**Pielęgniarstwo
Neurologiczne i Neurochirurgiczne**

THE JOURNAL OF NEUROLOGICAL AND NEUROSURGICAL NURSING

The use of Repty Functional Index and Oswestry Disability Questionnaire for the Functional Evaluation of the Patients Treated Surgically Because of Intervertebral Disc Damage

Wykorzystanie Wskaźnika Funkcjonalnego Repty oraz Kwestionariusza Oswestry do oceny czynnościowej chorych leczonych operacyjnie z powodu uszkodzenia krążka międzykręgowego

Renata Jabłońska, Agnieszka Królikowska, Robert Ślusarz

Neurological and Neurosurgical Nursing Department,
Nicolaus Copernicus University in Torun, Poland

Abstract

Introduction. Complex image of the patients with spine discopathy makes it difficult to evaluate objectively and unequivocally the treatment effects. An analysis of functional condition, frequently used as an objective method of therapeutic proceedings efficiency is an integral part of this evaluation.
Aim. The aim of the work is to evaluate the condition of patients after neurosurgical treatment of disc herniation with the usage of Reply Functional Index (RFI) and Oswestry Questionnaire (ODI\NDI).
Material and Methods. Evaluations relied on triple estimation; before operation (first assessment), on the day of discharge from hospital (second assessment) and 6 months after the surgery (third assessment). For the first and second assessment 188 patients were evaluated and in the third one 140. Oswestry Questionnaire (ODI/NDI) and Repty Functional Index (RFI) were applied.
Results. The evaluation of the functional efficiency according to RFI proved that the majority of the patient could be qualified to group IV, which shows that the patients are self-reliant. While evaluating the patients according to ODI/NDI it was noticed that in particular assessments the number of people who are slightly disabled increased — an increase by 6.4% compared with evaluation 1 and then by another 41.3%.
Conclusions. The functional efficiency of the researched patients improved significantly, what was observed using ODI/NDI questionnaire. The correlation between ODI/NDI and RFI scales in the functional evaluation of the patients surgically treated because of discopathy is low. **(JNNN 2014;3(2):64–74)**
Key Words: neurosurgery, nursing assessment, postoperative nursing

Streszczenie

Wprowadzenie. Złożony obraz chorych z dyskopatią kręgosłupa utrudnia obiektywną, jednoznaczną ocenę wyników leczenia. Integralnym elementem tej oceny jest analiza stanu funkcjonalnego, często stosowana jako obiektywna metoda skuteczności postępowania terapeutycznego.
Cel. Ocena stanu chorych po neurochirurgicznym leczeniu przepukliny jądra miażdżystego z wykorzystaniem skal: Wskaźnik Funkcjonalny Repty (WFR) oraz Kwestionariusz Oswestry (ODI/NDI).
Materiał i metody. Badania polegały na trzykrotnej ocenie w czasie: przed operacją (ocena 1.), dzień wypisu z oddziału (ocena 2.) i 6 miesięcy po przeprowadzonym zabiegu (ocena 3.). Do badań włączono i poddano ocenie 1. i 2. — 188 chorych, w ocenie 3. uczestniczyło 140 chorych. Wykorzystano kwestionariusz Oswestry (ODI/NDI) oraz Wskaźnik Funkcjonalny Repty (WFR).
Wyniki. Ocena wydolności funkcjonalnej według WFR pokazała, że większość badanych kwalifikowała się do IV grupy, świadczącej o samodzielności chorych. Oceniając badanych według ODI/NDI zauważono, że w poszczególnych ocenach wzrastała liczba osób, które mają minimalne upośledzenie — wzrost o 6,4% w stosunku do oceny 1., a następnie o kolejne 41,3%.

Wnioski. Wydolność funkcjonalna badanych uległa poprawie, co zaobserwowano w pomiarze kwestionariuszem ODI/NDI. Korelacja między skalą ODI/NDI i skalą WFR w ocenie funkcjonalnej chorych po leczeniu operacyjnym choroby dyskowej jest niska. **(PNN 2014;3(2):64–74)**
Słowa kluczowe: neurochirurgia, ocena pielęgniarska, opieka pooperacyjna

Introduction

Spine diseases may occur in many states and pathological changes located within spine structures and tissue lesions distant from the spine, including internal organs. In most cases (60–90%) these diseases have its origin in damage of intervertebral disc, leading to the herniated nucleus pulposus [1,2].

The term herniated nucleus pulposus is a broad concept, including different types and degreases of its relocation. This concept has many synonyms, such as: herniated (slipped) disc, displacement of the intervertebral disc, discopathy or disc disease [1–6]. This disease is most common in the lumbosacral and cervical spine.

Among the factors affecting the therapeutic treatment of the disc disease, three main components must be listed: pain, degree of disability and symptoms of defects [7,8]. These factors will also determine daily functioning of the patients in their lives.

Surgical treatment of patients with intervertebral disc injury is one of the most frequent procedures performed in neurosurgical wards. According to the Polish Society of Spinal Surgery approximately 60–80 thousand operations have to be carried out each year. Chronic pain is the main problem of the patients affected by these disorders. It is a very common phenomenon because even with a healthy population approximately 75–85% of people complain about back pain. What is more, pain of the lumbar part of the spinal cord is the most common reason for people's disability after the age of 45 [9–13]. Low back pain is the fifth most common reason for all physician visits in the United States [14].

