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Effect of Minimally Invasive and Open Surgical Approaches on Fear and Death Anxiety in Patients with Lung Cancer

Akciğer Kanseri Hastalarında Uygulanan Minimal İnvaziv ve Açık Cerrahi Yöntemlerinin Korku ve Ölüm Anksiyetesi Üzerine Etkisi

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ABSTRACT

Objective: Lung cancer surgery, whether minimally invasive or open, may induce surgical fear and death anxiety, potentially affecting patients' well-being and recovery. Therefore, assessing the psychological outcomes of different surgical approaches is essential for optimizing perioperative care.

This study aimed to compare the effects of minimally invasive and open surgical approaches on surgical fear and death anxiety in patients with lung cancer and to identify associated factors.

Methods: A non-randomized comparative pretest-posttest design was used. The sample consisted of 85 lung cancer patients undergoing minimally invasive (n=60) or open surgery (n=25). Data were collected using a Personal Information Form, the Surgical Fear Questionnaire, and the Death Anxiety Scale.

Results: No significant differences were found between groups in preoperative or postoperative surgical fear and death anxiety scores. Demographic and clinical variables, including age, gender, marital status, and chronic disease, were not significantly associated with these outcomes ($p>0.05$). Although postoperative scores showed a slight decrease, this change was not statistically significant ($p>0.05$). Preoperatively, concerns related to physical changes were higher in the minimally invasive group ($p=0.024$), but this difference was not observed postoperatively ($p=0.69$).

Conclusion: The surgical approaches had no significant effect on surgical fear and death anxiety. The slight postoperative decrease was not statistically significant. Preoperative concerns regarding physical changes in the minimally invasive group disappeared postoperatively. Sociodemographic variables were not associated with these outcomes. Routine perioperative assessment of surgical fear and death anxiety, along with individualized counseling and psychological support, may enhance patient comfort and recovery.

Keywords: Lung cancer, minimally invasive surgery, thoracotomy, fear, anxiety

ÖZ

Amaç: Akciğer kanseri cerrahisi, minimal invaziv ya da açık olsun, cerrahi korku ve ölüm anksiyetesine yol açabilir ve bu durum hastaların iyilik halini ile iyileşme sürecini etkileyebilir. Bu nedenle, farklı cerrahi yaklaşımların psikolojik sonuçlarının değerlendirilmesi, perioperatif bakımın iyileştirilmesi açısından önemlidir. Bu çalışma, akciğer kanseri hastalarında minimal invaziv ve açık cerrahi yöntemlerin cerrahi korku ve ölüm anksiyetesi üzerindeki etkilerini karşılaştırmayı ve ilişkili faktörleri belirlemeyi amaçlamıştır.

Yöntem: Bu çalışmada randomize olmayan, karşılaştırmalı bir ön test-son test tasarım kullanılmıştır. Çalışmaya minimal invaziv cerrahi (n=60) veya açık cerrahi (n=25) uygulanan toplam 85 akciğer kanseri hastası dahil edilmiştir. Veriler, Kişisel Bilgi Formu, Cerrahi Korku Ölçeği ve Ölüm Kaygısı Ölçeği kullanılarak toplanmıştır.

Bulgular: Ameliyat öncesi ve sonrası cerrahi korku ve ölüm anksiyetesi puanları açısından gruplar arasında anlamlı bir fark bulunmamıştır. Yaş, cinsiyet, medeni durum ve kronik hastalık gibi demografik ve klinik değişkenlerin bu sonuçlarla anlamlı bir ilişkisi saptanmamıştır ($p>0,05$). Ameliyat

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sonrası puanlarda hafif bir azalma eğilimi gözlenmekle birlikte bu değişim istatistiksel olarak anlamlı değildir (p>0,05). Ameliyat öncesinde fiziksel değişikliklere ilişkin kaygılar minimal invaziv grupta daha yüksek bulunmuştur (p=0,024); ancak bu fark ameliyat sonrasında gözlenmemiştir (p=0,69).

