Submission ID #: 67270
Scriptwriter Name: Sulakshana Karkala
Project Page Link: https://review.jove.com/account/file-uploader?src=20517398

Title: Novel Mini-Open Transforaminal Lumbar Interbody Fusion

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Author Questionnaire

1. We have marked your project as author-provided footage, meaning you film the video yourself and provide JoVE with the footage to edit. JoVE will not send the videographer. Please confirm that this is correct.

√ Correct

2. Microscopy: Does your protocol require the use of a dissecting or stereomicroscope for performing a complex dissection, microinjection technique, or something similar?

SCOPE: **2.3.1, 2.3.2, 2.4.2, 2.4.3, 2.5.1, 2.5.2, 2.6.1, 2.6.2, 2.7.1, 2.7.2, 2.8.3, 2.9.1, 2.9.2., 2.12.2, 2.13.1,2.13.2**

3. Software: Does the part of your protocol being filmed include step-by-step descriptions of software usage? **No**

4. Proposed filming date: To help JoVE process and publish your video in a timely manner, please indicate the proposed date that your group will film here: **03/17/2025**

When you are ready to submit your video files, please contact our China Location Producer, Yuan Yue.

Current Protocol Length

Number of Steps: 14
Number of Shots: 35°

Introduction

NOTE TO VO: Please record the introduction statements

1.1. The investigation focuses on how MO-TLIF *(M-O-T-L-I-F)* , a novel minimally invasive technique, provides enhanced clinical outcomes and improved radiological results in the treatment of lumbar degenerative disease when compared to traditional surgical methods

1.1.1. *Suggested shot:3.3*

What are the most recent developments in the surgical field of research?

1.2. Lumbar decompression surgery is moving toward less invasive methods and quicker recovery after the operation, which makes the whole treatment process better for patients.

1.2.1. *Suggested shot:2.8.1*

How will these findings advance research?

1.3. MO-TLIF combines the advantages of open and minimally invasive methods, providing a customary alternative for grass-roots surgeons because of its smooth learning curve.

1.3.1. *Suggested shot:3.1*

Ethics Title Card
This research has been approved by the Ethics Committee at the Second Affiliated Hospital of Soochow University

Protocol

2. Establishing Surgical Access and Performing Lumbar Decompression with Internal Fixation

Demonstrator: Zhengfeng Lu

NOTE: All scope shots are surgery shots

2.1. To begin, disinfect the surgical site on a patient under anesthesia **[1]**. Make a 3-centimeter longitudinal incision along the marked line on the lower back using a number 10 blade **[2]**. Cut through the skin, subcutaneous tissue, and thoracolumbar fascia sequentially using a high frequency electrotome **[3]**.

2.1.1. WIDE: Talent disinfecting the surgical site.

2.1.2. Talent making a 3 cm incision along the marked line using a number 10 blade.

2.1.3. Shot of the layers being cut using high-frequency electrotome.

2.2. Detach the paraspinal muscles along the spinous process using a high-frequency electrotome to expose the affected spinous process, lamina, and part of the facet joint **[1]**. Place the lamina retractor at the outer edge of the upper facet of the lower vertebra to expose the surgical field **[2]** and establish the approach channel within 5 minutes **[3]**.

2.2.1. Shot of the paraspinal muscles being detached to expose spinal structures.

2.2.2. Talent placing the lamina retractor to expose the surgical field.

2.2.3. Shot of an approach channel being made.

2.3. With an ultrasonic or ordinary bone knife, remove the superior subarticular process and part of the inferior supraspinous process **[1]**. Remove part of the ventral ligamentum flavum to expose the dura mater and nerve roots, while preserving the dorsal ligamentum flavum and epidural fat **[2-TXT]**.

2.3.1. FILE: 67270_screenshot_2.3.1.mp4. 00:27-00:44, 00:46-00:54

2.3.2. FILE: 67270_screenshot_2.3.2.mp4 01:24-01:52

TXT: Title surgery table towards contralateral side if bilateral decompression or contralateral stenosis is required

2.4. ~~If bilateral decompression or contralateral stenosis is required, tilt the radiolucent spinal surgery table towards the contralateral side **[1].**~~ Remove the base of the spinous process **[2]** and resect the hypertrophic ligamentum flavum until reaching the contralateral lateral recess to achieve a 270-degree decompression **[3]**.