The complex and characteristic image of the patients suffering from disc herniation makes the results of the treatment difficult to assess. An integral element of this evaluation is an analysis of functional condition often used as an objective method to measure therapeutic efficiency [15–19]. The available literature presents several different scales describing the efficiency of the treatment considering severity of functional disability [19–21]. The following may serve as examples: Short Form Health Survey SF — 36, Functional — Economic Outcome Rating Scale of Prolo, Roland Questionnaire and Oswestry Questionnaire (ODI/NDI). They obtained a positive opinion as very useful in the assessment of the patients with back pain because they take into consideration objective and subjective factors that are typical for this disorder [19]. Repty Functional Index (RFI) is also a universal tool to assess how independent

the patients with various neurological and motor disorders including the back pain are [22,23].

The aim of the work is to evaluate the condition of patients after neurosurgical treatment of disc herniation with the usage of WFR and ODI/NDI scales.

Material and Methods

Study subjects

The research was carried out in Neurosurgery and Neurotraumatology Ward with Therapeutic Improvement Section of University Hospital. A plan of prospective studies with assessments in three different periods of time was used in order to complete the aim of the work: 1st assessment — the day before the surgery, 2nd assessment — the day of patient's discharge, 3rd assessment — six months after the surgery.

Patients admitted to hospital with lumbo-sacral or cervical discopathy took part in the research. They were diagnosed on the basis of clinical examination confirmed by neuroimaging (MRI, CT). Another criteria which included their evaluation was the performance of the microdiscectomy. Based on the result of this treatment 188 patients were included in the first and second evaluation. In the third evaluation 140 patients decided to take part — which means that 74,5% of questionnaires were sent back by those who had received them from us. This rate is satisfactory in the evaluation of examinations performed in health field [24].

There were more women than men covered by the research — 98 people (52.1%). Five groups were differentiated according to the age: the largest number of people were 40–49 years old (30.9%). Significantly more patients suffered from lumbar discopathy — 140 people (74.5%). This characteristic is presented in Table 1.

Methodology

In order to evaluate the level of disability Oswestry questionnaire in ODI version (Oswestry Disability Index) was used for people with pain conditions of lumbar spine and in NDI version (Neck Disability Index) for patients with pain conditions of cervical spine [20–25]. This questionnaire is often used to evaluate the level of disability with lumbar or cervical discopathy. After 25

Table 1. Sociodemographic and clinical data

Researched feature		N	%
Gender	Female	98	52.1
	Male	90	47.9
Age	up to 30 years	18	9.6
	30–39 years	46	24.5
	40–49 years	58	30.9
	50–59 years	52	27.7
	over 60 years	14	7.5
Type of occupation	manual	94	69.6
	mental	41	30.4
Characteristic of occupation	sitting — dynamic	16	11.9
	sitting — static	32	23.7
	standing — dynamic	46	34.1
	standing — static	6	4.4
	on the move	35	25.9
Education	Primary	17	9.0
	Vocational	75	39.9
	Secondary	62	33.0
	Higher	34	18.1
Diagnosis	Lumbar discopathy	140	74.5
	Cervical discopathy	48	25.5
BMI	Underweight <18.5	1	0.5
	Normal weight 18.5–24.9	83	44.1
	Overweight 25–29.9	73	38.8
	Obesity >30	31	16.5

requires a lot of help), group III — partial dependence (the patient requires help), group IV — independence (a patient is self-sufficient) [22,23].

The aforementioned, standardized tools were used in all three stages of examinations (first, second and third evaluations). Featuring them in the work exceeds the bounds of this article.

Ethical considerations

The protocol for this study was accepted by the Local Bioethical Committee, and all participants gave their formal consent to participate in the study.

Statistical analysis

Tables with numbers and percentage were used in the descriptive analysis of the results obtained. An average and standard deviation was calculated. Correlation between two variables was described using R Spearman's correlation coefficient. Non-parametric Mann-Whitney U test was also used to assess the differences of one characteristic between two populations (groups), Kruskala-Wallis rank test was used to compare numerous samples of independent (groups) and independence test χ^2 was applied in order to verify the hypotheses concerning existence of dependence among the researched nominal variables.

The results were verified by adopting the level of significance at p≤0.05. All the calculations and figures were created with the use of Microsoft Excel and Statistica 6.0.

years of employment it is thought to be the best method for functional estimation of those patients [20]. It was the first scale which allowed to estimate disability while taking into consideration problems of everyday life.

Acquired results, in ODI as well as NDI scales, allowed to distinguish 5 groups of disability: group I — minimal disability, group II — moderate disability, group III — severe disability, group IV — complete disability, group V — invalidity [20,21].

Functional evaluation was also carried out using Reply Functional Index — RFI (Repty Functional Index) [22,23]. This scale was drawn up by J. Opara and his partner [22,23]. from Górnośląskie Center of Rehabilitation "Repty" in Tarnowskie Góry; created as a modification of American scale FIM (Functional Independence Measure). The patients were evaluated according to the following criteria: self-care, control of anal sphincters, mobility, locomotion, Communications. Having summed up all the points each patient was assigned to a particular group of disability: group I — complete dependence (a patient requires intensive care), group II — significant dependence (the patient

Results

Functional evaluation according to RFI and ODI/NDI

The evaluation of functional efficiency according to RFI scale showed that the majority of the patients could be qualified to group IV — the patient is independent. The results in an unambiguous way depict no correlation between the obtained values and the time when they were taken, correlation statistically insignificant (p>0.05) (table 2). Assessing the patients according to ODI/NDI it was noticed that in particular evaluations the number of people who are minimally disabled increases — increase by 6.4% in comparison with assessment 1, and then by 41.3%. There were no people who were qualified as completely disabled (p<0.05) (Table 2).