Sonuç: Cerrahi yöntemlerin cerrahi korku ve ölüm anksiyetesi üzerinde anlamlı bir etkisi olmadığı belirlenmiştir. Postoperatif dönemdeki hafif azalma istatistiksel olarak anlamlı değildir. Minimal invaziv grupta fiziksel değişimlere ilişkin preoperatif kaygılar postoperatif dönemde ortadan kalkmıştır. Sosyodemografik değişkenlerin bu sonuçlarla ilişkili olmadığı saptanmıştır. Perioperatif dönemde cerrahi korku ve ölüm anksiyetesinin rutin olarak değerlendirilmesi, bireyselleştirilmiş danışmanlık ve psikolojik destek hasta konforunu ve iyileşme sürecini destekleyebilir.

Anahtar kelimeler: Akciğer kanseri, minimal invaziv cerrahi, torakotomi, korku, anksiyete

INTRODUCTION

In recent years, advances in minimally invasive surgical techniques have led to increased use of video-assisted thoracoscopic surgery (VATS) and robotic surgery in the treatment of early-stage lung cancer [1]. VATS is performed using an endoscopic camera and rigid instruments. It offers several advantages, including smaller incisions, reduced postoperative pain, and faster recovery [2]. Robot-assisted thoracoscopic surgery was developed to overcome the limitations of VATS. It enables more precise manipulation beyond the natural range of human hand movements and allows safer procedures in complex anatomical regions. Conventional robotic surgery typically involves four incisions, including a camera port, instrument ports, and an assistant port. However, the number and location of these incisions may vary depending on surgeon experience, tumor characteristics, and the type of procedure [3].

The open surgical approach (thoracotomy) is the traditional method and is generally preferred in complex cases. Both minimally invasive and open approaches follow oncologic resection principles [1]. Thoracotomy provides direct access to the thoracic cavity and remains the gold standard in selected complex cases [4]. These include large tumors (>7 cm), chest wall invasion, incomplete fissures, pleural adhesions, previous thoracic surgery, and centrally located tumors. It is also preferred in procedures requiring sleeve resection, bronchoangioplasty, or carinal resection [5].

Death anxiety refers to fear, worry, and distress related to one's own death or the dying process [6]. It can significantly affect quality of life and complicate adaptation to treatment. In patients with cancer, death anxiety is influenced by several factors, including disease prognosis, treatment procedures, fear of death, concerns about leaving loved ones, and increased awareness of life's finiteness [7,8]. A substantial proportion of patients with advanced-stage cancer experience death anxiety, which negatively impacts quality of life [9]. In patients with stage II non-small cell lung cancer, elevated preoperative death anxiety has been associated with reduced treatment adherence and delayed recovery. Additionally, 75% of patients reported fear of death prior to surgery [10]. Patients undergoing minimally invasive surgery generally report lower levels of anxiety and fear compared to those undergoing open surgery. Among cancer patients, common concerns include fear of recurrence (73%), surgical procedures (65%), pain (58%), and death (82%). Structured preoperative education programs have been shown to reduce fear and anxiety [1]. Similarly, Kim [11] reported a 40% reduction in fear levels among patients undergoing VATS lobectomy who received adequate preoperative information.

This study aimed to compare the effects of minimally invasive and open surgical approaches on surgical fear and death anxiety in patients with lung cancer during the preoperative and postoperative periods, and to identify associated factors. The study underscores the importance of holistic nursing care that addresses not only physical recovery but also patients' emotional and psychological needs. Furthermore, it highlights the value of integrating psychosocial assessments into routine surgical care. It also emphasizes the development of targeted nursing interventions to support patient well-being.

MATERIAL AND METHOD

Study Design and Setting

This study used a non-randomized comparative pre- and posttest design. Data were collected between April and August 2025 in the thoracic surgery wards of a state hospital in İstanbul. The unit consists of three 15-bed, single-occupancy wards. Patients admitted for preoperative care were transferred to the postoperative intensive care unit and then returned to the wards after recovery.

Population and Sample

The study population consisted of patients scheduled for lung cancer surgery using either minimally invasive or open approaches. Over a three-month period, 327 cases (278 minimally invasive and 49 open) were identified from an annual total of 1,312 surgeries (1,114 minimally invasive and 198 open) for sample estimation.

The sample size was calculated using G*Power for an independent-samples t-test with a 95% confidence level (α=0.05), an effect size of 0.65, and 85% power. The minimum required sample size was 45 patients in the minimally invasive group and 25 in the open surgery group (n=70). To account for a potential 15% data loss, the planned sample size was increased to 52 minimally invasive and 29 open surgery patients (n=81). The study was completed with 60 minimally invasive and 25 open surgery patients (n=85).

