Endoscopic Discectomy for Extraforaminal Lumbar Disc Herniation

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Summary. The microendoscopic discectomy (MED) technique has been one of the promising surgeries for lumbar disc herniation in the last few years. The purpose of this study is to report the feasibility of a minimally invasive technique for extraforaminal lumbar disc herniation. Ten patients with extraforaminal lumbar disc herniation (one at L3-4, four at L4-5, and five at L5-S1) underwent MED using the METRx system. A tubular retractor was inserted posterolaterally adjacent to the caudal base of the transverse process at the level of the affected disc. The nerve root was carefully distinguished from its surrounding tissues, and then the herniated disc was excised. The mean length of the preoperative clinical course was 7 months. The pain in the lower extremity was relieved in all patients. The clinical results in the MED group were the same as those in the open surgery group. Endoscopic herniotomy requires much less extensive muscle dissection than open surgery. The MED technique for extraforaminal lumbar disc herniation can be performed safely and effectively. There is a learning curve to this procedure.

Key words. Extraforaminal lumbar disc herniation, Microendoscopic discectomy (MED), Far-lateral herniation

Introduction

Foley and Smith [1] reported that endoscopic disectomy has been one of the promising surgeries for lumbar disc diseases in the last few years. They also reported five cases of far-lateral discs. However, few authors have reported

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endoscopic techniques for extraforaminal lumbar disc herniation [2, 3], especially L5-S1 extraforaminal lumbar disc herniation [2, 4].

For the posterolateral type of lumbar disc herniation, microendoscopic discectomy (MED) is a minimally invasive surgery that does not invade the paravertebral muscles [2]. For the extraforaminal type of lumbar disc herniation, open surgery requires more extensive muscle dissection than that for the posterolateral type of lumbar disc herniation. Moreover, open surgery for extraforaminal lumbar disc herniation provides a narrow operative field, especially at the L5-S1 extraforaminal region. MED may give us a pinpoint approach even for L5-S1 extraforaminal lumbar disc herniation [4].

The purposes of this study were to determine the feasibility of an endoscopic technique for extraforaminal decompression of disc disease, to extend the indication for L5-S1 extraforaminal lumbar disc herniation, and to compare the advantages and disadvantages of MED with those of open surgery.

Materials and Methods

From December 2000 to September 2002, 10 patients (4 men and 6 women) with extraforaminal herniated lumbar disc disease underwent MED using the METRx system [1, 2]. The mean patient age was 58 years (range, 42–70 years). The mean duration of symptoms was 7 months (range, 0.5–24 months). The levels operated on were one L3-4, four L4-5, and five L5/S1. From January 2000 to November 2000, two patients (one man and one woman) with extraforaminal lumbar disc herniation underwent open surgery. The mean patient age was 64 years (range, 53–75 years). The affected disc levels operated on were one L4-5 and one L5-S1. All patients underwent MED or open surgery under general anesthesia.

MED was performed using the METRx system (Medtronic Sofamor Danek, Memphis, TN, USA) (Fig. 1). The patient was positioned prone with the abdomen free and the spine flexed to open the interlaminar space. A C-arm fluoroscope was positioned so that lateral fluoroscopic images of the operative lumbar interspace were obtained (Fig. 2). After the lateral images were checked, the patient was prepared and draped. The surgeon stood on the left side of the patient, and a videomonitor was placed on the right side. A 16-mm skin incision was made 5 cm lateral from the midline. A muscle-splitting approach to the lumbar disc disease was performed using a series of sequential dilators and a tubular retractor system [2]. The tubular retractor was inserted posterolaterally adjacent to the caudal base of the transverse process at the affected disc level and was locked to a flexible arm assembly system that was secured to the operating table. Before the L5-S1 extraforaminal lumbar

