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Title: Treatment with Locking Intramedullary Nailing for Intertrochanteric Fracture of the Femur Utilizing a New Awl with a Distal Positioner

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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.**

Current Protocol Length
Number of Steps: 15
Number of Shots: 32

Introduction

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

1.1. **Zongpei Lian:** This research investigates complex fracture treatment, focusing on optimizing rapid and precise guidewire insertion techniques during intramedullary nailing for intertrochanteric femur fractures.

1.1.1. INTERVIEW: Named talent says the statement above in an interview-style shot, looking slightly off-camera. *Suggested B-roll: 2.3.1*

What research gap are you addressing with your protocol?

1.2. **Zongpei Lian:** We present a protocol for accessing the guidewire of intramedullary femoral nailing in obese patients using an in-house designed awl.

1.2.1. INTERVIEW: Named talent says the statement above in an interview-style shot, looking slightly off-camera. *Suggested B-roll: 2.5.1*

What advantage does your protocol offer compared to other techniques?

1.3. **Zongpei Lian:** The newly designed guide awl with a distal positioner could reduce the difficulty in opening the femur for inserting the interlocked intramedullary nail.

1.3.1. INTERVIEW: Named talent says the statement above in an interview-style shot, looking slightly off-camera. *Suggested B-roll: 2.13.1*

What research questions will your laboratory focus on in the future?

1.4. **Zongpei Lian:** We will focus on developing an integrated care-rehabilitation support platform for frail elderly with rehabilitative potential.

1.4.1. INTERVIEW: Named talent says the statement above in an interview-style shot, looking slightly off-camera. *Suggested B-roll: 2.14.2*

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

Ethics Title Card

This research has been approved by the Ethics Committee at the Tongji Hospital, Tongji Medical College, Huazhong University of Science & Technology

Protocol

NOTE: The writer has not reviewed the footage for regular talent shots. The author provided timecodes are added in red

2. Surgical Treatment with the Newly Designed Guide Apparatus

Demonstrator: Zhengqiang Luo

2.1. To begin, position the patient supine on a radiolucent table **[1]**. Place the contralateral limb in an adjustable leg holder **[2]**.

2.1.1. WIDE: Talent positioning the patient on a radiolucent operating table. Video: 1. 消毒铺巾 Disinfect the surgical field and drape the patient.mp4 0:00–0:20

2.1.2. Talent securing the contralateral limb in a leg holder. Video: 1. 消毒铺巾 Disinfect the surgical field and drape the patient.mp4 0:20–0:40

~~2.2. Position the image intensifier on the ipsilateral side to acquire both anterior-posterior and lateral projections **[1]**.~~

~~2.2.1. Talent gently abducting the patient's torso while explaining the angle for access~~

~~2.3. Apply traction and internal rotation to the ipsilateral leg under image intensifier guidance to reduce the fracture **[1]**.~~

~~2.3.1. Talent adjusting intensifier.~~ **NOTE**: NOT FILMED

2.4. Now, drape the patient for a standard femoral nail procedure **[1]**. Using iodine povidone, disinfect the surgical field longitudinally from the costal margin to the foot and transversely from the anterior midline beyond the posterior spine **[2]**.

2.4.1. Talent opening and spreading drapes over the surgical area. Video: 1.消毒铺巾 Disinfect the surgical field and drape the patient.mp4 0:40–1:00

2.4.2. Talent applying iodine povidone using sterile swabs across the defined area. Video: 1.消毒铺巾 Disinfect the surgical field and drape the patient.mp4 1:00–1:20

2.5. Then, place four sterile towels on specific anatomical areas **[1]** and secure them with towel clips or adhesive drapes **[2]**. Extend the sterile field with middle sheets and center a large fenestrated drape over the hip **[3]**. Now, cover the distal limb using a sterile stockinette and secure with an elastic bandage **[4]**. Perform open reduction of the comminuted fracture fragments **[5]** and assemble the guidance device **[6]**.

2.5.1. Talent placing sterile towels one by one on the designated areas. Video: 1.消毒铺巾 Disinfect the surgical field and drape the patient.mp4 1:20–1:40

2.5.2. Talent securing towels in place with clips or adhesive. Video: 1.消毒铺巾 Disinfect the surgical field and drape the patient.mp4 1:40–2:00

2.5.3. Talent draping the hip with a large fenestrated sheet. Video: 1.消毒铺巾 Disinfect the surgical field and drape the patient.mp4 2:00–2:25

2.5.4. Talent sliding a stockinette over the distal limb and wrapping with an elastic bandage. Video: 1.消毒铺巾 Disinfect the surgical field and drape the patient.mp4 2:25–2:50

2.5.5. Added shot: Talent performing open reduction of fracture fragments.

切开复位粉碎性骨折断端 Perform open reduction of the comminuted fracture fragments.mp4 切开复位 1(0:00-0:20)+切开复位 3(0:00-0:17)

2.5.6. **Added shot: Talent assembling the guidance device.** 导向器组装演示 Assemble the guidance device.mp4 0:00-0:20

2.6. Next, make a longitudinal skin incision approximately 3 to 5 centimeters long, 2 to 3 centimeters proximal to the trochanteric apex, extending along the femoral shaft axis **[1]**. Using a scalpel, dissect through the gluteus medius fascia **[2]** and palpate the tip of the greater trochanter to confirm location **[3]**.

