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Early Assessment of Functional Capacity with Patients After Degenerative Change in the Spine — Preliminary Reports

Wczesna ocena wydolności funkcjonalnej chorych po operacji zmiany zwyrodnieniowej kręgosłupa — doniesienia wstępne

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Abstract

Introduction. Degenerative Disease of the spine is characterised by progressive damage of the intervertebral disc and articular cartilage, which deteriorates biomechanical properties of the spine promotes micro-traumatic effect in articular capsules and the ligament system.
Aim. The study aims at assessing the functional capacity in patients before and after surgery treatment of the degenerative change in the spine.
Material and Methods. Tests were carried out in the Department and Clinic of Neurosurgery and Neurotraumatology at CM UMK on the group of 58 patients operated on because of the degenerative change in the spine. Direct observation with the use of measurements before and after operations treatment was applied. In the assessment of patient there was applied Functional Capacity Scale — FCS, Functional Independence Measure — FIM, Oswestry Disability Index — ODI and Functional Index Repty — FIR.
Results. There was observed a statistically significant difference ($p<0.05$) in pain intensity before and after surgery. Pain intensity after surgery was significantly reduced. There were also observed statistically significant correlations ($p<0.05$) between the FCS scale and FIM ($r_s=0.5260$), ODI ($r_s=-0.4325$) and FIR ($r_s=0.4451$).
Conclusions. It was proved that functionality of patients after the surgery on the day of discharging form hospital had been significantly improved compared to the pre-surgical period. The analysis of patient's condition showed a statistically significant correlation between each scale applied in the assessment of the functional condition. **(JNNN 2014;3(1):25–30)**
Key Words: Functional Capacity Scale (FCS), degenerative change in the spine, surgical treatment

Streszczenie

Wprowadzenie. Choroba zwyrodnieniowa kręgosłupa charakteryzuje się postępującym uszkodzeniem krążka międzykręgowego i chrząstki stawów międzywyrostkowych, co pogarsza właściwości biomechaniczne kręgosłupa, sprzyja mikrotraumatyzacji torebek stawowych i układu więzadłowego.
Cel. Celem pracy było dokonanie oceny wydolności funkcjonalnej chorych przed i po leczeniu operacyjnym zmiany zwyrodnieniowej kręgosłupa.
Materiał i metody. Badania przeprowadzono w Katedrze i Klinice Neurochirurgii i Neurotraumatologii CM UMK na grupie 58 chorych operowanych z powodu zmiany zwyrodnieniowej kręgosłupa. W badaniach zastosowano obserwację bezpośrednią z wykorzystaniem pomiaru przed i po leczeniu operacyjnym. W ocenie chorych posłużono się Functional Capacity Scale — FCS, Functional Independence Measure — FIM, Oswestry Disability Index — ODI oraz Functional Index Repty — FIR.

Wyniki. Odnotowano istotną statystycznie różnicę (p<0,05) w natężeniu dolegliwości bólowych przed i po zabiegu operacyjnym. Natężenie bólu po zabiegu istotnie malało. Zaobserwowano również istotne statystycznie korelacje (p<0,05) pomiędzy skalą FCS a FIM (r_s=0,5260), ODI (r_s=-0,4325) oraz FIR (r_s=0,4451).
Wnioski. Wykazano, że funkcjonalność chorych po zabiegu operacyjnym w dniu wypisu z oddziału uległa znacznej poprawie w porównaniu z okresem przedoperacyjnym. Przeprowadzona analiza oceny stanu chorego wykazała istotną statystycznie korelację pomiędzy poszczególnymi skalami zastosowanymi do oceny stanu funkcjonalnego.
(PNN 2014;3(1):25–30)
Słowa kluczowe: Functional Capacity Scale (FCS), zmiana zwyrodnieniowa kręgosłupa, leczenie operacyjne

Introduction

Degenerative Disease of the spine is characterised by progressive damage of the intervertebral disc and articular cartilage, which deteriorates biomechanical properties of the spine promotes micro-traumatic effect in articular capsules and the ligament system [1].

