ORIGINAL ARTICLE / ÖZGÜN MAKALE

Quality of life in patients undergoing lung resection: Evaluation of outcomes of follow-up using brief pain inventory

Akciğer rezeksiyonu geçiren hastalarda yaşam kalitesi: Kısa ağrı envanteri ile takip sonuçlarının değerlendirilmesi

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ABSTRACT

Background: The aim of the study was to evaluate preoperative anxiety, postoperative pain and functional impairment using Brief Pain Inventory (BPI) in patients undergoing surgery for malignancy.

Methods: Between September 2020 and May 2022, a total of 94 patients (60 males, 34 females; mean age 59.5±12.2 years; range, 32 to 84 years) who underwent surgery for lung cancer were prospectively analyzed. The patients were evaluated using the BPI preoperatively and on postoperative Days 0, 3, and 30. The preoperative emotional impacts of patient variables and the influence of surgical management on postoperative pain were examined.

Results: Females experienced more preoperative emotional distress and insomnia (p=0.046, p=0.033, respectively). Patients diagnosed with cancer and had a history of surgery or thoracotomy demonstrated higher preoperative emotional distress (p=0.001, p<0.001, p<0.001, respectively). Postoperatively, patients who underwent thoracotomy reported greater pain with higher functional impairment compared to the video-assisted thoracoscopic surgery group (p=0.002, p=0.018, respectively). Patients whose drains were completely removed by the postoperative Day 3 had reduced discomfort and improved ability to perform breathing exercise (p=0.005, p=0.045, respectively). Thoracotomy and the placement of double drains were identified as independent factors contributing to difficulties in performing breathing exercises and coughing on Day 30 (p<0.05 for all). There was no significant difference in the pain scores and affected functions between the patients with a thoracotomy incision size of <10 cm and ≥10 cm (p=0.200, p=0.113, respectively).

Conclusion: Our study results indicate that a preference for minimal invasive procedures, the use of a single thoracic drain, and the prompt removal of the drain minimize pain and functional impairment. Women, patients with a preoperative diagnosis of malignancy requiring metastasectomy, and history of thoracotomy or surgery experience elevated levels of anxiety. Therefore, consistent monitoring and psychological support may be recommended to improve the quality of life for this patient population.

Keywords: Brief Pain Inventory, lung cancer, metastasectomy, pain, quality of life.

ÖZ

Amaç: Bu çalışmada Kısa Ağrı Envanteri (BPI) kullanılarak malignite nedeniyle ameliyat edilen hastalarda ameliyat öncesi anksiyete, ameliyat sonrası ağrı ve fonksiyon kaybı değerlendirildi.

Çalışma planı: Eylül 2020 - Mayıs 2022 tarihleri arasında akciğer kanseri nedeniyle ameliyat edilen toplam 94 hasta (60 erkek, 34 kadın; ort. yaş: 59.5±12.2 yıl; dağılım, 32-84 yıl) prospektif olarak incelendi. Hastalar ameliyat öncesi ve ameliyattan sonra 0, 3 ve 30. günlerde BPI ile değerlendirildi. Hasta değişkenlerinin ameliyat öncesi duygusal etkileri ve cerrahi tedavinin ameliyat sonrası ağrıya etkisi araştırıldı.

Bulgular: Kadınlarda ameliyat öncesi emosyonel stres ve uykusuzluk daha fazla görüldü (sırasıyla p=0.046, p=0.033). Malignite tanısı olan ve daha önce ameliyat veya torakotomi öyküsü olan hastalar daha fazla emosyonel etkilenme göstermekteydi (sırasıyla p=0.001, p<0.001, p<0.001). Ameliyat sonrası torakotomi yapılan hastalar, video yardımlı torakoskopik cerrahi grubuna kıyasla daha fazla ağrı bildirdi ve fonksiyonel kayıpları daha yüksekti (sırasıyla p=0.002, p=0.018). Ameliyat sonrası 3. günde tüm drenleri sonlandırılmış hastalarda daha az ağrı izlendi ve solunum egzersizini daha iyi yapabildi (sırasıyla p=0.005, p=0.045). Ameliyat sonrası 30. günde torakotomi ve ameliyatta çift dren yerleştirilmesi solunum egzersizinde zorlanmayı etkileyen bağımsız faktörler olarak saptandı (tümü için p<0.05). Torakotomi insizyon boyutu 10 cm altı ve üstü olan hastalar arasında ağrı ve etkilenen işlevlerde anlamlı bir fark saptanmadı (sırasıyla p=0.200, p=0.113).

