The validity of upright myelography for diagnosing lumbar disc herniation


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Abstract

Although computed tomographic (CT) myelography and magnetic resonance imaging (MRI) are used for assessing lumbar disc herniations (LDH), they cannot provide images when patients are standing or walking, whose CT myelograms and MRI images show only slight disc bulging. The purpose of this study was to evaluate the usefulness of upright myelography. We examined by myelography in both an upright and a lying position for 50 patients with LDH at L4-5 and L5-S1 to assess the difference in disc bulge size. Lateral myelogram was used for evaluating the difference quantitatively. In 29 patients with damage at L4-5, 21 (72.4%) had increased disc bulging when upright, and 22 (75.9%) showed subligamentous LDH. In 21 patients with damage at L5-S1, fewer patients showed increased disc bulging when upright than showed unchanged disc bulging. This upright myelographic technique could show increased disc bulging in patients with mild compression at L4-5 whose sciatica increased in an upright position. Upright myelography seems to be the only method for assessing patients with LDH, especially at the L4-5 level, whose neurological symptoms develop during standing or walking. © 2002 Elsevier Science B.V. All rights reserved.

Keywords: Myelography; Lumbar disc herniation; Upright position; Subligamentous; Transligamentous

1. Introduction.

Myelography, computed tomographic (CT) myelography, and magnetic resonance imaging (MRI) have been used to assess patients with sciatica caused by lumbar disc herniations (LDH). Several investigators considered that CT myelography and MRI are diagnostically superior to myelography and should be the first choice for assessing patients with LDH [1–9]. Although CT myelography and MRI have become increasingly important, they cannot provide images when patients are in an upright or symptomatic position [6].

We frequently encounter patients with severe sciatica whose CT myelograms and MRI images show only slight disc bulging. Some complain of increased sciatic pain in an upright or symptomatic position, such as standing or walking. The discrepancy between severe clinical symptoms and slight radiographic findings has often confused us in our diagnosis of LDH [10].

Patients are usually assessed by myelography, CT myelography, or MRI in a lying position. Of the three techniques, myelography alone allows the taking of images when patients are upright. It is thus potentially useful for assessing patients who develop sciatica only when standing or walking.

The purposes of this study were to compare the usefulness of upright and conventional myelography, and to consider the correlation between radiographic features and intraoperative findings.

2. Materials and methods

Between September 1999 and May 2000, 77 patients with sciatica underwent myelography in both an upright and a lying position. Most LDH occurs at L4-5 or
L5-S1. Fifty patients with those results and who received discectomy were included in this study. We excluded patients who did not receive surgery or who had lumbar spinal canal stenosis, spinal tumor, or dural compression due to spondylolisthesis.

The study population comprised 15 women and 35 men, whose average age was 40.7 years. Conventional lying myelography was performed first. Then the patient table was tilted to an upright position to reflect a symptomatic position such as standing or walking, and upright lateral myelography was performed without a change in lumbar lordosis. Among antero-posterior, lateral, and oblique myelograms examined in all the 50 patients, lateral myelogram seemed to be sufficient for evaluating the difference in disc bulge size quantitatively. Furthermore, we considered that lumbosacral nerve root compression in antero-posterior and/or oblique projection was inadequate for the quantitative analysis. Those were the reasons we selected lateral myelogram alone in this upright myelographic study.

The difference in disc bulge size between lying and upright was directly measured from the two overlapping myelogram, although the myelograms showed a 20% oversized shadow. Under surgery, we then removed each herniated nucleus pulposis and freed the affected nerve root under general anesthesia. Intraoperatively, we confirmed the herniation size and the morphological type of disc herniation, subligamentous or transligamentous, in all 50 patients.

3. Results

The clinical data are summarized in Tables 1–3. The locations of disc herniation and the target levels of the upright myelography were L4-5 for 29 patients and L5-S1 for 21. We defined the difference in disc bulging distance as unchanged (0 mm), slightly increased (0–2 mm), or moderately increased (> 2 mm).

