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Quality of life of patients treated with radiotherapy

Jakość życia chorych leczonych metodą radioterapii

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Streszczenie

Wstęp: Radioterapia jest jedną z najczęściej stosowanych metod leczenia przeciwnowotworowego. Pomimo ciągłego rozwoju technologicznego może powodować wystąpienie objawów niepożądanych, a w rezultacie obniżać jakość życia pacjentów poddawanych radioterapii.

Cel pracy: Analiza jakości życia chorych leczonych metodą radioterapii oraz określenie wpływu wybranych czynników klinicznych i związanych z powikłaniami leczenia na jakość życia chorych onkologicznie.

Materiał i metody: Badaniem objęto 100 chorych z rozpoznaną chorobą nowotworową, w tym 47 (47%) kobiet i 53 (53%) mężczyzn, ze średnią wieku 62,1 (±9,47) lat. W badaniu wykorzystano standaryzowany kwestionariusz EORTC QLQ-C30, pozwalający ocenić jakość życia pacjentów z chorobą nowotworową oraz kwestionariusz własnej konstrukcji zawierający dane socjodemograficzne i kliniczne. Zebrany materiał empiryczny poddano analizie statystycznej. Za poziom istotności przyjęto $p<0,05$.

Wyniki: W przebadanej grupie chorych średni wskaźnik ogólnej jakości życia wynosił 50,5 (±16,28) z medianą 50. Najwyższą jakość życia u badanych odnotowano w sferze funkcjonowania poznawczego, natomiast najniższą w obszarze funkcjonowania społecznego. U 72% badanych występowały powikłania leczenia radioterapią. Podczas analizy stwierdzono, że ogólna jakość życia oraz funkcjonowanie we wszystkich domenach są niższe w stosunku do wyników pacjentów, u których objawy niepożądane leczenia nie wystąpiły. W wyniku analizy stwierdzono także, że u chorych na nowotwory głowy i szyi, będących napromienianych na ten sam obszar, poziom funkcjonowania poznawczego jest istotnie niższy niż poziom funkcjonowania w tej samej domenie pacjentów napromienianych w okolicy klatki piersiowej ($p<0,008$) i w okolicy narządów rozrodczych ($p<0,007$).

Wnioski: Występuje zróżnicowanie jakości życia pacjentów bez i z powikłaniami leczenia promieniowaniem jonizującym, które mają znaczny wpływ na jakość życia pacjentów onkologicznych. Lokalizacja obszaru napromienianego podczas radioterapii ma znaczący wpływ na jakość życia badanych. Leczenie radioterapią wpływa negatywnie na jakość życia chorych.

Słowa kluczowe: nowotwór, leczenie onkologiczne, promieniowanie jonizujące, jakość życia, powikłania radioterapii

Summary

Abstract: Radiotherapy is one of the most commonly used anticancer treatments. Despite continuous technological development it may cause adverse symptoms, and as a result reduce the quality of life in patients undergoing radiation therapy.

Objective of the work: Analysis of the quality of life of patients treated with radiation therapy and the effect determination of selected factors and their clinical complications on the quality of life of oncological patients.

Material and methods: The study included 100 patients diagnosed with cancer, including 47 (47%) women and 53 (53%) men, with an average age of 62.1 (± 9.47) years. The study used a standardized questionnaire EORTC QLQ-C30, in assessing the quality of life of cancer patients and a questionnaire of our own design containing sociodemographic and clinical data. The collected empirical data were analyzed statistically. The level of significance was $p <0.05$.

Results: In the group of patients tested the average rate the overall quality of life was 50.5 (± 16.28) with a median of 50. The highest quality of life in the test reported in the field of cognitive functioning, and the lowest in the area of social functioning. In 72% of patients

experienced complications of radiotherapy. During the analysis, it was found that the overall quality of life and functioning in all domains is lower comparing to the results of patients with no side effects of treatment. The analysis also found that in patients with head and neck cancer, which are irradiated at the same area, the level of cognitive functioning is significantly lower than the level of functioning in the same domain patients irradiated in the chest area ($p < 0.008$) and in the area of reproductive organs ($p < 0.007$).