Sonuç: Çalışma sonuçlarımız minimal invaziv girişimlerin tercih edilmesi, tek toraks dreni kullanılması ve drenin mümkün olduğunca erken sonlandırılmasının ağrının yanında fonksiyonel kaybı da azalttığını göstermektedir. Kadınlar, metastazektomi gerektiren malignite tanısına sahip olan hastalar ve torakotomi ve ameliyat öyküsü olan hastalar ameliyat öncesi daha yüksek anksiyete yaşamaktadır. Bu nedenle, bu hasta grubunda yaşam kalitesinin iyileştirilmesi için düzenli takip ve psikolojik destek önerilebilir.

Anahtar sözcükler: Kısa Ağrı Envanteri, akciğer kanseri, metastazektomi, ağrı, yaşam kalitesi.

Pain, as defined by the International Association for the Study of Pain (IASP), is "an unpleasant sensory and emotional experience associated with actual or potential tissue damage".[1] It is a concept shaped by biological, psychological, and social factors, reliant on individual self-report and inherently subjective.[1] Due to its close association with mood, it can considerably negatively impact patients with malignancies. Anticipated discomfort is a significant concern for individuals diagnosed with malignancies from the beginning.

Patients admitted for lung surgery may experience significant stressors, such as fear of mortality, anxiety about the future, and uncertainty regarding their condition, which can trigger depression in susceptible individuals.[2] The elevated anxiety of a patient undergoing lung surgery for a diagnosis or suspicion of cancer may be intensified by postoperative pain, adversely impacting quality of life (QoL).[3]

To date, various scales have been developed to facilitate communication with patients on their pain. Numerical charts or visual representations of face expressions have been created to assist caregivers in accurately interpreting the patient's subjective feelings. The Brief Pain Inventory (BPI) is a comprehensive scale designed to evaluate the QoL by analyzing patients' functional impairment and emotional changes alongside physical pain.[4]
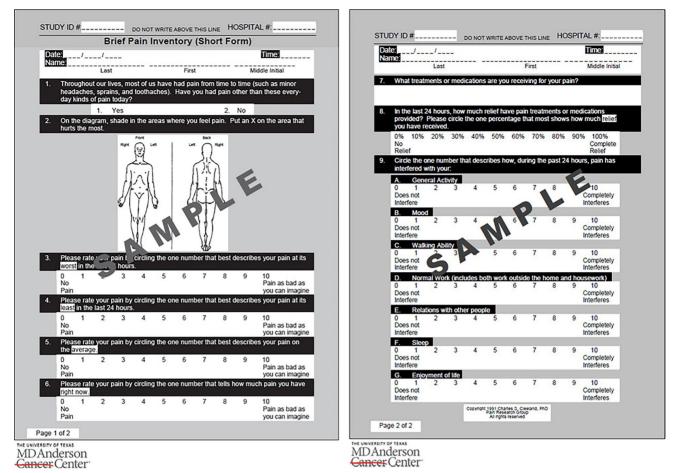
Upon recognizing that patients defined pain in two dimensions - pain and response to pain- the authors of the BPI designated these dimensions as sensory and reactive. The scale was developed with items to assess intensity or severity, reflecting the sensory aspect of pain, and with items to evaluate the extent to which everyday activities are impacted, illustrating the reactive aspect. To monitor changes in physical pain over time, four items were developed to assess the worst, least, average, and current pain levels. The evaluation of functioning and emotional health includes inquiries regarding general activity, walking, work, mood, enjoyment of life, relationship with others, and sleep.[5] It has been translated into several other languages, and its validity in Turkish has been documented by Dicle et al.[6] The BPI, initially developed for the chronic generalized pain experienced by cancer patients, has also been utilized in non-oncological pain conditions such as osteoarthritis, neuropathy, fibromyalgia, and post-surgical pain assessment.[7,8] Ochroch et al.[9] employed the BPI physical pain scale for pain evaluation following various thoracotomies.

