



Research Article

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Quality of Life, Independence, and Support Before and After Surgery with Spinal Cancer

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Abstract

Introduction: The spine is the most common site of metastasis of various cancers to the bone, which affects patients' quality of life and independence.

The aim of this study was to assess the quality of life, self-efficacy, and social support of patients before and after surgery for spinal cancer, whether it is dependent on the location of the neoplasm and stage.

Methods: The study was conducted in 47 patients with spinal cancer from March 2023 to August 2024 at the Department of Neurosurgery and Neurological Rehabilitation of St. Raphael's Hospital in Kraków. Approval was obtained from the bioethics committee and the clinical trials research team.

The study was conducted by analyzing medical records in the Medi's programme, and by a diagnostic survey using standardized research tools: The World Health Organization Quality of Life (WHOQOL)-BREF, the Lawton scale, the AIS and the Multidimensional Scale of Perceived Social Support.

Statistical analysis was developed in IBM SPSS software. Differences were assessed using the Wilcoxon and Kruskal-Wallis tests. Spearman's correlation coefficients were used to assess relationships between quantitative variables. A $p < 0.05$ was used as the limit of the significance level.

Discussion: Statistically significant differences were found between the pre- and post-treatment measurement of quality of life for the psychological domain ($p < 0.001$). Significantly lower values were recorded after surgery. A statistically significant weak positive relationship was found between the AIS scale after surgery and the somatic domain before surgery. No correlation was shown between social support and quality of life before and after surgery for spinal cancer. If the quality of life in terms of the somatic domain before surgery is higher, the acceptance of the disease after surgery is also higher. In contrast, patients with a lower quality of life before surgery, e.g. due to mobility difficulties or pain complaints, also have a lower acceptance of their illness after surgery, which may manifest itself in negative emotions related to the illness.

Conclusions: Quality of life for the psychological domain is higher before surgery than after. There is no correlation between quality of life in patients before and after surgery for spinal cancer and the location of the lesion.

Keywords: Spinal cancer; Neurosurgery; Quality of life; Patient self-efficacy; Social support; Tumour location; Stage.

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Introduction

Spinal tumours are a significant clinical and epidemiological problem. Invariably in Poland for several years, the incidence rate among malignant tumours has fluctuated between 5.5% and 6.2%, which translates into approximately 5500 to 6000 new cases per year (KRN 2020) and 3800 deaths. Cancers in a given anatomical area are most common in people over 45 years of age. The incidence is almost five times higher in men than in women.

The choice of treatment method is related to factors that depend on the type of tumour and its individual characteristics, i.e. location, stage and clival differentiation. Personal factors such as age, performance status, presence of comorbidities or nutritional status of the organism are also important factors in the choice of therapy. The standard treatment pathway for patients with spinal tumours, at early clinical stages, is surgery [1].

With increasing life expectancy, advances in systemic treatment of patients with malignant tumours, the number of surgical procedures performed for spinal metastases is steadily increasing. The surgical treatment of spinal tumours has evolved significantly in recent decades with the advent of advanced classification of spinal tumours, grading and constantly improving surgical techniques. Over the years, several prognostic scoring systems have been developed according to the Taurus, Sioutos or Van der Linden scales. The Tokuhashi and Tomita prognostic scales remain the most widely used prognostic tools. The choice of the appropriate surgical technique depends on the location of the tumour, the number of vertebrae involved, the spinal segment, the need for stabilisation and the general condition of the patient. Classical procedures involving removal of part of the vertebral column can be performed from an anterior, posterior or lateral approach. Huang et al. points out that total spondylectomy, proposed by Tomita et al. in the 1990s, has become one of the most popular techniques for the treatment of advanced spinal tumours [2].

In the approach to the oncology patient, quality of life has become a parameter as important as other parameters characterising the treatment process. It is now treated on a par with figures representing data such as overall survival, disease-free life and recurrence and life expectancy with controlled disease.

The definition of quality of life takes into account four basic areas of patient functioning: physical functioning and mobility, emotional functioning, social functioning and symptoms of the disease and effects of treatment [3].

