Combined Approach for Far-Lateral Lumbar Disc Herniation

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Abstract

This study evaluated the combination of the classical interlaminar approach and the intertransverse route through a midline approach for the treatment of 18 patients with far-lateral lumbar disc herniations, as identified by magnetic resonance imaging. The patients presented with acute severe sciatica, antalgic posture, positive Lasègue sign and femoral stretch test, motor and sensory deficits, and reflex loss findings. Discectomy of all 18 patients was performed by the combined approach. Neurological outcome of all patients was excellent in the follow-up period, ranging from 5 to 8 years. This combined midline approach permits complete evacuation of the involved disc level and treatment of additional bone resection procedures. Therefore, we advocate this approach in far-lateral lumbar disc herniation cases.

Key words: combined intertransverse-interlaminar approach, far-lateral lumbar disc herniation

Introduction

Routine use of computed tomography (CT) and magnetic resonance (MR) imaging techniques can now solve the diagnostic problems of far-lateral lumbar disc herniation (FLLDH), and allow discussion of the advantages of various surgical approaches.4,5,17) The far-lateral space may be exposed either through the paramedian intermuscular intertransverse15,16,20) or the midline approach.2,7,8,12,24) Medial facetectomy, complete facetectomy, or intertransverse routes together with fenestration by classical interlaminar discectomy can provide access to the far lateral space in cases of FLLDH.2,7,8,12,24) The present study describes the advantages of the combined midline approach,12,24) which is a combination of the classical interlaminar and the intertransverse approaches.

Clinical Materials and Methods

I. Patient population

Eighteen patients, seven males and 11 females aged from 43 to 67 years (mean 59 years), underwent surgery for FLLDHs among a series of 900 patients with lumbar disc herniation between December 1994 and December 1997. These 18 procedures corresponded to 2% of all lumbar spinal disc herniations recorded during that period at the Neurosurgery Department of Taksim State Hospital. The same surgeon (T.B.) treated all 18 patients. The motor power, sensory deficit, reflex change, and Lasègue sign and femoral stretch test results were recorded by two of the authors preoperatively and postoperatively. Continuous pain restricting the daily activity of the patient without additional neurological deficit was accepted as the clinical sign of spinal instability at the postoperative period. The patients were examined postoperatively after 1, 6, and 12 months, and in December 2002 for evaluation of their final neurological status. All patients manifested acute severe sciatica and antalgic posture. Lasègue sign and femoral nerve stretch tests were positive in seven and 14 of the patients, respectively. Ten patients suffered from motor deficit and reflex loss, and all patients had sensory deficit of the dermatome of the involved radix (Table 1). The preoperative diagnosis was based on MR imaging in all patients. In addition, preoperative CT was obtained for 10 patients. The mean period between the onset of the complaints and the operation was 3.2 months. FLLDHs were detected at the L4-5 intervertebral space in nine, at the L3-4 space in seven, and at the L5-S1 space in two patients.
Table 1  Preoperative findings and final postoperative results of the patients (postoperative 5 to 8 years)

<table>
<thead>
<tr>
<th>Level</th>
<th>No. of cases</th>
<th>Motor deficit</th>
<th>Sensory deficit</th>
<th>Reflex loss</th>
<th>Lasègue sign</th>
<th>Femoral stretch test</th>
</tr>
</thead>
<tbody>
<tr>
<td>L3-4</td>
<td>7</td>
<td>4</td>
<td>—</td>
<td>7</td>
<td>—</td>
<td>4</td>
</tr>
<tr>
<td>L4-5</td>
<td>9</td>
<td>5</td>
<td>—</td>
<td>9</td>
<td>—</td>
<td>5</td>
</tr>
<tr>
<td>L5-S1</td>
<td>2</td>
<td>1</td>
<td>—</td>
<td>2</td>
<td>—</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 2  Results of the preoperative and postoperative examination in the 1st, 6th, and 12th months, and at 5–8 years

<table>
<thead>
<tr>
<th>Neurologic complaint</th>
<th>Preop.</th>
<th>Postop.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1st month</td>
<td>6th month</td>
</tr>
<tr>
<td>Motor deficit</td>
<td>10</td>
<td>6</td>
</tr>
<tr>
<td>Sensory deficit</td>
<td>18</td>
<td>improved in 3</td>
</tr>
<tr>
<td>Reflex loss</td>
<td>10</td>
<td>improved in 3</td>
</tr>
<tr>
<td>Lasègue sign</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>Femoral stretch test</td>
<td>14</td>
<td>9</td>
</tr>
</tbody>
</table>

II. Operative technique

Skin incision is made longer than the usual classical interlaminar approach (= 8 cm) to overcome the retraction of the paravertebral muscles for exposing the intertransverse space. The lumbodorsal fascia is detached bluntly from the attachment to the spinous processes. The paravertebral muscles of the involved level are dissected subperiosteally from the spinous processes and laminae, and are further retracted laterally over the facet joint.

