

Quality of Life in Patients Following Vertebroplasty

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Abstract

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AIM: To examine the quality of life in patients who underwent vertebroplasty treatment and compare it to the preoperative quality of life.

STUDY DESIGN: The Cross-sectional study conducted at the Department of Orthopaedics, Clinical Hospital Centre Osijek.

PATIENTS AND METHODS: The research included 50 patients under stationary treatment in hospital at the Department of Orthopaedics. The research instruments include a questionnaire containing demographic data and the standardised EuroQol Research Foundation Questionnaire (EQ-5D-5L) consisting of five dimensions which include mobility, self-care, usual activities, pain level and anxiety.

RESULTS: The average score of the current health status before surgery was 67.5 whereas post-operative health was rated 80 ($p < 0.001$). After the procedure, a significantly higher number of respondents reported greater mobility levels, and lower pain intensity; fewer respondents reported feeling anxious or depressed ($p < 0.001$), more respondents rated their self-care abilities higher ($p = 0.003$), and felt improvements when performing usual activities ($p = 0.031$).

CONCLUSION: After the vertebroplasty, a significantly higher number of respondents reported higher levels of mobility, lower pain or discomfort levels, and a smaller number of respondents felt anxious or depressed, more respondents felt they can take better care of themselves, and are better at performing usual activities when compared to the preoperative status.

Introduction

Quality of Life

The World Health Organization (WHO) defines quality of life as individuals' perception of their position in life in the specific cultural, social and environmental context (World Health Organization 1999), while Robert Cummins, the founder of the international group of scientists and researchers "International Well-Being Group", holds a view that the quality of life is a multidimensional construct consisting of: living standard, health, productivity, the possibility of achieving close contacts, security, belonging to a community and a sense of security in the future [1]. Health is one of the factors that affect the personal quality of life, and individual experience perception of the life satisfaction should be recognised as a valuable indicator of the status of the population

health. Poor health is undoubtedly one of the external factors that adversely affect the individuals' lives. It affects them not just regarding physical symptoms and thus limiting their functioning, but also causes indirect effects such as changes in the ability to work, potential isolation, increasing dependence on others, bad habits, etc. Two persons can suffer from the same disease, but people differ in their perceptions, attitudes, reactions, hopes, fears [2].

The medical notion of quality of life can be defined as the ability of a person to live after a medical intervention as similar as possible in physical, mental and social terms as he/she did before the surgery or prior illness. In providing health care, a nurse should keep in mind that the quality of life depends on the subjective judgment of an individual, which means that it is individual and cannot be directly linked to the illness a person suffers from [3]. Numerous studies were conducted worldwide on

persons suffering from various physical diseases. Pains are specified as the most important variable, i.e. a physical symptom associated with subjective quality of life.

One of the most common complications of osteoporosis are vertebral compression fractures, which are a common cause of chronic pains, and result in progressive morphological changes of the spine with the development of kyphosis and accompanying additional reduction of body height. These significantly restrict the mobility of patients and deteriorate their overall quality of life. Osteoporotic vertebral compression fractures usually affect the middle and lower spine and thoracolumbar transition and less lumbar segment. In patients with osteoporotic spine, mortality is increased by 23% to 34% compared to patients without fracture [4].

Spine fractures are two to three times more frequent than hip fractures, especially in females. The most recent US data show that at least 700,000 patients per year have the osteoporotic spine fracture, which is one of the leading health problems of the elderly population [5].

Osteoporotic Spine fractures were usually treated conservatively: rest, analgesics, and by application of the Jewett type orthosis or other types of orthoses. Bedrest accelerates the loss of bone mass, and in most patients, these therapy measures do not reduce pain [6].

Surgical treatment of osteoporotic fractures becomes more frequent both in our country and in the world. Modern surgical techniques of treatment are vertebroplasty and kyphoplasty which significantly reduce pain and improve the mobility of patients and thus their quality of life [6].

The goal of this study is to research the quality of life in patients who underwent vertebroplasty compared to the preoperative quality. In this prospective study the data obtained from a questionnaire designed for this study, and from the standardised questionnaire EQ-5D-5L (EuroQol Research Foundation) [7], containing the data on mobility, self-care, usual activities, pain level and anxiety will be analysed.