Elevated anxiety levels in cancer patients admitted for surgery are frequently found in clinical practice. The BPI, renowned for its ability to effectively monitor mood and physical pain, was selected for this study owing to its comprehensive and systematic approach. In the present study, we aimed to identify patient groups at risk of preoperative psychological distress and to explore interventions to reduce postoperative physical discomfort and functional impairment.

PATIENTS AND METHODS

This single-center, prospective study was conducted at Ege University Faculty of Medicine, Department of Chest Surgery between September 2020 and May 2022. Patients aged between 18 to 85 years scheduled for surgery due to histopathologically confirmed primary lung carcinomas, suspected malignant lesions, or a preliminary diagnosis of pulmonary metastasis were screened. Those aged over 85 years due to potential cognitive limitations, individuals with significant visual and/or hearing impairments, those with diabetic neuropathy, patients whose postoperative intensive care duration exceeded 12 h due to complications, and those who were included preoperatively but received a benign result from the frozen section of their surgical specimen were excluded from the study. Finally, a total of 94 patients (60 males, 34 females; mean age 59.5±12.2 years; range, 32 to 84 years) who met the inclusion criteria were recruited. A written informed consent was obtained from each patient. The study protocol was approved by the Ege University Medical Research Ethics Committee (date: 03.09.2020, no: 20-9T/77). The study was conducted in accordance with the principles of the Declaration of Helsinki.

The Turkish language version of the BPI was acquired under license from the University of Texas MD Anderson Cancer Center. Figure 1 displays the English version. In the BPI-Turkish edition, the term normal work is designated as deep breathing exercise and cough. Although patients were instructed to complete the questionnaire independently, verbal interviews were conducted for those who requested assistance due to visual impairments. The BPI was administered preoperatively, on postoperative Day 0 (POD0), on postoperative Day 3 in the ward (POD3), and at one month postoperatively in the outpatient setting. The preoperative mood, relations with other individuals, sleep quality, and enjoyment of life scores were documented, with the average of

Figure 1. Items from the Turkish version of the BPI, reproduced under license.

BPI: Brief Pain Inventory.

these four parameters referred to as the emotional mean.

The patients were classified based on age to below and above 65 years, as well as the presence of a history of malignancy, prior surgical interventions, chemotherapy, use of antidepressant/anxiolytic medications, and educational attainment.

Surgical procedure

The surgical method groups consisted of video-assisted thoracoscopic surgery (VATS) and thoracotomy. The VATS group composed solely of procedures performed through thoracoports. All cases involving the use of a retractor were classified as thoracotomy, including hybrid cases with VATS. A thoracotomy was classed as a mini-thoracotomy, if the incision size was smaller than 10 cm.[10] The number of drains inserted and the time of drain removal following surgery were recorded. Patients

did not get perioperative regional anesthesia. The standardized POD0 analgesic regimen included 75 mg of intramuscular diclofenac sodium administered twice daily, 100 mg of intravenous tramadol hydrochloride given four times daily, and 1,000 mg of paracetamol. From the first postoperative day, analgesic administration was based on patient need. Patients requiring analgesics on POD3 received 50 mg of oral diclofenac potassium administered twice daily.

