

Project Page Link: <https://review.jove.com/account/file-uploader?src=21007838>

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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: 12

Number of Shots: 44

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. **Lulu Cheng:** We study how Tissue-Bone Homeostasis Manipulation regulates peripatellar soft tissue tension and improves function in knee osteoarthritis.

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. **Lulu Cheng:** This protocol applies to knee osteoarthritis patients with soft tissue imbalance, limited patellar mobility, and functional impairment.

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. **Lulu Cheng:** This protocol enables objective evaluation of soft tissue tension, joint mobility, and functional recovery in KOA.

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. **Dongjing Li:** The key challenge is precise identification of pain points and maintaining consistent manipulation force and technique.

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

~~Are there any additional methods or analyses that can be performed following this procedure?~~

- 1.5. **Dongjing Li:** This protocol can be combined with imaging, biomechanics, and neurophysiological assessments for deeper mechanism analysis.

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 Institutional Ethics Committee at Rehabilitation Center of the First Affiliated Hospital of Anhui University of Chinese Medicine

Protocol

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

2. Soft Tissue Manipulation and Posterior Chain Relaxation

Demonstrator: lulu cheng or dongjing li

Authors: After the shoot, please let us know who demonstrated the procedure for each protocol section.

Note: The details were not provided upon requesting and both names have been added

- 2.1. To begin the Tissue-Bone Homeostasis Manipulation or TBHM (*T-B-H-M*), align the patient in a relaxed supine position with fully exposed lower limbs [1]. Position the palm or thenar eminence over anterior thigh muscles [2] and use forearm-driven force to apply longitudinal pushing along the muscle fibers from proximal to distal end [3].
 - 2.1.1. WIDE: Talent standing near a patient relaxing on a bed in a supine position with exposed lower limb.
 - 2.1.2. Talent placing the palm over patient's thigh muscles.
 - 2.1.3. Talent is using fore arms to apply pressure from proximal to distal end of the patient's thigh.
- 2.2. Use the palm and fingers to knead circularly over the anterior [1], medial [2], and lateral thigh muscles [3], followed by the calf muscles with continuous contact and moderate pressure for three minutes, adjusting pressure based on patient's feedback [4]
 - 2.2.1. Talent kneading patient's anterior thigh in circular motions.
 - 2.2.2. Talent kneading patient's medial thigh muscles in circular motions.
 - 2.2.3. Talent kneading patient's lateral thigh muscles in circular motions.
 - 2.2.4. Talent kneading patient's calf muscles in circular motions.
- 2.3. For the pain-point manipulation, palpate the peri-knee region to identify tender points in the patellar ligament, synovium, infrapatellar fat pad, muscle insertion sites, and collateral ligaments regions [1]. Place the thumb pad or fingertip directly on each identified pain point [2] and apply circular kneading in clockwise or counterclockwise direction around the patella using small-amplitude movements [3].
 - 2.3.1. Talent palpating the peri-knee area of patient to identify the pain points.
 - 2.3.2. Talent placing his thumb or fingertip on the pain point.
 - 2.3.3. Talent massaging the patella region in circular movements.
- 2.4. Increase palpation pressure gradually [1] and expand the examination area to identify difficult-to-locate pain points [2]. Use moderate pressure to maintain a steady rhythm of one to two Hertz approximately [3]. Treat each point sequentially for three cycles with a total duration of three minutes [4] and apply focused fingertip kneading motions to the most sensitive points for an additional one to two minutes [5].
 - 2.4.1. Talent increasing palpation pressure gradually

- 2.4.2. Talent expanding the examination area to locate the pain points.
- 2.4.3. Talent massaging with moderate pressure in a steady rhythm.
- 2.4.4. Talent treating each point one after the other.
- 2.4.5. Talent applying focused pressure for extra time at most sensitive points.
- 2.5. For the posterior chain relaxation, realign the patient in prone position [1]. Place both palms over the lumbar region [2] and use rhythmic pressure from the forearm to knead the erector spinae [3].
 - 2.5.1. WIDE: Patient aligning in prone position.
 - 2.5.2. Talent placing palms on patient's lumbar region.
 - 2.5.3. Talent massaging the patient's spine region with rhythmic pressure.
- 2.6. Maintain moderate and continuous pressure throughout the process, progressing sequentially from proximal to distal regions like gluteal muscles [1], hamstrings [2], and triceps surae [3]. Repeat three cycles for a total duration of approximately five minutes, reducing the duration for patients with poor tolerance [4].
 - 2.6.1. Talent applying moderate pressure continuously on the gluteal muscles.
 - 2.6.2. Talent applying moderate pressure continuously on the hamstrings.
 - 2.6.3. Talent applying moderate pressure continuously on the triceps surae.
 - 2.6.4. Talent repeating the cycle by applying moderate pressure.

