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Retrospective Analysis of Anaesthesia Management for Lung Lobectomy via Thoracotomy

Torakotomi ile Yapılan Akciğer Lobektomi Ameliyatlarının Anestezi Yönetiminin Retrospektif Analizi

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Abstract

Objective: Lung lobectomy is a common procedure for treating pulmonary conditions, including lung cancer. Effective analgesia is crucial for minimizing postoperative pain and enhancing recovery. Traditional opioid-based analgesia (OA) is associated with significant side effects, prompting increased interest in regional anesthesia (RA) techniques. This study evaluates the impact of OA versus RA on perioperative and postoperative outcomes in lung lobectomy patients.

Method: This retrospective study included patients who underwent lung lobectomy between April 2020 to December 2022. Patients were divided into Group OA and Group RA. The collected data encompassed preoperative demographic characteristics and intraoperative hemodynamic parameters. Intraoperative timing variables included anesthesia duration, surgical duration, and one-lung ventilation (OLV) time. Postoperative outcomes consisted of intensive care unit-length of stay (ICU-LOS), hospital length of stay, durations of invasive mechanical ventilation (IMV) and non-invasive mechanical ventilation (NIMV), and mortality.

Results: Patients enrolled in the study were divided into Group OA (n=32) the Group RA (n=44). Demographic data and comorbidities were comparable between groups (p>0.05). OLV duration was slightly longer in Group OA (181.7±63.7 min) than in Group RA (161.8±59.8 min), without statistical significance (p=0.168). ICU-LOS stay was shorter in Group RA

Öz

Amaç: Akciğer lobektomisi, akciğer kanseri dahil olmak üzere çeşitli pulmoner hastalıkların tedavisinde yaygın olarak uygulanan bir cerrahi işlemdir. Etkili analjezi, postoperatif ağrının en aza indirilmesi ve iyileşmenin hızlandırılması açısından büyük önem taşır. Geleneksel opioid bazlı analjezi (OA), önemli yan etkilere neden olabilmekte ve bu durum rejyonal anestezi (RA) tekniklerine olan ilgiyi artırmıştır. Bu çalışma, OA ile RA'nın akciğer lobektomisi uygulanan hastalardaki perioperatif ve postoperatif sonuçlar üzerindeki etkisini değerlendirmektedir.

Yöntem: Bu retrospektif çalışmaya, Nisan 2020 ile Aralık 2022 tarihleri arasında akciğer lobektomisi uygulanan hastalar dahil edilmiştir. Hastalar Grup OA ve Grup RA grubu olmak üzere ikiye ayrılmıştır. Toplanan veriler, preoperatif döneme ait demografik özellikler ve intraoperatif hemodinamik parametreleri içermektedir. İntraoperatif zamanlama verileri arasında anestezi süresi, cerrahi süresi ve tek akciğer ventilasyonu (OLV) süresi yer almaktadır. Postoperatif sonuçlar ise yoğun bakımda kalış süresi (ICU-LOS), hastanede yatış süresi, invaziv mekanik ventilasyon (IMV) ve non-invaziv mekanik ventilasyon (NIMV) süreleri ile mortalite verilerini kapsamaktadır.

Bulgular: Çalışmaya katılan hastalar Grup OA (n=32) ve Grup RA (n=44) olarak ikiye ayrılmıştır. Demografik veriler ve eşlik eden hastalıklar açısından gruplar arasında anlamlı bir fark bulunmamıştır (p>0,05). OLV süresi Grup OA'da (181,7±63,7 dk) Grup RA'ya (161,8±59,8 dk) göre biraz

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Abstract

(1.32±0.77 days) compared to Group OA (2.53±2.77 days; p=0.007). In Group OA, the need for IMV was higher (18.75%) compared to Group RA (6.81%), and the mean IMV duration was also longer (25.67±19.28 hours vs. 10.67±11.54 hours); however, these differences were not statistically significant. No significant differences were observed in hemodynamic stability or non-invasive ventilation times.