Statistical analysis

Statistical analysis was performed using the IBM SPSS version 25.0 software (IBM Corp., Armonk, NY, USA). Descriptive data were expressed in mean ± standard deviation (SD), median (min-max) or number and frequency, where applicable. The normality assumption of quantitative data was assessed using the Shapiro-Wilk test, and

group differences in univariate analyses were analyzed with the Mann-Whitney U test and the Kruskal-Wallis test. The interrelationship of quantitative data was examined using Spearman rho correlation coefficient. Multiple regression analysis was employed to identify the factors influencing the scores of interest at each stage (Preop., POD0, POD3, and POD30.) A *p* value of <0.05 was considered statistically significant.

RESULTS

The demographic data of the patients are summarized in Table 1. Among the 51 patients diagnosed with malignancy, 13 had colorectal, eight had lung, seven had breast, six had bone, five had endometrial, five had soft tissue, three had bladder, two had laryngeal, one had hepatobiliary, and one had kidney cancer. Twenty-three patients exhibited stable hypertension while receiving medical treatment. Twelve patients had coronary artery disease which did not contraindicate surgery, and five patients were diagnosed with mild chronic obstructive pulmonary disease (COPD).

The factors influencing the preoperative emotional state of patients and the pain and pain-related functional scores during the postoperative period (POD0, POD3, and POD30) were categorized under two sections.

Preoperative emotional findings

The mean preoperative mood score was 1.44 for females and 0.88 for males (p<0.05). Insomnia scores were significantly higher in females (p<0.05). The emotional mean scores, reflecting criteria indicative of emotional state, were also elevated in females (p<0.05). The female sex, a history of malignancy, previous surgeries, and a history of thoracotomy were associated with increased emotional impact (Table 2). In the multiple regression model constructed with these parameters, preoperative emotional mean scores were significantly elevated in patients with a history of thoracotomy (p=0.001) (Table 3.1). A history of thoracotomy was an independent factor contributing to preoperative emotional distress. When sleep disruption was assessed as an indicator of anxiety, multiple regression analysis identified patients with a history of malignancy and those who previously underwent thoracotomy as being at higher risk (p<0.05; p<0.001, respectively) (Table 3.2).

No significant difference in the preoperative emotional parameter scores was observed between patients who received chemotherapy and/or radiotherapy and those who did not. Similarly, there was no notable difference in preoperative emotional scores with respect to the use of antidepressant/anxiolytic medications or educational attainment.

Postoperative pain findings and its effects

Table 1. Demographic characteristics of the population

	n	%	Mean±SD
Age (year)			59.5±12.2
<65	63	67.1	
≥65	31	32.9	
Sex			
Male	60	63.8	
Female	34	36.2	
History of malignancy			
No	43	45.7	
Yes	51	54.3	
History of any surgery			
No	39	41.5	
Yes	55	58.5	
History of thoracotomy			
No	77	81.9	
Yes	17	18.1	
Antidepressant/anxiolytic use			
No	78	83.0	
Yes	16	17.0	
Educational status			
Primary education	32	34	
High school	35	37.2	
Undergraduate	27	28.8	
Type of resection performed			
Wedge	49	52.1	
Anatomic resection	45	47.9	
Surgical procedure type			
Videothoracoscopy	15	15.9	
Thoracotomy	79	84.1	
<10 cm	39	49.4	
≥10 cm	40	50.6	
Incision length (cm)			10±3.1
Number of drains			
One	69	73.4	
Two	25	26.6	
Drain removal day (postoperative)			
≤3	47	50	
>3	47	50	

SD: Standard deviation.

