

Recurrent Lumbar Disc Herniation After Discectomy: Clinical Result of Repeated Discectomy and Analysis of Factors Affecting Surgical Outcome

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Purpose. To identify the factors that may influence the outcome of repeated discectomy in patients with recurrent disc herniation.

Methods. A series of 825 patients underwent surgery for lumbar disc herniation in our department from January 1995 to February 2005. A total of 33 consecutive patients who underwent repeated discectomy for recurrent lumbar disc herniations were retrospectively analyzed to assess factors affecting surgical outcome. Revision surgery was performed in all patients with conventional open discectomy. Visual analogue scale (VAS) and MacNab criteria were used to evaluate the severity of pain and satisfaction after revision surgery. The factors that might affect clinical outcome included gender, cigarette smoking, traumatic event, pain-free interval, side and degree of herniation and clinical improvement rate.

Results. The incidence of recurrent lumbar disc herniation was about 4%. Satisfactory outcomes were noted in 27 patients (82%) according to the MacNab criteria, and 26 (79%) patients had no radicular pain based on the VAS scale. No single factor was found to be predictive of clinical outcomes of repeated discectomy.

Conclusion. Repeated discectomy for recurrent lumbar disc herniation leads to a satisfactory outcome. Therefore, repeated open discectomy can be considered when managing patients with recurrent lumbar disc herniation. (*Mid Taiwan J Med* 2007;12:125-32)

Key words

lumbar vertebrae, recurrent lumbar disc herniation, repeated discectomy

INTRODUCTION

Although surgical treatment of lumbar disc herniation is successful in most patients, discectomy can lead to unsatisfactory outcomes, such as recurrent or increased back and/or sciatic pain. Standard open discectomy is associated with a 5% to 20% failure rate [1-3]. The main causes of this clinical entity, known as failed back surgery syndrome, include inadequate diagnosis [4], improper patient selection [4,5], inadequate surgical decompression (e.g. failure to recognize

lateral recess stenosis, lateral disc herniation or a sequestered free fragment) [6], recurrent disc herniation at the operated level or at another level [7,8] and epidural fibrosis [9,10].

When sciatic pain is recurrent after a pain-free interval following discectomy, recurrent disc herniation should be one of the diagnoses first considered. The incidence of recurrent disc herniation after lumbar discectomy is 5% to 15% [11-13].

There have been many studies on the causes of failed back surgery syndrome, such as recurrent disc herniation, new disc herniation at a different disc, epidural fibrosis, local arachnoiditis, spinal stenosis, facet arthritis,

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instability, spondylitis and spondylodiscitis [1,7,14-18]; however, few studies have specifically focused on recurrent disc herniation after discectomy. The purpose of this study was to assess the outcome of repeated discectomy for recurrent disc herniation and to identify the factors that may influence the surgical outcome.

SUBJECTS AND METHODS

A series of 825 patients underwent surgery for lumbar disc herniation in our department from January 1995 to February 2005. A total of 40 patients required subsequent reoperation because of persistent or recurrent post-operative back and leg pain. Patients were included in this study if they met the following criteria: 1) disc herniation had to be at the same level as the primary herniation, either on the same or the opposite side; 2) the pain-free interval after primary discectomy had to be greater than 6 months. Patients with disc herniation at a new level with respect to the primary herniated disc were excluded from this study. Revision surgery was indicated for patients with intractable pain that had not responded to conservative management for 6 to 8 weeks. Of the 40 patients that met the criteria and underwent repeated surgery, 3 developed recurrence at a new level, decompression was inadequate in 2 patients and a dural tear occurred in 1 patient. One patient developed recurrent disc herniation at the same level, but he died due to reasons unrelated to the operation or disc herniation. Therefore, the medical records and image studies of 33 consecutive patients with recurrent lumbar disc herniation were retrospectively reviewed in this study.

The pain-free interval, and side and degree of herniation had been recorded in the patients' charts. Recurrent disc herniation was confirmed by magnetic resonance imaging (MRI) in 12 patients (36%), MRI with Gadolinium enhancement in 16 patients (48%), computed tomography (CT) in 3 patients (9%) and CT with myelogram in 2 patients (6%). The degree of herniation was defined according to the type of disc contour. The disc was considered protruded if there was a focal extension of the disc beyond

the posterior margin of the vertebral body; the disc was considered extruded if the disc tissue had migrated through a defect in the outer annular fibers but was connected to the disc; a disc was considered to be sequestered if the herniated tissue was no longer connected to the disc.

