

# Quality of life and functional outcome after lumbar disc herniation surgery

**Mehdi Mahmoodkhani**

Isfahan University of Medical Sciences <https://orcid.org/0000-0001-6903-0839>

**Zeinab Moradi**

Isfahan University of Medical Sciences <https://orcid.org/0000-0002-9136-6600>

**Bahram Aminmansour**

Isfahan University of Medical Sciences <https://orcid.org/0000-0002-2961-2815>

**Donya Sheibani Tehrani**

Shahid Beheshti University <https://orcid.org/0000-0002-5893-0353>

**Mehdi Teimouri** (✉ [mteimouri@med.mui.ac.ir](mailto:mteimouri@med.mui.ac.ir))

Isfahan University of Medical Sciences <https://orcid.org/0000-0001-8866-4175>

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## Research Article

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# Abstract

**Introduction:** Low back pain is one of the most common diseases that the general population of adults faces various physical, mental, economic and social problems. Patients underwent lumbar disc surgery. Due to the fact that patients experience various degrees of disability during this period, the present study was conducted to determine the Quality of life and functional outcome in patients with lumbar disc herniation undergoing Lumbar disc surgery with foraminotomy approach.

**Method:** This study was a descriptive study before and after the intervention. The study population included patients undergoing lumbar disc surgery who referred to Kashani Educational-Medical Center in Isfahan in 2021 who were included in the study by census. 120 people were included in the study by census method. They were followed up for one year. Three months after surgery, 116 patients, six months later, 112 patients, and one year later, 104 patients remained in the study. Patients were assessed preoperatively, 3, 6 and 12 months postoperatively by standard questionnaires: SF12, Austrian Functional Disability Questionnaire, European Quality of Life Questionnaire and DASS. the data were analyzed in SPSS22.

**Result:** all physical and mental dimensions of quality of life, except for three mental dimensions (SF, RE, MH) before surgery and 12 months after surgery were significantly different ( $P < 0.05$ ). The preoperative and 12 months postoperative functional incapacity index showed a significant difference.

The EQ-5D index improved after 12 months and was significantly different from before surgery ( $P < 0.05$ ). depression and anxiety after 12 months did not show a significant difference compared to before surgery ( $P < 0.05$ ).

the results revealed that there was a significant relationship between ODI and body mass index ( $P = 0.002$ ), and age ( $P = 0.01$ ), as well as between depression and gender ( $P = 0.003$ ). The individuals at older ages and with higher body mass index (overweight and obese) showed higher degrees of disability. Women showed more incidence of depression compared to men.

**Conclusion:** According to the present study results, it can be stated that in today's world, the physical aspects and physical ability of patients cannot solely reflect improvement of disease status in patients.

## Introduction

Back pain is a common musculoskeletal disorder whose international prevalence is different worldwide. Since it is considered as the main cause of restricted activity and occupational absence, it results in incidence of medical burden and staggering economic costs, thereby being considered as one of the major public health problems worldwide (1).

Low back pain is usually defined as pain, muscle tension, or stiffness localized below the costal margin and above the inferior gluteal folds, with or without leg pain (sciatica) (2). Furthermore, during the clinical

evaluation, a clinician has to consider that LBP can also be influenced by psychological factors, such as stress, depression, and/or anxiety (3). History should also include substance use exposure, work and habits factors. Regarding the importance of the issue, studying the global burden of disease is updated once every one to two years (4).

In 2015, low back pain prevalence was 4.2% in individuals aged between 24 and 39 years old and 19.6% in those aged between 20 and 59 (5). The prevalence of low back pain is estimated to range from 15 to 45% in French healthcare workers; the point prevalence of LBP in US adults aged 20–69 years old was 13.1% (6). The general population prevalence of LBP is estimated to be 5.91% in Italy (7). In 2019, in a systematic study, the prevalence of low back pain in the world was reported between 21 and 75% (8).

Low back pain covers a spectrum of different types of pain (eg, nociceptive, neuropathic and nociplastic, or non-specific) that frequently overlap. To a large extent, therapy depends on pain classification, and usually starts with self-care and pharmacotherapy in combination with non-pharmacological methods, such as physical therapies and psychological treatments in appropriate patients (9). For refractory low back pain, a wide range of non-surgical (eg, epidural steroid injections and spinal cord stimulation for neuropathic pain, and radiofrequency ablation and intra-articular steroid injections for mechanical pain) and surgical (eg, decompression for neuropathic pain, disc replacement, and fusion for mechanical causes) treatment options are in patients (10).

One of the most common special causes of backpain is disc herniation. Young and middle-age individuals constitute the major group of sufferers from this condition, Disc herniation occurs by 5–20 cases in every 1000 adults, with men to women prevalence of 2 to 1 (11).

