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Preoperative Anxiety Predicts Dissatisfaction with the Results of Lumbar Intervertebral Discectomy

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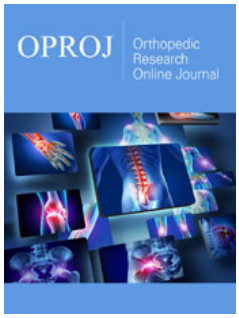

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Abstract

Background: Preoperative anxiety may lead to increase in morbidity and postoperative pain in patients with lumbar disc herniation. A prospective study was conducted to evaluate the incidence, determinants and prognostic value of preoperative anxiety in patients scheduled for lumbar discectomy.

Methods: The prospective observational study was performed on 100 patients. Visual analog scale and Amsterdam Preoperative Anxiety and Information Scale (APAIS) were used to evaluate preoperative anxiety level. The clinical outcome and overall satisfaction with the results of the treatment was evaluated after six months.

Results: Most of the patients (86%) described preoperative anxiety and APAIS scores were significantly higher for surgery than for anesthesia. Patients with higher anxiety values experienced higher pain intensity and were less informed about the disease. APAIS-anxiety scores were significantly correlated with the desire for information according to APAIS-knowledge values ($r=0.59$; $p<0.0001$). Female gender was the only factor that proved to be significantly related to APAIS scores in a multivariate model ($p=0.04$). Preoperative anxiety was not correlated with postoperative pain intensity, however, the patients with higher preoperative APAIS scores were more frequently not satisfied with the results of the treatment ($p=0.03$).

Conclusion: The present study showed that preoperative anxiety is common before lumbar discectomy and female gender is the most important contributor to higher anxiety values. Preoperative anxiety is related to the desire for information, pain intensity and the extent of knowledge about the disease and associated with postoperative dissatisfaction with the treatment results.

Keywords: Preoperative anxiety; Lumbar discectomy; Radiculopathy; Lumbar disc herniation

Abbreviations: APAIS: Amsterdam Preoperative Anxiety and Information Scale; LDH: Lumbar Disc Herniation; LD: Lumbar Discectomy; VAS: Visual Analog Scale; ODI: Oswestry Disability Index; BMI: Body Mass Index

Background

Preoperative anxiety can be described as an unpleasant state of tension or uneasiness that results from a patient's doubts or fears before an operation [1]. Preoperative anxiety is common in surgical patients - the incidence as high as 94% has been described [2]. Pain, disability, gender, age, previous surgery or anesthesia experience, education and the patient's information requirements are among the potential risk factors for the development of elevated preoperative anxiety [3,4]. Patients scheduled for spinal or neurosurgical operations are also likely to suffer from preoperative anxiety, which may lead to increase in morbidity and mortality, frequent postoperative pain and increased anesthetic requirements [5-8].

Radiculopathy caused by Lumbar Disc Herniation (LDH) is a leading reason for lumbar spine surgery and despite predominantly positive results, Lumbar Discectomy (LD) is not

always successful in terms of pain relief and functional improvement of the patients [9,10]. Thus, the analysis of clinical factors and patient characteristics, potentially influencing postoperative outcomes of LD, is crucial. Preoperative anxiety has been described among the prognostic factors for the persistence of pain and worse patient-reported outcomes after LD [9,11-14]. In 2017, Dorow et al. [9] explored the socio-demographic, medical, occupational and psychological variables associated with pain intensity in lumbar disc surgery patients and found that age, anxiety and dysfunctional coping behavior were significantly associated with worse postoperative pain [9]. In a recent meta-analysis Theunissen et al. [15] also emphasized the association of preoperative anxiety and catastrophizing with postsurgical pain after LD. However, patient satisfaction is another important criterion of treatment success and a significant correlation between preoperative anxiety and postoperative satisfaction with treatment results has been verified in patients with spinal stenosis and spondylolisthesis [16]. Nevertheless, the relationship between preoperative anxiety and patient satisfaction with the results of LD is unclear.

