Bratisl Lek Listy 2010; 111 (5)
290 – 295

CLINICAL STUDY

Quality of life after elective lumbar spinal fusions

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Abstract: *Objectives:* Our goal was to evaluate the quality of life in patients who underwent an elective lumbar stabilization and fusion.
Materials and methods: We treated 208 patients (120 females and 88 males) for degenerative lumbar spine conditions. In 165 cases we performed the transforaminal lumbar interbody fusion (TLIF), in 38 the posterolateral lumbar fusion (PLF) and in 5 the anterior lumbar interbody fusion (ALIF). Before and after the surgery, pain was evaluated with the VAS and the quality of life with the second version of the SF-6. Follow up was from six months to two years. We used the statistical tests chi-square, t-test and ANOVA.
Results: Satisfied were 62.5 % of patients, partially satisfied were 19.7 % and dissatisfied were 17.8 % of patients. The average VAS decreased from 68 to 35. There was a significant improvement in mobility and decrease of consumption of analgetics after the surgery. Clinically significant improvements were in all domains of sf-36 except the mental health, social function and mental composite score. We had 30 complications in 28 patients. A revision surgery was necessary in 18 cases. Complications had no significant effect on the SF-36 and VAS score.
Conclusion: The results are comparable with published data. Correctly indicated spinal operations are effective in reducing pain and improvement of the function. We have noted a significant decrease of pain, improvement of mobility, and a reduction of analgetics consumption. Despite the improvements, post-operatively all values of the SF-36 were lower than standards for the population. Complications and reoperations in our group are relatively common problems, surprisingly did not affected the quality of life after surgery *(Tab. 9, Ref. 38).*
Full Text (Free, PDF) *www.bmj.sk.*
Key words: quality of life, sf-36, low back pain, lumbar fusion.

A rapid development of spinal surgery has been observed, especially in the last 30 years. The number of spinal operations increased from 1990 to 2001 by 220 %, respectively from 1996 to 2001 by 113 % in the U.S. (2, 11, 18). This enormous growth is associated with rapidly growing expenses. But details of the benefit of surgical therapy are inconclusive and there is no consensus in the way of treatment (5, 6, 8, 11, 13, 16, 17, 18, 24). Improvement of treatment is based on constant revision of results of the therapeutic processes.

Material and methods

There have been included 208 patients that underwent an elective stabilization with decompression and fusion for degenerative lumbar spine in the 1st Orthopedic-Traumatologic Department of Medical Scholl of Comenius University Bratislava, in the period from January 2005 to June 2007. Patients were treated using the EXPEDIUM system. The transforaminal lumbar interbody fusion (TLIF) with cages Leopard and Devex was performed in 165 patients, the anterior lumbar interbody fusion (ALIF) with Brantigan cages in 5 patients and the posterolateral lumbar fusion (PLF) in 38 patients. The monitoring itself lasted from 6 months to 2 years.

The criteria of inclusion were following:
– pain of lumbar spine and/or lower limbs for more than 1 year,
– failure of conservative treatment,
– MRI or CT confirmed the finding of central or lateral stenosis, degenerative disc disease, or degenerative or isthmic spondylolisthesis.

The exclusion criteria were following:
– cauda equina syndrome and rapidly progressing paraparesis of lower limbs,
– previous surgery of lumbar spine,
– congenital anomalies of lumbar spin,
– history of trauma of lumbar spine,
– malignancy in the spinal region or any other malignancy,
– history of infection in the spinal region,
– serious internal disease – decompensated or poorly compensated: hypertension, diabetes mellitus, ischemic disease of heart and lower limbs, bronchial asthma, BMI over 40, severe liver, renal and hematological disease.

No more than 10 days before the surgery and 6, 12 and 24 months after the surgery, patients' pain was evaluated with the

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Tab. 1. Satisfaction with surgery.

