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Title: Ultrasound-Guided Fire Needle Acupuncture for Treating Sialorrhea in Tracheotomized Patients

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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**? No

Current Protocol Length

Number of Steps: 14

Number of Shots: 39

Introduction

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

INTRODUCTION:

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

- 1.1. **Yanging Lu:** We aim to reduce sialorrhea in post-stroke tracheostomy patients, lowering care burden and aspiration risk.
 - 1.1.1. INTERVIEW: Named talent says the statement above in an interview-style shot, looking slightly off-camera

~~Describe the research contexts or systems in which this protocol can be applied.~~

- 1.2. **Yanging Lu:** This protocol applies to patients with abnormal gland secretion caused by various central nervous system injuries.
 - 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. **Ruofan Wang:** This protocol allows researchers to study fire needle effects on gland secretion, sialorrhea frequency, and subglottic saliva volume.
 - 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. **Ruofan Wang:** The key challenge is precise, safe fire needling per patient; we solved this with pre-needling ultrasound localization.
 - 1.4.1. INTERVIEW: Named talent says the statement above in an interview-style shot, looking slightly off-camera. *Suggested B-roll: 2.12.2*

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

- 1.5. **Ruofan Wang:** Future studies should extend duration, assess durability, decannulation rates, and stratified skin reactions.
 - 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 Ethics Committee of the Fifth Affiliated Hospital of Guangzhou University of Chinese Medicine

Protocol

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

2. Fire Needling Under Ultrasound Guidance

Demonstrator: Yanqing-Lu

- 2.1. To begin, set up the treatment environment and prepare the patient for the procedure [1]. Then, turn on the ultrasound system and press the **Start-End** (*Start-End*) button to initiate the examination [2]. **NOTE: The VO is edited for the deleted shot**
 - 2.1.1. Establishing shot of the patient in the procedure room.
 - 2.1.2. Talent turning on the ultrasound system.
 - ~~2.1.3. Show the ultrasound system interface and press Start End to begin the examination.~~ **NOTE: Not filmed, redundant shot**
- 2.2. Press the **Probe** button [1] and select the L15-4 (*L-Fifteen-Four*) linear array transducer [2].
 - 2.2.1. Show the ultrasound system interface and press Probe.
 - 2.2.2. Show the probe selection menu and select the L15-4 linear array transducer.
- 2.3. Press the **Patient** button and enter the patient's name [1]. Then, select the color Doppler mode [2].
 - 2.3.1. Press Patient and type the patient's name.
 - 2.3.2. Show the ultrasound system interface and select the color Doppler mode.
- 2.4. Localize the acupoints on one side of the face sequentially as Xiaguan [1], Yifeng [2], and the Inferior Jiache Point [3].
 - 2.4.1. Talent pointing Xiaguan ST7 on one side of the face.
 - 2.4.2. Talent pointing Yifeng TE17 on one side of the face.
 - 2.4.3. Talent pointing the Inferior Jiache Point on one side of the face.
- 2.5. Place the ultrasound transducer transversely with the probe marker positioned at Xiaguan [1]. Move the ultrasound transducer horizontally to identify the local vascular course under ultrasound imaging [2].
 - 2.5.1. Talent placing the ultrasound transducer transversely with the probe marker positioned at Xiaguan ST7.
 - 2.5.2. Talent moving the ultrasound transducer horizontally.
- 2.6. Define the needle insertion points on the skin surface at Xiaguan and 0.5 centimeters

lateral to it on both sides horizontally [1]. Select an appropriate needling depth to target the masseter muscle layer while avoiding blood vessels [2]. Press the **Measurement** button to measure the needling depth range [3] and record the needling depth [4].

NOTE: The VO is edited for the deleted shot

2.6.1. Talent marking the needle insertion points on the skin surface at Xiaguan ST7 and 0.5 centimeters lateral to it on both sides horizontally.

2.6.2. Talent selecting the appropriate needling depth to target the masseter muscle layer while avoiding blood vessels.

2.6.3. Show the ultrasound system interface and press **Measurement** to measure the needling depth range.

~~2.6.4. Talent marking the superficial needle insertion point on the skin.~~ **NOTE: Not filmed, redundant shot**

2.6.5. Talent recording the needling depth.

2.7. Next, place the ultrasound transducer longitudinally with the probe marker positioned at Yifeng [1]. Move the ultrasound transducer vertically to identify the local vascular course under ultrasound imaging [2].

2.7.1. Talent placing the ultrasound transducer longitudinally with the probe marker positioned at Yifeng TE17.

2.7.2. Talent moving the ultrasound transducer and the shot of local vascular course.

2.8. Define the needle insertion points on the skin surface at Yifeng and 0.5 centimeters superior and inferior to it vertically [1]. Determine an appropriate needle insertion depth that effectively targets the parotid gland layer while minimizing the risk of vascular injury [2], then use the Measurement function to assess the depth range [3]. ~~Identify and mark the superficial insertion site on the skin [4]~~ and document the selected needling depth.[4]. **NOTE: The VO is edited for the deleted shot**

2.8.1. Talent marking the needle insertion points on the skin surface at Yifeng TE17 and 0.5 centimeters superior and inferior to it vertically.

