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Erbayraktar, Serhat

Feridun, Acar

Tekinsoy, Bulent

Acar, Umit

Guner, E. Metin

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Outcome Analysis of Reoperations after Lumbar Discectomies: a Report of 22 Patients

SERHAT ERBAYRAKTAR^{1*}, FERİDUN ACAR¹, BÜLENT TEKİNSOY²,
ÜMİT ACAR¹, and E. METİN GÜNER¹

*Dokuz Eylül University, School of Medicine, Departments of Neurosurgery¹
and Radiology², İzmir 35340, Turkey*

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Our aim was to analyse causes for persistence of pain after lumbar discectomy and outcome of reoperations. Out of 37 reoperated patients, 22 with a minimum follow-up period of one year were included in this retrospective study concerning the years 1993 to 2000. All patients had previously undergone laminotomy and discectomy and fusion was not required during second operations. Outcome was evaluated according to the modified criteria of Kawabata *et al.*. Overall incidence of reoperation was 6.5%. Reoperations were performed because of recurrent disc herniation in 9 patients, epidural fibrosis in 8, and de novo disc herniation at a different level in 5. Contrast enhanced computerized tomography was used in 17 patients and this might be the reason for misdiagnosis of recurrent disc herniation in the two patients with epidural fibrosis. In patients with de novo disc herniation, symptoms recurred earlier. In 20 patients, satisfactory relief of pain, as well as better outcome could be achieved ($p<0.05$), but no significant improvement in neurological deficits was observed. Excellent results were obtained more in patients with recurrent disc herniation and poor outcomes correlated with long (> 1 year) time intervals for onset of recurrent sciatica ($p<0.05$). However, patients with epidural fibrosis were also glad postoperatively for decreased pain severity. Only co-existence of epidural fibrosis and de novo disc herniation predicted an inferior outcome. Although recurrent disc herniation seemed to respond best to surgical treatment, we recommend reoperation when objective preoperative findings indicate the presence of surgically correctable compression regardless of its type.

The failed back surgery syndrome (FBSS) is a severe, long-lasting and disabling complication of lumbosacral spine surgery. Failure of therapy may result from structural abnormalities in the back, psychosocial influences, or a combination of both (20,22). Recurrent disc herniation (RDH), epidural fibrosis (EF), spinal instability, wrong level of operation, stenosis of the spinal or nerve root canal and inadequate surgical techniques are the most frequently documented causes (6,20). Reoperation rates after lumbar discectomy range from 4 to 15 % depending on the type of surgical procedure (6,11,12,16,25,26). Frequently, recurrent or uninfluenced sciatic pain and neurologic deficiency or lumbar spine instability may lead to revision (8). At first reoperations, RDH is commonly found as the cause of recurrent complaints (2,10,11). Besides, there is a consensus on the fact that results of recurrent disc excision are comparable to those after the initial operations (6,13,20). On the other hand, rate of EF and spinal instability increase to greater than 60 % in multiple revision patients and outcome significantly worsens (8,13). The main therapeutic problem in

patients with EF is the lack of randomized trials concerning the effectiveness of any treatment modality relative to others, placebo, or no treatment. Instead of reoperation, there is a trend toward conservative therapy with spinal cord stimulation considering it as a first choice of treatment in FBSS due to EF during the last decade (6).

In this retrospective study, we investigated the effectiveness of reoperation in a series of 22 patients who underwent previously a lumbar discectomy and compared our results with that of the other studies.

MATERIALS AND METHODS

During the years 1993 and 2000, lumbar discectomy was performed in 570 patients. Reoperation was performed in 37 of them. The reoperated patients who could have been followed regularly at least one year postoperatively, were included in this study. Among them, 22 patients (12 men and 10 women) all of whom had had only one previous lumbar discectomy performed also in our hospital and had undergone a second operation for persistence or recurrence of leg pain are described. The mean age of the patients at the time of the first operation was 44 years (25 to 66). In all patients the leg pain was worse than the back pain before the first operation and the mean duration of the complaints was 24 months (2 months to 12 years). The previous operations were discectomies performed via laminotomy in all.