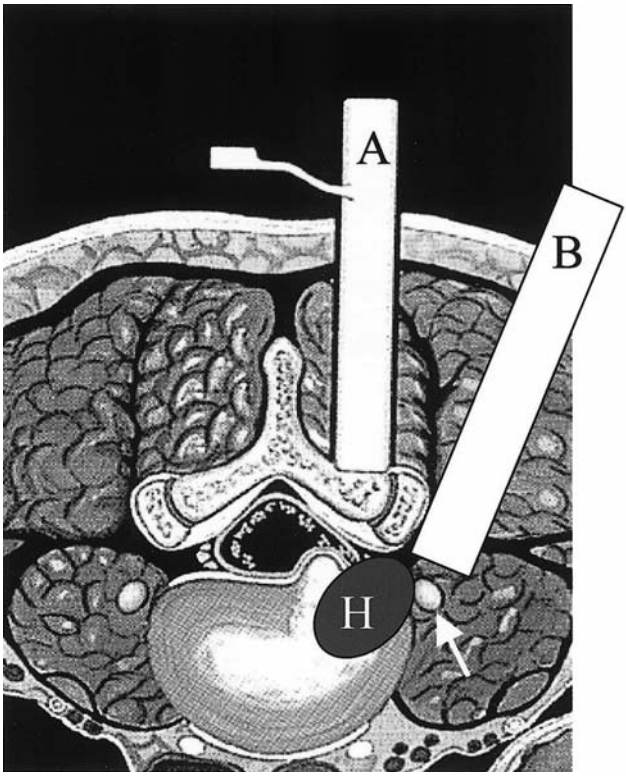


Fig. 1. Axial view illustrating nerve root (*arrow*) compressed by extraforaminal lumbar disc herniation (*H*). Illustration of the tubular retractors for intracanal lumbar disc herniation (*A*) and for extraforaminal lumbar disc herniation (*B*)

herniated disc was exposed, the L5 nerve root was carefully distinguished from its surrounding tissues. The endoscopic image on the videomonitor (Fig. 3) showed the right L5 nerve root retracted cranially and the herniated disc exposed at the extraforaminal region. Then the herniated disc was excised. In open surgery, a 10-cm midline skin incision was made. After the paravertebral muscle was retracted, the herniated disc was excised.

Neurological assessment was conducted in accordance with the scoring system of the Japanese Orthopaedic Association (JOA). In this system, a 29-point score represents the normal (maximum) score, and the extent (rate) of relative neurological improvement was calculated by the following equation: improvement rate = (final JOA score − initial JOA score)/(29 − initial JOA score) ∗ 100 [5, 6].

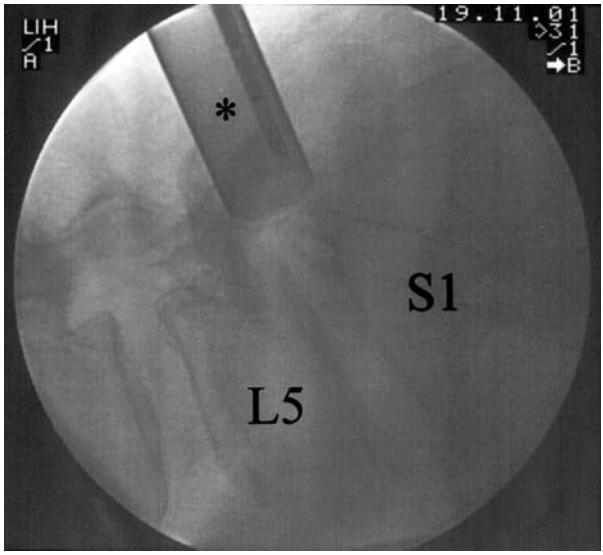


Fig. 2. Lateral fluoroscopic view of tubular retractor placement (*asterisk*) for *L5-S1* extraforaminal lumbar disc herniation

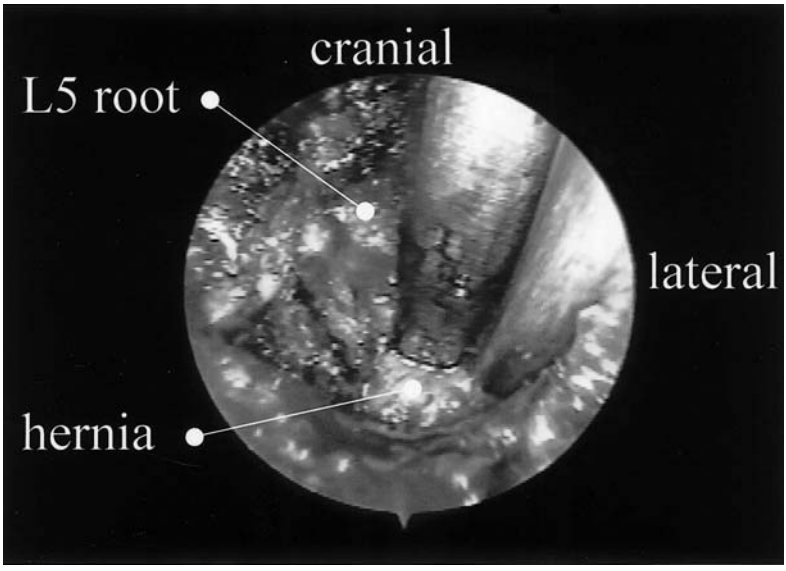


Fig. 3. Actual endoscopic view, as it appears on the video monitor, is circled. The right L5 root is retracted cranially and the contained herniated disc is exposed at the right L5-S1 extraforaminal region

