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The Quality of Life of Patients after Surgical Treatment of Brain Tumours and the Location of the Tumour

Jakość życia pacjentów po leczeniu operacyjnym guzów mózgu a umiejscowienie nowotworu

Agnieszka Królikowska¹, Piotr Zieliński², Marek Harat³, Renata Jabłońska¹, Beata Haor¹, Karolina Filipowska¹, Robert Ślusarz¹

¹Neurological and Neurosurgical Nursing Department, Faculty of Health Science, Collegium Medicum, Nicolaus Copernicus University, Toruń, Poland

²Department of Neurosurgery, Regional Specialist Hospital in Grudziądz, Poland

³Neurosurgery Unit 10th Military Research Hospital and Polyclinic Independent Public Healthcare Centre, Bydgoszcz, Poland

Abstract

Introduction. The location of intracranial neoplasms and the process of treating these lesions itself can significantly affect the quality of life of patients. Hence, the aim of the study was to investigate the impact of the location of the brain tumour on the quality of life of surgically treated patients.

Aim. The aim of the study was to investigate the influence of the location of the brain tumour on the quality of life of surgically treated patients.

Material and Methods. The study included 236 patients with brain tumours operated at the Department of Neurosurgery of the 10th Military Clinical Hospital with the SP ZOZ Polyclinic in Bydgoszcz. Patients with different tumour locations were included: in the temporal lobe, in the frontal lobe, in the parietal lobe, in the ventricles of the brain and in the extra-cerebral locations. The following questionnaires were used to assess the quality of life: EORTC QLQ-C30 and EORTC QLQ-BN20, in which the patients were tested three times: on the day of admission to the Clinic, on the fifth day after brain tumour surgery and 30 days after the surgery.

Results. Patients' quality of life decreased in the early postoperative period in all groups in terms of tumour location, especially in patients with tumours of the frontal lobe (−0.104) and ventricular neoplasms (−0.109) ($p > 0.05$). On the 30th day, however, an improvement in the quality of life was achieved in all groups, the highest improvement was obtained in patients with tumours located extra-cerebrally (0.115) and tumours of the temporal lobe (0.097) ($p > 0.05$).

Conclusions. There was no effect of the location of the brain tumour on the quality of life of the studied patients. In the early postoperative period, the quality of life decreased, while it improved 30 days after the surgery. (JNNS 2020;9(3):91–96)

Key Words: brain tumour, quality of life, tumour location

Streszczenie

Wstęp. Umiejscowienie nowotworów wewnątrzczaszkowych a także sam proces leczenia tych zmian mogą znacząco wpływać na jakość życia pacjentów. Stąd celem pracy było zbadanie wpływu usytuowania guza mózgu na jakość życia chorych leczonych operacyjnie.

Cel. Celem pracy było zbadanie wpływu usytuowania guza mózgu na jakość życia chorych leczonych operacyjnie.

Materiał i metody. Badaniem objęto 236 pacjentów z guzami mózgu operowanych w Klinice Neurochirurgii 10 Wojskowego Szpitala Klinicznego z Polikliniką SP ZOZ w Bydgoszczy. Uwzględniono pacjentów z różnym umiejscowieniem nowotworu: w płacie skroniowym, w płacie czołowym, w płacie ciemieniowym, w komorach mózgu oraz położonych zewnątrzczaszkowo. Do oceny jakości życia wykorzystano kwestionariusze: EORTC QLQ-C30

i EORTC QLQ-BN20, którymi pacjenci badani byli trzykrotnie: w dniu przyjęcia do Kliniki, w piątej dobie po operacji nowotworu mózgu oraz 30 dni po zabiegu.

Wyniki. Jakość życia pacjentów uległa obniżeniu we wczesnym okresie pooperacyjnym we wszystkich uwzględnionych grupach pod względem lokalizacji nowotworu, a szczególnie u chorych z nowotworami płata czołowego (−0,104) i nowotworami komór mózgu (−0,109) ($p>0,05$). W 30 dobie natomiast uzyskano poprawę jakości życia także we wszystkich ujętych grupach, najwyższą poprawę uzyskano u pacjentów z guzami położonymi zewnątrzmożgowo (0,115) i guzami płata skroniowego (0,097) ($p>0,05$).