2.4.1. ~~Talent tilting the surgical table to the contralateral side.~~

NOTE: Converted to on-screen text since footage is not acceptable

2.4.2. FILE: 67270_screenshot_2.4.2-2.4.3.mp4. 00:51-00:58, 01:13-01:15

2.4.3. FILE: 67270_screenshot_2.4.2-2.4.3.mp4. 07:48-07:54, 08:22-08:32

2.5. Use a nerve root retractor to retract the nerve roots and dural sac and expose the operating area **[1]**. Incise the annulus fibrosus using a number 11 scalpel **[2]**.
2.5.1. FILE: 67270_screenshot_2.5.1.mp4. 00:01-00:22
2.5.2. FILE: 67270_screenshot_2.5.2.mp4. 00:02-00:15

2.6. Then remove the nucleus pulposus with a Kerrison **[1]** and scrape the endplate cartilage using a bone rongeur to expose the bony endplate **[2]**.
2.6.1. FILE: 67270_screenshot_2.6.1.mp4 00:03-00:08,00:11-00:16
2.6.2. FILE: 67270_screenshot_2.6.2.mp4. 05:01-05:20

2.7. Sequentially dilate the intervertebral space with an intervertebral disc chisel **[1]** and flush with normal saline to achieve hemostasis **[2]**.
2.7.1. FILE: 67270_screenshot_2.7.1.mp4 03:01-03:12
2.7.2. FILE: 67270_screenshot_2.7.2.mp4 00:00-00:10

2.8. Use a bone rongeur to trim the excised articular processes and part of the lamina and create approximately 2 square millimeter bone fragments **[1]**. Pack some bone grafts into the cage **[2]**. ~~and place the remaining fragments into the intervertebral space **[3]**.~~ After placing the remaining fragments into the intervertebral space, position the cage centrally within the intervertebral space **[4]**.
2.8.1. Talent trimming bone to generate small fragments.
2.8.2. Talent packing bone grafts into cage.
2.8.3. ~~FILE: 67270_screenshot_2.8-(1).mp4.~~
NOTE: Footage not usable since it is in vertical format
2.8.4. Talent positioning cage centrally in the disc space.

2.9. After confirming the position of the intervertebral fusion device ~~by lateral and anteroposterior fluoroscopy **[1]**.~~ , use a neural stripper to probe the dural sac and nerve roots to confirm mobility, no compression, and absence of spinal canal stenosis **[1]**.
2.9.1. ~~SCOPE: Lateral and anteroposterior fluoroscopy image confirming cage position~~.
NOTE: Shot deleted since footage is not acceptable
2.9.2. FILE: 67270_screenshot_2.9.2.mp4. 00:16-00:21,00:40-00:51,

2.10. Now, flush the intervertebral space with saline solution **[1]**. Use 3-0 *(three-zero)* absorbable sutures to close the fascia layer with a locking technique **[2]**.
2.10.1. Talent flushing surgical site with saline.
2.10.2. Talent closing fascia using locking sutures.

2.11. Perform continuous suturing of the fat layer **[1]** and close the skin using either staples or sutures **[2-TXT]**.
2.11.1. Talent suturing fat layer continuously.

2.11.2. Talent closing skin with staples or sutures. **TXT: This procedure does not require the routine drainage placement**

2.12. Next, make a 1-centimeter incision at the projection sites of the pedicles above and below the target intervertebral space **[1]**. Under C-arm *(See-arm)* fluoroscopy, insert a sharp trocar needle through the skin to access the pedicle, ensuring precise positioning at the planned entry point **[2]**.
2.12.1. Talent making 1-centimeter incisions at pedicle sites.
2.12.2. Talent inserting trocar under C-arm fluoroscopy.

2.13. After confirming correct needle placement, use a small-diameter reamer to gradually enlarge the pedicular channel **[1]**. Using a dedicated guiding system, insert the pedicle screw and connecting rods, then tighten the screw caps **[2]**. Irrigate the incision with saline to ensure complete hemostasis **[3]**.
2.13.1. Talent using needle reamer to enlarge pedicular channel.
2.13.2. FILE: 67270_screenshot_2.13.2.mp4. 00:00-00:23
2.13.3. Talent irrigating incision with saline.

2.14. Use 3-0 absorbable sutures to close the incision layer by layer **[1]**. Cover the incision with a dressing **[2]** and check postoperative lower limb activity **[3]**.
2.14.1. Talent suturing incision in layers.
2.14.2. Talent covering wound with dressing.
2.14.3. Talent assessing lower limb movement.

Results

3. Representative Results

3.1. The mean operation time was significantly longer for multi-level surgeries compared to single-level surgeries **[1]**. Intraoperative blood loss was higher in multi-level procedures at 108.3 milliliters than in single-level procedures which was 62.5 milliliters **[2]**.