Patients and Methods

Patients

The subjects were patients with a fractured vertebra under stationary treatment in the Department of Orthopaedics of the University Hospital Center Osijek. The study included 50 patients. The study was conducted from September 2015 to June 2016.

Study Design

Vertebroplasty is a minimally invasive procedure of vertebral reinforcement for treating the painful acute fracture of the vertebral body. While the patient is under local anaesthesia, the surgeon creates a tiny path through a small incision (puncture) in the patient's back to a fractured vertebra, using a needle under x-ray control. Through this channel, bone cement is applied to prevent further collapse. The procedure is performed on one or both sides of the vertebral body. The patient can be verticalized an hour after the procedure, and then he/she can leave the hospital [8].

Health Outcomes

The research instruments include a questionnaire containing demographic data (sex, age, occupation, body height, body weight), questions about location of the vertebral fracture, the cause of the vertebral fracture, duration of difficulties to surgery (in months), date of surgery, satisfaction compared to the preoperative status and whether they would agree to re-surgery in case of another fracture. The standardised EuroQol Research Foundation Questionnaire (EQ-5D-5L) [7] consisting of dimensions which include five items related to the said dimension was used for self-rating. The first dimension consists of five questions assessing the mobility problems. The second dimension consists of five questions related to personal hygiene (washing) and dressing. The third dimension consists of five questions related to usual activities, e.g. work, study, housework, family or leisure activities). The fourth dimension consists of five questions that determine the level of pain. The fifth domain consists of five questions that determine the level anxiety and depression. At the end of the questionnaire, the patient's health is rated as good or bad. The respondents filled out a questionnaire before and after surgery and after the first check-up, i.e. three weeks after the surgery and the results are expressed by the EQ-5D-5L index.

Statistical Data Processing

Category data are presented in absolute and relative frequencies. Numerical data are described by arithmetic mean and standard deviation when distribution follows normal one, and in other cases by median and limits of the interquartile range. Differences of category variables were tested by the Fisher's exact test. The normality of distribution of numerical variables was tested by the Kolmogorov-Smirnov's test. The differences of normally distributed numerical variables between two dependent groups (before and after surgery) were tested by the Wilcoxon's test. The McNemar's test was used to research depending category variables (before and after surgery). All P values are two-sided. The level of

significance was set at $\alpha = 0.05$. The statistical SPSS software (version 16.0, SPSS Inc., Chicago, IL, USA) was used for statistical analysis.

Results

Main Characteristics of Patients

The study was conducted on 50 patients, of whom 11 (22%) males and 39 (78%) females. The median age is 74 years (interquartile range 66-79 years) in the range of 47-90 years. According to work status, 44 (88%) are retirees, 2 (4%) of respondents are housewives or shopmen, and one respondent is an administrative clerk or a hairdresser (2%).

The age median is 74 years (interquartile range 66-79 years). The males are significantly taller (Mann-Whitney U test, $p < 0.001$), who also have higher body weight (Mann-Whitney U test, $p = 0.035$), while there is no significant difference in the body weight index between sexes. The median duration of symptoms is three months (interquartile range of 2 to 5 days (Table 1).

Table 1: Sex-related characteristics of patients

	Median (interquartile range)		Total	p*
	Male	Female		
Age (years)	74 (62 - 80)	73 (67 - 78)	74 (66 - 79)	0.743
Height (cm)	172 (170 - 180)	157 (160 - 165)	163 (158 - 70)	<0.001
Weight (kg)	80 (76 - 90)	72 (62 - 80)	75 (64 - 80)	0.035
BMI (kg/m ²)	26.9 (22.9 - 31.1)	27.9 (24 - 30.5)	27.2 (23.9 - 30.6)	0.656
Duration of difficulties (months)	3 (2 - 6)	3 (2 - 5)	3 (2 - 5)	0.970

*Mann Whitney U test.

