

Ewa Szeliga, Ewelina Czenczek-Lewandowska, Aldona Kontek, Andżelina Wolan-Nieroda, Agnieszka Guzik, Katarzyna Walicka-Cupryś

Institute of Physiotherapy, Medical Department, University of Rzeszow, Poland

# Evaluation of the quality of life after surgical removal of lung cancer

The authors declare no financial disclosure

## Abstract

**Introduction:** Morbidity and mortality attributed to lung cancer remain at high levels, especially where men are concerned. The surgery for lung cancer involves removing neoplastic lesions in order to save the largest possible part of the healthy lung. Of importance is also pre- and post-surgical rehabilitation. The aim of this thesis is to gauge the quality of life of the patients who have had their lung cancer surgically removed.

**Material and methods:** The study was conducted on 72 patients (52 men and 20 women) after surgical removal of lung cancer. The subjects were examined prior to, a week after and six months following surgery. The investigation employed the standardised questionnaires to assess the quality of life, i.e. EORTC QLQ-C30 and EORTC QLQ-LC13, as well as the visual analogue pain scale (VAS). Statistical analyses were performed using the Anova Friedman test and Dunna test, and p-value calculated in multiple comparisons with significance level assumed at  $p < 0.05$ .

**Results:** During six months after the operation, the quality of life deteriorated in relation to the one before operation as evidenced by the functioning scale at the level of  $p < 0.001$ . Overall symptom scale, as well as symptomatic scale and the VAS scale showed that some symptoms increased significantly in the early period after surgery  $p < 0.001$ , then with the passage of time, the patients felt improvement, however, some of them, e.g. pain sensations can persist till six months after surgery.

**Conclusions:** Surgical removal of lung cancer is associated with a significant deterioration of the quality of life in the early period after surgery and can persist till six months later.

**Key words:** quality of life, lung cancer, thoracotomy, oncological patient

**Adv Respir Med. 2019; 87: 14–19**

## Introduction

Neoplastic diseases occupy a leading position in the list of civilisation diseases and causes of death [1]. According to the World Health Organization (WHO), particular attention should be paid to carcinoma of the lungs, which is the most common cause of death among all malignant neoplasms. In 2018, carcinoma of the lungs caused the death of 388 000 patients in Europe [2, 3].

Neoplastic disease, especially in its advanced stages, is associated with suffering, fati-

gue, shortness of breath, loss of appetite, weight loss, the physical pain related to radical treatment, as well as mental pain, which can seriously affect quality of life in different dimensions [4, 5]. Several studies have indicated a relationship between overall survival and the differences pertaining to the quality of life of healthy persons compared to cancer patients. Recent studies have shown a significant correlation between the severity of symptoms of advanced neoplastic disease of the lungs and the length of the patient's life [6]. Furthermore, modern palliative care and support from the

**Address for correspondence:** Ewelina Czenczek-Lewandowska, Institute of Physiotherapy, Medical Department, University of Rzeszow, Poland, e-mail: e.czenczek@univ.rzeszow.pl  
DOI: 10.5603/ARM.a2019.0002

Received: 30.10.2018

Copyright © 2019 PTChP

ISSN 2451–4934

closest people can not only lead to significant improvement in the quality of life of patients, but also prolong the survival of those with non-small cancer [7]. However, to determine the worst symptoms impacting on the quality of life, one needs to examine which of the manifestations are the most burdensome for the patient. In the United States and Europe, there are some reports concerning the severity of symptoms of persons with advanced carcinoma of the lungs, however, there remains a lack of similar studies on subjects with carcinoma of the lungs that has not yet progressed to the advanced stage [8–10].

Methods for treating microcellular non-small cell- and lung cancer vary considerably. Surgical treatment in stages I, II and IIIA is only used in the treatment of non-small cell lung carcinoma and is possible only in 20 to 30% of patients, because most subjects do not qualify for this treatment due to higher advancement of the disease. The purpose of this type of treatment is radical resection of the primary tumour and any metastases in the mediastinum and hilus of the lymph nodes. This is due to post-operative pain, lung ventilation disorders and other complications that may occur when performing a thoracotomy [11]. Unfortunately, the survival rate following surgical treatment is not satisfactory; it is often the cause of relapse leading to remote metastasis, which contributes to the fact that approximately 50% of patients operated on survive only five years following surgery. Many studies have shown that among some individuals who have already been diagnosed with the disease, micrometastases occur during treatment. For this reason, following surgery, chemotherapy and radiation therapy are the most commonly used treatment methods — they are also applied in the treatment of smallcell carcinoma [12, 13].