Wnioski. Nie zaobserwowano wpływu położenia nowotworu mózgu na jakość życia badanych pacjentów. We wczesnym okresie pooperacyjnym jakość życia ulega obniżeniu, natomiast 30 dni po zabiegu operacyjnym nastąpiła jej poprawa. (PNN 2020;9(3):91–96)

Słowa kluczowe: guz mózgu, jakość życia, lokalizacja guza

Introduction

Tumours of the central nervous system are divided into primary brain tumours and metastatic tumours. Over 40% of primary intracranial tumours are gliomas, the second diagnosed group are meningiomas (approx. 30%). These primary brain lesions account for less than half of intracranial tumours. Currently, metastatic neoplasms are diagnosed more frequently [1]. On average 80–85% of proliferative processes are located supratentorially, 15–20% subtentorially [2].

It is important to determine the histological nature of the brain tumour and its degree of malignancy, which is very important information that is the basis for making therapeutic decisions, as well as determining the prognosis for a patient suffering from cancer. Moreover, it is very important to know the location of the neoplasm, as it may affect the functioning of the patient and determine the potential treatment effects [3].

Intracranial tumours cause non-specific symptoms following intracranial hypertension and a number of focal symptoms that depend on local damage to the brain by the proliferative process. Focal symptoms may be irritating (epileptic seizures) or defective. Irritation symptoms are characteristic of metastases to the brain and some slowly growing neoplasms (meningiomas, oligodendrogliomas). Defective focal symptoms occur in patients with rapidly growing tumours (e.g. gliomas). The presence of negative symptoms does not always ensure the location of the tumour [1].

Surgical treatment is the basic method of therapeutic management in patients with intracranial neoplasms. This method allows to establish the histopathological diagnosis, and the reduction of the tumour mass reduces or eliminates the neurological symptoms in the patient [4]. Nowadays, in order to ensure safety during surgical treatment, neurosurgeons use methods of intraoperative imaging, tumour visualization and localization of appropriate tissue, such as: neuro-navigation, intraoperative magnetic resonance, intraoperative computed tomography, intraoperative ultrasound, fluorescence, various methods of neurophysiological monitoring [4,5].

Recognition of the above changes, numerous symptoms of the disease, and methods of treatment are reflected in the quality of life of people struggling with the intracranial proliferative process. It should be emphasized that the quality of life in a holistic approach to the patient, especially oncological, has for many years become a parameter as important as other parameters important in the treatment process. Currently, it is treated on a par with such data as: overall survival, patient's life free from symptoms of the disease, life expectancy with a controlled proliferation process [6].

The aim of the study was to investigate the influence of the location of the brain tumour on the quality of life of surgically treated patients.

Material and Methods

The research material consisted of patients with brain tumours planned for surgical treatment at the Department of Neurosurgery of the 10th Military Clinical Hospital with the SP ZOZ Polyclinic in Bydgoszcz. The research was approved by the Bioethics Committee at Collegium Medium in Bydgoszcz (consent no. KB 222/2011).

The study group consisted of 236 people, 124 women (52.5%) and 112 men (47.5%). The most numerous groups in terms of age were patients between 41 and 60 years of age — 103 people (43.6%), the second largest group were patients between 21 to 40 years of age — 75 (31.8%). Most of the patients (70%) lived in cities. Taking into account the education of the respondents 37.7% (89 people) had secondary education, 30.5% (72 people) had higher education. Most of the respondents 74.6% (176) remained in stable relationships, 44.5% of the respondents (105 people) were economically active (Table 1).

Each patient (on the day of admission to the Department of Neurosurgery, 5 days after brain tumour surgery, 30 days after surgery) completed the quality of life questionnaires three times: EORTC QLQ-C30 (The European Organization for Research and Treatment of Cancer Quality of Life Questionnaire — C30), and

Table 1. Characteristics of the study group

Variable	N	%
Gender		
Women	124	52.5
Men	112	47.5
Total	236	100.0
Age		
Up to 20 years	9	3.8
21–40 years	75	31.8
41–60 years	103	43.6
60 years and more	49	20.8
Total	236	100.0
Place of residence		
Village	72	30.5
City up to 25 000 inhabitants	49	20.8
City from 26 000 to 100 000 inhabitants	36	15.3
City over 100 000 inhabitants	79	33.5
Total	236	100.0
Education		
Primary	16	6.8
Vocational	59	25.0
Secondary	89	37.7
Higher	72	30.5
Total	236	100.0
Marital status		
Single	38	16.1
Stable relationships	176	74.6
Divorced	11	4.7
Widow/Widower	11	4.7
Total	236	100.0
Professional situation		
Student	14	5.9
Professional work	105	44.5
Old-age/disability pension	91	38.6
Retirement/disability pension+professional work	14	5.9
Unemployed	12	5.1
Total	236	100.0

the module EORTC QLQ-BN20 (The European Organization for Research and Treatment of Cancer Quality of Life Questionnaire — Brain Module). The quality of life was assessed on a scale from 0 to 1, where 0 meant a very low quality of life, 1 — the quality of life was very good.

