Acta Clin Croat 2024; 63: 123-133
doi: 10.20471/acc. 2024.63.01.15

Original Scientific Paper

ANXIETY, FEARS AND FEAR-AVOIDANCE BELIEFS AND THERAPEUTIC OUTCOME AFTER LUMBAR MICRODISCECTOMY

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SUMMARY – Microdiscectomy is one of the surgical methods for the treatment of herniated intervertebral disc in patients with low back pain. The aim of the research was to evaluate the presence of psychological and cognitive-behavioral factors, including anxiety, fears and fear-avoidance beliefs of physical activity and work and their correlation with the pain and functional disability in patients after lumbar microdiscectomy and subsequent physical therapy. The research was performed on 198 patients (95 men and 103 women), mean age 50.20±10.26 years. The following questionnaires were used in the study: Spielberger Anxiety Inventory-State and Trait; Fear-Avoidance Beliefs Questionnaire (Physical activity and Work); for intensity of pain, visual analog scale and Oswestry Low Back Pain Disability Questionnaire. These assessments were carried out after microdiscectomy, as follows: just before rehabilitation treatment, and 1, 3 and 6 months after microdiscectomy. The pain and functional disability had significant correlations with the following factors: anxiety-state ($p<0.01$), anxiety-trait ($p<0.01$), fear/avoidance beliefs - physical activity ($p<0.01$) and fear/avoidance beliefs - work ($p<0.01$). The pain and functional disability in patients after lumbar microdiscectomy showed significant correlation with anxiety, fears and fear-avoidance beliefs. The mentioned psychological and cognitive-behavioral factors can predict the degree of functional recovery and indicate additional therapy after lumbar microdiscectomy.

Key words: *Low back pain; Lumbar microdiscectomy; Anxiety; Fears; Fear-avoidance beliefs; Disability*

Introduction

Pathoanatomical changes of the intervertebral disc and other surrounding spinal structures in patients with low back pain (LBP) are only peripheral source of nociceptive pain. In addition to peripheral, included are also central neural mechanisms which can modulate but also create the perception of pain. It has been proven that people with LBP have increased cortical neuronal activations in emotional specific regions of the brain, which can cause the appearance of anxiety, fear and cognitive-behavioral disorders[1-3].

The terms anxiety and fear are often mentioned in close connection to conditions where pain is present. Anxiety is an aspect seen as a future-oriented cognitive-affective state that occurs in response to anticipated threats which are often vague or uncertain in nature. Also, anxiety is often a response to an imprecise or unknown threat. In contrast to anxiety, fear is described as a present-oriented state that is

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Received July 19, 2018, accepted September 10, 2018

designed to protect the individual from a perceived immediate state. Pain-related fear is the fear that emerges when stimuli related to the pain problem are perceived as a main threat[4-6]. It is often associated with catastrophic (mis)interpretations of pain, increased perception of pain, fears and avoiding behaviors, motor abnormalities and functional disability[7]. Therefore, the pain should not be estimated only in terms of intensity and its other biological features, but also in terms of its negative impact on the psychological and emotional state, functionality, social status and quality of life[8-12]. On the other hand, negative emotions and psychological disorders have a feedback effect and can increase the intensity of pain and degree of disability, as it was proven by recent studies. Therefore, negative emotions and psychological disorders should be recorded in diagnostic workup and included in treatment procedures of pain because it will enable better success of treatment[8-16].

In patients with LBP, the presence of pain can also be associated with negative emotions and psychological disorders including anxiety, fears and fear-avoidance beliefs, i.e., fear of movements (physical activity and work), which can be predictors of poorer therapeutic effect on LBP and its transition into a chronic form of the disease[17-20].

The aim of this research was to evaluate the presence of psychological and cognitive-behavioral factors including anxiety, fears and fear-avoidance beliefs of physical activity and work, and their correlation with pain and functional disability in patients after lumbar microdiscectomy and subsequent physical therapy.

Materials and Methods

Study patients and therapeutic procedures

The research was performed on 198 patients with LBP after lumbar microdiscectomy (95 men and 103 women), mean age 50.20±10.26 (range 29-69) years. Examinations were performed at the Department of Medical Rehabilitation, Clinical Center of Vojvodina, Novi Sad, where the patients were moved after lumbar microdiscectomy from the Department of Neurosurgery in order to implement physical therapy and rehabilitation. Subjects with diabetes, cerebrovascular insult and alcoholism were not included. Patients received standard physical therapy including low-level laser and magnetotherapy, kinesiotherapy, and adjusted exercises. All patients also received instructions on correct posture and ergonomic principles in the activities of daily living.

The study evaluated the effects of anxiety and fears on pain and functional ability/disability. Study parameters and their outcomes and mediators were assessed after microdiscectomy, i.e., just before physical and rehabilitation treatment, at the end of this treatment (at one month), and then three and six months after microdiscectomy.