	Dissatisfied	Partially satisfied	Satisfied	Chi-square test
Whole sample, n=208	37 (17.8%)	41 (19.7%)	130 (62.5%)	
CS, n=91	17 (20%)	19 (23%)	55 (57%)	
DDD, n=57	11 (18.7%)	11 (20.9%)	35 (60.4%)	p=0.15
LS, n=35	7 (19.3%)	8 (19.3%)	20 (61.4%)	
S, n=25	2 (8%)	3 (12%)	20 (80%)	
PLF, n=38	4 (10.5%)	6 (15.8%)	28 (7.7%)	
TLIF, n=165	32 (19.4%)	34 (20.6%)	99 (60%)	p=0.61
ALIF, n=5	1 (20%)	1 (20%)	3 (60%)	
1 segment, n=191	34 (17.8%)	38 (19.9%)	119 (62.3%)	p=0.97
2 segments, n=17	3 (17.6%)	3 (17.6%)	11 (64.7%)	

CS – central stenosis, DDD – degenerate disk disease, LS – lateral stenosis, S – spondylolisthesis, s. – surgery, PLF – posterolateral lumbar fusion, TLIF – transforaminal interbody lumbar fusion, ALIF – anterior lumber interbody fusion

Tab. 2. Visual analogue scale.

Whole sample	Before s. 68	After s. 35		Δ = 30
Diagnosis	Cs n=91 36.9	Ddd n=57 36.7	ls n=35 36.6	s n=25 27.6	Anova, p=0.018*
Type of fusion	Plf 31.45	Alif 33.6	Tlif 36.6		Anova, p=0.1
No. Of segments	One 35.4	Two 35.6			T-test, p=0.95

* – statistically significant, Δ – maximal statistically significant difference (paired t--test for p=0.05), CS – central stenosis, DDD – degenerate disk disease, LS – lateral stenosis, S – spondylolisthesis, s. – surgery, PLF – posterolateral lumbar fusion, TLIF – transforaminal interbody lumbar fusion, ALIF – anterior lumber interbody fusion

VAS (visual analogical scale) and the quality of life using the second version of the SF-6 (32). In these intervals, we got data on the consumption of analgesics and mobility. The overall satisfaction with the outcome of the operation was assessed at 6, 12 and 24 months after the surgery in the three-point scale (satisfied, unsatisfied, partially satisfied). 208 patients were included – 120 women (57.7 %) and 88 men (42.3 %).

The mean age was 54.6±9.04 years (range 32–69 years). Most of the patient were treated for central stenosis – 91 cases (44 %) and degenerative disc disease – 57 (27 %), lateral stenosis was treated in 35 (17 %) and spondylolisthesis in 25 cases (12 %).

In the vast majority, one segment was treated (191 patients or 92 %), 2 segments were treated not so frequently (17 patients, 8 %).

Results

A satisfaction with the outcome of the operations was reported by 130 (63 %) patients, dissatisfied were 37 (18 %), partially satisfied 41 (20 %) patients. Patients with spondylolisthesis were more satisfied after the surgery than patients with other diagnoses – 80 % satisfied, 8 % dissatisfied. Other diagnoses were satisfied in about 60 % and dissatisfied in about 20 % (Tab. 1). However, the differences were not statistically significant – tested with chi-square, p=0.15. Satisfaction did not depend on the type of fusion and the number of treated segments.

The mean VAS value was 68 before surgery, after surgery it was 35. A statistically significant difference was 30 points (tested with paired t-test for p=0.05). Patients with a diagnosis of central stenosis, degenerative disc disease and lateral stenosis achieved after surgery the VAS score around the value of 37. Patients operated for spondylolisthesis reached the average value of VAS 28 (Tab. 4). The difference was tested with ANOVA and was statistically significant, p=0.018. The type of fusion and

Tab. 3. Mobility.

	<100 m	<500 m	<1 km	>1 km	chi-square
before surgery	40 (19.2%)	69 (33.2%)	63 (30.3%)	36 (17.3%)	p<0.001*
after surgery	17 (8.2%)	21 (10.1%)	29 (14%)	141 (67.8%)	
CS n=91	9 (9.9%)	10 (11%)	11 (12%)	61 (67%)	p=0.83
DDD n=57	5 (8.8%)	6 (10.5%)	7 (12.3%)	39 (68.4%)	
LS n=35	3 (8.6%)	4 (11.4%)	6 (17.1%)	22 (62.9%)	
S n=25	0 (0%)	1 (4%)	5 (20%)	19 (76%)	
PLF, n=38	1 (2.6%)	4 (10.5%)	6 (15.8%)	27 (71.1%)	p=0.07
TLIF, n=165	16 (9.7%)	17 (10.3%)	20 (12.1%)	112 (67.9%)	
ALIF, n=5	0 (0%)	0 (0%)	3 (60%)	2 (40%)	
1 segment, n=191	17 (8.9%)	18 (9.4%)	27 (14.1%)	129 (67.5%)	p=0.45
2 segments, n=17	0 (0%)	3 (17.6%)	2 (11.8%)	12 (70.6%)	