Inclusion criteria were age ≥ 18 years, histopathologically confirmed lung cancer, and scheduled minimally invasive or open surgery, with no communication difficulties. Patients using anxiolytic medications were excluded from the study.

Data Collection

Data were collected via face-to-face interviews with patients meeting the inclusion criteria. The first interview was conducted one day before surgery following hospital admission, during which patients were informed about the study, assured of confidentiality, and informed that the data would be used solely for research purposes. Each session lasted approximately 15-20 minutes. The second interview was conducted on the day of discharge prior to the patients leaving the hospital.

Instruments

Patient Information Form

A form was developed by the researchers based on the relevant literature [7,8,12] to collect patients' sociodemographic and medical information. The form included variables such as age, gender, marital status, employment status, education level, income, time since diagnosis, presence of chronic diseases, and self-perceived health status.

Surgical Fear Questionnaire (SFQ)

The SFQ, developed by Theunissen et al. [13], measures short- and long-term fear related to elective surgical procedures. The Turkish validity and reliability study was conducted by Bağdigen and Karaman Özlü [14]. The scale consists of eight items and two subscales, each containing four items: short-term fear (items 1-4) and long-term fear (items 5-8). Responses are scored on an 11-point Likert scale ranging from 0 (not afraid at all) to 10 (extremely afraid). Subscale scores range from 0 to 40, and the total score ranges from 0 to 80. Higher scores indicate greater levels of surgical fear. In the present study, Cronbach's α was 0.89 for the total scale, 0.86 for short-term fear, and 0.92 for long-term fear. Subscale scores range from 0 to 40, while the total score ranges from 0 to 80.

Death Anxiety Scale (DAS)

The DAS, developed by Templer [6], assesses an individual's fear of death. The Turkish adaptation was conducted by Akça and Köse [15]. The scale consists of 15 yes/no items and includes three subdimensions: cognitive-emotional (items 1-7), physical changes (items 8-11), and concerns related to time perception (items 12-15). "Yes" responses are scored as 1 and "no" as 0. Certain items are reverse-coded (items 2, 3, 5, 6, and 7). Total scores range from 0 to 15, with higher scores indicating greater death anxiety. Score interpretation classifies 0-7 as low, 8-10 as moderate, and 11-15 as high death anxiety. The scale is widely used in psychiatric evaluations of patients with cancer, terminal illness, older adults, chronic illnesses, and preoperative surgical patients. The Cronbach's alpha for the overall scale was 0.86, with subscale values of 0.89 for cognitive-emotional, 0.90 for physical changes, and 0.88 for concerns related to time perception.

Ethical Considerations

Ethical approval was obtained from the Non-Interventional Research Ethics Committee of Biruni University (approval no: 2024/BİAEK/06-01, date: 20.01.2025). Institutional permission was granted by the Provincial Health Directorate (approval no: 2025/2, date: 06.03.2025). Approval for the use of the scales was obtained from the respective authors. Data collection adhered to the principles of voluntariness, respect, privacy, and equality. The purpose of the study was explained to participants both verbally and in writing using an informed voluntary consent form. Participants were informed that their data would remain confidential. The study was conducted in accordance with the Declaration of Helsinki.

Statistical Analysis

Data were analyzed using SPSS version 27.0. Normality was assessed using skewness and kurtosis values, all of which were within acceptable ranges, indicating a normal distribution. Parametric tests were applied: independent-samples t-tests were used for between-group comparisons, and one-way analysis of variance (ANOVA) was used for variables with three or more groups. Paired-samples t-tests were used for within-group pretest-posttest comparisons. Effect sizes were calculated using Cohen's d to evaluate the clinical relevance of differences independent of statistical significance. Values of 0.20, 0.50, and 0.80 were interpreted as small, medium, and large effects, respectively. Continuous variables are presented as mean with standard deviation, while categorical variables are presented as frequencies and percentages. Statistical significance was defined at $p<0.05$, with a 95% confidence level.

RESULTS

Demographic and Clinical Characteristics of the Patients

Table 1 presents the demographic and clinical characteristics of the study participants. Comparative analysis indicated that patients undergoing minimally invasive and open lung cancer surgery had similar sociodemographic profiles. In both groups, the majority of patients were aged 61 years or older. The mean age was 60.22±12.92 years in the minimally invasive group and 59.72±12.65 years in the open surgery group, with no statistically significant difference between them ($p>0.05$).