Most studies have evaluated surgical outcome of recurrent herniated lumbar disc using only one questionnaire, such as the visual analogue scale (VAS) [13]. We chose two common self-reported questionnaires to evaluate severity of pain before and after revision surgery: the VAS questionnaire and the MacNab scale. These two questionnaires assess different aspects of patient outcome. The MacNab scale was used to assess the working capacity after spine surgery. The scale of satisfaction was graded as excellent, good, fair or poor. "Excellent" means that the patient has no complaints and is able to return to full working capacity. "Good" means that the patient has full working capacity but slight lower back and leg pain. "Excellent" or "good" is regarded as satisfactory outcome. "Moderate" indicates that the patient does not have normal working capacity; lower back and leg pain is reduced but still requires the administration of analgesics. "Poor" indicates that the degree of pain is unchanged or worse; the patient requires regular administration of analgesics. The visual analogue scale was used to determine the severity of sciatic pain before and after surgery. The most severe pain was scored as 10, and no pain was scored as 0. The difference between preoperative and postoperative VAS scores was the measurement of surgical outcome. We used the Wilcoxon rank-sum test to evaluate the change in VAS score and the Fisher Exact test to analyze the post-surgical MacNab scores. A p value of less than 0.05 was considered significant.

RESULTS

The incidence of recurrent lumbar disc herniation in our institution was about 4% (34/825). There were 11 women and 22 men in the study; their mean age at the last surgery was 41 years (range, 22 to 62 yr). All of the patients were followed for at least 1 year; the average

period of follow-up was 39.6 months (range, 12 to 124 mo). Seven patients (21%) had experienced traumatic events before their recurrent symptoms. Nineteen patients (58%) were smokers. The levels of disc herniation were L4-L5 (n = 23) and L5-S1 (n = 10). The mean pain-free interval was 24.3 months (range, 6 to 78 mo). There were 29 cases of ipsilateral herniation and 4 cases of contralateral herniation. During the first discectomy, 21 discs were protruded and 12 discs were extruded; during revision surgery, 16 discs were protruded and 17 were extruded. The primary operation in all patients was conventional discectomy with laminotomy. All of the revision surgeries were performed from the original site of the recurrent disc herniation, starting at an area known to be intact, finding landmarks, beginning medially, and working out laterally to locate the pathological entity. Using a curette, the epidural scar tissue from the previous laminotomy area was separated from the margin of the lamina. Access to the normal anatomic planes of the epidural space was gained by removing the lamina to the point at which the epidural scar tissue was detached and by partial resection of the scar tissue enclosing the dural tube. After creating a normal anatomic plane, exposure was carried out laterally so that the lateral edge of the nerve root was visible. The nerve root was then mobilized gently and retracted medially to expose the disc fragment. Nerve roots that adhered to the extruded disc fragment or to the ligamentous structures required sharp dissection for separation. Identification of pedicles allows for clean separation of the scar tissue from bone as well as identification of the disc space. If any doubt existed regarding the identification of the nerve root, a wide laminectomy with excision of the facet joint was required, until the pedicle was visible. In general, if facetectomy is required, posterolateral fusion and transpedicle screw fixation may be performed simultaneously to avoid iatrogenic instability. However, no extensive laminectomy with facetectomy was needed in our 33 patients. Dural tears were found in two patients during the revision surgery and were repaired with sequential sutures. No

cerebrospinal fluid leakage was seen in any of the patients.

Based on the MacNab criteria, 27 patients (82%) had good to excellent outcomes. Based on the visual analogue scale, 26 had no radicular pain.

We further analyzed the relationship between predisposing factors and clinical results. Age, gender, cigarette smoking, traumatic events, level of herniation, degree of herniation, times of operation, lesion side and pain-free interval did not affect the clinical outcomes of repeated discectomy according to either the VAS scale or the MacNab scale ($p > 0.05$) (Table). Furthermore, there were no significant differences between the ipsilateral herniation and the contralateral herniation based these two scales.

DISCUSSION

The long-term outcome of patients who undergo surgical treatment for recurrent disc herniation varies widely. This may be due to the inclusion criteria used in different studies. For example, some studies have reviewed patients with recurrent herniation together with those who present with herniation at a new level; other studies have tried to compare patients with recurrent herniation with those in whom lumbar surgery failed due to causes other than herniation [1-3]. The strict definition of recurrent disc herniation is the presence of herniated disc material at the same, ipsi- or contralateral level in a patient who has experienced a pain-free interval of at least 6 months since surgery.