Conclusion: The use of RA in patients undergoing thoracotomy for lobectomy offers significant advantages over OA, including shorter ICU length of stay and reduced need for and duration of IMV. Routine integration of RA techniques into multimodal analgesia protocols for thoracic surgery may improve patient outcomes.

Keywords: Lung lobectomy, opioid-based analgesia, perioperative care, regional anesthesia

Öz

daha uzundu, ancak istatistiksel olarak anlamlı değildi (p=0,168). Grup RA yoğun bakımda kalış süresi Grup OA grubuna kıyasla daha kısa bulunmuştur (1,32±0,77 gün vs. 2,53±2,77 gün; p=0,007). Grup OA'da IMV gereksinimi (%18,75), Grup RA'ya (%6,81) kıyasla daha yüksek olup; ortalama IMV süresi de daha uzundu (25,67±19,28 saat vs. 10,67±11,54 saat), ancak bu farklar istatistiksel olarak anlamlı değildi. Hemodinamik stabilite ve NIMV açısından ise gruplar arasında anlamlı bir fark saptanmamıştır.

Sonuç: Lobektomi amacıyla torakotomi uygulanan hastalarda RA kullanımı, OA'ya kıyasla yoğun bakımda kalış süresinin kısalması ve IMV gereksinimi ile süresinin azalması gibi anlamlı avantajlar sunmaktadır. RA tekniklerinin toraks cerrahisinde multimodal analjezi protokollerine rutin olarak entegre edilmesi, hasta sonuçlarını iyileştirebilir.

Anahtar kelimeler: Akciğer lobektomisi, opioid bazlı analjezi, perioperatif bakım, rejyonal anestezi

Introduction

Lung lobectomy, a common surgical procedure for treating various pulmonary conditions including lung cancer, often necessitates comprehensive perioperative management to optimize patient outcomes. Effective analgesia is essantial for reducing postoperative pain, facilitating early mobilization, enhancing respiratory exercises and improving overall recovery. Traditionally, opioid-based analgesia (OA) has been the main method for managing postoperative pain in thoracic surgeries. However, the use of opioids is associated with significant problems such as respiratory depression, nausea, vomiting, and prolonged hospital stays (1,2).

In recent years, regional anesthesia (RA) techniques have emerged as effective alternatives to OA, particularly in surgical approach. The choice of RA technique is generally guided by the type of thoracotomy approach used (3).

Paravertebral block (PVB) results in lower postoperative morphine consumption than erector spinae plane block (ESPB) after thoracotomy, despite similar pain scores, highlighting ESPB as a safer alternative due to its simpler anatomical approach (4). Additionally, ESPB has demonstrated non-inferior analgesic efficacy compared to PVB in abdominal surgery, supporting its potential utility in thoracic procedures as well (5). By offering superior pain relief, reducing opioid requirements, and minimizing opioid-related adverse effects, RA has the potential to significantly enhance postoperative recovery (6).

The impact of different analgesic strategies on critical perioperative outcomes such as intensive care unit length of stay (ICU-LOS), overall hospital length of stay (hLOS), and the need for postoperative mechanical ventilation remains an area of active investigation. Studies have suggested that RA may lead to improved hemodynamic stability and better postoperative pulmonary function compared to OA (7). However, evidence comparing these two approaches specifically in the context of lung lobectomy is limited.

This retrospective study aims to evaluate the effects of OA versus RA on various perioperative outcomes in patients undergoing lung lobectomy. By analyzing data from a cohort of patients, this study seeks to provide insights into the efficacy and safety of regional techniques in enhancing postoperative recovery and reducing morbidity and mortality in this patient population.

Materials and Methods

Study Design and Setting

This retrospective observational cohort study was conducted to evaluate the effects of different perioperative analgesic strategies—OA versus RA—on postoperative outcomes in patients undergoing lung lobectomy. The study was performed at University of Health Sciences Turkey, Başakşehir Çam and Sakura City Hospital, a tertiary care center, and included patients operated between April 2020 and December 2022. The study protocol was approved by the Local Ethics Committee of University of Health Sciences Turkey, Başakşehir Çam and Sakura City Hospital (approval number: 2022.12.421, date: 24/12/2022) and was conducted in accordance with the Declaration of Helsinki.