Information about the incidence, potential risk factors and prognostic value for preoperative anxiety before LD is controversial. The present study aims to: 1) evaluate the level of preoperative anxiety in patients scheduled for LD; 2) assess the factors potentially contributing to anxiety before LD; 3) evaluate the importance of anxiety as a prognostic factor for postoperative pain and dissatisfaction with the treatment results after LD.

Methods

Study population

We evaluated prospectively a consecutive sample of patients scheduled for LD, admitted to the department of neurosurgery. The patients were included in the study if they had radicular pain with or without neurologic deficits due to LDH. The existence of LDH (protrusion, extrusion, or sequestration) was verified by magnetic resonance imaging or computed tomography. Exclusion criteria included cauda equina syndrome, acute pain and severe radicular deficits requiring urgent operation, cognitive deficits that prevented effective communication, and general contraindications to elective surgery. All patients were operated upon using a standard posterior microdiscectomy approach. Informed consent was obtained from all participating individuals and the study protocol was approved by the Research Ethics Committee of the University of Tartu (285/T-1)

Data collection

The patients provided basic information about sociodemographic and disease characteristics. Visual analog scales (VAS-p), ranging from 0 to 100, were used for assessment of pain (indicating average radicular or lumbar pain in the last 2 days) and Oswestry Disability Index (ODI) scores [17] were used to evaluate functional disability of the patients.

The VAS for anxiety (VAS-a) and Amsterdam Preoperative Anxiety and Information Scale (APAIS) [18] were used to evaluate the current anxiety level on the day before the operation. The VAS-a scale was applied by asking the patients to indicate their anxiety level using a number between 0 (no anxiety) and 100 (highest anxiety). The APAIS was used to evaluate the level of anxiety of the patients at the time of the interview. The APAIS comprised 6 questions where each component was scored on a Likert scale from 1 to 5 (where 1 was none and 5 most anxiety or highest need for information). The APAIS score (APAIS-total) was then divided into the anxiety component (APAIS-a, 4 questions with a maximum score of 20) and the knowledge or "need-for-information" component (APAIS-k, 2 questions with a maximum score of 10). The APAIS-k component scores were grouped into low (2 to 4), medium (5 to 7) and high (8 to 10) need for information, as in the original APAIS study. Within the APAIS, the items which assess anxiety regarding surgery (APAIS-sur, 3 questions with a maximum score 15) and the items which evaluate anxiety regarding anesthesia (APAIS-an, 3 questions with a maximum score 15) were also analysed separately.

To evaluate the extent of knowledge of the patients about their disease, a knowledge test was performed, where the patients were asked to answer ten multiple choice questions about LDH, the upcoming surgery and basic instructions for the postoperative period. In each question, there was only one correct answer and the patients were asked to encircle only one of the answers. It was possible to get a maximum of 10 points, one for each correctly answered question. If a patient encircled two options for one question with one of those being correct, they were given 0,5 points. A wrong answer or all three options encircled gave 0 points.

Postoperative evaluation

A follow-up evaluation was performed 6 months after the operation. The patients were interviewed over the phone. They were asked about daily persisting back or leg pain and an average VAS-p (from 0 to 100) was used to evaluate pain intensity considering the previous two weeks. Furthermore, the patients were asked to rate their global satisfaction with the results of the treatment. The answers were rated as 'satisfied', 'somewhat dissatisfied' or 'dissatisfied' and the patients, who were dissatisfied or somewhat dissatisfied were categorized as dissatisfied for further analysis.

Statistical analysis

Statistical analyses included descriptive statistics for all measures. All continuous variables were checked for normality using Kolmogorov-Smirnov test. Statistical comparisons between groups were performed with Student's t-test (paired and unpaired). Paired t test was used to compare the pre- and postoperative VAS-p scores as well as APAIS-an and APAIS-sur items. Mann-Whitney U-test was used for comparisons between groups if the data was not normally distributed. Kruskal-Wallis analysis of variance was used to compare the APAIS-a data between different APAIS-k groups. Spearman's correlation analysis was used to evaluate the correlation between the continuous variables. Fisher's exact test was used to compare the differences in proportions. Bonferroni correction was used for post-hoc analysis. Multiple linear regression was performed to analyze the effect of main demographic and clinical variables on the

APAIS-total values. Multivariate logistic regression model was built to assess the influence of anxiety scores, clinical and demographic factors on satisfaction with treatment results. The analyses were performed using the JMP software (version 8.0.1, SAS Institute Inc., Cary, NC, USA) and GraphPad InStat-3 (GraphPad Software Inc., San Diego, CA, USA). A P value <0.05 was considered statistically significant.