One of the methods for treating disc herniation is surgery (laminectomy, laminotomy, and foraminotomy). Park (2013) studied 55 patients and followed them up in six years. They found that at the time of discharge, 98% of patients showed improvement and complete satisfaction with surgery. Although in subsequent months 20% of them experienced some problems, there was no important complication post-operation. In the six-year follow-up, an excellent outcome was obtained in 39 patients (89%). There was no need for reoperation in any of the patients. The factors that are associated with the surgical outcomes may differ across different age groups. The surgical outcome has been well described in young and middle-aged adults, but elderly patients have lower potential for improvement post operation and improvement of neurological damage (12). Shepard (2019) stated that various risk factors may be involved in the relapse of disc herniation including smoking, diabetes, obesity, the technique during operation, and biomechanical factors (13).

Huang (2016) stated that the relapse rate of disc herniation was between 5 and 15% (14). Hlubek (2017) also reported the rate of reoperation as variable between 5 and 18%. Lumbar disc herniation, in addition to causing low back pain, changes the quality of life of patients (15).

Traditionally, the effects of treatment are investigated based on pain scales reported by the patient, return to job, functional status, radiological/imaging outcomes, and by assessing the level of complications

(16).

Quality of life is a complex concept, which is interpreted and defined in different ways inside and across various fields. In recent years, the outcomes of quality of life have been reported based on patient self-assessment as well as scales such as patients' global assessment (Hagg et al. 2002), or health-related quality of life (HRQoL) (Jansson et al. 2005, Kagaya et al. 2005, Gerszten et al. 2006, Heider et al. 2007, Veresciagina et al. 2007, Jansson et al. 2009, Stromqvist et al. 2009) (17).

Traditionally, the biomedical outcomes rather than quality of life have been the main endpoint in medical and healthcare research. Nevertheless, over the past decades, further research has been focused on the quality of life of patients and quality of life assessments have increased. Indeed, a paradigm shift has happened in assessing the outcomes of medical care; the focus of outcome assessment has changed from clinical indicators of the disease towards the patients' understanding of their health status and treatment.

Quality of life is not measured directly; rather it is usually measured using measurement scales as questionnaire. Considering the importance of the issue, the present study was performed to determine the Quality of life and functional outcome in patients with lumbar disc herniation undergoing Lumbar disc surgery with foraminotomy approach.

## Method

This study is of descriptive pre- and post-intervention type. The study population consists of patients undergoing disc herniation surgery referring in 2021 to Kashani educational healthcare center in Isfahan city, who were enrolled through census. After approval in the ethics code of Isfahan University of medical sciences with the code of IR.MUI.MED.REC.1400.169, the researcher referred to the place of study implementation (Kashani educational healthcare center). He identified the patients suffering from herniated disc who had this herniation surgery indication. After identifying the patients, before the surgery, the researcher presented the necessary explanations about the study objectives to the patients. In case they were willing to participate in the study, written informed consent form was taken from them.

The patients were emphasized to participate in the research up to one year considering its significance. Eventually, 120 patients were included through census method who were followed up for one year. Three months post-operation, 116, six months 112, and one year 104 patients remained in the study.

The inclusion criteria were as follows: all patients who were candidates for disc herniation surgery with age range of 20 to 60 years of age, no physical or psychological disease, and do not have rheumatic disease. Furthermore, informed consent was another important inclusion criteria. The patients who did not announce their consent for participation, those who died in the course of study for any reason, and the ones with psychological or physical diseases and had previous disc herniation surgery were excluded.

The patients were investigated pre-operation, 3, 6, and 12 postoperation using standard questionnaires. These questionnaires included short-form 12 (SF-12) questionnaire for measuring quality of life, Oswestry low back pain disability questionnaire for measuring the level of disability, EuroQol quality of life scale for measuring the health associated quality of life, and DASS questionnaire to measure the depression, anxiety, and stress.

### **SF12 questionnaire**

This questionnaire is a general instrument for measuring the health status of people 14 years of age in the above. It includes the subscales of physical functioning, playing the physical roles, bodily pains, general health, energy and vitality, social functioning, playing the emotional roles, as well as psychological health. The relative validity related to the physical items of this instrument for 12 physical items was 0.67 on average, while for the psychological ones it was 0.97. Reliability assessment of this instrument was performed through repeated test reliability method, whereby the correlation was found 0.89 and 0.76 for physical and psychological items respectively.