Parametric and non-parametric significance tests were used to verify the hypotheses. At $p < 0.05$, a difference or relationship was considered statistically significant.

Results

When assessing the quality of life with the EORTC QLQ-C30 and EORTC-BN20 questionnaires before the surgery, the average was 0.706. On the fifth day after surgery, the mean quality of life decreased and amounted to 0.614. In contrast, 30 days after the surgery, the mean quality of life increased and amounted to 0.707. This value turned out to be comparable to the preoperative period.

The quality of life of patients after tumour surgery was then compared, taking into account their location. The following groups of patients were specified: with tumours located in the temporal lobe (52 patients), in the frontal lobe (45 people), in the parietal lobe (18 patients), in the ventricles of the brain (13 patients) and with tumours located extracerebrally (76 patients). On the 5th postoperative day, a decrease in the quality of life was noted in all the groups mentioned above, the highest in patients with tumours of the frontal lobe (mean -0.104) and in patients after surgery for intraventricular tumours (mean -0.109). The ANOVA test did not detect significant differences between the mean values ($p=0.99$). Due to the fact that in the group of patients with tumours located in the frontal lobe, the distribution of data deviated from the normal distribution and the difference between the variances was detected (Levene's test) ($p=0.0005$), the non-parametric Kruskal–Wallis test was used, which also did not detect significant difference between groups in terms of reduction in quality of life ($p=0.95$). Therefore, it can be concluded that the decline in the quality of life level in the early postoperative period is not related to the tumour location (Table 2).

We also analysed changes in quality of life in subgroups with different tumour location between day 5 and 30 after surgery. Positive mean values of changes in each subgroup indicate a general improvement in the quality of life of patients. Improvement in quality of life was observed in patients with extracerebral tumours (0.115), then with tumours of the temporal lobe (0.097) and tumours of the frontal lobe (0.096). The Shapiro–Wilk test did not reject the hypothesis about the normality of the data distributions in subgroups 2, 3 and 4. The Levene's test did not detect significant differences between the variances in the compared groups ($p=0.94$). Therefore, the parametric one-way ANOVA test was used, which did not detect significant differences between the mean changes in quality of life ($p=0.62$). Hence, it can also be concluded that the increase in the quality of life level after surgery does not depend on the tumour location (Table 3).

Table 2. Quality of life on the 5th postoperative day and the location of the brain tumour

	Parameters	Location of the brain tumour				
		Temporal lobe (1)	Frontal lobe (2)	Parietal lobe (3)	Brain ventricles (4)	Extracerebral position (5)
Life quality on the 5 th day after surgery	N	52	45	18	13	76
	Min	-0.697	-0.333	-0.288	-0.471	-0.610
	Max	0.407	0.174	0.158	0.313	0.333
	Median	-0.102	-0.106	-0.097	-0.117	-0.081
	Average	-0.096	-0.104	-0.086	-0.109	-0.096
	SD	0.169	0.134	0.126	0.225	0.218
Shapiro-Wilk normality test	W	–	0.942	0.979	0.979	–
	W _{kr}	–	0.945	0.897	0.866	–
	Normality	–	no	yes	yes	–
Levene's test (F _{kr} =2.42)	F			5.23		
	p			0.0005		
ANOVA test (F _{kr} =2.42)	F			0.047		
	p			0.99		
Kruskal–Wallis test (H _{kr} =9.49)	H			0.68		
	p			0.95		

Table 3. Quality of life between the 5th and 30th day after the surgery, location of the brain tumour

	Parameters	Location of the brain tumour				
		Temporal lobe (1)	Frontal lobe (2)	Parietal lobe (3)	Brain ventricles (4)	Extracerebral position (5)
Life quality on the 30 th day after surgery	N	52	45	18	13	76
	Min	-0.244	-0.289	-0.243	-0.412	-0.363
	Max	0.572	0.413	0.245	0.279	0.456
	Median	0.092	0.090	0.069	0.117	0.110
	Average	0.097	0.096	0.049	0.070	0.115
	SD	0.157	0.163	0.148	0.184	0.180
Shapiro-Wilk normality test	W	–	0.982	0.937	0.872	–
	W _{kr}	–	0.945	0.897	0.866	–
	Normality	–	yes	yes	yes	–
Levene's test (F _{kr} =2.42)	F			0.20		
	p			0.94		
ANOVA test (F _{kr} =2.42)	F			0.65		
	p			0.62		

Discussion

Over the last decade, there have been improvements in many treatments for brain tumours. However, these changes are still difficult to treat and patients have poor prognosis [7]. Assessment of quality of life is nowadays often used in clinical trials as an indicator of disease severity or as an outcome [8].

