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Title: Full-Endoscopic Trans-Kambin Triangle Lumbar Interbody Fusion: Surgical Technique

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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. Interview statements: Which interview statement filming option is the most appropriate for your group? **Please select one.**

☒ Interviewees self-record interview statements. JoVE can provide support for this option.

3. Proposed interview filming date: Please indicate the proposed date that your group will self-film interviews: **30/06/2026**

When you are ready to submit your video files, please contact our Content Manager, [Utkarsh Khare](#).

Current Protocol Length

Number of Steps: 18

Number of Shots: 20

Interviews

INTRODUCTION:

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

- 1.1. **Masatoshi Morimoto**: Our work focuses on KLIF, a full endoscopic technique for safely fusing the lumbar spine through Kambin's triangle.

- 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. **Masatoshi Morimoto**: Existing lateral fusions risk psoas and vessel injury; KLIF instead accesses the disc through Kambin's triangle, avoiding those structures.

- 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. **Masatoshi Morimoto**: This protocol allows us to evaluate fusion success, slippage reduction, and neural decompression after minimally invasive endoscopic surgery.

- 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. **Takayuki Kitahara**: The main challenge during this procedure is foraminoplasty, which creates a twelve-millimeter safety window to insert the cage without damaging the exiting nerve root.

- 1.4.1. INTERVIEW: Named talent says the statement above in an interview-style shot, looking slightly off-camera *Suggested B roll; 2.4.2*

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

1.5. **Takayuki Kitahara:** Future studies can extend KLIF to multilevel fusion and integrate navigation or robotic assistance to further improve accuracy and safety.

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

Ethics Title Card

This research has been approved by the Ethics Committee of Tokushima University Hospital

Protocol

NOTE: The script is drafted using available footage

Video editor: Use a title card to show the given information

Perform the following steps:

- Preoperative preparation and patient positioning
- Percutaneous pedicle screw (PPS) placement
- Endoscopic approach to Kambin's triangle

2. Foraminoplasty: Expanding the Safety Window

Demonstrator: Masatoshi Morimoto

2.1. To begin, insert the endoscope with a 25- or 30-degree viewing angle into the cannula under continuous saline irrigation [1].

2.1.1. LAB MEDIA: Step_4-1_endoscope_insertion__S1010015__00-00_00-15.MP4: 00:00-00:15

2.2. Using a bipolar radiofrequency probe, clear soft tissues on the surface of the superior articular process and identify the exiting nerve root located cranially and ventrally [1].

2.2.1. LAB MEDIA: Step_4-2_RF_soft_tissue_removal__endo__43-00_44-00.MP4: 00:09-00:17, 00:45-00:56

2.3. Then, insert a high-speed endoscopic drill equipped with a 3-millimeter diameter diamond burr through the working channel [1].

2.3.1. LAB MEDIA: Step_4-3_drill_insertion__endo__45-00_45-30.mp4

2.4. Drill the ventral aspect of the superior articular process to widen Kambin's triangle, with the high-speed drill typically set to 64,000 rpm and equipped with a 3-millimeter diamond burr [1]. Continue drilling until the distance between the remaining facet bone and the exiting nerve root is at least 12 millimeters [2].