Currently, quality of life assessment is often used in clinical trials as an indicator of disease severity. The instruments used in studies by various authors are recognised and widely used tools to assess quality of life in a multidimensional aspect. The mean quality of life assessed with the EORTC QLQ-30 and EORTC QLQ-BN20 questionnaire from before surgery was 0.706, 5 days after surgery up to 0.614, and 30 days after surgery up to 0.707. Furthermore, 5 days after surgery, a significant reduction in the level of quality of life was observed, while 30 days after surgery, quality of life had significantly improved, reaching the level of quality of life before treatment.

In conclusion, the lowest quality of life was observed on the fifth day after surgery. Many symptoms, such as fatigue, nausea and vomiting, pain, dyspnoea, insomnia and lack of appetite, in-

creased, especially immediately after the operation [4].

The aim of this study was to assess the quality of life, self-efficacy and social support of patients before and after surgery for spinal cancer, whether it is dependent on the location of the cancer and the stage.

Materials and methods

The study was conducted from March 2023 to August 2024 in the Department of Neurosurgery, as well as the Department of Neurological Rehabilitation of St. Raphael's Hospital in Kraków after obtaining management approval. Approval from the bioethics committee (KBKA 32/0/2023) and the Clinical trials.gov PRS research team (NCT 06395831) was obtained prior to the study. The study group included 47 patients who were scheduled for surgery for spinal cancer. Patients gave written informed consent to participate in the study, which targeted patients before surgery and after surgery (immediately before the patient was discharged home).

The method of patient recruitment was that every patient who was admitted to the ward with a diagnosis of spinal cancer and was qualified for surgery and gave written informed consent for the study and the processing of personal data was recruited into the study.

Inclusion criteria for the study group included patients who gave written informed consent to participate in the study before surgery, after surgery, and completed post-operative questionnaires. On the other hand, the criteria for exclusion from the study included patients who refused to participate in the further part of the study during the study, and when the questionnaires were not completely or correctly completed.

Calculations were performed using IBM SPSS software. The results of quantitative variables were presented using descriptive statistics; for qualitative variables, percentages were presented. The difference in the level of variables between the pre- and post-treatment measurements was assessed using the Wilcoxon test for dependent samples. Kruskal-Wallis tests were performed to assess the significance of differences between three or more groups. Spearman correlation coefficients were used to assess associations between quantitative variables. Non-parametric methods were chosen due to distributions deviating from a normal distribution. A $p < 0.05$ was used as the limit of the significance level.

Schedule of study material collection:

1. Before surgery, a diagnostic survey using a self-administered questionnaire on past illnesses and treatment and the standardized research tools outlined below.
2. After surgery in the hospital ward, a diagnostic survey with the use of the standardized research tools presented below.
3. Analysis of medical records of patients included in the study group in the hospital database in the Medi's programme taking into account data on the severity of the neoplastic lesion, its location and type of neoplastic lesion.

The study was conducted by analyzing medical records in the Medi's programme and by a diagnostic survey using a self-

administered questionnaire on past diseases and treatment and the following standardized research tools:

- Abbreviated version of the quality-of-life assessment questionnaire
- The World Health Organization Quality of Life (WHOQOL) -BREF
- Lawton Scale I - ADL

- AIS questionnaire
- Zimet Multidimensional Scale of Perceived Social Support - MSPSS original version

Results

1. The assessment of the quality of life of patients before and after surgery for spinal cancer taking into account the four domains is presented in Table 1.

Table 1: Quality of life assessment of patients before and after surgery for spinal cancer including four domains.