According to the fracture localisation, most of the patients, 24 (51.1%) are with the lumbar vertebral fracture, and in 32 (64%) patients the fracture was caused by primary osteoporosis (unknown cause). 47 (91.8%) patients are satisfied with their postoperative status compared to the preoperative status, and 45 (91.8%) reports that they would agree to surgery again in the case of re-fracture (Table 2).

Table 2: Patients according to fracture localisation and cause and satisfaction with surgery

	Number (%) of patients			p*
	Male	Female	Total	
Fracture site (localisation)				
Lumbar vertebra	5 (45.5)	19 (52.8)	24 (51.1)	0.898
Thoracic vertebra	4 (36.4)	12 (33.3)	16 (34)	
Several locations	2 (18.2)	5 (13.9)	7 (14.9)	
Fracture cause				
Primary osteoporosis (unknown cause)	10 (90.9)	22 (56.4)	32 (64)	0.072
Secondary osteoporosis (rheumatoid arthritis, systemic lupus erythematosus)	1 (9.1)	17 (43.6)	18 (36)	
Postoperative satisfaction compared to the previous condition				
Yes	11 (100)	36 (94.7)	47 (95.9)	>0.950
No	0 (0)	2 (5.3)	2 (4.1)	
In a case of re-fracture, would you agree to undergo surgery again?				
Yes	9 (81.8)	36 (94.7)	45 (91.8)	0.214
No	2 (18.2)	2 (5.3)	4 (8.2)	
Total	11 (100)	38 (100)	49 (100)	

*Fisher's exact test.

Quality of Life (EQ-5D-5L)

Twenty-three (46%) respondents reported moderate mobility before surgery compared to 14 (28%) after surgery, and 21 (42%) reported slight problems (Table 3).

Table 3: Pre- and Postoperative Mobility

	Number (%) of patients according to mobility problem					Total
	No problems	Slight problems	Moderate problems	Severe problems	Unable to walk	
Pre-operative	1 (2)	10 (20)	23 (46)	15 (30)	1 (2)	50 (100)
Post-operative	12 (24)	21 (42)	14 (28)	3 (6)	0	50 (100)

Nine (18%) respondents reported severe problems at washing or dressing prior to surgery and two respondents after surgery, respectively, whereas 16 (32%) state that they have no problems at washing or dressing (Table 4).

Table 4: Pre- and Postoperative Self-Care

	Number (%) of patients according to self-care problem					Total
	No problems	Slight problems	Moderate problems	Severe problems	Unable to wash or dress them	
Pre-operative	5 (10)	13 (26)	22 (44)	9 (18)	1 (2)	50 (100)
Post-operative	16 (32)	21 (42)	11 (22)	2 (4)	0	50 (100)

Thirteen (26 %) respondents have severe problems doing their usual activities before surgery and four respondents (8%) after surgery, respectively, whereas 8 (16%) state that they have no problems doing their usual activities after surgery (Table 5).

Table 5: Pre- and usual postoperative activities

	Number (%) of patients according to the problem related to usual activities					Total
	No problems	Slight problems	Moderate problems	Severe problems	Unable to do my usual activities	
Pre-operative	2 (4)	11 (22)	22 (44)	13 (26)	2 (4)	50 (100)
Post-operative	8 (16)	28 (56)	10 (20)	4 (8)	0	50 (100)

Three (6%) respondents do not have pain or discomfort before surgery and 16 (32%) respondents after surgery, respectively (Table 6).

Table 6: Pre- and postoperative pain or discomfort

	Number (%) of patients according to the problem related to pain and discomfort					Total
	Have no pain or discomfort	Have slight pain or discomfort	Have moderate pain or discomfort	Have severe pain or discomfort	Have extreme pain or discomfort	
Pre-operative	3 (6)	13 (26)	19 (38)	14 (28)	1 (2)	50 (100)
Post-operative	16 (32)	19 (38)	13 (26)	2 (4)	0	50 (100)

Twelve (24%) respondents report moderate anxiety or depression before surgery, and only 3 (6%) respondents report their moderate anxiety or depression after surgery, whereas only one respondent reported severe anxiety or depression (Table 7).