The assessment of the quality of life is useful not only in a subjective evaluation of the health status of the patient, but also in the monitoring of drugs and their effects on the health of the patient. This is done using a number of questionnaires aimed at investigating a disease entity. One such research tool for people suffering from lung cancer is the European Organisation for Research and Treatment of Cancer Quality of Life Questionnaire (EORTC QLQ-C30) with the lung cancer module QLQ-LC13 [14].

Nowadays the high quality of life of patients after cancer surgical treatment is one of the main goals of comprehensive treatment [15]. However, surgical treatment of lung cancer is so invasive that it lowers QoL in the early period after surgery, nevertheless, with the passage of

time, in the period of convalescence after the procedure, the patient should feel improvement in functioning in various spheres of life. The aim of the current study was to assess the quality of life of the patients before, the week after and six months following the surgical removal of lung cancer.

## Material and methods

### Description of the study group

The initial number of patients who entered the study amounted to 112 persons treated in the Department of Chest Surgery at the Specialist Team of Tuberculosis and Lung Diseases. The incompleteness of the results did not allow everyone to be included in the analysis. After applying the exclusion criterion, a total of 72 patients (20 women and 52 men) after surgical treatment of lung cancer were examined. The age of the subjects ranged from 40 to 78 years (average 62.4 years; standard deviation = 8.9).

### Procedure

Data were collected from February 2014 to November 2017. The study included patients qualified for surgery for the removal of the lung lobe or the entire lung, who gave their consent to the test, and the exclusion criteria were as follows: no consent for the study, incomplete results, e.g. no interview during follow up visit within 6 months after the surgery. The individuals qualified for the study were at the stage of surgical treatment. The attending physician decided about further treatment. Some of the subjects had adjuvant chemotherapy and radiotherapy. After the surgery, each person was qualified for rehabilitation.

### Research tools

Research in the form of medical history was performed for each patient prior to surgery, a week after the procedure and was repeated six months after the operation. Each person that agreed to participate in the study was informed about the purpose of testing and the fact that he/she could not answer some of the questions or withdraw his/her consent to their conduct. All of the patients before and a week after surgery participated in rehabilitation.

The research method was a standardised questionnaire for assessing the quality of life of people with cancer using the EORTC QLQ-C30 (3.0 version), as well as the additional module EORTC QLQ-LC13, designed for patients with carcinoma of the lungs; a VAS pain scale was also used.

The EORTC QLQ-C30 and LC13 questionnaires are standardised research tools to assess the quality of life in oncological patients, as well as the impact of cancer treatment on the patient’s functioning. The EORTC QLQ-C30 questionnaire consists of 30 questions which are grouped in five scales assessing the patient’s functioning in the physical, emotional and social sphere, as well as social roles, memory and concentration. The next three subscales are used to evaluate symptoms such as nausea and vomiting, fatigue and pain sensations. The final subscale concerns the overall assessment of health and the quality of life. The answers are scored from 0 to 7 points, where the higher score represents higher quality of life. The QLQ-LC13 module assesses the severity of symptoms in the scale from 0 to 100 points, where the highest result means the best state of being of the patient [16]. The consent for the use of the above-mentioned questionnaires in the study was obtained from the European Organisation for Research and Treatment of Cancer (Brussels, 2014).

**Tools/statistical tests**

Statistical analyses were performed using the Anova Friedman test and Dunna test (post-hoc), and calculated the p-value in multiple comparisons with significance level at  $p < 0.05$ . Statistical analysis was carried out with the Statistica 13.1 software (StatSoft, Poland).

Statistical examination of the collected data was based on a comparison between each of the three or four groups, on the basis of the observation of the same group of objects measured three times in the case of the EORTC-QLQ-C30 and LC 13 (before, a week and a half and six months after surgery), and four times in the case of the VAS (before, the day after, one week and six months after surgery).