Physical Component Summary (PCS) measure include General Health (GH), Physical Functioning (PF), Role Physical (RP), and Body Pain (BP). Mental Component Summary (MCS) measure include Vitality (VT), Social Functioning (SF), Role Emotional (RE), and Mental Health (MH).

A score of 50 for any of the SF-12 domains or component summaries is equivalent to the reference population mean, and the standard deviation is set at 10.

Score>50, indicate better physical or mental health than the mean.

Score<50, indicate worse physical or mental health than the mean.

Higher score represents higher quality of life (18).

### **The Modified Oswestry Low Back Pain Disability Questionnaire**

This questionnaire consists of 10 six-option sections (the functions covered are personal care, lifting, walking, sitting, standing, sleeping, social life, traveling, and employment/ homemaking (replacing the sex life item). capturing the functions of individuals in their daily activities. Each section ranks the level of disability in functioning from zero (desired functioning with no feelings of pain) up to 10 (disability in doing activities because of pain). Option A is assigned zero while the rest of options are assigned 2 scores. Overall, the score of each section is 10, and the total disability index ranges from 0% (no disability) to 100% (the most severe disability). In this questionnaire, 0-20%, 20-40%, 40-60%, 60-80%, and 80-100% are categorized as minimal disability, moderate disability, severe disability, crippled, and debilitating disability respectively. The value obtained from the Cronbach alpha coefficient for determining internal consistency of this questionnaire has been obtained 0.92 (2).

### **EuroQol EQ-5D Quality of Life Scale**

It is a simple and general instrument that can be used for investigating the health and effects of treatment on a wide range of diseases. It offers a simple descriptive profile and a single index value for the health status, which can be used in economic and clinical assessments of healthcare as well as examining the public health. This questionnaire is completed by the respondents, it is cognitively convenient, and its completion lasts around 4 min.

It includes a descriptive section and visual scale section. The first section includes five unicellular dimensions, examining the status of excitement, self-care, general activities, pain/discomfort, and anxiety/depression at three levels of no difficulty, difficult to some extent, and extremely difficult. For each person, a special health status is defined from the combination of one level of all five dimensions (243 health states). On the other hand, lack of consciousness and death are completed by the patient's care providers. Overall, there are 245 states for this section of the questionnaire. The second part of the questionnaire is a 20-cm visual scale graduated from zero (the worst health status conceivable) to 100 (the best conceivable health status), whereby the person marks their current health status on this scale (19).

### **Depression Anxiety Stress Scale (DASS21)**

This scale was designed by Lavibdand (1995). It is a set of three self-reporting scales for assessing negative emotional states in depression, anxiety, and stress. Anthony et al. (1998) performed factor analysis for this scale, and again found three factors of depression, anxiety, and stress. The results of that study showed that 68% of the variance of the entire scale would be accounted for by these three factors. The Cronbach alpha coefficient for all three factors was 0.97, 0.92, and 0.95 respectively. Each of the subscales of DASS has seven items, where the final score of each subscale is obtained through summing up the scores of items related to that. Each score is scored from zero (it does not apply to me et al.) to 3 (it applies to me completely). The intensity of each of the subscales of depression, anxiety, and stress is as follows. Depression: normal (0-9), mild (10-13), moderate (14-20), severe (21-27), very severe (28); anxiety: normal (0-7), mild (8-9), moderate (10-14), severe (15-19), very severe (20); stress: normal (0-14), mild (15-18), moderate (19-25), severe (26-32), and very severe (33) (20).

Once collected, the data were analyzed in SPSS 22 at significance level of less than 0.05. For the quantitative variables, for data description, mean and standard deviation were applied. On the other hand regarding the qualitative variables, distribution and frequency percentage were used. Data normality was checked by Kolmogorov-Smirnov test, and for data analysis, T-test and chi-square tests were utilized. At the end it should be noted that the information of all patients was confidential and researcher would not use these data in any other study.

## **Results**

A total of 120 patients were included in the study, of which 79 (65.8%) were male, 41 (34.2%) were female and the mean age of patients was  $42.20 \pm 8.38$  years. Body mass index in patients was equal to It was  $28.22 \pm 9.3$ . Further, 52 (43.3%) of patients smoked cigarettes.

## SF-12 questions

Table No. (1) examines the quality of life of patients before surgery, 3, 6 and 12 months after surgery.

