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The quality of life of patients after lumbar microdiscectomy

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SUMMARY

Introduction/Objective The quality of life (QL) is a modern concept of observing the outcome of the disease and the success of the therapeutic procedure in all fields of medicine.

The aim was to assess the QL of surgically treated patients with lumbar radiculopathy (LR) at the beginning of treatment and three and six months after the initiation of prescribed and applied medical rehabilitation.

Methods The study group included randomized and stratified sample of 50 patients treated with lumbar microdiscectomy (LM). Conservative treatment was carried out using physical therapy procedures, and kinetic and ergonomic therapeutic procedures and educational training program in ergonomics were carried out in all the patients. To assess the condition of the patients, the QL and the efficacy of the rehabilitation treatment, we used two standardized questionnaires, the Short Form Survey Instrument (SF-36) and the Oswestry Disability Index (ODI).

Results The lowest values of the SF-36 – PCS, SF-36 – MCS, and of the ODI were recorded at the beginning of the rehabilitation (PCS: 28.8; MCS: 37.8; ODI: 56.1%). The most significant improvements of the scores were observed three months after the treatment initiation (PCS: 42.8; MCS: 45.2; ODI: 38.9%). At six months of treatment, the scores were slightly higher (PCS: 49.2; MCS: 52.5; ODI: 23.7%) ($p < 0.001$).

Conclusion The QL and the functional status of patients after LM are significantly better after three and six months in comparison with the beginning of rehabilitation, and the state for six months compared to the state for three months.

Keywords: lumbar radiculopathy; microdiscectomy; quality of life; SF-36; ODI; treatment outcome

INTRODUCTION

The main symptom of lumbar radiculopathy (LR) is pain in the lumbo-sacral region with propagation to the lower extremities. The intensity of the neuropathic pain depends on the extent of the local damage and on the individual characteristics of the patient and experiential pain perception [1].

Healthy functioning and the quality of life (QL) of patients with LR depend on the severity of the disease, the intensity of the symptoms and on the degree of incapacity. It has been also largely dependent on the applied therapeutic methods and protocols. In addition, the socio-economic implication plays a relevant role [2]. The QL provides valuable information about functional ability, level and quality of social interaction, mental state, somatic sensations, and satisfaction with life, reflecting the definition of health by the World Health Organization and reflecting the previous scientific data about the impact of the disease and treatment on disability and daily functioning [3].

Questionnaires, as instruments for measuring the QL, regarding their structure, may be general (generic) questionnaires that are structured to express the extent of injury from the standpoint of patients, and questionnaires for

a specific disease. The latter ones are formed with an objective to provide a higher sensitivity and specificity [4]. The choice of instrument should be determined by the clinician, according to the clinical problem and measuring characteristics of the instrument [5].

The aim of this study was to evaluate the QL of patients immediately after lumbar microdiscectomy (LM) at the beginning of the rehabilitation, and then after three months and after six months of the prescribed supervised regular physical rehabilitation treatment. For the evaluation, we utilized both general questionnaire and the questionnaire specific for lumbar pain syndrome (LPS).

METHODS

This randomized prospective clinical study included 50 patients with LR of disc genesis who were treated with LM. In all the patients, rehabilitation treatment was carried out under the regular protocol with the use of physical therapy procedures and ergonomic physical training.

Inclusion criteria for the patients in this study were the following: age between 20 and 65 years, patients of both sexes, orientated in

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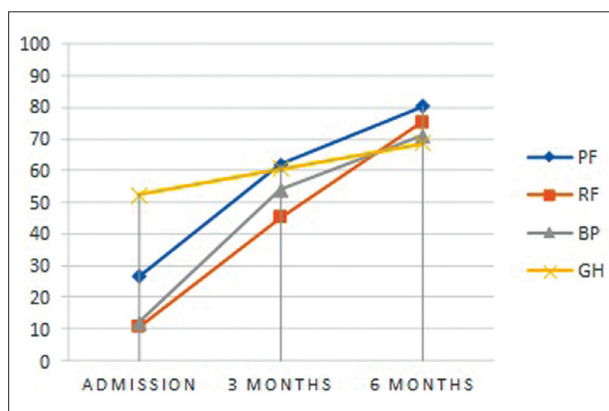


Figure 1. Four basic domains of the Physical Health Composite Scale score change over six months after surgery; PF – physical functioning; RF – role of physical function; BP – bodily pain; GH – subjective feeling of health

time, space and to other persons, competent to sign an informed consent to participate in the study and with the ability to follow and to adhere to the prescribed treatment regimen and examination, subjects diagnosed with LPS of discogenic etiology (LR, lumbar disc herniation) previously operated.