Of the 29 patients with L4-5 LDH, 21 (72.4%) were included in the increased groups, and eight (27.6%) in the unchanged group. Twenty-two (75.9%) had subligamentous LDH, and 7 (24.1%) transligamentous. Of the 21 patients in the increased groups, 18 (85.7%) had subligamentous LDH, and three (14.3%) transligamentous. Of the eight patients in the unchanged group, 3.

<table>
<thead>
<tr>
<th>Table 1</th>
<th>The summary of the data (L4-5 LDH)</th>
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M, male; F, female; R, right; L, left; Sub, subligamentous; Trans, transligamentous.
Table 2
The summary of the data (L5-S1 LDH)

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<th>Grade of change</th>
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<td>Sub</td>
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<tr>
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<td>F</td>
<td>L5-S1(R)</td>
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<td>Sub</td>
<td>2</td>
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<td>Trans</td>
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<td>Slightly Increased</td>
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<tr>
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<td>F</td>
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<td>Sub</td>
<td>0</td>
<td>Unchanged</td>
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<tr>
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</table>

M, male; F, female; R, right; L, left; Sub, subligamentous; Trans, transligamentous.

Table 3
The summary of the clinical data (50 LDH)

<table>
<thead>
<tr>
<th>Level/group</th>
<th>Total</th>
<th>%</th>
<th>Age</th>
<th>Sub</th>
<th>%</th>
<th>Age</th>
<th>Trans</th>
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<td>100</td>
<td>41.9Y</td>
<td>22</td>
<td>75.9</td>
<td>42.3Y</td>
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<td>44.7Y</td>
<td>18</td>
<td>85.7</td>
<td>43.9Y</td>
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<td>14.3</td>
<td>49Y</td>
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<td>Unchanged group</td>
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<td>27.6</td>
<td>34.6Y</td>
<td>4</td>
<td>50</td>
<td>34.8Y</td>
<td>4</td>
<td>50</td>
<td>34.8Y</td>
</tr>
<tr>
<td>L5-S1</td>
<td>21</td>
<td>100</td>
<td>39.1Y</td>
<td>14</td>
<td>66.7</td>
<td>42.1Y</td>
<td>7</td>
<td>33.3</td>
<td>33.1Y</td>
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<tr>
<td>Increased group</td>
<td>8</td>
<td>38.1</td>
<td>48.8Y</td>
<td>7</td>
<td>87.5</td>
<td>48.6Y</td>
<td>1</td>
<td>12.5</td>
<td>50Y</td>
</tr>
<tr>
<td>Unchanged group</td>
<td>13</td>
<td>61.9</td>
<td>33.2Y</td>
<td>7</td>
<td>53.8</td>
<td>35.7Y</td>
<td>6</td>
<td>46.2</td>
<td>30.3Y</td>
</tr>
</tbody>
</table>

Sub, subligamentous; Trans, transligamentous; Y, year.

half had subligamentous LDH and half transligamentous. The average ages of the patients were 44.7 years in the increased groups and 34.6 years in the unchanged group.

Of the 21 patients with L5-S1 LDH, eight (38.1%) were included in the increased groups, and 13 (61.9%) in unchanged group. Fourteen (66.7%) had subligamentous LDH, and seven (33.3%) transligamentous. Of the eight patients in the increased groups, seven (87.5%) had subligamentous LDH, and one (12.5%) transligamentous. Of the 13 patients in the unchanged group, the numbers of subligamentous and transligamentous LDH were nearly equal. The average ages of the patients were 48.8 years in the increased groups and 33.2 years in the unchanged group. Four representative myelograms are presented (Fig. 1A and B, Fig. 2 A and B, Fig. 3A and B).

4. Discussion

Myelography is widely used to assess patients with LDH. However, it is an invasive, painful, and unpleasant procedure accompanied by considerable radiation, and its diagnostic accuracy seems to be inferior to that of MRI and CT myelography [2,5–8,11]. These procedures are consequently considered to be the first choice for imaging in patients with suspected LDH [1–9].

