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Original Article

Quality of Life and Functional Status of Patients with Lumbar Radiculopathy

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Abstract

Background: Quality of life (QL) of patients with lumbar radiculopathy (LR) stands for personal experience of the functional effect of the ailment and therapy applied to the patient. We aimed to evaluate the QL in patients with LR before the start of treatment, as well as three and six months following the start of medical rehabilitation, that was prescribed and implemented.

Methods: The research was conducted at the Special Hospital for Progressive Muscular and Neuromuscular Diseases in Novi Pazar, Serbia, from 2014 to 2016. A stratified, randomized sample included fifty patients with LR. All patients had an educational training program in ergonomics, physical therapy procedures, and kinetic and ergonomic therapeutic procedures as part of the conservative treatment. We employed two standardized questionnaires, the Oswestry Disability Index (ODI) and the SF-36, to evaluate the patients' condition, their QL, and the effectiveness of rehabilitation treatment.

Results: In terms of SF-36 - PCS, SF-36 - MCS, and ODI, the lowest values were noted at the start of rehabilitation (PCS:35.5; MCS:37.8; ODI:51.5%). Three months later, there was a significant improvement in the scores (PCS:42.8; MCS:45.2; ODI:38.9%), and six months later, the scores were somewhat higher (PCS:49.2; MCS:40.6; ODI:23.7%) ($P<0.01$).

Conclusion: When comparing the conditions, the QL and functional status of patients with LR are significantly improved. They were better at three and six months compared to the start of rehabilitation and at six months compared to the condition at three months.

Keywords: Lumbar radiculopathy; Quality of life; Functional status; Serbia

Introduction

Lumboishialgia pain is prevalent in the clinical image of lumbar radiculopathy (LR), i.e., back pain and pain in the area of the dermatomes and innervating area of the nervus ischiadicus (1).

The term quality of life (QL) refers to the contemporary idea of monitoring outcomes of treatment and the success of therapy procedures in all areas of medicine, as well as in the problematics of LR (2).

Patients with LR report higher levels of pain intensity and functional impairment, interfering with daily activities and work productivity and leading to increased medical care utilization and economic burden. LR is characterized by pain radiating along the nerve root, and due to its neuropathic nature, it significantly reduces the QL (3).

Generic and/or specific questionnaires are used for the assessment of QL. Application of the right questionnaires to patients with LR holds major importance for the assessment of the impact of the illness on working, psychophysical, and functional abilities, on QL, and on the development of diagnostic, educational, and therapeutic procedures. It is simultaneously the most precise way of discovering how realistic the patients' expectations of the treatment are, as well as best way of observing changes during treatment, quality of care provided to the patients and outcome of the whole treatment. Finally, the analysis of QL after therapy procedures adds to education of health staff (4). Patients' own reports must be considered the golden standard for assessment of QL and represent both their subjective experience and an objective measure of QL in relation to health (5).

The aim of the research was to assess the QL of LR patients using a general and a lumbar pain syndrome (LPS)-specific questionnaire at the start of rehabilitation, three months later, and six months after conducting medical rehabilitation.

Methods

Study design, sample, and procedures

The research was conducted at the Special Hospital for Progressive Muscular and Neuromuscular Diseases in Novi Pazar, Serbia, from 2014 to 2016. Fifty individuals with LR of discal genesis were included in a randomized, controlled prospective study. All patients received rehabilitation treatment using physical treatments and ergonomic instruction, all in accordance with standard protocol.

The inclusion criteria for patients in the study were: male and female patients aged between 20 and 65 years; patients had to be able to be oriented in time, space, and by other people; they had to be competent to sign an agreement form for participation in research and be able to monitor and stick to the prescribed treatment and regime of examination; and they had a confirmed diagnosis of LPS of discogenic etiology (LR, lumbar discus hernia).