Intervertebral disc damage results from two factors: everyday mechanical operating and the aging process [2–4]. It consists in biomechanical and tissue decomposition of the disc and is generated mainly by water deficiency and balance disorder in the proteoglican synthesis with domination of their disintegration. The intervertebral disc with age gradually loses its flexibility, resilience, resistance to loads. The beginning the process of collagen fibers degeneration also weakens the structures of annulus fibrosus. In consequence, depreciation and adaptive capabilities of the disc become smaller and smaller [5,6]. Degeneration of the nucleus pulposus is favored by the fact that it is fed only by diffusion, and its metabolism without the vascular system cannot be efficient.

The disc is provided with blood only by small vessels perforating the cartilage. They undergo involution, atrophy, and finally obliteration around the third decade of life, leaving nutrition to lymphatic channels and extracellular fluid circulation. This loss of blood supply is considered to be the reason for degenerative changes observed with age [4,7–9].

In this aspect, the degenerative disease may result from tissue wear, however it is the innate predispositions which presumably matter here. Contemporary genetic tests as well as the achievements of molecular biology provide new evidence confirming the existence of family predisposition (decreased hydration of proteoglycans of the intervertebral disc as well as worse quality of collagen which is an element of both the annulus fibrous as well as of the nucleus fibrous, generated by a kind of gene mutations) [7–14].

The aging process of the intervertebral disc is often caused by excessive strain on the back, birth defects, and also spine damage caused by a history of diseases and injuries [15]. In the result the height of the intervertebral disc is lowered which destabilizes the whole segment of motion and leads to destruction of its remaining elements. In a significant, visible extend its functional abilities: flexibility, bearing capacity and the capability of depreciation are reduced [1,3].

Complex and characteristic picture of patients with degenerative spinal disease impedes unambiguous assessment of treatment results. An integral element of the patients' condition assessment is their everyday functioning. Among the factors having an effect on this assessment one should mention three main components of the disease: pain, degree of disability and defect symptoms [15,16].

The study aims at assessing the functional capacity in patients before and after surgery treatment of the degenerative change in the spine.

Material and Methods

Subjects

Tests were carried out in the Department and Clinic of Neurosurgery and Neurotraumatology at CM UMK on the group of 58 patients operated on because of the degenerative change in the spine. Among the 58 patients operated on because of degenerative change in the spine, 30 patients (51.7%) were men. The age of the patients ranged from 29 (the youngest patient) to 63 (the oldest patient) years (average age was 47±8 years) (Table 1).

Table 1. Characteristics of the observed group

Variables	N (%)
Sex	
• woman	28 (48.3)
• men	30 (51.7)
Age	
• 18–30 years	2 (3.4)
• 31–50 years	28 (48.3)
• 51–80 years	28 (48.3)
Place of living	
• city	42 (72.4)
• country	16 (27.6)
Clinical diagnosis/location of change	
• cervical intervertebral discs	17 (29.3)
• lumbar intervertebral discs	41 (70.7)

Taking into account the clinical diagnosis, in most cases (41 patients — 70%) it was lumbar discopathy. In the clinical assessment in the neurological tests in patients before surgery there were not identified any disorders of consciousness or significant neurological deficiencies. Patients before surgery felt pain around the neck or lumbar assessed by means of Visual Analog Scale (VAS) [17]. For statistical analyses there were adopted following criteria of the pain intensity degree assessment: group 0 — no pain, group I (1–3 points) — weak pain, group II (4–7 points) — medium pain, group III (8–10 points) — strong pain.

Criteria for including patients in the tests:

- Patients with an identified degenerative change in the spine — regarding damage of intervertebal disc (dyskopathy),
- Patients for the first time qualified to surgical treatment,
- patients who on the Day of admission to hospital were not showing any disorders of consciousness (a possibility of logical verbal contact with the patient) or significant neurological deficiencies.

Criteria for excluding patients from the tests:

- patients with an identified degenerative change of the spine, other than discopathy,
- patients who underwent more than one surgery or with whom various forms of treatment had already been applied,
- patients, who on the Day of admission to hospital showed disorders of consciousness (no possibility of logical verbal contact with the patient).