Descriptive statistics								
	WHOQOL BREF - somatic domain (before surgery, 0-100)	WHOQOL BREF - somatic domain (after surgery, 0-100)	WHOQOL BREF - psychological domain (before surgery, 0-100)	WHOQOL BREF - psychological domain (after surgery, 0-100)	WHOQOL BREF - social domain (before surgery, 0-100)	WHOQOL BREF - social domain (after surgery, 0-100)	WHOQOL BREF - environmental domain (before surgery, 0-100)	WHOQOL BREF - environmental domain (after surgery, 0-100)
Mean	59,70	59,04	62,13	48,68	71,91	68,98	81,23	78,85
Me	56,00	56,00	69,00	50,00	75,00	75,00	81,00	81,00
Sd	12,990	11,398	15,666	12,473	16,736	15,742	19,370	18,493
N	47	47	47	47	47	47	47	47
Wilcoxon test results								
	WHOQOL BREF - soma-domain (post-treatment, 0-100) - WHOQOL BREF - soma-domain (pre-treatment, 0-100)	WHOQOL BREF - psycho-logical domain (post-treatment, 0-100) - WHOQOL BREF - psycho-logical domain (pre-treatment, 0-100)	WHOQOL BREF - social domain (post-treatment, 0-100) - WHOQOL BREF - social domain (pre-treatment, 0-100)			WHOQOL BREF - environment domain (after treatment, 0-100) - WHOQOL BREF - environment domain (before treatment, 0-100)		
Z	-0,514	-5,485				-1,572		
p	0,607	<0,001				0,116		

Statistically significant differences were found between pre- and post-treatment measurements of quality of life for the psychological domain ($p < 0.001$). Significantly lower values were found after surgery.

2. The relationship between quality of life in patients before and after surgery for spinal cancer and the location of the spinal tumour lesion is presented in Table 2.

Table 2: Relationship between quality of life in patients before and after surgery for spinal cancer and the location of the spinal cancer lesion.

Descriptive statistics								
Localization of the vertebral column tumour	WHOQOL BREF - somatic domain (before surgery, 0-100)	WHOQOL BREF - somatic domain (after surgery, 0-100)	WHOQOL BREF - psychological domain (before surgery, 0-100)	WHOQOL BREF - psychological domain (after surgery, 0-100)	WHOQOL BREF - social domain (before surgery, 0-100)	WHOQOL BREF - social domain (after surgery, 0-100)	WHOQOL BREF - environmental domain (before surgery, 0-100)	WHOQOL BREF - environmental domain (after surgery, 0-100)
Thoracic section	Mean	54,46	53,62	57,23	47,23	70,69	70,69	70,85
	Me	56,00	56,00	56,00	50,00	75,00	75,00	69,00
	Sd	8,647	10,112	16,187	11,952	17,361	14,256	20,880
	N	13	13	13	13	13	13	13
Spinal canal	Mean	60,87	60,00	62,13	46,40	71,13	64,53	80,93
	Me	56,00	56,00	63,00	44,00	81,00	56,00	81,00
	Sd	10,716	9,142	15,629	14,227	17,320	15,431	21,409
	N	15	15	15	15	15	15	15

Cervical segment	Mean	62,17	62,58	66,67	53,42	70,83	71,83	90,67
	Me	63,00	66,00	72,00	59,50	72,00	75,00	97,00
	Sd	18,712	15,894	16,216	12,486	14,167	18,992	12,587
	N	12	12	12	12	12	12	12
Lumbar region	Mean	62,71	61,00	63,43	48,14	77,71	70,43	85,00
	Me	63,00	63,00	69,00	50,00	81,00	75,00	88,00
	Sd	12,189	6,137	14,501	9,281	20,742	14,211	14,697
	N	7	7	7	7	7	7	7

Kruskal-Wallis test results

	WHOQOL BREF - somatic domain (before surgery, 0-100)	WHOQOL BREF - somatic domain (after surgery, 0-100)	WHOQOL BREF - psychological domain (before surgery, 0-100)	WHOQOL BREF - psychological domain (after surgery, 0-100)	WHOQOL BREF - social domain (before surgery, 0-100)	WHOQOL BREF - social domain (after surgery, 0-100)	WHOQOL BREF - environmental domain (before surgery, 0-100)	WHOQOL BREF - environmental domain (after surgery, 0-100)
HKW	4,993	5,137	2,867	3,346	1,260	1,754	6,076	3,805
df	3	3	3	3	3	3	3	3
p	0,172	0,162	0,413	0,341	0,739	0,625	0,108	0,283

There were no statistically significant differences between groups on any of the scales ($p > 0.05$).

Table 3: Relationship between tumor grade and domains of quality of life in patients before and after surgery, and between tumor grade and disease acceptance scale.