CS – central stenosis, DDD – degenerate disk disease, LS – lateral stenosis, S – spondylolisthesis, s. – surgery, PLF – posterolateral lumbar fusion, TLIF – transforaminal interbody lumbar fusion, ALIF – anterior lumber interbody fusion, * – statistically significant

Tab. 4. Consumption of analgetics.

	no	sometimes	daily	chi-square
before surgery	0 (0%)	43 (20.7)	165 (79.3%)	p<0.001*
after surgery	66 (31.7%)	74 (35.6%)	68 (32.7%)	
CS, n=91	26 (28.6%)	34 (37.4%)	31 (34.1%)	p=0.062
DDD, n=57	18 (31.6%)	20 (35.1%)	19 (33.3%)	
LS, n=35	9 (25.7%)	13 (37.1%)	13 (37.1%)	
S, n=25	13 (52.0%)	7 (28.0%)	5 (20.0%)	
PLF, n=38	14 (36.8%)	13 (34.2%)	11 (28.9%)	p=0.88
TLIF, n=165	50 (30.3%)	60 (36.4%)	55 (33.3%)	
ALIF, n=5	2 (40%)	1 (20%)	2 (40%)	
1 segment, n=191	62 (32.5%)	67 (35.1%)	62 (32.5%)	p=0.74
2 segments, n=17	4 (23.5%)	7 (41.2%)	6 (35.3%)	

CS – central stenosis, DDD – degenerate disk disease, LS – lateral stenosis, S – spondylolisthesis, * – statistically significant

number of treated segments had no influence on the postoperative VAS value (Tab. 2).

Before the surgery, 54 % of the patients reported problems with walking in the distance of 100 or 500 m. After the surgery, 68 % of patients could walked more than 1 km. The improved walking capability after the surgery was statistically significant, tested with chi-square, p <0.001. There were no significant differences between the diagnoses, and also the type of fusion and number of treated segments had no influence on the postoperative ability to walk (Tab. 3).

All patients took analgetics before the surgery, 80 % of patients took analgetics daily. After the surgery, 30 % of patients were without analgetics, and the daily use was 33 % (Tab. 4). The decrease in consumption was statistically significant – tested with chi-square, p<0.001. Patients with spondylolisthesis consumed fewer analgesics after the surgery than patients with other diagnoses – but the difference was not statistically significant, tested with chi-square, p=0.062 (Tab. 4). Also the type of fusion and the number of treated segments had no influence on the postoperative consumption of analgetics.

Post-operative scores were statistically significantly better in all domains of SF 36. A statistically significant change was depending on the domain from 1.5 to 12.4 points (Tab. 5). A clinically significant improvement was present in all domains except the mental health, social function and mental composite score. Patients with spondylolisthesis reached a higher postoperative score. Differences were statistically significant for the physical function, body pain, general health and both composite scores (Tab. 5.). The type of fusion and the number of treated segments had no influence on the postoperative SF-36 values (Tab. 6.).

Excepted the mental health, all domains of SF-36 had shown a strong negative correlation between the VAS and the domains and composite scores – the lower postoperative VAS score, the bigger improvement of domains of SF-36. The correlations were more significant in physical domains than in mental domains (Tab. 7).

We have noted 30 complications in 28 patient cases, e.g. in 13.5 % (Tab. 8). A revision surgery was necessary in 18 cases – 8.7 %. Most frequent complications were related to instrumentation – 17, which represents 61 % of all complications. An improper introduction of screws in 8 patients was dealt with a revision. In 3 patients, however a permanent neurological complication occurred – in all cases it was unilateral paresis of lower limbs, no patient had sphincter or sexual disorders. Once a breakage of a carbon cage occurred during operation – the complication was resolved by an immediate extraction and exchange for a titanium cage. An improper introduction of TLIF cage was revised, extracted by anterior approach and conversed to ALIF.

Tab. 5. Quality of life.