Results

The mean follow-up period was 12 months for MED and 18 months for open surgery. The average JOA score in the MED group was 11 preoperatively and 25 postoperatively. In the MED group, the postoperative JOA score was significantly higher than the preoperative score. In the open surgery group, the preoperative score was 14 and the postoperative score was 25. The average JOA was 78% in the MED group and 75% in the open surgery group. The average blood loss was 37 ml in the MED group and 80 ml in the open surgery group. The average frequency of prescription of a nonstersidal antiinflammatory drug (NSAID) was 1.25 in the MED group and 2 in the open surgery group. The maximum body temperature was 37.6°C in the MED group and 37.8°C in the open surgery group. The period until normal temperature was reached was 2.25 days in the MED group and 2.5 days in the open surgery group. The mean operative time was 155 min (range, 60–275 min) in the MED group (Fig. 4) and 88 min in the open surgery group. No recurrence was observed during the follow-up period.

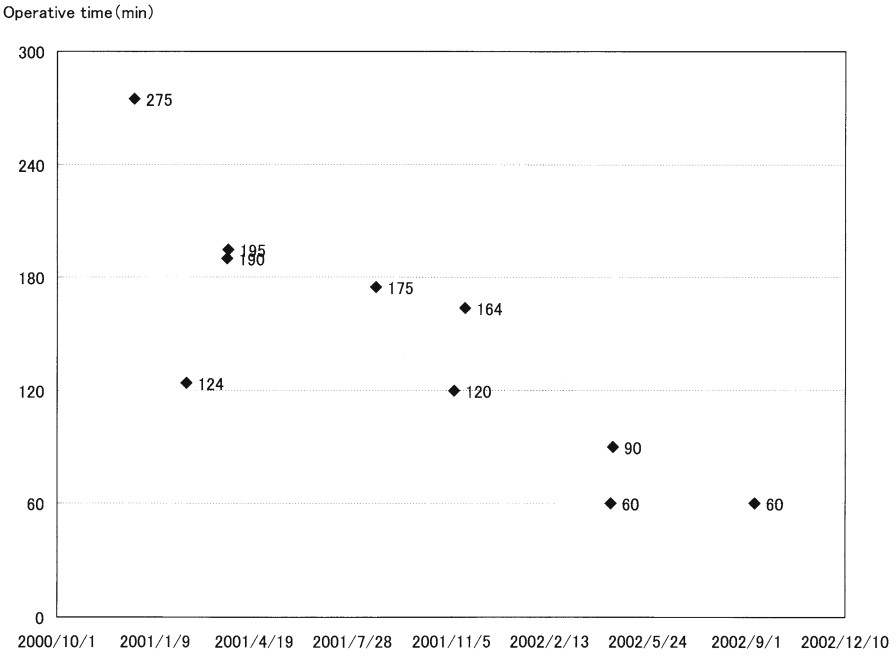


Fig. 4. Our learning curve for endoscopic extraforaminal lumbar discectomy. *X-axis*, learning period; *Y-axis*, operation time (min)