Taking into account clinical diagnosis and WFR scale, there were not any differences between the results obtained in a given time frame and that they were not statistically significant (Table 3).

Table 2. Functional evaluation of the patients according to RFI and ODI/NDI

Assess-ment	RFI — group								ODI/NDI — group									
	1		2		3		4		1		2		3		4		5	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
1st	2	1.1	0	0	14	7.4	172	91.5	7	3.7	99	52.7	69	36.7	13	6.9	0	0.0
2nd	2	1.1	0	0	10	5.3	6	93.6	19	10.1	107	56.9	54	28.7	8	4.3	0	0.0
3rd	2	1.4	0	0	7	5.0	131	93.6	72	51.4	46	32.9	20	14.3	2	1.4	0	0.0

$\chi^2=1.155$; $d_f=4$; p=ns $\qquad\qquad$ $\chi^2=138.949$; $d_f=6$; $d_f=0.5189$; p<0.05

Table 3. Functional capacity of patients according to RFI compared to 1, 2, and 3 clinical estimation

RFI scale groups	1st assessment				2nd assessment				3rd assessment			
	L-S		C		L-S		C		L-S		C	
	N	%	N	%	N	%	N	%	N	%	N	%
I	2	1.1	0	0.0	2	1.1	0	0.0	2	1.4	0	0.0
II	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
III	10	5.3	4	2.1	7	3.7	3	1.6	5	3.6	2	1.4
IV	128	68.1	44	23.4	131	69.7	45	23.9	99	70.7	32	22.9
Overall	140	74.5	48	25.5	140	74.5	48	25.5	106	75.7	34	24.3

$\chi^2=0,60587$; $d_f=4$; p=n.s.

Table 4. Capacity of patients according to ODI/NDI compared to 1, 2, and 3 clinical estimation

ODI/NDI scale groups	1st assessment				2nd assessment				3rd assessment			
	L-S		C		L-S		C		L-S		C	
	N	%	N	%	N	%	N	%	N	%	N	%
I	3	1.6	4	2.1	13	6.9	6	3.2	56	40.0	16	11.4
II	73	38.8	26	13.8	80	42.6	27	14.4	33	23.6	13	9.3
III	54	28.7	15	8.0	41	21.8	13	6.9	17	12.1	3	2.1
IV	10	5.3	3	1.6	6	3.2	2	1.1	0	0.0	2	1.4
V	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Overall	140	74.5	48	25.5	140	74.5	48	26	106	75.7	34	24.3

L-S: r=0.5147; p<0.05, C: r=0.3767; (p<0.05)

The results regarding the clinical diagnosis and ODI/NDI scale (table 4) were separated. In case of L-S discopathy, most patients (73 people, 38.8%) before the surgery were qualified into the second group (moderate level of disability). After the surgery in second group there were included 80 patients (42.6%), also most of them. However, in the third estimation, most of the responders qualified to the first (42.6%) and second group (23.6%). Which means that their functional capacity rose in the third estimation. It is a statistically significant difference; r=0.5147, p<0.05. Among people with this diagnosis there were no people from group 5.

By analyzing the results acquired from patients with cervical discopathy (Table 4) similarities were visible: most people (13,8%) in first estimation qualified to the

second group. Similar results were acquired the second estimation, after the surgery 14.4% of patients qualified to the same group. However, in the third estimation, most of the responders qualified to the first (11.1%) and second (9.3%) group. This data proves that the health condition improves with time, this difference is significant on the moderate level: r=0.3767, (p<0.05). Comparable to L-S discopathy Among people with this diagnosis there were no people from group 5.

Later the individual categories of WFR and ODI/NDI (Table 5) were examined.

Table 5. Functional evaluation of the patients according to RFI and ODI/NDI in each category

Categories	1st assessment					2nd assessment					3rd assessment				
	N	$\bar{x}$	SD	min	max	N	$\bar{x}$	SD	min	max	N	$\bar{x}$	SD	min	max
RFI															
Self-care	188	38.86	5.0511	6	42	188	38.49	5.1755	6	42	140	39.98	4.9928	6	42
Control of anal sphincters	188	13.73	1.3218	2	14	188	13.74	1.3947	2	14	140	13.86	1.0633	2	14
Mobility	188	19.19	3.2113	3	21	188	18.99	3.1060	3	21	140	18.21	4.1440	2	22
Locomotion	188	11.99	2.3537	5	14	188	12.10	2.6539	2	14	140	12.06	3.0280	1	14
Communications	188	13.66	1.6711	2	14	188	13.70	1.6639	2	14	140	13.46	1.9170	2	14
ODI/NDI															
Severity of pain	188	3.1	1.159	0	5	188	0.8	0.981	0	5	140	1.31	1.257	0	5
Independence	188	1.6	0.934	0	4	188	2.3	1.030	0	5	140	1.18	0.850	0	4
Lifting objects	188	2.9	1.011	0	5	188	3.3	1.053	1	5	140	1.76	1.244	0	5
Walking	188	1.6	1.028	0	5	188	1.5	1.167	0	5	140	0.97	1.045	0	5
Sitting	188	2.0	1.051	0	5	188	2.0	1.158	0	5	140	1.17	0.913	0	3
Standing	187	2.2	0.934	0	5	187	2.0	1.011	0	5	140	1.57	1.073	0	5
Sleeping	188	1.4	0.777	0	4	188	0.8	0.764	0	3	140	0.89	0.895	0	5
Social life	188	2.2	0.973	0	5	188	2.1	1.067	0	5	140	1.22	0.989	0	4
Sexual activity	188	1.0	1.017	0	5	188	0.6	0.921	0	5	139	0.68	0.771	0	4
Travelling	188	2.3	1.003	0	4	188	2.7	1.015	0	5	140	1.21	0.942	0	4

