Study Designs

This single-center randomized controlled trial (RCT) was approved by the Ethics Council in Biomedical Research of University Medical Center Ho Chi Minh City on October 17, 2024, and by the Scientific Research Committee of the same institution under approval number 3038/UMP-BOARD. The study was registered with the International Standard Randomized Controlled Trial Number (ISRCTN) registry under the identifier ISRCTN16782271 on December 25, 2024.

Patients were enrolled and randomly assigned in a 1:1 ratio to the ESPB or TPVB group. Randomization was performed using permuted block randomization. Each participant's study number and group assignment were recorded on separate sheets, placed into opaque, sequentially numbered envelopes, and only opened once the patient entered the operating room. Both regional anesthesia techniques were performed after induction of general anesthesia to maintain patient blinding. Postoperative data collectors were also blinded to group allocation.

Participants

The study was conducted at the University Medical Center Ho Chi Minh City from Jan to March 2025. Inclusion criteria consisted of patients aged 18 to 75 years, classified as American Society of Anesthesiologists (ASA) physical status I–III, who were scheduled for elective lobectomy. Exclusion criteria included patients with dementia, neuropsychiatric disorders, chronic pain or continuous opioid use for more than three months, and those requiring invasive mechanical ventilation postoperatively. Patients who had not undergone a lobectomy were excluded from the analysis, as they were no longer considered part of the study population.

Outcomes

Outcomes were assessed at predefined postoperative intervals. The primary outcome was to measure cumulative morphine consumption at 24 and 48 hours after surgery. The secondary outcome was to evaluate pain intensity using the VAS score at rest and during coughing at 1, 2, 6, 12, 24, 48, 72, and 96 hours postoperatively. The tertiary outcomes involved assessing the dermatomal distribution of sensory blockade using the pinprick test 6 and 24 hours after surgery.

Statistical Analysis

Statistical analyses were performed using R software (version 4.3.2, R Foundation for Statistical Computing, Austria). Descriptive statistics were used to summarize the data: categorical variables were presented as frequencies and percentages, while continuous variables were assessed for normality using the Shapiro-Wilk test

and expressed as mean ± standard deviation or median with interquartile range, depending on the distribution. Sensory blockade levels from T2 to T10 were illustrated using frequency distribution plots. The coefficient of variation (CV), calculated by dividing the standard deviation by the mean, demonstrates the stability of sensory dermatomal block levels of the two techniques. For analytical statistics, categorical variables were compared using the Chi-square test or Fisher's exact test, and continuous variables were compared between the TPVB and ESPB groups using the independent t-test (for normally distributed data) or Mann-Whitney U test (for non-normally distributed data). Box plots with 95% confidence intervals were used to visualize differences in cumulative morphine consumption and VAS pain scores across time points. A p-value < 0.05 was considered statistically significant.