Criteria for exclusion were individuals who did not fit the inclusion criteria; individuals with comorbidities that could have influenced the course and character of the illness and QL; individuals who participated in additional clinical research; and individuals who were unable to complete the requirements of a clinical assessment for any cause.

Patients were selected for clinical research participation by basic randomization, which involved sorting patients according to tables containing random numbers from the protocol.

Instruments

The Oswestry Disability Index (ODI) and Medical Outcomes Study Short Form 36 (SF-36) questionnaires were administered to the included patients three times: immediately upon admission, three months later, and six months following medical rehabilitation.

SF-36 is comprised of 36 questions and includes 8 areas of QL: mental health (MH), bodily pain (BP), vitality (VT), physical functionality (PF), social functionality (SF), role of emotional functionality (RE), role of physical functionality (RF), and personal opinion of health (GH); two summary scores are given by further grouping of 4 areas: physical (PCS) and mental (MCS). The values of all 8 individual domains were included in the formula for the calculation of summarized scores; however, 4 individual scores for each summarized score were stressed out. The score has a minimum of 0 and a maximum of 100. Higher scores represent a higher QL.

The ODI was generated in 10 sections of 6 questions arranged on a Likert scale. The first area determines pain intensity, while the other nine

cover the debilitating effects of pain on typical activities. I stands for intensity of pain (PAIN), II for basic daily activities (CARE), III for lifting, IV for walking, V for sitting, VI for standing, VII for sleeping, VIII for working activities, IX for social life (SOCIAL), and X for traveling. Every subscale has a score range of 0 to 5, with higher scores denoting more disability. The percentage of the maximum score (0–100%) represented 10 results.

Statistical analyses

The Health Outcomes Scoring Software 4.5 program was used for data input and statistical processing related to patient QL, and the SPSS program, version 20.0 (IBM Corp., Armonk, NY, USA), was utilized for calculations. Descriptive and inferential statistical techniques (such as the Friedman Test, General Linear Model, Student's *t*-test, Mann-Whitney U test, Linear Regression, and Spearman's Rank Order Correlation) were used in the analysis. An evaluation error of 0.05 (5%) was marked as the threshold of statistical significance in all the analyses.

Ethical considerations

This study was approved by the Institutional Review Board of the Special Hospital for Progressive Muscular and Neuromuscular Diseases in Novi Pazar, Serbia (IRB study number 1041, September 2014). This study adhered to the 1964 Declaration of Helsinki and its subsequent revisions, requiring each participant to provide written informed consent before recruitment.

Results

The research included 50 patients with diagnosed LR (60% female and 40% male), with an average age of 48.20 ± 6.49. Discus hernia was present at the following levels of the spinal unit: L5-S1 (56%), L4-L5 (42%), and L3-L4 (2%). Previous episodes of ailments caused by LR were registered in 86% of the patients, while in the remaining 14% there were no previous ailments. General information about patients is shown in Table 1.

Table 1: General characteristics of the patients (N = 50)

Characteristics		***Number (%); ±SD***
Gender	Male	20 (40.0)
	Female	30 (60.0)
Age (yr)	Mean	48.20±6.49
Education	No primary education	6 (12.0)
	Primary	15 (30.0)
	Secondary/High school	21 (42.0)
	University degree	8 (16.0)
Marital status	Married/in a relationship	39 (78.0)
	Divorced/separated	3 (6.0)
	Widowed	4 (8.0)
	Single	4 (8.0)
Level of discus hernia	L_3-L_4	1 (2.0)
	L_4-L_5	21 (42.0)
	L_5-S_1	28 (56.0)
Earlier episodes	No	7 (14.0)
	Yes, one episodes	10 (20.0)
	Yes, more episodes	33 (66.0)

Results of the evaluation of QL (SF-36) and functionality (ODI) during the first interview of the patients showed lower values in the domain of QL PCS=35.5 and MCS=40.6 and higher values of disability ODI=51.50%. A significant improvement was recorded in both domains of QL (PCS=44.7 and MCS=40.6) and functionality (ODI=36%) during the second interview. The third interview shows results common to the general population in terms of QL (PCS=50.8 and MCS=52.6) as well as in terms of functionality during everyday life activities (ODI=22.50%) (Table 2).