3. Patella and Exercise-based Manipulation

- 3.1. For point kneading the patella, align the patient in a relaxed supine position [1]. Place the thumb pads along the patellar margin [2] and divide the patella into two layers- superficial layer or patellar edge [3] and deep layer or subpatellar structures [4].
 - 3.1.1. Talent aligning the patient in a relaxed supine position.
 - 3.1.2. Talent placing the thumb along patient's patellar margin.
 - 3.1.3. Talent showing the superficial layer of the patella
 - 3.1.4. Talent showing the deep layers of the patella.
- 3.2. Knead in circular movements [1] in eight directions [2]. Use small circular thumb movements to generate force and maintain consistent amplitude, controlled pressure to avoid abrupt force and patient discomfort [3]. Start with the superficial layer [4], complete all directions and proceed to the deep layers- kneading each direction for fifteen seconds for a total duration of 5 minutes [5].
 - 3.2.1. Talent kneading the patient's patella in circular movements.
 - 3.2.2. TEXT ON A PLAIN BACKGROUND
 - 1) Superior
 - 2) Superomedial
 - 3) Medial
 - 4) Inferomedial
 - 5) Inferior
 - 6) Inferolateral
 - 7) Lateral
 - 8) Superolateral
 - 3.2.3. Talent massaging with consistent amplitude and controlled pressure.

- 3.2.4. Talent kneading the superficial layer of patella.
- 3.2.5. Talent kneading the deep layer of the patella.
- 3.3. For the patella pushing manipulation, place one thumb on the lateral side of the patella and the fingers on the medial side [1]. Reinforce the pushing thumb with opposite palm [2]. Apply slow and controlled, push-pull movements in four directions of patella up to maximal tolerable range of motion to complete one cycle of approximately five seconds [3]. Hold for three seconds and gently move the patella along the femoral cartilage surface, continuing for a total duration of 2 minutes and reducing the amplitude for high pain sensitivity [4].
 - 3.3.1. Talent placing the thumb on lateral side and fingers on medial side of the patella.
 - 3.3.2. Talent reinforcing the thumb with opposite palm.
 - 3.3.3. Talent applying slow, push-pull movements in 4 directions.
 - 3.3.4. Talent holding for 3 seconds and moving the patella towards the femoral cartilage.
- 3.4. For exercise-based manipulation, align the patient in prone position [1], then hold the ankle joint with one hand [2] and stabilize the knee joint with the other [3].
 - 3.4.1. Talent aligning the patient in prone position.
 - 3.4.2. Talent holding the patient's ankle joint with one hand.
 - 3.4.3. Talent stabilizing the knee joint with other hand.
- 3.5. Use slow and controlled movements to perform passive knee extension and flexion within the functional range [1]. Repeat five times within one minute avoiding excessive end-range compression and stop movement if sharp pain occurs [2].
 - 3.5.1. Talent performing passive knee extension and flexion using slow movements.
 - 3.5.2. Talent repeating the extension-flexion movements for one minute.
- 3.6. Next, perform traction-shaking by maintaining the knee at approximately ninety-degree flexion in the prone position [1]. Grasp the ankle with both hands and lift the lower leg ten centimeters off the treatment bed [2]. Apply gentle traction with small, smooth and continuous rhythmic vertical oscillations to avoid joint irritation [3]. Repeat three cycles within one minute [4-TXT].
 - 3.6.1. Talent holding patient's knee at 90° flexion in the prone position.
 - 3.6.2. Talent grasping the ankle and lifting the lower leg of patient.
 - 3.6.3. Talent applying gentle traction with continuous rhythmic vertical oscillations.
 - 3.6.4. Talent repeating the traction for 1 minute. **TXT: TBHM frequency: Twice a week for 6 weeks**

Results

4. Results

- 4.1. The baseline levels of the primary outcome indicators [1] of the two groups of patients before treatment were balanced with good comparability, and the differences were not statistically significant [2]. The improvement range and efficacy persistence of the primary indicators in the TBHM group were significantly better than those in the control group after treatment [3] and during the follow-up period [4].
- 4.1.1. LAB MEDIA: Table 2: *Video editor: Please emphasize the “Outcomes” column.*
- 4.1.2. LAB MEDIA: Table 2: *Video editor: Please emphasize TBHM group and Control group sub-columns sequentially under the pre-assessment column.*
- 4.1.3. LAB MEDIA: Table 2: *Video editor: Please emphasize TBHM group and Control group sub-columns sequentially under the post-assessment column.*
- 4.1.4. LAB MEDIA: Table 2: *Video editor: Please emphasize TBHM group and Control group sub-columns sequentially under the follow-up column.*
- 4.2. The baseline levels of secondary outcomes [1] in the two groups before treatment were comparable and balanced [2]. The improvement range and efficacy persistence of the secondary indicators in the TBHM group were significantly better than those in the control group after treatment [3] and during the follow-up period [4].
- 4.2.1. LAB MEDIA: Table 3: *Video editor: Please emphasize the “Outcomes” column.*
- 4.2.2. LAB MEDIA: Table 3: *Video editor: Please emphasize TBHM group and Control group sub-columns sequentially under the pre-assessment column.*
- 4.2.3. LAB MEDIA: Table 3: *Video editor: Please emphasize TBHM group and Control group sub-columns sequentially under the post-assessment column.*
- 4.2.4. LAB MEDIA: Table 3: *Video editor: Please emphasize TBHM group and Control group sub-columns sequentially under the follow-up column.*

