

# Training system of percutaneous endoscopic lumbar discectomy in China

De-Hong Yang

Department of Spinal Surgery, Nanfang Hospital, Southern Medical University, Guangzhou 510515, Guangdong, China.

**Correspondence to:** Dr. De-Hong Yang, Department of Spinal Surgery, Nanfang Hospital, Southern Medical University, Guangzhou 510515, Guangdong, China. E-mail: drmyang@yahoo.com

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Dr. Yang is the chief physician and professor in Department of Spinal Surgery, Nanfang hospital, South Medical University, Guangdong Province, China. He obtained MD in the 4th Military Medical University in Xi'an, China and PhD degree in Southern Medical University in Guangdong, China. From 2002 to 2007, He was a visiting scholar at Massachusetts General Hospital & Harvard Medical School and he was employed as a staff (instructor) in Harvard University in 2007. His research interests are minimal invasive spinal surgery, degenerative spine disease and osteoporosis.

Percutaneous endoscopic lumbar discectomy (PELD) is by far the most minimally invasive technique for lumbar disc herniation. The small incision, short recovery time, relatively low cost and low surgical morbidity make this technique attractive for both doctors and patients. However, the technique is still unfamiliar to doctors, even those with many years of experience in spine surgery. In brief, the core of this technique is “placing the working cannula in right location and forceping out the herniated disc” based on our own experience. However, surgeons, especially beginners, sometimes get “lost” in their operations, which can result in complications such nerve damage, disc fragment left over, etc.

For many surgeons, the PELD technique is challenging to learn because the training process is different

from open surgery. In the open operation, the close collaboration between responsible and assistant doctors gives the assistant a lot of opportunities to practice during the operation. PELD operation is an one person performance, the forcep holder deal with everything and assistant does not have any real practice. However, once the beginner stands by the patient and holds the instruments, he has to rely mostly on himself. Consequently, the initial learning process is a technical challenge that it is thought to be insurmountable for some surgeons. The slow learning curve, long hands-on training time, together with insufficient training source, discourages doctors to adopt PELD technique. Therefore, quite a few doctors chose open surgery rather than PELD to treat lumbar disc herniation, because they were more confident with their open surgery techniques instead of PELD.



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After two decades of developing the surgical approach and visible technique, Yeung<sup>[1]</sup> introduced his “inside-out” technique (YESS) with a rigid rod-lens, water flow-integrated, and multichannel spinal cannula that combined a camera, light and the working channel together. He introduced this technique into China in 1997. More doctors in China began to learn the YESS technique, and they began to practice this technique more routinely. They became mentors for other surgeons in China who wanted to learn the technique. In 1999, Hoogland *et al.*<sup>[2]</sup> started a new technique of a lateral transforaminal approach to the spinal canal (THESSYS). The THESSYS technique was introduced to China in 2007<sup>[3]</sup>. After mastering the PELD technique, surgeons began to spread this technique, and a formal training system was soon developed.

Before the PELD training program, minimally invasive spinal surgery workshops involving MED technique appeared in China as early as 2004. In 2007, PELD technique was introduced in seminars. In 2010, PELD cadaver workshop advertisements appeared in meeting notices. Currently, more than 20 seminars were held in China annually. As other surgical technique trainings, the training of PELD for Chinese doctors was in two stages. The first consisted of training abroad in which pioneers were educated abroad and returned to their home country to start practice. The second was training at home in which overseas returnees introduced PELD technique and held workshops to spread the techniques. For a surgeon without a background in endoscopic surgery, seminar, cadaver workshop and hands on practice are the stepwise way to learn the technique. The important areas that help the surgeon to understand the PELD technique include a clear understanding of the anatomical structure and image pictures, accurate judgment of different tissue under endoscopy, and correct 3D positional imprints. Therefore, training and learning are heavily focused on these three aspects.

