

CASE REPORT

Successful full-endoscopic decompression surgery under local anesthesia for L5 radiculopathy caused by L5-S foraminal stenosis and L4-5 lateral recess stenosis : A case report

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Abstract : In this report, we presented a 65 year-old male case having right leg pain due to L5 radiculopathy. Based on the radiological examination including CT, MRI and radiculography, double crash impingement of L5 nerve root due to L4-5 lateral recess and L5-S foraminal stenosis was diagnosed. Because of the strong pain, he could not work anymore. His job was a general manager of big hospital, he needed to return to job as soon as possible. We decided to conduct the full-endoscopic decompression surgery of ventral facetectomy (FEVF) for L4-5 lateral recess stenosis and foraminoplasty (FELF) for L5-S foraminal stenosis. The technique can be done under the local anesthesia with only 8 mm skin incision; thus, it must be the least invasive spine surgery. Soon after the surgery, he could return to the original job as a general manager. In conclusion, the full-endoscopic decompression surgery for the spinal canal stenosis such as FELF and FEVF would be minimally invasive procedure and it enable patients the quick return to the original activity. *J. Med. Invest.* 67: 192-196, February, 2020

Keywords : foraminal stenosis, lateral recess stenosis, minimally invasive surgery, full-endoscopic lumbar foraminoplasty, full-endoscopic ventral facetectomy

INTRODUCTION

The trans-foraminal full-endoscopic lumbar discectomy (TF-FED) technique was developed in the beginning of this century (1, 2). In 2003, Dezawa introduced the surgical technique in Japan (3). The FED was initially indicated for herniated nucleus pulposus (HNP). The TF-FED technique has been developing recently with the invention of the ultra-thin high speed surgical drill (4, 5, 6). Full-endoscopic lumbar foraminoplasty (FELF) is the second stage following the TF-FED with using the high-speed drill for enlargement of the foraminal stenosis of the lumbar spine (7, 8, 9, 10). Moreover, full-endoscopic ventral facetectomy (FEVF) is the advanced technique of the FELF (11, 12). The lateral recess stenosis can be decompressed under the local anesthesia with the FEVF. These full-endoscopic procedures require only an 8-mm skin incision and damage of the paravertebral muscles would be minimum, they would be the least invasive spinal surgery at present.

We presented, here, a case having a L5 nerve root impingement due to both of L4-5 lateral recess and L5-S foraminal stenosis. He was treated with decompression surgery by using FEVF at L4-5 and FELF at L5-S under local anesthesia. Nowadays, for such pathology, facetectomy and fusion would be a gold standard (13), and we could avoid the fusion surgery using TF-FED technique minimally invasively.

CASE PRESENTATION

A 65-year-old man presented with a 3-month history of pain on the lateral aspect of the right lower leg and pain on the dorsal aspect of the right big toe. His symptom gradually got deteriorated, and he consulted a local doctor. Initially, he was treated conservatively; however, the strong pain persisted and could not work. He was referred to our department for further examination and possible minimally invasive surgery, because he could not take a longer sick leave due to his position to be manager of a big hospital. On physical examination, there was no muscle weakness on the both sides on manual muscle testing (MMT). There was no left side weakness, but on the right side, the straight leg raising test (SLRT) was positive at 80 degrees, and kemp sign was positive not on left side but on right side. Deep tendon reflex (DTR); patella tendon reflex (PTR) and Achilles tendon reflex (ATR) were normal on both sides. The diagnosis was the right L5 radiculopathy due to both of lumbar lateral recess stenosis with disc herniation at L4-5 and lumbar foraminal stenosis at L5-S based on the results of CT images in Figure 1 and MRI in Figure 2. We performed a right L5 selective nerve root block with 1% xylocaine following radiculography. The contrast medium indicates the L5 nerve root compression at L4-5 lateral recess and L5-S foraminal area as shown Figure 3. He got a reproductive pain on the lateral aspect of the right lower leg and the dorsal aspect of the right big toe.

We suspected that the main cause of his symptom was right L5 radiculopathy due to the L4-5 lateral recess stenosis and right L5-S foraminal stenosis; double crush syndrome of right L5 nerve root. It was a good case for full-endoscopic lumbar foraminoplasty (FELF) and ventral facetectomy (FEVF), and we planed right L5-S FELF at first.