In our own research, the quality of life of patients undergoing surgery due to a brain tumour decreased on the fifth day after surgery, while on the 30th day after surgery it reached the level from before surgery.

The study included patients with tumours of the temporal lobe, frontal parietal lobe, then tumours of the ventricles and extra-cerebral tumours. In the postoperative period, a reduction in the quality of life was observed

in all study groups (especially in patients with tumours of the frontal lobe and ventricular area), but no significant differences were found between the means ($p > 0.05$). On the thirtieth day after the surgery, the increase in the quality of life was observed in each group of patients, the highest in patients with tumours located extracerebrally and with tumours of the temporal and frontal lobe. However, no significant differences were found between the mean changes in quality of life ($p > 0.05$). The obtained values indicate that the quality of life in the studied patients did not depend on the tumour location.

Liu et al. [9] showed that the location of the tumour is correlated with the occurrence of certain symptoms that may be reflected in the quality of life. Patients with left hemispheric tumours may have problems with communication even before starting treatment. In addition, the location of the tumour may affect mood changes that may result from damage to the left hemisphere of the brain, while anxiety may result from damage to the right hemisphere. Depression may be more common in the group of patients with malignant gliomas located in the left hemisphere. This is confirmed by studies of patients with low-grade glial tumours located in the ventral frontal cortex and changes in the temporal cortex, which showed statistically significantly worse mood changes after surgery than in patients with tumours located in other brain structures. Cognitive impairment may also be related to the location of the tumour. Left hemisphere tumours were associated with decreased verbal test scores, while processes located in the right brain hemisphere lowered facial recognition scores. In another study of patients with low-grade gliomas, greater cognitive impairment was found in patients with tumours located in the dominant hemisphere. Cancer progression may affect the intensity of cognitive functions [9].

According to Salo et al., patients with tumours located on the right side or in the anterior region have a worse quality of life compared to patients with tumours located on the left side of the brain and posteriorly [10]. In studies by Giovagnoli et al., patients with tumours located in the right hemisphere and in the anterior part had the best quality of life in the postoperative period [11].

Schucht et al. pay attention to the location of low-grade tumours and the safety of their operations, especially gliomas located in the middle. The authors emphasize that the treatment of these tumours is possible and safe when appropriate intraoperative mapping is used. The group of patients with centrally located tumours and patients with tumours of the frontal lobe were compared. Mild neurological deficits were of similar severity. Resolution was achieved in 12.1% of patients with centrally located tumours and 83.9% of patients with tumours in the anterior part of the frontal lobe. In patients with centrally located tumours, poor control

of epileptic seizures was achieved, which could ultimately affect the quality of life of these patients [12].

In the studies by Jakol et al., patients with changes in the occipital lobe showed a reduction in the quality of life after surgery. Reduced visual function was associated with a loss of independence and a reduced quality of life. It was also reported that patients with severe visual impairment had significantly impaired cognitive functioning [13].

According to Cheng et al. [14], there was no difference in the quality of life assessments between patients with supranational and subtentorial tumours, between patients with tumours in the left and right hemispheres, and between patients with tumours located in different lobes, as well as in patients with normal and impaired cognitive functions [14].

Whittle et al. [15] compared the quality of life of patients with intracranial supratentorial tumours and degenerative disease in the preoperative period. It turned out that patients with spine disease in this period showed significant weakness in many domains of quality of life, as well as functional and mood disorders compared to patients with brain tumours.

Conclusions

No influence of the location of the brain tumour on the quality of life of the studied patients was observed. In the early postoperative period, the quality of life decreases, while it improves 30 days after surgery.

Implications for Nursing Practice

Disturbances caused by the location of brain tumours and surgical treatment may be reflected in the daily functioning of patients and in their quality of life. In planning patient care, these dysfunctions should be taken into account, especially in the early postoperative period, when the quality of life turns out to be the lowest.

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Corresponding Author:

Agnieszka Królikowska
 Department of Neurological and Neurosurgical Nursing,
 Faculty of Health Science,
 The Ludwik Rydygier Collegium Medicum in Bydgoszcz,
 The Nicolaus Copernicus University Toruń, Poland
 Łukasiewicza 1 street, 85-821 Bydgoszcz, Poland
 e-mail: agakrolikowska6@wp.pl

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Author Contributions: Agnieszka Królikowska^{A-E}, Piotr Zieliński^A, Marek Harat^A, Renata Jabłońska^{F,G}, Robert Ślusarz^{G,H}, Beata Haor^F, Karolina Filipka^{F,G}

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