Conclusions: There is a diversity of quality of life of patients with and without complications of treatment with ionizing radiation, which have a significant impact on the quality of life of cancer patients. Location area irradiated during radiotherapy has a significant impact on the quality of life of patients. Treatment with radiation therapy adversely affects the quality of life of patients.

Keywords: Cancer, cancer treatment, ionizing radiation, quality of life, complications of radiotherapy

Introduction

The quality of life for patients treated with anticancer concept is crucial, bearing the multidimensional and interdisciplinary features [1-2]. Given the medical aspects, usually described as a subjective assessment of the patient's life and satisfaction from it, referring to the ideal state, determined by the patient [2-3]. The study of quality of life are becoming increasingly important, it is gaining in popularity because of the holistic approach of medical staff to patients, thereby increasing researchers interest of subjective patients feelings and their assessment of the situation, in which they find themselves. [2]

The population of patients with cancer in Poland increases its size. This is evidenced by the data presented by the Ministry of Health, according to which there was a significant increase in new cases in 2014 [4]. Cancer is the second most common cause of death in Poland, therefore, constitute a significant problem among the elderly, but most of all becomes a major cause of premature mortality in the population before the age of 65 [4]. The situation in the world is presented in a similar manner, where the number of new cancer cases increases, but also the number of deaths because of them [1, 4-5]. Patients diagnosed with cancer are subjected to anticancer treatment. One method of treatment is radiation therapy, which is used in approximately 60% of patients diagnosed with malignancy. Unfortunately, only about half of these people treatment with ionizing radiation is used as a variant of radical therapy, which is expected to lead to a permanent remission of the disease [1, 6]. Radiotherapy is one of the most

common, but also one of the most effective treatments for cancer patients, which is still developing, and new methods of radiation allow for the best possible protection of healthy tissues [7-9]. Despite the fact that, radiation therapy is a treatment method capable of causing a wide variety of local (e.g. radioreaction, skin, on the mucous, xerostomia), but also systemic (e.g. a continuous fatigue caused by therapy, difficulty with concentration, nausea, vomiting), adverse reactions [10 -13]. In addition, a treatment with ionizing radiation is associated with mental deterioration of patients, which affects the whole of clinical complications occurring, but also fear and anxiety about their health and future. Changes in appearance, deterioration in general health and taking therapies forced other changes in physical functioning and the broader functioning of the psycho-social, determine the deterioration of the quality of life of patients treated with radiotherapy [2, 14].

According to Yucel B. et al., the radiation has a significant negative impact on patients suffering from various types of cancer. The same authors suggest the need of regular assessment of life quality during the investigation of the therapeutic among the group[1]. Similarly Żmijewska-Tomczak M. et al. indicate the adverse effect of treatment with ionizing radiation in the quality of life in patients with head and neck malignant tumors [10]. And Y. Yu et al., in the conclusions of their research emphasize the role of preventive education of oncological patients. They obtained results that nursing educational activities among a group of cancer patients, can significantly improve their quality of life [15]. We can conclude, that the main aim of conducting research on the quality of life of cancer patients is to assess the state of their health and functioning in areas that are important to them. However, they are also important in the education and identification of causes of lower life satisfaction and the improving standards of behavior in patients with anticancer treatment [1, 16-18].

Objective of the work

Analysis of the quality of life of patients treated with radiation therapy and to determine the effect of selected clinical factors and complications associated with the treatment on quality of life of oncological patients.