Participants

The study population consisted of adult patients aged 18 years and older who underwent elective lung lobectomy

within the specified period. Inclusion criteria required the availability of complete perioperative and postoperative data. Patients were excluded if they underwent emergency surgery, had incomplete medical records, or underwent concurrent additional surgical procedures. All eligible patients were included consecutively to reduce selection bias.

Exposure and Group Allocation

Patients were divided into two groups according to the analgesic strategy used: Group OA and Group RA, who received regional techniques or not. The choice of analgesic approach was made by the attending anesthesiologist according to clinical protocols and patient suitability, independent of the study investigators.

Anesthesia and Analgesia Protocols

As part of our standard anaesthesia protocol, we administered general anaesthesia to all patients and intubated them using a double-lumen tube. Anesthesia induction was standardized, and maintenance was achieved with sevoflurane (0.8-1 MAC) and remifentanil infusion. Mechanical ventilation was adjusted according to individual intraoperative needs.

In the Group RA, regional techniques (either PVB or ESPB) was administered preoperatively under ultrasound guidance by an experienced anesthesiologist prior to induction. At the end of surgery, patients received intravenous paracetamol (1000 mg) and tramadol (100 mg). Postoperatively, they were given intravenous paracetamol 1000 mg three times daily and tramadol 100 mg twice daily.

In the Group OA, patients received intravenous paracetamol (1000 mg) and morphine hydrochloride (0.1 mg/kg) intraoperatively. Postoperative analgesia included paracetamol 1000 mg three times daily and a continuous intravenous infusion of morphine hydrochloride (0.005-0.01 mg/kg/h). In both groups, pethidine chloride was administered as rescue analgesia if required.

Data Collection

Data were extracted retrospectively from the hospital's electronic medical record system. Demographic variables included age, sex, height, weight, body mass index, ASA classification and comorbidities. Intraoperative parameters included the duration of OLV, and hemodynamic variables [systolic arterial blood pressure (SABP), diastolic arterial blood pressure (DABP), heart rate (HR) and peripheral oxygen saturation (SpO_2)], which were recorded at three standardized time points: before induction, after OLV, and before extubation. The duration of anesthesia did not include the time required for block placement in the Group RA, as it was performed before induction.

Postoperative variables included the ICU-LOS, total hLOS, the number of patients who required invasive (IMV) or non-invasive mechanical ventilation (NIMV), the duration of ventilation among these patients, and in-hospital mortality.

Outcomes

The primary outcomes of the study were ICU-LOS and hLOS. Secondary outcomes included the need of postoperative IMV and NIMV, perioperative hemodynamic stability, and mortality.

Minimization of Bias

To minimize potential selection and information bias, only patients with complete data were included. Data abstraction was performed by trained personnel blinded to the study hypothesis.

Statistical Analysis

Since this study was designed retrospectively, no a priori power analysis was conducted. However, to assess whether the sample size was sufficient to detect clinically meaningful differences in the primary outcomes, a post-hoc power analysis was performed, indicating that the sample size was statistically adequate. The data were analysed via SPSS (Mac OS, version 27.0). The normality of the data was assessed with the Kolmogorov-Smirnov test. Normally distributed data were analyzed using independent t-tests, while non-normally distributed data were analyzed with the Mann-Whitney U test. Categorical variables were compared using chi-square or Fisher's exact tests. Continuous variables were expressed as mean ± standard deviation and categorical variables were presented as counts and percentages. Statistical significance was determined by p-values <0.05.

Results

Between April 2020 and December 2022, 76 patients undergoing lobectomy via thoracotomy were enrolled in the study (Figure 1). Patients enrolled in the study were divided into the Group OA (n=32) and the Group RA (n=44). When demographic data and comorbidities of the patients were compared, there wasn't significant difference between the groups ($p>0.05$) (Table 1).