The examinations were conducted with patient consent and approval from the local Ethics Committee, and in concordance with the Declaration of Helsinki.

Mediators and measurement of outcomes

The levels of patient anxiety, fears, pain and disability were evaluated by using the following specified questionnaires:

1) Spielberger Anxiety Inventory-State for evaluation of state anxiety (STAI-S) with score range 20-80 (a higher score indicates a higher degree of anxiety);
2) Spielberger Anxiety Inventory-Trait for evaluation of trait anxiety (STAI-T) with score range 20-80 (a higher score indicates a higher degree of anxiety);
3) Fear-Avoidance Beliefs Questionnaires (FABQ) were used for assessment of the beliefs about the influence of LBP on physical activity (FABQ-PA) with score range 0-24 and work activity (FABQ-W) with score range 0-42;
4) visual analog scale (VAS) for assessment of pain intensity. Pain intensity was measured by numerical pain scale 0-10 (0 indicates no pain and 10 indicates maximum pain); and
5) Oswestry Disability Questionnaire (version 2.1) for assessment of patient's ability/disability for selfcare and social life (pain, self-care, lifting, walking, sitting, standing, sleep, sexual life, social life, and traveling). The results are expressed as Oswestry Disability Index (ODI) with range 0-100 (0 indicates no disability and 100 indicates maximum disability possible).

Statistical analysis

As indicators of basic data, arithmetic mean, median, mode, mode frequency, minimum and maximum values and standard deviation were used. In addition to standard statistical methods and Student's t-test, techniques of mixed model ANOVA with the use of software package STATISTICA 12, serial

number AXA 302C271408AR-B were used. Values of $p<0.05$ were regarded as statistically significant, and $p<0.01$ as statistically highly significant.

Results

The results of the examination are shown in tables and figures. Their comparison with literature data are presented in the Discussion section. The number, gender and age of the examined patients are shown in Table 1. The mean age of examined persons was 50.2 years, without significant differences between men and women.

Current intensities of pain expressed by VAS estimated at the start, and after 1, 3 and 6 months are shown in Table 2. The decrease of pain intensity during the observed period was highly significant ($p<0.01$).

The levels of disability in the observed period, in the whole group of patients, were evaluated by the Oswestry Disability Questionnaire, i.e., ODI. The results of ODI are shown in Table 3. The mean ODI values decreased during the testing period, and differences between these values recorded at one month after initiation of physical therapy and then at three and six months after microdiscectomy were highly significant ($p<0.01$).

Table 1. Number, gender and age of patients

Age (years)	M	Median	Mode	MF	Min	Max	SD
All patients, N=198)	50.2	52.0	45	20	29	69	10.26
Women, n=103	49.2	50.5	45	18	29	69	8.95
Men, n=95	51.3	52.0	54	12	29	68	11.46

M = arithmetic mean; MF = mode frequency; SD = standard deviation

Table 2. Current pain intensity at monitored intervals

Monitored interval	Current pain (VAS)							
	M	Median	Mode	MF	Min	Max	SD	p
At the start	4.64	5	5	79	3.00	7.00	0.901687	-
1 month	2.69	3	3	93	2.00	4.00	0.666480	<0.01
3 month	1.79	2	1	90	1.00	3.00	0.810096	<0.01
6 month	0.95	1	0	80	0.00	3.00	0.906188	<0.01

M = arithmetic mean; MF = mode frequency; SD = standard deviation

Table 3. Oswestry Disability Index values during observed period

Testing interval	Oswestry Disability Index							
	M	Median	Mode	MF	Min	Max	SD	P
At the start	50.40	51	60	20	26	78	10.29	-
1 month	40.05	38	36	30	22	76	8.91	<0.01
3 month	33.07	32	32	29	20	64	7.77	<0.01
6 month	26.74	26	24	40	14	48	7.23	<0.01

M = arithmetic mean; MF = mode frequency; SD = standard deviation

The relationships between the current (state) degree of anxiety (estimated by STAI-S questionnaire) and current intensity of pain (expressed by VAS), as well as disability (expressed by ODI) were evaluated during the testing period. The patients whose STAI-S score was 31-44 were classified in the group with a moderate level of current anxiety, and those with score 45 or higher were categorized in the group with a high level of current anxiety. The results of VAS and ODI in the mentioned groups are illustrated in Figures 1 and 2.

People with a moderate level of current anxiety (whose STAI-S score was 31-44) had less intensity of pain (VAS) and lower degree of disability (ODI) than those with a high level of anxiety (score 45 or higher) at all testing intervals. Differences in pain intensity (VAS) and level of disability (ODI) were highly significant ($p<0.01$) between these two groups (with moderate and high anxiety) at all testing intervals (Figs. 1 and 2).