The transverse processes, cranial and caudal to the facet joint, are palpated and exposed through the superolateral and inferolateral sides of the joint. The operating microscope is used for the following procedures. The degenerated disc space is confirmed through the fenestration and ligamentum flavectomy. The virtual transverse line of the disc level can be followed to identify the location of the far-lateral space. Approaching laterally, the intertransverse fascia extending between the transverse processes is incised. The ruptured disc fragment is generally situated at the exit of the neural foramen and superior to the spinal radix. After removal of the sequestrated disc fragment through the intertransverse route, the whole disc space is evacuated through the previously prepared fenestration window by approaching medially (Fig. 1).

Fig. 1 Drawing illustrating the operative view of the combined approach. The L-3 and L-4 nerve roots pass through the same level (L3-4 intervertebral disc space, dotted line). The L-3 root is compressed by the far-lateral lumbar disc herniation (arrow) and the L-4 root courses through the medial side of the facet joint.

Results

The postoperative hospitalization period ranged from 3 to 7 days. The final neurological examination performed at postoperative 5 to 8 years revealed complete resolution of the Lasègue sign and femoral stretch tests in all patients. Motor and sensory deficits disappeared in all patients, and reflex losses improved in 10 patients (Table 2). Postoperative MR imaging was performed after 1 or 6 months. No patient suffered spinal instability or required for reoperation for recurrence.

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Illustrative Cases

Case 1: A 56-year-old woman presented with acute, severe left sciatica, and antalgic posture persisting for 6 weeks. Pain was provoked by coughing and physical effort. Neurological examination revealed loss of patellar reflex and quadriceps femoris weakness on the left. Lasègue sign and femoral stretch test were positive on the left. Sensory deficit was detected in the left L-3 dermatome. Lumbar CT and MR imaging revealed FLLDH on the left side at the L3-4 intervertebral space (Fig. 2A, B). The patient was operated through the combined approach. Following the operation, the patient was neurologically intact but decreased left patellar reflex persisted at follow-up examination after 8 years. Postoperative MR imaging showed complete removal of the disc material (Fig. 2C).

Case 2: A 39-year-old woman presented with acute severe right sciatica after lifting a heavy object 3 weeks previously. Lasègue sign and femoral stretch test were positive on the right. She had antalgic posture and sensory deficit involving the right L-4 spinal nerve root. The motor power and reflexes were normal. MR imaging revealed FLLDH on the right side at the L4-5 intervertebral space (Fig. 3A, B). A sequestrated disc fragment was removed through the right intertransverse midline approach, and the disc space was evacuated through the fenestration. Her complaints were completely resolved by the 4th postoperative day, and MR imaging obtained after 4 weeks revealed no compressing mass at the
L4-5 space (Fig. 3C). The patient was neurologically intact 5 years after the operation.

Discussion

FLLDH accounts for 0.7–11.7% of all lumbar disc herniations. The association of centrolateral or foraminal disc herniations with FLLDH is responsible for the high incidence of FLLDH. The incidence of FLLDH was 2% in this study. FLLDH generally affects the high lumbar levels. The most commonly involved level is the L4-5 intervertebral space, followed by the L3-4 and L5-S1 spaces. FLLDH at the L4-5 and L3-4 spaces accounts for 85% of all reported cases. Similarly, our study found a predilection for the L4-5 (9 cases) and L3-4 spaces (7 cases) rather than the L5-S1 space (2 cases). The mean age of patients with FLLDH is generally higher than that of those with posterolateral herniation, ranging from 44 to 65 years as in the current study.

Classic posterolateral disc herniation affects the nerve root or one level below, whereas FLLDH affects the corresponding exiting nerve root located at the same level. Since FLLDH more often compromises the upper lumbar nerve roots, the femoral nerve stretch test is often positive, as in 78% of the cases in this study. Positive Laségue sign is generally less common, and is mainly caused by FLLDH at the L5-S1 intervertebral space, with an incidence of 10% to 53% in different series involving all lumbar levels. The total number of FLLDH cases at the L5-S1 space was not greater than 7% with uncommon positive Laségue sign. In our series, Laségue sign was positive in seven cases (39%). Compression of the nerve root and ganglion causes severe pain and antalgic posture. Sphincter deficit is present in 4% of cases, but no such finding was present in our series.

CT and MR imaging are the main diagnostic modalities for FLLDH. Lumbar myelography is inadequate to detect FLLDH. Preoperative MR imaging now demonstrates FLLDH clearly, and was used for the follow up in our patients.

Complete facetectomy has been recommended both for decompression of the spinal canal and exploration of the intervertebral foramen. Although facetectomy is recommended as a suitable route for removal of the sequestrated disc fragment and discectomy, it may result in instability in some cases. Biomechanical studies on unilateral or bilateral medial facetectomy detected lumbar spinal instability in flexion. Furthermore, total facetectomy, even unilaterally, causes instability in the lumbar motion segment in axial rotation and flexion. Comparison of the results of complete facetectomy, laminotomy with medial facetectomy, and intertransverse discectomy techniques in a series of 170 patients showed that instability developed in only 4% of cases, thus requiring spinal fusion. Although instability requiring spinal fusion is rare after unilateral or complete facetectomy, persistent back pain is a common finding. Primary fusions should be considered in patients with a FLLDH at the same level as degenerative spondylolisthesis, particularly in cases in which a full facetectomy has already been performed. No case of instability in our series can be explained by any bone removal in this operative technique.