Results

We prospectively collected data on 100 consecutive patients (38% female and 62% male), but 23 patients failed to complete the follow-up evaluation (15 were unreachable and 8 declined to participate), leaving 77 patients for the final analysis. The characteristics of the patients and clinical variables are presented in Table 1.

Table 1: Patients characteristics.

Variable	Patients (N = 100)
Personal variables	
Age	45.4±12.6
Gender (F:M)	38:62
Education >12 years	22
Married	53
Working	71
Disease variables	
BMI (kg/m2)	28.6±6.3
Pain duration (months)	14.5±33.3
Pain intensity (VAS)	57.1±21.3
Anxiety intensity (VAS)	38.1±25.6
ODI	44.2±20.7
Affected levels L5/S1 L4/L5 L3/L4	 40 55 5
Herniation type	
Containted herniation	61
Noncontainted herniation Sequestration Extrusion	30 9
Radicular deficit	91
Previous spine operations	22
Knowledge test results	6.98±2.12

VAS visual analog scale, ODI Oswestry Disability Index, BMI body mass index

Anxiety values

Most of the patients (86%) described preoperative anxiety (VAS-a>0). The APAIS scores of the cases are presented in Table 2. All APAIS scores were significantly higher for surgery than for anesthesia: APAIS total - 8.69±3.18 vs 5.8±2.88 (t=9.82; p<0.0001); APAIS-a - 5.62±2.39 vs 3.66±2.02 (t=8.96; p<0.0001) and APAIS-k - 3.11±1.28 vs 2.17±1.16 (t=7.62; p<0.0001). VAS-a scores were significantly correlated with APAIS-a (r=0.6; p<0.0001), APAIS-k (r=0.29; p-0.0055) and APAIS-total values (r=0.55; p<0.0001).

Determinants of anxiety

VAS-a scores were significantly related to VAS-p results (r=0.32; p=0.0015). Patients with higher pain intensity according to VAS-p scores experienced also higher anxiety according to APAIS-a (r=0.25; p=0.016), APAIS-k (r=0.24; p=0.025) and APAIS-total (r=0.27; p=0.01) scores. The mean preoperative VAS-a score was significantly higher in females (3.03±2.14 vs 5.07±2.71; U=635; P=0.0004), but there were no significant gender differences in VAS-p scores. Female patients had significantly higher APAIS scores than men (Table 2). Education, age, body mass index (BMI), ODI, history of previous spine operations, marital and employment status were not related to VAS-a or APAIS scores. The relations between VAS-a and the knowledge test results were not significant (r= -0.19; p=0.058), but the patients with higher anxiety according to APAIS-a were less informed about the disease according to the knowledge test (r=-0.21; p=0.037). APAIS-a scores were significantly correlated with APAIS-k (r=0.59; p<0.0001) values.

There was a correlation between increasing anxiety level and need for information according to APAIS-k: APAIS-a scores were 8.67±2.83, 10.2±3.5, and 12.1±3.6, respectively, for low, medium, and high APAIS-k scores (p<0.001). However, there was no correlation between the need for information according to APAIS-k and the knowledge test results. The female gender was the only factor that proved to be significantly related to APAIS-total scores in a multivariate analysis (t=2.13; p=0.04).

Table 2: Gender differences of APAIS scores.

