



US Musculoskeletal Review

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Transforaminal Endoscopic Surgery in Lumbar Disc Herniation in an Economic Crisis—The TESSYS Method

a report by

Menno Ipreburg¹ and Alexander Godschalx²

*1. Orthopaedic Surgeon; 2. Anesthesiologist and Pain
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Endoscopic lumbar disc surgery has dramatically changed over the past 10 years. Smaller incisions, fewer complications, and quicker return to work are increasingly important issues in a world where an economic crisis is going on. Patients want to get back to work fast, because they do not want to lose their jobs. In The Netherlands, which has a population of 16 million, the cost of lumbar radicular syndrome (LRS) is estimated at approximately €1.3 billion every year. Medical costs account for the smallest portion of this total amount. In his study, Ruetten¹ came to the conclusion that mean post-operative work disability in the full-endoscopic group was 25 days versus 49 days in the

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microscopic group ($p < 0.01$). Considering the large number of spine surgeons who took part in the first Minimally Invasive World Spine Congress in Hawaii in June 2008 and again at the International Society for Minimal Intervention in Spinal Surgery (ISMISS) Congress in Las Vegas, there is rapidly growing interest in minimally invasive spine surgery. This kind of procedure has been proved to be a reliable treatment for several spine disorders.

In the 1970s, Kambin^{2,3} and Hijikata⁴ started to use specially designed cannulas to perform percutaneous dorsolateral nucleotomy, with a reported satisfactory outcome in 75% of their patients. Later, Yeung,⁵ Knight,⁶ Ahn,⁷ Hoogland,⁸⁻¹¹ and others¹²⁻²³ have used more laterally located entrance points with the help of smaller-caliber rod lens fiber optics.

A lateral transforaminal endoscopic entrance is used for the removal of intervertebral herniated disc material. This entrance is less traumatic for the patient than the usual dorsal approach. This method allows access to all herniated discs, except the dorsally dislocated ones. Although the technique is more difficult at the beginning—most surgeons being used to operating on patients who are in the prone position—the author prefers the lateral position. The advantages of the lateral position are reduced intra-abdominal pressure (especially in obese patients) and subsequently less bleeding, and a bigger safety zone because, due to gravity, the dura falls to the opposite side. Both the surgeon and the anesthetist have a better view of the patient, operated on under local

anesthesia and analgo-sedation, and this position enables them to appreciate possible pain reactions more effectively. With flexed hips there will be less lordosis, enabling easier access. The Lasègue test can be carried out intraoperatively and the patient can be asked to move his/her leg freely to see whether the pain can still be evoked.

Operating Technique

Positioning the patient well is essential: with the help of the image intensifier, it must be possible to view the spine in two directions (anteroposterior and lateral) at an angle of exactly 90°. Confirmation of the position of the annular tear, protrusion, and/or sequestered disc material can be obtained by intraoperative discography. Depending on the patient's posture, a line is drawn 14–15 cm from the center of the back in case of a herniation at the L5–S1 level; for the L4–5 and L3–4 levels, the line is 1 cm and 2 cm lower, respectively. Local anesthesia is administered at the entrance site. The needle is set and its position is checked by means of the image intensifier. A guiding wire is placed in the needle after the correct position has been reached. Next, the first conical rod is introduced over the guiding wire and, consequently, the first, second, and third conical tubes are introduced in order to stretch the soft-tissue parts. The second and third conical tubes are then removed and the first reamer is brought in counter-clockwise.

Checking the image intensifier throughout, reaming is carried out up to 1 or 2 mm medially from the medial interpedicular line, then the first reamer, conical tube, and rod are removed. The guiding wire remains

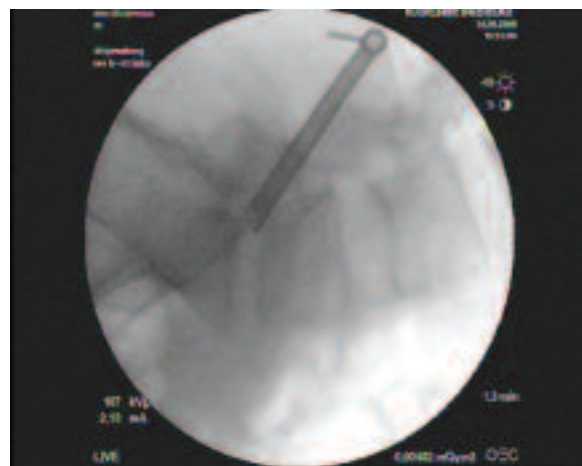
A comparison of the endoscopic transforaminally operated patients with the microscopically operated ones in the Swedish study showed a statistically significantly better result for the endoscopic transforaminally operated group.

in place under all circumstances. For the patient, the first reaming is often the most painful. Over the guiding wire, a second conical rod is introduced up to the required level, then the second conical tube and the second reamer. The same applies for the third conical rod, tube, and reamer.

Figure 1: Position of the Working Cannula in Anteroposterior View in a L5–S1 Case



Figure 2: Lateral View of the Same Case as Shown in Figure 1



The patient is asked to tell the surgeon if he or she experiences pain under the knee in the case of L4–5 and L5–S1 herniations (see *Figure 3*). Sometimes some pain is felt in the greater trochanter region during reaming, or even some radiating pain in the proximal lateral upper leg. Usually, however, the patient is comfortable and able to have a conversation with the anesthesiologist (vocal anesthesia); excellent co-operation with the anesthesiologist is essential. The guiding wire and the third conical tube are removed and the working cannula can then be introduced over the third conical rod. Its tip should be located on the hernia. The image intensifier is used to check the position of the working cannula (see *Figure 4*). The foraminoscope can now be introduced and the hernia removed. Sometimes a large sequester can be wholly removed immediately, but in most cases the ‘crabmeat’ of the degenerated intervertebral disc has to be taken out with a small pair of tongues and rongeurs—and a lot of patience. Intraoperatively, the patient can be asked to move his or her leg to test whether the pain has gone. The Lasègue test can also be carried out.