Table 2: Results of the questionnaire scores of SF-36 and ODI

Questionnaire		*Admission*	*3 months*	*6 months*	*F value*	*P-value*
SF-36	PCS	35.5	44.7	50.8	450.221	<0.001
	MCS	40.6	44.8	52.6	106.543	<0.001
ODI		51.50%	36.0%	22.50%	432.810	<0.001

F value – RM ANOVA

The analysis of variance for repeated evaluation (RM ANOVA) showed that values of all domains changed significantly during the research in both the general SF-36 questionnaire (F=450.221 and *P*<0.001) and the specific ODI questionnaire (F=432.810 and *P*<0.001). The biggest improvement in both questionnaires was registered within the first three months since the beginning of the rehabilitation (Figs. 1-3).

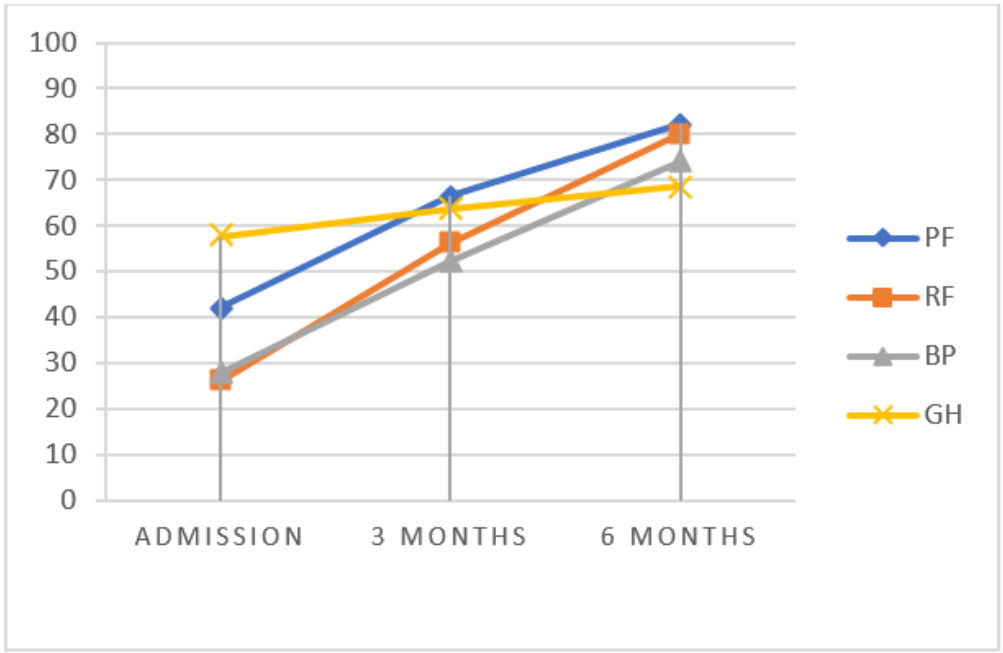

Fig. 1: Four basic domains of PCS change over 6 months from admission

Fig. 2: Four basic domains of MCS change over 6 months from admission

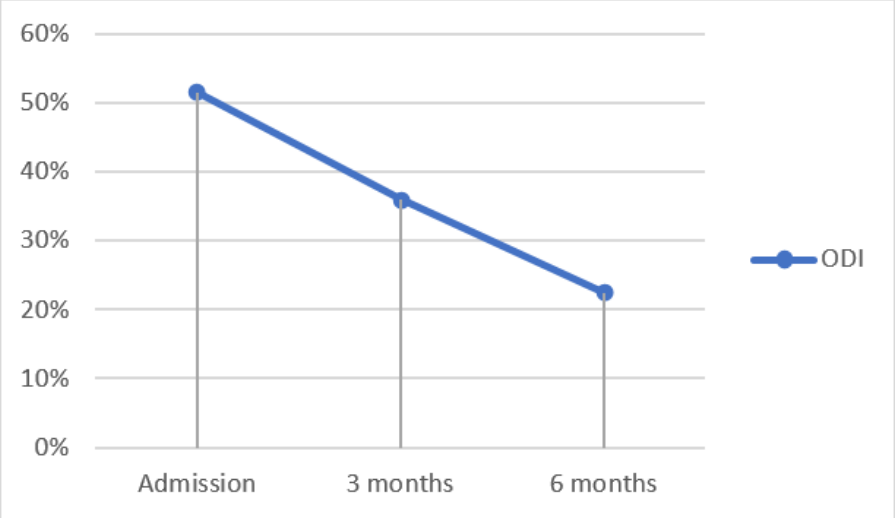

Fig. 3: Values of ODI score change over 6 months from admission

By comparing the results of the QL domain of our research with research on the general population from different countries, it is determined that the values of the last condition during the interview (6th months of rehabilitation) are close to general values. In comparison with general populations, statistically significant differences are present in the following domains: RE, MH, and VT compared to Australia; PF, RF, RE, VT compared to China; MH, VT compared to the USA; BP and VT compared to Great Britain; PF, RF, RE, VT, and GH compared to Switzerland (Table 3).

Table 3: Comparative overview SF-36 scores with the general population