Material and methods

The study group included 100 patients, including 47 (47%) women and 53 (53%) of men diagnosed with cancer, treated with radiotherapy in 2016 in the Department of Radiotherapy of Warmia - Mazury in Olsztyn Oncology Center. The patients were informed about the purpose of the study, they had the opportunity to ask questions

and to get a clarification. Everyone expressed their deliberate approval to participate in the study. The research method of our own design used a diagnostic survey and a questionnaire to collect data and standardized questionnaire EORTC QLQ-C30 (European Organization for Research and Treatment of Cancer) in assessing the quality of life of patients with cancer. The use of the questionnaire was approved by the European Organization for examining the quality of life in Brussels. The questionnaire EORTC QLQ-C30 includes five scales assessing the functional status of the patient, relating to: physical functioning, social roles - functioning at work, emotional functioning, cognitive functioning - memory and concentration, social functioning, three scales assessing symptoms: fatigue, nausea and vomiting, and pain, as well as the scale of the overall assessment of the state of health / quality of life. Additionally, it consists of six individual questions, evaluating symptoms such as loss of appetite, suffocation, insomnia, constipation, diarrhea and financial difficulties as a consequence of the disease. Responses to the questionnaire are in a 4-point scale: ("never" (1) "sometimes" (2) "often" (3) "very often" (4) evaluating the severity of the analyzed parameters. For each questions an inpatient selects one answer.

The data collected using a questionnaire EORTC QLQ-C30 were statistically analyzed in accordance with the guidelines ESTRO. The calculations of the strict rate were made, and then in accordance with the recommendations of linear transformation was made, which gave a rate value, which provided for all scales and single symptoms between 0 and 100. The higher the functional scale factor the better overall health and quality of life. In turn, the higher score for the individual symptoms corresponded to a greater symptom severity – an inpatient felt worse. The collected data were statistically analyzed using the Statistica PL 12 (StatSoft). For the analysis results, the following statistical methods were used: position and variability standards, chi-square test (χ^2) Test Mann-Whitney U (Z), ANOVA Kruskal - Wallis test (H). For hypothesis testing the level of significance of $p < 0.05$was taken.

Results

The study included 100 patients, aged from 40 to 80 years, with an average age of 62.1 (± 9.47) and median of 63 years. The most numerous group were people over 61 years of age (n = 59; 59%). Only ⅓ of tested was economically active and 56% (n = 56), were retired. Over half of the patients declared to be married (n = 58; 58%). The most commonly diagnosed cancer in the test group was a lung cancer (n = 17; 17%), as well as larynx cancer (n = 12; 12%). Almost ⅓ of patients (n = 31; 31%) was subjected to the head and neck irradiation, 29% (n = 29) of the chest, 15% (n = 15) of the abdomen and 25% (n = 25) the reproductive organs area. During the

treatment with ionizing radiation the majority of patients (n = 73; 73%) experienced side effects of radiation therapy, such as: continuous fatigue, abdominal pain and bloatedness. mouth mucous reaction, nausea and vomiting, diarrhea and cough. The most common complication in the study group was postradiation reaction at the site irradiated (n = 44; 44%). The patients also reported a number of complications, so called "other", like: headaches, dizziness, earaches, hair loss, poor attention, dining problems, abnormal urination and stool, suffocation, lack of appetite, back pain and pain in the reproductive organs area. The analysis shows that the overall indicator of the quality of life of patients treated with ionizing radiation is in the range from 25 to 83.3 points, and its average value is 50.5 ± 16.28 with a median of 50. In analyzing individual domains indicators for treated with radiotherapy quality of life in each of these domains were defined. The detailed descriptive statistics for overall quality of life and the functioning scale of patients treated with ionizing radiation are presented in Table 1.

Table 1. Descriptive statistics for the overall quality of life and functioning scales of patients in the study group

Scales functioning QLQ-30	N	M	Me	min	max	SD
Overall quality of life	100	50.5	50	25	83.3	16.28
Physical functioning	100	72.47	73.33	20	100	15.53
The functioning of the roles, work	100	50.33	50	0	100	25.18
Cognitive functioning	100	76.33	83.33	0	100	25.97
Emotional functioning	100	61.42	58.33	16.67	100	15.56
Social functioning	100	45.67	41.67	0	100	25.58

Explanations: N – number, M - the arithmetic mean, SD - standard deviation, Me - median, min. - min, max. - maximum