The relations between the level of trait (general) anxiety that was determined by STAI-T questionnaire and current intensity of pain (expressed by VAS), as well as disability (expressed by ODI) during the examination (at the start and after 1, 3 and 6 months) are shown in Figures 3 and 4.

Figures 3 and 4 show that patients with a moderate level of general anxiety (whose STAI-T score was 31-44) had less pronounced feeling of pain and lower ODI values than those with a high level of anxiety (score of 45 or higher) at all intervals observed. These differences were statistically highly significant ($p<0.001$).

The fear of physical activity and its avoidance were estimated by using the FABQ-PA questionnaire. According to FABQ-PA score, patients were divided into 2 groups, i.e., one group of patients with a score up to 14, who in practice are considered to have a greater chance for better and faster recovery, and another group with a score above 14, who have a lower chance for recovery. The results of current pain intensity (VAS) and ODI at the observed intervals were compared between the two groups of patients, as shown in Figures 5 and 6.

The results in Figures 5 and 6 show that patients with a FABQ-PA score up to 14 had significantly lower pain intensity and less ODI values than the group with a score above 14, as can be seen in all periods of the study. These differences between the groups were statistically highly significant ($p<0.001$).

Fear of activities at work and their avoidance were estimated by using the Fear Avoidance Beliefs Questionnaire - Work (FABQ-W) among 121 patients who were in the workplace engaged in physical work. According to score of FABQ-W questionnaire, patients were divided into 2 groups: the first group of patients, with a score up to 29, which in practice is considered to have a greater chance for a better and faster recovery and a second group with a score above 29, which has a lower chance for recovery. The results of current pain intensity (VAS) and ODI in investigated periods were compared between the first and second groups of patients and results are shown in Figures 7 and 8.

The results in Figures 7 and 8 show that patients with a FABQ-W score up to 29 had a significantly lower pain intensity (VAS) and lower ODI values than the group with a score above 29, as seen in all study intervals. These between-group differences were statistically highly significant ($p<0.001$).

Discussion

Chronic pain has negative impact on the psychological and emotional state, functionality, social status, and quality of life[8-12]. On the other hand, negative emotions and psychological disorders, and negative social status have reverse effect and can increase the intensity of pain perceptions. In chronic LBP, the mentioned psychosocial factors are essentially mutually widely connected and have an interactive relationship with each other. Therefore, they should all be recorded in diagnostic workup and included in treatment procedures because this will enable better success of treatment and faster functional recovery[8-16].

The range of STAI-S and STAI-T scores for each subtest is 20-80, with the higher score indicating greater anxiety. In various studies in young and adult population, a cut-off point of 39-40 has been suggested to detect clinically significant symptoms for the anxiety scale; however, other studies have suggested a higher cut-off score of 54-55 for older adults.

The levels of current and general anxiety were determined by the principle that a score of 45 or more denotes high anxiety, which is in accordance with the recommendations given by Spielberger *et al.*[21]. The score for moderate degree of anxiety has some differences in certain populations and we defined that these score values could be between 31 and 44 in our subjects.

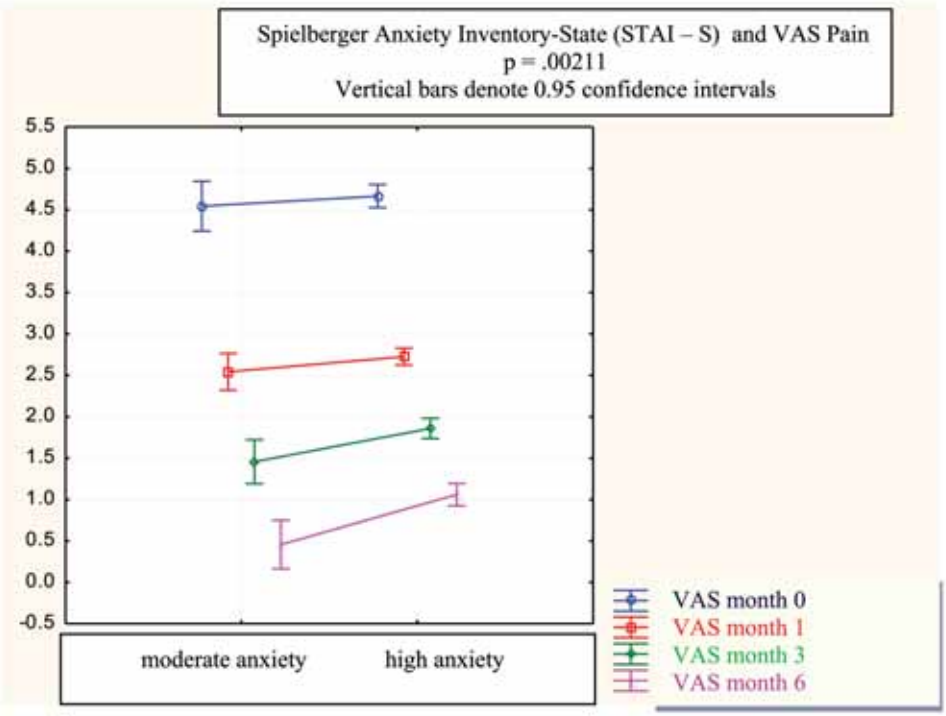

Fig. 1. Degree of current (state) anxiety and current intensity of pain during testing period.