Table 2. Characteristics and preoperative emotional effect scores of patients

Characteristics	Mood	Relation with other people	Sleep	Enjoyment of life	Emotional mean*
Age (year)					
<65	0.95	0.30	0.97	0.81	0.76
≥65	1.35	0.16	1.06	0.84	0.84
p	0.387	0.122	0.280	0.475	0.468
Sex					
Male	0.88	0.25	0.82	0.75	0.68
Female	1.44	0.26	1.32	0.94	0.99
p	**0.046**	0.408	**0.033**	0.269	**0.024**
History of malignancy					
Yes	1.39	0.35	1.45	1.16	1.09
No	0.72	0.14	0.47	0.42	0.44
p	**0.011**	0.255	**0.007**	**0.007**	**0.001**
History of any surgery					
Yes	1.36	0.36	1.42	1.16	1.08
No	0.69	0.10	0.41	0.33	0.38
p	**0.005**	0.064	**0.003**	**0.001**	**<0.001**
History of thoracotomy					
Yes	2.12	0.24	2.47	2.00	1.71
No	0.86	0.26	0.68	0.56	0.59
p	**0.002**	0.859	**<0.001**	**<0.001**	**<0.001**

* The emotional mean was calculated by averaging mood, relation with other people, sleep and enjoyment of life.

Table 3.1. Multiple regression analysis for preoperative emotional mean

	OR	95% CI for OR		*p*
		Lower bound	Upper bound	
Sex				
Male	−0.132	−0.524	0.261	0.507
History of malignancy (Yes)	0.414	−0.081	0.909	0.100
History of any surgery (Yes)	0.115	−0.418	0.648	0.669
History of thoracotomy (Yes)	**0.921**	0.391	1.450	**0.001**

Table 3.2. Multiple regression analysis for preoperative sleeplessness

	OR	95% CI for OR		*p*
		Lower bound	Upper bound	
Sex				
Male	−0.217	−0.743	0.308	0.413
History of malignancy (Yes)	**0.680**	0.017	1.342	**0.044**
History of any surgery (Yes)	0.050	−0.663	0.764	0.889
History of thoracotomy (Yes)	**1.541**	0.832	2.250	**<0.001**

CI: Confidence interval; OR: Odds ratio.

Twenty-one patients (22.3%) reported that their pain at POD0 was unlike any pain they had ever experienced. No significant difference in pain levels was observed between the age groups; however, the younger patient cohort reported greater difficulties in walking on POD0 (p=0.024).

Patients who underwent thoracotomy exhibited markedly higher scores on the worst pain and average pain assessments on POD0. The mean total effect associated with functions impaired by pain was greater in thoracotomy patients (p<0.05). Postoperative physical pain and its impact on function are shown in Table 4. In a multivariate regression model incorporating age, sex, type of operation, and number of drains for the highest postoperative pain scores, patients who underwent thoracotomy reported greater pain irrespective of other variables (p<0.05). No significant difference was observed between the two groups for postoperative pain and functional impairment based on the classification of thoracotomy incision size (p>0.05).

At POD3, thoracotomy patients exhibited elevated physical pain scores, while patients with removed drains reported diminished discomfort during this interval.

Table 4. Scores for pain and dysfunction at POD0

Characteristic	Worst pain	Least pain	Average pain	General activity	Walking ability	Breathing exercise & cough	Total effect*
Age (year)							
>65	8.02	2.83	5.65	3.90	2.62	6.75	3.14
≥65	7.65	3.00	5.77	2.84	1.42	6.48	2.73
p	0.239	0.439	0.769	0.122	**0.024**	0.749	0.533
Type of surgery							
Thoracotomy	8.09	3.04	5.86	3.84	2.29	6.90	3.15
VATS	6.87	2.07	4.80	2.07	1.87	5.40	2.23
p	**0.002**	0.062	**0.016**	**0.032**	0.233	0.066	**0.018**
Number of drain							
One	7.77	2.68	5.45	3.61	2.48	6.51	3.03
Two	8.24	3.44	6.36	3.40	1.52	7.08	2.92
p	**0.037**	0.082	**0.011**	0.927	0.223	0.209	0.837

POD0: Postoperative Day 0; VATS: Video-assisted thoracoscopic surgery; * The total effect represents the median scores for general activity, mood, walking ability, breathing exercise and cough, relations with other people, sleep and enjoyment of life, reflecting the entire influence of pain on the patient.