Criteria for non-inclusion of the patients were as follows: patients who do not meet the criteria for inclusion, patients with diagnosed comorbidity that may affect the current nature of the disease and the QL, participation in other clinical research, inability to comply with the requirements of the clinical trials for any reason.

A sample of the patients included in the clinical trial was determined by simple randomization and by sorting based on the table of random numbers taken from the regular protocol. The total number of patients in the study period from 2014 to 2016 who met the inclusion criteria and entered the selection of research was 84 and the number of patients who met criteria for non-inclusion was eight.

It is important to accentuate that none of the patients who were included in the clinical trial had left the clinical study.

The patients who were involved in the study were interviewed by administering the generic Medical Outcomes Study Short Form 36 (SF-36v2[®]) and the specific Oswestry Disability Index (ODI) questionnaires in three specific time periods: at the beginning of the medical rehabilitation (immediately after surgery), three months later, and six months after the beginning of the treatment.

SF-36v2[®] contains 36 questions, issues that include the following eight fields of the QL: physical functioning (PF), the role of physical function (RF), the role of emotional functioning (RE), social functioning (SF), bodily pain (BP), mental state (MH), vitality (VT), a subjective feeling of health (GH). By further grouping into four areas, two summary scores were obtained: physical (PCS) and mental (MCS). The formula for the calculation of the summary scores included the values of all eight single domains and four basic for each of the summary scores (Figures 1 and 2). The minimum score value was zero, and the maximum was 100 – higher score value signifies better QL.



Figure 2. Four basic domains of the Mental Health Composite Scale score change over six months after surgery; RE – role of emotional functioning; SF – social functioning; MH – mental state; VT – vitality

The ODI was generated in ten sections comprising six questions each, and answers were ranked by the Likert scale. The first area assessed the intensity of pain, while the remaining nine covered disabling effect of pain produced by the typical activity: I – intensity of pain (PAIN); II – baseline activities of daily living (CARE); III – lifting (LIFT); IV – walking (WALK); V – sitting (SIT); VI – standing (STAND); VII – sleeping (SLEEP); VIII – working (house chore and office work activities (WORK)); IX – social life (SOCIAL); and X – travel (TRAVEL). Each subscale was graded from 0 to 5, where higher values represented greater disability. The sum of 10 results was expressed as a percentage of the maximum score (0–100%).

Calculations were performed by using the IBM SPSS Statistics, Version 20.0 (IBM Corp., Armonk, NY, USA) and Health Outcomes Scoring Software 4.5, which is a program designed for the entry and statistical processing of statistical data about the QL of patients. Statistical analysis comprised descriptive and inferential methods (Friedman test, General Linear Model, Student's t-test, Mann-Whitney U-test, linear regression, Spearman's rank order correlation). In all used analyses, an alpha of 0.05 is used as the cut-off value for significance.

RESULTS

General characteristics of the patients included in the study are shown in Table 1. Of the total number of patients, 68% were female and 32% male, the mean age was 47.12 ± 7.63 .

Disc herniation was most common at the L4–L5 (50%) and L5–S1 (46%) levels, and just 4% of the patients experienced disc herniation at the L3–L4 level. Most patients (80%) reported the presence of previous episodes of lumbar pain syndrome, while the remaining 20% of patients denied the existence of the previous episodes.

The results of the assessment of the QL obtained by the general SF-36v2[®] questionnaire and the results of the functional capabilities obtained by the specific ODI questionnaire in surgically treated patients with LR are shown in Table 2.