The analysis found that the highest quality of life of patients presented in terms of physical function (M = 72.47) and cognitive function (M = 76.33). Functioning in roles / work is at the same level as for the overall quality of life (M = 50.5) of patients undergoing radiotherapy treatment, while the lowest level in relation to all domains proved to be the area of social functioning (M = 45.67). In 73% of all surveyed had complications after the radiotherapy treatment (RTH), therefore aspect of variation of quality of life of patients with adverse reactions RTH was analyzed, and patients who had no complications of this method of anticancer treatment. For comparison obtained in quality of life the Mann-Whitney U (Z) test

was used to compare the two groups of independent variables. The detailed results are presented in Table 2.

Table 2. Comparison of descriptive statistics for the quality of life of patients with complications and without complications, and an indication of the significance of differences

QLQ-30	Complications due to radiotherapy treatment											
	General		Physical functioning		Functioning in the roles, work		Cognitive functioning		Emotional functioning		Social functioning	
	P	B / p	P	B / p	P	B / p	P	B / p	P	B / p	P	B / p
N	72	28	72	28	72	28	72	28	72	28	72	28
M	44.0	67.3	69.1	81.2	42.4	70.8	70.4	91.7	56.5	74.1	37.5	66.7
Me	41.7	66.7	70.0	80.0	33.3	66.7	66.7	100.0	58.3	66.7	33.3	66.7
min	25.0	33.3	20.0	40.0	0.0	33.3	0.0	50.0	16.7	58.3	0.0	33.3
max	66.7	83.3	100.0	100.0	100.0	100.0	100.0	100.0	91.7	100.0	100.0	100.0
SD	12.3	13.0	15.2	13.0	22.4	20.1	27.3	13.2	13.4	13.5	23.4	18.1
FROM	-6.05		-3.73		-5.18		-3.97		-5.08		-5.39	
p	0.0001 ***		0.0002 ***		0.0002 ***		0.0007 ***		*** 4 0.000		0.0001 ***	

*** p <0.001

Explanations: P - patients with complications RTH, B / p - patients without complications RTH, N - number M - the average rate, SD - standard deviation, Me - median, min. - minimum MAX.- maximum, p - level of significance, Z - U Mann-Whitney

The results draw a conclusion that the overall quality of life of patients suffering from complications of treatment with ionizing radiation is significantly lower (p <0, 0001) than in patients who do not have the side effects of treatment. On the basis of this analysis, it was found that the quality of life of patients who experienced complications RTH is significantly lower in each of the domains of the operation, the lowest average rate of the quality of life is in the social functioning domain of (M = 37.5 - patients with complications RTH; M = 66.7 - patients without complications RTH), and the highest in the cognitive domain (M= 70.4 - patients with complications RTH; M = 91.7 - patients without complications RTH) for the entire study group.

In the next stage, we analyzed in detail the complications occurring in studied patients, after that, the affection of different complications on the quality of life and functioning of the inpatients were examined. In this case the test was used for analysis a comparison of a number of independent samples groups Kurskalla - Wallis test (H). The analysis found that the skin radioreaction and the group "others" have a significant impact on the overall quality of life and functioning of patients. The constant fatigue significantly affects the operation in the area of physical, cognitive, emotional and social functioning, as well as the overall quality of life. The quality of life dimension in general and the functioning of the physical and emotional impact are statistically significant symptoms such as: nausea and vomiting, whereas abdominal pain and bloatedness have a significant impact on the overall quality of life of oncological patients. The detailed results of the analysis are presented in Table 3.

