. Disinfect the skin starting from the marked point and moving outward in concentric circles [1]. Ensure that the disinfection area covers the entire hand and extends at least 15 centimetres proximally along the forearm from the marked point [2]. Perform three rounds of disinfection, ensuring a one-third overlap between successive passes for complete coverage [3].
 - 3.3.1. Talent disinfecting the skin outward from the marked point in concentric circles.
 - 3.3.2. Talent extending the disinfection area over the entire hand and proximally along the forearm.
 - 3.3.3. Talent repeating the disinfection with overlapping passes.
- 3.4. To administer local anesthesia, draw a one-in-one ratio of 0.9 percent saline and 2 percent lidocaine hydrochloride into a sterile syringe for a total volume of 5 milliliters [1]. Insert the needle at a 30-degree angle to the skin [2] and advance until the needle tip reaches the subcutaneous layer superficial to the A1 (A-one) pulley at a depth of approximately 2 to 3 millimeters [3]. Aspirate for 2 to 3 seconds to confirm the absence of blood return [4].
 - 3.4.1. Talent drawing the anesthesia solution into a sterile syringe.
 - 3.4.2. Talent inserting the needle at a 30-degree angle to the skin.
 - 3.4.3. Talent advancing the needle to the subcutaneous layer upto a depth of 2-3 mm superficial to the A1 pulley.
 - 3.4.4. Talent aspirating with the syringe and checking for absence of blood return.
- 3.5. Inject 0.2 to 0.3 milliliters of anesthetic solution to form a small skin wheal measuring 0.5 to 1 centimeter in diameter [1].
 - 3.5.1. Talent injecting the anesthetic solution to form a small skin wheal.
- 3.6. Adjust the needle to a perpendicular position [1] and advance until the needle tip reaches the level of the A1 pulley at a depth of approximately 5 to 8 millimeters [2]. Aspirate for 2 to 3 seconds [3]. If no blood return is observed, inject 1 milliliter of anesthetic solution [4].
 - 3.6.1. Talent adjusting the needle to a perpendicular position.

- 3.6.2. Talent advancing the needle to the level of the A1 pulley upto a depth of 5-8 mm.
- 3.6.3. Talent aspirating with the syringe to check for absence of blood return.
- 3.6.4. Talent injecting 1 mL of anesthetic solution.
- 3.7. Test anesthesia with light touch using a sterile cotton swab [1]. Pinprick the area with a sterile needle tip and, if sensation persists, administer an additional 0.5 milliliters of anesthetic, then reassess after 3 minutes. [2].
 - 3.7.1. Talent touching the anesthetized area with a sterile cotton swab.
 - 3.7.2. Talent testing the anesthetized area with a sterile needle tip.

4. Acupotomy Procedure

- 4.1. Using the non-dominant thumb, apply pressure proximal to the marked nodule while simultaneously flexing and extending the finger to stabilize the tendon [1].
 - 4.1.1. LAB MEDIA: Sections 3.2-3.7.1. 00:00 – 00:07
- 4.2. Insert the acupotomy needle through the skin until tendon sheath resistance is felt, continue with controlled longitudinal cutting until the resistance releases, and then slowly withdraw the needle [1]. If minor triggering persists, perform 1 to 2 additional longitudinal cuts and stop the procedure once adequate release is achieved [2].
 - 4.2.1. LAB MEDIA: Sections 3.2-3.7.1. 00:08 – 00:15
 - 4.2.2. LAB MEDIA: Sections 3.6. 00:00 – 00:08
- 4.3. Have the patient flex and extend the finger 5–10 times to confirm smooth tendon gliding and resolution of tenderness, triggering, and locking [1].
 - 4.3.1. LAB MEDIA: Sections 3.2-3.7.1. 00:16 – 00:48
- 4.4. Apply pressure to the insertion site with sterile gauze for 3 to 5 minutes until visible bleeding ceases [1] and slight local skin blanching is observed, indicating adequate hemostasis [2].
 - 4.4.1. Talent applying pressure to the insertion site with sterile gauze.
 - 4.4.2. Close shot of slight local skin blanching at the insertion site.
- 4.5. Disinfect the insertion site using iodophor [1]. Apply a sterile adhesive dressing after confirming the absence of active bleeding followed by subsequent post-operative management [2].
 - 4.5.1. Talent disinfecting the insertion site with iodophor.
 - 4.5.2. Talent applying a sterile adhesive dressing to the insertion site.