Most studies have shown that repeated open discectomy for recurrent disc herniation leads to satisfactory outcomes. Cinotti et al [19,20] demonstrated no significant difference in clinical outcome between patients with recurrent herniation and those without recurrent herniation. In another study, Suk et al [13] showed that satisfactory results from a revision surgery for recurrent lumbar disc herniation were comparable with those of primary discectomy. Dai et al [21] also obtained satisfactory results from their study. Satisfactory outcomes were also obtained from the current study according to the VAS and MacNab scales.

Table. Predisposing factors affecting surgical outcome

	n (%)	Change of VAS mean (SD)*	<i>p</i> [†]	Satisfied (%)	<i>p</i> [‡]
Sex					
Male	22 (67)	6.6 ± 3.3	0.83	81.8	1.00
Female	11 (33)	6.8 ± 3.3		81.8	
Age group (yr)					
< 40	17 (52)	7.2 ± 3.2	0.36	82.4	1.00
≥ 40	16 (48)	6.2 ± 3.3		81.3	
Traumatic events					
No	26 (79)	6.4 ± 3.3	0.28	80.8	1.00
Yes	7 (21)	7.9 ± 2.8		85.7	
Smoking					
No	14 (42)	5.9 ± 3.7	0.26	78.6	1.00
Yes	19 (58)	7.3 ± 2.8		84.2	
Pain-free interval after previous surgery					
< 1 year	19 (58)	7.1 ± 3.1	0.39	78.9	1.00
≥ 1 year	14 (42)	6.1 ± 3.4		85.7	
Side of HIVD					
1st, right	22 (67)	7.3 ± 3.0	0.17	90.9	0.15
1st, left	11 (33)	5.6 ± 3.6		63.6	
2nd, right	25 (76)	7.4 ± 2.9	0.06	92.0	0.06
2nd, left	8 (24)	4.6 ± 3.7		50.0	
Type of HIVD					
1st protrusion	21 (64)	6.9 ± 3.3	0.55	85.7	0.64
1st Extrusion	12 (36)	6.3 ± 3.3		75.0	
2nd protrusion	16 (48)	6.5 ± 3.3	0.70	81.3	1.00
2nd Extrusion	17 (52)	6.9 ± 3.2		82.4	
Side of recurrence					
Same side	29 (88)	6.5 ± 3.4	0.43	79.3	1.00
Opposite side	4 (12)	8.3 ± 1.7		100.0	
Spinal level involved					
L4-L5	23 (70)	6.5 ± 3.5	0.78	73.9	0.14
L5-S1	10 (30)	7.2 ± 2.7		100.0	

*Higher value indicates better improvement of pain relief. [†]Based on Wilcoxon rank-sum test. [‡]Based on Fisher Exact test. VAS = visual analogue score; HIVD = herniated intervertebral disc.

Several factors that influence the long-term outcome of revision surgery for recurrent disc herniation could be of predictive value for prognosis. Finnegan et al [15] and Waddell et al [22] have noted that a duration of pain relief of less than 6 months or 1 year predicted a poor prognosis. Baba et al [16] and O'Sullivan et al [23] noted that the outcome was inversely related to the number of operations. Patients who had undergone first-time revision improved earlier and had better results.

There are numerous risk factors for recurrent disc herniation, such as a constitutional weakness of anular tissue [24], exposure to repetitive lifting, exposure to vibrations, and smoking [24,25]. It has been reported that as

many as 42% of patients with recurrent herniation stated that the onset of radicular pain was related to a traumatic event [13,20]. Cinotti et al [20] reported that a few risk factors were found to be associated with ipsilateral recurrent herniation: male patients with marked degenerated discs were more likely to experience recurrent herniation, particularly after an isolated injury or a precipitating event. We also found that young age (52%), male gender (67%) and smoking (58%) were dominant factors in our recurrent group, but these risk factors were not related to the surgical outcome in the current study.