Table 5. Scores for pain and dysfunction at POD30

Characteristic	Worst pain	Least pain	Average pain	General activity	Walking ability	Breathing exercise & cough	Total effect*
Type of surgery							
Thoracotomy	1.56	0.11	0.66	0.43	0.11	1.75	0.69
VATS	0.80	0.00	0.13	0.007	0.00	0.20	0.37
p	**0.013**	0.20	**0.017**	**0.046**	0.273	**<0.001**	**0.005**
Number of drain							
Single	1.46	1.12	0.57	0.32	0.10	1.07	0.74
Double	1.36	0.04	0.60	0.52	0.08	2.16	1.02
p	0.842	0.344	0.497	0.095	0.592	**0.002**	0.182

POD30: Postoperative Day 30; VATS: Video-assisted thoracoscopic surgery; * The total effect represents the median scores for general activity, mood, walking ability, breathing exercise and cough, relations with other people, sleep and enjoyment of life, reflecting the entire influence of pain on the patient.

By POD30, the differences in pain and total effect scores between the thoracotomy group and the VATS group remained significant ($p<0.05$ and $p<0.01$). Additionally, patients in the thoracotomy group reported greater difficulty with coughing ($p<0.001$) (Table 5). At POD30, 79.7% of thoracotomy patients still required analgesic medication, compared to 26.7% in the VATS group. In the multiple regression model, patients who underwent thoracotomy and those with two drains independently exhibited significantly higher severe worst pain scores ($p<0.05$ for both). Furthermore, in the multiple regression analysis examining factors influencing the difficulty of coughing exercises, the presence of double drains was identified as an independent determinant ($p<0.05$).

DISCUSSION

The subjective and multifaceted nature of pain necessitates the establishment of a common language between the patient and the healthcare provider. The Numerical Pain Rating (NRS) Scale, Visual Analog Scale (VAS), Verbal Rating Scale (VRS), McGill Pain Questionnaire (MPQ), and FACES Pain Rating Scale are commonly used instruments which primarily assess the sensation of pain.[11] These scales offer both advantages and disadvantages. Verbal scales provide a superficial description of pain and are suitable for contexts where a detailed explanation is unnecessary. Numeric scales require literacy and may pose challenges in cases of cognitive impairment. Clinicians must select the most appropriate pain scale for each patient.[12] In our study, the BPI was preferred due to its capability to detect mood changes in addition to physical pain sensation. This highlighted the importance of evaluating the QoL in surgical patients as a whole, including their emotional well-being.

Pain is the most critical factor affecting QoL. Our study revealed that patients suffered more pain and functional impairment following thoracotomy compared to the VATS group. This outcome aligns with the existing literature.[13] The continued necessity for analgesics in 79.7% of patients who underwent thoracotomy one month postoperatively signifies that thoracotomy seriously affects everyday living even after this duration, suggesting these patients may be susceptible to chronic post-thoracotomy pain.

Considering that the primary source of pain is intercostal nerve injury and compression, several studies have reported a direct relationship between wound size and both pain and functional loss. Endoh et al.[14] compared VATS, lateral thoracotomy, and posterolateral thoracotomy in patients undergoing lobectomy, emphasizing that major incisions adversely affect not only pain but also respiratory function. In our study, no significant correlation was found between thoracotomy size and pain or functional loss, including deep breathing exercises, walking, and general activity, regardless of the resection type. This result suggests that minimizing the thoracotomy incision may have caused increased tension in the intercostal muscles, ribs, skin, and fascia when the retractor was placed. Therefore, prioritizing VATS or selecting interventions that do not necessitate the placement of retractors appears to be a crucial strategy for optimizing pain management.