Table 3. The significance of complications occurring and the level of quality of life

Occurring complications		Overall quality of life	Physical functioning	The functioning of the roles, work	Cognitive functioning	Emotional functioning	Social functioning
	N						
Skin radioreaction at the site irradiated	44	0.002 ***	0.001 ***	0.0003 ***	0.001 ***	0.007 ***	0.001 ***
Mouth mucous reaction	17	0.88	0.89	0.48	0.15	0.31	0.46
Xerostomia	19	0.99	0.85	0.92	0.06	0.40	0.50
Cough	11	0.08	0.11	0.80	0.36	0.94	0.69
Diarrhea	12	0.34	0.59	0.73	0.38	0.73	0.10
Nausea / vomiting	12	0.01 **	0.04 *	0.43	0.35	0.01 **	0.19
Abdominal pain, bloatedness	21	0.03 *	0.84	0.16	0.84	0.21	0.13
Limited mobility of the shoulder joint	2	0.47	0.30	0.61	0.91	0.16	0.07
Constant fatigue	23	0.0001 ***	0.001 ***	0.13	0.04 *	0.02 *	0.001 ***
Other	42	0.0003 ***	0.02 *	0.0005 ***	0.0007 ***	0.0003 ***	0.002 ***

* P <0.05; ** p <0.01; *** p <0.001

After analyzing the results of Table 3 it can be concluded that the adverse effects caused by radiotherapy as an anticancer therapy, such as: skin radioreaction, nausea and vomiting,

abdominal pain, bloatedness, constant fatigue and other complications, significantly reduce the quality of life. In the next stage of the analysis it was examined, to which extent the diagnosed tumor type and the area irradiated affect the incidence of complications, for which a chi-squared test -χ was used 2. However, the result of the analysis shows no significant effect of the irradiated region of the body (χ^2= 8.08; p <0.23) or the type of cancer (χ^2= 10.33; p <0.11) on the frequency of occurrence of adverse reactions after RTH. In the next step, the effect of the area irradiated on quality of life and the level of functioning of the patients treated with radiotherapy were tested, to which test was used to compare several samples of independent groups Kruskall-Wallis test (H), and for a detailed analysis of intergroup differences nonparametric test was used, a multiple comparisons for all ranks. The analysis was reported a statistically significant (p <0.001) effect of the irradiated area on the cognitive functioning of patients treated with ionizing radiation. A detailed analysis of intergroup differences of significance was reported for cognitive function depending on the area irradiated in accordance with the location of the diagnosed tumor. The results are shown in Table 4.

Table 4. The significance of intergroup differences for cognitive functioning including the irradiation area

Cognitive functioning	Head and neck area	Thorax area	Abdomen area	Reproductive organs area
Head and neck area		0.008 ***	0.165	0.007 ***
Thorax area	0.008 ***		1,000	1,000
Abdomen area	0.165	1,000		1,000
Reproductive organs area	0.007 ***	1,000	1,000	

* P <0.05; ** p <0.01; *** p <0.001

Analyzing the detailed test results, we can conclude that the quality of life of patients in the area of cognitive functioning, irradiated in the head and neck area, is significantly lower than the cognitive functioning of patients irradiated in the chest area (p <0.008) and irradiated in the area of the reproductive organs (P < 0.007).

Discussion

In the foreign language literature, but also native literature, you can find a lot of research results, which are related to the quality of life of patients irradiated, but they often focus on specific questionnaires dedicated to specific areas of irradiation. This may be a difficulty when comparing the obtained results. Some of the results also apply to the quality of life and functioning of patients before treatment, during and after therapy, which can produce a very wide range of information concerning fluctuations in the level of quality of life depending on the stage of therapy, in which patients are located.

