Low-Back Pain Following Surgery for Lumbar Disc Herniation

A Prospective Study

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Background: Lumbar disc herniation often causes sciatica. Although surgery may provide relief of sciatic pain, it is uncertain how surgery affects the relief of low-back pain. The purpose of the present prospective study was to assess the efficacy of discectomy in the treatment of low-back pain associated with lumbar disc herniation.

Methods: Between 1998 and 2001, forty consecutive patients with single-level, unilateral lumbar disc herniation were treated surgically. The first twenty patients (Group 1) underwent standard discectomy, and the second twenty (Group 2) underwent microendoscopic discectomy. Curettage of the disc space was not performed. All forty patients were prospectively followed, and clinical outcomes were evaluated with use of a questionnaire. The mean duration of follow-up was forty months.

Results: All forty patients were satisfied with the outcome. Leg pain decreased rapidly (within one month) in all patients and continued to decrease at the time of the latest follow-up. There was no significant difference between the two groups in terms of leg pain, with the numbers available ($p = 0.39$). A significant decrease in the mean low-back pain score was noted at the time of the latest follow-up ($p = 0.0007$).

Conclusions: Excision of a herniated disc for relief of sciatica provided rapid relief of sciatica and low-back pain. The findings of the present small study suggest that lumbar disc herniation might be a possible cause of low-back pain.

Level of Evidence: Therapeutic study, Level IV (case series [no, or historical, control group]). See Instructions to Authors for a complete description of levels of evidence.

Lumbar disc herniation is the most common cause of sciatica. Excellent results following discectomy have been reported[1-3]. In one study, excision of a herniated disc provided rapid relief of sciatica in eighty-six of eighty-seven selected patients[3]. However, relief of low-back pain has been far less predictable. The purpose of the present prospective study was to examine patients with lumbar disc herniation and to evaluate the change in low-back pain after surgery on the basis of subjective pain criteria and patient-oriented outcome measures.

Materials and Methods

Forty consecutive patients with a lumbar disc herniation were treated surgically between 1998 and 2001. All patients had persistent or frequently recurring leg pain that had been resistant to nonoperative treatment for a minimum of two months. The exclusion criteria included previous lumbar spine surgery, multilevel disc herniation, bilateral disc herniation, rapid progressive severe motor deficit (less than grade 3 of 5), or other vertebral conditions that might account for the low-back pain. Patients receiving Workers' Compensation were also excluded. Eligible patients provided informed consent, and the study was approved by the internal review board. The study group included nine women and thirty-one men, who had a mean age of thirty-four years (range, fifteen to seventy-one years) at the time of surgery. Sixteen patients were involved in heavy-duty work, twelve were involved in light-duty work, four were involved in office work, six were students, and two were retired. Magnetic resonance imaging was performed to confirm the presence of a herniated disc in all forty patients. The level of the herniation was L4-L5 in sixteen patients and L5-S1 in twenty-four (see Appendix). The extent of intervertebral disc degeneration was graded on midsagittal T2-weighted magnetic resonance images according to the criteria of Weishaupt et al.[4].

The first twenty patients (Group 1) underwent conventional open discectomy, and the second twenty patients (Group 2) had excision of disc fragments with use of a microendoscopic discectomy system (METRx; Medtronic Sofamor Danek, Memphis, Tennessee). The groups were comparable

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with regard to age, gender, and the level of herniation. All procedures were performed with the patient under general anesthesia. Open discectomy, as described by Wood and Hanley[5], was performed for decompression of the affected nerve root under loupe magnification. Excision of the disc was limited to accessible loose disc material without incision of the anulus. Curettage of the disc space was not performed. Microendoscopic discectomy was accomplished by means of an open surgical technique with use of a tubular retractor under endoscopic visualization[6]. On the basis of the findings at the time of surgery, we classified the herniation into one of three types: subligamentous extrusion (twenty-eight patients), transligamentous extrusion (nine), and sequestration (three). The patients were allowed to walk while wearing a lumbar corset on the day after surgery. Postoperatively, vigorous work and activity were restricted for six weeks. We recommended that patients wear a corset to reduce trunk motion during this period. After this period, unrestricted activity was permitted.

All forty patients completed a questionnaire (adapted from the low-back pain questionnaire of the North American Spine Society[7]) preoperatively, one month after surgery, at three-month intervals for the first year, and approximately every six months thereafter. These data were collected by independent observers. The intensity of leg pain and low-back pain was recorded with use of a 100-mm visual analog scale, with a score of 0 indicating no pain and a score of 100 indicating the worst conceivable pain[8]. The rate of improvement was calculated with use of the following formula: ([preoperative score – postoperative score] × 100)/preoperative score. As for the subjective outcome, patients were asked to choose one of the following responses regarding their satisfaction with the surgical treatment: (1) surgery met my expectations; (2) I did not improve as much as I had hoped, but I would undergo the same surgery for the same outcome; (3) surgery helped, but I would not undergo the same treatment for the same outcome; or (4) I am the same as or worse than I was before the surgery. The first and second responses on this subjective index were considered to indicate a favorable outcome, and the third and fourth responses were considered to indicate an unfavorable outcome.