Table 7: Pre- and postoperative anxiety or depression of respondents

	Number (%) of patients according to the problem related to anxiety and depression					Total
	Not anxious or depressed slightly anxious or depressed	Slightly anxious or depressed	Moderately anxious or depressed	Severely anxious or depressed extremely anxious or depressed	Extremely anxious or depressed	
Pre-operative	15 (30)	16 (32)	12 (24)	7 (14)	0	50 (100)
Post-operative	26 (52)	20 (40)	3 (6)	1 (2)	0	50 (100)

Respondents were divided according to whether they have or do not have problems. After surgery, significantly more respondents experience better mobility, feel less pain or discomfort, and fewer respondents are anxious or depressed (McNemar's test, $p < 0.001$), more respondents are more able to do self-care (McNemar's test, $p = 0.003$), and better doing their daily activities (McNemar's test, $p = 0.031$) compared to the preoperative status (Table 8).

Table 8: Division of respondents according to parameters before and after surgery

		Number (%) of patients - preoperative			p*
		Have no problems	Have problems	Total	
Mobility	Post-operative	1 (100)	11 (22)	12 (24)	<0.001
	Have no problems	0	38 (78)	38 (76)	
	Have problems	1 (100)	49 (100)	50 (100)	
Self-care	Post-operative	4 (80)	12 (27)	16 (32)	0.003
	Have no problems	1 (20)	33 (73)	34 (68)	
	Have problems	5 (100)	45 (100)	50 (100)	
Usual activity	Post-operative	2 (100)	6 (13)	8 (16)	0.031
	Have no problems	0	42 (87)	42 (84)	
	Have problems	2 (100)	48 (100)	50 (100)	
Pain and discomfort	Post-operative	3 (100)	13 (28)	16 (32)	<0.001
	Have no problems	0	34 (72)	34 (68)	
	Have problems	3 (100)	47 (100)	50 (100)	
Anxiety and depression	Post-operative	15 (100)	11 (31)	26 (52)	<0.001
	Have no problems	0	24 (69)	24 (48)	
	Have problems	15 (100)	35 (100)	50 (100)	

*McNemar's test.

Mean score of categories and the current health is significantly higher after surgery in all categories (Wilcoxon's test, $p < 0.001$). Mean score of the current health status before surgery was 67.5 (interquartile range from 58.75 to 70) and 80 (interquartile range from 78.75 to 90) after surgery, respectively (Wilcoxon's test, $p < 0.001$) (Table 9).

Table 9: Pre-operative and post-operative self-rated quality of the respondents' life

	Median (interquartile range)		p*
	Pre-operative	Post-operative	
Mobility	3 (3 - 4)	2 (1.75 - 3)	<0.001
Self-care	3 (2 - 3)	2 (1 - 3)	<0.001
Usual activities	3 (2 - 4)	2 (2 - 3)	<0.001
Pain and discomfort	3 (2 - 4)	2 (1 - 3)	<0.001
Anxiety and depression	2 (1 - 3)	1 (1 - 2)	<0.001
Self-rating of health (today)	67.5 (58.75 - 70)	80 (78.75 - 90)	<0.001

*Wilcoxon's test.

Post-operative satisfaction was significantly increased in the case of the lumbar vertebrae fractures, and also in patients with fractures of the thoracic vertebrae. In patients with multiple fracture localisations, the significant difference is found only for mobility (Wilcoxon test, $p = 0.020$) and in the health rating (Wilcoxon test, $p = 0.027$) (Table 10).

