

CASE REPORT

Percutaneous Endoscopic Lumbar Discectomy for a Huge Herniated Disc Causing Acute Cauda Equina Syndrome : A Case Report

Subash C. Jha^{1,2}, Ichiro Tonogai¹, Yoichiro Takata¹, Toshinori Sakai¹, Kosaku Higashino¹, Tetsuya Matsuura¹, Naoto Suzue¹, Daisuke Hamada¹, Tomohiro Goto¹, Toshihiko Nishisho¹, Takahiko Tsutsui¹, Yuichiro Goda¹, Mitsunobu Abe¹, Kazuaki Mineta¹, Tetsuya Kimura¹, Akihiro Nitta¹, Shingo Hama¹, Tadahiro Higuchi¹, Shoji Fukuta¹, and Koichi Sairyo¹

¹Department of Orthopedics, Tokushima University, Tokushima, Japan, ² Department of Orthopedics and Traumatology, Kathmandu University Hospital, Dhulikhel, Nepal

Abstract : Microsurgery for lumbar disc herniation that requires surgical intervention has been well described. The methods vary from traditional open discectomy to minimally invasive techniques. All need adequate pre-anesthetic preparation of patients as general anesthesia is required for the procedure, and nerve monitoring is necessary to prevent iatrogenic nerve injury. Conventional surgical techniques sometimes require the removal of the corresponding lamina to assess the nerve root and herniated disc, and this may increase the risk for posterior instability of the vertebral body. Should this occur, fusion surgery may be needed, further increasing morbidity and cost. We present here a case of lumbar herniated disc fragments causing acute cauda equina syndrome that were endoscopically resected through a transforaminal approach in an awake patient under local anesthesia. Percutaneous endoscopic discectomy under local anesthesia proved to be a better alternative to open back surgery as it made immediate intervention possible, was associated with fewer perioperative complications and morbidity, minimized soft tissue damage, and allowed early rehabilitation with a better outcome and greater patient satisfaction. In addition to these advantages, percutaneous endoscopic discectomy protects other approaches that may be needed in subsequent surgeries, whether open or minimally invasive. *J. Med. Invest.* 62 : 100-102, February, 2015

Keywords : percutaneous endoscopic discectomy, cauda equina syndrome, local anesthesia

INTRODUCTION

Cauda equina syndrome is one of the very few real emergency conditions in spine pathology. Earliest possible diagnosis and prompt intervention will achieve the best possible outcome (1). Management of the syndrome frequently involves surgical decompression. If undertaken within 48 h of symptom onset, the risk of long-term neurological damage will be reduced (2). If the etiology is a herniated disc, the surgical technique may vary, ranging from open minimally invasive to percutaneous endoscopic discectomy.

We present here a case of percutaneous endoscopic lumbar discectomy (PELD) using a transforaminal approach under local anesthesia for a newly diagnosed case of acute cauda equina syndrome due to a herniated disc at the L4-L5 level. This case highlights an effective treatment option for cauda equina syndrome due to a herniated disc in which symptoms were promptly relieved intraoperatively and the patient was actively involved ; thus, fully utilizing the benefits of advances in endoscopic techniques (3).

CASE REPORT

A 36-year-old woman presented with a 1-month history of low back pain and radiating pain to the left lower limb with numbness.

Received for publication November 26, 2014 ; accepted December 25, 2014.

Address correspondence and reprint requests to Koichi Sairyo, MD, PhD, Department of Orthopedics, Tokushima University 3-18-15 Kuramoto, Tokushima 770-8503, Japan and Fax : +81-88-633-0178.

On physical examination, there was no right side weakness, but on the left side the straight leg raising test (SLRT) was positive at 40 degrees and muscle strength of both the tibialis anterior (TA) and extensor hallucis longus (EHL) was reduced to 2/5 on manual muscle testing (MMT). Hypoesthesia (3/10) in the left L5 dermatome was also noted. The working diagnosis was lumbar disc herniation at L4-L5 with left L5 radiculopathy. She was referred for magnetic resonance imaging (MRI) and percutaneous endoscopic discectomy, but she chose to seek a second opinion. One week later, she presented to the emergency department with more severe low back pain radiating to the bilateral lower limbs, numbness, saddle anesthesia, bilateral lower limb weakness, and bladder dysfunction. On examination, her SLRT on the right side was positive at 60 degrees and on the left side was 40 degrees. Bilateral lower extremity TA, EHL, and flexor hallucis longus (FHL) strength on the MMT was reduced to 2/5. Hypoesthesia (3/10) was noted in the L5-S5 dermatomes bilaterally, along with saddle anesthesia. MRI showed a massive herniated disc at L4-L5 that had migrated caudally causing severe compromise of the spinal canal (Figure 1). The preoperative diagnosis was a herniated L4-L5 disc leading to acute cauda equina syndrome. She emergently consented to transforaminal percutaneous endoscopic discectomy under local anesthesia at L4-L5, from the left side, keeping in mind that if any difficulty were encountered, an inter-laminar procedure might be required.