The insertion of double drains, positioned apically and basally, is prevalent, particularly following anatomical resections. Research highlights the benefits of the placement of a single drain.[15] In our study, the number of drains inserted into the thorax, a parameter examined in the correlation between pain and functional impairment, appears to be a significant factor. The Enhanced Recovery After Surgery (ERAS) guideline similarly recommends the placement of a single drain to reduce pain.[16]

No significant difference in pain experience was observed between age groups when patients were categorized as under or over 65 years, based on the premise that pain is influenced by past experiences. Unexpectedly, patients under 65 years of age reported greater difficulties with mobility on POD0. We believe that this may be attributable to younger patients being more active prior to hospitalization compared to the older cohort, which may have left them less capable of ambulation postoperatively. Similar findings from psychological research involving cancer patients in the literature support our conclusions. Notably, older patients were reported to demonstrate greater success in managing the diagnosis of cancer compared to their younger counterparts. The heightened future goals and ambitions of younger patients may contribute to increased psychiatric vulnerability; however, comprehensive analyses are needed.[17]

Anxiety and depression are linked to a diminished QoL.[18,19] Massie[20] highlighted that lung cancer patients face a significant risk, with depression rates varying from 11 to 44%. Erol et al.[3] identified a preoperative depression frequency of 44% and anxiety frequency of 28% among surgical patients diagnosed with lung cancer. Studies examining the predictive characteristics

of anxiety and depression address the influence of sex.[21] In our study, preoperative mood and sleeplessness scores, as indicators of anxiety, were found to be elevated in women. Higher psychiatric susceptibility in female patients may be attributed to physical vulnerabilities, differences in stress-coping mechanisms, social roles, societal identities, and responsibilities, as highlighted in previous studies.[22,23] We propose that enhanced psychiatric monitoring and timely interventions for female patients could significantly improve their QoL.

Our study indicates that the preoperative mood of patients scheduled for surgery due to suspected malignancy, as well as those undergoing metastasectomy, is worse than that of individuals who have not yet received a diagnosis, likely attributable to the inherent stress associated with the stigma of cancer. On the other hand, our BPI findings suggest that the process may be more unpredictable and detrimental if a new metastasis develops in a patient with extra-thoracic cancer.

Our findings demonstrate that previous thoracotomy is significantly anxiety-inducing for patients who anticipate experiencing similar pain. Researches highlighted the importance of preoperative education and mental assistance to preserve QoL, based on their studies linking thoracotomy anxiety with elevated anxiety levels and diminished respiratory capacity in the postoperative period.[24] Inquiring about the history of thoracotomies in patients admitted for malignancy surgery is crucial for both psychological evaluation and surgical techniques.

Research examining the QoL of cancer patients highlights the challenges of pain management and access to psychosocial assistance among individuals with low socioeconomic status.[25] Academic success may influence emotional awareness and self-evaluation. Our investigation revealed no variation in preoperative emotional scores based on patients' educational attainment. Insomnia was more prevalent in the group with a comparatively higher level of education at POD0; however, it was not considered an indicator of anxiety.

The incidence of anxiety and depression among cancer patients is considerable. Surgical stress is likely to further compromise their QoL. While postoperative healing is monitored post-discharge, comprehensive assessment of QoL is frequently neglected. Evaluating only chest radiography, pulmonary function, or medical treatment adequacy

covers minimal criteria for well-being and QoL. Given the significance of comprehensive treatment strategies currently recognized for patients with malignancy, our data emphasize the necessity of identifying at-risk populations among those undergoing surgical stress and referring them for prompt evaluation of anxiety and depression.

Nonetheless, there are some limitations to this study. Larger series provide more precise evaluations of BPI outcomes in lung surgery. Another limitation is the variation in surgical teams. This has led to a lack of standardization in operative durations and drain management.

In conclusion, our study results indicate that a preference for minimal invasive procedures, the use of a single thoracic drain, and the prompt removal of the drain minimize pain and functional impairment. Women, those with a preoperative diagnosis of malignancy, requiring metastasectomy, and history of thoracotomy or surgery experience elevated levels of anxiety. Therefore, consistent monitoring and psychological support may be recommended to improve the QoL of this patient population.

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