There is no definitive conclusion about the incidence and mechanism of contralateral recurrent herniation. It has been suggested that if

during primary discectomy the external annulus was damaged on the side opposite to that undergoing surgery, then disc material not removed during the primary discectomy may be extruded through the weakened annulus and cause contralateral herniation [13]. The incidence of contralateral recurrent lumbar disc herniation has been reported to range from 21% to 34% [13,19,23]; however, few studies have reported the results of surgery in patients with contralateral recurrent herniation [19,26,27]. Cinotti et al [19] compared 16 patients with contralateral herniation with 40 patients with ipsilateral herniation under the hypothesis that excision of contralateral recurrent herniation would further damage the vertebral motion segment, causing more severe postoperative lower back pain. However, the result showed that the surgical outcomes after contralateral disc excision were similar to those after primary discectomy and no additional procedures were needed. In our study, there was no significant difference in clinical outcome between patients with contralateral and those with ipsilateral recurrent herniation.

Although most specific studies have shown satisfactory results, they evaluated the surgical outcome and analyzed the predisposing factors of recurrent herniated lumbar disc with only one questionnaire. No factors were found to be significantly related to the results of revision surgery for recurrent disc herniation [13,20,21,28]. We chose two common self-reported questionnaires, the MacNab criteria, which surveys patient satisfaction, and the VAS scale, which evaluates the severity of pain. These two questionnaires assess different aspects of patient outcome. We found that there was no predisposing factor that statistically influences the postoperative satisfaction and pain scale. A comprehensive disease-specific questionnaire, based on the SF-36 or LSOQ [29], should be developed to assess predisposing factors and evaluate the outcomes for recurrent lumbar disc herniation.

Several aspects of the current study affect the validity of the results. First, this is a

retrospective study. Patients with recurrent disc herniation may ask for only medical treatment or visit a different hospital for repeated surgery, so they were not included. Although the patients included in our series all received primary and repeated surgery in our institution, the incidence of recurrent disc herniation may be underestimated. Second, there was no standardized neuroimaging tool used in the preoperative studies. Although most of the patients were evaluated by MRI with enhancement, some were evaluated only by MRI, CT with myelogram or CT. Discordance between neuroimaging and intraoperative findings has been reported to occur in 18% to 33% of the cases [30]. It is especially difficult to differentiate between perineural fibrosis and recurrent disc herniation based on preoperative clinical findings and image studies other than MRI with Gadolinium enhancement. Recurrent disc herniation is seen as an iso- or hypointense soft tissue mass on magnetic resonance imaging; the nerve root and/or dural sac is often compressed, and there is a lack of early central contrast enhancement, whereas epidural fibrosis shows homogeneous enhancement [31]. The scar may surround the nerve roots and cause symptoms due to neural tension, decreased axoplasmic transport, restriction of blood flow, or venous return [11]. A scar does not benefit from reoperation and in fact may result in worse outcomes. We do not arrange re-operation for patients with evident perineural fibrosis on imaging studies.

In conclusion, this retrospective study shows that the outcome of repeated discectomy for recurrent lumbar disc herniation is satisfactory. Fusion is not necessarily the first option in the surgical treatment of recurrent disc herniation [29,32]. The decision to perform a fusion should be made when diagnostic evaluation shows a recurrent disc herniation with discogenic disease proved by discography or instability. Based on the results of this study, repeated discectomy is recommended for the management of recurrent lumbar disc herniation.

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腰椎椎間盤切除術後復發性突出：再次手術之臨床結果及手術結果影響因子之分析

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目的 腰椎間盤切除術後發生復發性腰椎間盤突出，多與其他背部手術失敗症候群混合在一起討論，而缺乏專門的探討，且因為定義的不一致，對於復發率以及手術治療的結果有很大的變異。本篇文章的目的在於回溯性的探討手術治療復發性椎間盤突出的臨床結果與預後因子的分析。

方法 從1996年1月至2005年2月中共有825位患者在我們的機構中接受腰椎間盤切除，其中有33位符合復發性腰椎間盤突出的條件(距離第一次手術後6個月以上且發生於同一節者)並接受再次腰椎間盤切除術。我們以VAS scale和MacNab criteria評估手術後的疼痛的改善與滿意度，並且分析性別、吸煙者、是否有創傷事件、無症狀間隔時間、椎間盤突出的位置與程度與臨床滿意度的關係。

結果 復發性腰椎間盤突出的發生率是大約4%。根據MacNab criteria有82%的病患可得到滿意的預後，根據VAS scale有79%的病患可得到滿意的結果。

結論 這項回顧性研究結果顯示再次的腰椎間盤切除術，可以滿意的治療復發性腰椎間盤突出。(中台灣醫誌2007;12:125-32)

關鍵詞

腰部椎骨，復發性腰椎間盤突出，重覆的腰椎間盤切除術

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