Hemodynamic Parameters Before and After Induction

The comparison of perioperative hemodynamic parameters between Group OA and Group RA is presented in Table 2. Before induction, no statistically significant differences were observed between the groups in terms of SABP, DABP, HR and SpO_2. Specifically, SABP was 132.91±13.75 mmHg in Group OA and 131.70±14.14 mmHg in Group RA (p=0.712), while DABP was 81.69±11.06 mmHg in Group OA and 83.33±10.76 mmHg in Group RA (p=0.522). Similarly, HR and SpO_2 values were comparable between the groups (HR: 85.09±12.56 bpm vs. 89.53±14.14 bpm, p=0.163; SpO_2: 98.94±1.58% vs. 98.95±1.64%, p=0.966).

Following OLV, SABP and DABP values remained statistically similar between Group OA and Group RA (SABP: 105.38±11.67 mmHg vs. 105.91±8.52 mmHg, p=0.820; DABP: 64.56±8.93 mmHg vs. 65.81±6.69 mmHg, p=0.490). HR and SpO_2 measurements also did not differ significantly (HR: 81.66±9.64 bpm vs. 82.33±11.27 bpm, p=0.788; SpO_2: 97.28±2.88% vs. 97.07±2.72%, p=0.747).

Before extubation, no significant differences were found in SABP, HR, or SpO_2 between the two groups (SABP: 107.72±18.17 mmHg vs. 105.41±11.53 mmHg, p=0.501; HR: 83.63±11.35 bpm vs. 82.75±11.16 bpm, p=0.739; SpO_2: 99.47±1.27% vs. 99.09±1.57%, p=0.271). Although the DABP value was slightly higher in Group RA compared to Group OA (66.86±10.49 mmHg vs. 62.38±9.80 mmHg), this difference did not reach statistical significance (p=0.062).

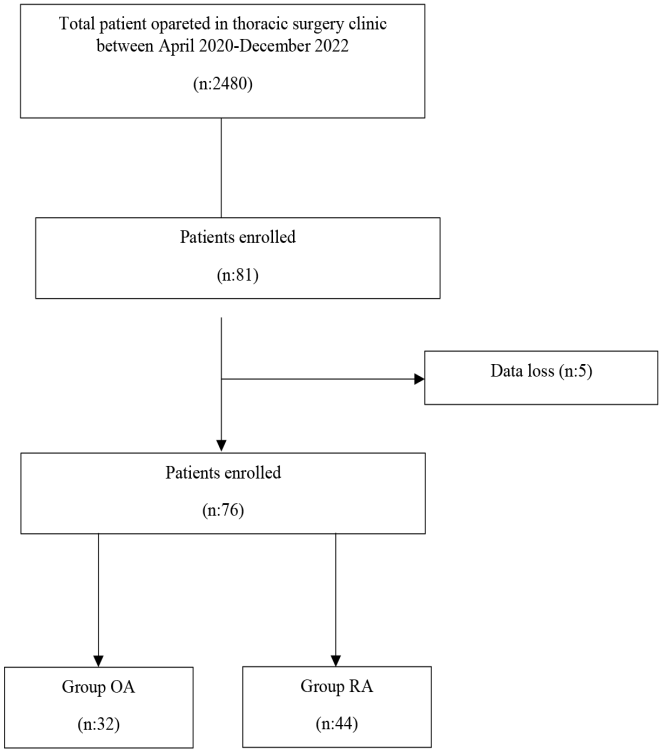

Figure 1. Flow diagram
OA: Opioid-based analgesia, RA: Regional anesthesia

Surgical, Anesthesia and OLV Durations

A comparison of surgical, anesthesia, and OLV times between Group OA and Group RA is shown in Table 3. The mean duration of surgery was 201.72±63.68 minutes in Group OA and 186.59±60.24 minutes in Group RA, with no statistically significant difference observed between the groups (p=0.295). Similarly, anesthesia time did not differ significantly between the groups, with a mean of 245.00±68.49 minutes in Group OA and 222.84±64.17 minutes in Group RA (p=0.153).