The mean interval between the preceding and the present operation was 24 months (1 month to 9 years) and the mean duration for the beginning of the recurrent sciatica after the initial operation was 13.5 months (1 month to 5 years). Patients were evaluated preoperatively by radiography and one or more of computerized tomography (CT) magnetic resonance (MR) and myelography. For decompression we performed not only discectomy, but also wide bony removal and foraminotomy with resection of the scar tissue enclosing the dural tube in all patients. In patients who underwent either hemilaminectomy or total laminectomy, at least half of each facet joint was preserved. Neurolysis of the scarred nerve root was also performed in patients with postoperative fibrosis. Methyl prednisolone acetate was instilled to the exposed nerve root during all reoperations in order to reduce postoperative pain and spasm due to the dissection of scarred paravertebral muscles, dural sac and nerve root. A third operation was not performed on any patient.

The mean follow-up duration was 24 months (12 months to 4 years). The operative outcome was evaluated according to the modified criteria of Kawabata *et al.*(15) as follows: *excellent*, no symptoms and normal objective findings (neurologically intact); *good*, marked improvement and no disabilities (minor sensory deficit and paresis grade 4/5 with improvement at least one grade); *fair*, some residual symptoms (minor complaints) and abnormal objective findings (minor sensory deficit, mild atrophy, and paresis grade 3/5 or 4/5 with improvement of at least one grade); and *poor*, no improvement (major complaints, marked deficits and atrophy) or deterioration.

Statistics. One-way ANOVA was used to compare time intervals prior to either recurrence of symptoms or reoperation in patients with three diagnostic subgroups. Comparisons for the changes in neurological findings were also performed with the McNemar test. Chi-square analysis was applied during comparisons concerning the rating scale and Fischer's exact test was used when needed. In one dichotomy, patients with improvement postoperatively (i.e., excellent and good) were compared with those with no improvement (i.e., fair and poor). In another dichotomy, patients with excellent results were compared with those with good, fair and poor. P- values less than 0.05 were accepted to have significance.

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RESULTS

Analysis of the initial operation. Herniated disc was excised in L3-4, L4-5, and L5-S1 levels in 1, 11, and 7 of patients, respectively. In two patients a two-level and in one a three-level disc excision had been performed. Among single-level disc herniations, lumbar disc herniation was found to be in midline and in posterolateral in 4 and 5 of patients, respectively. Extruded disc could be removed only in 7 patients all of whom had single level disc herniation.

The short-term clinical outcome after the initial operation was excellent in 8 patients, good in 7 and fair in 7. However, late follow-up revealed that clinical outcome was fair and poor in 19 and 3 cases, respectively.

TABLE I . Summary of the patients' characteristics related to diagnosis.

	Recurrent disc herniation (n=9)	De novo disc herniation (n=5)	Epidural fibrosis (n=8)
Age (years)	46.33±14.36	46.80±15.59	38.37±7.61
Gender (M/F)	5/4	1/4	5/3
Time interval for recurrent pain (months)	18.00±24.14	5.40±2.60	13.37±17.90
Time interval for reoperation (months)	37.33±31.43	5.6±2.96	21.37±20.61
Postoperative clinical improvement	9	3	8

Analysis of the second operation. Sciatica was problematic in all patients, but associated back pain was prominent in only 9 patients. In patients with de novo disc herniation (DNDH), not only the mean interval for the recurrence of symptomatology, but also that of between the two operations were short (Fig. 1). However, these were not statistically significant findings ($p>0.05$ by one-way ANOVA). Of the study group 31% (8 patients) related the onset of recurrent pain to an isolated injury or a precipitating event. Factors such as age, sex and side of surgery did not differ between patients with discrete diagnostic subgroups (Table I). Although the radicular symptoms and signs were confined to the left side in 12 patients before the initial operations, two of them developed contralateral symptoms and another two bilateral symptoms prior to the second operation. Motor deficits were found in 21 patients whereas sensory and deep tendon reflex deficits in 19 and 21 patients, respectively.