Self-care is the first criterion analyzed, in WFR scale, Here, in numerical value, the decrease from 38.86 to 38.42 points was noted in the first estimation and a little increase to 39.98 in third estimation. Taking into consideration mobility, higher values were noted before the surgery (19.19 points) in contrast to after-surgical period — 18.99 points in the second estimation and 18.21 in the third estimation. When locomotion is taken into account, the lowest results were acquired before surgery (11.99 points), in other assessments, however, 12.1 points (second estimation) and 12.06 points (third estimation). Detailed information in this aspect was presented in table 5, but there were no statistically significant connections in acquired results (p>0.05).

In the case of ODI/NDI scale different values were noticed. Severity of pain — at first significant decrease of the average of 2.3 points, then increase of 0.51pt. Generally the severity of pain decreased positively of about 1.79pt. Independence — at first negative increase of the average of 0.7pt, and then decrease of 1.12pt. Another determinant, lifting objects — at first negative increase of 0.4pt, and then decrease of 1.54pt; general positive decrease of 1.14pt. Sexual activity — at first decrease of 0.4pt, and then increase of 0.08pt. Summing up the most positive decrease of the average concerned severity of pain, lifting objects and travelling. The differences appeared to be statistically significant (Table 5).

Correlation between RFI and ODI/NDI scales

In the further analysis correlation of particular groups of disability were taken into consideration. Both ODI/NDI and RFI scales were used in 1st, 2nd and 3rd assessments (table 6).

During preoperative period (1st assessment) in RFI scale 2 people (100.0%) were qualified as severely disabled in ODI/NDI scale. There were 14 people in group II (a patient requires help), 4 people were moderately disabled (28.6%), 4 people (28.6%) were qualified as severely disabled and 6 people — as fully disabled. In group IV (independence) classification in ODI/NDI scale ranged from minimal disability to full disability. More than half of the researched patients assessed as fully independent in RFI scale were qualified to a group of moderate disability in ODI/NDI scale — 95 people (55.2%), and 63 people (36.6%) to severe disability.

Second classification of the patients in the 2nd assessment proceeded in a similar way. In group I (independence) in RFI scale 2 people (100.0%) were qualified as severely disabled in ODI/NDI scale. There were 10 people in group II (the patient requiring help) 3 people (30.0%) were moderately disabled, 4 people (40.0%) were qualified as severely disabled and 3 people (30.0%) — as fully disabled. In group IV (independence) classification in ODI/NDI scale ranged from minimal disability to full disability. More than a half of the researched pa-

Table 6. Correlation between RFI and ODI/NDI scales — the results in the analyses period of time

Scales		RFI							
		I		II		III		IV	
	ODI/NDI	N	%	N	%	N	%	N	%
1st Assessment	I	0	0.0	0	0.0	0	0.0	7	4.1
	II	0	0.0	4	28.6	0	0.0	95	55.2
	III	2	100.0	4	28.6	0	0.0	63	36.6
	IV	0	0.0	6	42.9	0	0.0	7	4.1
	V	0	0.0	6	0.0	0	0.0	0	0.0
N=188, R=0.212, t(N-2)=2.956, p=0.004									
2nd Assessment	I	0	0.0	0	0.0	0	0.0	19	10.8
	II	0	0.0	3	30.0	0	0.0	104	59.1
	III	2	100.0	4	40.0	0	0.0	48	27.3
	IV	0	0.0	3	30.0	0	0.0	5	2.8
	V	0	0.0	0	0.0	0	0.0	0	0.0
N=188, R=0.227, t(N-2)=3.186, p=0.002									
3rd Assessment	I	1	50.0	1	14.3	0	0.0	62	47.3
	II	0	0.0	1	14.3	0	0.0	52	39.7
	III	1	50.0	4	57.1	0	0.0	16	12.2
	IV	0	0.0	1	14.3	0	0.0	1	0.8
	V	0	0.0	0	0.0	0	0.0	0	0.0
N=140, R=0.233, t(N-2)=2.818, p=0.006									

tients assessed as fully independent in RFI scale were qualified to a group of moderate disability in ODI/NDI scale — 104 people (59.1%), and 48 people (27.3%) to severe disability.

The classification of the patients in the 3rd assessment proceeded a bit differently. In group I (independence) in RFI measurement 1 person was qualified as minimally disabled and also 1 person as severely disabled in ODI/NDI scale. There were 7 people in group II (the patient requires help) 1 person (14.3%) was minimally disabled, also 1 person was moderately disabled, 4 people (57.1%) were qualified as severely disabled and 1 person (14.3%) as fully disabled. In group IV (independence) classification in ODI/NDI scale ranged from minimal disability to full disability. Almost half of the researched patients assessed as fully independent in RFI scale were qualified to a group of minimal disability according to ODI/NDI scale — 62 people (47.3%), 52 people (39.7%) to moderate disability and next 16 people (12.2%) to severe disability.