**Table No. (1): Quality of life of patients before surgery, 3, 6 and 12 months after surgery**

		before surgery	3months after surgery	6months after surgery	12months after surgery	P-value
		Mean±SD	Mean±SD	Mean±SD	Mean±SD	
Physical	PF	32.5±11.5	34.7±12.1	45.9±11.2	52.2±10.8	0.001
	PR	30.2±13.7	32.5±13.2	44.5±12.4	56.7±11.3	0.003
	BP	33.7±10.2	34.1±9.9	43.8±10.1	53.2±9.7	0.0001
	GH	28.9±10.1	31.4±11.3	43.1±11.3	55.1±11.9	0.01
Mental	VT	40.2±10.9	41.6±11.7	43.4±9.7	55.7±9.2	0.03
	SF	30.1±12.1	31.7±11.6	41.6±10.2	52.5±11.4	0.08
	RE	30.9±12.8	31.1±12.7	42.8±12.8	54.4±11.3	0.236
	MH	34.8±12.1	35.1±11.8	47.2±12.3	59.3±12.7	0.120
Summary	PCS	32.1±11.1	32.7±10.9	44.1±11.1	55.9±11.4	0.02
	MCS	34.9±12.2	35.2±12	46.9±11.7	57.7±11.8	0.03

According to the results of Table No. (1), all physical and mental dimensions of quality of life, except for three mental dimensions (SF, RE, MH) before surgery and 12 months after surgery were significantly different ( $P < 0.05$ ). The three mental dimensions of (SF, RE, MH) before surgery and 12 months after showed no significant difference in patients ( $P > 0.05$ ).

## Oswestry Low Back Pain Disability Questionnaire

**Table No. (2): ODI of patients before surgery, 3, 6 and 12 months after surgery**

	before surgery	3months after surgery	6months after surgery	12months after surgery	P-value
	Mean±SD	Mean±SD	Mean±SD	Mean±SD	
ODI	50±22	43±19	41±18	34±14	0.02

According to the results of Table No. (2), the preoperative and 12 months postoperative functional incapacity index showed a significant difference ( $P < 0.05$ ). The results also showed that the patients' disability had improved from severe to moderate disability. Patients were asked to state whether their expectations of the disability had been met. The expectation of 86 patients (72%) in meeting disability was met.

## EuroQol EQ-5D Quality of Life Scale

**Table No. (3): EuroQol EQ-5D of patients before surgery, 3, 6 and 12 months after surgery**

	before surgery	3months after surgery	6months after surgery	12months after surgery	P-value
	Mean±SD	Mean±SD	Mean±SD	Mean±SD	
EQ-5D	51.9±10.3	63±21.4	54.4±16.8	73.5±20.1	0.0001

As shown in Table No. (3), the EQ-5D index improved after 12 months and was significantly different from before surgery ( $P < 0.05$ ).

## Depression Anxiety Stress Scale (DASS21)

**Table No. (4): DASS21 of patients before surgery, 3, 6 and 12 months after surgery**



		before surgery	3months after surgery	6months after surgery	12months after surgery
		N (%)	N (%)	N (%)	N (%)
<b>Depression</b>	Normal	12 (10)	13 (11.21)	21 (17.75)	25 (24.04)
	Mild	15(12.5)	17 (14.66)	19 (16.96)	16 (15.38)
	Moderate	13 (10.83)	21 (18.1)	23 (20.54)	21 (20.19)
	Severe	51(42.5)	43 (37.07)	32 (28.57)	24 (23.08)
	Extremely severe	29(24.17)	22 (18.97)	17 (15.18)	21 (17.31)
	P-value	0.087			
<b>Anxiety</b>	Normal	11 (9.17)	11 (9.48)	14 (12.5)	12 (11.54)
	Mild	15 (12.5)	26 (22.41)	30 (26.79)	34 (32.69)
	Moderate	23 (19.17)	28 (24.14)	22 (19.64)	20 (19.23)
	Severe	45 (37.5)	30 (25.86)	29 (25.89)	20 (19.23)
	Extremely severe	26 (21.67)	21 (18.10)	17 (15.18)	18 (17.31)
	P-value	0.965			
<b>Stress</b>	Normal	2 (1.67)	4 (3.33)	10 (8.93)	21 (20.19)
	Mild	6 (5)	8 (6.67)	13 (11.61)	32 (30.77)
	Moderate	31 (25.83)	38 (31.67)	38 (33.93)	34 (32.69)
	Severe	46 (38.33)	41 (34.17)	31 (27.68)	9 (8.65)
	Extremely severe	35 (29.17)	29 (24.17)	20 (17.86)	8 (7.69)
	P-value	0.07			

As shown in Table No. (4), depression and anxiety after 12 months did not show a significant difference compared to before surgery ( $P>0.05$ ).

Finally, the results revealed that there was a significant relationship between ODI and body mass index ( $P=0.002$ ), and age ( $P=0.01$ ), as well as between depression and gender ( $P=0.003$ ) ( $P<0.05$ ). The individuals at older ages and with higher body mass index (overweight and obese) showed higher degrees of disability. Women showed more incidence of depression compared to men.