3.1.1. LAB MEDIA: Table 2. *Video editor: Highlight the row showing "Operation Time (min)"*

3.1.2. LAB MEDIA: Table 2. *Video editor: Highlight the row labeled "Intraoperative Blood Loss (mL)"*

3.2. Postoperative cross-sectional area values of the paraspinal muscles showed no significant difference between the decompression and contralateral sides **[1]**. Fat infiltration levels remained stable postoperatively, showing no significant difference on either decompression or contralateral sides **[2]**.

3.2.1. LAB MEDIA: Table 3. *Video editor: Highlight the "Postoperative" row and compare "CSA (mm²)" values for "Decompression Side" and "Contralateral Side".*

3.2.2. LAB MEDIA: Table 3. *Video editor: Please highlight post-operative rows*

3.3. MO-TLIF *(M-O-T-L-I-F)* procedure demonstrated minimal paraspinal muscle damage postoperatively **[1-TXT]**, with the cross-sectional area and fat infiltration remaining largely unchanged **[2]**.

3.3.1. LAB MEDIA: Table 4. **TXT: MO-TILF: Mini-Open Transforaminal Lumbar Interbody Fusion**
Video editor: Please highlight post-operative rows

3.3.2. LAB MEDIA: Table 3
Video editor: Please highlight CSA and FI values of post-operative rows

Pronunciation Guide:

1. Transforaminal
Pronunciation link:
https://www.merriam-webster.com/medical/transforaminal
IPA: /ˌtrænsfəˈræmɪnəl/
Phonetic Spelling: trans-fuh-RAH-muh-nuhl

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2. Interbody
Pronunciation link:
https://www.howtopronounce.com/interbody
IPA: /ˌɪntərˈbɑːdi/
Phonetic Spelling: in-ter-BAH-dee

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3. Fusion
Pronunciation link:
https://www.merriam-webster.com/dictionary/fusion
IPA: /ˈfjuːʒən/
Phonetic Spelling: FYOO-zhuhn

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4. Electrotome
Pronunciation link:
https://www.howtopronounce.com/electrotome
IPA: /ɪˈlɛktroʊˌtoʊm/
Phonetic Spelling: ih-LEK-troh-tohm

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5. Ligamentum flavum
Pronunciation link:

- Ligamentum: https://www.howtopronounce.com/ligamentum
- Flavum: https://www.howtopronounce.com/flavum

IPA:

- Ligamentum: /ˌlɪgəˈmɛntəm/
- Flavum: /ˈfleɪvəm/

Phonetic Spelling:

- Ligamentum: lig-uh-MEN-tuhm
- Flavum: FLAY-vuhm

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6. Dura mater
Pronunciation link:
https://www.merriam-webster.com/medical/dura%20mater
IPA: /ˈdʊrə ˈmeɪtər/
Phonetic Spelling: DOO-ruh MAY-ter

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7. Annulus fibrosus
Pronunciation link:
https://www.howtopronounce.com/annulus-fibrosus

IPA: /ˈæn.jʊ.ləs faɪˈbroʊ.səs/
Phonetic Spelling: AN-yuh-luhs fy-BROH-suhs

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8. Nucleus pulposus
Pronunciation link:
https://www.howtopronounce.com/nucleus-pulposus
IPA: /ˈnuː.kli.əs pʌlˈpoʊ.səs/
Phonetic Spelling: NOO-klee-uhs pul-POH-suhs

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9. Kerrison
Pronunciation link:
https://www.howtopronounce.com/kerrison
IPA: /ˈkɛrɪsən/
Phonetic Spelling: KER-ih-suhn

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10. Rongeur
Pronunciation link:
https://www.merriam-webster.com/medical/rongeur
IPA: /rɒnˈʒʊr/
Phonetic Spelling: ron-ZHOOR

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11. Fluoroscopy
Pronunciation link:
https://www.merriam-webster.com/dictionary/fluoroscopy
IPA: /flʊˈrɒskəpi/
Phonetic Spelling: floo-RAH-skuh-pee

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12. Trocar
Pronunciation link:
https://www.merriam-webster.com/medical/trocar
IPA: /ˈtroʊˌkɑr/
Phonetic Spelling: TROH-kar

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13. Pedicle
Pronunciation link:
https://www.merriam-webster.com/medical/pedicle
IPA: /ˈpɛdɪkəl/
Phonetic Spelling: PED-ih-kuhl

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14. Supraspinous
Pronunciation link:
https://www.howtopronounce.com/supraspinous
IPA: /ˌsuːprəˈspaɪnəs/
Phonetic Spelling: soo-pruh-SPY-nuhs

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15. Paraspinal

Pronunciation link:
https://www.howtopronounce.com/paraspinal
IPA: /ˌpærəˈspaɪnəl/
Phonetic Spelling: par-uh-SPY-nuhl