Table 1. General characteristics of the patients (n = 50)

Characteristics		Number (%) ± SD
Sex	Male	16 (32)
	Female	34 (68)
Age (years)	Mean	47.12 ± 7.63
Education	No primary education	3 (6)
	Primary	15 (30)
	Secondary / high school	22 (44)
	University degree	10 (20)
	Marital status	Married / in a relationship
Marital status	Divorced/separated	3 (6)
	Widowed	2 (4)
	Single	7 (14)
	Level of discus hernia	L ₃ -L ₄
Level of discus hernia	L ₄ -L ₅	25 (50)
	L ₅ -S ₁	23 (46)
Earlier episodes	No	10 (20)
	Yes, one episodes	11 (22)
	Yes, more episodes	29 (58)

Table 2. Results of the Medical Outcomes Study Short Form 36 and Oswestry Disability Index questionnaire scores

Questionnaire	Admission	3 months	6 months	F-value*	p-value
SF-36	PCS	28.8	42.8	49.721	< 0.001
	MCS	37.8	45.2	72.055	< 0.001
MCS	56.1%	38.9%	23.70%	1341.180	< 0.001

SF-36 – Medical Outcomes Study Short Form 36; PCS – Physical Health Composite Scale score; MCS – Mental Health Composite Scale score; *repeated measures ANOVA

At the start of rehabilitation, we recorded a very low value of the PCS 28.8, while the value of the MCS was slightly higher, but also at a low level (37.8). After three months of rehabilitation, value of all scores on the SF-36V2* questionnaire were significantly increased (PCS = 42.8; MCS = 45.2), and after 6 months, the values approximately reached the levels that characterize the general population (PCS = 49.22; MCS = 52.5). Analysis of variance for repeated measures (RM ANOVA) showed that the values of PCS (Figure 1) and MCS (Figure 2) scores have significantly changed during the study ($F = 490.721$, $p < 0.001$). Both summary scores showed the greatest registered progress in the first three months from the start of rehabilitation treatment.

Furthermore, after examining the results of the six-month research, we found that the domains that participate in the formation of the total PCS and MCS scores and after comparing them with the values given for the general population in different countries, we concluded that the values of the domains moved closer to the general population after six months of rehabilitation. Compared with the general population of Switzerland, Great Britain, United States and China, a statistically significant difference ($p < 0.05$) was registered among the majority of the domain, except for two domains: Switzerland ($p_{SF} = 0.26$ and $p_{VT} = 0.88$); United Kingdom ($p_{SF} = 0.14$ and $p_{GH} = 0.27$); United States ($p_{SF} = 0.35$ and $p_{BP} = 0.08$); China ($p_{SF} = 0.96$ and $p_{GH} = 0.18$). When compared with the general population in Australia, a statistically significant difference ($p < 0.05$) was observed in PF, RE,

Table 3. Comparative overview of the Medical Outcomes Study Short Form 36 scores with the general population

		Results of our research			General population				
		I	II	III	a	b	c	d	e
SF-36	PF	26.5	62	80.3	90.6	85	84.2	85	83.9
	RF	10.5	45	75.2	85.8	81.55	80.9	85	77.5
	RE	39.8	68.5	89.3	79.2	83.5	81.3	80.2	79.7
	SF	26	60.7	81.5	83.7	84.35	83.3	81.4	82.1
	BP	11.9	53.8	71	77.6	79.8	75.2	76.6	71.2
	MH	48	61.8	77.6	69.2	73.8	74.7	70.6	73.6
	VT	28	54.7	64.9	65.1	58.7	60.9	61.7	57.7
	GH	52.4	60.62	68.52	76.1	70.35	71.9	66.3	72.8

SF-36 – Medical Outcomes Study Short Form 36; PF – physical functioning; RF – role of physical function; RE – role of emotional functioning; SF – social functioning; BP – bodily pain; MH – mental state; VT – vitality; GH – subjective feeling of health; I – admission; II – 3 months; III – 6 months; a – Switzerland; b – United Kingdom; c – USA; d – China; e – Australia [6]

**Figure 3.** Values of the Oswestry Disability Index score change over six months after surgery

MH, VT, and GH domains, while in the remaining three domains no statistically significant difference was found ($p_{RF} = 0.16$, $p_{SF} = 0.76$, $p_{BP} = 0.93$). The analysis of comparisons of the results of our research with the results in the general population of different countries are shown in Table 3.

Multivariate linear regression analysis showed that the values of PCS and MCS were not significantly related with the monitored characteristics of our patients.

Immediately after surgery, we registered a high ODI score of 56.10%; however, each following test recorded significant improvements in the functionality of the patients, and the ODI score was 38.9% after three months, which decreased to 23.7% after six months of the rehabilitation treatment (Figure 3).

ODI domain values during six months of the follow-up after LM are given in Table 4. The analysis of the presence of individual responses in ODI domain Friedman's test revealed statistically significant differences among three measurements ($p < 0.001$). The biggest improvement was registered in the first three months from the beginning of the rehabilitation treatment.