Spearman correlations		
Grade		
Correlation coefficient		p
WHOQOL BREF - somatic domain (pre-treatment, 0-100)	-0,448	0,002
WHOQOL BREF - psychological domain (pre-treatment, 0-100)	-0,468	<0,001
WHOQOL BREF - social domain (pre-treatment, 0-100)	-0,260	0,077
WHOQOL BREF - environment domain (before treatment, 0-100)	-0,495	<0,001
WHOQOL BREF - somatic domain (after treatment, 0-100)	-0,549	<0,001
WHOQOL BREF - psychological domain (after treatment, 0-100)	-0,662	<0,001
WHOQOL BREF - social domain (after treatment, 0-100)	-0,658	<0,001
WHOQOL BREF - environment domain (after treatment, 0-100)	-0,855	<0,001
AIS total score (after treatment)	-0,115	0,441

3. The relationship between tumour grade and the domains of patients' quality of life before and after surgery, and between tumour grade and the disease acceptance scale, are presented in table 3.

There were statistically significant negative average associations between tumour grade and pre-treatment quality of life domains: somatic, psychological, environmental.

There were statistically significant negative strong associations between tumour grade and domains of quality of life: somatic post, psychological post, social post, environmental post.

There was no relationship between tumour grade and the illness acceptance scale - AIS.

4. The relationship between the different domains of quality of life before and after surgery and the waiting time for surgery, acceptance of the disease, and patients' self-efficacy is presented in Table 4.

Table 4: Relationship between the domains of quality of life before and after surgery and the waiting time for surgery, acceptance of the disease, patients' independence.

Correlations						
	Age (years)	Time (in months) to surgery	AIS total points (after treatment)	I-ADL total score (after treatment)		
Spearman rho	WSSWS (total points) - before surgery	Rho	0,021	-0,232	0,119	0,072
		p	0,886	0,117	0,427	0,632
	WSSWS (total points) - after surgery	Rho	0,070	-0,253	0,167	0,091
		p	0,640	0,086	0,263	0,541
	WHOQOL BREF - somatic domain (before treatment, 0-100)	Rho	0,185	-0,256	0,376	-0,085
		p	0,212	0,082	0,009	0,568

WHOQOL BREF - psychological domain (before treatment, 0-100)	Rho	0,153	-0,069	0,199	-0,104
	p	0,306	0,646	0,180	0,488
WHOQOL BREF - social domain (before treatment, 0-100)	Rho	0,073	-0,130	0,168	-0,033
	p	0,626	0,385	0,258	0,828
WHOQOL BREF - environment domain (before treatment, 0-100)	Rho	0,109	-0,081	0,269	0,149
	p	0,467	0,588	0,067	0,318
WHOQOL BREF - somatic domain (after treatment, 0-100)	Rho	0,043	-0,140	0,138	-0,219
	p	0,774	0,347	0,356	0,139
WHOQOL BREF - psychological domain (after treatment, 0-100)	Rho	0,251	-0,089	0,098	-0,205
	p	0,089	0,552	0,510	0,167
WHOQOL BREF - social domain (after treatment, 0-100)	Rho	0,188	-0,117	0,015	-0,279
	p	0,207	0,432	0,921	0,058
WHOQOL BREF - domain environment (after treatment, 0-100)	Rho	0,167	-0,135	0,204	-0,086
	p	0,261	0,366	0,169	0,566

Table 5: Relationship between social support and quality of life before and after surgery for spinal cancer.

<i>Correlations</i>								
	SWS significant person - before	SWS family - before	SWS friend - before	SWS significant person - after	SWS family - after	SWS friend - after		
Spearman rh	WHOQOL BREF - somatic domain (before treatment, 0-100)	Rho	0,186	0,045	0,136	0,185	0,098	0,134
		p	0,212	0,763	0,361	0,213	0,510	0,369
	WHOQOL BREF - psychological domain (before treatment, 0-100)	Rho	-0,003	-0,153	-0,028	0,002	-0,110	-0,029
		p	0,982	0,306	0,851	0,987	0,464	0,845
	WHOQOL BREF - social domain (before treatment, 0-100)	Rho	0,198	-0,015	0,147	0,206	0,050	0,146
		p	0,182	0,922	0,323	0,166	0,738	0,329
	WHOQOL BREF - environment domain (before treatment, 0-100)	Rho	0,059	-0,069	0,049	0,065	-0,024	0,049
		p	0,693	0,643	0,746	0,665	0,875	0,746
	WHOQOL BREF - somatic domain (after treatment, 0-100)	Rho	0,138	-0,003	0,022	0,137	0,046	0,019
		p	0,355	0,984	0,881	0,359	0,757	0,897
	WHOQOL BREF - psychological domain (after treatment, 0-100)	Rho	-0,081	-0,111	-0,014	-0,076	-0,062	-0,016
		p	0,588	0,459	0,926	0,611	0,677	0,913
	WHOQOL BREF - social domain (after treatment, 0-100)	Rho	0,097	0,008	0,081	0,102	0,063	0,077
		p	0,515	0,957	0,590	0,495	0,674	0,606
	WHOQOL BREF - domain environment (after treatment, 0-100)	Rho	-0,088	-0,076	-0,017	-0,084	-0,031	-0,020
		p	0,555	0,610	0,910	0,575	0,839	0,895