Male participants predominated in both groups. Most patients were married, had completed primary or secondary education, and were retired. A considerable proportion reported that their income was lower than their expenses. Regarding clinical characteristics, most patients had been diagnosed within the past year. The minimally invasive group had a higher proportion of patients without chronic diseases. Most participants lived with their spouse. Preoperative self-perceived health status was

Table 1. Demographic and Clinical Characteristics of Patients (n=85)					
	Minimally invasive, (n=60)		**Open surgery, (n=25)**		**p-value**
Age	f	%	f	%	0.621
≤45	7	11.7	3	12.0	
46-60	18	30.0	7	28.0	
≥61	35	58.3	15	60.0	
Mean age	Min: 23 Max: 84 Mean ± SD: 60.22±12.92		Min: 27 Max: 76 Mean ± SD: 59.72±12.65		
Gender					
Female	18	30.0	7	28.0	0.702
Male	42	70.0	18	72.0	
Marital status					
Single	13	21.7	8	32.0	0.513
Married	47	78.3	17	68.0	
Education level					
Illiterate	10	16.7	4	16.0	0.215
Primary-middle school	36	60.0	12	48.0	
High school	8	12.4	5	20.0	
University	6	10.0	4	16.0	
Employment status					
Employed	13	21.7	7	28.0	0.206
Unemployed	15	25.0	4	16.0	
Retired	32	53.3	14	56.0	
Income status					
Income<expenses	36	60.0	14	56.0	0.330
Income=expenses	22	36.7	11	44.0	
Income>expenses	2	3.3	-	-	
Duration of lung cancer					
≤1 year	45	75.0	17	68.0	0.251
2-5 years	11	18.3	5	20.0	
≥6 years	4	6.7	3	12.0	
Chronic disease					
Diabetes	5	8.3	4	16.0	0.168
Hypertension	7	11.7	5	20.0	
COPD	10	16.7	7	28.0	
None	37	61.7	10	40.0	
Self-perceived preoperative health status					
Poor	11	18.3	5	20.0	0.321
Moderate	25	41.7	11	44.0	
Good	21	35.0	8	32.0	
Very good	3	5.0	1	4.0	
Self-perceived postoperative health status					
Poor	2	3.3	2	8.0	0.106
Moderate	22	28.3	12	48.0	
Good	38	63.3	11	44.0	
Very good	3	5.0	-	-	

SD: Standard deviation, COPD: Chronic obstructive pulmonary disease generally moderate. Postoperative health perception was more positive, especially in the minimally invasive group, where it was mostly rated as good. No statistically significant differences were found between the groups for these variables (p>0.05).

Surgical Fear and Death Anxiety According to Sociodemographic Characteristics

Table 2 shows surgical fear and death anxiety scores by demographic characteristics. Patients aged 45 years and younger showed higher short-term surgical fear scores. However, no statistically significant differences were found between age groups in terms of short-term fear, long-term fear, death anxiety subscales, or total scores (p>0.05).

Female patients had higher short- and long-term surgical fear and death anxiety scores than male patients; however, these differences were not statistically significant (p>0.05).

Marital status was not associated with significant differences in surgical fear or death anxiety scores. Similarly, the presence of chronic disease did not significantly affect these outcomes (p>0.05).

Surgical Fear and Death Anxiety in Patients Undergoing Minimally Invasive and Open Surgery

Table 3 compares preoperative and postoperative surgical fear and death anxiety levels between minimally invasive and open surgery groups. Preoperatively, no significant differences were found between groups in short-term fear, long-term fear, total surgical fear, cognitive-emotional anxiety, concerns related to time perception, or total death anxiety (p>0.05). The only significant between-group difference was observed in the physical changes subscale, with lower scores in the open surgery group (t=2.306, p=0.024). The effect size for this difference was medium (Cohen's d=0.55), indicating a clinically meaningful difference in preoperative physical change concerns between groups. Effect sizes for other preoperative comparisons were small (d range: 0.02-0.37), suggesting limited practical differences despite non-significant p-values.