Procedure

Direct observation with the use of measurement was applied in the research. For the assessment of patient's early functional capacity before and after the surgery, Functional Capacity Scale (FCS) was applied [18]. This scale allows to recognize patient's abilities in the specified clinical condition regarding functional ability, as well as the scope on necessary assistance offered by the nursing staff, which means specifying the deficit regarding the determinant. The Scale consists of 12 determinants (mobility, diet, hygiene, physiological needs, measurement of vital signs — GCS, breathing, diagnostics, preparation for surgery and after care, dressings — drainage, pain severity, pharmacotherapy, mental state). To the assessment of the patients the following criteria were adopted: I group (48–40 points) — independence (a self-sufficient patient), II group (39–31 points) — slight dependence (the patient needs assistance), III group (30–21 points) — moderate dependence (the patient requires considerable assistance) and IV group (20–12 points) — dependence (the patient requires intensive care). For comparative purpose of the functional capacity with the final result of surgical treatment — patients were assessed also by means of the Functional Independence Measure (FIM) [19], Oswestry Disability Index (ODI) [20] and Functional Index Repty (FIR) [21].

Statistical Analysis

Results were drawn up by means of Microsoft Excel 2000 and Statistica version 5.1. In the statistical analysis there was applied Student's test *t* for the purpose of comparing average values in comparable groups. Correlations were calculated by means of Spearman's rank correlation coefficient (r_s). Statistical hypotheses were verified at the significance level $p<0.05$.

Ethical Approval

Consent was obtained for carrying out research from the Bioethical Committee on Nicolaus Copernicus University at Collegium Medicum im. Ludwika Rydygiera in Bydgoszcz, regarding the conception of the study presented (KB/02/2006 and KB/291/2013).

Results

In the assessment by FCS scale (Table 2) the average functional capacity for the group tested before surgery (on the acceptance day) was 41.5 points. Most patients were qualified to group I — 45 patients (77.6%), the least to group III — 2 patients (3.4%). None of the tested patients was qualified to group IV. After the surgery (on the day of discharge from hospital) average functional capacity of the tested group was 44.5 points. The number of the patients tested who were qualified to group I increased, and was — 53 patients (91.4%), the smallest number of patients were qualified to group III — 1 person (1.7%). Similarly to the date of admission none of the tested patients was classified into group IV.

In the assessment by scale FIM (Table 2) the average assessment of functional independence on the day of admission to hospital was 107.8 points. Most patients were qualified to group IV — 47 patients (81.0%), least to group I — 1 person (1.7%). After the surgery, the average assessment of functional independence went up and was 118.2. Most patients tested were classified into group IV — 53 patients (91.4%). None of the tested patients was qualified to group II.

In the assessment with FIR scale (Table 2) the average functional coefficient of the tested group on the day of admission was 85.0 pkt. Most patients were qualified to group IV — 34 patients (58.6%), least to group II

Table 2. Functional capacity of patiens before and after surgry

Group	Measurement before the surgery			Measurement after the surgery		
	FCS	FIM	FIR	FCS	FIM	FIR
I	45 (77.6)	1 (1.7)	0(0)	53 (91.4)	1 (1.7)	0 (0)
II	11 (19.0)	3 (5.2)	9 (15.5)	4 (6.9)	0 (0)	0 (0)
III	2 (3.4)	7 (12.1)	15 (25.9)	1 (1.7)	4 (6.9)	6 (10.3)
IV	0 (0)	47 (81.0)	34 (58.6)	0 (0)	53 (91.4)	52 (89.7)
Average points.±SD	41.5±4.7	107.8±18.4	85.0±15.2	44.5±4.2	118.2±15.0	96.9±11.1

— 9 patients (15.5%). None of the tested patients was qualified to group I. After the surgery the average functional rate of the tested group was 96.9 points. The number of the tested patients qualified to group IV increased and was — 52 patients (89.7%), the remaining patients tested were qualified to group III — 6 patients (10.3%). None of the tested patient was classified into groups I and II.

The average of pain intensification in the tested group before the surgery was 6.9 points. Most patients were qualified to group II — 34 patients (58.6%), least to group I — 2 patients (3.4%). None of the patients tested was classified into group 0 (no pain). Average pain in the group tested after the surgery was 2.3 points and meant, that pain in the tested patients was significantly reduced. Most of the patients tested were qualified to group I — 38 patients (65.5%). There were patients who were claiming that they did not feel pain, — group 0 — 8 patients (13.8%). A statistically significant difference was observed between pain intensity on the admission day and the day of discharging from hospital (t=9.17; p<0.05) (Table 3).