2.6.1. Talent making a careful longitudinal skin incision. Video: 4.在大转子尖端选择一个理想的入路点.mp4 0:00–0:10

2.6.2. Talent dissecting the fascia with precision. Video: 4.在大转子尖端选择一个理想的入路点.mp4 0:10–0:20

2.6.3. Talent palpating the tip of the greater trochanter with gloved fingers. Video: 4.在大转子尖端选择一个理想的入路点.mp4 0:20–0:35

~~2.7. Identify the ideal entry point at the tip of the greater trochanter **[1]**. Under anterior-posterior fluoroscopy, align the entry point with the trochanteric tip **[2]**. Under lateral fluoroscopy, confirm the alignment with the medullary canal **[3]**.~~ **NOTE**: NOT FILMED

~~2.7.1. Talent pointing to and marking the ideal entry point on the trochanter.~~

~~2.7.2. SCREEN: Show anterior-posterior fluoroscopic view aligning the entry point.~~

2.7.3. ~~SCREEN: Show lateral fluoroscopic image confirming alignment~~.

2.8. After aligning the entry point with the trochanteric tip, place the tip of the awl at the marked entry point **[1]**, make a small incision at the distal position tube **[2]**, insert a 3-millimeter wire, and confirm K-wire tip location **[3]**.

2.8.1. Talent placing the awl's tip at the marked entry location. Video: 5.放置锥子尖端并置入克氏针.mp4 0:21–0:35

2.8.2. Talent making a second small incision. Video: 5.放置锥子尖端并置入克氏针.mp4 1:22–1:42

2.8.3. Talent inserting the customized wire through the distal positioning tube. Video: 5.放置锥子尖端并置入克氏针.mp4 1:42–1:52

~~2.8.4. SCREEN: Display fluoroscopic image showing K-wire position.~~ **NOTE**: NOT FILMED

2.9. Advance the wire to offset proximal femur valgus and confirm extension into the medullary cavity **[1]**.

2.9.1. Talent pushing the customized wire deeper into the bone. Video: 6.在克氏针引导下用锤子打开近端皮质.mp4 0:00–0:10

2.10. Insert a 2.5-millimeter guidewire through the awl to a depth of around 15 centimeters and confirm position under image intensifier **[2]**.

2.10.1. Talent feeding the guidewire into the medullary cavity. Video: 6.在克氏针引导下用锤子打开近端皮质.mp4 0:10–0:20

2.11. Tap the awl gently with a hammer to open cortex **[1]** and keep tip aligned with lesser trochanter **[2]**.

2.11.1. Talent tapping the awl with a hammer. Video: 6.在克氏针引导下用锤子打开近端皮质.mp4 0:20–0:35

2.11.2. Talent pointing to the awl remaining aligned with lesser trochanter. Video: 7.在导向器辅助下置入克氏针.mp4 0:17–0:37

2.12. Next, attach the nail to the handle and tighten with torque wrench **[1]**.

2.12.1. Talent placing the nail into position and locking it. Video: 9.组装髓内钉.mp4 0:00–0:10

2.13. Insert the nail, ensuring the proximal tip aligns with the greater trochanter **[1-TXT]** and the distal gap is 10 to 20 millimeters **[2]**.

2.13.1. Talent inserting the nail into the canal. **TXT: Ensure distal end terminates at metaphyseal-diaphyseal junction** Videos: 8.扩髓.mp4 0:00–0:09 and 10.插入髓内钉.mp4 0:00–0:10

2.13.2. Talent pointing to the alignment. Video: 10.插入髓内钉.mp4 0:10–0:15

~~2.14. Verify fracture reduction and locking position under imaging **[1]**.~~

~~2.14.1. SCREEN: Display alignment and locking confirmation.~~**NOTE**: NOT FILMED

2.15. After verifying fracture reduction, insert guidewire and confirm position for proximal blade/screw **[1]**. Finish with distal locking **[2-TXT]**.