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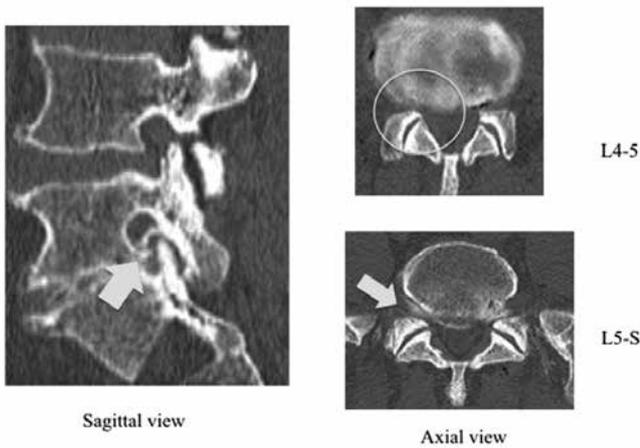


Figure 1 Computed tomography (CT) scans with discography at L5-S before surgery. Arrows indicate right foraminal stenosis at the level of L5-S. Circle indicates right lateral recess stenosis at L4-5.

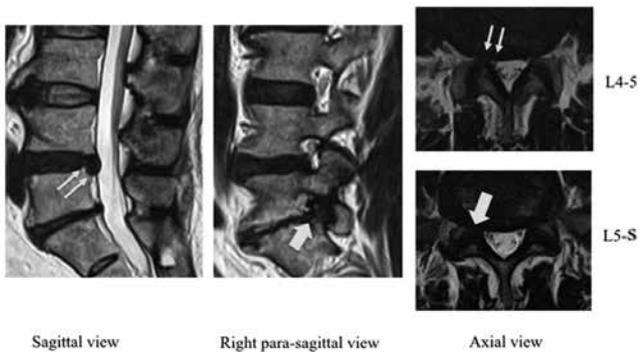


Figure 2 Magnetic resonance images (MRI) before surgery. The panel on the left shows a sagittal view, small arrows indicate the herniated nucleus pulposus at L4-5, and it is compressing the right L5 nerve root. The panel in the center shows a right para-sagittal view; big arrow indicates right foraminal stenosis at the level of L5-S. On the axial view, lateral recess stenosis at L4-5 (small arrows) and foraminal stenosis at L5-S (big arrow) is noted.

• L5 radiculograph



Figure 3 Radiculographic findings

Surgical technique

The FELF at the right L5-S level was conducted under the local anesthesia. The patient was positioned prone on a standard spine frame. The optimum location for cannula insertion was determined before the surgery to be 6 cm right of the midline on CT images. After adequate painting and draping, 1% xylocaine was used for local anesthesia under C-arm guidance. After administration of local anesthesia around the entry point, we conducted an intraoperative discography with using a mixture of indigo carmine and contrast medium. We inserted a guide wire through the spinal needle after insertion of a spinal needle into the disc under C-arm. After which, the needle was removed.

We made an 8 mm skin incision and inserted the tapered cannulated obturator along with a cannula into the right L5-S foraminal area. After that, the endoscope was inserted into the foraminal space. By using a high-speed drill, we performed foraminoplasty for the narrow foramen and lateral recess; the width between L5 pedicle and S1 pedicle of the sacrum. We could find the right L5 root was decompressed (Figure 4). Then, we removed the endoscope and cannula and closed the wound. There were no surgery-related complications. The next day, it disappeared his pain on the dorsal aspect of the right big toe, and he slightly felt numbness on the same lesion. His right big toe pain was improved; however, he felt strong pain on the right lower leg pain in long distance walking.

Two months later after the right L5-S FELF, we performed L4-5 FEVF; we carefully resected the ventral side of the superior articular process of the L5 using a high-speed drill. After we found L5 nerve root was decompressed (Figure 5), the blue-stained slightly bulging nucleus pulposus of the L4-5 intervertebral disc was exposed. We removed it by using small forceps and a radiofrequency wave system; inside-out technique (Figure 5). He got an adequate decompression by removing of the ventral aspect of the superior articular process of the L5.

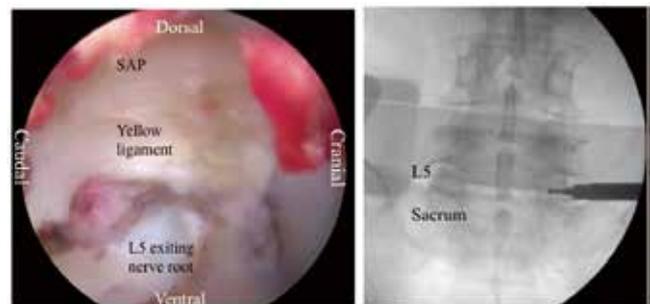


Figure 4 L5-S foraminal decompression. Left panel shows arthroscopic findings of right L5-S foraminal decompression. L5 exiting nerve root was sufficiently decompressed after removing superior articular process (SAP) and yellow ligament. Right panel shows fluoroscopic view of foraminal decompression using high speed drill.