Because of the level of significance statistically significant correlations were noticed on a low level between the results according to RFI and ODI/NDI scales (p<0.05) (Table 6).

Influence of the chosen factors on functional efficiency according to RFI and ODI/NDI scales

Statistically significant difference was noticed in gender groups concerning the results obtained in RFI scale in the 1st assessment (p<0.05). In the remaining measurements of this scale and in ODI/NDI scale the results in gender groups did not differ in a significant way (p>0.05) (Table 7).

Because of the level of significance significant correlations of age and functional efficiency evaluated in RFI scale were not noticed (p>0.05), however, it remained in noticeable but low correlation with the results of ODI/NDI scale in the 1st and 3rd assessment (p<0.05) (Table 7).

Statistically significant difference was noticed in place of residence groups both in RFI and ODI/NDI scales. These results were obtained in the 2nd assessment (p<0.05) (Table 7).

Education is also a significant factor influencing the functional condition of the researched patients. This correlation was noticed in RFI measurement in the preoperative assessment (p<0.05). In the remaining cases the correlation was not noticed (Table 7).

Statistically significant differences were not noticed in a type and characteristic of patient's occupation in each analysis of the period of time, regardless of which of the tools was used (p<0.05) (Table 8).

Table 7. Demographic factors and functional efficiency according to RFI and ODI/NDI in measurements taken at three different times

	RFI			ODI/NDI		
	1st Assessment	2nd Assessment	3rd Assessment	1st Assessment	2nd Assessment	3rd Assessment
GENDER						
Sum of range man	8496.0	8301.0	4449.0	8070.0	7975.5	4018.5
Sum of range woman	8820.0	9456.0	5421.0	9696.0	9790.5	5851.5
U	3969.0	4206.0	2418.0	3975.0	3880.5	2002.5
Z	1.182	-0.546	0.029	-1.166	-1.419	-1.770
p level	0.237	0.585	0.977	0.244	0.156	
Accurate Z values	2.444	-1.289	0.069	-1.300	-1.596	-1.923
p level	0.015	0.197	0.945	0.194	0.110	0.54
N significant figures man	90	90	63	90	90	63
N significant figures woman	98	98	77	98	98	77
Age groups						
N	188	188	140	188	188	140
R	0.114	0.002	-0.032	0.151	0.118	0.174
t (N-2)	1.559	0.025	-0.379	2.085	1.624	2.076
P	0.121	0.980	0.705	0.038	0.106	0.040
Education						
N	188	188	140	188	188	140
R	-0.156	-0.035	0.092	-0.028	0.025	-0.147
T(N-2)	-2.155	-0.477	1.089	-0.389	0.332	-1.741
p	0.032	0.634	0.278	0.698	0.740	0.084
Place of residence						
Df	(3, N=188)	(3, N=188)	(3, N=140)	(3, N=188)	(3, N=188)	(3, N=140)
H=	0.2065	8.8258	0.6587	5.0235	8.4231	1.6259
p	0.9765	0.317	0.8829	0.1701	0.0380	0.6535

Table 8. Type and characteristics of patients' occupation and functional efficiency according to RFI and ODI/NDI in measurements taken at three different times

	RFI			ODI/NDI		
	1st Assessment	2nd Assessment	3rd Assessment	1st Assessment	2nd Assessment	3rd Assessment
Type of patients' occupation						
Sum of range manual labour	6597.5	6386.5	3141.0	6364.0	6532.0	3383.5
Sum of range mental labour	2582.5	2793.5	1515.0	2816.0	2648.0	1272.5
U	1721.5	1921.5	930.0	1899.0	1787.0	807.5
Z	0.981	-0.024	-0.470	-0.132	0.667	1439.0
p level	0.327	0.981	01.638	0.895	0.504	0.150
Accurate Z values	1.918	-0.053	-1.359	-0.147	0.738	1.581
p level	0.055	0.958	0.174	0.883	0.460	0.114

N significant figures manual labour	94	94	66	94	94	66
N significant figures mental labour	41	41	30	41	41	30
2*1 str.	0.327	0.979	0.640	0.896	0.506	0.150
Characteristics of pateints' occupation						
df	(4, N=135)	(4, N=135)	(4, N=96)	(4, N=135)	(4, N=135)	(4, N=96)
H=	6.2875	5.5976	1.8447	1.1007	1.8260	3.3098
p	0.1787	0.2313	0.7643	0.8942	0.7677	0.5074

Table 9. Spine surgical procedures, BMI and functional efficiency according to RFI and ODI/NDI in measurements taken at three different times

	RFI			ODI/NDI		
	1st Assessment	2nd Assessment	3rd Assessment	1st Assessment	2nd Assessment	3rd Assessment
Spine surgeries						
Sum of range No	16433.5	16459.5	9120.0	16648.0	16653.0	8944.5
Sum of range Yes	1332.5	1306.5	750.0	1118.0	1113.0	925.5
U	1033.5	1059.5	605.0	1027.0	1022.0	429.5
Z	-0.547	-0.409	-0.360	0.581	0.608	-1.780
p level	0.585	0.682	0.719	0.561	0.544	0.075
Accurate Z values	-1.131	-0.967	-0.847	0.648	0.683	-1.934
p level	0.258	0.334	0.397	0.517	0.495	0.053
N significant figures No	175	175	130	175	175	130
N significant figures Yes	13	13	10	13	13	10
2*1 str.	0.587	0.684	0.723	0.565	0.54	0.074
BMI						
N	188	188	140	188	188	140
R	-0.012	0.011	0.100	0.059	0.022	-0.094
t(N-2)	-0.164	0.156	1.186	0.804	0.306	-1.108
p	0.870	0.876	0.238	0.422	0.760	0.270

Similar results were obtained from BMI and spine surgeries analysis. These data are presented in Table 9.