Sf-36	***Results of our research***			***General population***				
	Admission	3 months	6 months	Australia	China	USA	United Kingdom	Switzerland
Pf	42.2	66.4	82.3	83.9	85.0	84.2	85.0	90.6
			P	.131	.03	.092	.03	<.001
Rf	26.1	56.1	80.2	77.5	85.0	80.9	81.55	85.8
			P	.121	.02	.38	.278	.009
Re	50.7	70.5	85	79.7	80.2	81.3	83.5	79.2
			P	.031	.044	.094	.295	.021
Sf	44.5	67.5	85	82.1	81.4	83.3	84.35	83.7
			P	.097	.054	.222	.385	.28
Bp	28.1	52.4	74.1	71.2	76.6	75.2	79.8	77.6
			P	.11	.145	.32	.009	.071
Mh	50.1	56.5	68.2	73.6	70.6	74.7	73.8	69.2
			P	.002	.097	<.001	.002	.293
Vt	40.4	51.1	72.7	57.7	61.7	60.9	58.7	65.1
			P	<.0001	<.0001	<.0001	<.0001	<.0001
Gh	57.74	63.74	68.56	72.8	66.3	71.9	70.35	76.1
			P	.073	.217	.125	.268	.005

By analyzing the presence of certain answers from the domain of a specific ODI questionnaire, Friedman's test indicates that there is a statistically significant difference compared to the three evaluations ($P<0.001$). The biggest improvement was registered within the first three months of the rehabilitation treatment in all domains (Table 4).

Table 4: The mean value of domains ODI score

Domains of ODI	***Admission***	***3 months***	***6 months***	***χ^2 value***	***P-value***
PAIN	2.44	1.7	0.96	85.035	<0.001
CARE	1.6	1.14	0.68	59.000	<0.001
LIFT	3.54	2.64	1.58	88.576	<0.001
WALK	2.6	1.68	1.08	76.266	<0.001
SIT	2.72	2.04	1.44	75.160	<0.001
STAND	3.42	2.62	2	76.588	<0.001
SLEEP	2.06	1.22	0.58	73.510	<0.001
WORK	2.74	1.88	1.1	82.146	<0.001
SOCIAL	2.32	1.5	0.94	76.702	<0.001
TRAVEL	2.34	1.66	0.92	74.273	<0.001