2.15.1. Talent feeding guidewire and adjusting depth. Video: 11.完成远端锁定.mp4 11.1(01:45–02:10)

2.15.2. Talent securing proximal blade/screw and completing distal locking. **TXT: Post-surgery, obtain radiographs every 3–4 weeks until bone heals** Videos: 11.完成

远端锁定.mp4 11.1(03:05–03:25) and 11.2(0:00–0:11)

Results

3. Results

3.1. The patients were treated with locking intramedullary nailing with the help of a newly designed guide apparatus or conventional guide apparatus. The mean operation time in the newly designed guide group was around 45.8 min **[1]**, which was less compared to the mean operation time of 58 minutes in the conventional guide group [**2]**.

3.1.1. LAB MEDIA: Table 2 *Video editor: Highlight 45.8 ± 1.6 in row "mean operation time"*

3.1.2. LAB MEDIA: Table 2 *Video editor: Highlight 58.0 ± 2.3 in row "mean operation time"*

3.2. The intraoperative blood loss in the newly designed guide group was 104 milliliters **[1]**, and 122.8 milliliters in the control group **[2]**.

3.2.1. LAB MEDIA: Table 2 *Video editor: Highlight 104.3 ± 5.8*

3.2.2. LAB MEDIA: Table 2 *Video editor: Highlight 122.8 ± 7.2*

3.3. The success rate of the one-time inserted guide wire was 100% in the newly designed guide group **[1]** and the radiation times were less **[2]**. There was no significant change in bone healing time between the two groups **[3]**.

3.3.1. LAB MEDIA: Table 2 *Video editor: Highlight 100%*

3.3.2. LAB MEDIA: Table 2 *Video editor: Highlight 14.9 ± 0.7*

3.3.3. LAB MEDIA: Table 2 *Video editor: Highlight the row "bone healing time"*

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1. Radiolucent

- **Pronunciation link**: (merriam-webster.com)
- **IPA**: /ˌreɪ.di.oʊˈluː.sənt/
- **Phonetic Spelling**: ray-dee-oh-loo-suhnt

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2. Ipsilateral

- **Pronunciation link**: (merriam-webster.com)
- **IPA**: /ˌɪp.sɪˈlæt.ər.əl/
- **Phonetic Spelling**: ip-sih-lat-uh-ruhl

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3. Povidone

- **Pronunciation link**: (merriam-webster.com)
- **IPA**: /ˈpoʊ.vɪˌdoʊn/
- **Phonetic Spelling**: poh-vi-dohn

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4. Stockinette

- **Pronunciation link**: (merriam-webster.com)
- **IPA**: /ˌstɒk.ɪˈnɛt/
- **Phonetic Spelling**: stok-ih-net

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5. Comminuted

- **Pronunciation link**: (merriam-webster.com)
- **IPA**: /ˈkɒm.ɪˌnjuː.tɪd/
- **Phonetic Spelling**: kom-ih-nyoo-tid

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6. Trochanteric

- **Pronunciation link**: (merriam-webster.com)
- **IPA**: /ˌtroʊ.kænˈtɛr.ɪk/
- **Phonetic Spelling**: troh-kan-ter-ik

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7. Gluteus

- **Pronunciation link**: (merriam-webster.com)
- **IPA**: /ˈgluː.ti.əs/

- **Phonetic Spelling**: gloo-tee-uhs

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8. Fascia

- **Pronunciation link**: (merriam-webster.com)
- **IPA**: /ˈfæʃ.ə/
- **Phonetic Spelling**: fash-uh

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9. Fluoroscopy

- **Pronunciation link**: (merriam-webster.com)
- **IPA**: /flʊˈrɒs.kə.pi/
- **Phonetic Spelling**: floo-ros-kuh-pee

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10. Medullary

- **Pronunciation link**: (merriam-webster.com)
- **IPA**: /ˈmɛd.əˌlɛr.i/
- **Phonetic Spelling**: med-uh-lair-ee

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11. Valgus

- **Pronunciation link**: (merriam-webster.com)
- **IPA**: /ˈvæl.gəs/
- **Phonetic Spelling**: val-guhs

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12. Awl

- **Pronunciation link**: (merriam-webster.com)
- **IPA**: /ɔːl/
- **Phonetic Spelling**: awl

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13. Diaphyseal

- **Pronunciation link**: (merriam-webster.com)
- **IPA**: /ˌdaɪ.əˈfɪz.i.əl/
- **Phonetic Spelling**: dye-uh-fiz-ee-uhl

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14. Metaphyseal

- **Pronunciation link**: (merriam-webster.com)
- **IPA**: /ˌmɛt.əˈfɪz.i.əl/
- **Phonetic Spelling**: met-uh-fiz-ee-uhl

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15. Intramedullary

- **Pronunciation link**: (merriam-webster.com)
- **IPA**: /ˌɪn.trəˈmɛd.əˌlɛr.i/
- **Phonetic Spelling**: in-truh-med-uh-lair-ee