Discussion

Maintaining functional ability and preventing patients from being disabled is the main task while taking care of patients with disc disease [26]. The number of changes connected with chronic, progressive pain, generate faulty posture which in turn results in deficits in physical, social and emotional functioning. It is the loss of functional efficiency that causes disability, affects the quality of life and results in significant increase of socio-economic costs [10–18].

It is difficult to find unified estimation criteria and periods of observation time after the surgery in medical literature, which could be used to uniform estimation of disc herniation surgical treatment result [27]. Often the period of observation varies from 4 weeks to 5 years after the operation [27]. In our examination triple evaluation was performed: before the surgery (first evaluation), on the day of discharge (second evaluation) and six months after the surgery (third estimation). Adoption of such time boundaries, especially in third estimation, stems from the assumption described in literature, that this period is long enough to stabilize functional condition and social situation after the discopathy treatment [27,28].

Taking gender into consideration 98 women (52.1%) and 90 men (47.9%) were researched. Some research prove that women are at a greater risk of back pains

while other do not confirm such a correlation [29,30]. Gender does not play any role in the results of treatment, however, it is thought that as far as women are concerned prognosis is worse because they are more vulnerable to functional stratifications [30–32].

An average age in this material (47 years of age) is comparable with the results obtained by the other authors; in the other articles the average ranged from 37 to 58 years of age [27,30,33]. One of the main risk factors of spinal cord disorders is the patients' occupation, especially hard manual labour with long-lasting forced position, lifting heavy objects and repeated flexion and rotation motions [26–34]. Just like in the other articles [26,30,34]. In a presented group of people those who worked manually (69.6%) mainly performing standing dynamic work (34.1%), on the move (25.9%) and sitting static (23.7%) outnumbered the rest of the researched patients. Analysing occupational status it is worth indicating that 11.7% of the patients were unemployed. In Häkkinen and co-authors' material 6.7% of people were unemployed [35].

The carried out analysis concerned the patients with disc herniation of a lumbo-sacral part (74.5% of the researched patients) and a cervical part (25.5%) of the-spinal cord. It is comparable with the works of the other authors that disc disease of the cervical part appears at least twice less often than disc disease of the lumbo-sacral part [15,18,36]. In the literature obesity is often shown as the reason for back pains but in epidemiological research both positive and negative correlations were noticed. An average body mass index (BMI) for the whole group was 26.2 and is comparable with the measurements found in various articles [26,34,37].

The analysis of the patients' functional condition, which concerned mainly the evaluation of their ability to perform basic everyday tasks was carried out using Oswestry Questionnaire (ODI/NDI) and Repty Functional Index (RFI).

In the initial research in which ODI/NDI scale was used the patients presented moderate decrease of functional condition — 52.7% of the researched patients were moderately disabled while 36.7% severely disabled. This condition improved significantly after the surgery; in particular assessments number of people with minimal disability increased — increase by 6.4% in comparison with 1st assessment, and then by another 41.3%. This improvement concerned the patients both with lumbo-sacral and cervical discopathy. These data correspond with the results found in literature. An average index of ODI for the group of the researched patients with lumbo-sacral discopathy was as follows: in Häkkinen's work [37] — 55 before and 36 after the surgery, in Strömqvist's work [32] — 50 before and 20.5 after the surgery, in Ryang's work [33] — 56.7 before and 12 after the surgery. Average NDI rate for the group

of examined patients with cervical discopathy, however, according to Godlewski amounts to [38]. 25 before the operation and 11 after. While according to Steinmetz [39] — 60 before the operation and 29 after.

In individual categories of ODI/NDI questionnaire different results were obtained. It shows heterogeneous influence of particular activities on the functional condition of the patient with disc disease. In Häkkinen's research [37] the patients found pain, social life, walking and standing the most problematic. In Radziszewski research [19], who analyses a group of patients after surgical and preservative treatment, the change of functional condition, in comparison with the initial research, was more often observed among the patients after surgical treatment. Significant improvement of functional efficiency observed after the surgery in a direct and initial research decreased in a distant research. Similar data are also presented by the other authors [32,33,37].

RFI research proved that the patients both before and after the surgery were completely independent.

Statistically significant correlations were noticed on a low level between the results according to RFI and ODI/NDI scales. It should be stated that despite low correlation, the results obtained from both the questionnaires do not cohere with each other especially in the case of more numerous groups. It can be accidental. Discrepancies concern also essences touched by both tools. First of all, RFI does not ask about pain so crucial as far as everyday functioning is concerned. It does not ask about travelling and sexual activity, either. Repty Functional Index is more restrictive or being more precise it specifies the range of answers. Undoubtedly an advantage of ODI/NDI questionnaire is its universality of use.

