

# Anesthesia Management in Non-Intubated Thoracoscopic Surgery (NIVATS): A Retrospective Study

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## ABSTRACT

**Objectives:** Video-assisted thoracoscopic surgery (VATS) is a widely used technique for thoracic operations. Non-intubated VATS (NIVATS) under regional or local anesthesia can be performed in selected patients. Epidural analgesia or interfascial plane blocks can be used for successful NIVATS. Erector spinae plane block (ESPB) is a type of interfascial plane block that is effective for NIVATS procedures. At our clinic, we successfully perform NIVATS with ESPB or rhomboid intercostal plane block (RIB). In this paper, we assess the effectiveness of these anesthesia methods used during NIVATS procedures.

**Methods:** We retrospectively reviewed 61 patients that underwent NIVATS procedures at our clinic between November 2017 and August 2023. This study received ethical committee approval (2023.255.IRB1.084). These 61 patients were assessed based on their demographic information, ASA grades, procedure indication, procedure duration, post-procedure complications, and type of anesthesia.

**Results:** All 61 patients received intraoperative sedation. Of these, 16 received epidural analgesia, 10 received ESPB, 6 received RIB, and 29 received local anesthesia. Perioperative care did not differ between groups and all surgeries were completed without complications. No patients required transition to general anesthesia.

**Conclusion:** Patients in the epidural group were younger, which we think correlates with increasing comorbidities and anticoagulant usage with age. Other parameters were similar between groups. Overall, we recommend further prospective studies with larger sample sizes to evaluate the outcomes of different anesthesia techniques for NIVATS procedures.

**Keywords:** Epidural analgesia, regional anesthesia, video-assisted thoracic surgery.

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## Introduction

Video-assisted thoracoscopy (VATS) has become a widely used technique for various aspects of thoracic operations, from acquiring biopsy samples to pneumonectomy. VATS procedures are generally performed under general anesthesia with single lung ventilation. Non-intubated VATS (NIVATS), which is performed without general anesthesia or intubation, is a recently introduced technique with numerous applications.<sup>[1-3]</sup> NIVATS diminishes risks related to general anesthesia and single lung ventilation and enables surgery on patients that are not good candidates for general anesthesia.

NIVATS is commonly performed under epidural anesthesia, various thoracic interfascial plane blocks, or local anesthesia.<sup>[1-5]</sup> Erector spinae planar block (ESPB) is a regional block

that is effective as an analgesic and anesthesia method for VATS procedure.<sup>[6-8]</sup> The advantage of ESPB over epidural anesthesia is decreased risks related to neuraxial blockage, such as hemodynamic instability, motor blockage, or respiratory compromise. ESPB, as a superficial block, is safe with anticoagulant or antiaggregant usage and its hemorrhagic complications have lower morbidity than neuraxial interventions.<sup>[9]</sup>

Rhomboid intercostal block (RIB) is another type of regional anesthesia that is utilized for analgesia in thoracic operations including VATS.<sup>[10,11]</sup> Its advantages are similar to those of ESPB and the greater distance from the central nervous system results in decreased complications with an analgesic effect similar to ESPB. There are previous reports of NIVATS with ESPB and epidural analgesia. At our clinic,

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we have successfully performed these procedures under RIB. In this study, we analyze data from NIVATS cases at our clinic and assess the effectiveness of anesthetic methods used in NIVATS procedures.

## Methods

At our clinic, preoperative approval is routinely obtained from patients for academic usage of their medical and demographic data. Following ethical committee approval (2023.255.IRB1.084), we screened NIVATS procedures performed at our clinic between November 2017 and August 2023. Patient records indicated 61 cases. We obtained demographic data, anesthesiology assessment forms, anesthesiology reports, and post-anesthesia care unit (PACU) forms for these patients. American Society of Anaesthesiologists (ASA score) classification was chosen as an indicator of functional capacity.

We grouped patients based on anesthetic type and analyzed demographic data, ASA score classification, anesthetic method, local anesthetic drugs used during regional anesthesia, surgery indication, surgery duration, and anesthesia-related complications. Statistical analysis was performed using SPSS 29 (Armonk, NY: IBM Corp, USA). Variables are reported as the average±standard deviation. The independent sample t test was used to compare the means for continuous variables between groups. Pearson's  $\chi^2$  test was used to compare categorical variables. After these analyses, variables with  $p < 0.20$  significance were included in a logistic regression model. Significance was set at  $p < 0.05$ .