No patient was lost to follow-up. The mean duration of follow-up was forty months (range, twenty-four to fifty-four months).

Statistical Analysis

Data are presented as the mean and the standard deviation. The degree of relief from pain was evaluated with the Wilcoxon signed-rank test. For intergroup comparison of means, we used a t test with Welch's correction. For testing relationships between variables, we used Spearman's correlation coefficient. The level of significance was set at $p < 0.05$.

Results

Leg pain decreased rapidly (within one month) in all patients and continued to decrease at the time of the latest follow-up. A significant decrease in leg pain, as measured with the visual analog scale, was noted. The mean leg-pain score was 87.3 ± 10.5 before surgery and 8.4 ± 8.4 at the time of the final follow-up ($p = 0.0002$) (Fig. 1). No significant difference was found between the two groups ($p = 0.39$). A significant improvement in the low-back pain score was also noted. The mean low-back pain score was 51.5 ± 32.0 before surgery and 10.4 ± 9.9 at the time of the final follow-up ($p = 0.0007$) (Fig. 2). Low-back pain decreased in thirty-seven patients, did not change in one patient, and slightly increased in one patient. In the remaining patient, an eighteen-year-old woman who had a large extruded disc with severe disc degeneration, the low-back pain score increased from 3 to 20. A transient increase in low-back pain was observed in five patients during the follow-up period. Two patients, including the eighteen-year-old woman mentioned above and a twenty-nine-year-old man, needed daily doses of nonsteroidal anti-inflammatory

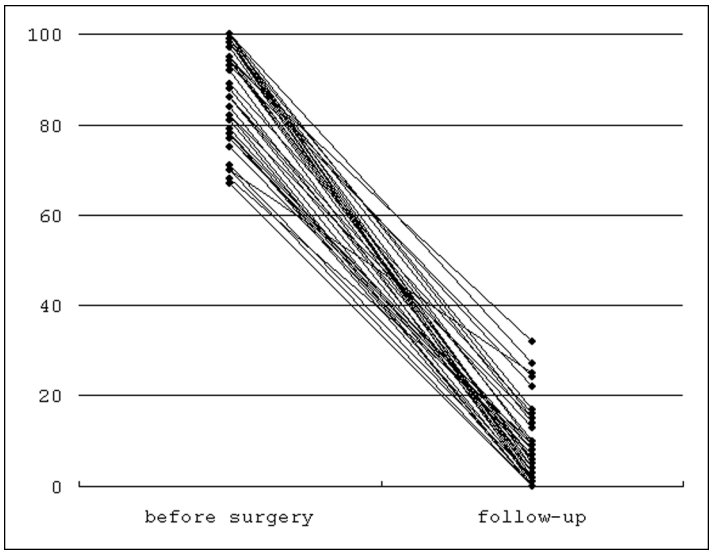

Fig. 1
Visual analog scales for leg pain in all forty patients. A score of 0 indicates no pain, and a score of 100 mm indicates the worst conceivable pain.

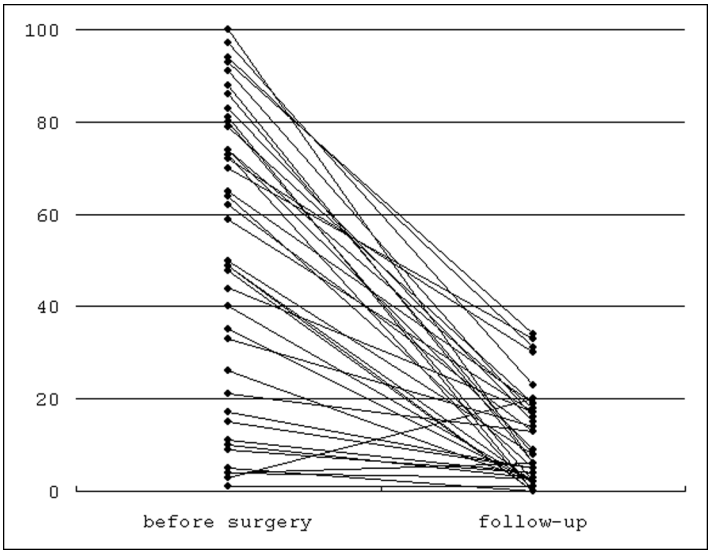

Fig. 2
Visual analog scales for low-back pain in all forty patients. A score of 0 indicates no pain, and a score of 100 mm indicates the worst conceivable pain.

drugs for eight and twelve weeks, respectively, for relief of the low-back pain. One patient, a thirty-five-year-old man, had a recurrence of symptomatic disc herniation one year after surgery and was treated with exercise therapy, which relieved the symptoms. There were no major postoperative complications. One patient who had intraoperative leakage of cerebrospinal fluid was managed with a fibrin sealant, and no additional treatment was required.