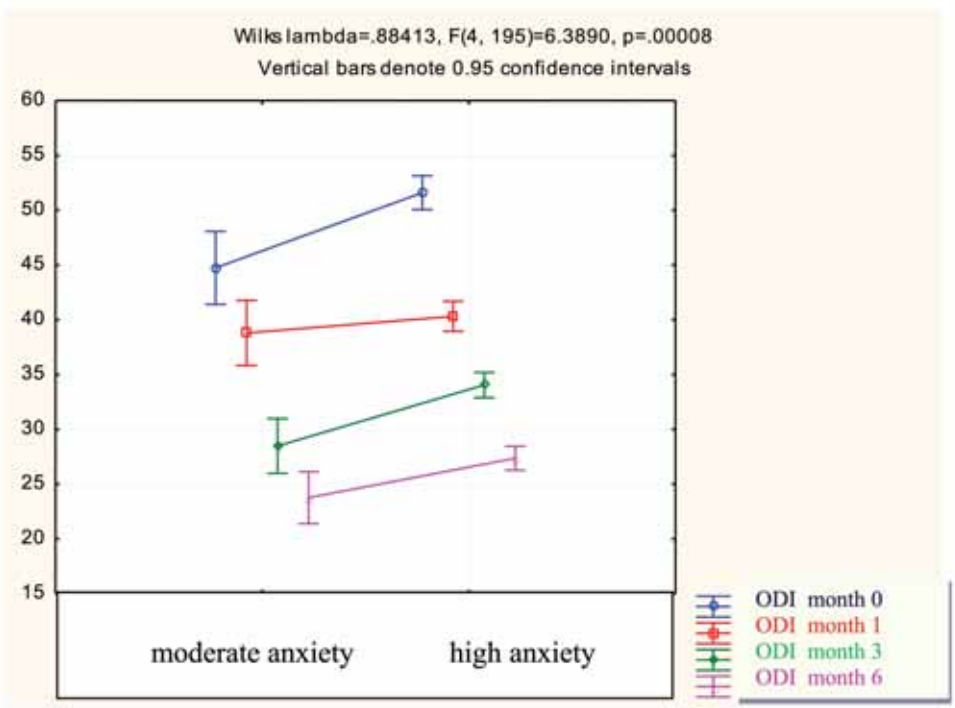

Fig. 2. Degree of current (state) anxiety and results of the Oswestry Disability Index.

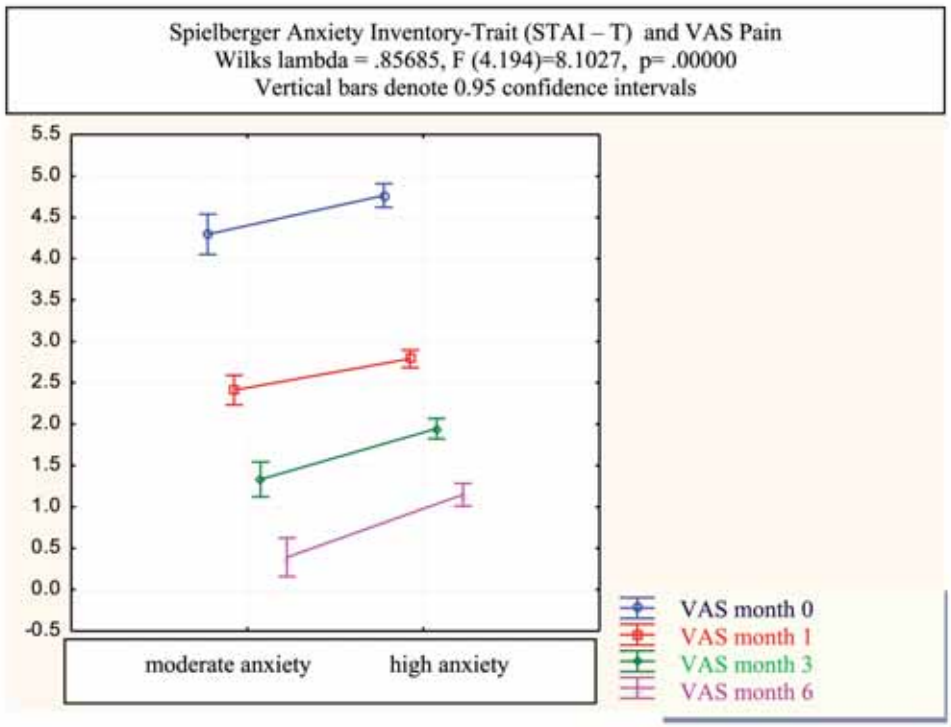

Fig. 3. The level of trait (general) anxiety and intensity of current pain during testing period.