Due to a wide range of the studied functional areas included in the questionnaires EORTC QLQ-C30 and EORTC QLQ-LC13, the focus was

on selected areas, i.e. Functional scale, Overall Symptom scale, Symptomatic scale, and pain sensations that were analysed using the VAS scale and omitting e.g. self-assessment of the quality of life.

**Results**

**The distribution of points in the EORTC QLQ-C30 questionnaire before, a week and a half and six months after surgery: functioning scale**

The value of the coefficient p in the Friedman test was given as  $p < 0.001$ . To determine in detail the moments that mark differences within studies, multiple comparisons were analysed to achieve the final results.

The outcomes of three consecutive measurements of the functional scales were not equal (Friedman  $p < 0.001$ ). They differed in the measurement before and after a week, and before and after six months. There were no significant differences in the measurements made after one week and six months in relation to each other.

Changes in overall functioning were significant between the studies where it concerned the time before surgery and one week following treatment. Significant improvement or worsening was not observed six months after treatment (Table 1).

**The distribution of points in the EORTC QLQ-C30 questionnaire before, a week and a half and six months after surgery: overall symptom scale**

The results of three successive scores of the scales of symptoms were not equal (Friedman  $p < 0.001$ ). They differed in the measurement before and after a week, and before and after six months. There were no significant differences in the measurements made after one week and six months in relation to each other.

The intensity of feelings of discomfort, i.e., fatigue, nausea and vomiting, pain, shortness

**Table 1. EORTC QLQ-C30 Questionnaire - functional scales - analysis of results of repeated measurements**

Functional scales Measurement period	Mean rank	Sum of ranks	$\bar{X}$	SD	Friedman's Anova	Dunn'sTest (post-hoc) $p < 0.05$		
						Before	After a week	After six months
Before	1.38	49.50	24.56	7.88	$p < 0.001$	–	37	30.5
After a week	2.40	86.50	33.72	9.18		37	–	6.5
After six months	2.22	80.00	32.99	7.75		30.5	6.5	–

$\bar{X}$  — arithmetic mean; SD: standard deviation; p-level of probability

**Table 2. EORTC QLQ-C30 Questionnaire - symptoms scales - analysis of results of repeated measurements**

Symptoms scales Measurement period	Mean rank	Sum of ranks	$\bar{X}$	SD	Friedman's Anova	Dunn'sTest (post-hoc)		
						Before	After a week	After six months
Before	1.03	37.00	4.06	7.76	$p < 0.001$	–	60	45
After a week	2.69	97.00	32.55	10.52		60	–	15
After six months	2.28	82.00	23.29	9.98		45	15	–

$\bar{X}$  — arithmetic mean; SD: standard deviation; p-level of probability

**Table 3. EORTC QLQ-CL13 Questionnaire — symptoms scales — analysis of results of repeated measurements**

Symptoms scales Measurement period	Mean rank	Sum of ranks	$\bar{X}$	SD	Friedman's Anova	Dunn'sTest (post-hoc)		
						Before	After a week	After six months
Before	1.15	41.50	6.87	8.25	$P < 0.001$	–	47.5	44
After a week	2.47	89.00	22.07	7.03		47.5	–	3.5
After six months	2.38	85.50	21.14	9.86		44	3.5	–

$\bar{X}$  — arithmetic mean; SD: standard deviation; p-level of probability

of breath, sleep disturbances, loss of appetite, constipation, diarrhoea increased significantly week after treatment compared to the state before the operation ( $p < 0,001$ ). However, six months after treatment, symptoms significantly decreased (Table 2).

### The distribution of points in the questionnaire EORTC – QLQ- LC 13 before, a week and a half and six months after surgery: Symptomatic scale

The results of three consecutive measurements of the symptom scale were not equal (Friedman  $p < 0.001$ ). They differed in the measurement before and after a week, and before and after six months. There were no significant differences in the measurements made after one week and six months in relation to each other.

The presence of symptoms such as dyspnoea, cough, haemoptysis, canker sore, trouble swallowing, numbness of the limbs, hair loss, chest pain, pain in the arm and shoulder, and pain in other parts of the body was less frequent before medication, significantly intensified in the week after the operation and remained at the same high level six months following treatment (Table 3).