## Results

In our sample, the average patient age was 66.6 years. On average, patients in the epidural group were significantly younger than the other patients. Significant differences were not found for other demographic variables. All patients were ASA class III or IV, most of which were ASA class III. Distribution of ASA classes was similar between all groups. Of the 61 patients, 16 received thoracal epidural catheter

preoperatively. Of these, 10 patients received ESPB and 6 patients received RIB. The remaining 29 patients received local anesthesia and sedation. No patients required conversion to general anesthesia. All 61 patients received intraoperative sedative agents to increase their comfort during the operation. These sedative agents included midazolam, fentanyl, and intermittent small boluses of propofol. Detailed anesthesia methods are provided in Table 1.

Regional anesthesia in these patients included continuous epidural anesthesia, ESPB, and RIB. All regional anesthesia techniques were administered by the same anesthetist experienced in these techniques.

Regarding regional anesthesia techniques, epidural analgesia was applied with an epidural catheter placed between the T5–T7 levels. 2% prilocaine was administered during surgery. ESPB was applied using ultrasound guidance and localized at the T5–T6 levels. A 22G 50 mm needle was placed between the transverse spinal processes and erector spinae fascia and 20 mL 0.25% bupivacaine was administered to the operation side. RIB was also applied with ultrasound guidance. The rhomboid major muscle fascia and intercostal muscle fascia were localized at T4–T5. A 22G 50 mm needle was placed at the interfascial plane and 20 mL 0.25% bupivacaine was applied to the operation side.

NIVATS indications for the 61 patients were as follows: malignant pleural effusion (43), empyema (12), hemothorax (2), interstitial lung disease (1), lymphoma (1), and lymph node biopsy (2). Talk pleurodesis was applied to 36 patients. One patient with interstitial lung disease underwent wedge resection under epidural analgesia because intubation was risky due to severe fungal infection. The average operation time for these patients was 25.4 min. The operation took longer than 45 min for three patients because of pleural adhesions. The operation duration did not differ significantly between groups.

No patients developed significant complications during the procedures, such as significant pain, marked respiratory distress, severe bleeding, or hemodynamical instability.

**Table 1.** Characteristics of the 61 cases included in this study grouped by anesthesia type

	Epidural anesthesia	ESPB	RIB	Local anesthesia
Number of patients	16	10	6	29
Age	63.6±4.9	66.1±4.0	65.3±4.4	68.8±5.5
Sex (Male/Female)	10/6	6/4	4/2	20/9
ASA score (III/IV)	12/3	8/2	5/1	20/7
Thoracoscopy indication	Malign pleural effusion 12 Lymph node biopsies 2 Lymphoma 1 Interstitial lung disease 1	Malign pleural effusion 7 Empyema 3 Lymph node biopsy 1	Malign pleural effusion 4 Empyema 2	Malign pleural effusion 20 Empyema 7 Hemothorax 2
Procedure duration (min)	25.6±9.6	24.5±5.7	23.3±7.5	25.5±8.3

ESPB: Erector spinae plane block; RIB: Rhomboid intercostal plane block; ASA: American Society of Anesthesiology.

Vasoactive agents were not used. To facilitate the operation, both ESP and RIB patients received mild sedation during the procedure. After uncomplicated follow-up, all patients were discharged to the ward.

## Discussion

Patients in the epidural group were significantly younger than the other patients. Increasing comorbidities and anticoagulant usage in older patients may direct the anesthetist away from neuraxial anesthesia, resulting in lower usage of epidural analgesia in older patients. In such patients, peripheral regional anesthesia or local anesthesia can be safely used.

ASA scores were similar between groups. As ASA score is a broad assessment of functionality, individual differences between patients might direct the anesthesiologist and surgeon toward specific anesthetic management, which may be central or peripheral regional anesthesia or local anesthesia.

The procedure indications were diverse, ranging from pleural drainage to wedge resection. In the literature, usage of NIVATS for such operations has been reported. Our results are consistent with prior reports, as all operations were completed with regional or local anesthesia. No patients had significant complications, such as marked respiratory distress, significant pain, marked respiratory distress, severe bleeding, or hemodynamical instability, and no cases required transition to general anesthesia.

The limitations of this study include the small number of patients in each group and the retrospective nature of the analysis. Larger, prospective cohort studies and randomized trials are recommended to further analyze intraoperative and postoperative outcomes related to regional anesthesia techniques in NIVATS procedures.

In conclusion, interfascial plane blocks with sedation are effective as a sole anesthetic method for NIVATS procedures. Although ESPB in NIVATS was described in previous studies, our observations show that RIB can be included among the armamentarium used by anesthesiologists for NIVATS. Further studies with larger sample sizes are necessary to evaluate the outcomes of interfascial plane blocks in NIVATS procedures.

## Disclosures

**Ethics Committee Approval:** The study was approved by The Koç University Ethics Committee (Date: 04/08/2023, No: 2023.255. IRB1.084).

**Informed Consent:** Written informed consent was obtained from all patients.

**Peer-review:** Externally peer-reviewed.

**Conflict of Interest:** None declared.

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