χ^2 – Friedman test

Multivariate linear regression analysis (MLRA) showed that the values of PCS were not significantly connected with the observed patient characteristics, as opposed to MCS, where the values were significantly related to degree of education and the way of occurrence of ailments. With patients with secondary education with control of influence of other demographic characteristics,

the score was 6.038 lower than with patients with other degrees of education (95%CI 0.698 to 11.378 and *P*=0.028), also, with patients with university degree the score was 9,436 higher than with patients with other degrees of education (95%CI 1.759 to 17.112 and *P*=0.017). With patients who experienced the ailments suddenly, with control of influences of all other demographic characteristics, the score was 5.680 higher than with patients who experienced the ailments gradually (95%CI 0.165 to 11.194 and *P*=0.044). MLRA confirmed that values of ODI were significantly related to the degree of education, where the score was 15.167 lower than with patients with other degrees of education (95%CI 2.927 to 27.406 and *P*<0.05) while controlling the influence from other demographic characteristics. In order to compare evaluations of QL via general questionnaire (SF-36) and ailment specific questionnaire (ODI), correlation of given score values from both questionnaires from all three terms of individual patient examination was conducted. Summary scores PCS and MCS were used for SF-36, while for ODI: PAIN, LIFT, WALK, WORK, SOCIAL. Highest recorded values of correlation in relation to interview terms were between: PCS and LIFT (r=0.567 and *P*<0.01) at the first interview; PCS and WORK (r=-0.543 and *P*<0.001) at the second interview; PCS and WORK (r=0.743 and *P*<0.01) at the third interview. The gradual increase in correlation value during the three interview terms indicates an even closer relationship between domains of the two utilized questionnaires; therefore, the recorded average high correlation values between the questionnaires testify to their validity.

Discussion

Term QL related to health came to be because of understanding that health is very important, if not the most important condition of good QL (2). In order to form a complete image of the health condition of the patients, it is necessary to conduct an evaluation of QL in relation to health, apart from the usual clinical examinations. Assessments must not focus exclusively on the affected organ or system of organs but must cover functional disorders (physical, emotional, and social) viewed because of their disease and experienced by the patients themselves (6).

Our research included 20 male and 30 female patients. Majority of modern research conducted on patients with LR indicates greater presence in male compared to female patients (7, 8). Gender presence in our research is correlated to other researches (9, 10). That work active population is affected by LR is evidenced by the fact that the greatest number of the patients in our research belonged to age group of 40 to 60, average age being 48.20±6.49 years. Identical data was reached already (11-13).

The majority of patients, in terms of education level and marital status, were married and had completed their secondary and elementary education, and this finding is consistent with previous studies (14). The relationship between marital status and level of education and the occurrence of LR is mostly reflected in the patient's psychological background and kind of occupation, or motivation for faster recovery. In terms of degree of education there is no correlation with the occurrence of LR, but with the difficulty of work that the patients perform during everyday activities. Family has a significant role in QL, and patients who are married and have kids have higher physical and general health compared to the examinees who are not married or do not have children and who are characterized by suffering very strong physical pain. Furthermore, single people experience higher social isolation than married people and also a greater decrease in physical activity as an indicator of QL (15).

In the process of evaluating the QL of patients with LR, selecting the questionnaire is the most crucial decision. It has been proven that in rheumatology research covering LR the most reliable and frequently used questionnaire is SF-36 (16). Apart from the fact that SF-36 paints a very realistic picture of QL, it has an outstanding correlation with functional and emotional ability of the patient, especially with patients with different

modalities of LR treatment (17). SF-36 general questionnaire was an instrument in our research as well.