Results

6. Results

- 6.1. The pain outcome represented by the mean Visual Analog Scale, or VAS (*V-A-S*) scores in 16 patients with trigger finger was approximately 6.31 pre-operatively [1] and decreased to 0.81 after treatment, showing a significant reduction in pain [2].
 - 6.1.1. LAB MEDIA: Figure 3A. *Video editor: Highlight the green bar representing the pre-treatment VAS score.*
 - 6.1.2. LAB MEDIA: Figure 3A. *Video editor: Highlight the orange bar representing the post-treatment VAS score.*
- 6.2. The functional outcome represented by Quinnell's grade was approximately 3.19 pre-operatively [1] and decreased to 0.75 after treatment indicating a significant improvement in functional mobility following the acupotomy procedure [2].
 - 6.2.1. LAB MEDIA: Figure 3B. *Video editor: Highlight the green bar representing the pre-treatment Quinnell's grade.*
 - 6.2.2. LAB MEDIA: Figure 3B. *Video editor: Highlight the orange bar representing the post-treatment Quinnell's grade.*

Pronunciation Guide:

1. Metacarpophalangeal
 Pronunciation link: <https://www.merriam-webster.com/dictionary/metacarpophalangeal>
 IPA: /ˌmeɪ.ə.kɑːr.pou.fəˈlæn.dʒi.əl/
 Phonetic Spelling: met·uh·kaar·poh·fuh·lan·jee·uhl
2. Palpate
 Pronunciation link: <https://www.merriam-webster.com/dictionary/palpate>
 IPA: /ˈpæl.pet/
 Phonetic Spelling: pal·payt
3. Proximal
 Pronunciation link: <https://www.merriam-webster.com/dictionary/proximal>
 IPA: /ˈprɑːk.sə.məl/
 Phonetic Spelling: praak·suh·muhl
4. Distal
 Pronunciation link: <https://www.merriam-webster.com/dictionary/distal>
 IPA: /ˈdɪs.təl/
 Phonetic Spelling: dis·tuhl

5. Induration
Pronunciation link: <https://www.merriam-webster.com/dictionary/induration>
IPA: /ˌɪn.dəˈreɪ.jən/
Phonetic Spelling: in-duh-ray-shuhn
6. Acupotomy
Pronunciation link: <https://www.howtopronounce.com/acupotomy>
IPA: /ˌæk.jəˈpɑː.tə.mi/
Phonetic Spelling: ak-yuh-paat-uh-mee
7. Lidocaine
Pronunciation link: <https://www.merriam-webster.com/dictionary/lidocaine>
IPA: /ˈlaɪ.dəˌkeɪn/
Phonetic Spelling: lie-duh-kayn
8. Hydrochloride
Pronunciation link: <https://www.merriam-webster.com/dictionary/hydrochloride>
IPA: /ˌhaɪ.droʊˈklɔːr.aɪd/
Phonetic Spelling: high-droh-klor-ide
9. Subcutaneous
Pronunciation link: <https://www.merriam-webster.com/dictionary/subcutaneous>
IPA: /ˌsʌb.kjuːˈteɪ.ni.əs/
Phonetic Spelling: sub-kyoo-tay-nee-uhs
10. Aspirate
Pronunciation link: <https://www.merriam-webster.com/dictionary/aspirate>
IPA: /ˈæs.pəˌreɪt/
Phonetic Spelling: ass-puh-rayt
11. Anesthetic
Pronunciation link: <https://www.merriam-webster.com/dictionary/anesthetic>
IPA: /ˌæn.əsˈθet.ɪk/
Phonetic Spelling: an-uhs-thet-ik
12. Perpendicular
Pronunciation link: <https://www.merriam-webster.com/dictionary/perpendicular>
IPA: /ˌpɜː.pənˈdɪk.jə.lə/
Phonetic Spelling: pur-pun-dik-yuh-ler
13. Acupotomy needle
Pronunciation link: <https://www.howtopronounce.com/acupotomy>
IPA: /ˌæk.jəˈpɑː.tə.mi ˈniː.dəl/
Phonetic Spelling: ak-yuh-paat-uh-mee nee-duhl
14. Longitudinal
Pronunciation link: <https://www.merriam-webster.com/dictionary/longitudinal>
IPA: /ˌlɑːn.dʒəˈtuː.dən.əl/
Phonetic Spelling: laan-juh-too-duh-nuhl
15. Hemostasis
Pronunciation link: <https://www.merriam-webster.com/dictionary/hemostasis>

IPA: /hi:mə'stoʊ.sɪs/

Phonetic Spelling: hee·muh·stoh·suhs

16. Blanching

Pronunciation link: <https://www.merriam-webster.com/dictionary/blanching>

IPA: /'blæn.tʃɪŋ/

Phonetic Spelling: blan·ching

17. Iodophor

Pronunciation link: <https://www.howtopronounce.com/iodophor>

IPA: /aɪ'ɑː.də.fɔːr/

Phonetic Spelling: eye·aa·duh·for

18. Tendon sheath

Pronunciation link: <https://www.merriam-webster.com/dictionary/tendon>

IPA: /'ten.dən ʃiːθ/

Phonetic Spelling: ten·duhn sheeth

19. Flexor tendon

Pronunciation link: <https://www.merriam-webster.com/dictionary/flexor>

IPA: /'flek.sə 'ten.dən/

Phonetic Spelling: flek·ser ten·duhn

20. Palmar

Pronunciation link: <https://www.merriam-webster.com/dictionary/palmar>

IPA: /'pɑːməːr/

Phonetic Spelling: paal·mar