All thirty-two patients who had been employed before the development of leg pain returned to their previous occupation at an average of 1.9 months postoperatively and remained employed at the time of the latest follow-up.

The average duration of low-back pain before surgery was 17.0 ± 30.5 months, with ten patients having had low-back pain for more than one year. On preoperative magnetic resonance images, the extent of disc degeneration was considered to be grade 1 (no degeneration) for five patients, grade 2 for twelve, grade 3 for fifteen, and grade 4 (severe degeneration) for eight. With respect to the rate of improvement, there were no significant differences, with the numbers available, between patients who had been managed with conventional discectomy and those who had been managed with endoscopic discectomy ($p = 0.99$), between patients who had been less than forty years old and those who had been more than forty years old at the time of the operation ($p = 0.57$), between patients who had been involved in heavy-duty labor and those who had not ($p = 0.18$), between patients who had had low-back pain for less than one year before surgery and those who had had low-back pain for more than one year before surgery ($p = 0.43$), or between patients with grade-1 or 2 disc degeneration and those with grade-3 or 4 disc degeneration ($p = 0.39$). Although there was a positive trend between the duration of low-back pain prior to surgery and disc degeneration, a significant correlation was not demonstrated, with the numbers available ($p = 0.062$).

With regard to satisfaction at the time of the latest follow-up, nineteen (95%) of the twenty patients who had been managed with conventional discectomy (Group 1) and sixteen (80%) of the twenty patients who had been managed with endoscopic discectomy (Group 2) chose response 1 ("surgery met my expectations"). The remaining five patients in the study selected response 2 ("I did not improve as much as I had hoped, but I would undergo the same surgery for the same outcome"). All of these responses were considered to represent a favorable outcome.

Discussion

Many authors have investigated the long-term outcomes of discectomy for lumbar disc herniation in order to address postoperative problems, including low-back pain[1-3,9,10]. Hanley and Shapiro reported that twelve (14%) of eighty-seven patients had disabling low-back pain at an average of thirty-eight months after discectomy for lumbar disc herniation[3]. Similarly, Weber reported that six (11%) of fifty-six patients had considerable low-back pain at an average of four years after surgery[9]. Although both reports described the prevalence of pain at the time of the latest follow-up, they did not show the change in the level of pain between the time of surgery and the time of the latest follow-up or indicate whether the pain was de novo or persistent.

Predisposing factors for postoperative disabling low-back pain have been reported to include heavy manual work[11], more than three months of sick leave before hospital admission[9], a cigarette smoking history of more than fifteen pack-years[3], and preoperative advanced disc degeneration[10]. However, the prognostic importance of these factors remains controversial. The association between the presence of a compensatable injury and disabling low-back pain also has been reported[3,7,12,13]. In those studies[3,7,12,13], patients who were receiving or applying for Workers' Compensation had significantly worse pain and disability scores compared with patients who were not receiving Workers' Compensation. This was the rationale for excluding Workers'

Compensation patients from the present study. The exclusion of such patients might have been one of the reasons for the good results that we observed in terms of the relief of low-back pain. Mochida et al., in a ten-year longitudinal study of percutaneous nucleotomy for lumbar disc herniation, noted that increased low-back pain after the operation was observed more frequently in patients in whom the disc had been extensively removed than in those in whom it had been preserved[14]. In our series, the remaining nucleus in the disc space was preserved as much as possible.

It is often difficult to determine the cause of low-back pain. Kuslich et al. stimulated various tissues during the surgical treatment of herniated discs with use of local anesthesia[15]. They found that stimulation of an affected nerve root elicited leg pain but not low-back pain and that stimulation of the posterior portion of the lumbar intervertebral discs evoked low-back pain only. Experimental studies have shown that the posterior portion of the lumbar intervertebral disc is innervated by sympathetic nerves, which are thought to be the afferent pathways of discogenic low-back pain[16,17]. Sensory innervations of the lumbar posterior longitudinal ligament and the lumbar dura mater also have been reported[18,19]. These findings suggest the pathways by which low-back pain may be induced by lumbar disc herniation.

In this small series, excision of a herniated disc for relief of sciatica provided rapid relief of both sciatica and low-back pain in a group of patients who had failed to respond to nonoperative care.

Appendix

(eA) Tables showing specific data on the patients are available with the electronic versions of this article, on our web site at www.jbjs.org (go to the article citation and click on "Supplementary Material") and on our quarterly CD-ROM (call our subscription department, at 781-449-9780, to order the CD-ROM). ■

NOTE: The authors thank Tomoko Goto for her help with preparation of the English-language manuscript.

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The authors did not receive grants or outside funding in support of their research or preparation of this manuscript. They did not receive payments or other benefits or a commitment or agreement to provide such benefits from a commercial entity. No commercial entity paid or directed, or agreed to pay or direct, any benefits to any research fund, foundation, educational institution, or other charitable or nonprofit organization with which the authors are affiliated or associated.

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