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Influence of Depression on Patients' Satisfaction with the Outcome of Microsurgical "Key-hole" vs Classical Discectomy: Prospective Matched-cohort Study

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Aim. To assess the influence of depression on patients' satisfaction with lumbar discectomy performed by two different surgical techniques.

Methods. A prospective matched-cohort analysis of classical lumbar discectomy following static imaging (n = 45) and microlumbar "key-hole" discectomy after dynamic CT/myelography (n = 55) was performed. The outcome was independently assessed using Prolo economic/activity (E) and functional/pain (F) scale, and depressiveness according to Hamilton rating scale. Patients without improvement on the Prolo scale were classified as failed back surgery syndrome, and with a Hamilton score 17 as depressive.

Results. The groups were well matched by age, sex, clinical presentation and incidence of depression. In the "key-hole" group, both activity and pain outcome were better than in the classical technique group (median E score (range) = 4 (2-5) vs 3 (2-4), p = 0.002, median F score (range) = 4 (2-5) vs 4 (1-5), p = 0.008). Eighteen patients were classified as failed back syndrome, 6 in the "key-hole" group, and 12 in the classical group (z = 3.16, p = 0.075). The incidence of failed back syndrome among non-depressive patients was significantly lower in "key-hole" group (2/55 patients vs 8/45, z = 2.345, p = 0.009). Occurrence of unsatisfactory results among depressive patients was very similar in both groups (4/55 patients vs 4/45, z = 0.296, p = 0.384).

Conclusion. Introduction of functional imaging and "key-hole" technique decreased incidence of failed back syndrome among non-depressive patients. Unsatisfactory outcome among depressive patients was unrelated to the imaging and surgical technique. Connection between depression and failed back syndrome, although detected, remains unclear and must be further investigated.

Key words: depression; diskectomy; lumbosacral region; myelography; outcome assessment (health care); quality of life; spine

The incidence of low back pain is close to that of the common cold (1). Lumbar discectomy is the last treatment method for patients suffering low back pain and is indicated when all conservative measures have failed. Lumbar discectomy, although considered the most optimistic part of neurological surgery, is connected with an unacceptably high unsuccessful outcome rate, up to 60% (2-4). Three mortal sins responsible for failed back surgery which surgeons admit are (5,6): doing the wrong operation, doing the correct operation at the wrong level, and operating on the wrong patients.

During February 2000, surgeons of the Division of Neurosurgery, General Hospital Pula, changed the treatment protocol of low back pain patients in order to prevent the first and second error. According to the new protocol, all patients were investigated using dynamic myelography augmented with CT. Microsurgical "key-hole" technique parameters proposed by Williams were introduced (7-9). During a two year ime period prior to the introduction of the new treatment protocol, patients were investigated using static imaging (CT and/or MRI) and were operated on with microscopic assistance following classical surgical technique principles. The aim of the study was to asses the influence of dynamic imaging, microsurgical "key-hole" surgical technique, and depression on outcome of lumbar discectomy.

Patients and Methods

Patients

From September 1, 1997, to June 23, 2001, a hundred and twenty patients were referred from the neurosurgical outpatients department to the hospital because of backache with a spreading pain in the leg. The pain had lasted longer than 3 months and had not stopped despite the application of conservative therapy. The second reason for admission was the presence or a deterioration of neurological deficit (motor weakness, problems with defecation and/or urination). The indications for surgery and inclusion criteria for the both study groups were mechanical back-pain and mono- or polyradiculopathy. The existence of a positive correla-

tion between the EMG, CT and/or MRI and the clinical picture was needed for the inclusion in the study. Patients who had previously been operated on more than twice were excluded from the study.

Patients surgically treated prior to February 13, 2000, comprised the first studied cohort. They underwent CT and/or MRI and were operated on using classical surgical technique. The patients surgically treated after February 13, 2000, were investigated with dynamic myelography supplemented with CT. Surgical technique used in second cohort followed principles proposed by R. Williams (7-9).

The data of preoperative activity and pain histories and physical examination findings were obtained from the central hospital database. After 6 month to 4 years of the follow-up, the patients were called for interview.

