

Early Outcome of Sciatica after Redo Surgeries for Recurrent Lumbar Disc Herniation

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Abstract

Background Data: Result of redo discectomies varies widely in the literature. This may be due to variability in inclusion criteria and associated pathologies which may alter results. We tried to evaluate the early outcome of recurrent sciatica after redo discectomies in highly selected cases and risk factors for poor outcome.

Purpose: to assess the rate of success of redo lumbar discectomy in patients with recurrent sciatica.

Study Design: A retrospective clinical case study

Patients and Methods: A retrospective study including 30 cases with recurrent sciatica caused by true recurrent disc herniation over a period of 8 years. Clinical and radiological data were analyzed for proper selection and to exclude cases with associated pathologies. A Visual Analogue Scale was used to score pain severity before and after surgeries. Complications following redo surgeries were classified as minor and major. The outcome depended on pain relief and complications. Probable risk factors were recorded to detect those that might have contributed for unsatisfactory results.

Results: Outcome was satisfactory in 20 cases, accepted in 6 cases and unsatisfactory in 4 cases. The overall improvement in sciatic pain after redo surgeries was comparable with that following primary surgery. We found diabetes the major risk factor for unsatisfactory results.

Conclusion: Redo discectomy for recurrent sciatica proved to be of value and high rate of success when attempted in well-selected cases. (2014ESJ065)

Keywords: lumbar disc prolapsed, surgery, recurrent

Introduction

Primary lumbar disc herniation was estimated to have an incidence of approximately 1% of population per year.¹⁷ Of those, 2-4% has been suggested to be surgical candidates.⁹ This reflects the size of the problem indicating a number of 200-400

discectomies per million populations each year. In fact, among those patients undergoing primary discectomies, complete recovery is achieved in only 60%.^{24,27} Several studies reported the unsatisfactory results of primary discectomies, including both persistence and recurrence of symptoms, to be 5-20%.^{8,16,23,28} While persistence of

symptoms after initial surgery denotes mainly inadequate surgical procedure, recurrence of symptoms after pain free interval may indicate a true recurrent herniation, de novo herniation at a different level, epidural scar, arachnoiditis, facet syndrome, secondary spinal canal stenosis, segmental instability, spondylitis or spondylodiscitis.⁸ Recurrent herniation following initial discectomy has been reported in 5–11% of patients.^{7,10,14} Therefore, recurrent disc herniation is considered a major cause of surgical failure.^{8, 16} Studies that evaluated revision surgeries for broader diagnoses such as epidural scars, new level herniation, foraminal stenosis, or segmental instability^{3,7,11,14,15,16} reported overall less favorable outcomes than those studies including patients with selected recurrent disc herniations.^{5,6,24} Moreover, studies dealing with and evaluating both back and radicular pains may give unclear impressions about patient satisfaction and outcome.⁵ The purpose of this study was to evaluate the outcome of the revision discectomies on recurrent sciatica in highly selected cases with recurrent disc herniations, and to find out the risk factors that influenced the unsatisfactory outcomes.

Patients & Methods

This retrospective study was carried on by analyzing the clinical and radiological data of patients admitted to the department of neurosurgery, Mansoura University Hospital with the diagnosis of recurrent lumbar disc herniation, during the time period of the last 8 years. In this study, true recurrent disc herniation was defined as “MRI documented existence of herniated disc material at the same level of a previous discectomy, either ipsi- or contralateral, with recurrence of sciatica after a pain-free interval of at least 6 months”. Pain-free state was further defined as improvement of sciatic pain postoperatively to ≤ 2 on Visual Analogue Scale (VAS), as this mostly reflects a postoperative parathesia and not a true pain. Excluded from these definitions, are those with new level herniations associated with true recurrences. In addition, we further excluded cases of true recurrences at one or more levels in patients with initial discectomies at more than one level.

Between March 2003 and May 2011, a number of 57 patients admitted for revision discectomy in our department, following an initial successful lumbar

discectomy have met our initial criteria. The majority of these patients underwent initial wide laminectomy with extensive symptomatic side discectomy, while the others (20%) underwent a less invasive approach in the primary surgery. The detailed clinical sheets of these patients including history, clinical examination and operative findings, as well as, their neutral and dynamic plain radiographs were all reviewed. Any case that might be associated with pathology other than the true recurrence of herniation was further excluded from our study.