Multivariate linear regression analysis confirmed that the value of the ODI were significantly associated with marital status. In patients who were married or in a common law marriage, after controlling the effects of all other demographic characteristics, the score was greater by 6.452

Table 4. The mean value of domains the Oswestry Disability Index score over six months after surgery

Domains of ODI	Admission	3 months	6 months	χ^2 value*	p-value
PAIN	2.06	1.28	0.52	85.035	< 0.001
CARE	1.9	1	0.46	31.524	< 0.001
LIFT	4.14	3.4	2.14	66.511	< 0.001
WALK	2.76	1.82	0.78	46.587	< 0.001
SIT	3.38	2.1	1.38	60.336	< 0.001
STAND	3.5	2.46	1.86	51.228	< 0.001
SLEEP	1.42	1.2	1.0	35.086	< 0.001
WORK	3.22	2.32	1.04	28.526	< 0.001
SOCIAL	2.4	2	1.7	29.925	< 0.001
TRAVEL	3.16	1.9	0.9	40.880	< 0.001

ODI – Oswestry Disability Index; PAIN – intensity of pain; CARE – baseline activities of daily living; LIFT – lifting; WALK – walking; SIT – sitting; STAND – standing; SLEEP – sleeping; WORK – working (house chores and office activities); SOCIAL – social life; and TRAVEL – travel;

*Friedman test

than the score found in patients with other marital status (95% CI 1.508–11.397; $p < 0.05$). In patients who were operated on ho had the 'single / never married' marital status, the score was by 7.421 lower than the score in the same group of patients with other characteristics relating to the marital status (95% CI 1.798–13.044; $p < 0.05$).

For the purpose of comparison of the assessment of the QL with a generic questionnaire (SF-36v2[®]) and with a specific questionnaire for the patients with LR (ODI), we performed the correlation analysis of score values obtained from both questionnaires at all three points of time and for each particular interview. For the SF-36v2[®], we used summary scores PCS and MCS, and for the ODI we used PAIN, LIFT, WALK, WORK, and SOCIAL. At the beginning of the treatment, the highest recorded value of the correlation was found between PCS and PAIN ($r_s = -0.210$; $p = 0.143$). After three months of rehabilitation, the average value of the correlation coefficient showed better agreement between the selected scores of the selected questionnaire than at the beginning of the treatment process, hence emphasizing the need for the use of the specific questionnaire for assessing the QL during the rehabilitation treatment. At this survey time period, the highest value of the correlation coefficient was observed between the PCS and PAIN ($r_s = -0.251$; $p = 0.078$). Six months after the beginning of the rehabilitation, the correlation coefficient values were approximately at the same level as at the second survey time period, wherein the highest value of correlation was between the PCS and PAIN ($r_s = -0.312$; $p < 0.05$).

DISCUSSION

The most important goal of any society should certainly be the health of its population and the improvement of the QL. In regards to this, the research related to the evaluation of the QL in patients affected with one of the most common pathology is gaining the raising importance in both clinical and population studies. The patient's own report is considered the gold standard for assessing the

QL. Doward et al. [7] have compared the reports of experts from different fields relevant to the QL with patients reports and they noted a high degree of correlation. They concluded that the patient report was not only an indicator of the patient's subjective experience, but also an objective indicator of the QL in relation to health.

A total of 50 patients participated in our study: 34 female and 16 male. In a meta-analysis carried out by Morley et al. [8], the sample comprised 1,672 patients with LPS and women were also more frequently presented (62%). In our study, the average age of patients was 47.12 ± 7.63 years and most of the patients were in the age range of 40–59 years, which is similar to demographic data presented in other researches [9, 10]. These data support the fact that LR affects the working population and that it has been the reason of disability in working population. In regard to educational attainment and marital status, the majority of the patients were secondary and elementary educated and married, which is consistent with other studies [11, 12]. The connection of the occurrence of LR with education and marital status has been reflected primarily in the type of occupation and in the psychological support of the patient influencing the patient's motivation to accelerate the healing. It was noted that educational attainment has no connection with the development of LR, but it was related to the level of difficulty of the physical work that the patients had performed. Shadbolt et al. [13] concluded that family was important for the QL, and that respondents who were married and had children had a better general health and physical functioning than those who were married and did not have children and whose characteristic was having very strong body pain. Shadbolt et al. [13] also said that people who were not married manifested a higher degree of social isolation than people who were married. Patients who were not married had a bigger decrease in physical activity that is the important component dimension of the QL [13].