The mean duration of OLV was also found to be slightly longer in Group OA (181.72±63.68 minutes) compared to Group RA (161.82±59.79 minutes); however, this difference did not reach statistical significance (p=0.168).

Table 1. Demographical data of the patient

	Group OA [a,b] (n=32)	Group RA [a,b] (n=44)	p-value [c,d]
Age (years)	62.56±7.71	59.64±10.16	0.176
Height (cm)	169.91±7.34	171.66±7.92	0.330
Weight (kg)	76.69±12.73	76.27±13.55	0.893
BMI (kg/m²)	26.58±4.26	25.84±3.89	0.437
ASA scores			
II	9 (28.12%)	13 (29.5%)	
III	21 (65.62%)	29 (65.9%)	0.869
IV	2 (6.25%)	2 (4.5%)	
Comorbidities (n)	1.70±2.17	1.47±1.90	0.687

[a]: Mean ± standard deviation, [b]: n (%), [c]: Independent sample t-test, [d]: Chi-square test, *: p<0.05 is accepted as statistically significant difference, BMI: Body mass index, OA: Opioid-based analgesia, RA: Regional anesthesia

Hospital Stay and Mechanical Ventilation Durations

As presented in Table 4, the mean duration of stay in the ICU-LOS was significantly longer in Group OA compared to Group RA (2.53±2.77 days vs. 1.32±0.77 days, p=0.007). In contrast, hLOS did not differ significantly between the groups, with Group OA having a mean duration of 7.06±4.45 days and Group RA 7.82±3.06 days (p=0.383).

The need for IMV was higher in Group OA (18.75%) compared to Group RA (6.81%), although this difference was not statistically significant (p=0.112). Similarly, the mean duration of IMV was longer in Group OA (25.67±19.28 hours) than in Group RA (10.67±11.54 hours), but this difference also did not reach statistical significance (p=0.179). The need for NIMV was comparable between the two groups (12.50% in Group OA vs. 11.36% in Group

Table 2. Comparison of hemodynamic parameters (mean ± SD)

	Group OA[a] (n=32)	Group RA[a] (n=44)	p-value[b]
Before induction			
SABP (mm/Hg)	132.91±13.75	131.70±14.14	0.712
DABP (mm/Hg)	81.69±11.06	83.33±10.76	0.522
HR (bpm)	85.09±12.56	89.53±14.14	0.163
SpO_2 (%)	98.94±1.58	98.95±1.64	0.966
After one lung ventilation			
SABP (mm/Hg)	105.38±11.67	105.91±8.52	0.820
DABP (mm/Hg)	64.56±8.93	65.81±6.69	0.490
HR (bpm)	81.66±9.64	82.33±11.27	0.788
SpO_2 (%)	97.28±2.88	97.07±2.72	0.747
Before extubation			
SABP (mm/Hg)	107.72±18.17	105.41±11.53	0.501
DABP (mm/Hg)	62.38±9.80	66.86±10.49	0.062
HR (bpm)	83.63±11.35	82.75±11.16	0.739
SpO_2 (%)	99.47±1.27	99.09±1.57	0.271

[a]: Mean ± SD: Mean ± standard deviation, [b]: Independent sample t-test, *: p<0.05 is accepted as statistically significant difference, SABP: Systolic arterial blood pressure, DABP: Diastolic arterial blood pressure, HR: Heart rate, SpO_2: Peripheral oxygen saturation, OA: Opioid-based analgesia, RA: Regional anesthesia

Table 3. Comparison of surgical, anesthesia and one lung ventilation times (mean ± SD)

	Group OA[a] (n=32)	Group RA[a] (n=44)	p-value[b]
Surgery time (min)	201.72±63.68	186.59±60.24	0.295
Anesthesia time (min)	245.00±68.49	222.84±64.17	0.153
One-lung ventilation time (min)	181.72±63.68	161.82±59.79	0.168

[a]: Mean ± SD: Mean ± standard deviation, [b]: Independent sample t-test, *: p<0.05 is accepted as statistically significant difference, pressure, HR: Heart rate, SpO_2: Peripheral oxygen saturation, OA: Opioid-based analgesia, RA: Regional anesthesia