Figure 5 L4-5 lateral recess decompression
Left panel shows arthroscopic findings of right L4-5 lateral recess decompression. L5 traversing nerve root was sufficiently decompressed after removing superior articular process (SAP) and yellow ligament. Right panel shows arthroscopic findings that right L5 traversing nerve root was sufficiently decompressed after removing blue stained herniated nucleus pulposus.

Postoperative course

Immediately after the operation, his right lower leg pain almost disappeared. One hour later, he started walking without any leg pain. During and after the surgery, there was no complication such as exiting nerve root injury, dural tear, hematoma and so on. Postoperative course was uneventful. Six months had passed since he underwent FEVF, we evaluated the effective of the FEVF by using modified Macnab's criteria. The result was excellent ; no pain and no restriction of activity. On the CT scans taken before and after the surgery, the area of the foraminoplasty, indicating the foraminal widening, is clearly seen in Figure 6 and 7. The intervertebral foramen (Figure 6) and lateral recess (Figure 7) were completely decompressed. Figure 8 demonstrates MRI before and after the surgery. It indicates the decompression at L4-5 and L5-S.

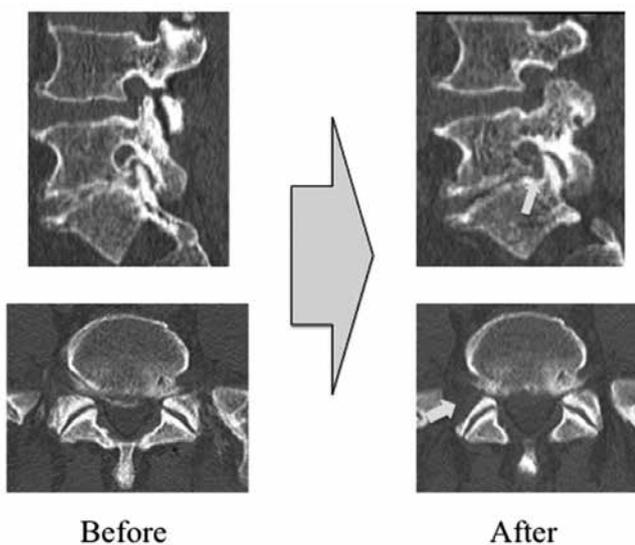


Figure 6 Computed tomography scans before and after the full-endoscopic lumbar foraminoplasty at the level of right L5-S. Arrows indicate the area of the foraminoplasty, indicating the foraminal widening, is clearly seen.

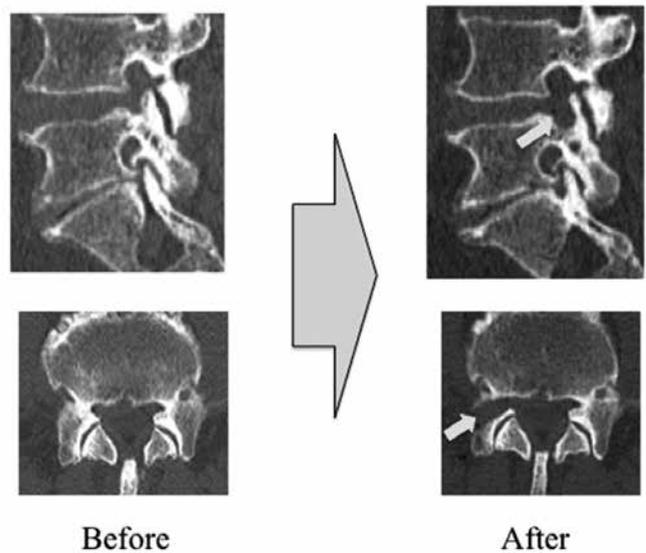


Figure 7 Computed tomography scans before and after the full-endoscopic ventral facetectomy at the level of right L4-5. Arrows indicate the area of the foraminoplasty, and the sufficient decompression of the right foramen and lateral recess at L4-5 ; ventral aspect of superior articular process of the L5.