Of the 57 patients with true single level recurrent herniation operated in that period, 19 patients were excluded from the study for the following reasons; 2 cases had incomplete follow up data, 7 cases presented mainly with back pain (in addition to sciatica), 2 had concomitant spinal canal stenosis, 2 patients had spinal instability, 1 patient had neurological deficit (weak ankle dorsiflexion), and 5 cases had intraoperative finding of only an epidural scar. The remaining 38 patients were evaluated retrospectively. In 8 patients the postoperative VAS scores for their sciatica following the initial surgery were found to be > 2 , which does not meet our criteria for a postoperative pain-free state. Those were included in the analysis to estimate the mean improvement of sciatica following initial surgeries, but excluded from analysis of the results of redo surgeries as they were not meeting the definition of “true recurrence”.

As regard the remaining 30 cases with true single-level recurrent herniation, we recorded age, sex, type and time of initial surgery, level, side and degree of herniation (in initial and revision surgeries), the pain-free interval following initial surgery, the Visual Analogue Scale (VAS) score for pain before and after each surgery, detected risk factors for recurrence, the duration of revision surgery, operative findings, hospital stay, and clinical outcome in terms of pain improvement and complications. We used a 10-cm long VAS divided at 10 mm intervals. Marks done by patients on the scale were approximated to the nearest whole numbers. The degree of pain relief was calculated as the difference between pre- and postoperative VAS scores divided by preoperative score and multiplied by 100. Postoperative complications were divided into minor and major complications. Deep infections (discitis), CSF fistula requiring operative repair, and

neurological deficits were considered as major complications. Major complications usually influence the overall satisfaction of patients. The term minor complications included those like superficial wound infection, transient CSF leak, stitch sinus, or local wound tenderness.

The outcomes of patients were assessed at 3 months following the redo surgery when patients had stopped all medications and returned to full activity. We categorized outcomes into 3 groups; satisfactory, accepted, and unsatisfactory outcomes. Satisfactory outcome was defined as 75% or more improvement in radicular pain intensity with no or minor complications. Accepted outcome represented improvement in pain intensity equal to or more than 50% but less than 75%, with no or minor complications. However, unsatisfactory outcome meant less than 50% improvement in pain and/or a major postoperative complication. All included patients had a history of a sudden onset of recurrent radicular pain, either on the same or the opposite side of initial surgery. The only indication for revision surgery in our study was intractable pain, not responding to conservative management for more than 8 weeks. Revision surgeries were performed in all patients, with conventional open discectomy. Conventional open discectomy means a midline back incision centered on the desired level, muscle separation, attacking the symptomatic side by performing minimal medial facetectomy, exposure of the root and dural sac, foraminotomy, and maximal removal of the loose disc material leaving the epidural scar on the dorsal aspect of thecal sac untouched. Revision surgeries were done under direct vision in the conventional way. None of our patients underwent physiotherapy after the redo surgery nor needed lumbar support as all were biomechanically stable before and after surgery of their recurrences.

In our study, we define types of disc prolapse according to both MRI criteria and intraoperative findings. Disc protrusion means retropulsion of the disc material at the level of the intervertebral disc –without migration- in MRI images with intact annulus and/or posterior longitudinal ligament (PLL) found during surgery. Subligamentous herniation means migration of disc material in a cranial or caudal direction remaining in continuity with intradiscal content with intact PLL during surgery.

Transligamentous herniation means herniation of the disc material through the PLL seen during surgery with or without migration in MRI but remaining in continuity with the intradiscal contents. Sequestration means a separate disc fragment seen free inside the spinal canal in MRI images and/or during surgery.

Results

Patients in this study were predominantly males (17 cases) representing 57% of cases, while females (13 cases) represented 43% of cases. Ages varied from 19 to 65 years (Table 1). Twenty-three patients (77%) underwent initial surgery with bilateral laminectomy and symptomatic side extensive discectomy, without curettage of end plates (Figure 1). Seven patients (23%) underwent initial less invasive procedure, in the form of hemilaminectomy (3 cases) or unilateral flavectomy (4 cases) and unilateral less extensive discectomy by removing the offending disc material (Figure 2). The time passed from the initial operations to the time of the second surgery ranged from 10-23 months with a mean of 12.4 months. No patients had pending litigations, or work-related compensation claims.

The levels of initial disc herniation were one case with L3/4 (3%), 20 cases with L4/5 (67%), and 9 cases with L5/S1 (30%). In 17 cases, the initial herniation was left paracentral, in 13 cases it was right paracentral. During initial surgery, there were 17 cases with protrusion, 8 cases with subligamentous herniation, 4 cases with transligamentous herniation, and 1 case with sequestered disc. All cases reported a VAS score for pain more than 5 with a range of 6 to 10 and a mean of about 8 (8.4). The pain-free interval ranged from 7 to 18 months with a mean of 9.6 months.