Hundred and twenty patients were operated on due to low back pain and were included in the study; 60 patients underwent classical lumbar discectomy and 60 the "key-hole" technique (Fig. 1). From 60 "key-hole" group patients, 5 were lost, as we were unable to get in touch with them because of a change of address. From 60 classical technique group patients, 5 had died in the meantime for reasons unrelated to the operation. Another 10 patients were lost for the same reasons as in the "key-hole" group.

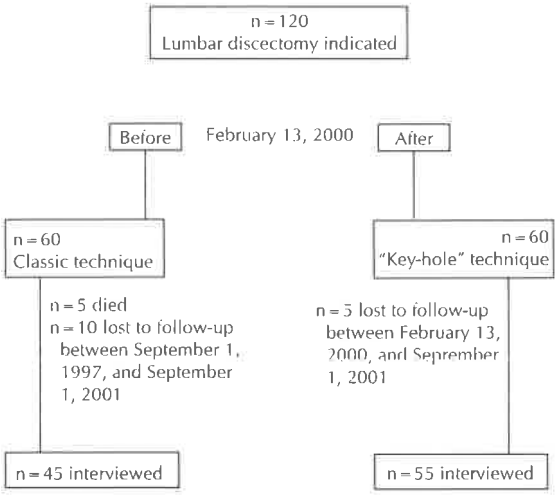

Figure 1. Profile of the study.

Surgical Treatment

Patients were operated on in prone kneeling position. Following placing of the "key-hole" group patient on the operating table, the exact operational level was marked with spinal needle under x-ray guidance. For the patients in the classical technique group, the level was palpated at the beginning of the operation. In the "key-hole" group, laminoplasty was used instead of laminectomy. In the "key-hole" group, the lateral fibers of the ligamentum flavum and epidural fat tissue were preserved. Annulus fibrosus was opened by the dilatation of fibers rather than cutting with a scalpel. Evacuation of only enough disc tissue to achieve decompression rather than complete evacuation of disc tissue with the curettage of the disc space was carried out. Electrocoagulation of the extradural space and placement of foreign material as surgical were avoided. Instability was treated with intertransverse fusion with autologous bone graft instead of pedicle screw fixation used in the classical technique group. In the "key-hole" group, foraminal decompression was performed via a paraspinal approach. In the classical technique group, foraminal decompression was performed through the spinal canal (7-9).

Surgery Outcome

To determine outcome, the preoperative and postoperative condition of the patients was rated in accordance with the Prolo economic/activity (E) and functional/pain (F) scale (10). The group whose median (range) was greater on the Prolo scale is considered to have had a successful surgical outcome. The preoperative Prolo scale ratings were calculated from the medical records saved in the central hospital database. After 6 months to 4 years of the follow up, in a time period between September 1, 2001, and December 15, 2001, a neutral investigator (I.LJ.B.) interviewed the patients, and determined the postoperative Prolo rating scale. The type of operation was unknown to the examiner.

The ratings on the Prolo scale were from 1 (poor) to 5 (excellent). Economic/activity grades were as follows: E1 – completely disabled, E2 – no gainful occupation, E3 – working actively but not at premorbid level, E4 working at the previous level with limitation, and E5 – working at the previous level without limitation. Functional/pain grades were: F1 – total incapacity, F2 – moderate-to severe daily pain, F3 – low level to daily pain, F4 – occasional or episodic pain, and F5 – no pain.

The patients who did not have any difference between the preoperative and postoperative Prolo score were considered as failed back surgery syndrome.

Depression

During the follow-up, an independent investigator (I. LJ. B.) assessed depressive symptoms according to the Hamilton rating scale. Hamilton depression rating scale (11, 12) is based on the investigator's evaluation and includes 17 depressive state indicators: 1. depressed mood, 2. guilt feelings, 3. suicidal ideas, 4. insomnia – early, 5. insomnia – middle, 6. insomnia – late, 7. work and activity, 8. retardation – psychomotor, 9. agitation, 10. anxiety – psychological, 11. anxiety – somatic, 12. somatic gastrointestinal symptoms, 13. somatic general symptoms, 14. sexual dysfunction – menstrual disturbance, 15. hypochondria, 16. weight loss, and 17. insight in illness. The indicators were evaluated on a scale from 0 to 4, with exceptions of the items No. 4, 5, 6, 12, 13, 14, 16, and 17, which ranged from 0 to 2. Patients with a total score of more than 17 were considered as depressive (13).