We used contrast enhanced CT during the preoperative investigations in 17 patients. Gadolinium-DTPA enhanced MR and CT-myelography were also performed in 6 and 1 patients, respectively. Radiologically, EF was supposed to be responsible for recurrence of the symptomatology in 6 patients because of severely compressed dural sac and nerve root whereas retained disc fragment or RDH and DNDH at a different level in 11 and 5 patients, respectively. However, intraoperative findings were consistent with EF in 8 patients, RDH in 9. The lesions dissected at the second operation were located at the same site as the initial operation in 17 patients. Another disc level was also explored together with the previous one in four patients. In the remaining patient, a new laminotomy had to be performed because of a nerve root compression due to de novo herniation of the adjacent disc. Retained fragments were also removed during reoperations in one third of the patients with RDH. In most of the

patients with disc herniation, fibrosis was also present but usually to less of an extent and was not accepted to be the main cause of nerve compression. But 4 of the 5 patients with DNDH at a different level, moderate EF was present in the previous laminotomy site and was also decompressed during reinterventions. In three (14%) patients, dural tear developed during dissection of the peridural scar tissue and repaired with suturing. Fortunately, none of them was complicated postoperatively.

TABLE II. Operative outcome related to diagnostic subgroups.

	Excellent	Good	Fair	Poor
Recurrent disc herniation (n= 9)	7	2	-	-
De novo disc herniation (n=5)	1	2	1	1
Epidural fibrosis (n=8)	2	6	-	-

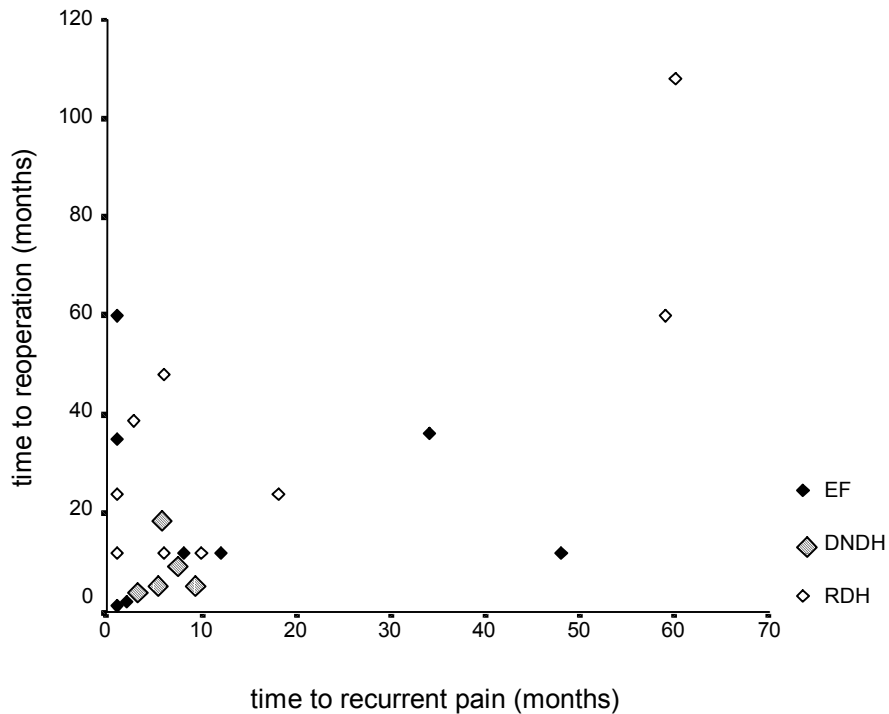


FIG. 1. Time-dependent distribution of the patients.

Distribution of patients related to the time interval for either recurrent sciatica and reoperation. Better outcomes were contributed by the patients whose symptoms had recurred before one year due to a disc herniation. Abbreviations: RDH= recurrent disc herniation; DNDH= de novo disc herniation; EP= epidural fibrosis.