2.4.1. LAB MEDIA: Step_4-4_SAP_drilling_64000rpm__endo__48-20_49-20.mp4: 00:12-00:22, 00:29-00:33, 00:46-00:54

2.4.2. LAB MEDIA: Step_4-5_12mm_rule_check__endo__64-30_65-30.MP4: 00:10-00:30

3. Disc Preparation and Expansion

- 3.1. Once the 12-millimeter safety window is confirmed, remove the endoscope while leaving the oblique cannula in place [1].
 - 3.1.1. LAB MEDIA: Step_5-1_to_5-6_dilator_to_Sguide__S1010015__01-00_03-30.mp4; 00:10-00:17
- 3.2. Insert the pencil dilator into the cannula and loosen the temporarily tightened set screws of the percutaneous pedicle screw system [1].
 - 3.2.1. LAB MEDIA: Step_5-1_to_5-6_dilator_to_Sguide__S1010015__01-00_03-30.mp4; 00:27-00:36
- 3.3. Under anteroposterior and lateral fluoroscopic guidance, advance the pencil dilator to the center of the disc by tapping it with a mallet. Confirm that the disc height is distracted by the pencil dilator [1].
 - 3.3.1. LAB MEDIA: Step_5-1_to_5-6_dilator_to_Sguide__S1010015__01-00_03-30.mp4; 00:41-00:50 and Figure 4D
- 3.4. Insert the initial cannula into the disc along the pencil dilator. Then temporarily tighten the set screws to hold the distracted height [1].
 - 3.4.1. LAB MEDIA: Step_5-1_to_5-6_dilator_to_Sguide__S1010015__01-00_03-30.mp4; 03:05-03:08, 03:24-03:33.
- 3.5. Using a rongeur through the cannula, remove as much residual disc fiber as possible from inside the disc [1].
 - 3.5.1. LAB MEDIA: Step_5-1_to_5-6_dilator_to_Sguide__S1010015__01-00_03-30.mp4; 03:44-04:00
- 3.6. Insert the safe guide wire into the disc. Remove the oblique cannula while leaving the safe guide wire in place [1].
 - 3.6.1. LAB MEDIA: Step_5-1_to_5-6_dilator_to_Sguide__S1010015__01-00_03-30.mp4; 05:55-06:00
- 3.7. Assemble the 8 by 10-millimeter distractor and T-handle. Pass the assembled distractor through the safe guide wire to expand the disc height [1] and loosen the set screws that were temporarily tightened [2].
 - 3.7.1. LAB MEDIA: Step_5-7_to_5-9_distractor_to_OpenSquareCannula__S1010015__04-00_06-00.mp4: 00:00-00:11, 00:30-00:33
 - 3.7.2. LAB MEDIA: Step_5-7_to_5-9_distractor_to_OpenSquareCannula__S1010015__04-00_06-00.mp4: 00:58-01:00.
- 3.8. Next, rotate the distractor 90 degrees to vertically expand the intervertebral disc space and facilitate reduction of the vertebral slippage [1].

3.8.1. LAB MEDIA: Step_5-7_to_5-9_distractor_to_OpenSquareCannula__S1010015__04-00_06-00.mp4: 01:17-01:22

3.9. Then, tighten the set screws to fix the distracted position once the disc height is expanded and the vertebral slippage is reduced [1].

3.9.1. LAB MEDIA: Step_5-7_to_5-9_distractor_to_OpenSquareCannula__S1010015__04-00_06-00.mp4: 01:24-01:37

4. Bone Grafting and Cage Insertion

4.1. Prepare the autologous bone graft harvested from the iliac crest or the allograft bone substitute [1].

4.1.1. LAB MEDIA: Step_6-1_bone_graft_prep__S1010014__00-00_00-30.mp4: 00:12-00:24

4.2. Insert the bone funnel into the open square cannula. Using the bone tamp and a mallet, fill the anterior and lateral disc space with the bone graft material [1].

4.2.1. LAB MEDIA: Step_6-2_bone_funnel_grafting__S1010016__06-00_07-00.mp4: 00:03-00:06, 00:44-00:50

4.3. Under anteroposterior and lateral fluoroscopic guidance, insert the expandable cage into the disc space [1].

4.3.1. LAB MEDIA: Step_6-4_cage_insertion__S1010016__09-00_10-00.mp4: 00:19-00:24, 00:42-00:48 and figure 5E and F

4.4. Then, expand the cage to the desired height to properly restore the intervertebral disc height and foraminal height [1].

4.4.1. LAB MEDIA: Step_6-5_cage_expansion__S1010016__10-00_11-00.mp4: 00:31-00:55 and Figure 5G

4.5. Confirm the final cage position and expansion height fluoroscopically, followed by final cage fixation and wound closure [1].

4.5.1. LAB MEDIA: Step_6-6_final_fluoroscopic_confirmation__S1010016__11-30_12-00.mp4; 00:10-00:20

Results

5. Results

- 5.1. Preoperative X-ray and MRI demonstrated L4 anterior slippage and severe central stenosis at the L4 and L5 level [1].
 - 5.1.1. LAB MEDIA: Figure 6A-D.
 - 5.1.2. LAB MEDIA: Figure 6A-D.
- 5.2. Postoperative imaging confirmed successful cage placement and reduction of the slippage [1]. MRI demonstrated effective decompression of spinal canal stenosis [2].
 - 5.2.1. LAB MEDIA: Figure 7A, B.
 - 5.2.2. LAB MEDIA: Figure 7A, B.
 - 5.2.3. LAB MEDIA: Figure 7C, D.
- 5.3. The surgical wounds were minimal, demonstrating the minimally invasive nature of the procedure [1].
 - 5.3.1. LAB MEDIA: Figure 8.