Statistical Analysis

Chi-square test was used for the analysis of the differences in the prevalence of depression among patients with failed surgery and successful operations, and differences between the classical and "key-hole" groups for the following parameters: gender, number of previous operations, presence of mechanical pain and radiculopathy. Mann-Withney U-test was used for the analysis of the difference in age between the two study groups, and differences between the classical and "key-hole" groups in preoperative and postoperative grades on the economic/activity and function/pain scales. Wilcoxon's nonparametric test was used to compare preoperative and postoperative values on the economic/activity and function/pain scales within each group.

Results

Forty-five patients who underwent classical lumbar discectomy following static imaging were matched with 55 "key-hole" patients. There were 60 male and 40 female patients. The mean age was 48 years in both groups (Table 1). There were no significant differences between the two groups in the number of previous operations, presence of mechanical pain, and radiculopathies, and the number of depressive patients. Preoperative diagnostics and operations carried out are shown in Table 2.

There were no differences between preoperative values on economic/activity and functional/pain scales between the classical technique and the "key-hole" group (Table 3). After 6 months to 4 years of the follow-up, values on the economic/activity scale were greater than the preoperative values in both classical technique and "key-hole" groups. Follow-up values on the functional/pain scale were greater than the preoperative values in both classic technique and "key-hole" groups. Both economic and pain outcomes after the follow-up period were better in the "key-hole" group than in the classic technique group.

There were 6 patients in the "key-hole" group and 12 patients in the classical technique group with failed back surgery syndrome. The difference between the two groups was near a statistical significance (p = 0.075).

Eight out of 18 failed back surgery patients had depression, compared with 8 patients out of 82 that were satisfied with surgery (8/18 vs 8/82; chi-square = 10.760, p < 0.001). In the "key-hole" group there were 4 patients with coexisting failed back syndrome and depression and 4 patients in classical technique group (z = 0.296, p = 0.384). There were 2 non-depressive patients with "key-hole" technique, whereas 8 non-depressive patients were unsatisfied with classical discectomy (z = 2.345, p = 0.009).

Table 1. Clinical characteristics of patients undergoing the classical lumbar discectomy (n = 45) or microlumbar "key-hole" discectomy (n = 55)

	Lumbar discectomy surgical technique		
	classical	p	"key-hole"
Age (range, years)[a]	48 (35-69)	0.881	48 (28-71)
Sex (M/F)[b]:			
male	24	0.305	36
female	21		19
Previous operations[b]:			
0	30	0.123	46
1	10		5
2	5		4
Mechanical pain[b]:			
present	14	0.282	24
absent	31		31
Radiculopathy[b]:			
monoradiculopathy	33	0.508	41
polyradiculopathy	7		5
cauda equina syndrome	5		9
Depression[c]	9	0.162	7
Follow-up (months)	18-48		6-18

[a]Mann-Withney U-test.
[b]Chi-square test.
[c]Test of differences between proportions.

Table 2. Preoperative diagnostics and performed surgeries in the patients undergoing classical lumbar discectomy (n = 45) or microlumbar "key-hole" discectomy (n = 55)

	Surgical technique	
No. of patients	classical	"key-hole"
Instability	15/45	22/55
Reoperation – instability	9/15	3/22
Operation:		
interlaminectomy	28	32
laminectomy/laminoplasty	16	19
PSF/ITF[a]	15	22
paraspinal foraminotomy	0	2
Level of surgery:		
L1/L2	0	2
L2/L3	1	1
L3/L4	5	5
L4/L5	24	27
L5/S1	10	13
L3/L4/L5	4	3
L4/L5/S1	1	4

[a]Pedicle screw fixation/intertransversal fusion.