An acceptable level of pain relief could be achieved in 20 patients during the postoperative period (χ^2 test, $p < 0.05$ in dichotomy 1). Severe back pain and sciatica persisted in only two patients whose radiographic findings were indicating DNDH on either CT or MR. Motor deficits improved in 3 of 21 patients, sensory deficits in 2 of 19, and deep tendon reflex

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deficits in 1 of 21. However, these changes were not statistically significant during intragroup comparisons (McNemar test, $p > 0.05$). The clinical outcome after the second operation was found to be excellent in 10 patients, good in 10, fair in 1 and poor in 1 (Table II). These results were representing an overall clinical improvement in 91% of the reoperated patients. Excellent results were significantly frequent in patients reoperated for RDH (χ^2 test, $p < 0.05$ in dichotomy 2). Length of the time interval for beginning of sciatica after the initial operation correlated well with outcome (Fig. 2). Patients whose symptoms

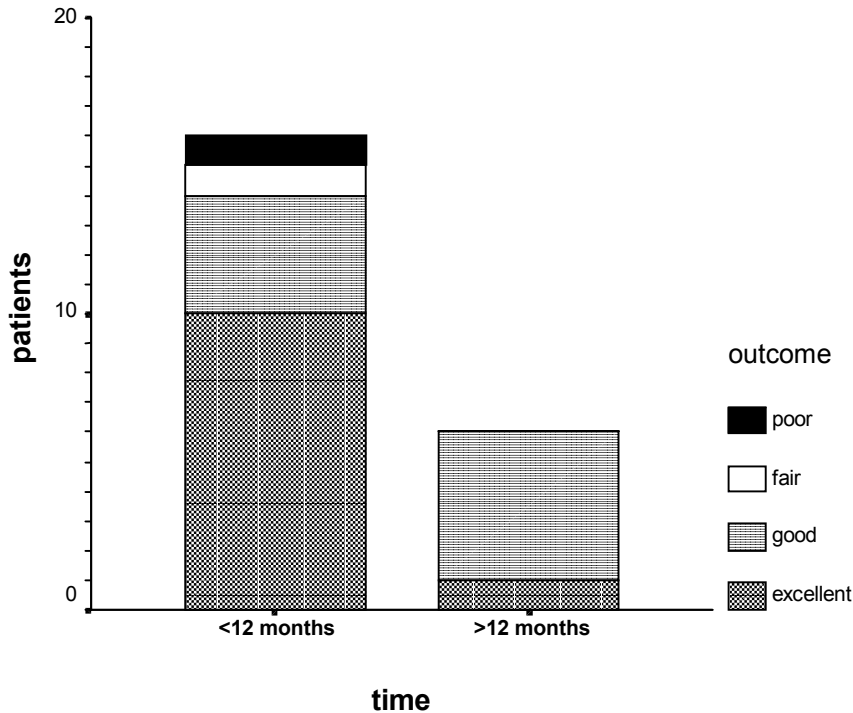


FIG. 2. Analysis of outcome according to the length of pain-free interval after initial operations.

Relationship between clinical outcome and length of time interval for recurrent sciatica. Significantly better outcomes were noted in patients whose symptoms recurred before one year ($p < 0.05$).

recurred before one year seemed to have better outcomes (χ^2 test, $p < 0.05$ in dichotomy 2). In two patients with an inferior outcome, conservative treatment with was constituted since no surgically remediable lesion was elicited. A fair amount of control over pain could be obtained in both.

DISCUSSION

Outcome studies of lumbar disc surgery (14) document a success rate between 49-90% and reported rates of reoperation after lumbar discectomy (6,11,12,16,25,26) range from 4% to 15%. Residual or reextruded disc herniations, either sub- or transligamentous, are found at revisions (2). In a series of 65 patients, Jönsson *et al.* documented RDH and EF in 29 and 38 per cent of their patients, respectively (13) In the present study, RDH was responsible for

recurrence of sciatica in 41 per cent of the patients. EF and DNDH were also found in 36% and 23% of the patients, respectively.

Preoperative differentiation of such causes leading to recurrence of symptomatology is important not only for surgical planning, but also for predicting outcome. Sensitivity and validity of diagnostic tools used can not as yet be considered to be optimal (7). A strong positive correlation between CT and operative findings suggests that postcontrast CT may be used as one of the reliable method for preoperative differentiation of RDH from EF (17). But sensitivity of MR as verified by reoperation was found to be over 90 per cent and this diagnostic tool was recommended for making the differential diagnosis of RDH (4,5,7). We observed some discordance between the radiological and surgical findings in our reoperated cases. Preoperative diagnosis of RDH failed to be proven surgically in 18% whereas marked EF was observed 33% more than the estimated. But the rate of DNDH could be predicted precisely. The fact that postcontrast CT was used in the majority of our patients may explain this high preoperative misdiagnosis rate.