Conclusions

1. Functional efficiency of the researched patients improved significantly after the surgery. It was observed in ODI/NDI questionnaire measurement.
2. Functional evaluation according to RFI remained on the same level (complete independence) both before and after the treatment.
3. Correlation between ODI/NDI scales in functional evaluation of the patients after surgical treatment of disc disease is low.

Implications for Nursing Practice

The Oswestry Disability Questionnaire appears to be a more accurate device and more useful for the functional evaluation of neurosurgical treatment of patients with herniated nucleus puspulus in everyday nursing practice. This fact is also supported by the universality of its use

in many countries [40–45]. the ease of understanding and the ability to classify patients with different degree of activity limitation.

References

[1] Roberts S., Evans H., Trivedi J., Menage J. Histology and pathology of the human intervertebral disc. *J. Bone Joint Surg*. 2006;88(suppl 2):10–14.

[2] Schoenfeld AJ., Weiner BK. Treatment of lumbar disc herniation: Evidence — based practice. Int J Gen Med 2010; 3 *Int J Gen Med*. 2010;21(3):209–214.209–214.

[3] Abenhaim L., Rossignol M., Vacat JP. et al. The role of activity in the therapeutic management of back pain. *Spine*. 2000;20(4):1–33.

[4] Boss N., Semmer N., Elfering A. et al. Natural history of individuals with asymptomatic disc abnormalities in magnetic resonance imaging: predictors of low back pain — related medical consultation and work incapacity. *Spine*. 2000;25(12):1484–1492.

[5] Borenstein DG. Epidemiology, etiology diagnostics evaluation, and treatment of low back pain. *Curr Opin Rheumatol*. 2001;13(2):128–134.

[6] Ahmed M., Modic MT. Neck and low back pain: neuroimaging. *Neurol Clin*. 2007;25(2):439–471.

[7] Pengel LH., Herbert RD., Maher CG., Refshauge KM. Acute low back pain: systematic review of its prognosis. *BMJ*. 2003;9,327 7410):323.

[8] Chou R., Qaseem A., Snow V. et al. Diagnosis and treatment of low back pain: a joint clinical practice guideline from the American College of Physicians and the American Pain Society. *Ann Inter Med*. 2007;147(7):478–491.

[9] May S. Patients' attitudes and beliefs about back pain and its management after physiotherapy for low back pain. *Physiother Res Int*. 2007;12(3):126–135.

[10] Weiner BK. Difficult medical problems: on explanatory models and a pragmatic alternative. *Med Hypotheses*. 2007;68(3):474–479.

[11] Brox JI., Storheim K., Grotle M., Tveito TH., Indahl A., Eriksen HR. Evidence-informed management of chronic low back pain with back schools, brief education, and fear-avoidance training. *Spine J*. 2008;8(1):28–39.

[12] Fava GA., Sonino N. The biopsychosocial model thirty years later. *Psychother Psychosom*. 2008;77(1):1–2.

[13] Willems P. Decision making in surgical treatment of chronic low back pain: the performance of prognostic tests to select patients for lumbar spinal fusion. *Acta Orthop Suppl*. 2013;84(349):1–35.

[14] Deyo RA., Mirza SK., Martin BI. Back pain prevalence and visit rates: estimates from U.S. national surveys, 2002. *Spine*. 2006;31(23):2724–2727.

[15] Ferrara L., Triano JJ., Sohn MJ., Song E., Lee DD. A biomechanical assessment of disc pressures in the lumbosacral spine in response to external unloading forces. *Spine J*. 2005;5(5):548–553.

[16] Filiz M., Cakmak A., Ozcan E. The effectiveness of exercise programmes after lumbar disc surgery: a randomized controlled study. *Clin Rehabil*. 2005;19(1):4–11.

[17] Jansson KA., Németh G., Granath F., Jönsson B., Blomqvist P. Health-related quality of life in patients before and after surgery for a herniated lumbar disc. *J Bone Joint Surg Br*. 2005;87(7):959–964.

[18] Kagaya H., Takahashi H., Sugawara K., Kuroda T., Takahama M. Quality of life assessment before and after lumbar disc surgery. *J Orthop Sci*. 2005;10(5):486–489.

[19] Radziszewski KR. The functional status in patients with discopathy of the lumbar spine receiving only conservative therapy or operative therapy. *Wiad Lek*. 2008;61(1–3):23–29 (in Poland).

[20] Fairbank JC., Pynsent PB. The Oswestry Disability Index. *Spine*. 2000;15,25(22):2940–2952.

[21] Rąpała A., Rąpała K., Lachowicz W. Methods of clinical evaluations and scales of assessment of the cervical and lumbar disc disease based on the Oswestry scale. *Ortop Traumatol Rehabil*. 2004;30,6 (2):149–154 (in Poland).

[22] Opara J., Dmytryk J., Ickowicz T., Doniec J. Functional marker "Repty" for evaluation of independence in patients with paraplegia. *Chir Narządów Ruchu Ortop Pol*. 1997;62(5):445–449 (in Poland).

[23] Opara J. *Clinimetrics in neurorehabilitation*. Warszawa, Medical PZWL, 2012:10–11.