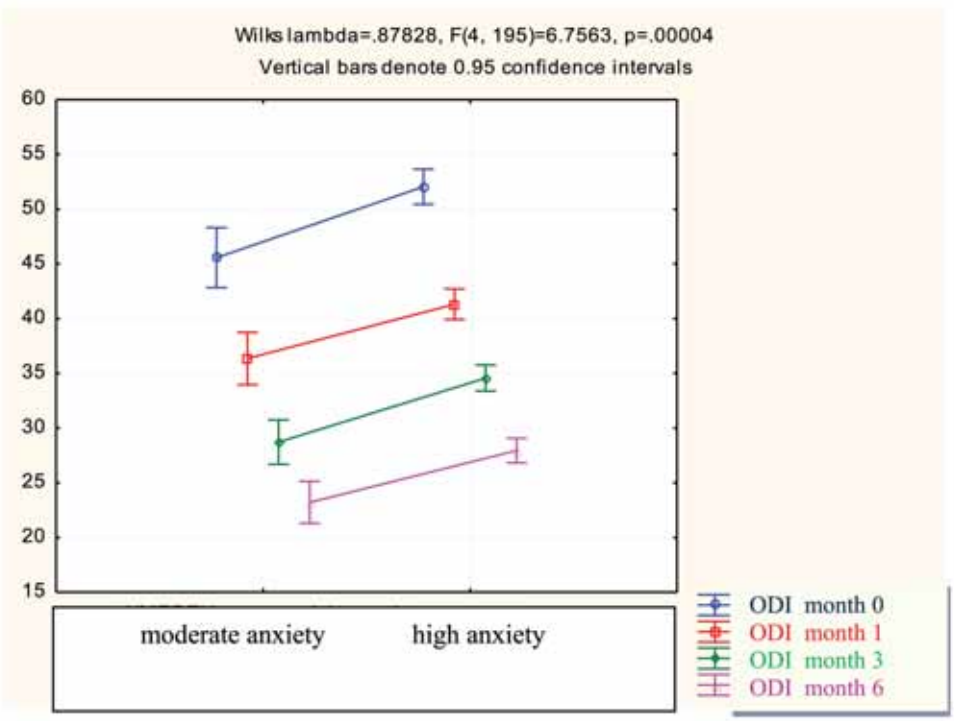

Fig. 4. The levels of trait (general) anxiety and results of the Oswestry Disability Index during testing period.

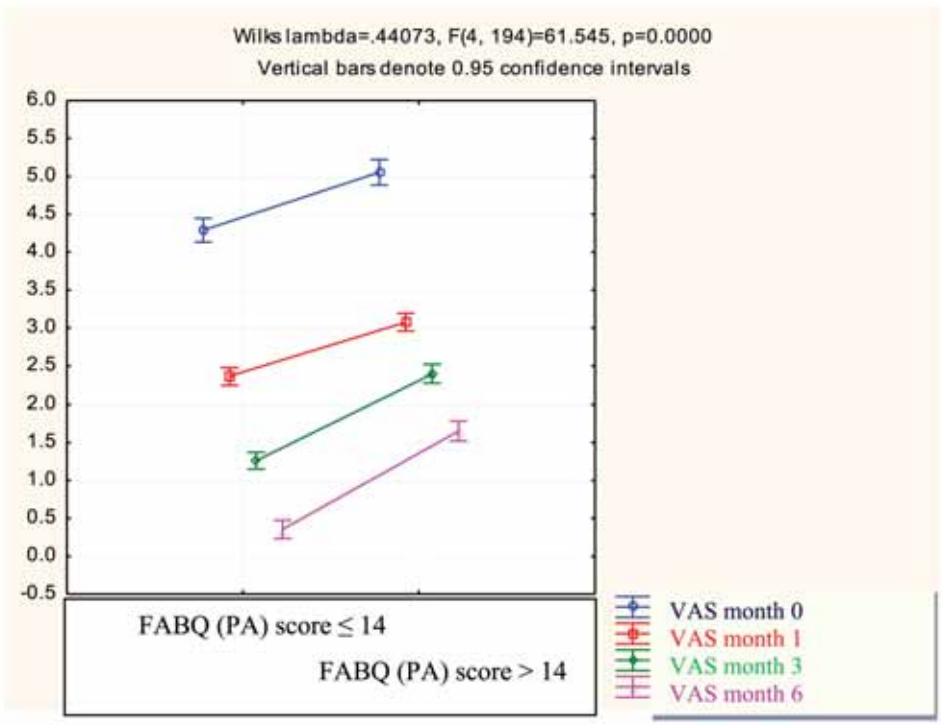

Fig. 5. The fear/avoidance of physical activity and intensity of pain.