Postoperatively, no statistically significant differences were found between groups for any subscale or total scores of surgical fear or death anxiety (p>0.05). Short- and long-term fear scores were nearly identical, indicating that postoperative fear was

Table 2. Fear and Death Anxiety Perceptions According to Demographic Characteristics (n=85)

Demographic group	Short-term fear Mean ± SD	Long-term fear Mean ± SD	Surgical Fear Questionnaire Mean ± SD	Cognitive-emotional Mean ± SD	Physical changes Mean ± SD	Concerns related to time perception Mean ± SD	Death Anxiety Scale Mean ± SD
Age							
≤45	18.90±11.14	13.20±12.50	32.10±22.45	3.30±2.83	1.20±1.39	1.20±0.63	5.70±4.39
46-60	12.64±8.86	8.88±9.06	21.52±16.77	2.44±2.82	0.80±1.35	1.40±0.50	4.64±3.43
≥61	13.42±11.21	9.72±9.26	23.14±19.04	2.42±2.40	0.86±1.22	1.30±0.70	4.58±3.51
F	1.345	0.738	1.185	0.568	0.364	0.389	0.414
p-value	0.266	0.481	0.311	0.569	0.696	0.679	0.663
Gender							
Female	14.84±9.44	11.72±9.98	26.56±17.98	3.24±2.69	1.20±1.47	1.32±0.62	5.76±4.17
Male	13.41±11.11	9.11±9.39	22.53±19.24	2.23±2.25	0.75±1.17	1.31±0.65	4.30±4.23
t	0.561	1.143	0.896	1.767	1.492	0.022	1.735
p-value	0.576	0.256	0.373	0.081	0.140	0.983	0.086
Marital status							
Single	13.33±9.25	11.95±10.73	25.28±19.42	2.47±2.96	1.04±1.49	1.47±0.61	5.00±4.46
Married	14.00±11.09	9.20±9.17	23.20±18.80	2.54±2.24	0.82±1.20	1.26±0.64	4.64±3.27
t	0.248	1.142	0.437	0.115	0.682	1.314	0.397
p-value	0.805	0.257	0.663	0.908	0.497	0.192	0.692
Chronic disease							
Yes	15.40±12.20	10.42±9.97	25.83±20.67	2.54±2.62	0.88±1.23	1.38±0.66	4.80±3.81
No	12.30±8.67	9.34±9.27	21.65±16.90	2.51±2.24	0.88±1.33	1.25±0.62	4.65±3.37
t	1.353	0.517	1.022	0.066	0.010	0.900	0.203
p-value	0.180	0.607	0.310	0.946	0.992	0.371	0.840

F: ANOVA test statistic, t: Independent-samples t-test statistic, SD: Standard deviation

Table 3. Comparison of Preoperative and Postoperative Surgical Fear and Death Anxiety Levels Between Patients Undergoing Minimally Invasive Surgery and Open Surgery (n=85)

Preoperative		Mean	SD	t	p-value
Short-term fear	Minimally invasive	12.70	9.76	1.539	0.128
	Open surgery	16.56	12.22		
Long-term fear	Minimally invasive	9.61	9.68	0.394	0.695
	Open surgery	10.52	9.52		
SFQ total score	Minimally invasive	22.31	18.51	1.061	0.292
	Open surgery	27.08	19.65		
Cognitive-emotional	Minimally invasive	2.51	2.53	0.075	0.941
	Open surgery	2.56	2.18		
Physical changes	Minimally invasive	1.08	1.38	2.306	0.024
	Open surgery	0.40	0.81		
Concerns related to time perception	Minimally invasive	1.36	0.66	1.095	0.277
	Open surgery	1.20	0.57		
DAS total score	Minimally invasive	4.96	3.87	0.947	0.347
	Open surgery	4.16	2.71		
Postoperative					
Short-term fear	Minimally invasive	12.08	9.63	1.198	0.234
	Open surgery	14.72	8.19		
Long-term fear	Minimally invasive	9.36	9.38	0.704	0.483
	Open surgery	10.92	8.94		
SFQ total score	Minimally invasive	21.45	18.30	0.995	0.323
	Open surgery	25.64	16.06		
Cognitive-emotional	Minimally invasive	2.56	2.56	0.078	0.938
	Open surgery	2.52	2.34		
Physical changes	Minimally invasive	0.98	1.24	1.843	0.069
	Open surgery	0.48	0.87		
Concerns related to time perception	Minimally invasive	1.36	0.66	1.095	0.277
	Open surgery	1.20	0.57		
DAS total score	Minimally invasive	4.91	3.69	0.860	0.392
	Open surgery	4.20	2.97		

SFQ: Surgical Fear Questionnaire, DAS: Death Anxiety Scale, SD: Standard deviation, t: Independent-samples t-test statistic

not influenced by surgical approach. Similarly, total surgical fear, cognitive-emotional anxiety, and concerns related to time perception scores did not differ significantly between groups.

