Factors predicting the prognosis of lumbar radiculopathy due to disc herniation

HIROMICHI KOMORI, ATSUSHI OKAWA, HIROTAKA HARO, and KEN-ICHI SHINOMIYA

Department of Orthopedic Surgery, Tokyo Medical and Dental University, 1-5-45 Yushima, Bunkyo-ku, Tokyo 113-8519, Japan

Abstract This study was designed to determine the prognostic factors in unilateral lumbar radiculopathy due to herniated nucleus pulposus (HNP); this was done by prospectively investigating the clinical course of consecutive patients with HNP. The study population consisted of 131 patients who complained primarily of unilateral leg pain, and who were examined by magnetic resonance imaging (MRI) to establish a definite diagnosis. Patients with a questionable diagnosis were excluded. The initial assessment was done within the first 2 months of presentation, according to conventional surgical indications. Surgery was performed only in patients who gave their informed consent for the procedure. Questionnaires were sent to patients twice, in 1994 and 1996, to assess the clinical outcome in those patients who did not meet the surgical indications and in those who met the indications, but who refused surgery. Clinical outcomes were classified into three categories based on the patients' own assessment. Fifty patients met the surgical indication criteria, and 25 were actually operated on. Neither these patients' profiles nor their MRI findings correlated with the results of the initial assessment. Patient age was significantly correlated with outcome only at the time of the first follow-up. The type of HNP and the result of the initial assessment were correlated with outcome at the times of both follow-ups, but the significance of these correlations had decreased at the second follow-up. In conclusion, initial assessment and type of HNP on MRI are major prognostic factors. However, the conventional manner of treatment selection is inadequate for the appropriate management of lumbar disc herniation.

Key words Magnetic resonance imaging · Lumbar disc herniation · Prognosis

Introduction

Many types of pathology may cause unilateral leg pain. Herniated nucleus pulposus (HNP) is a very common cause of unilateral lumbar radiculopathy manifesting as unilateral leg pain. Several well-designed studies of patients with HNP have revealed the satisfactory results of conservative treatment, although some authors have reported that about 20% of all patients had to be treated surgically during follow-up because of prolonged or aggravated leg pain. Many investigations of the outcome of lumbar disc surgery however, have revealed a poor prognosis for patients operated on after prolonged conservative treatment, and the authors of these studies recommended that the period of conservative management should be limited to 2 or 3 months. Consequently, for the appropriate management of lumbar disc herniation, it appears important to assess precisely the prognosis of a given patient at an early stage after the onset of symptoms.

Before the magnetic resonance imaging (MRI) technique was developed as a diagnostic tool, invasive procedures such as myelography and/or discography were performed to investigate the cause of the leg symptoms in patients whose symptoms worsened or remained unchanged after receiving conservative treatment for a certain period. MRI has allowed us to determine the cause of unilateral leg pain at a much earlier stage, and to provide adequate treatment. However, despite knowing the definite cause of the leg pain at an early stage, we cannot accurately answer the patients' questions as to whether and when their pain will disappear. The purpose of this study was to determine which factors, especially in terms of MRI findings, influence the prognosis of the lumbar radiculopathy due to HNP, by prospectively investigating the clinical course of patients with HNP.

Patients

Between June 1, 1991, and March 31, 1993, 245 consecutive patients who complained of unilateral leg symp-
toms were examined with MRI at Toride Kyodo General Hospital. Patients who did not complain of spontaneous leg pain but of intermittent claudication; those who had central canal stenosis, spondylolysis or spondylolisthesis; those with central disc herniation or contralateral disc protrusion; and those who had no axial images related to “symptomatic” HNP were excluded. Finally, 147 patients were definitively diagnosed with unilateral lumbar radiculopathy due to symptomatic HNP. Of these 147 patients, 131 in whom we could directly assess the clinical course of symptoms for 2 months were admitted to this prospective study. Ninety-two patients first visited Toride Kyodo General Hospital after the onset of symptoms. Fourteen were referred to us from nearby hospitals, and 25 patients came from other hospitals without a referral.

Our conservative treatment consisted of rest, administration of drugs, and pelvic traction at the outpatient clinic, except for 14 patients required who hospitalization due to the severity of pain.

Methods

Table 1 shows the patients’ profiles, local symptoms, and MRI findings. MRIs were recorded as soon as possible using a 0.5 Tesla scanner (Rezona; Yokogawa Medical, Tokyo, Japan). T1-weighted sagittal and axial images (spin echo sequence; TR, 500; TE, 15–25) and T2-weighted sagittal and axial images (gradient echo sequence, TR, 500; TE, 30; flip angle, 32) were taken under the following conditions: slice interval, 6 mm; section thickness, 5 mm; matrix, 256*256; and number of excitations, four. The patients’ occupations in terms of physical activity graded according to a three-point scale; heavy, moderate, and light. Pain at first visit was also graded according to a three-point scale, depending on the degree of disturbance of capacity to walk: severe, cannot walk; moderate, can walk with difficulty; and mild, can walk tentatively. Tension signs were assessed according to four grades, based on the results of the straight leg raising test (SLRT) and the femoral nerve stretch test (FNST); mild, SLR of more than 70° or pain provocation at hip extension; and none, no laterality. Paresis was graded based on a three-point scale; severe, Manual Muscle Testing (MMT) less than grade 4 or sensory loss of less than 50% compared with normal side; moderate, laterality; and none, no laterality.

Classification of HNP type was conducted as illustrated in Fig. 1, using the T1-weighted sagittal view. Type 1 was differentiated from type 2 based on the continuity of a low signal area in the posterior disc margin (black line in Fig. 1), and type 3 was differentiated from type 2 depending on whether the base of the extruded disc extended beyond the disc height. There were four patients in whom the HNP type changed during follow-up (from type 1 to type 3, one patient; from type 2 to type 3, three patients). These patients were classified based on the results of the first MRI. Disc degeneration was graded according to a four-point scale (normal, mild, moderate, severe) depending on the signal intensity on a T1-weighted midline sagittal view.

The initial assessment was done within the first 2 months of presentation according to conventional surgical indications, that is, persistence of intolerable leg pain for more than 1 month, and severe neurological deficit, such as foot drop. Surgery was performed only in patients who met these criteria and who gave their informed consent. The patients who did not meet the criteria for surgical treatment continued to receive conservative therapy. To assess the clinical outcome in patients who did not meet surgical indications and in those who met the surgical indications but who refused surgery, a questionnaire was sent twice to the patients, in April 1994 and in April 1996 (Fig. 2).

Clinical outcomes were classified into the following three categories based on the patients’ own assessment: poor, no change or residual symptoms (activities of daily life [ADL] disability +); fair, residual symptoms (ADL disability −); and good, greatly reduced pain or no symptoms.

Non-parametric methods were used for statistical analyses, with P values of less than 0.05 being regarded as significant.

Table 1. Factors investigated

<table>
<thead>
<tr>
<th>Patient profile</th>
<th>Past history of LBP</th>
<th>Past history of sciatica</th>
<th>Period between onset and first visit</th>
<th>Leg symptoms at first visit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
<td>Pain complaints</td>
</tr>
<tr>
<td>Age</td>
<td>Occupation</td>
<td></td>
<td></td>
<td>Tension sign</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Motor pareses</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Sensory disturbance</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>MRI findings</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Level of herniation</td>
</tr>
</tbody>
</table>

LBP, Low back pain; MRI, magnetic resonance imaging