Table 3. Degree of pain intensity before and after the surgery

VAS	Measurement before the surgery	Measurement after the surgery
	N (%)	N (%)
0	0 (0)	8 (13.8)
1	2 (3.4)	38 (65.5)
2	34 (58.6)	10 (17.2)
3	22 (37.9)	2 (3.4)
Average points.±SD	6.9±1.6	2.3±1.8

Student'sTest t=9.17; p<0.05

The scales used for patient's functional assessment and final assessment of treatment results were subject to statistical verification (Table 4). In the case of correlation of scale FCS with the remaining research tools, there were obtained statistically significant coefficients with the highest for scale FIM (r_s=0,5260). The statistically significant high p<0.05) value of Spearman's rank coefficient (r_s=0,7804) specified for the correlation between FIR and FIM results from the structural similarity of these two scales. The FIR scale was generated by simplifying and modifying the FIM scale.

Table 4. Spearman's coefficient values*

	FCS	FIM	ODI	FIR
FCS	–	0.5260	-0.4325	0.4451
FIM	0.5260	–	-0.4894	0.7804
ODI	-0.4325	-0.4894	–	-0.6646
FIR	0.4451	0.7804	-0.6646	–

* p<0.05

Discussion

Maintaining functional capacity and preventing disability is the main task in care of patients with degenerative spine disease [22]. It is the loss of functional capacity which generates the occurrence of disability, reduces the quality of life and very significantly increases socio-economic costs. Additionally, disability is an important part of patient's condition assessment, coming directly from the patient and being valuable supplementation of the disease activity assessment by the doctor [23]. Patients' functional condition assessment is very often used as an objective method of therapeutic efficacy [23–25].

As it is emphasised by numerous authors — the spine affected by the degenerative process is one of the most frequent source of pain [1,26]. Extensive research — 46 394 patients from 15 European countries and Israel — showed large showed a high prevalence of chronic pain, its impact on the quality of patients' lives as well as significant loading due to the fact of the health protection sector [26,27]. According to this research approximately 50% of patients had back pain, 40% arthralgia, 20% headache and pain in the neck and 20% pain in limbs. The most frequent reasons for pain in 50% of patients were degenerative changes and discopathy, next injuries — 22% rheumatoid arthritis — 8%, migraine — 7%

and others. In the assessment among the patients, 45% of them were claiming that treatment was effictive, 41% — not very effective and15% — ineffective. Only 28% of patients said that doctor did not know how to heal their pain.

In our research responders underwent surgical operations, which above all were to limit their pain. This was the case — the average of the pain suffered before the surgery was 6.9, whereas after the operation it was 2.3. That is compliant with reports from other authors, who also draw attention to pain weakening: from 7.2 points to 2.1 points. [28], from 5.7 points. to 2.5 points [29]. Long-term test results show that patients operated on because of pain, obtain better results in the direct period than in the remote one.

The occurrence of pain to a large extent determines the functional capacity — or coping with activities of daily living. In the tests carried out, most patients before the operation surgery were qualified to the group certifying their independence. After the surgery the percentage still went up in each scale analysed which certifies the improvement of capacity as the effect of treatment applied. These data correspond to reports from other authors [28–31].

The tools (FCS, FIM, FIR, ODI), used to the analysis, which was confirmed by the tests, significantly correspond to each other. It justifies their application in the performance of nursing care in perioperative treatment of degenerative changes of the spine.

Conclusions

It has been proved that functionality of patients after surgery, on the day of discharging from the ward was considerably improved compared to the pre-operation period. The carried out analysis of the patient's condition showed statistically significant correlation between each scale used for the assessment of functional condition.

Implications for Nursing Practice

The functional assessment should be an inseparable element of nursing assessment regarding patient's condition both before as well as after the surgery. It may have a significant effect on planning and choosing the model of care of patients with spinal dysfunction. The scales applied constitute an excellent guideline for their choice in this group of patients.

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