Comparison of Preoperative and Postoperative Mean Scores of Surgical Fear and Death Anxiety

Tables 4 and 5 present the results of paired-samples t-tests comparing pre- and postoperative mean scores of surgical fear and death anxiety in patients undergoing minimally invasive and open surgery. No statistically significant differences were found between pre- and postoperative measurements for short-term fear, long-term fear, or total surgical fear ($p>0.05$). Similarly, no significant differences were found in any subdimension of death anxiety following surgery ($p>0.05$). Effect sizes for within-group pre-to-post changes were uniformly small (Cohen's d range: 0.00-0.20 for the minimally invasive group; 0.03-0.20 for the open surgery group), indicating that the modest reductions observed postoperatively lack clinical as well as statistical significance. These findings should be interpreted cautiously given the limited statistical power associated with the unequal group sizes.

DISCUSSION

This study evaluated surgical fear and death anxiety in patients with lung cancer undergoing minimally invasive or open surgery during the preoperative and postoperative periods. The results indicated that fear and anxiety levels were comparable between the two surgical approaches. Demographic variables, including age, gender, education, marital status, and income, were also similar across groups, providing a relatively homogeneous sample. This homogeneity strengthened the comparability of the

Table 4. Comparison of Pretest and Posttest Surgical Fear Perceptions in Patients Undergoing Minimally Invasive and Open Surgery (Paired Samples t-Test) (n=85)

Surgical approach	Variable	Assessment time	Mean	SD	t	p-value
Minimally invasive	Short-term fear	Preoperative	12.70	9.76	0.851	0.402
		Postoperative	12.08	9.63		
	Long-term fear	Preoperative	9.61	9.68	0.720	0.471
		Postoperative	9.36	9.38		
	SFQ total score	Preoperative	22.31	18.51	1.020	0.314
		Postoperative	21.45	18.30		
Open surgery	Short-term fear	Preoperative	16.56	12.22	1.482	0.151
		Postoperative	14.72	8.19		
	Long-term fear	Preoperative	10.52	9.52	0.641	0.524
		Postoperative	10.92	8.94		
	SFQ total score	Preoperative	27.08	19.65	1.210	0.238
		Postoperative	25.64	16.06		

t: Paired samples t-test statistic, SFQ: Surgical Fear Questionnaire, SD: Standard deviation

Table 5. Comparison of Pretest and Posttest Death Anxiety Perceptions in Patients Undergoing Minimally Invasive and Open Surgery (Paired Samples t-Test) (n=85)

		Assessment time	Mean	SD	t	p-value
Minimally invasive	Cognitive-emotional	Preoperative	2.51	2.53	0.410	0.680
		Postoperative	2.56	2.56		
	Physical changes	Preoperative	1.08	1.38	0.891	0.381
		Postoperative	0.98	1.24		
	Concerns related to time perception	Preoperative	1.37	0.67	0.020	0.970
		Postoperative	1.36	0.66		
	DAS total score	Preoperative	4.96	3.87	0.941	0.352
		Postoperative	4.91	3.69		
Open surgery	Cognitive-emotional	Preoperative	2.56	2.18	0.214	0.831
		Postoperative	2.52	2.34		
	Physical changes	Preoperative	0.40	0.81	0.561	0.588
		Postoperative	0.48	0.87		
	Concerns related to time perception	Preoperative	1.22	0.57	0.026	0.931
		Postoperative	1.20	0.57		
	DAS total score	Preoperative	4.16	2.71	0.720	0.474
		Postoperative	4.20	2.97		

DAS: Death Anxiety Scale, SD: Standard deviation, t: Paired samples t-test statistic

groups and reduced the likelihood that psychological differences were attributable to sociodemographic disparities rather than surgical approach.