Diabetes was detected in 12 cases, traumatic events in 5 cases, smoking in 3 cases, while no risk factors were detected in 10 cases (Table 1). The revision surgeries were carried out by conventional open procedures, consuming time roughly 25% more than the initial procedure. Intraoperatively, there were disc fragments with variable degrees of peridiscal fibrosis. In 16 cases recurrence was ipsilateral, while in 14 cases it was contralateral to initial disc herniation. All cases with initial minimally invasive surgeries and less extensive discectomies developed ipsilateral recurrent herniations.

Protrusion happened in 4 cases, subligamentous herniation in 2 cases, transligamentous herniation in 15 cases, and sequestration in 9 cases. One of the recurrent herniations was associated with intradural rupture of the disc (Figure 3). This case required a dorsal dural incision, removal of the disc material between the quada equine, water tight suturing of the dura, with onlay sheet of surgicel soaked with 2 cc of patient's blood. Postoperative hospital stay didn't differ significantly between revision, and initial surgeries.

The mean improvement of radicular pain following initial surgery was about 81% (among the 38 cases including those with residual sciatica and VAS score > 2), while after redo surgery for the selected true recurrences (30 cases), the mean improvement in sciatic pain was 72% which is statistically highly significant difference (P=0.001). However, comparing success rate (satisfactory + accepted results) of revision surgeries to that of initial surgeries revealed no statistically significant difference (P=0.739). This means that revision surgery was as effective as initial discectomy in relieving 50% or more of preoperative pain in well selected cases, despite the degree of pain relief tends to be greater in initial surgeries.

By comparing the degrees of pain relief following revision surgeries to those following initial surgeries, we found 20 cases (67%) with less pain relief, 3 cases (10%) with equal pain relief, and 7 cases (23%) with more pain relief after the redo surgeries. All cases with initial minimally invasive surgeries, except one case (86%) reported more than 75% of pain relief, and consumed relatively shorter operative time; which may be due to less extensive epidural scar (Figure 4). The majority of the whole cases (70%) developed no complication following redo surgeries. Sixty-seven percent of patients reported satisfactory results, while 20% had accepted results. We considered both results (87% of cases), as success. Unsatisfactory (Failure) results were found in 13% of cases due to either poor improvement of pain or development of a major complication. One case developed a postoperative foot drop as a result of root injury during discectomy of recurrent L4/5 disc. Another case developed persistent CSF fistula that necessitated surgical repair. Detailed data about pain relief, complication rate and outcomes are listed in Table 2. We also compared outcomes between diabetic and non-diabetic patients in terms of pain relief, complications, and success rates (Table 3).



Figure 1. Right recurrent L4/5 disc herniation. The patient underwent initial wide laminectomy and extensive right discectomy in the initial surgery. Right sciatica relapsed after 10 months of pain relief. Redo surgery fulfilled satisfactory results.

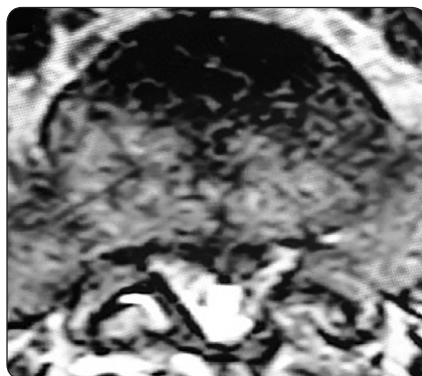


Figure 2. A case of recurrent left L5/S1 lumbar disc herniation, following an initial minimally invasive discectomy. Relapse of sciatica developed after 18 months of pain relief and did not respond to 8 weeks of conservative management. Redo surgery resulted in a satisfactory result.



Figure 3. A case of recurrent L4/5 lumbar disc herniation. Intradural rupture was found intraoperatively. Redo surgery resulted in an accepted result.



Figure 4. A case with recurrent L5/S1 herniation. Note the minimal scarring at the interlaminar space.