For a typical training class, teaching modules generally include an introduction of PELD technique, working cannula placement, endoscopic performance, and pitfalls that might be encountered. After lectures, cadaver workshop let each attendee practice the working cannula insertion and practice operations under endoscopy. An operation demonstration with instant explanation would come before or after workshop. Then, before practicing operations on patients, an intensive watching and hands-on operations needs to be finished. Many surgeons have expressed interest in attending a mid-career training program to focus on the PELD technique. They would have an opportunity to get hands-on operation training

during that period. In addition, some physicians have expressed a desire to invite experts to their local hospitals in order to have hands on demonstrations.

Chinese teachers have invented a couple of methods to boost the learning<sup>[4]</sup>. They guide the trainees to combine X-ray, magnetic resonance imaging and computed tomography images to 3D models to help the trainees build 3D images. The learning curve is 60 operations for the surgeon to be skilled to perform PELD<sup>[5]</sup>. In a transforaminal approach, the L4/5 technique was easier to master than L5/S1<sup>[6]</sup>.

In order to standardize the application of minimal invasive spinal surgery in China, a Spinal Endoscopic Diagnosis and Treatment Management Standards (edition 2013) was established by National Health and Family Planning Commission in 2013<sup>[7]</sup>. It established detailed requirements for medical institutions, doctors and ancillary staff. It also set the standard for endoscopic diagnosis and treatment. Most importantly, the detailed requirements of medical education and training bases for spinal endoscopic activities were clearly defined. The education bases must be:

1. Class 3A ranked hospitals;
2. No less than 10 years experience in spinal diseases treatment, with grade 4 (highest) surgical ability to perform spinal endoscopic activities; no less than 1,500 spinal cases were surgically treated in the past 3 years, and 50 cases of endoscopic operations annually;
3. No less than 2 doctors have grade 4 spinal endoscopic surgery ability, and at least 1 is a consultant doctor;
4. The institution fulfills the entire requirement including staffs, techniques, instruments and facilities;
5. The institution has held national spinal endoscopy meeting or finished national continuing medical education program.

After establishment, it served as a solid protocol, but updates are absolutely required, especially as more and more doctors obtained the ability to perform good PELD.

In China, physicians not working in spinal surgery units have performed the PELD technique in treating lumbar disc herniation. It is difficult to determine the training qualifications of the doctors who perform PELD in pain clinics. An Internet search of renowned physicians in the Pain department with their showed that some doctors switched from the Orthopedic Department and some had switched from the Anesthesia Department. In the beginning, they all received training from an orthopedist and now they collaborate with spine orthopedist to open training programs. The Association of Chinese Spine

Pain and Minimal Invasive Technique was established in 2016 and provided a new communication platform for all kind of doctors who performed PELD technique.

Although progress has been achieved, short-term training programs were still not enough for attendees to start practicing PELD. Even after a couple of training classes, many doctors were hesitant to undertake their first operation. This reason can be summed up by the Chinese expression: “easy when watching and hard while doing”. In the future, the training system should focus on “hands on” practice in the operating room.

The PELD technique has become more and more widely accepted by doctors and patients. New indications for the procedure include: spinal canal stenosis, infections, and tumors. In addition, new instruments have been developed. Systematic training or re-training of surgeons is necessary. First, the trainees need to be classified according their background and experience on endoscopic practice. For example, spinal surgeons are familiar with anatomical structure of lumbar spine and more skilled in handling possible pitfalls whereas anesthetists are familiar with punctures. Some doctors come to learn from how to perform the technique and others come to resolve problems in their practice. Accordingly, the teaching methods and courses need to fulfill the different expectations. Second, training system needs to be focused on both quantity and quality. Besides short-term training, trainees and trainers should also focus on long-term hands on clinical training. Third, training needs to be separated into basic and advanced stages. Two types of training facilities should be established. Certificated regional training center focused on short-term training including lecture, cadaver practice and operation observation. Certificated clinics focused on hands-on training. Fourth, the old protocol needs to be revised. Strict rules should be applied to standard certification

system to guide the training facilities and to make sure only qualified doctors perform PELD.

## DECLARATIONS

### Authors' contributions

D.H. Yang contributed solely to the paper.

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### Conflicts of interest

There are no conflicts of interest.

### Patient consent

Not applicable.

### Ethics approval

Not applicable.

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