### The distribution of points in the VAS scale before, the day after, one week and six months after surgery

The results of three consecutive measurements of the VAS scale were not equal (Friedman

$p < 0.001$ ). They differed in the measurement before and after the first day, before and after a week, after the first day and after six months and after a week and after six months. They did not differ in the measurement before and after six months and after the first day and after a week (Table 4).

The analysis showed an increase in pain the day after surgery, compared to pain experienced prior to the operation. Then, with the passing of time, the pain decreased significantly, but in the last measurement was no less than prior to treatment.

## Discussion

Neoplastic disease is a very stressful illness due to different prognoses for survival and various clinical treatment courses. The rapid development of medical achievements has meant that the chances of survival among cancer patients have increased [17]. For most people, the disease still has negative associations with death, and many often tend to think of it as a chronic disease. Therefore, it is important to influence the improvement of the quality of life for those undergoing oncological treatment by attaching to it greater importance [18, 19].

Our study showed that the quality of life of patients, even six months after the operation, did not return to the state it had been before the operation. The quality of life before and one week after surgery had significantly deteriorated,

**Table 4. VAS scale — analysis of results of repeated measurements**

VAS scale Measurement period	Mean rank	Sum of ranks	$\bar{X}$	SD	Friedman's Anova	Dunn's Test (post-hoc)			
						Before	After the first day	After a week	After six months
Before	1.21	43.50	0.44	1.32	$p < 0.001$	–	90.5	70	25.5
After the first day	3.72	134.00	7.58	2.51		90.5	–	20.5	65
After a week	3.15	113.50	5.36	1.90		70	20.5	–	44.5
After six months	1.92	69.00	1.89	1.04		25.5	65	44.5	–

$\bar{X}$  — arithmetic mean; SD: standard deviation; p-level of probability

then slightly got better six months after surgery. On the whole, some symptoms showed some improvement, e.g., nausea, vomiting, headache, shortness of breath and sleep disorders decreased. While the scale of functioning and scale of symptoms slightly ameliorated, the patients still experienced problems with physical functioning, shortness of breath and pain in the arm and chest [20, 21].

According to Wołowicka [22], surgery has a major impact on physical functioning in terms of performance and overall quality of life. With the passage of time following surgery, the quality of life improved. In our study, we also noted change for the better over time following surgery; however, improvement for the functioning scale and the scale of symptoms was small, while the largest advancement was noted for the scale of symptoms.

In relation to the mental dimension of the quality of life, this improved with the passage of time since surgery and the strongest symptoms of depression and clasp annoy patients in the perioperative period. These conclusions were also reached by other researchers [23, 24].

The majority of patients experienced weakness and needed to rest. According to Wołowicka, approximately 30% of subjects in the later period following major surgery reported the impairment of physical activity [25]. Existing studies show that six months following surgery, long walks tired approximately 58% of respondents.

Our research demonstrated that the pain experienced was the highest the day after surgery. With time, it decreased significantly but ultimately, did not reach the same level as before surgery. In addition, studies have shown that chest pain occurred in more than two thirds of respondents and that additionally, half of respondents felt pain in the arm or shoulder. Similar results were reported by Nowicki, who also observed the frequent occurrence of difficulty sleeping,

dyspnoea, shortness of breath and a very high incidence of coughing, which corresponds to their own studies showing that only 19% of patients did not report cough after surgery, 89% felt dyspnoea, and 92% reported shortness of breath when walking of patients [21].

According to the study carried out by Książek, the quality of life in terms of parameters such as nausea, lack of appetite, shortness of breath and pain was systematically improving with time, which is confirmed by their and other researchers' testing [23]. Similar results were found in the studies conducted by Eton. Nausea and other effects of treatment were eliminated, because they were considered as related to treatment and not a symptom [24, 25].

Our own research, along with that of others, show that with time, the symptoms resulting from resection of the lung have a decreasing tendency. Unfortunately, in most patients, their physical condition worsens and is maintained even in the late period following the operation [26–28].

The research carried out in this paper made it possible to obtain results of the assessment of the overall quality of life among patients undergoing surgery for lung cancer. The analysis allows concluding that tumour resection is beneficial for the health of individuals. It is not only a lifesaving treatment, but the best method for healing cancer. Although it involves pain and complications at an early stage, it is a comprehensive procedure that not only extends the life of the patient, but also has very good effects in terms of treatment.