## Discussion

As the results indicated all physical and mental dimensions of quality of life, except for three mental dimensions (SF, RE, MH) before surgery and 12 months after surgery were significantly different. The three mental dimensions of (SF, RE, MH) before surgery and 12 months after showed no significant difference in patients. The preoperative and 12 months postoperative functional incapacity index showed a significant difference. The results also showed that the patients' disability had improved from severe to moderate disability. Patients were asked to state whether their expectations of the disability had been met. The expectation of 86 patients (72%) in meeting disability was met.

The EQ-5D index improved after 12 months and was significantly different from before surgery. depression and anxiety after 12 months did not show a significant difference compared to before surgery.

Finally, the results revealed that there was a significant relationship between ODI and body mass index ( $P = 0.002$ ), and age ( $P = 0.01$ ), as well as between depression and gender ( $P = 0.003$ ). The individuals at older ages and with higher body mass index (overweight and obese) showed higher degrees of disability. Women showed more incidence of depression compared to men.

Nayak (2019) in a systematic review showed that these scores the quality of life based on HRQoL scale improved significantly after the surgical intervention. Also, there was a significant difference between pre- and post-operation regarding the quality of life based on the SF instruments for all thoracic/lumbar surgical operations (21).

Lubelski (2015) investigated 196 patients referring to Cleveland clinic over three years. The results showed that after 150 days of follow-up, the patients showed improvement in quality of life, pain, disability, as well as psychosocial outcomes post-surgery. The results of the two studies were in line with the findings of the present research in general. In the present study, the mental dimensions did not show significant improvement after 12 months. The lack of accordance can be due to high burden of disease and problems in return to work for patients (22).

Clavel (2017) examined 51 Spanish patients. The results indicated that ODI before and after the disc herniation surgery improved after one year follow-up. HRQOL had also improved but in patients who had previous vertebral column surgery, less improvement was observed in HRQOL, disability, and pain (23).

Buchmann (2016) in Germany examined 64 patients. The patients evaluated the general outcome of this herniation surgery as good, but in the follow-up stage it was not satisfactory enough. The results suggested that the patients should be accurately informed about the possibility of disc herniation re-surgery before their operation (24). In this study, the patients with previous disc herniation surgery were excluded. The results of this study concurred with the findings of Clavel and Buchmann regarding improvement of quality of life index and disability in patients.

Lin (2018) performed a study on 154 patients undergoing disc herniation surgery in Taiwan. The results revealed that physical health and social relations in the course of the study had more desirable levels among patients younger than 65 years of age. The patients complained from poor quality of sleep.

Further, depression symptoms were also observed in them (25). In the present study, again depression was found in patients pre-and post-operation, which was not surprising considering lack of improvement in psychological health post-operation.

Kepatanakis (2017) investigated 56 patients undergoing disc herniation surgery in Greece. They found that quality of life showed improvements pre-operation, 6 weeks, 3 months, 6 months, and 12 months post-operation in both physical and psychological dimensions. However, in the psychological dimension less improvement was observed which concurred with the present study findings (26).

Wagner (2020) investigated 245 patients who had undergone disc herniation surgery in Germany for four years. Out of them, 180 patients (73.5%) remained in the study up to 12 months of follow-up. The scores of quality of life increased considerably for three months and were maintained up to one year. The mean scores of ODI during 12 months improved considerably. Depression of patients after 12 months had not been improved which is in line with the present study (27).

Mu (2019) in China examined 165 patients who had undergone disc herniation surgery over three years. There was a significant correlation between depression and anxiety among patients suffering from this herniation. In the present study, again patients after 12 months of surgery did not show improvement in anxiety and depression (28).

Netto (2018) investigated 32 patients in Brazil. The mean scores of pain scale and Oswestry disability index improved four months post-operation. Further, general health, as well as social and psychological health aspects showed improvements, but in the present study psychological health was not ameliorated after 12 months (29).

## **Conclusion**

According to the present study results, it can be stated that in today's world, the physical aspects and physical ability of patients cannot solely reflect improvement of disease status in patients. This means that psychological aspects are also important and influence the physical as well as quality of life aspects of patients in the long run. In this regard, it is suggested that in healthcare centers social support and psychological support units provide the necessary training before and after operations that are specifically associated with mobility and activity constraints for patients in the future. Finally, it should be noted that the present study focuses on the importance of psychological indicators of patients before and after lumbar disc surgery, and the surgeon should know the level of expectations of the patient from the results of the design.

## **Declarations**

Conflict of interest: The authors declared there is no conflict of interest

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