	All Patients	Female	Male	U (t)	p
APAIS-total	14.53±5.37	17.5±5.55	12.7±4.37	(4.54)	<0.0001
APAIS-anxiety component*	9.23±3.92	10.86±4.19	8.24±3.4	669.5	0.0025
APAIS-knowledge component*	5.29±2.08	6.37±1.99	4.6±1.84	496.5	<0.0001
APAIS-anesthesia component**	5.8±2.88	7.14±3.2	4.98±2.35	619.5	0.0006
APAIS-surgery component**	8.69±3.18	10.17±3.12	7.77±2.88	550.5	0.0004
1. I am worried about the anesthesia	1.97±1.12	2.4±1.26	1.7±0.92	784.5	0.0056
2. Anesthesia is on my mind continually	1.67±1.02	1.95±1.18	1.49±0.88	827	0.02
3. I would like to know as much as possible about the anesthesia	2.17±1.16	2.68±1.23	1.84±1	629.5	0.0006
4. I am worried about surgery	2.98±1.2	3.34±1.28	2.75±1.09	770.5	0.012
5. Surgery is on my mind continually	2.64±1.35	3.14±1.36	2.33±1.26	714.5	0.005
6. I would like to know as much as possible about surgery	3.11±1.28	3.63±1.14	2.79±1.26	617	0.002

Questions1,2,4, and 5 are the anxiety component; questions 3 and 6 are the knowledge component. **Questions1, 2, 3 are the anesthesia component; questions 4, 5, 6 are the surgery component.

Values are expressed as mean ± standard deviation.

APAIS Amsterdam Preoperative Anxiety and Information Scale

Relations between anxiety scores and outcome

Pre- and postoperative VAS-p results were significantly different (5.7±2 vs 3.6±2.8; t=5.5; p<0.0001). The patients, who were satisfied with the treatment results had significantly lower postoperative VAS-p values (3.1±2.8 vs 4.9±2.3; U=314; p=0.02). We did not find correlation between preoperative anxiety scores and postoperative VAS-p values, however, the patients with higher APAIS-total, APAIS-a and APAIS-sur scores were more frequently not satisfied with the results of the treatment (Table 3). APAIS-total score was the only factor that proved to be significantly related to the dissatisfaction with the treatment results in a multivariate model ($\chi 2$= 4.63; p=0.03).

Table 3: Comparison between satisfied and dissatisfied patients after lumbar discectomy (77 patients).

Variable	Satisfied (N = 60)	Dissatisfied (N = 17)	t	U	p
Personal variables					
Age	45±11	43.6±12.7	0.43		0.66
Age>60	53	15			1
Gender (F:M)	21:39	6:11			1
Education >12 years	12	2			0.78
Married	32	21			1
Working	38	13			1
Knowledge test results	7±1.8	6.6±2.6		505.5	0.93
Disease variables					
BMI (kg/m^2)	28.2±5.8	27.8±4.8		494.5	0.94
Pain duration (months)	12.6±33.6	6.4±6.1		435	0.95
Pain intensity (VAS)	58±21	57±10		476.5	0.76
ODI	42±19.3	44±20.1	0.31		0.75
Previous spine operations	12	5			0.5
Preoperative anxiety					
VAS-anxiety	35±26	48±21		327.5	0.07

APAIS-total	14±5.3	17.3±4.6		248.5	0.028
APAIS-anxiety	8.7±3.7	10.9±3		277.5	0.017
APAIS-knowledge	5.15±2.14	6.27±1.75		272	0.052
APAIS-surgery	8.46±3.2	10.38±2.78		285.5	0.04
APAIS-anesthesia	5.4±2.6	6.5±3.1		356	0.18

VAS visual analog scale, ODI Oswestry Disability Index, BMI body mass index, APAIS Amsterdam Preoperative Anxiety and Information Scale

Discussion

The present study showed that preoperative anxiety is common before LD and female gender is the most important contributor to higher anxiety values. Preoperative anxiety is related to the extent of knowledge about LDH and associated with postoperative dissatisfaction with the treatment results.

In our study, 86% of the patients experienced preoperative anxiety before LD and the APAIS scores were significantly higher for surgery than for anesthesia. Our findings are similar to previous reports about higher anxiety values for surgery than for anesthesia before LD [7], or neurosurgical operations in general [5,6,8]. Aust et al. demonstrated that the magnitude of the difference in surgery and anesthesia anxiety scores depends on the surgical discipline and among the overall differences observed between the surgical disciplines, the largest one was observed in neurosurgical patients [5]. However, despite the relevance of anxiety about surgery, it has to be acknowledged that some patients feel more anxiety about anesthesia.