The patient was positioned prone on a standard spine frame. The optimum location for cannula insertion was determined before surgery to be 8 cm left of midline on computed tomography and MRI (4, 5). After adequate painting and draping, 1% lidocaine was used for local anesthesia under C-arm guidance (4). Intravenous

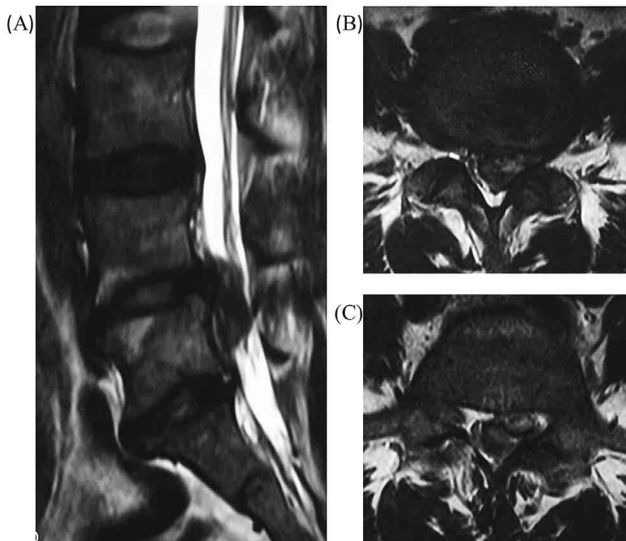


Figure 1 : Preoperative magnetic resonance imaging. Sagittal (A) and axial T2-weighted images showing a huge extruded herniated nucleus pulposus (HNP) at the L4-L5 disc level (B), with the HNP caudally migrated at the L5 pedicle level (C).

pentazocin was given for mild sedation, and the level of anesthetic was titrated so that patient was able to communicate with the surgeon throughout the procedure.

The Wolf endoscope system was used for the procedure. Using anterior-posterior and lateral fluoroscopy, a needle was advanced to the L4-L5 disc space. Safe access to the herniated nucleus pulposus was made through Kambin's safety triangle following a walking technique between the exiting L4 nerve root and the traversing L5 nerve root (4-6). Discography was conducted with indigo carmine to dye the nucleus pulposus and herniated mass blue. In this procedure, the annulus fibrosus remains white and the epidural space remains red due to the presence of vessels. A guide pin was inserted into the disc through a puncture wound, and the obturator and cannula were inserted sequentially through the 8 mm skin incision. After cannula insertion, an endoscope with an optical angle of 25 degrees was inserted to visualize the fragment at the base of the herniated mass, which was then removed piece by piece. Then, following an inside-out and hand down technique, the cannula was moved toward the epidural space, where the herniated mass was removed (4). The beveled end of the working cannula was also used as a nerve root retractor. The pulsation of the dural tube indicated adequate decompression (4). During the operation, on the table, after removal of the herniated disc, the patient reported prompt relief of her symptoms, with no further pain in the bilateral lower extremities. Motor power improved in the right lower extremity, as did sensation around the perineum (i.e. saddle anesthesia ; S3-5 dermatomes).

She had significant improvement in her symptoms immediately following surgery. Complete motor and sensory improvement in the right lower extremity was noted with full recovery from saddle anesthesia. Only left foot drop with TA of 3/5 and EHL of 2/5 on the MMT and left L5 dermatome hypoesthesia of 3/10 persisted for many days, and we did not therefore expect immediate recovery. Immediate postoperative MRI showed significant decompression with some remnant disc material (Figure 2). Thus no additional surgery was advised, but to rather wait and watch. At the 6-week and 3-month follow ups, she had experienced no recurrence of symptoms and had a Japanese Orthopedic Association score (7) of 28 ; motor and sensory symptoms were normalized in bilateral lower limbs. At 3 months, MRI showed complete resolution of the residual herniated disc (Figure 3).

