



## Analysis of Clinical Results of Three Different Routes of Percutaneous Endoscopic Transforaminal Lumbar Discectomy for Lumbar Herniated Disk

Hyeun Sung Kim<sup>1</sup>, Farid Yudoyono<sup>1,2</sup>, Byapak Paudel<sup>1,3</sup>, Ki Joon Kim<sup>1</sup>, Jee Soo Jang<sup>1</sup>, Jeong Hoon Choi<sup>1</sup>, Sung Kyun Chung<sup>1</sup>, Jeong Hoon Kim<sup>1</sup>, Il Tae Jang<sup>4</sup>, Seong Hoon Oh<sup>5</sup>, Jae Eun Park<sup>4</sup>, Sol Lee<sup>4</sup>

■ **OBJECTIVE:** Percutaneous endoscopic transforaminal lumbar discectomy (PETLD) can be performed by using foraminal, intervertebral, and suprapedicular routes. The aim of this study was to assess clinical results of three different routes of PETLD.

■ **METHODS:** One hundred eleven patients who underwent PETLD between January 2016 and October 2016 were included in this study. PETLD was performed using the foraminal (group A), intervertebral (group B), and suprapedicular (group C) routes in 32, 46, and 33 patients, respectively. Outcomes were evaluated using the visual analogue scale (VAS), Oswestry Disability Index (ODI), and MacNab criteria.

■ **RESULTS:** Seventy-one men and 40 were women (mean age  $53.33 \pm 14.12$  years). The mean follow-up period was  $6.44 \pm 3.26$  months. The preoperative VAS score decreased significantly ( $P < 0.01$ ) in all 3 groups, but the postoperative VAS score was higher for the foraminal route than for the intervertebral ( $P = 0.001$ ) and suprapedicular routes ( $P < 0.001$ ). Excellent outcome grade according to MacNab criteria was less in foraminal route (18.7%) than in intervertebral (52.2%) and suprapedicular (56.7%) routes. ODI improved significantly ( $P < 0.01$ ) in all 3 groups.

■ **CONCLUSION:** All 3 routes of PETLD resulted in good to excellent clinical results. Nevertheless, the postoperative VAS score was higher for the foraminal route than for the intervertebral and suprapedicular routes, probably not because of the surgery but because of the neurologic

characteristics of the disk location. The surgeon should consider this problem to alleviate pain postoperatively and counsel to patient well before surgery.

### INTRODUCTION

Chronic back pain and back-related leg pain are commonly associated with lumbar disk herniation (LDH). Epidemiologic studies reported that with the increasing aging population, the number of patients with LDH and degenerative disk disease has also increased.<sup>1,2</sup> Conventional open discectomy and lumbar interbody fusion remain the standard management technique for LDH; however, they require prolonged hospital stays and recovery periods.<sup>2</sup> Since the posterolateral nucleotomy technique was introduced by Kambin and Gellman, it has undergone remarkable development. Percutaneous endoscopic transforaminal lumbar discectomy (PETLD) based on the Kambin's triangle has been used recently as an alternative technique to conventional open discectomy with increased rate of satisfactory results.<sup>3-6</sup>

To our knowledge, no study has assessed the clinical outcome of 3 routes of PETLD. This study assessed comparative clinical outcome of LDH treated by foraminal, intervertebral, and suprapedicular routes via a percutaneous transforaminal out-and-in approach.

### MATERIALS AND METHODS

We retrospectively evaluated data for 111 patients who underwent PETLD during January 2016 to October 2016. The patients were divided into 3 groups according to PETLD route as follows:

#### Key words

- Foraminal route
- Intervertebral route
- Lumbar disk herniation (LDH)
- Percutaneous endoscopic transforaminal lumbar discectomy (PETLD)
- Suprapedicular route

#### Abbreviations and Acronyms

- CT:** Computed tomography  
**LDH:** Lumbar disk herniation  
**MRI:** Magnetic resonance imaging  
**ODI:** Oswestry Disability Index  
**PETLD:** Percutaneous endoscopic transforaminal lumbar discectomy  
**VAS:** Visual analogue scale

From the <sup>1</sup>Department of Neurosurgery, Nanoori Suwon Hospital, Suwon, Korea; <sup>2</sup>Department of Neurosurgery, Hasan Sadikin Hospital, College of Medicine, Padjadjaran University, Bandung, Jawa Barat, Indonesia; <sup>3</sup>Grande International Hospital, Kathmandu, Nepal; <sup>4</sup>Department of Neurosurgery, Nanoori Hospital, Seoul, Korea; and <sup>5</sup>Department of Neurosurgery, Nanoori Incheon Hospital, Incheon, Korea