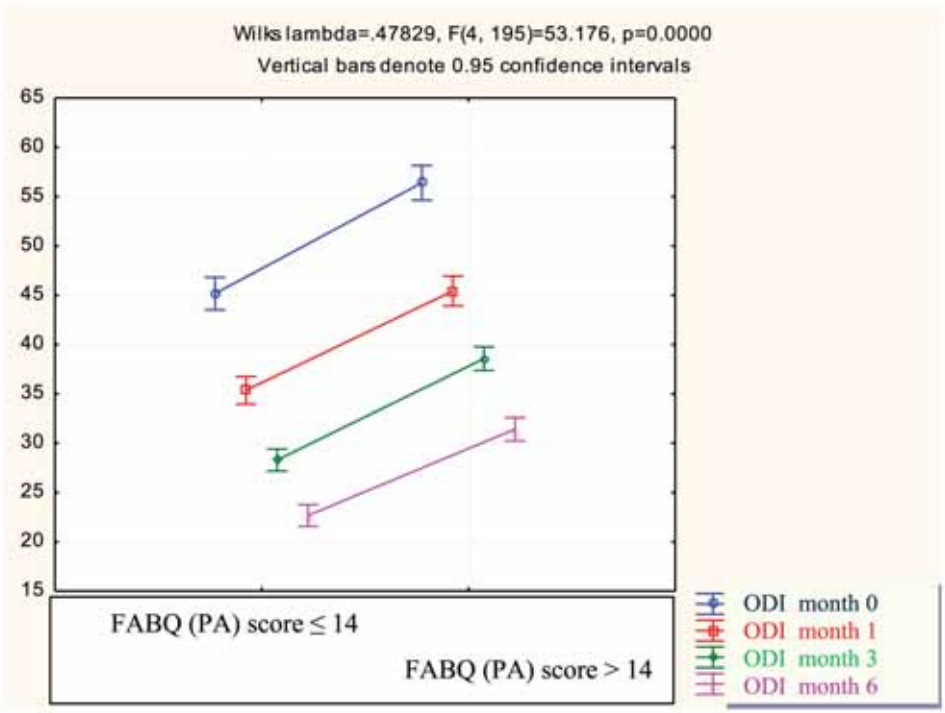

Fig. 6. The fear/avoidance of physical activity and Oswestry Disability Index.

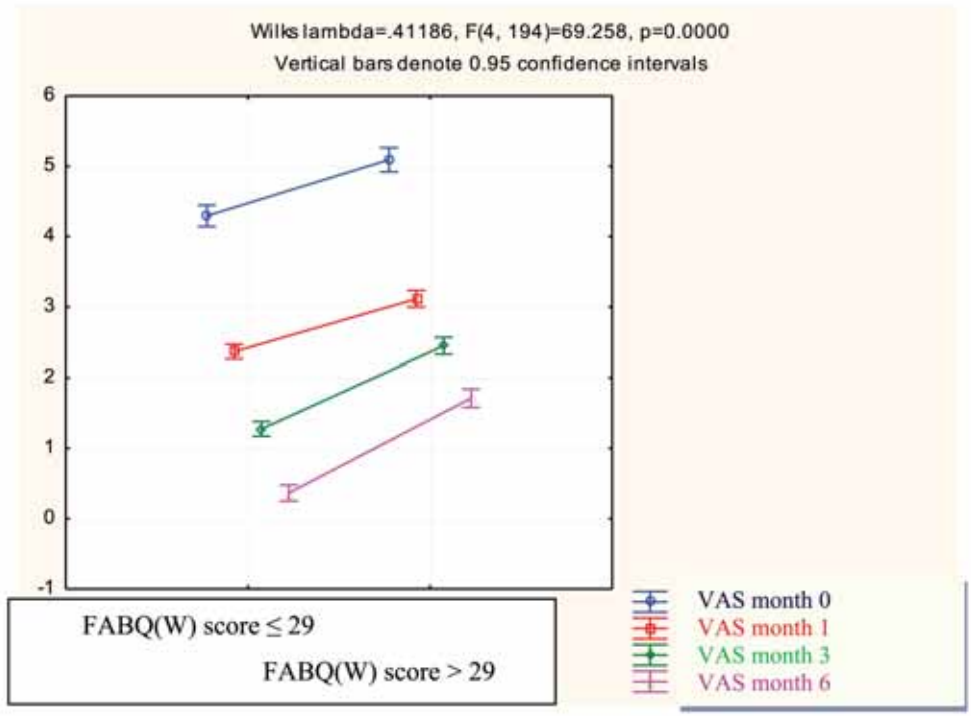

Fig. 7. The fear/avoidance of work and intensity of pain in periods of examination.