CT and MR imaging can demonstrate the precise location of a FLLDH, thus allowing the use of new routes to expose the far lateral space by the use of classical midline approach. The intertransverse route provides access to the far-lateral space through the lateral side of the facet joint. In contrast to the posterior midline approach, it provides direct exposure to the far lateral space. There are two options in the intertransverse route, the midline paramuscular and lateral transmuscular (muscle-splitting) approaches. The lateral transmuscular approach supplies a wider view than the midline paramuscular route, but has a lack of clear anatomical landmarks, so requires x-ray confirmation. The combination of the midline paramuscular and classical interlaminar approach used in our study is known as the combined approach, and provides a better procedure especially if the FLLDH is associated with other pathologies, such as lumbar canal stenosis, multiple disc herniations, spondylolisthesis, or enlarged facets, particularly in the elderly, which require additional surgical procedures. Therefore, both nerve roots at the same level, compressed by the FLLDH and coursing through the medial side of the facet joint, can be released from the compressive pathological process in the combined approach (Fig. 1). Otherwise, as in the lateral transmuscular approach, decompression of only one root may cause unresolved complaints of the patient.

The incidence of recurrence in cases of FLLDH is 4%. Migration of the degenerated disc material through the rupture site of the FLLDH following the operation accounts for a possible mechanism of this complication. The involved disc space can be evacuated completely in the combined approach, which may be an important factor in the prevention of recurrence. The combination of the paramuscular route and fenestration also allows the treatment of
spinal stenosis and enlarged facet joints from the posterior midline, which is the main advantage of the combined approach. In our series, the FLLDH and the disc material at the involved level was removed totally through the combined approach, and resulted in excellent outcomes.

References


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Commentary on this paper appears on the next page.

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**Commentary**

The authors demonstrate wide experience in treating lumbar disc herniation. They have done excellent work, following a series of patients for years after surgery. However, it is not specified whether the 18 patients that are discussed in this paper (among the 900 lumbar disc operated upon) are the only ones presenting with far lateral herniation, or if they are just a fraction of all FLLDH; that is, if the authors treated all FLLDH patients with this combined approach or not.

In my opinion, not all FLLDH patients are to be treated with a combined approach, because some of these patients have a normal posterior longitudinal ligament and absence of disc material in the spinal canal. In fact, the robustness of the ligament accounts for the fact that a small part of nucleus polposus spreads outside the canal, generally during severe effort. In this case, there is no need to perform an interlaminar disc evacuation, which is in fact detrimental. Leaving alone the disc allows the persistence of the shock absorber effect of the disc, and avoids recurrence of herniation through the surgical opening in the ligament.

The combined approach is mandatory when the preoperative examinations demonstrate a postero-lateral intracanal herniation in addition to a far lateral herniation. In this case, patients present with a two roots deficit, either sensitive or motor. As far as I can see, this is not the case for the patients shown in Fig. 2A and 2B. Anyhow, the paper is a good one, discussion of literature data is exhaustive, and presentation is clear.

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In the Americas, the operative approach for far-lateral disc herniation is indeed lateral, slightly closer to the midline than arrow “B” in Figure 4. Furthermore, we use minimal invasive techniques with tubes only 26 mm in diameter, and the patients go home that night or the following day. Study Figure 1. Why not take a direct approach? It can be done. Look at Figures 2A, B and 3B. Why not divide the muscle with a small tube and decompress the nerve by removing the fragment. Admittedly, months and years later the picture is probably the same. The goal is to select the right patient, which these authors did beautifully, and decompress the nerve. But the perioperative care with tubular muscular splinting techniques are very minimal. In fact, I have had a surgeon return to full activities within one week. The authors are correct in pointing out that this disc pathology tends to be higher in the lumbar spine with slightly different clinical presentations. They are correct in showing reflexes are slow to return. Therefore, their data is very honest.

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This point of discussion has been already mentioned in a technical note by John Jane in 1990 who emphasized easy and safe anatomical identification of far lateral lumbar disc disease with the combined intertransverse-interlaminar approach. This larger series of 18 patients, with excellent results and outcomes, is to be applauded. This paper will be welcome reading to all neurosurgeons in the practice of disc surgery to the effect that if you are anatomically well oriented in the region, you can use a smaller far lateral skin incision right over a FLLDH by the muscle splitting technique, but if you are less familiar with the intertransverse anatomy, and less frequently performing FLLDH excision, you can finish your microdiscectomy quicker by entering the disc space with elevation of the paraspinous muscles subperiosteally and retracting laterally through a larger midline or a paramedian skin incision for exposure.

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