Pronunciation Guide:

1. Homeostasis
Pronunciation link: <https://www.merriam-webster.com/dictionary/homeostasis>
IPA: /ˌhoʊ.mi.oʊˈster.sɪs/
Phonetic Spelling: hoh·mee·oh·stay·suhs
2. Supine
Pronunciation link: <https://www.merriam-webster.com/dictionary/supine>
IPA: /suːˈpaɪn/
Phonetic Spelling: soo·pyne
3. Thenar
Pronunciation link: <https://www.merriam-webster.com/dictionary/thenar>

IPA: /'θiː.nər/

Phonetic Spelling: thee·nar

4. Longitudinal

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

IPA: /ˌlɑːn.dʒəˈtuː.dən.əl/

Phonetic Spelling: lon·juh·too·duh·nuhl

5. Proximal

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

IPA: /'prɑːk.sə.məl/

Phonetic Spelling: prok·suh·muhl

6. Distal

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

IPA: /'dɪs.təl/

Phonetic Spelling: diss·tuhl

7. Patellar

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

IPA: /pəˈtel.ər/

Phonetic Spelling: puh·tel·er

8. Synovium

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

IPA: /sɪˈnoʊ.vi.əm/

Phonetic Spelling: sih·noh·vee·uhm

9. Infrapatellar

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

IPA: /ˌɪn.frə.pəˈtel.ər/

Phonetic Spelling: in·fruh·puh·tel·er

10. Ligament

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

IPA: /'lɪɡ.ə.mənt/

Phonetic Spelling: lig·uh·muhnt

11. Palpate

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

IPA: /'pæl.pert/

Phonetic Spelling: pal·payt

12. Peri-knee

Pronunciation link: No confirmed link found

IPA: /ˌper.iˈniː/

Phonetic Spelling: peh·ree·nee

13. Counterclockwise

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

IPA: /ˌkaʊn.t̬əˈklɔːk.waɪz/

Phonetic Spelling: kown·ter·klok·wyz

14. Hertz
 Pronunciation link: <https://www.merriam-webster.com/dictionary/hertz>
 IPA: /hɜːts/
 Phonetic Spelling: hurts
15. Lumbar
 Pronunciation link: <https://www.merriam-webster.com/dictionary/lumbar>
 IPA: /ˈlʌm.bər/
 Phonetic Spelling: lum·bar
16. Erector Spinae
 Pronunciation link: <https://www.merriam-webster.com/medical/erector%20spinae>
 IPA: /ɪˈrɛk.təˈspaɪ.niː/
 Phonetic Spelling: ih·rek·ter spy·nee
17. Gluteal
 Pronunciation link: <https://www.merriam-webster.com/dictionary/gluteal>
 IPA: /ˈgluː.ti.əl/
 Phonetic Spelling: gloo·tee·uhl
18. Hamstrings
 Pronunciation link: <https://www.merriam-webster.com/dictionary/hamstring>
 IPA: /ˈhæm.strɪŋz/
 Phonetic Spelling: ham·stringz
19. Triceps Surae
 Pronunciation link: <https://www.merriam-webster.com/medical/triceps%20surae>
 IPA: /ˈtraɪ.sepsˈsʊr.iː/
 Phonetic Spelling: try·seps sur·ee
20. Superomedial
 Pronunciation link: No confirmed link found
 IPA: /ˌsuː.pə.roʊˈmiː.di.əl/
 Phonetic Spelling: soo·puh·roh·mee·dee·uhl
21. Inferomedial
 Pronunciation link: No confirmed link found
 IPA: /ɪnˌfɪr.oʊˈmiː.di.əl/
 Phonetic Spelling: in·feer·oh·mee·dee·uhl
22. Inferolateral
 Pronunciation link: No confirmed link found
 IPA: /ɪnˌfɪr.oʊˈlæʃ.ər.əl/
 Phonetic Spelling: in·feer·oh·lat·er·uhl
23. Femoral
 Pronunciation link: <https://www.merriam-webster.com/dictionary/femoral>
 IPA: /ˈfem.ə.əl/
 Phonetic Spelling: fem·er·uhl
24. Traction
 Pronunciation link: <https://www.merriam-webster.com/dictionary/traction>

IPA: /'træk.fən/

Phonetic Spelling: trak·shuhn

25. Oscillations

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

IPA: /,ɑː.sə'leɪ.fənz/

Phonetic Spelling: ah·suh·lay·shuhnz