2.8.2. Talent selecting the appropriate needling depth to target the parotid gland layer while avoiding blood vessels.

2.8.3. Show the ultrasound system interface and press Measurement to measure the needling depth range.

~~2.8.4. Talent marking the superficial needle insertion point on the skin.~~ **NOTE: Not filmed, redundant shot**

2.8.5. Talent recording the needling depth.

~~2.9. Next, localize the Inferior Jiache Point and the surrounding needling points [1].~~ Place the ultrasound transducer transversely with the probe marker positioned at the Inferior

Jiache Point [1]. Move the ultrasound transducer horizontally to identify the local vascular course under ultrasound imaging [2]. **NOTE: The VO is edited for the deleted shot**

~~2.9.1. Talent locating the Inferior Jiache Point and surrounding needling points on the face. **NOTE: Not filmed**~~

2.9.2. Talent placing the ultrasound transducer transversely with the probe marker positioned at the Inferior Jiache Point. **NOTE: Slated as 2.9.1**

2.9.3. Talent moving the ultrasound transducer horizontally the shot of local vascular course under ultrasound imaging. **NOTE: Slated as 2.9.2**

2.10. Identify the needle insertion points on the skin surface at the Inferior Jiache Point and 0.5 centimeters laterally from it on both sides [1]. Select a suitable depth for needle insertion to access the submandibular gland while carefully avoiding adjacent blood vessels [2]. Afterwards, utilize the measurement function to assess the range of depths. [3]. ~~Mark the superficial insertion point on the skin [4]. Document the selected needling depth [5]. **NOTE: The VO is edited for the deleted shot**~~

2.10.1. Talent marking the needle insertion points on the skin surface at the Inferior Jiache Point and 0.5 centimeters lateral to it on both sides horizontally.

2.10.2. Talent selecting the appropriate needling depth to target the submandibular gland layer while avoiding blood vessels.

2.10.3. Show the ultrasound system interface and press Measurement to measure the needling depth range.

~~2.10.4. Talent marking the superficial needle insertion point on the skin. **NOTE: Not filmed, redundant shot**~~

2.10.5. Talent recording the needling depth.

2.11. Similarly, localise the acupoints on the contralateral side [1], perform preoperative disinfection using medical alcohol [2].

2.11.1. Talent marking any one point on the contralateral side.

2.11.2. Talent disinfecting the treatment area on the face using medical alcohol.

2.12. Now, heat the tip of the fire needle in the outer flame of an alcohol lamp until it glows from red to white-hot [1]. Rapidly and perpendicularly insert it into the acupoint and the surrounding needling points to the predetermined depth [2].

2.12.1. Talent heating the tip of the fire needle in the outer flame of an alcohol lamp until it glows red to white hot.

2.12.2. Talent rapidly inserting the heated fire needle perpendicularly into the acupoint and surrounding needling points to the predetermined depth. **NOTE: 2.12.2 and 2.13.1. should be combined into a single shot, following this sequence: needle**

Xiaguan → immediately press the puncture site with a cotton swab → needle
Yifeng → immediately press → needle the inferior Jiache point → immediately
press.

2.13. After pricking, press the needle hole with a clean dry cotton ball to prevent infection [1].

2.13.1. The needle hole is being pressed with a clean dry cotton ball.

2.14. Perform needling on the opposite side of the face and mandible using the same method [1]. Finally, assess the patient's sialorrhea status before and after treatment using the Drooling Severity and Frequency Scale or DSFS (*D-S-F-S*) [2].

2.14.1. Talent performing fire needling on the opposite side of the face.

2.14.2. LAB MEDIA: Table 1

Results

3. Results

- 3.1. Before treatment, DSFS scores showed no significant difference between the control group and the experimental group [1]. After treatment, the DSFS scores in the experimental group were significantly lower than those in the control group [2].
 - 3.1.1. LAB MEDIA: Tables 2 and 3. *Video editor: Highlight the rows labeled “before” for both “control group” and “experimental group”*
 - 3.1.2. LAB MEDIA: Tables 2 and 3. *Video editor: Highlight the row “2 weeks” and compare the values across the columns for “control group” and “experimental group”*
- 3.2. There was no significant difference in unstimulated salivary flow rate between the control and experimental groups before treatment [1]. Following treatment, however, the unstimulated salivary flow rate in the experimental group was significantly lower than that in the control group [2].
 - 3.2.1. LAB MEDIA: Table 4. *Video editor: Highlight the row “Before” for both “control group” and “experimental group”*
 - 3.2.2. LAB MEDIA: Table 4. *Video editor: Highlight the row “2 weeks” and compare the values for “control group” and “experimental group”*
- 3.3. Prior to treatment, the 1-hour subglottic secretion aspirate volume showed no significant difference between the control and experimental groups [1]. After treatment, the experimental group demonstrated a significantly lower 1-hour subglottic secretion aspirate volume compared to the control group. [2].
 - 3.3.1. LAB MEDIA: Table 5. *Video editor: Highlight the row “Before” for both “control group” and “experimental group”*
 - 3.3.2. LAB MEDIA: Table 5. *Video editor: Highlight the row “2 weeks” and compare the values for “control group” and “experimental group”*