Table 3. Preoperative and postoperative economic/activity (E) grades and function/pain (F) grades in patients undergoing classic lumbar discectomy or microlumbar "key-hole" discectomy

	Surgical technique		
	classical	p	"key-hole"
Economic/activity Prolo grade[a]:			
preoperative	2 (1-3)	0.697[c]	2 (1-3)
postoperative	3 (2-4)	0.002[c]	4 (2-5)
p	< 0.001[b]		< 0.001[b]
Pain/functional Prolo grade[a]:			
preoperative	2 (1-3)	0.238[c]	2 (1-4)
postoperative	4 (1-5)	0.008[c]	4 (2-5)
p	< 0.001[b]		< 0.001[b]
Failed back syndrome	12	0.075[d]	6
non-depressive	8	0.009[d]	2
depressive	4	0.384[d]	4

[a]Results are expressed as median (range).
[b]Wilcoxons nonparametric test.
[c]Mann-Withney U-test.
[d]Chi-square test.

Discussion

Our study showed that microsurgical "key-hole" technique following dynamic imaging resulted in an improvement of patients activity and pain score compared with patients operated on using classical lumbar discectomy following static imaging. Furthermore, there was a connection between depression and unsatisfactory outcome.

Possible limitation of the study is the duration of the follow-up between 6 months and 1 year in a third of patients in microsurgical "key-hole" group. Asch et al (14), in their multiple outcome study of lumbar microdiscectomy reported very similar outcome results at 6-month follow-up examination as at 1-year follow-up examination. Therefore, outcome after 6-month follow-up can be considered as the final result. The strength of the study is its objectivity. A neutral investigator, for whom the type of surgery was masked, rated the outcome. Furthermore, all patients presenting with low back pain and having an indication for surgery were included. In previously published similar studies, the outcome of virgin disc herniation surgeries or spinal stenosis on only a single level was evaluated or surgeons involved in the treatment of the patients did an assessment of results (7,15-20). Therefore, the results of previously published reports appeared too optimistic and the problem of unsatisfactory outcome could be ignored (21).

Following the introduction of MRI in routine investigation of patients with low back pain, dynamic myelography and postmyelogram CT lost its popularity as an old-fashioned technique (22-24). However, dynamic CT/myelography is still recommended for operative decision making and planning because it gives, from the surgeon's perspective, the best view of the motion segment stability and the amount of the spinal canal decompression needed (25).

In the early 1790s, pioneers in microsurgery introduced microlumbar discectomy, which significantly improved the outcome of lumbar disc surgery (15-19). During the past 30 years, operating microscopes have become inevitable tools in surgical theaters but characteristic parts of traditional macrosurgical techniques such as laminectomy, removal of epidural fat, scalpel incision of the annulus fibrosus, curettage of the disc space, and spinal canal approach for foraminal disc herniation are continually in use. Reduced wound size of microlumbar discectomy forces the surgeon to think critically about exactly what pathology is causing the nerve root encroach-

ment, where it is located in the spinal canal, and if it is connected with instability (20).

Disc herniation is quite common but asymptomatic (27-29). Psychosocial factors have a significant influence on pain perception (29,30). The influence of these confounding factors may partially explain why surgery is not always successful (31). A few studies have investigated the influence of psychological factors in disc herniation and attempted to predict the surgical outcome by preoperative psychological assessment (32-34). Chronic low back pain is associated with major depression in approximately 50% of cases (35). Polatin and associates showed that among 200 patients with chronic pain 55% developed depression before the onset of chronic pain, and 45% became depressed after the onset of chronic pain (36). Duration of the pain was related to the development of depression (37). In the same study, the incidences of bipolar, panic, obsessive-compulsive, phobic, and generalized anxiety disorders were approximately the same as in a normal population. Nygaard and associates (38) showed that leg pain lasting preoperatively more than 8 months correlates with an unfavorable outcome in the patients with lumbar disc herniation. In their study, the delay of care in disc herniation caused a high risk of not returning to work. These results showed that time point for surgery is important for prevention of chronic pain and coexisting depression.

Our next step should be a prospective study dealing with the timing of surgery, and aiming to clarify relationship between depression and surgical outcome.

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