	Whole sample, n=208			Diagnosis after s.				
	before s.	after s.	Δ	CS, n=91	DDD, n=57	LS, n=35	S, n=25	ANOVA
PF	28.4	39.1	9.8+	38.2	38.2	38.6	44.7	<0,001*
RP	22.1	35.8	12.9+	35.3	35.8	36.1	37.5	ns
BP	29.1	42.5	12.4+	41.6	42.1	42.9	46.2	0,01*
GH	44.9	47.1	1.6	46.1	46.3	47.8	49.5	0,002*
VT	40.4	47.3	6+	46.9	47.1	47.2	49.3	ns
SF	36.2	41.7	4.3	41.1	41.3	41.5	44.4	ns
RE	27.0	37.2	9.3+	36.8	36.9	37.8	38.9	ns
MH	43.7	45.8	1.5	45.2	45.3	45.7	49.2	0,005*
PCS	26.3	38.2	11+	37.3	37.8	38.1	41.9	0,01*
MCS	39.4	42.5	2.4	42.1	42.2	42.4	44.2	ns

+ – clinically significant difference, * – statistically significant , ns – statistically non-significant, Δ – maximal statistically significant difference, s. – surgery, PF – Physical Function, RP – Role Physical, BP – Bodily Pain, GH – General Health, VT – Vitality, SF – Social function, RE – Role Emotional, MH – Mental Health, PCS – Physical Composite Scale, MCS – Mental Composite Scale

Tab. 6. Quality of life depending on different treatment.

	Type of fusion				Number of segments		
	ALIF, n=5	TLIF, n=165	PLF, n=38	ANOVA	one, n=191	two, n=17	paired T-Test
PF	37.3	38.5	41.9	0,04*	38.5	39.2	ns
RP	33.8	35.6	37.1	ns	35.1	35.9	ns
BP	41.5	42.1	44.6	ns	42.2	42.5	ns
GH	46.7	48.2	48.5	ns	47.0	47.6	ns
VT	47.0	47.0	48.6	ns	47.3	47.3	ns
SF	41.3	42.7	43.4	ns	41.6	43.1	ns
RE	36.4	37.0	38.4	ns	36.9	37.3	ns
MH	45.4	47.2	47.4	ns	45.5	45.9	ns
PCS	36.5	37.7	40.3	ns	37.8	38.2	ns
MCS	42.2	43.4	43.7	ns	42.4	42.8	ns

PF – Physical Function, RP – Role Physical, BP – Bodily Pain, GH – General Health, VT – Vitality, SF - Social function, RE – Role Emotional, MH – Mental Health, PCS – Physical Composite Scale, MCS – Mental Composite Scale, * – statistically significant, ns – non significant

Tab. 7. SF-36 and VAS correlation.

	Correlation coefficient
Physical Function (PF)	-0.86
Role Physical (RP)	-0.81
Bodily Pain (BP)	-0.77
General Health (GH)	-0.58
Vitality (VT)	-0.83
Social function (SF)	-0.7
Role Emotional (RE)	-0.83
Mental Health (MH)	0.05
Physical Composite Scale (PCS)	-0.85
Mental Composite Scale (MCS)	-0.49

Tab. 8. Complications.

	Number	%
Complication	30	13.50 %
Infection	6	2.90 %
Improper introduction of cage	1	0.48 %
Improper introduction of screw – neurolog. Deficit	3	1.44 %
Improper introduction of screw – without consequence	5	2.40 %
Dural sack lesion	5	2.40 %
Breakage of cage	1	0.48 %
Broken screw	7	3.36 %
Donor site pain	2	1.00 %

All dural sack lesions were a few mm^2 and were solved with a simple suture, without the need of further revision. Two deep infections developed, they were managed by an early revision, drainage and antibiotics therapy. We experienced 4 superficial infections, they were resolved with antibiotics therapy. Broken screws were extracted and replaced.

Generally, complications had not a significant effect on domains and composite scales of the SF-36 and on the postoperative VAS score (Tab. 9).

Tab. 9. Complications - comparison of domains of SF-36 and VAS.

	No complications	Complications	Paired t-test
Physical Function (PF)	39	39.6	ns
Role Physical (RP)	35.8	35.9	ns
Bodily Pain (BP)	42.2	42.6	ns
General Health (GH)	47.1	47.1	ns
Vitality (VT)	47	47.3	ns
Social function (SF)	40.3	41.9	ns
Role Emotional (RE)	37.1	37.3	ns
Mental Health (MH)	45.8	46.3	ns
Physical Composite Scale (PCS)	38.2	38.3	ns
Mental Composite Scale (MCS)	42.1	42.5	ns
Visual analogue scale (VAS)	35.3	37.5	ns

ns – non significant

Discussion

The results of studies depends heavily on the criteria of inclusion and exclusion – in studies with a strict patient selection, where they are operated in the major centers of leaders in the field (often in the implementation of new methodology or instrumentation), achieved results are significantly better than in the population studies of "common" workplaces. There are also significantly better results and less complications when it comes to company sponsored studies or studies where the co-/author participate on the development of instrumentation (3). Probably a significant impact "placebo effect" of surgeon and institution (usually a renowned expert and center) plays its role, an increased attention and care of patients in sponsored trials. Younger patients without serious co-morbidity are selected, with higher motivation of early return to full activities – regularly exercising, with a higher education and higher incomes.