Herron *et al.* (10) reported that true recurrence of disc herniation was found at the same intervertebral level in 74% whereas at a different level in 26% of their reoperated 46 patients. Contrary to their results, Kloc *et al.* (18) documented recurrence of disc herniation at the same level in 44% and at a different level in 56% of their 73 patients. Our results were found to be in accordance with that of the former. Among 14 patients with surgically proven disc compression, 9 of them had recurrences at the same level. When all patients were included, rate of recurrent compression at the same level was increasing to 77%. These results may indicate inadequate application of the surgical techniques during initial operations or less likely the development of spinal instability.

Fusion is not routinely recommended in patients undergoing repeat laminotomy and discectomy for RDH (10). Unless there is spinal instability, RDH may be adequately treated by repeat laminotomy and discectomy alone. None of our patients required a posterior fixation and fusion procedure either before or after the second operation. We widened the previous laminotomy and foraminotomy borders routinely in all patients, but took care of preserving at least half of each facet joint at the same time.

There are many outcome scales that makes it difficult to compare the results of different centers (1,3,15,19,23). But it is widely accepted that the results after repeated surgery on RDH are comparable to those of the first intervention. Although complete or partial relief of all pain symptoms was achieved in 56 to 86 per cent of the reoperated patients (2,10), long-term rate of good to excellent results were ranging between 64-69%. The fact that excellent results were observed in 45% of our patients may be misinterpreted as worse when compared with that of the other series. However, we achieved clinical and neurological improvement in other 45 per cent of the cases, too. Thus, second operation was found to be unfavorable in only two patients.

In the present study, nerve root compression responded well to repeat decompression in 78% of the patients with RDH. Similar results were widely shown in many previous reports. Contrary to Lehmann (21) and Silvers (25), we obtained superior results especially in patients whose symptoms had recurred before one year postoperatively and majority of those patients were suffering from RDH. Analysis of these two observations showed us that among patients with disc herniations, those developing early recurrent sciatica seemed to offer better results. Worse outcome was commonly documented after reoperations for EF and sciatica, as well as neurological deficits were seldom found to be improved (6,8,13,20). But it is not always easy to decide whether radiologically demonstrated epidural scar tissue is responsible for the occurrence of FBSS. Cinotti *et al.* stressed the importance of this problem, since they

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could have not found any correlation between the amount of EF, as seen intraoperatively and on MR, and the result of surgery (5). Nevertheless, in spite of some optimistic reports (9,13), repeated surgery for fibrosis commonly gave only 30-35% success rate in many previous studies and 15-20% of those patients had reported worsening of their symptoms (6). Schlarb and Wenker (24) determined the failure rate of reoperations for EF as 76%. Therefore, several months of conservative treatment with or without spinal cord stimulation was advocated in the management of FBSS due to EF. Our results concerning this group of patients conflicted with those. The rate of excellent results were low, but marked improvement could also be achieved in 75% of such patients after decompression and none of them worsened postoperatively. The fact that we gave the chance of reoperation to the patients whose symptoms were accepted to be resulting from radiologically proven evidents of dural sac and nerve root compression may explain this controversy. We obtained worse outcome in two patients who were reoperated for DNDH. Interestingly, both of them had associated EF of the previous laminotomy site. So, co-existence of two discrete type of compressive lesions predicted a high risk of bad outcome. Fortunately, preoperative diagnosis of such a co-existence was not problematic in our patients, even with CT. Despite inverse relation between the outcome and number of operations, we could have expected a third operation for these patients. However, we could not detect any surgically remediable lesion and decided to treat them conservatively. Double-crush injury of the related nerve root, as well as mechanical pain due to multi-level surgery may explain the inferior outcomes observed in those patients.

CONCLUSION

In the present study, results of reoperations for RDH or DNDH at a different level compared favorably with those reported after original surgeries. Although rate of excellent results after reoperations for EF was low when compared with that of RDH, patients without any associated DNDH were glad that they had had the second operations. We believe that adequate decompressive surgery still offers favorable outcome when the organic cause of the recurrent symptoms is clearly evident.

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