There were no statistically significant relationships between the variables.

There was a statistically significant weak positive relationship between the AIS scale after surgery and the somatic domain before surgery.

5. The relationship between social support and quality of life before and after spinal cancer surgery is shown in Table 5.

Discussion

The progressive ageing of modern societies is associated with an increase in the incidence of cancer. According to current reports, cancer is the second cause of death in Poland [5].

The spine is the most frequent site of metastases within the skeletal system, and the third most frequent after the lungs and liver. It is estimated that 70-90% of patients with advanced breast and prostate cancer have metastases to the spine. The location of the lesions is in the thoracic (60-70%), lumbar (20-25%) and, less commonly, cervical (10-15%) regions. The average time from onset of symptoms to diagnosis is approximately 2-3 months. The first non-symptomatic sign of a spinal flip (but requiring differentiation with inflammation, laceration) is biological pain (95%) and neurological deficits (75-85%), including sensorimotor dysfunction and sphincter dysfunction [2].

The spine is the most common site of metastasis of various cancers to bone.

This is due to the abundance of venous plexuses, the structure of spongy bone, vertebral bodies and the presence of well-vascularised red marrow. Intradural spinal cord compression due to tumour infiltration occurs in 5% of patients who die of malignant neoplasm. Of this number, approximately 10% of cases involve the cervical spinal cord. The expected increase in the number of patients treated with this complication is the result of advances in cancer diagnosis and treatment, leading to an increase in detection and thus in the frequency of previously uncommon complications.

The cancers that most commonly metastasise to or infiltrate the spine are lung cancer, breast cancer, prostate cancer, kidney cancer and cancers of the haematopoietic system (multiple myeloma, lymphomas, leukaemias). The primary focus fails to be detected in approximately 10% of patients with extradural spinal cord compression. In 8% of cases, spinal metastases are the first sign of cancer. The localisation of the tumour in the spine does not depend on the type of primary tumour. Metastases virtually never involve the disc, even when the vertebral column is completely destroyed. Metastatic tumours rarely cross the dura. Tumours with spinal cord compression mostly affect people over 50 years of age.

Direct mechanical pressure, deformation of the nerve tissue and disturbances in the blood supply led to swelling of the spinal cord tissues, first of the white matter and then of the grey matter of the spinal cord. This is the underlying cause of myelopathy [6-8].

The advanced stage of cancer is a major source of stress for both the patient and their relatives. Cancer is associated with suffering - in the physical, mental, spiritual and social spheres. It is accompanied by negative emotions. A sense of hopelessness, helplessness and despair arises in the patient. It also emphasises the importance of having and using psychological resources such as hope and a sense of efficacy in self-management and effective use of pain management strategies, and for maintaining good cooperation with the treatment and care team [5].

Conducting research on the quality of life of patients with various disabling conditions provides insight into and a better understanding of the complex nature of the disease in relation to the patient group. Quality-of-life studies provide a basis for subjective assessment of the state of patients in medical care and allow for valuable information to be obtained from the patients themselves, concerning not only the symptoms of the disease and the adverse effects of the treatment provided, but also an assessment of the psychological, social and spiritual dimensions. Quality-of-life surveys of patients should take into account their general condition and the many distressing symptoms that may make it difficult to complete the questionnaires and impose an additional burden on patients [5].