[24] Glidewell L., Thomas R., MacLennan G. et al. Do incentives, reminders or reduced burden improve healthcare professional response rates in postal questionnaires? two randomised controlled trials. *BMC Health Serv Res*. 2012;12:250.

[25] Vernon H., Mior S. The Neck Disability Index: a study of reliability and validity. *J Manipulative Physiol Ther*. 1991;14:409–415.

[26] Puolakka K., Ylinen J., Neva MH., Kautiainen H., Häkkinen A. Risk factors back pain — related loss of work time after surgery for lumbar disc herniation: a 5 — year follow — up study. *Europ Spine J*. 2008;17(3):386–392.

[27] Selkowitz DM., Kulig K., Poppert EM. et al. The immediate and long — term effects of exercise and patient education on physical, functional, and quality — of — life outcome measures after single — level lumbar microdiscectomy: a randomized controlled trial protocol. *BMC Musculoskelet Disord*. 2006;25,7:70.

[28] Chin KR., Tomlinson DT., Auerbach JD., Shatsky JB., Deirmengian CA. Success of lumbar microdiscectomy in patients with modic changes and low — back pain: a prospective pilot study. *J Spinal Disord Tech*. 2008; 21(2):139–144.

[29] Gilgil E., Kacar C., Butun B. et al. Prevalence of low back pain in a developing urban setting. *Spine*. 2005;30(9):1093–1098.

[30] Masala S., Pipitone V., Tomassini M., Massari F., Romagnoli A., Simonetti G. Percutaneous vertebroplasty in painful schmorl nodes. *Cardiovasc Intervent Radiol*. 2006;29(1):97–101.

[31] Aalto TJ., Malmivaara A., Kovacs F. et al. Preoperative predictors for postoperative clinical outcome in lumbar spinal stenosis: systematic review. *Spine*. 2006;31,18:E648-E663.

[32] Strömqvist F., Ahmad M., Hildingsson C., Jönsson B., Strömqvist B. Gender differences in lumbar disc herniation surgery. *Acta Orthop*. 2008;79(5):643–649.

[33] Ryang YM., Oertel MF., Mayfrank L., Gilsbach JM., Rohde V. Standard open microdiscectomy versus minimal access trocar microdiscectomy: results of a prospective randomised study. *Neurosergery*. 2008;62(1):174–181.

[34] Rąpała A., Rąpała K., Łukawski S. Analysis of different constitutional, clinical, radiographic factors of 160 patients with low back pain based on own studies, observations and literature. *Chir Narządów Ruchu Ortop Pol*. 2006;71(1):5–9 (in Poland).

[35] Häkkinen A., Kiviranta I., Neva MH., Kautiainen H., Ylinen J. Reoperations after first lumbar herniation surgery; a special interest on residives turing a 5 — year follow — up. *BMC Musculoskelet Disord*. 2007;Jan 9,8:2.

[36] Jacob T., Zeev A. Are localized low back pain and generalized back pain similar entities? Results of a longitudinal community based study. *Disabil Rehabil*. 2006; 28(6):369–377.

[37] Häkkinen, Kautiainen H., Järvenpää S., Arkela-Kautiainen M., Ylinen J. Changes in the total Oswestry Index and its ten items in females and males pre- and post-surgery for lumbar disc herniation: a 1-year follow — up. *Eur Spine J*. 2007;16(3):347–352.

[38] Godlewski B., Grochal M., Jekimov R., Wójcik R., Radek M., Radek A. Evaluation of outcome after surgical treatment of cervical disc disease with Dero C — Disc Peek cages. *Neurol Neurochir Pol*. 2007;41(5):417–426.

[39] Steinmetz MP., Patel R., Traynelis V., Resnick DK., Anderson PA. Cervical disc arthroplasty compared with fusion in a workers' compensation population. *Neurosurgery*. 2008;63(4):741–747.

[40] Vigatto R., Alexandre NM., Correa Filho HR. Development of a Brazilian Portuguese version of the Oswestry Disability Index: cross-cultural adaptation, reliability, and validity. *Spine*. 2007;15,32(4):481–486.

[41] Gaul C., Mette E., Schmidt T., Grond S. Practicability of a German version of the "Oswestry Low Back Pain Disability Questionnaire". *Schmerz*. 2008;22(1):51–58.

[42] Monticone M., Baiardi P., Ferrari S. et al. Development of the Italian version of the Oswestry Disability Index (ODI-I): A cross-cultural adaptation, reliability, and validity study. *Spine*. 2009;34(19):2090–2095.

[43] Ma C., Wu S., Xiao L., Xue Y. Responsiveness of the Chinese version of the Oswestry disability index in patients with chronic low back pain. *Eur Spine J*. 2011;20(3):475–481.

[44] Denis I., Fortin L. Development of a French-Canadian version of the Oswestry Disability Index: cross-cultural adaptation and validation. *Spine*. 2012;37(7): E439–444.

[45] Djurasovic M., Glassman SD., Dimar JR 2nd., Crawford CH 3rd., Bratcher KR., Carreon LY. Changes in the Oswestry Disability Index that predict improvement after lumbar fusion. *J Neurosurg Spine*. 2012;17(5):486–490.

Corresponding Author:
Renata Jabłońska
Neurological and Neurosurgical Nursing Department,
Nicolaus Copernicus University in Torun,
Bydgoszcz, St. Techników 3, 85-801 Bydgoszcz, Poland
e-mail: renjab_1@wp.pl