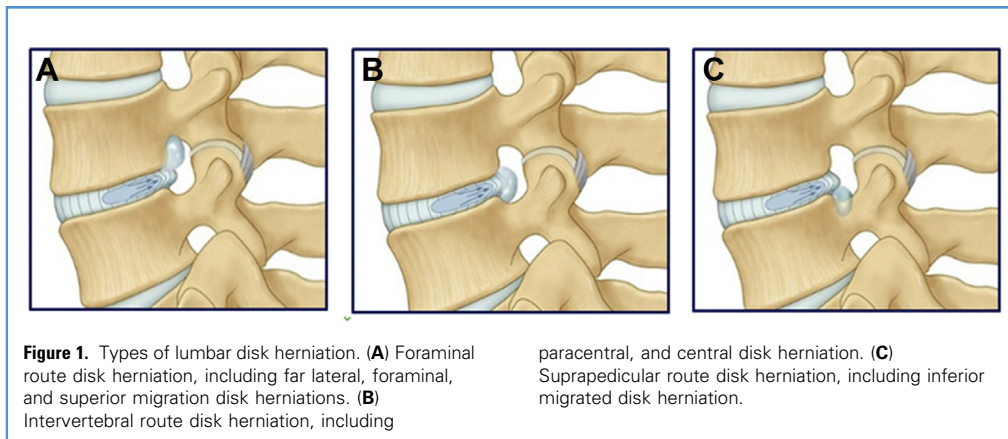
To whom correspondence should be addressed: Farid Yudoyono, M.D.  
 [E-mail: faridense@gmail.com; faridspine@gmail.com]

Citation: *World Neurosurg.* (2017) 103:442-448.  
<http://dx.doi.org/10.1016/j.wneu.2017.04.008>

Journal homepage: [www.WORLDNEUROSURGERY.org](http://www.WORLDNEUROSURGERY.org)

Available online: [www.sciencedirect.com](http://www.sciencedirect.com)

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foraminal route (group A), intervertebral (group B), and suprapedicular route (Group C; **Figure 1**). Illustrative figures for 3 routes of PETLD are shown in **Figures 2 and 3**

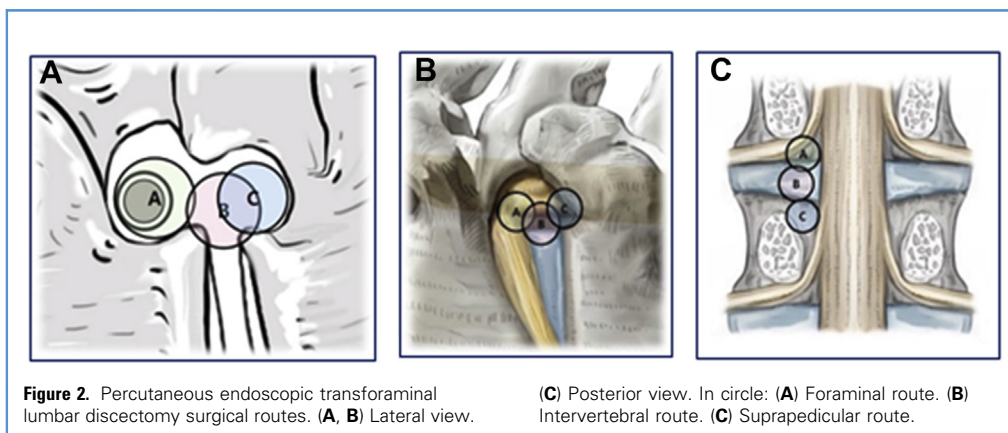
X-ray imaging, computed tomography (CT), and magnetic resonance imaging (MRI) were done in all cases to confirm diagnosis and to rule out other pathologies. The findings demonstrated on the CT and MRI scans were correlated with the neurologic examination.

The indications for PETLD were as follows: 1) unilateral or bilateral radicular leg pain, single- or double-level LDH, as demonstrated on CT scan and MRI, and 2) failure of conservative therapies for at least 4 weeks, including medication, physiotherapy, nerve root block, and others. The exclusion criteria were definitive segmental instability in dynamic radiographs, spondylolisthesis more than grade I, combination with severe spinal stenosis, combination with infectious disease, and less than 4 weeks of conservative therapy. All patients underwent post-operative MRI after 4 hours for assessment of radiologic surgical success of PETLD and as a reference MRI for future to distinguish new disc herniation from the recurrence.

### Operative Techniques

The patient was placed in the prone position on a radiolucent table and was given a prophylactic antibiotic before the operation.

The operation was performed using a conscious local anesthetic state induced by using an initial injection of 7–10 mL of 1% lidocaine during needle insertion in the foraminal space and a second booster injection of 2–4 mL of 1.6% lidocaine (8 mL 2% lidocaine plus 2 mL saline plus 0.05 mL epinephrine) 4–5 minutes after the initial injection. To avoid injuries to exiting and traversing nerve roots during the approach, the operation proceeded with continuous feedback from the patient. Fluoroscopic guidance was used to identify the intervertebral disk space. The skin entry point was marked at the midline of the disk space. An 18-gauge spinal needle was inserted at the point using the manual back muscle assessment method (**Figure 4**), approximately 12–14, 10–12, 8–10, and 6–8 cm away from the vertebral midline at L4–L5, L3–L4, L2–L3, and L1–L2 levels, respectively, with an approximately 25–45-degree angle. After passing through the fascia and back muscle, the needle was docked at Kambin's triangle, near the intervertebral disk. After checking the free epidural space with contrast dye injection (Iobrix injection; Taejoon Pharm, Seoul, Korea), a needle was inserted in the discal space, and discography was performed using 0.8% indigo carmine (Carmine, Korea United Pharmaceutical, Yoenki, Korea) mixed with contrast. A guide wire was inserted through the needle, and the needle was removed. Through the inserted guide wire, an obturator was inserted in Kambin's



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