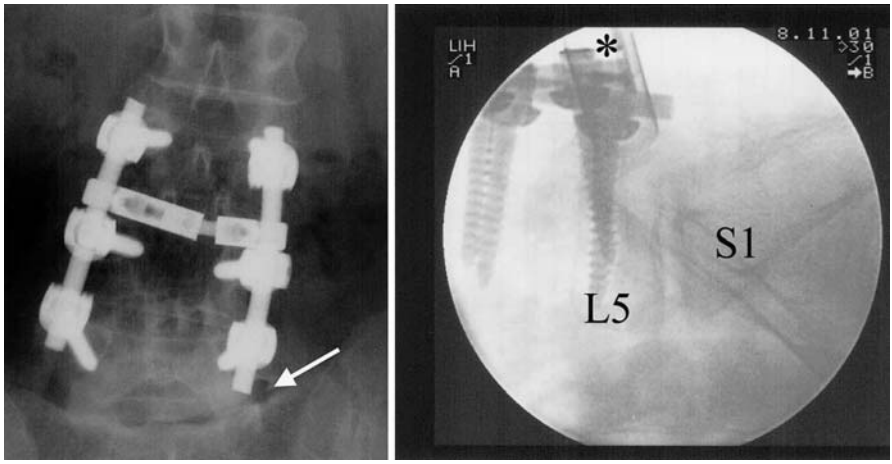


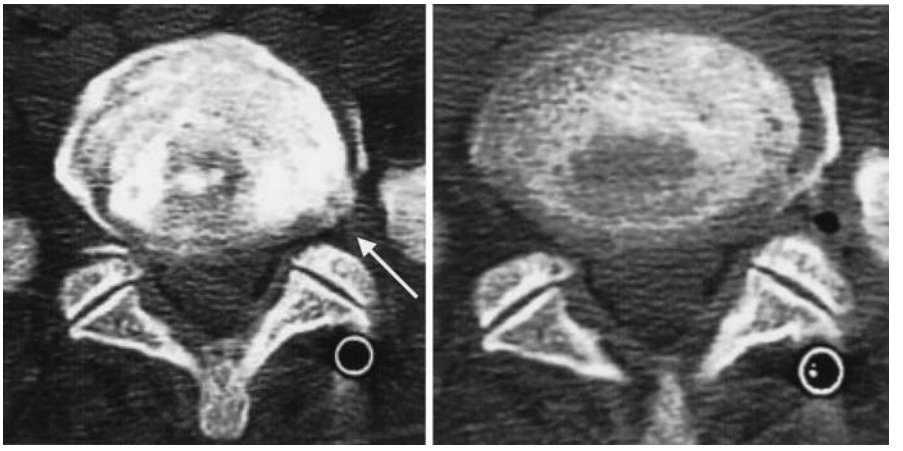
Fig. 5. Images of a 58-year-old woman with left L5-S1 extraforaminal lumbar disc herniation (*arrow*) who underwent L3-4 and L4-5 posterior lumbar interbody fusion (PLIF) using posterior instrumention 2 years before the onset of symptoms. **a** Anteropostero radiograph showing L3-4 and L4-5 PLIF using posterior instrumentation. **b** Lateral fluoroscopic view of tubular retractor placement (*asterisk*) for left *L5-S1* extraforaminal lumbar disc herniation

Case Report

A 58-year-old woman suffering from L3-4 and L4-5 degenerative disc disease underwent posterior lumbar interbody fusion (PLIF) and an additional posterior instrumentation (Fig. 5a). Two years after surgery, she experienced acute low back pain and severe pain in the right lower extremity. Although conservative treatment had been maintained for a year, severe pain in the left lower extremity had been prolonged. Computed tomograms after discography revealed left L5-S1 extraforaminal lumbar disc herniation (Fig. 6a). She underwent endoscopic disectomy using the METRx system (Fig. 5b). The severe pain in the left lower extremity disappeared within 1 week. After surgery, the JOA recovery rate of this patient was 80% (Fig. 6b). She was able to return to normal work and activities.

Discussion

The microendoscopic discectomy (MED) technique using the METRx system is safe and effective for performing minimally invasive lumbar microdiscectomy [1, 2], even for extraforaminal lumbar disc herniation [3, 4]. Generally, the advantages of MED are the small skin incision, less involvement of par-



a b

Fig. 6. **a** Preoperative computed tomogram after discography at the L5-S1 disc level showing left extraforaminal lumbar disc herniation (*arrow*). **b** Postoperative plain computed tomogram at the *L5-S1* disc level

avertebral muscle, and short bed rest [1]. Its disadvantages are the technical demands and loss of depth perception, which may cause prolongation of the operative time [1, 4]. In this study, there was a learning curve for using the MED system efficiently and safely for extraforaminal lumbar disc herniation [2, 4].

Our learning curve showed that operative times decreased rapidly to 60 min after 1 year (Fig. 4). In the first case, most of the operative time was occupied with setting the METRx system and checking the C-fluoroscopic images frequently. In the last two cases, it took about 30 min to expose the affected nerve root and the herniated disc in the extraforaminal region. A few reports demonstrate the clinical anatomy in the extraforaminal region [7]. Exposure of the fat tissues around the nerve root was important for this procedure. Endoscopic discectomy for extraforaminal lumbar disc herniation has technical demands and requires depth perception [4].

Open surgery for extraforaminal lumbar disc herniation usually requires bone resection on the lateral portion of the facet joint. In the first patient with L3-4 extraforaminal lumbar disc herniation who underwent MED, the lateral portion of the facet joint was partially resected. Recently no bone resection was required except at the L5-S1 extraforaminal lumbar disc herniation. We performed MED for L5-S1 extraforaminal disc herniation in five cases. In the first patient with L5-S1 extraforaminal lumbar disc herniation who underwent MED, more manipulation of the nerve root and ganglion was necessary to dissect the disc herniation after resection of the lateral portion of the L5 root foramen and the lateral portion of the L5-S1 facet joint. After surgery,

mild dysesthesia was observed in this patient [7]. Recently, for L5-S1 disc herniation, we partially resected the lateral portion of the superior articular process of the sacrum using chisels and exposed the L5 nerve root, which was compressed cranially by the L5-S1 herniated disc (Fig. 3).

MED using the METRx system was effective for the patient with L5-S1 extraforaminal lumbar disc herniation who underwent posterior lumbar interbody fusion (PLIF) 2 years before MED. Once the surgeon is comfortable performing lumbar MED, further indications for the use of this technique include cervical discectomy, thoracic discectomy, lumbar laminectomy, and interbody lumbar fusion [2].

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