Previous studies have documented the considerable psychological burden associated with lung cancer surgery. In patients who underwent VATS, 48.4% were reported to have experienced high preoperative anxiety, with higher levels particularly among women and those who had been hospitalized for more than 24 hours [12]. Similarly, Kim et al. [16] identified thoracotomy as an independent risk factor for postoperative anxiety and depression, increasing the risk by 4.5-fold and 3.4-fold, respectively. A comparative study indicated that VATS patients experienced fewer sleep disturbances, less daytime somnolence, better functional capacity, and higher life satisfaction during hospitalization, as well as lower distress, milder pain, and improved quality of life after discharge [17]. Nonetheless, Chen et al. [18] found no significant differences in psychological outcomes among patients who underwent VATS, RATS, or thoracotomy, emphasizing the heterogeneity of findings and the multifactorial nature of psychological adaptation.

In the present study, surgical fear and death anxiety did not differ significantly according to demographic characteristics. However, previous studies reported higher anxiety levels among women

[12,16,19] and younger patients [19], with the highest scores observed in the 18-29 age group and the lowest in patients aged ≥75. Other studies also indicated that women tended to report greater death anxiety, possibly due to a higher propensity to express emotions, and that lower education levels were associated with increased death anxiety [20]. The absence of significant demographic differences in our study suggested that surgical fear and death anxiety were associated more with individuals' coping strategies, illness perceptions, psychosocial support, and subjective experiences related to the surgical process than with age, gender, or education level.

Clinical variables, including time since diagnosis and the presence of chronic disease, were comparable between the minimally invasive and open surgery groups. This allowed surgical fear and anxiety to be interpreted as primarily related to the surgical process rather than patients' lifestyle or disease characteristics. Postoperatively, both groups demonstrated improvements in self-perceived health status, suggesting that completion of surgery positively affects physical and psychological well-being. Postoperative data were collected at discharge, a clinically meaningful timepoint that captures the patient's psychological state following the acute surgical experience and prior to outpatient recovery. Although this reflected only short-term outcomes, it provided a practical and standardized window for perioperative nursing assessment. Future studies should incorporate follow-up measurements at one and three months to characterize the longer-term trajectory of surgical fear and death anxiety. Consistent with previous literature, postoperative well-being improved, and minimally invasive surgery was associated with faster recovery and better functional outcomes [12,17]. Comparative studies also indicated that minimally invasive procedures offered advantages in functional recovery and postoperative comfort, while long-term oncological outcomes did not differ significantly from those of open surgery [21,22]. These results suggested that although the physiological impact of the surgical technique was more pronounced, differences in psychological outcomes between surgical approaches were likely limited. In addition, this finding may indicate that patients prioritize survival, treatment success, and recovery expectations over the technical characteristics of the surgical approach when evaluating their psychological experience.

Comparisons between surgical approaches showed that pre- and postoperative levels of surgical fear and death anxiety were generally similar between the minimally invasive and open surgery groups. In the preoperative period, only the subscale measuring concerns about physical changes was higher in the minimally invasive group; however, this difference was no longer significant postoperatively. These findings suggested that uncertainties or aesthetic concerns associated with minimally invasive surgery were more prominent before surgery but diminished after the procedure. Huang et al. [23] highlighted that chronic procedure-related symptoms following minimally invasive lung surgery could affect body image, psychological well-being, and quality of life. Thus, the higher preoperative concern regarding physical changes may have reflected patients' anticipation of potential postoperative bodily effects. The higher preoperative "concern about physical changes" in the minimally invasive group may have reflected anxiety related to aesthetic outcomes, potential scarring, and body image. Although minimally invasive surgery was perceived as less traumatic, patients could still experience preoperative anxiety associated with chronic postoperative symptoms, pain, and changes in body perception [24]. Patients undergoing minimally invasive surgery may have had higher expectations regarding postoperative comfort and cosmetic outcomes, which may have increased their sensitivity to potential physical changes before surgery.

In addition, systematic reviews report that minimally invasive procedures reduce short-term morbidity and enhance recovery but do not consistently affect long-term survival or psychosocial outcomes [25,26]. Thus, technical superiority does not necessarily translate into better psychological adaptation. Importantly, although most intergroup comparisons did not reach statistical significance, effect sizes were small to medium (Cohen's d range: 0.02-0.55), suggesting that some differences may have had clinical relevance that the current sample size was insufficient to detect statistically. These findings made a distinct contribution to the literature by demonstrating that, even in a non-randomized clinical sample with unequal group sizes, the psychological burden of lung cancer surgery-as measured by validated instruments-did not appear to differ substantially by surgical approach, reinforcing the need for psychological assessment regardless of technique.