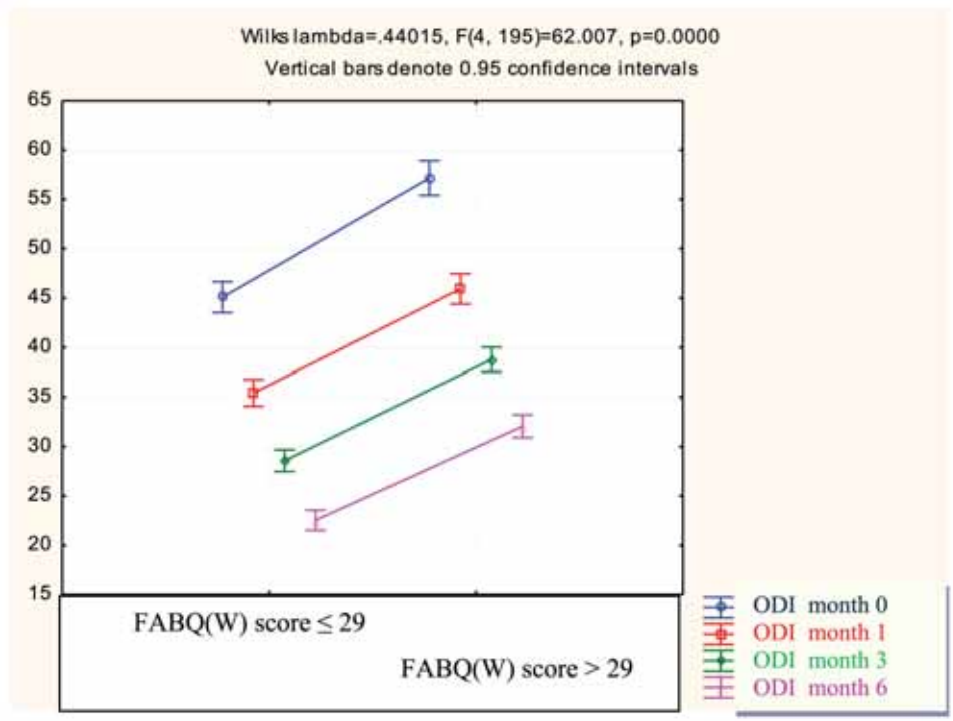

Fig. 8. The fear/avoidance of work and Oswestry Disability Index in periods of examination.

The level of state (current) anxiety in our patients had a significant correlation with pain intensity and functional disability. So, patients with a high level of current anxiety (STAI-S score 45 or more) also had higher pain intensity (according VAS) and higher disability index (according to Oswestry questionnaire). On the other hand, patients with a low to moderate level of current anxiety (STAI-S score below 45) had much lower pain intensity and degree of disability, and these differences were statistically highly significant compared with the group with a high level of anxiety.

It is interesting to note that the level of trait (general) anxiety in our investigation, determined by the STAI-T questionnaire, was equally associated with pain intensity and functional disability as was state (current) anxiety (STAI-S), indicating that these two types of anxiety have similar effects on the above mentioned characteristics of LBP.

In addition to anxiety, as a form of negative orientation, fear of physical activity and work, i.e., fear of movement and its avoidance may also be present. Fear of movement and its avoidance, as a kind of cognitive-behavioral factors, may be present in some patients with LBP, especially among those who have undergone surgical treatment. The mentioned factors are evaluated by various investigators, including Carleton *et al*. They concluded that pain and fear of movement in people with LBP could also cause pain-related anxiety, catastrophic thinking, perceived disability, and poor treatment outcome[17].

Appropriate prospective studies demonstrate that the presence of fear and avoidance of movement, causing the patient become more passive, are predictors of lower therapeutic success, which creates the possibility that LBP turns to a chronic disease[18,19]. To detect the presence of these disorders, there are various approaches and assessments by using appropriate questionnaires. They can also be used for assessment of prognosis and efficacy of therapeutic procedures and as indicators of the potential for the occurrence of LBP chronicity. These questionnaires may also serve as guidelines for the application of additional psychological, cognitive and behavioral therapeutic procedures[18,19,2].