Table 4. Comparison of hospital stay and mechanical ventilation times (mean ± SD)

	Group OA [a,b] (n=32)	Group RA [a,b] (n=44)	p-value[c,d,e]
ICU-LOS (days)	2.53±2.77	1.32±0.77	**0.007***
hLOS (days)	7.06±4.45	7.82±3.06	0.383
IMV need (n)	6 (18.75%)	3 (6.81%)	0.112
IMV duration (hours)[#]	25.67±19.28	10.67±11.54	0.179
NIMV need (n)	4 (12.50%)	5 (11.36%)	0.880
NIMV duration (hours)[#]	60.00±39.79	60.00±30.98	0.264

[a]: Mean ± SD: Mean ± standard deviation, [b]: n (%), [c]: Independent sample t-test, [d]: Chi-square test, [e]: Mann-Whitney U test, *: p<0.05 is accepted as statistically significant difference, [#]: Patients who did not develop a need were excluded
ICU-LOS: Intensive care unit length of stay, hLOS: Hospital length of stay , IMV: Invasive mechanical ventilation, NIMV: Non-invasive mechanical ventilation

RA, p=0.880). Likewise, NIMV duration was similar, with both groups having a mean duration of 60.00 hours (OA: 60.00±39.79, RA: 60.00±30.98, p=0.264). No mortality was observed in either group.

Discussion

This study compared the perioperative and postoperative outcomes of patients undergoing thoracotomy for lobectomy under two different analgesic strategies. The findings highlight that RA was associated with significantly improved postoperative outcomes in terms of ICU-LOS, while IMV requirement and duration were also lower in the RA group, although these differences did not reach statistical significance. Importantly, these outcomes were achieved without compromising intraoperative hemodynamic stability.

First, our results revealed no statistically significant differences in demographic characteristics, comorbidities, or intraoperative hemodynamic parameters (SABP, DABP, HR, SpO_2) between the groups. These findings suggest that the observed postoperative differences cannot be attributed to preoperative risk factors or intraoperative instability, underscoring the specific influence of the analgesic modality used. This suggests that RA and OA maintain similar hemodynamic stability during the perioperative period, corroborating the results of a study by Ke et al. (8), which indicated that both methods provide comparable hemodynamic stability. Hamilton et al (9). reported that paravertebral and fascial plane blocks in thoracic surgery reduce opioid consumption, improve pain control, and preserve hemodynamic stability. However, in our study, the use of a standardized anesthesia protocol for all patients and close intraoperative monitoring may have allowed for rapid correction of any hemodynamic fluctuations. This could explain the lack of significant differences between the groups.

Recent studies have shown that the decrease in oxygen saturation during OLV is a physiological response, and that lung-protective ventilation strategies are effective in maintaining adequate oxygenation during this period (10-12). Although the mean SpO_2 value during OLV was approximately 97% in both groups, this still represents a relative decrease from pre-OLV baseline levels, reflecting the expected physiological effect of lung isolation. In addition, the standard deviation values suggest variability across cases and indicate that lung-protective ventilation strategies—such as the use of higher FiO_2, optimal patient positioning, and PEEP adjustments—were likely applied to maintain oxygenation above 90%, in line with current practice guidelines.

Ventilation-related lung injury and postoperative analgesia are emphasised in ERATS protocols (13,14). Importantly, a significant reduction was observed in ICU-LOS and duration of IMV in the Group RA. Patients in the Group RA had a notably shorter ICU stay and required less IMV time compared to those in the Group OA, suggesting that improved pain control may have contributed to faster respiratory recovery and stabilization. These results are consistent with findings by Hutton et al. (15), who reported the benefits of RA in reducing pulmonary complications and improving respiratory function in thoracic surgeries (16). This is also supported by the study of Kukreja et al. (17), which found that RA significantly reduces ICU-LOS and enhances recovery (16-18). The significantly shorter ICU stay observed in the RA group, along with the trend toward reduced IMV requirement and duration, may be explained by more effective postoperative pain control. This likely contributed to faster recovery of respiratory function. Adequate analgesia reduces diaphragmatic splinting, increases tidal volume, and lowers the incidence of atelectasis and hypoventilation. These physiological benefits may facilitate the earlier return of spontaneous breathing and enable quicker weaning from IMV.