Herkowitz reported that metrizamide myelography reduced the complications associated with myelography, contributed to greater accuracy in the diagnosis of lumbar disc disease, and had a negligible risk of post-myelographic aracnoiditis [11]. He emphasized that it might be useful for patients with objective findings who required surgical treatment. Fries suggested that CT
was a satisfactory method of diagnosing LDH because of its direct anatomical information, although operator error was possible, it was not suitable for obese patients, it sometimes gave false negatives in patients with spinal block and extruded LDH [4]. He emphasized that myelography might be helpful in patients with severe deformities of the spine, such as scoliosis. Modic reported that myelography was more sensitive to changes of arachnoiditis than either MRI or CT myelography [7]. Herzog and Schipper emphasized that MRI and CT myelography should be the examinations of first choice, and that myelography should be reserved for large patients in whom clinical suspicions of the presence of LDH could not be confirmed with MRI or CT [5,8].

On the other hand, Kuroki suggested that myelography could not provide images in an upright or symptomatic position [6]. Certainly, MRI and CT myelography cannot provide images in an upright position. Therefore, they are unsatisfactory for assessing patients whose sciatic pain develops or increases in an upright or symptomatic position. We attempted upright myelography on the basis that only it can give images in an upright or symptomatic position.

We usually performed myelography in lateral, antero-posterior, and oblique projections. Although myelogram obtained in the latter two projections were useful for detecting the nerve root compression, those were inadequate for quantitative evaluation. Then, we selected lateral myelogram in the present study, and measured directly the difference in disc bulge size.

The occurrence of increased bulging at L4-5 in an upright position was nearly three times that of unchanged bulging. Subligamentous LDH was almost three times as common as transligamentous LDH, and three-fourths of the patients with increased bulging had subligamentous LDH. Thus, most of the patients in the increased groups had LDH at L4-5, and most had subligamentous LDH. The average age of the patients in the increased groups was more than 10 years older than in the unchanged group. We consider that narrowing of the intervertebral disc space and loosening of the posterior longitudinal ligament caused by degenerative changes accompanying aging are the main reasons for

Fig. 1. Case 2, 45-year-old man. Small-sized subligamentous LDH at L4-5. (A) Lateral myelogram in a lying position showed small disc bulging at L4-5. (B) Disc bulging moderately increased in an upright position and difference in disc bulge size was 2 mm.
the greater disc bulging in an upright or symptomatic position.

In contrast, the occurrence of increased bulging at L5-S1, in an upright position was less than that of unchanged bulging. The main cause was the reduction of the axial load at L5-S1 in an upright or symptomatic position due to the inclination of the sacral plate. The average age of the patients in the increased groups was again more than 10 years older than the unchanged group, for the same reasons as above.

For these reasons, we speculate that upright myelography is useful and effective for assessing patients with L4-5 LDH whose neurological symptoms are remarkable when standing or walking but whose MRI and CT myelographic findings are unremarkable. These findings could compensate for the discrepancies between intraoperative findings, neurological symptoms, and radiographic features. In other words, upright myelography at the L4-5 level could explain why bulging due to LDH is smaller intraoperatively than expected preoperatively. However, upright myelography is not as useful at L5-S1 level. Here, MRI and CT myelography would surpass upright myelography in diagnosing LDH.

In conclusion, upright myelography seems to be the only method for assessing patients with LDH, especially at the L4-5 level, whose neurological symptoms develop during standing or walking. This method is not only promising for the diagnosis of LDH, similar to MRI and CT myelography, but also useful and effective for patients whose neurological symptoms are more severe in an upright or symptomatic position than in a lying position.
Fig. 3. Case 31, 40-year-old man. Large-sized subligamentous LDH at L5-S1. (A) Lateral myelogram in a lying position showed large disc bulging at L5-S1. (B) Disc bulging slightly increased in an upright position and difference in disc bulge size was 1 mm.

References