Female gender was the most important factor contributing to higher levels of all components of anxiety according to APAIS. Our findings reconfirm the earlier reports about the relevance of gender as a risk factor for preoperative anxiety [3,7,8,19]. Eberhart et al. [3] reported that female gender independently predicted all three APAIS anxiety subscales in a cross-sectional survey which enrolled over 3000 patients scheduled to undergo elective surgery [3]. However, worse clincal status may increase anxiety values in females - Maclean et al. [20] found that a number of studies about surgical treatment of lumbar degenerative disease reported worse pre- and postoperative pain, disability and health-related quality of life among females [20]. In our study the pain intensity was associated with anxiety level, but females did not have higher VAS-p scores than male patients.

The patients with higher anxiety had worse knowledge test results and a higher need for information, however, there was no correlation between the patient's desire for information and the extent of knowledge about LDH. It is well known that two personalities relevant to patients' pre-surgical education have been differentiated: blunting-like and information-seeking personalities [21]. The blunters have no need for information as they cope with preoperative stress by actively avoiding the threat. The information-seeking personalities, on the contrary, want to know as much as possible and direct their attention towards the stressor. Still, a positive correlation between increasing anxiety level and need for information has been described by several authors [8,18] and there is evidence that enhanced patient education is important to reduce preoperative anxiety [4]. Burgess et al. found limited, but fair-quality evidence that supports the inclusion of a preoperative education session for improving clinical (pain, function, and disability), economic (quality-adjusted life years, healthcare expenditure, direct and indirect costs) and psychological outcomes (anxiety, depression and fear-avoidance beliefs) from spinal surgery [22]. Obviously, the patient's knowledge about the disease does not have to correlate with the desire for new information, however, according to our data, both these factors can be significant contributors to the development of preoperative anxiety and should be examined separately.

In our study, the patients with higher APAIS-values did not have significantly higher postoperative VAS-p scores but were more frequently not satisfied with the results of the treatment. Associations between preoperative anxiety and chronic postsurgical pain after LD has been described by several authors [9,11,15], however, Hegarty et al. [12] did not find a significant correlation between anxiety and postsurgical pain [12], and Laufenberg-Feldmann et al. [23] did not find evidence for the presence of anxiety before disc surgery as a prognostic factor for ongoing pain and regular postoperative intake of analgesics [23]. Postoperative patient satisfaction has become a central metric for measuring the quality of care after spine surgery and various factors have been suggested as influencing eventual satisfaction, however, it is still not clear why some patients are not satisfied with the treatment results. Ehlers et al. [24] found that more than half of the patients with no improvement or worse outcomes in pain or function after lumbar spine surgery were satisfied with their surgery, which suggested that satisfaction ratings may be based on non-clinical aspects of care [24]. Rönnberg et al. [25] found that patients with preoperative positive expectations on work return and realistic expectations on pain and physical recovery had a greater chance to be satisfied with the surgical results after lumbar disc herniation, as compared to patients with negative and/or unrealistic expectations [25].

Several limitations should be considered in interpreting our findings. First of all, the study focused on analyzing the effect of preoperative anxiety on postoperative satisfaction and clinical outcome, but the psychological status of patients after surgery was not evaluated. Secondly, we have used global assessment of satisfaction with the treatment outcome, which can mask specific dissatisfactions, and utilization of multi-item measures should be

recommended. Furthermore, the results may not be generalizable to other surgical populations and other surgical centers. Variations in the anxiety measurement methods may also create certain differences between different studies.

Conclusion

We can conclude that the patients undergoing LD present high levels of preoperative anxiety, especially related to surgery. As anxiety is related to dissatisfaction with treatment results, awareness, and proper preoperative screening are indicated in patients scheduled for LD. Additional preoperative educational information could be important to diminish perioperative anxiety. Further studies should be concentrating on the development of supportive measures and treatment of preoperative anxiety before LD.

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