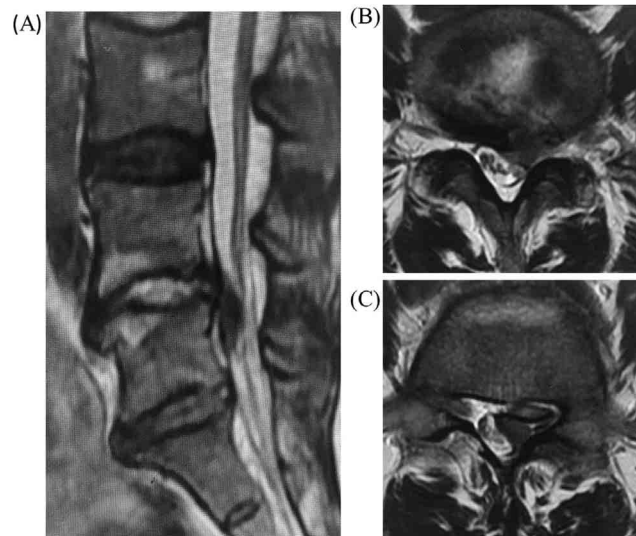


Figure 2 : Postoperative magnetic resonance imaging 1 day after percutaneous endoscopic discectomy.

Sagittal (A) and axial T2-weighted images showing a marked decrease in size of the herniated nucleus pulposus with decompression on the right side, despite some remnant disc at the L4-L5 disc level (B) and the L5 pedicle level (C).

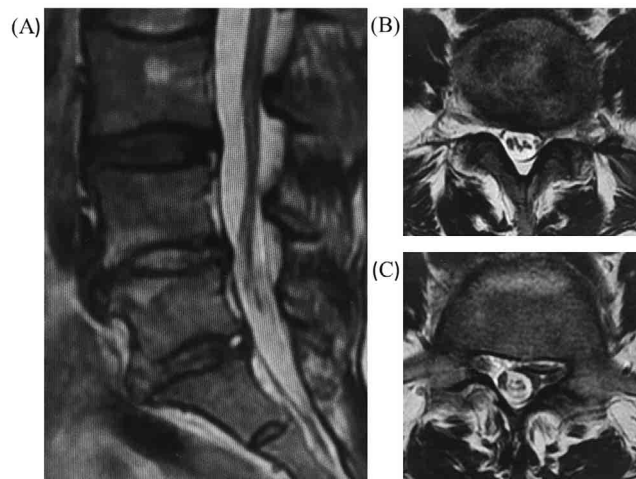


Figure 3 : Postoperative magnetic resonance imaging 3 months after percutaneous endoscopic discectomy.

Sagittal (A) and axial T2-weighted images showing complete resolution of the herniated nucleus pulposus at the L4-L5 disc level (B) and L5 pedicle level (C).

DISCUSSION

With advancements in surgical equipment and procedures, different techniques have been developed to meet patients' wishes and surgical techniques are becoming more sophisticated and result-oriented. Recent orthopedic surgical approaches take the soft tissues more into account, and surgical approaches have been transformed from open to minimally invasive in order to minimize damage to soft tissue structures. This concept has made the evolution of PELD more promising (8-11).

To date, percutaneous endoscopic discectomy is the most minimally invasive approach to lumbar disc pathology. Broadly, three different surgical approaches have been described for this procedure : the transforaminal, far lateral, and interlaminar approaches (3, 5, 12, 13). The most beneficial aspect of this technique is that

we can perform most surgeries under local anesthesia with the patient awake so that we can continuously communicate with the patient to monitor operative improvement or deterioration of symptoms on the table. This decreases the chance of iatrogenic nerve root injury while accessing the disc and performing decompression (4, 5). As highlighted in the present case, intervention can be performed emergently as routine pre-anesthesia preparation is not required, unlike in more conventional methods (5, 14).

Before introduction of the PELD technique, conventional methods for spinal canal decompression ultimately caused more soft tissue violation and even bone resection (4). This heightened the risks for postoperative instability, which in turn increased the risks for posterior spinal fusion rate as well as morbidity and rehabilitation needs. During open surgery, the nerve root has to be retracted medially, which increases the possibility of nerve paralysis; in transforaminal percutaneous endoscopic discectomy only the splitting of muscle is done, entry is through the safety triangle as it does not require bone resection, and this affords a quick start to rehabilitation, improving the postoperative course (9-11). All these features, plus the fact that the postoperative scar is only 8 mm, which further enhances its acceptability (4), contribute to better functional and emotional outcomes for patients.