Table 10: Pre-operative and post-operative self-rating of quality life of respondents according to the fracture localisation

Fracture localisation	Median (interquartile range)		p*
	Pre-operative	Post-operative	
Lumbar vertebra			
Mobility	3 (3 - 4)	2 (2 - 3)	<0.001
Self-care	3 (2 - 3)	2 (1 - 2)	<0.001
Usual activities	3 (2 - 4)	2 (2 - 2.75)	<0.001
Pain and discomfort	3 (3 - 4)	2 (1 - 3)	<0.001
Anxiety and depression	2 (1.25 - 3.75)	2 (1 - 2)	0.001
Self-rating of health (today)	65 (60 - 70)	82.5 (76.3 - 90)	<0.001
Thoracic vertebra			
Mobility	3 (2.25 - 4)	2 (1.25 - 3)	0.001
Self-care	3 (2 - 3.75)	2 (1.25 - 3)	0.001
Usual activities	3 (3 - 3)	2 (2 - 3)	0.001
Pain and discomfort	2.5 (2 - 3)	2 (1.25 - 2)	0.003
Anxiety and depression	2 (1 - 3)	1 (1 - 2)	0.005
Self-rating of health (today)	70 (56.3 - 73.8)	80 (80 - 90)	<0.001
Several locations			
Mobility	3 (2 - 4)	2 (1 - 3)	0.020
Self-care	3 (1 - 3)	2 (1 - 3)	0.317
Usual activities	4 (1 - 4)	2 (1 - 4)	0.059
Pain and discomfort	3 (2 - 4)	3 (1 - 3)	0.058
Anxiety and depression	2 (1 - 3)	1 (1 - 2)	0.180
Self-rating of health (today)	60 (50 - 80)	70 (55 - 90)	0.027

*Wilcoxon test.

Discussion

The purpose of this study was to research the quality of life in patients who underwent vertebroplasty and compare it to the preoperative quality of life. The study was conducted at the Clinical Hospital Centre Osijek and included 50 patients. The resulting analysis is divided into two parts. The first part of the analysis refers to the main characteristics of respondents, and the second one to the very quality of life that was, for the purpose of this study, evaluated by the standardised EQ-5D-5L Questionnaire (EuroQuol Research Foundation).

The study included participants of both sexes/genders. The results of this research show significantly larger number of females, i.e. 39 (78.0%) compared to the male population. The results of other researchers also indicate the significantly higher share of women in this health problem [9].

The mean age of our patients is 79 years, which is also expected because, according to the literature, the incidence of osteoporosis changes increases with age.

In most respondents, i.e. 24 of them (51.1%) the fracture localisation was at the lumbar vertebra and according to the results obtained 32 respondents (64.0%) stated osteoporosis as the cause of fracture. These results are contrary to the study conducted by

Cvijetić et al., 2007 in Zagreb [10].

According to these authors, the patients aged seventy years more often experience the hip fracture. After the age of 50, the increased incidence of the forearm fractures is noticed, after 60 years of vertebral fractures, and after 70 of hip fractures [10]. These figures may indicate the small sample size.

An interesting and expected fact is that 47 (91.8%) patients are satisfied with their postoperative status compared to the preoperative one, and 45 (91.8%) state that in the case of re-fracture they would again agree to the surgery. It suggests that vertebroplasty is an extremely favourable solution for these patients.

The quality of life before and after vertebroplasty regarding mobility, self-care, doing usual activities, pain and discomfort, anxiety and depression was evaluated by the EQ-5D-5L (EuroQol Research Foundation). This questionnaire is selected because it contains simple and understandable questions to all respondents.

According to the results of our research, the largest number of respondents, i.e., 23 (46.0%) reported pre-operative moderate mobility problems compared to 14 (28.0%) respondents after surgery. This percentage directly points to the high percentage of good quality of performed surgical procedures, because the goals of vertebroplasty are: reducing pain, improving a quality of life, improving biomechanics, reducing the need to use analgesics, preventing further development of deformities [11].

The study also shows that 9 (18.0%) patients have pre-operative problems when washing or dressing compared to 2 patients after surgery, while most of them, i.e. 16 (32.0%) state that they have no problems when washing and dressing. These results are expected and indicate improving the quality of life in patients after the surgery.

Problems in doing their usual activities before surgery have 13 (26.0%) respondents and 4 (8.0%) patients after surgery, respectively. This result also indicates the post-operative improved quality of life. Regarding the difficulty of wearing orthotics, and poor results of conservative treatment, the development of surgical techniques and technology created new possibilities for treatment of the spinal compression fractures. The patient stays in bed for at least an hour, and 24 hours after surgery is discharged from hospital [11].