### Conclusions

Surgical removal of lung cancer is associated with a significant deterioration of the quality of life in the early period after surgery and can persist till six months later.

## Conflict of interest

The authors declare no conflict of interest.

## References:

- Karczmarek-Borowska B, Tobiasz M, Bukala A. Acceptance of the disease in patients with lung cancer. *Pol Merkur Lekarski*. 2016; 40(236): 89–93, indexed in Pubmed: [27000811](#).
- [www.who.int.Cancer](#). (12.09.2018).
- Wei S, Tian J, Song X, et al. Causes of death and competing risk analysis of the associated factors for non-small cell lung cancer using the Surveillance, Epidemiology, and End Results database. *J Cancer Res Clin Oncol*. 2018; 144(1): 145–155, doi: [10.1007/s00432-017-2522-3](#), indexed in Pubmed: [28980067](#).
- Ferlay J, Colombet M, Soerjomataram I, et al. Cancer incidence and mortality patterns in Europe: Estimates for 40 countries and 25 major cancers in 2018. *Eur J Cancer*. 2018; 103: 356–387, doi: [10.1016/j.ejca.2018.07.005](#), indexed in Pubmed: [30100160](#).
- Hirsch FR, Scagliotti GV, Mulshine JL, et al. Lung cancer: current therapies and new targeted treatments. *Lancet*. 2017; 389(10066): 299–311, doi: [10.1016/S0140-6736\(16\)30958-8](#), indexed in Pubmed: [27574741](#).
- Hollen P, Gralla R, Liepa A, et al. Adapting the lung cancer symptom scale (LCSS) to mesothelioma. *Cancer*. 2004; 101(3): 587–595, doi: [10.1002/cncr.20315](#).
- Nipp RD, Greer JA, El-Jawahri A, et al. Early palliative care for patients with metastatic non-small-cell lung cancer. *N Engl J Med*. 2010; 363(8): 733–742, doi: [10.1056/NEJMoa1000678](#), indexed in Pubmed: [20818875](#).
- Iyer S, Taylor-Stokes G, Roughley A. Symptom burden and quality of life in advanced non-small cell lung cancer patients in France and Germany. *Lung Cancer*. 2013; 81(2): 288–293, doi: [10.1016/j.lungcan.2013.03.008](#), indexed in Pubmed: [23561304](#).
- Yang P, Chevillat AL, Wampfler JA, et al. Quality of life and symptom burden among long-term lung cancer survivors. *J Thorac Oncol*. 2012; 7(1): 64–70, doi: [10.1097/JTO.0b013e-3182397b3e](#), indexed in Pubmed: [22134070](#).
- Cleeland CS, Mendoza TR, Wang XS, et al. Levels of symptom burden during chemotherapy for advanced lung cancer: differences between public hospitals and a tertiary cancer center. *J Clin Oncol*. 2011; 29(21): 2859–2865, doi: [10.1200/JCO.2010.33.4425](#), indexed in Pubmed: [21690477](#).
- Lin S, Chen Y, Yang L, et al. Pain, fatigue, disturbed sleep and distress comprised a symptom cluster that related to quality of life and functional status of lung cancer surgery patients. *J Clin Nurs*. 2013; 22(9-10): 1281–1290, doi: [10.1111/jocn.12228](#), indexed in Pubmed: [23574291](#).
- Hamaji M, Allen MS, Cassivi SD, et al. Surgical treatment of metachronous second primary lung cancer after complete resection of non-small cell lung cancer. *J Thorac Cardiovasc Surg*. 2013; 145(3): 683–90; discussion 690, doi: [10.1016/j.jtcvs.2012.12.051](#), indexed in Pubmed: [23414986](#).
- Poghosyan H, Sheldon LK, Leveille SG, et al. Health-related quality of life after surgical treatment in patients with non-small cell lung cancer: a systematic review. *Lung Cancer*. 2013; 81(1): 11–26, doi: [10.1016/j.lungcan.2013.03.013](#), indexed in Pubmed: [23562675](#).