Complications such as nerve root injury, dural tear, intracranial hypertension, major vessel injury, and surgical site infection can occur during and after percutaneous endoscopic discectomy with a transforaminal approach (4). Patients should be properly counselled about recurrent disc herniation and operative failure, for which they may require the same or another procedure in the future (4, 5, 12, 15).

CONCLUSION

Central disc herniation and extruded huge disc fragments can now be effectively managed under local anesthesia even in emergency condition such as acute cauda equina syndrome (4-6, 14).

ACKNOWLEDGEMENTS

The authors declare that there are no conflicts of interest in relation to the article.

REFERENCES

- Gardner A, Gardner E, Morley T : Cauda equina Syndrome : a review of current clinical and medicolegal position. *European Spine Journal* 20(5) : 690-697, 2010
- Ahn UM, Ahn NU, Buchowski JM, Garrett ES, Sieber AN, Kostuik JP : Cauda Equina Syndrome secondary to lumbar disc herniation : a meta-analysis of surgical outcomes. *Spine* 25(12) : 1515-1522, 2000
- Ruetten S, Komp M, Merk H, Godolias G : Use of newly developed instruments and endoscopes : full-endoscopic resection of lumbar disc herniation via the interlaminar and lateral transforaminal approach. *J Neurosurg Spine* 6 : 521-530, 2007
- Sairyo K, Egawa H, Matsuura T, Takahashi M, Higashino K, Sakai T, Suzue N, Hamada D, Goto T, Takata Y, Nishiho T, Goda Y, Sato R, Tsutsui T, Tonogai I, Kondo K, Tezuka F, Mineta K, Sugiura, Takeuchi M, Dezawa A : State of the art : Transforaminal approach for percutaneous Endoscopic lumbar discectomy under local anaesthesia. *J Med Invest* 61(3-4) : 217-225, 2014
- Hirano Y, Mizuno J, Takeda M, Itoh Y, Matsuoka H, Watanabe K : Percutaneous endoscopic lumbar discectomy-Early clinical experience. *Neurol Med Chir (Tokyo)* 52 : 625-630, 2012
- Jasper GP, Francisco GM, Telfeian AE : Endoscopic transforaminal discectomy for an extruded lumbar disc herniation. *Pain Physicia* 16(1) : E31-35, 2013
- Minamide A, Yoshida M, Yamada H, Nakagawa Y, Kawai M, Maio K, Hashizume H, Iwasaki H, Tsutsui S : Endoscope-assisted spinal decompression surgery for lumbar spinal stenosis. *J Neurosurg Spine* 19(6) : 664-671, 2013
- Hijikata S : Percutaneous nucleotomy. A new concept technique and 12 years experience. *Clin Orthop Relat Res* 283 : 9-23, 1989
- Yeung AT : The evolution of percutaneous spinal endoscopy and discectomy : state of the art. *Mt Sinai J Med* 67 : 327-332, 2000
- Yeung AT, Tsou PM : Posterolateral endoscopic excision of lumbar disc herniation : Surgical technique, outcome, and complication in 307 consecutive cases. *Spine* 27 : 722-731, 2002
- Yeung AT, Yeung CA : Minimally invasive technique for management of lumbar disc herniation. *Orthop Clin North Am* 38(3) : 363-372, 2007
- Ruetten S, Komp M, Merk H, Godolias G : Recurrent lumbar disc herniation after conventional discectomy : a prospective, randomized study comparing full-endoscopic interlaminar and transforaminal versus microsurgical revision. *J Spinal Disord Tech* 22(2) : 122-129, 2009
- Lew SM, Mehalic TF, Fagone KL : Transforaminal percutaneous endoscopic discectomy in the treatment of far-lateral and foraminal lumbar disc herniation. *J Neurosurg* 94(2 Suppl) : 216-220, 2001
- Choi G, Lee SH, Raiturker PP, Lee S, Chae YS : Percutaneous endoscopic interlaminar discectomy for intracanalicular disc herniation at L5-S1 using a rigid working channel endoscope. *Neurosurgery* 58(1 Suppl) : ONS59-68, 2006
- Ruetten S, Komp M, Godolias G : An extreme lateral access for the surgery of lumbar disc herniation inside the spinal canal using the full-endoscopic uniportal transforaminal approach-technique and prospective results of 463 patients. *Spine* 30 : 2570-2578, 2005