The study included patients at different stages of treatment with ionizing radiation. The indicator of overall quality of life of patients was analyzed. The study showed that it was within the range of from 25 to 83.3, where the average quality of life was 50.5 and the median 50. King and An et al., indicate that the difference of 10 points is considered clinically significant in the context of improving or deteriorating the quality of life, and by-Tomczak Żmijewski et al., a difference of 20 points on a scale of 0 to 100 is a result of great importance [10, 19-20]. The results obtained with respect to the above described recommendations allow us to conclude that the quality of life in the studied group of patients is clearly reduced. The similar results obtained Żmijewska-Tomczak M. et al. They showed that radiation therapy had a significantly negative impact on the quality of life of patients with head and neck cancer, especially at the end of the course of therapy [10]. Identical results were obtained by Bjordan wsp.Wskazywały showing the quality of life reduction of patients during the period of 1 and 2 months after the start of radiotherapy [21]. While Budischewski et al., by subjecting test of 61 women with breast cancer at the beginning of the RT, and 6 weeks thereafter, indicated a significant negative impact of ionizing radiation therapy, among other roles in the functioning or the cognitive functioning of patients [22]. In a similar context, you can put Bansal'a et al study. The researchers found the indicators of general health and mental, social and emotional functioning significantly decreased during the treatment with ionizing radiation. They also showed that one week after the end of the radiotherapy course above indicators have improved, interestingly, none of them, however, returned to the values such as before radiotherapy [23]. De Graeff et al., similarly observed significantly lower scores for the overall health of a group of patients undergoing radiotherapy compared to the results before its launch. [24] There were also results found in opposition to the cited above. C. Xiao et al., examined the quality of life of patients in the early stages of breast cancer after the conserving surgery and following radiotherapy. According to the authors there were no significant changes in the quality of life of patients who have had a relatively stable quality of life, but these results may have been the result of breast

conserving surgery [25]. B. whereas Yucel et al. confirmed that ionizing radiation therapy adversely affects the quality of life of patients with various types of cancer, but also showed that the index of quality of life for these patients is improved within 6 months after the completion of this form of treatment for their cancer. The same authors also obtained the observation that in a study conducted, the quality of life was determined not only by the form of the treatment, but also by the factors specific to the patient, such as tumor stage or the irradiation field [1]. Similarly, in our study we have shown that the type and location of the tumor significantly affects the quality of life of patients undergoing radiotherapy. As a result of detailed analysis, the results show that the cognitive functioning of patients irradiated in the head and neck area is significantly lower than the cognitive functioning of patients irradiated for different areas. Fernández's et al. results, also indicated a large deterioration in the quality of life in the area of cognitive function after treatment with radiation therapy, wherein the head area was in the irradiation zone and the brain was the irradiated organ [26]. Irradiation of the brain tissue, which has regeneration restrictions can cause disturbances in the cognitive functioning of patients, so the above could have a negative impact on quality of life [27].

Given the side effects occurring during radiotherapy, in our study we analyzed the degree of variation in the quality of life of patients without and with complications of treatment with ionizing radiation. Our results showed that patients with side effects of treatment have a significantly lower rate of overall quality of life and functioning than patients who had no complications. As a result of detailed analysis we found that skin radioreaction has a significant effect on the overall quality of life and functioning of patients in all domains. It was also shown that the constant fatigue adversely affects the functioning in the physical, cognitive, emotional and social area, as well as the overall quality of life. Nausea and vomiting, have the negative impact on the overall quality of life and on physical and emotional functioning and abdominal pain and bloatedness significantly lower overall quality of life of patients. Similar results were presented by Żmijewska-Tomczak M. et al., who demonstrated that fatigue reported by patients at the end of a course of radiotherapy as a significantly adverse symptom of the deteriorating quality of life of patients, as well as nausea, constipation and pain [10]. Similar results were obtained by Jereczek-Fossa et al., showing that the fatigue can affect the overall quality of life more than the pain, sexual dysfunction or other side effects of anticancer therapy [28]. In conclusion, we can say that the treatment of radiotherapy and occurring in the course of its side effects are factors having a significant negative impact on the quality of life of cancer patients. Research on quality of life in this group of patients are a source

of knowledge about the disorders in their functioning and, consequently, allow to take an appropriate action to reduce the discomfort caused by antineoplastic therapy.

Conclusions

1. Patients treated with radiotherapy, who experienced side effects of treatment, have significantly lower quality of life in all domains comparing to patients who do not have complications of treatment.
2. Complications occurring after radiotherapy, have a significant negative impact on the overall quality of life of the inpatients and their functioning in all domains.
3. Patients irradiated in the head and neck area have a significantly lower quality of life in the area of cognitive functioning compared to patients irradiated to other areas.

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