Among these questionnaires, one of the most often applied in practice is FABQ (FABQ-PA and FABQ-W). This questionnaire is applied in practice for a long time as a reliable and proven method of testing and it is in line with recent similar tests[15,16,22,23]. In our study, evaluation of scores in FABQ-PA and FABQ-W questionnaires was performed by use of standard approaches and assessments mentioned in earlier and later studies on this topic[15-17]. Examinations of our patients revealed that people with a higher level of fear of physical activity and its avoidance (FABQ-PA questionnaire scores >14), as well as people with greater fear of work and its avoidance (FABQ-W score >29) had significantly greater pain and worse functional recovery. In our group of patients with FABQ-PA questionnaire scores over 14, the intensity of pain (VAS) and ODI were statistically significantly higher ($p<0.001$) than those recorded in the group with a score up to 14 at all observed intervals, i.e., from 0 to 6 months. Significantly worse results of pain intensity and functional disability were also found in patients whose FABQ-W score was above 29 as compared to those with a score up to 29 ($p<0.001$).

In patients who were surgically treated for chronic LBP, the mentioned psychological and cognitive-behavioral factors (anxiety, occurrence of fears, negative cognitive-behavioral status) can have a significant negative impact on the intensity of pain and functional ability[24-26].

Guclu *et al*.[26] also found that high intensity of pain, presence of anxiety, depression and fear of movement and avoidance of them had a significant impact on the reduction of functionality and quality of life in patients with chronic LBP, which also held true for patients who were treated surgically. According to Held *et al*.[27], in these patients, disability was primarily predicted by fear-avoidance.

Most researchers emphasize psychological factors and their impact on pain, postoperative recovery and functionality after microdiscectomy. However, there are also reverse attitudes that pain reduction after microdiscectomy is the primary and most important factor that decreases negative psychological attitudes[28,29]. On the other hand, the patient's positive expectations and optimism for the achievement of better recovery after spinal surgery, which are important psychological factors, have been mentioned among the newer predictive factors[30]. Yet, it seems that the most acceptable attitude could be that all of the above mentioned factors are in mutual reciprocal connection and that all of them together influence the recovery and functionality after microdiscectomy.

Conclusions

Anxiety (state and trait), fears and fear-avoidance beliefs of physical activity and work have considerable negative effects on the experience of pain and functional ability/disability in patients after lumbar microdiscectomy. Using appropriate questionnaires and recording the mentioned psychological factors, it is possible to predict the degree of functional recovery and additional psychological and cognitive-behavioral therapeutic procedures could be applied if necessary to obtain better recovery and function after microdiscectomy. The mentioned approaches and procedures deserve attention, as well as their application in the future in our region in patients undergoing microdiscectomy for the treatment of LBP. It will be the goal of our future activities.

Acknowledgments

The authors would like to thank Professor Dušanka Perišić, PhD, from Department of Mathematics and Informatics, Faculty of Sciences, University of Novi Sad, for help in statistical data processing.

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Sažetak

ANKSIOZNOST, STRAHOVI I UVJERENJA O STRAHU-IZBJEGAVANJU I TERAPIJSKI ISHOD NAKON LUMBALNE MIKRODISKEKTOMIJE

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Mikrodiskektomija je jedna od kirurških metoda za liječenje hernije intervertebralnog diska u bolesnika s lumbalnim sindromom. Cilj istraživanja bio je procjena prisutnosti psiholoških i kognitivno-ponašajnih čimbenika uključujući anksioznost, strahove i uvjerenja o izbjegavanju tjelesne aktivnosti i posla te njihove povezanosti s bolom i funkcionalnom onesposobljenošću bolesnika nakon lumbalne mikrodiskektomije i naknadne fizikalne terapije. Istraživanje je provedeno u Klinici za medicinsku rehabilitaciju Kliničkog centra Vojvodine u Novom Sadu u Srbiji na 198 bolesnika (95 muškaraca i 103 žene) srednje dobi 50,20±10,26 godina. Za ispitivanja korišteni su sljedeći upitnici: za anksioznost *Spielberger Anxiety Inventory (State/Trait)* za trenutno i opće stanje ispitanika; za strahove i uvjerenja upitnik za strah i izbjegavanje tjelesne aktivnosti i rada; za intenzitet boli vizualna analogna ljestvica; za funkcionalnu onesposobljenost upitnik Oswestry o onesposobljenosti kod lumboishialgije. Ove su procjene obavljene poslije mikrodiskektomije, tj. neposredno prije početka rehabilitacijskog programa te 1, 3 i 6 mjeseci nakon mikrodiskektomije. S bolom i funkcionalnom onesposobljenošću značajno su korelirali anksioznost-trenutno stanje ($p<0,01$), anksioznost-opće stanje ($p<0,01$), strah/izbjegavanje tjelesne aktivnosti ($p<0,01$) i strah/izbjegavanje rada ($p<0,01$). Spomenuti psihološki i kognitivno-ponašajni čimbenici mogu predvidjeti stupanj bolesnikova oporavka i indicirati dodatnu terapiju nakon lumbalne mikrodiskektomije.

Ključne riječi: *Lumbalni sindrom; Mikrodiskektomija; Anksioznost; Strahovi; Uvjerenja o izbjegavanju; Bol; Onesposobljenost*