Only a small number of respondents, i.e. three (6.0%) still feel pain after surgery, while the highest percentage, i.e. 16 respondents (32.0%) state that they do not feel pain after surgery. The results are in agreement with other studies. According to Rapan S et al., reducing pain with vertebroplasty amounts to 75.0 to 90.0% [11].

It is interesting that a large number of

respondents, 15 of them (30.0%) were depressed and anxious before surgery while the largest number of respondents, 26 of them (52.0%) does not feel post-operative anxiety and depression. It is expected, as the surgery trauma is minimised, the stability is provided immediately as well as rapid recovery of patients after surgery. Surgical patients are exposed to stronger anxiety, fear and depression than other patients because of exposure to the inevitability of surgical intervention, that is additionally aggravated by the fear of pain, anaesthesia, injury and, ultimately, death. The psychological preparation of patients includes informing patients about the procedure (duration, the order of actions, an expected level of discomfort or pain, etc.), modelling (usually watching short movie clips), learning coping strategies and providing emotional support [12]. Pre-operative preparation, provides better subjective enduring the surgery procedure and the postoperative course of a disease, reducing the need for intensive engagement of health professionals in post-operative treatment. This, in fact, reduces the number of days which patients spend in the hospital, which reduces the cost of treatment [12].

When preparing a patient for surgery, it is extremely important to inform him/her about the procedure, including information about common stress reactions and ways of their mitigation and learning how to control their stress reactions. This procedure is aimed to reduce the number of stresses that the patient will experience and strengthen the individual so as not to experience more serious consequences of a large sudden stress. The most effective information is those which contain information about what the patient will experience during the procedure (see, hear, feel) and details about the chronological course of the procedure. Accordingly, the patient will develop realistic, practical, unemotional expectations, which provide him/her with better-coping strategies [10].

After surgery, significantly more respondents experience better mobility, feel less pain or discomfort, and fewer respondents are anxious or depressed, more patients can take better self-care, and doing everyday activities better than before surgery. This confirms the hypothesis of our research. The pain level and the need to take painkillers are reduced immediately; owing to quick mobility they can self-care and doing their daily activities, thereby also increasing the level of quality of life. The results of vertebroplasty published so far are highly positive [11].

The mean scores of the current health of our respondents are significantly higher after surgery in all categories ($p < 0.001$). It is understandable because patients get earlier out of bed, pain score is lower, or there is no pain at all, they go home on the same or the next day to their familiar social environment that also helps their faster psychological recovery. With

about 15% of a filled-up vertebral body with cement, a satisfactory strength of a fractured vertebra is achieved.

The mean score of the current health before surgery in our patients is 67.5, and the mean score following surgery is 80. This study using the EQ-5D-5L (EuroQol Research Foundation) questionnaire has its limitations. The study involved a relatively small number of patients operated in one health facility.

Statistically, significant difference exists in self-rating of a quality of life of our patients according to fracture localisation that shows us increased satisfaction with the quality of life after surgery at the lumbar vertebrae fracture as well as at the thoracic vertebral fracture. Such results are expected. The operative trauma is minimal, the current stability and rapid mobilisation of the patient are provided, which, by application of the new safer generation of highly viscosity cement, makes it the method of choice in the treatment of the compression fractures of vertebral body [11].

In patients with fractures at several locations, the only difference occurs in the self-rated quality of life of mobility and the health assessment made at the first post-operative check-up. Two or more fractures because of reduced lung capacity, reduce mobility, cause chronic pain, loss of appetite and depressive syndromes. As mentioned above, in all subjects including patients who have multiple fracture locations the quality of life is significantly improved simultaneously reducing difficulties in walk and mobility after surgery.

By the defined goal, the following can be concluded from this research:

The level of quality of life in patients that underwent treatment with vertebroplasty is significantly improved compared to the pre-operative level.

After surgery, significantly more respondents experience better mobility, feel less pain or

discomfort, and fewer respondents are anxious or depressed, more patients can take better self-care, and doing everyday activities compared to the preoperative status.

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