The aim of regaining or preserving neurological function, the need for pain control, local reduction of the tumour mass, and achieving spinal stability were the main indications for surgical treatment. The indications were also guided by: epidural symptoms, spinal cord compression, spinal instability, previously ap-

plied treatment, if the radiotherapy dose reached the limit of tolerance for the spinal cord.

In the study by Klosinski and co-authors, no neurological deterioration was found in the surgical course, while pain was reduced or relieved in all patients. In each of the cases operated on, a reduction in neurological defects and pain was achieved, which significantly improved the patients' quality of life.

Most of the operated cases are metastatic tumours, where surgical treatment brings objective and subjective improvement in the patients' condition [6].

In our study, quality of life for the psychological domain is higher before surgery than after surgery for spinal cancer. In the other domains, no differences were observed before and after surgery.

Satisfactory treatment did not always mean a high quality of life for the patient. Since the interest in quality-of-life issues results in an emphasis in the treatment process on responsibility for all spheres of the patient's life, the introduction of this concept into medicine was a breakthrough in the way patients were looked at. Concern began to be expressed not only for prolonging the life of patients in a biological sense, but also for making patients as independent and active as possible, and for making their lives as satisfying as possible [3].

Quality of life is one of the parameters characterizing the success of treatment for oncologic patients, along with overall survival and disease-free life. Thus, the main aim of studies by other authors is to assess quality of life after surgical treatment.

The greatest improvement was observed in the group of patients operated on for non-malignant spinal tumours, and the lowest in patients treated for metastatic tumours. Contemporary surgical procedures used in neurosurgery reduce the quality of life of patients with spinal tumours only in the early postoperative period. Histopathological diagnoses of these tumours affect patients' quality of life [4].

Support gives the patient a greater sense of security and strength to fight a severe incurable disease. The results presented in many publications show that social support plays a very important role in the disease and it is the immediate family (spouse, children, siblings, parents) that are the main source of support, especially emotional support [5,9,10].

In the study by Królikowska and co-authors, the social support mainly from the immediate family experienced by the oncology patients studied had a positive impact on their quality of life. In the aspect studied, the main relationship was between the level of social support and the social functioning of the patients [11].

In my study, there was no relationship between social support and quality of life before and after spinal cancer surgery.

The strengths of my study were the use of multiple standardised survey instruments to assess quality of life, self-efficacy, disease acceptance, social support, and the conduct of these surveys in patients with four stages of spinal cancer over a long period of time in hospital - more than one year. A limitation of my study, was the exclusion from the study group of patients with tumour stages III and IV after surgery, who refused to participate

in further study, due to poor health during rehabilitation at the Neurological Rehabilitation Unit and neurological deficits present.

Conclusions

Quality of life for the psychological domain is higher before surgery than after surgery for spinal cancer. In the other domains, no differences were observed before and after surgery. There was no correlation between quality of life in patients before and after surgery for spinal cancer and the location of the lesion.

Quality of life after surgery in terms of somatic, psychological, social and environmental domains depends on the stage of the cancer.

Quality of life before surgery in terms of somatic, psychological and environmental domains depends on the degree of cancer.

The degree of acceptance of the disease does not depend on the stage of spinal cancer.

If the quality of life in terms of the somatic domain before treatment is higher, the also the acceptance of spinal cancer after surgery is higher. On the other hand, patients whose quality of life is lower before surgery, e.g., due to difficulty in moving or complaints of pain, also have lower acceptance of their disease after surgery, which may manifest as negative emotions related to the disease.

There was no relationship between social support and quality of life before and after surgery for spinal cancer.

Conclusion

In the approach to the oncology patient, quality of life has become a parameter as important as other parameters characterizing the treatment process. Therefore, maintaining a good quality of life should be a priority in a patient with spinal cancer as well.

In the global assessment of health-related quality of life, in addition to taking into account the symptoms of the disease and adverse effects of treatment, the patient's attitude toward himself, his own disease and the way he copes with the disease are also evaluated [3].

Future research should deal with quality of life in a holistic context and include an individualized approach to solving the patient's health, social and environmental problems, which will contribute to improving the quality of life of patients with spinal cancer.

Declarations

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