The preoperative values in our group are relatively homogeneous. Slightly better preoperativevalues and a lower age were in group of patients with spondylisthesis, which corresponds to

similar studies (30, 36, 37). Diagnosis of central stenosis, lateral stenosis and degenerative disc disease did not differ in the preoperative values.

The results of our study confirm the results of other clinical studies that correctly indicated and performed spinal operations are an effective modality in the reduction of pain and improving function (13, 17, 26, 29, 30, 34–38). In our study, we have achieved a significant pain decrease, significant improvement of mobility, and a reduction of analgetics consumption. Although significant differences were in all groups of patients, the best results were in patients operated for spondylolisthesis. Other diagnoses did not differ significantly. Better outcome of patients with spondylolisthesis were also reported in the Swedish register (29, 30, 36, 37). But in study of Gehrchen (10), there was no difference between isthmic spondylolisthesis and degenerative disc disease.

We noted significant improvements in physical function, physical role, body pain, physical composite score and emotional role. We observed a significant change also in the vitality and considerable although not clinically significant change in the social function. Changes in mental health and mental composite score were small. While in the most domains patients with spondylolisthesis achieved better postoperative score values, the absolute differences and therefore the size of therapeutical effect (except social function and vitality) were similar to all diagnoses.

Despite improvements, all postoperative values of domain of Sf-36 were lower than the norms for the population in the U.S. Only in vitality and general health, patients with spondylolisthesis achieved the population norms.

The ovverall satisfaction was 63 %, which is comparable to published data (3, 4, 12, 13, 29, 30). Again, there were significant differences between the diagnoses – for patients with spondylolisthesis the satisfaction was 80 %. It is a significant correlation between the function and pain (Tab. 7).

Despite a progress in technology and operational techniques, a lot of patients after the spinal operations are dissatisfied. In our study it was almost 18 %. The ratio of dissatisfied was relatively high, however, patients who would clearly benefit from the operation were not included in study – especially patients with cauda equina syndrome and progressive paraparesis of lower limbs.

The number of treated segments and the type of fusion in our study had no effect on the postoperative outcome, as confirmed by several authors (4, 5, 8, 19, 20).

Unfortunately, we have omitted from monitoring, due to the lack of experience in the start of this study. There are several evidences that psychosocial factors contributes to prediction of functional outcome more than physical variables (9, 14, 22, 25, 27, 28, 31). It seem that a good predictive value of the bad outcome have a low preoperative mental composite score (1), and it could serve as a simple tool to identify patients with a significant psychosocial distress.

Complications and reoperations in our group were relatively common – up to 13.5 % and 8.7 % reoperations (Tab. 8). However they did not differ from the published data (3, 8, 15, 21, 23, 30, 33–35, 38). Surprisingly, complications had no significant impact on the postoperative outcome (Tab. 4) – as in the study by Fritzell et al (7). However, we have been able to resolve the most of the complications early and except the cases of neurological deficit no irreversible damage was done. In the cases of neurological complications, the effect on the quality of life would be significantly more negative if the paresis would be associated with sphincter and sexual disorders and intense pain.

Conclusion

The results are comparable with published literature. Correctly indicated spinal operations are effective in the pain reduction and improvement of the function. We have noted a significant decrease of pain, significant improvement of mobility, and a reduction of analgetics consumption in our study. Patients with spondylolisthesis achieved a significantly better postoperative score in VAS, PF, BP, GH, MH and PCS. Other diagnoses in the monitored parameters did not differ significantly. The absolute differences and therefore the size of the treatment effect (except social function and vitality) were similar in all diagnoses. Despite improvements, post-operatively, all values of SF-36 were lower than standards for the population. Complications and reoperations in our set are relatively common problems like in the studies of other authors. Complications mentioned in our study did not affect the quality of life and intensity of pain after the surgery. Reducing the number of complications would not expect to improve the functional results. Reserves are in communication with patients – a correction of expectations, active approach of patients to their medical problems.

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Received August 15, 2009.
Accepted February 3, 2010.