- Kloot Wv, Kobayashi K, Yamaoka K, et al. Summarizing the Fifteen Scales of the EORTC QLQ-C30 Questionnaire by Five Aggregate Scales with Two Underlying Dimensions: A Literature Review and an Empirical Study. *Journal of Psychosocial Oncology*. 2014; 32(4): 413–430, doi: [10.1080/07347332.2014.917139](#).
- Lewandowski B, Szeliga E, Czenczek-Lewandowska E, et al. Comparison of oral-health-related quality of life in patients in the short- and long-term period following lower-facial injury and fractures - preliminary report. *Dent Med Probl*. 2018; 55(1): 57–62, doi: [10.17219/dmp/85255](#), indexed in Pubmed: [30152636](#).
- Polański J, Chudiak AK, Rosińczuk J. Kwestionariusze stosowane w ocenie wybranych objawów raka płuca. *Medycyna Paliatywna w Praktyce*. 2016; 10(3): 89–97.
- Kenzik KM, Martin MY, Fouad MN, et al. Health-related quality of life in lung cancer survivors: Latent class and latent transition analysis. *Cancer*. 2015; 121(9): 1520–1528, doi: [10.1002/cncr.29232](#), indexed in Pubmed: [25565326](#).
- Sloan JA, Zhao X, Novotny PJ, et al. Relationship between deficits in overall quality of life and non-small-cell lung cancer survival. *J Clin Oncol*. 2012; 30(13): 1498–1504, doi: [10.1200/JCO.2010.33.4631](#), indexed in Pubmed: [22454418](#).
- Liao YC, Shun SC, Liao WY, et al. Quality of life and related factors in patients with newly diagnosed advanced lung cancer: a longitudinal study. *Oncol Nurs Forum*. 2014; 41(2): E44–E55, doi: [10.1188/14.ONFE44-E55](#), indexed in Pubmed: [24578085](#).
- Chevillat AL, Novotny PJ, Sloan JA, et al. The value of a symptom cluster of fatigue, dyspnea, and cough in predicting clinical outcomes in lung cancer survivors. *J Pain Symptom Manage*. 2011; 42(2): 213–221, doi: [10.1016/j.jpainsymman.2010.11.005](#), indexed in Pubmed: [21398089](#).
- Nowicki A, Krzysińska J, Kowalewski J. Evaluation of the quality of life of patients treated surgically for lung cancer. *Contemp Oncol*. 2006; 9: 468–474.
- Wołowicka L. Quality of life in medical science. *Publisher Institutional Academy of Medical Sciences, Poznan* 2001: 46–49.
- Książek J. Assessment of quality of life for lung cancer patients in the perioperative period. *Psychooncol*. 2003; 7: 115–119.
- Eton DT, Cella D, Yount SE, et al. Validation of the functional assessment of cancer therapy--lung symptom index-12 (FLSI-12). *Lung Cancer*. 2007; 57(3): 339–347, doi: [10.1016/j.lungcan.2007.03.021](#), indexed in Pubmed: [17485135](#).
- Philip EJ, Coups EJ, Feinstein MB, et al. Physical activity preferences of early-stage lung cancer survivors. *Support Care Cancer*. 2014; 22(2): 495–502, doi: [10.1007/s00520-013-2002-5](#), indexed in Pubmed: [24091722](#).
- Brown Johnson CG, Brodsky JL, Cataldo JK. Lung cancer stigma, anxiety, depression, and quality of life. *J Psychosoc Oncol*. 2014; 32(1): 59–73, doi: [10.1080/07347332.2013.855963](#), indexed in Pubmed: [24428251](#).
- Chambers SK, Baade P, Youl P, et al. Psychological distress and quality of life in lung cancer: the role of health-related stigma, illness appraisals and social constraints. *Psychooncology*. 2015; 24(11): 1569–1577, doi: [10.1002/pon.3829](#), indexed in Pubmed: [25920906](#).
- Brocki BC, Andreassen J, Nielsen LR, et al. Short and long-term effects of supervised versus unsupervised exercise training on health-related quality of life and functional outcomes following lung cancer surgery - a randomized controlled trial. *Lung Cancer*. 2014; 83(1): 102–108, doi: [10.1016/j.lungcan.2013.10.015](#), indexed in Pubmed: [24246508](#).