The most important decision in the process of measuring the QL of patients with LR has been the selection of types of questionnaires that would be used [14]. In the field of rheumatic diseases, the questionnaire SF-36v2[®] has been proven as the most reliable questionnaire that reflects the QL very realistically and that has a good correlation with the physical and mental capabilities of patients, especially in patients with LPS treated with different treatment modalities. LPS has been the most common rheumatic disease [14]. The most commonly used generic questionnaire SF-36v2[®] Health Survey was an instrument in our research [15]. Since the SF-36v2[®] is not sufficiently sensitive to the changes in the QL important for people with LR, there was a need to include a specific instrument that would be focused on domains that were specific to LR and the characteristics of patients with LR. The need to include the specific questionnaire for assessing the QL of patients with LR was pointed out by Suarez-Almazor et al. [16] – in their research, they indicated that SF-36v2[®] survey does not adequately reflect the changes in the health status of patients with LPS. This statement has been notably reflected in our study in neurological symptoms reported by patients.

For the purposes of this study, as the questionnaire specific to the disease we used the ODI, a specific questionnaire for measuring the QL of patients with LR. It has been a very practical questionnaire for routine clinical use since it was designed as a multi-dimensional test. It measures the pain and functioning, as well as the pain during the activities causing limitations in physical activities; hence, it can be classified as a component of serious research.

Values of PCS and MCS showed statistically significant changes during our study. The biggest improvement was recorded after the first three months of the treatment in both summary scores. After six months from the start of rehabilitation, PCS value did not exceed the standard value of the SFS – 50 for the general US population. Lower values of PCS were justified by the severity of the damage and by recent surgery that both contributed to physical limitations in the early postoperative period as well as by applied precautions for wounds, injury to back and reherniation. The patient's fear of physical activity and body movement had contributed to lower PCS values as well. Johansson et al. [17] reported patients' beliefs in recovery and fears of physical activity as leading factors. Authors recommended that the patients with fears of physical activity should be identified and treated appropriately.

We also concluded that the patients with psychosocial problems more frequently shortened the time spent at work and in other activities, were less efficient, had less attention and motivation regarding work obligations, were more frequently nervous, in a bad mood, tired, with less energy and less active, and more irregular in maintaining social contacts. During the six-month follow-up period of the patients, the MCS values showed continuous increase and at the six-month survey period, these values exceeded the standard value of a healthy population of the United States – 50. When we compared the results of our research to some other research findings, we concluded that there is no agreement that the emotional and psychosocial factors have a major impact on success of the treatment in patients with LR. Johansson et al. [17] and Den Boer et al. [18] noted a more significant psychological impact in surgical patients when compared with nonsurgical. In contrast to these findings, Bošković et al. [19] and Iles et al. [20] after studying the psychosocial factors as predictive factors of the success of treatment in patients with LPS and LR concluded that depression, satisfaction/dissatisfaction with work, psychological stress, and other factors have considerably smaller influence and that has been correlated to our research.

Unlike the SF-36v2® survey, in which the questions referred to the time interval within the previous four weeks, the ODI questions were related to the current status of the patients. The average values of the total ODI score during the examination period changed significantly in both groups of patients, and the differences of these values three and six months after the surgery were highly statistically significant ($p < 0.001$) in comparison to the values at the beginning.

At the start of the hospitalization (and rehabilitation) and at three months from the start of the rehabilitation, half of the patients responded with, "The pain is very mild

at the moment." This fact can be justified by the effect of surgery and by early rehabilitation. Six months after the beginning of the rehabilitation, we concluded that in the majority of the patients (56%) a complete relief of pain was achieved.

The decision that the assessment shall be made after the first three months of the treatment was made because it was thought that this was a long enough period for the recovery and for the assessment of the therapeutic treatment outcomes. Assessment in the later period (e.g. after a year or more) could provide similar but also different or inadequate results (if, for example, there was an appearance – emergence – of new herniation of intervertebral discs or other pathological changes of the spine).

The fact that the period of three months after the operation is a long enough period for the assessment of the therapeutic effect and of the degree of recovery was supported by the research carried out by Häkkinen et al. [21]. They compared the score values on the ODI questionnaire administered six weeks after the surgery and then one year following the surgery for LR. They proved that the results obtained six weeks after the operation did not change substantially during the coming year.