For assessing QL of patients with LR, apart from the general health questionnaire, it is common to use a specific questionnaire, since general questionnaire is not sensitive enough to changes in QL important to the diseased (18, 19). The need for including special questionnaires in the assessment of QL of patients with LR was shown by Mahmutovic et al. (2) and Yao et al. (20), who claim in their research that SF-36 questionnaire inadequately reflects changes in health status of the patients with LPS. This claim of the author is especially noticeable with neurological symptoms in our research. A disease-specific questionnaire ODI was used for the needs of our research. The British Council for Medical Research and the journal "Spine" recommend that the ODI be used as a standard questionnaire for the assessment of back pain (18).

The values of PCS and MCS significantly changed during the research. The greatest improvement was recorded within the first three months of the rehabilitation treatment at both summary scores. Six months after the beginning of the rehabilitation, the value of PCS (50.8) crossed its standard value of 50 for the general American population. This can be justified by the evidence that LR has tendencies to disappear spontaneously in time, especially if treated by adequate multidisciplinary biopsychosocial rehabilitation (18, 21).

Values of MCS continuously grew during patient monitoring period, in order to cross the standard values of health population of the USA - 50 at six months' interview. Depression, job satisfaction/dissatisfaction, psychological stress, and other factors have significantly lesser influence by studying psychosocial factors as predictors for success of treatment at patients with LPS and LR, which correlates with our research (22). Compared to monitored characteristics of the patients (gender, age, education, marital status, beginning and way of beginning of current episode, earlier presence of ailments) values of MCS, with control of influence of all other demographic characteristics, are significantly related to degree of education and abrupt occurrence of ailments. Male gender, older age, and a lower degree of education are among the highlighted factors affecting the continuation of LPS (23).

As opposed to questions from the domain of SF-36 questionnaire relating to the period of the past four weeks, questions from ODI questionnaire were related to the current condition of the patients. Our study revealed significant changes in pain intensity evaluations after rehabilitation treatment. Initially, patients reported moderate pain intensity. Three months later, patients reported moderate to very mild pain intensity. Six months later, 36% of patients achieved complete analgesia. Patients' functional ability during everyday activities was monitored, showing limitations in lifting weight, prolonged sitting, standing, and walking. Despite improvements, patients remained cautious, ranging from avoiding harder activities to performing all activities without additional difficulties. Steru and Tynes (24) concluded in their three-year observation and study of a large number of workers in Norway that mechanical load of the spine during physical activity, elongated standing, lifting load with bent spine and straight knees, as well as forced squatting and kneeling positions, are correlated to the occurrence of LPS and LR.

Sitting, walking, and elongated standing as well as doing sports are not important risk factors in the occurrence of LPS and LR as opposed to greater mechanical overload of the spine during more difficult activities around the house and in the garden with bending, body torsion, whole body vibration, pushing and pulling, lifting bigger weights, and carrying weights, which in research were significant predictors (25-27). The increase of correlation values during patients' monitoring period shows that there is a need for using a specific questionnaire for assessment of QL, especially during rehabilitation treatment. Higher values of the correlation coefficient during all three examination terms speak to validity and a strong relationship between the two used questionnaires. Other studies have also found similar results (17, 20, 28, 29). Application of adequate question-

naires to patients with LR is essential for assessing the condition's impact on psychophysical, functional, and working abilities, as well as designing diagnostic, educational, and therapeutic measures.

Conclusion

Functional status and QL of patients are significantly improved in the comparison of the three conditions: at three months and at six months into the rehabilitation compared to the beginning of the rehabilitation, as well as at six months compared to the condition at three months.
Medical rehabilitation and ergonomic education have a significant positive influence not only on the physical but also on the emotional and social aspects of the lives of patients with LR. Multivariate analysis showed that education is an independent predictor of the outcome of functionality and QL, whose predictor is the way of occurrence of the ailments. The statistically significant negative correlation between SF-36 (PCS and MCS) and ODI (PAIN, LIFT, WALK, WORK, SOCIAL) scores and domains continuously increased and was present at all three examination terms.

Journalism Ethics considerations

Ethical issues (Including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

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Conflict of Interest

The authors declare that there is no conflict of interest.

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