After removing the hernia, the working cannula is taken out and the skin is closed with an intracutaneously dissolving stitch. The patient is usually able to leave the clinic two hours after the operation.

Figure 3: Endoscopic Disc Operation of Patient in Lateral Position



In August 2004 the author began using the transforaminal endoscopic technique. The approach has been developed by Dr Thomas Hoogland, Munich, in co-operation with JoiMax in Karlsruhe, Germany.

Up to December 2008, approximately 560 transforaminal endoscopic procedures have been performed, the first 217 in the Wilhelmina Hospital in Assen and the rest in Spine Clinic Ipreburg in Heerenveen/Veenhuizen, The Netherlands.

In the first six months of 2008 we conducted a retrospective study of 255 consecutive patients undergoing single-level transforaminal endoscopic discectomy. The follow-up period in the transforaminal operated group was 12–42 months. The purpose of this study was to compare clinical results with the results of the One-year Report of the Swedish National Spine Register²⁴ of microscopic discectomies.

Results

The follow-up period in the transforaminally operated group was 12–42 months. Up to the beginning of July 2008, the response rate was 62%. The majority of the surgeries were performed at the L4–5 and L5–S1 levels. During the first 80 endoscopic operations, the recurrence rate was 11%.²⁵ The overall recurrence rate after gaining experience was 6.6% in

the total group of 255 patients. The final Oswestry disability score was 13.4 ± 16.7 , the Roland disability score was 22 ± 2.8 , the visual analog scale (VAS) for back pain was 14.2 ± 16.8 , the VAS for leg pain was 13.7 ± 20.1 , and the Eurocol score was 0.87 ± 0.17 .

Five patients were re-operated on microscopically, and 12 endoscopically. One patient was converted to a microscopic operation due to pain. Two patients complained of headaches due to a dural tear. One patient had a transitory foot drop and three had a transitory sensibility disturbance of the foot. No infection, thrombosis, hematoma, or permanent nerve damage was observed.

The VAS scores for back and leg pain, walking distance and patient satisfaction in the endoscopic series were compared with the Swedish microscopic series and were statistically significantly better ($p=0.031$, $p=0.021$, $p<0.001$, and $p<0.001$, respectively).

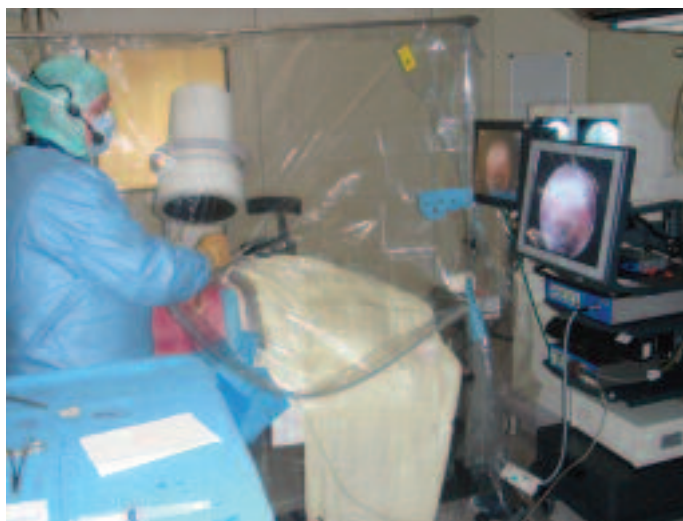
Conclusions

A comparison of the endoscopic transforaminally operated patients with the microscopically operated ones in the Swedish study showed a statistically significantly better result for the endoscopic transforaminally operated group with regard to VAS back and leg pain, walking distance, and patient satisfaction. In the endoscopic transforaminally operated group, at the final follow-up 75% had a VAS back pain and 72% a VAS leg pain score below 20mm, 75% were satisfied, and 92% could walk freely. These percentages were higher in comparison with the data from the Swedish registry.

The learning curve is steep. Outcomes improve with continued surgical experience. With a careful operating technique and local anesthesia and analgo-sedation, the complication rate is low. In an economic crisis, patients can resume their jobs more quickly after endoscopic surgery.

Of course more, and preferably prospective, studies should be executed. Recently, two good articles were published in *Spine* concerning endoscopic

Figure 4: Theatre Set-up



discectomy: the above-mentioned randomized controlled trial from Ruetten¹ and a cohort evaluation of 262 consecutive cases in recurrent disc herniation from Hoogland.²⁶

At the moment we are developing a stand-alone web-based research program for prospective studies. Patients will complete questionnaires pre- and post-operatively on the Internet, and the surgeon will add physical examination results, diagnosis, and surgical findings. An analysis module will enable the individual surgeon to examine his/her own results using the results of his/her colleagues as a benchmark. ■

Reprint Citation: *Ipreburg M, Godschalst A, Transforaminal Endoscopic Surgery in Lumbar Disc Herniation in an Economic Crisis—The TESSYS Method, US Musculoskeletal Review, 2008; 3 (2) 47–49*

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