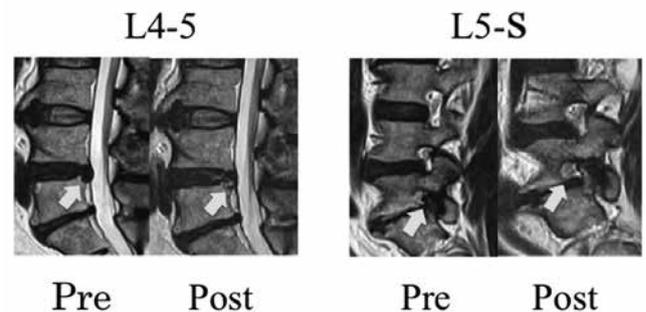


Figure 8 Magnetic resonance images before and after the surgery. Arrows indicate the removal of the herniated nucleus pulposus at L4-5 by the surgery. In the right para-sagittal view, arrow indicates the sufficient decompression of the right foramen at L5-S, and the right L5 nerve root is clearly confirmed.

DISCUSSION

In this case report, we described the usage of full-endoscopic technique to treat a patient with right L5 radiculopathy due to the degenerative changes. The main symptom in this patient was the pain on the lateral aspect of the right lower leg and on the dorsal aspect of the right big toe. On radiological examinations, we detected two factors, namely, right L4-5 lateral recess stenosis with lumbar disc herniation and right L5-S foraminal stenosis. For this condition, spinal decompression and arthrodesis at L5-S would be the gold standard (13).

If this patient would undergone fusion surgery, he may need to have longer sick. Since he was a top manager of the big hospital, and he needed to return to his job as soon as possible. This time, we selected full-endoscopic decompression surgery under the local anesthesia. After the full-endoscopic surgery, one may be able to return to the original job within 1 week (14). Indeed, 1

week after the initial surgery, he was somehow able to return to the job. After the initial surgery, lower leg pain persisted, we decided FEVF for the lateral recess stenosis at L4-5. After the second surgery, all pain disappeared; then, he could have full return to his manager job.

For his pathology, we used two kinds of the advanced full-endoscopic technique such as FELF and FEVF. FELF is the enlargement decompression surgery of the foraminal stenosis of the lumbar spine using trephine and/or the high speed drill. Yeung and Gore (7) performed FELF in 30 patients under local anesthesia and reported that mean visual analogue pain score improved from 7.2 preoperatively to 4.0 postoperatively. Ahn *et al.* (8) reported at least 80% of 35 patients with foraminal stenosis treated by TF-FELF procedure got excellent or good clinical results with Macnab's criteria. Similarly, in our patient, the pain on the dorsal aspect of the right big toe immediately improved. One more technique is the FEVF for the lateral recess stenosis (11, 12). During the FEVF surgery, decompression of the lateral recess would be made following the foraminal widening. In our patient, the lower leg pain immediately disappeared following the FEVF.

The strongest benefits of FELF and FEVF are that these procedures can be performed in an awake and aware state under the local anesthesia and direct injury to the exiting nerve root can be avoided; same as FED procedure. Previously, the foraminal stenosis and lateral recess stenosis are typically required general anesthesia. Symour and Vaz *et al.* (15) post-surgical complications (atelectasis, acute bronchitis, pneumonia, delirium and so on) are about 60% of cases in 288 cases in the surgeries under general anesthesia aged over 65 years old. The population is rapidly aging year by year, and the elderly; who would be combined with general multimorbidity, often falls in these degenerative lumbar spinal stenosis. FELF and FEVF procedure can be applied to the poor general condition's patients and reduce the risk of the postoperative complications.

The biggest concern with regarding to the surgical outcome would be an arise of instability and spondylolisthesis. FELF and FEVF requires removal of the superior articular process (SAP). Especially in FEVF, it requires complete removal of the SAP; therefore, spinal instability is a possible surgery-related complication. Kashima *et al.* (16) evaluated the contribution of the SAP to the facet contact area as the SAP facet contact area (%) of the total facet joint, because the entire SAP is removed during FEVF. Even in such the situations, nearly half of the facet contact could be maintained in the vertebral body of the lower intervertebral levels after the FEVF. Moreover, preservation of facet contact after FEVF could be promising in degenerated spine with disc collapse. Based on this information, Sairyo *et al.* (11,12) in cases of young patients and/or higher lumbar levels, FEVF would contraindicate because of possible instability after the operation. We plan to follow up this patient very carefully for any arise of instability of the lumbar spine. Actually, in our case, even after the SAP resection and decompression of the lateral recess, facet contact area was remained as shown in Figure 5.

CONCLUSION

In conclusion, we have successfully treated foraminal stenosis at right L5-S and lateral recess stenosis at L4-5 with herniated nucleus pulposus at L4-5; double crush syndrome of right L5 nerve root, in an awake and aware patient using a minimally invasive FELF and FEVF technique without fusion under local

anesthesia. We could avoid fusion surgery and send him to the original job soon after the surgery.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

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