In terms of mechanical ventilation times, both the duration and the need for IMV were lower in the RA group; however, these differences did not reach statistical significance. NIMV duration and requirement were found to be similar between the groups. This may be attributed to the use of similar postoperative monitoring and ventilatory protocols in both groups, and the fact that the need for NIMV was determined primarily by the patient's clinical condition rather than the analgesic technique. This aligns with findings of the studies, who reported that while RA reduces IMV duration, it does not significantly affect NIMV duration (18-20).

Only a limited number of studies have evaluated parameters such as hLOS as secondary outcomes, including different types of regional blocks (21), and these parameters remain underreported in the literature (22). Although the duration of NIMV and were numerically shorter in the Group RA, these differences did not reach statistical significance. This may reflect either the sample size limitations or multifactorial influences on these parameters beyond analgesia type. No mortality was observed in either group,

consistent with the low perioperative risk in elective thoracic surgery patients and further supporting the safety of both analgesic approaches.

Study Limitations

This study has several limitations that should be acknowledged. First, its retrospective design inherently introduces the possibility of selection bias and limits control over confounding variables. The accuracy and completeness of the data may have been affected by potential inconsistencies or omissions in medical records. Additionally, due to the retrospective nature of the study, a priori sample size estimation was not performed. However, a post-hoc power analysis was conducted to evaluate the adequacy of the available data, and it demonstrated that the statistical power was sufficient for the primary outcomes of the study.

Furthermore, the inclusion of patients from different ASA classification groups under a single category may have obscured potential differences related to comorbidity severity; this is acknowledged as an additional limitation. Although RA was performed following institutional protocols, variability in block technique, local anesthetic volume, and provider expertise were not fully standardized, which may have influenced the clinical outcomes.

Another important limitation is the absence of standardized documentation of postoperative pain scores (e.g., visual analogue scale or nutritional risk screening) and uniform quantification of opioid consumption, which precluded a direct comparison of analgesic efficacy between groups. Lastly, the relatively small sample size limits the generalizability of our findings to the broader population.

Future prospective, multicenter studies with larger cohorts and standardized outcome measures—particularly patient-centered parameters such as postoperative pain scores, opioid requirements, and recovery quality—are warranted to validate and expand upon these findings.

Conclusion

In patients undergoing thoracotomy for lobectomy, the use of RA was associated with a significant reduction in ICU-LOS. Although the need for and duration of IMV were lower in the RA group, these differences remained at the threshold of statistical significance. These outcomes were achieved without compromising intraoperative hemodynamic stability or surgical efficiency. Our findings support the potential role of RA as a valuable component of multimodal analgesic strategies in thoracic surgery. However, larger-scale prospective studies are needed to confirm these observations and to more clearly define the clinical benefits of RA in this context.

Ethics

Ethics Committee Approval: The study protocol was approved by the Local Ethics Committee of University of Health Sciences Turkey, Başakşehir Çam and Sakura City Hospital (approval number: 2022.12.421, date: 24/12/2022) and was conducted in accordance with the Declaration of Helsinki.

Informed Consent: Retrospective study.

Footnotes

AI programme has been used for grammar improvement in this article.

Authorship Contributions

Surgical and Medical Practices: E.M., Ö.A., O.S., C.K.B., Concept: E.M., Ö.A., O.S., C.K.B., F.G.Ö., Design: E.M., Ö.A., O.S., C.K.B., F.G.Ö., Data Collection or Processing: E.M., Ö.A., O.S., C.K.B., Analysis or Interpretation: E.M., Ö.A., O.S., F.G.Ö., Literature Search: E.M., Ö.A., O.S., C.K.B., Writing: E.M., Ö.A., O.S.

Conflict of Interest: No conflict of interest was declared by the authors.

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