Ability to function in terms of daily activities that was covered by the ODI questionnaire at admission and at the beginning of the treatment process was limited to light activities. Three months from the start of rehabilitation, the patients showed improvement but were still limited in their daily activities in regard to performance (adjusting) within proper body position. In the last survey period, the patients were still cautious, so their answers ranged from being rigid to avoid harder activities only, while lighter activities within the proper body position could be performed, to being able to perform heavier activities but with additional pain. Bakker et al. [22] in the review of prospective cohort studies have confirmed that sitting, walking, long standing in one place, as well as playing sports have not been significant risk factors for the development of LPS and LR, unlike most of the mechanical load of the spine during heavier work. Bending, torsion of the torso, and vibrations of the entire body were cited as significant predictors [22]. Roffey et al. [23–27] and Wai et al. [28–30] in eight systematic studies in total performed the analysis of the influence of the mechanical factors on the appearance of LPS and LR in a large number of workers in different professions. In these studies, the mechanical factors that were included were prolonged sitting in an awkward body position [23, 24], prolonged standing and walking [25], lifting and moving of patients [26], pushing or pulling [27], bending or twisting of the body during lifting of a heavy load [28, 29], carrying heavy loads [30].

Low values of correlation coefficients in patients who were operated on and a small correlation value of the SOC (social functioning) ODI domain with other scores and domains tells about the specifics of this domain and about the evident need to assess the QL of patients with LR by using batteries of generic and specific questionnaires. General generic questionnaires are needed to analyze appropriately the QL of patients in comparison to the normal population

and to compare the QL in patients with different diseases, while specific questionnaires are needed in order to assess in detail the health and the QL of these patients.

CONCLUSION

Given that the QL includes all aspects of life in patients who underwent LM, we did not expect an improvement in the first days after the operation. In further monitoring of our patients, we recorded significantly higher values of physical functioning and functioning in emotional and social aspects of the QL at three months and at six months when compared to the beginning of rehabilitation, and at six months when compared to three months of rehabilitation.

A statistically significant negative correlation between PCS and PAIN was recorded on the third repeated

measurement. Values of domains and scores and the small values of correlation coefficients indicate that this group of patients feels differently after surgery and rehabilitation, and that this observation requires more detailed analysis and the utilization of the battery of generic and specific questionnaires.

Medical rehabilitation and ergonomic educational training have great importance in the planned structured recovery of patients after LM.

Application of the appropriate questionnaires in patients with LR has been of great importance in the assessment of the impact of the disease on physical, psychological, functional, and work capacity and on the QL, and in patients after LM it plays an essential role in the assessment of the efficacy of the rehabilitation treatment and consequently in the planning of the further management of these patients.

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Квалитет живота болесника после лумбалне микродисцектомије

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САЖЕТАК

Увод/Циљ Квалитет живота (КЖ) представља савремени концепт посматрања исхода обољења и лечења у свим областима медицине.

Циљ је био проценити КЖ оперативно лечених болесника са лумбалном радикулопатијом (ЛРП) на почетку лечења и три и шест месеци после прописане и спроведене медицинске рехабилитације.

Методе Обухваћен је рандомизиран и стратификован узорак од 50 болесника лечених лумбалном микродисцектомијом (ЛМД). Код свих болесника спроведен је конзервативни третман применом физикалних процедура, кинезитерапијских процедура и ергономске едукације. За процену стања болесника, квалитета живота и ефекта реха-

билитационог третмана коришћена су два стандардизована упитника – *SF-36* и *The Oswestry Disability Index (ODI)*.

Резултати Најниже вредности *SF-36 – PCS*, *SF-36 – MCS* и *ODI* забележене су на почетку рехабилитације (*PCS*: 28,8; *MCS*: 37,8; *ODI*: 56,1%), после три месеца забележено је најзначајније побољшање скорова (*PCS*: 42,8; *MCS*: 45,2; *ODI*: 38,9%), а после шест месеци скорови су били мало већи (*PCS*: 49,2; *MCS*: 52,5; *ODI*: 23,7%) ($p < 0,001$).

Закључак КЖ и функционални статус болесника после ЛМД значајно су бољи после три и шест месеци у односу на почетак рехабилитације, као и после шест месеци у односу на стање после три месеца.

Кључне речи: лумбална радикулопатија; микродисцектомија; квалитет живота; *SF-36*; *ODI*; исход лечења