1. Ultrasound
Pronunciation link: <https://www.merriam-webster.com/dictionary/ultrasound>
IPA: /'ʌl.trə.saʊnd/
Phonetic Spelling: ul·truh·sound
2. Transducer
Pronunciation link: <https://www.merriam-webster.com/dictionary/transducer>
IPA: /trænz'du:.sə/
Phonetic Spelling: tranz·doo·ser
3. Doppler
Pronunciation link: <https://www.merriam-webster.com/dictionary/Doppler>
IPA: /'dɑ:.plə/
Phonetic Spelling: dop·ler
4. Acupoints
Pronunciation link: <https://www.merriam-webster.com/dictionary/acupuncture>
IPA: /'æk.jə.pɔɪnts/
Phonetic Spelling: ak·yuh·points
5. Xiaguan
Pronunciation link: <https://www.howtopronounce.com/xiaguan>
IPA: /ʃja:'gwɑ:n/
Phonetic Spelling: shyah·gwan
6. Yifeng
Pronunciation link: <https://www.howtopronounce.com/yifeng>
IPA: /i:'fʌŋ/
Phonetic Spelling: ee·fung
7. Inferior
Pronunciation link: <https://www.merriam-webster.com/dictionary/inferior>
IPA: /ɪn'fɪr.i.ə/
Phonetic Spelling: in·feer·ee·er
8. Jiache
Pronunciation link: <https://www.howtopronounce.com/jiache>
IPA: /dʒi:'ɑ:.tʃə/
Phonetic Spelling: jee·ah·chuh
9. Vascular
Pronunciation link: <https://www.merriam-webster.com/dictionary/vascular>
IPA: /'væs.kjə.lə/
Phonetic Spelling: vas·kyuh·ler
10. Masseter
Pronunciation link: <https://www.merriam-webster.com/dictionary/masseter>
IPA: /'mæs.ə.tə/
Phonetic Spelling: mass·uh·ter
11. Contralateral
Pronunciation link: <https://www.merriam-webster.com/dictionary/contralateral>
IPA: /,kɑ:n.trə'læt̬.ə.əl/
Phonetic Spelling: kon·truh·lat·er·uhl

12. Parotid
Pronunciation link: <https://www.merriam-webster.com/dictionary/parotid>
IPA: /pəˈrɑːtɪd/
Phonetic Spelling: puh·rah·tid
13. Submandibular
Pronunciation link: <https://www.merriam-webster.com/dictionary/submandibular>
IPA: /ˌsʌb.mænˈdɪb.jə.lə/
Phonetic Spelling: sub·man·dib·yuh·ler
14. Preoperative
Pronunciation link: <https://www.merriam-webster.com/dictionary/preoperative>
IPA: /ˌpriːˈɑː.pə.ə.tɪv/
Phonetic Spelling: pree·op·er·uh·tiv
15. Disinfection
Pronunciation link: <https://www.merriam-webster.com/dictionary/disinfection>
IPA: /ˌdɪs.ɪnˈfek.ʃən/
Phonetic Spelling: dis·in·fek·shuhn
16. Perpendicularly
Pronunciation link: <https://www.merriam-webster.com/dictionary/perpendicular>
IPA: /ˌpɜː.pənˈdɪk.jə.lə.li/
Phonetic Spelling: per·pun·dik·yuh·ler·lee
17. Sialorrhea
Pronunciation link: <https://www.merriam-webster.com/medical/sialorrhea>
IPA: /ˌsaɪ.ə.ləˈriː.ə/
Phonetic Spelling: sigh·uh·luh·ree·uh
18. Drooling
Pronunciation link: <https://www.merriam-webster.com/dictionary/drooling>
IPA: /ˈdruː.lɪŋ/
Phonetic Spelling: droo·ling
19. Severity
Pronunciation link: <https://www.merriam-webster.com/dictionary/severity>
IPA: /səˈver.ə.ti/
Phonetic Spelling: suh·ver·uh·tee
20. Unstimulated
Pronunciation link: <https://www.merriam-webster.com/dictionary/unstimulated>
IPA: /ˌʌnˈstɪm.jə.leɪ.tɪd/
Phonetic Spelling: un·stim·yuh·lay·tid
21. Salivary
Pronunciation link: <https://www.merriam-webster.com/dictionary/salivary>
IPA: /ˈsæl.ə.veɪ.ri/
Phonetic Spelling: sal·uh·vair·ee
22. Subglottic
Pronunciation link: <https://www.merriam-webster.com/dictionary/subglottic>
IPA: /ˌsʌbˈɡləʊ.tɪk/
Phonetic Spelling: sub·glah·tik

23. Secretion

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

IPA: /sɪˈkriː.ʃən/

Phonetic Spelling: suh·kree·shuhn

24. Aspirate

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

IPA: /ˈæs.pəˌeɪt/

Phonetic Spelling: ass·per·ayt

25. Experimental

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

IPA: /ɪkˌsper.əˈmen.təl/

Phonetic Spelling: ik·sper·uh·men·tl