Postoperative decreases in surgical fear and death anxiety were observed but were not statistically significant, indicating limited psychological relief. Preoperative anxiety strongly influences postoperative quality of life, and its reduction through information, counseling, and psychosocial support can improve outcomes [12]. Psychological adjustment and anxiety were shaped by multidimensional factors beyond the surgical approaches [27]. The persistence of anxiety after surgery may also reflect ongoing concerns related to cancer prognosis, recurrence risk, adjuvant treatment, and uncertainty regarding future health status. These findings underscored the importance of providing psychological support to all patients while preserving the technical advantages of minimally invasive procedures. Routine perioperative psychological assessment and early supportive interventions may therefore play a critical role in improving overall patient adaptation and recovery.

Study Limitations

This single-center study limits the generalizability of the findings to all lung cancer patients. Only patients undergoing minimally invasive or open surgery were included, while those receiving other treatment modalities were excluded. Surgical fear and death anxiety were measured using self-report instruments, which may have introduced response bias. In addition, the non-randomized design limits causal interpretation, as selection bias related to the surgical approach cannot be fully excluded. Group assignment was based on the planned surgical approach rather than randomization, which resulted in inherently unequal group sizes. This imbalance may have reduced the statistical power of intergroup comparisons and increased the risk of type II error, meaning that some non-significant findings may reflect insufficient power rather than true equivalence between surgical approaches. Furthermore, important clinical and psychosocial variables-such as cancer stage, previous surgical experience, psychiatric history, and social support levels-were not systematically assessed, which limits the explanatory scope of the findings. Postoperative data were collected at the time of discharge, capturing only short-term psychological responses; fear and death anxiety may evolve substantially over weeks or months following surgery, and longitudinal follow-up would be needed to characterize these trajectories. Nevertheless, the consistent application of standardized surgical protocols and data collection procedures across all participants enhances the internal reliability of the results.

CONCLUSION

This study found that minimally invasive and open surgical approaches were associated with similar levels of surgical fear and death anxiety in patients with lung cancer. Anxiety levels were not significantly related to demographic or clinical factors, suggesting that psychological responses may be influenced more by individual patient characteristics and psychosocial support than by the surgical approach. However, these findings should be interpreted cautiously; the non-randomized design and the imbalance in group sizes may have reduced statistical power, meaning that true differences cannot be entirely ruled out. Postoperative scores showed a slight, non-significant reduction, indicating that the surgical procedure itself had a limited short-term effect on psychological well-being. The use of validated instruments and effect size estimates alongside statistical significance provides a more comprehensive interpretation of these findings and suggests that clinically relevant differences may exist despite the absence of statistical significance.

These results highlight the importance of addressing psychological needs in all patients undergoing lung cancer surgery. From a nursing perspective, holistic, patient-centered care should include systematic psychological assessment, individualized education, and emotional support throughout the perioperative period. Preoperative anxiety may increase due to uncertainty about the procedure; therefore, providing clear information about surgery, recovery, and potential physical changes is essential to reduce anxiety and enhance psychological preparedness. Although minimally invasive approaches offer technical advantages, concerns related to body image may still contribute to anxiety, emphasizing the importance of assessing patients' expectations and perceptions. Strengthened collaboration between surgical teams and psychosocial care services may further support perioperative adjustment and overall psychological well-being.

Ethics

Ethics Committee Approval: Ethical approval was obtained from the Non-Interventional Research Ethics Committee of Biruni University (approval no: 2024/BİAEK/06-01, date: 20.01.2025). Institutional permission was granted by the Provincial Health Directorate (approval no: 2025/2, date: 06.03.2025).

Informed Consent: The purpose of the study was explained to participants both verbally and in writing using an informed voluntary consent form. Participants were informed that their data would remain confidential.

Footnotes

Biruni University, Institute of Graduate Education, Master's Program in Nursing, 2026.

Authorship Contributions

Concept: NT, AK; Design: NT, AK; Data Collection or Processing: NT; Analysis or Interpretation: NT, AK; Literature Search: NT, AK; Writing: NT, AK.

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