Table 1. Demographic Data of Patients

Parameter	Data	Patients No.	%
Sex	Males	17	57
	Females	13	43
Age	Below 40 years	17	57
	Above 40 years	13	43
Risk Factors	Diabetes	12	40
	Smoking	3	10
	Trauma	5	17
	None	10	33
Sciatica	Ipsilateral	16	53
	Contralateral	14	47

Table 2. Outcome of Sciatic Pain Following Initial and Revision Surgeries

Descriptive Outcome Clinical Data									
	Pre-discectomy VAS		Post discectomy VAS	Pain relief after discectomy %	Pre-revision VAS		Post-revision VAS	Pain relief after revision %	P
Mean	8.36		1.66	80.65	8.97		2.55	71.93	0.001* 0.003** 0.001***
Median	8.00		1.00	83.30	9.00		2.00	77.80	
SDV	1.47		1.02	10.39	1.03		1.64	17.48	
Range	5.00		4.00	40.00	4.00		7.00	70.00	
Min	5.00		.00	60.00	6.00		.00	30.00	
Max	10.00		4.00	100.00	10.00		7.00	100.00	
Percentiles	25	7.00	1.00	75.00	8.00		1.00	61.88	
	50	8.00	1.00	83.30	9.00		2.00	77.80	
	75	10.00	2.00	87.50	10.00		3.25	88.90	

VAS=Visual Analogue Scale score for pain, %=Percentage of pain relief

*Probability of Wilcoxon test between percent of pain relief after initial and revision surgeries

**Probability of Wilcoxon test between preoperative VAS of pain at initial and revision discectomies

***Probability of Wilcoxon test between postoperative VAS of pain at initial and revision discectomies

Table 3. Success and Failure Rates in Diabetic and Non-diabetic Patients

Type of patients	No.	% of Pain relief			Complications			Outcome			Success	Failure
		≥75	≥50-<75	<50	None	Minor	Major	Sat. ¹	Acc. ²	Unsat. ³		
Diabetic	12	3	7	2	5	6	1	2	7	3	75%	25%
Non-diabetic	18	18	-	-	16	1	1	17	-	1	94%	6%

¹satisfactory, ²accepted, ³unsatisfactory

Discussion

The success rate of redo surgeries for recurrent radicular pain varies widely from 50% to 90%.^{3,5,7,10,15,20,25} However, in series done on selected recurrent disc herniations, the success rate exceeded 75%.^{11,25} Studies done on revision surgeries, that included cases with epidural scarring, reported poor outcome of surgeries done on epidural scars compared to those done on recurrent discs.^{10,15,26} This study was designed to include a highly selected category of patients with failed back surgery. We only included those with proved recurrence of disc herniation at the same level of previous lumbar discectomy using gadolinium-enhanced MRI. We tried to exclusively evaluate recurrent radicular pain, so patients with primary backache were excluded from this study. We also excluded patients with associated conditions that can contribute for the recurrence of sciatica. So, we were able to assess the surgical outcome on recurrent sciatica due to true recurrence of lumbar disc herniation.

Although the degree of pain relief after revision surgery was reported to be less than that after initial discectomy in the majority (67%) of cases, the overall mean improvement of sciatic pain was 75% following the second operation which is comparable to that of the initial surgery. Moreover, we fulfilled a success rate (satisfactory and accepted results) of 87% after redo surgeries which compares favorably with the results of others.^{21,25,28}

Wide laminectomy with symptomatic side extensive discectomy was the initial surgery done in 23 cases (77%), while hemilaminectomy or flavectomy with unilateral less extensive discectomy was the procedure done in 7 cases (23%). When these figures were compared with numbers of corresponding discectomies done through this period we found that, 7.03% (23/327) of cases that underwent extensive discectomy via conventional approaches, and 6.36% (7/110) of cases that underwent less invasive surgeries with just removal of offending disc materials, developed recurrence. These figures reflect that, neither the invasiveness of the approach, nor the extent of discectomy seems to influence recurrence rate like many other studies had reported.^{6,12,18,25} We couldn't compare partial to complete discectomies in terms of recurrence because none of our cases underwent complete

discectomy (we did curettage of end plates in none of our patients). However, Cinotti et al,⁶ found no difference in the rate of recurrence associated with partial or complete discectomy. None of those cases who underwent initial less invasive surgeries developed major complications following redo surgeries, and all of them reported more than 75% improvement in their pain. These findings are in favor of minimally invasive discectomies which seem not to increase the rate of recurrence, yet associated with better results with redo surgeries once recurrence happened. The level of herniation, degree of herniation, and pain-free interval following initial surgery, seemed not to affect the clinical outcome. There was no significant difference between ipsilateral and contralateral herniation in terms of clinical outcome.

About 57% (17/30) of cases with recurrent disc herniation were males, and 57% (17/30), were below the age of 40. We found that, neither sex nor age was a significant risk factor for recurrence in our study, something that agrees with most studies.^{4,6,12,18,25} Diabetes was suggested by Robinson et al.,²² to be associated with increased susceptibility to disc prolapse. He analyzed the proteoglycan profile in the intervertebral discs of diabetic and nondiabetic patients, and found fewer proteoglycans in the former group. In our study, diabetes was not only the major detected risk factor for recurrence, but it seemed also to contribute for poor outcome. This finding agrees with that of Mobbs et al,¹⁸ who documented poor outcomes in diabetic patients with recurrent herniations. Failure of redo surgery was more than four-fold increased among diabetics compared to non diabetics in our study. Although smoking was detected in 3 of our patients (10%), this percent seems to be less than that of smokers in general population in our locality, giving an impression that smoking is not a considerable risk factor for recurrence. By comparing the degree of herniation in initial and revision surgeries, we found a tendency for increase in the degree of herniation with recurrence.

Although all cases with recurrent sciatica following initial discectomy in our department were investigated using gadolinium-enhanced MRI imaging, 5 cases were found intraoperatively to be symptomatic epidural scars and were excluded from our study. None of the cases underwent

myelography since it was reported to be neither sensitive nor specific in differentiation between scar and recurrent disc.²The sensitivity of non enhanced MRI was reported to be 100%, while specificity was raised from 71% to 100% after administration of contrast.¹³ Another study found that routine use of contrast-enhanced MRI examinations in patients, who have had prior lumbar surgeries, adds little diagnostic value and may be confusing.¹⁹ Generally, the scar enhances because it has a blood supply, a fenestrated capillary endothelium, and an extravascular space. Disc does not enhance or enhances minimally at its periphery because it has no blood supply. However, in 5 cases diagnosed before redo surgeries as being recurrent herniations, no disc material was found yet only a dense fibrous tissue. This may be due to technical errors regarding the amount or timing of dye injection, or may be due to misinterpretation. Most practitioners agree that optimal evaluation requires that the patient undergo neuroimaging immediately after contrast administration because the enhancement pattern is best within the first 5 minutes.¹

Conclusion

Less invasive discectomies seemed not to increase the risk of recurrent herniation, compared to more invasive techniques. However, surgical outcome of revision surgeries seemed to be more favorable following these initial less invasive procedures. Revision surgery to be highly effective in well-selected cases with recurrent lumbar disc herniation, with success rates reaching 87%. The outcome is comparable with that of primary discectomy, with no significant increase in operative time, or hospital stay. Diabetic patients carry about fourfold increase in unfavorable outcomes. We recommend conventional open discectomy for careful clinically, and radiologically selected cases with recurrent lumbar disc herniation.

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الملخص العربي

النتائج المبكرة للألم النسا بعد إعادة الجراحة للغضروف القطني المرتجع

البيانات الخلفية: تعتبر حالات الغضروف القطني المرتجع من المشاكل الجراحية المتكررة التي تواجه جراحي العمود الفقري وتختلف نتائج إعادة التدخل الجراحي كثيرا بين الدراسات المختلفة. وقد يرجع تباين النتائج إلى وجود جملة من المشاكل الجراحية الأخرى مصاحبة للغضروف المرتجع، مثل ضيق القناة الشوكية، وجود انزلاقات جديدة، ترحز الفقرات، وجود التصاقات حول جذور الأعصاب، أو غيرها مما يؤثر على نتائج الجراحات.

الطريقة: لذلك فقد قمنا بعمل دراسة تحليلية عن النتائج الجراحية المبكرة لإعادة استئصال الغضاريف القطنية المرتجعة مع استبعاد أي مشاكل مصاحبة بالعمود الفقري من شأنها التأثير على نتيجة الجراحة. أسفرت عملية الانتقال عن اختيار عدد ثلاثون حالة تم عمل إعادة استئصال غضاريف قطنية مرتجعة لها على مدار ثماني سنوات ومتابعة نسبية تحسن الألم بعد فترة ثلاث أشهر من الجراحة وعودة المريض إلى نشاطه السابق. تم تقسيم النتائج إلى: مرضية، مقبولة، وغير مرضية. النتائج: أظهرت عشرون حالة نتائج مرضية، وستة حالات كان بها نتائج مقبولة لتكون نسبة نجاح الجراحات ست وعشرون حالة من إجمالي ثلاثون (87%). هذا وقد حصلنا على نتائج غير مرضية في أربع حالات (13%) كان معظمها يعاني من مرض السكري.

الاستنتاج: خلصنا في نتائج البحث إلى أن إعادة استئصال الغضاريف القطنية المرتجعة تعطي نتائج تقارن بالجراحات الأولى في الحالات التي يتم انتقائها بعناية، كما وجدنا أن مرض السكري يرفع نسبة فشل نتائج تلك الجراحات حوالي أربعة أضعاف.