Original Article

JCMCTA 2026 ; 37 (1) : 73-78
DOI: https://doi.org/10.3329/jcmcta.v37i1.91582

Perioperative Challenges and Benefits of Awake Thoracic Surgery: Insights from Non-Intubated VATS Pleural Biopsy

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Abstract

Background: Non-intubated Video-Assisted Thoracoscopic Surgery (VATS) pleural biopsy is a valuable option for patients with comorbidities, avoiding general anesthesia and reducing perioperative risks. Data from low-resource settings are scarce. The aim of the study is to assess perioperative challenges, diagnostic yield, and short-term outcomes of awake non-intubated VATS pleural biopsy in Bangladesh.

Materials and methods: A prospective study was conducted at the National Institute of Diseases of the Chest and Hospital, Dhaka, from January 2022 to June 2023. Thirty adults with exudative pleural effusion underwent non-intubated VATS pleural biopsy under local anesthesia with sedation. Perioperative events, histopathology, and recovery outcomes were analyzed using SPSS v 26.0.

Results: All patients (n=30) completed the procedure; 6.7% required conversion to general anesthesia. Complications were minimal (Desaturation, 6.7%, coughing: 10%). Mean operative time was 38.6±5.8 minutes. Recovery was early: ambulation in 5.4±2.2 hours and oral intake in 3.8±1.5 hours. Histopathology revealed tuberculous pleuritis (30%) mesothelioma (23.3%) and metastatic carcinoma (20%). Mean hospital stay was 5.3±1.1 days.

Conclusion: Awake non-intubated VATS pleural biopsy is safe, effective and associated with rapid recovery and minimal complications. It represents a practical strategy for resource-limited settings where anesthesia risks must be minimized.

Key words: Awake thoracic surgery; Non-intubated VATS; Perioperative outcome; Pleural biopsy; Spontaneous ventilation.

Introduction

Video-Assisted Thoracic Surgery (VATS) has become a minimally invasive cornerstone in thoracic diagnostics and management.[1] Recently, non-intubated VATS pleural biopsy has gained popularity, offering advantages over traditional general anesthesia, particularly in high-risk and comorbid patients.[2] Surveys of European Society of Thoracic Surgeons (ESTS) members show that about 59 % have performed non-intubated thoracic surgeries, with 98 % using them for thoracoscopic pleural procedures, including decortication and biopsy.[3] A seven-year multicenter series reported 1,025 non-intubated thoracic resections, including 467 pleural biopsies, with minimal mortality and low morbidity.[4] The Bangladesh Health Bulletin 2023 notes respiratory diseases accounted for 11.3% of hospital admissions, with pleural effusions forming a major part of thoracic referrals.[5] One of Bangladesh's oldest specialized pulmonary centers plays a key role in diagnosing and managing pleural diseases.[6] Although formal national registries for awake VATS are lacking, anecdotal reports and case series show increasing local use of non-intubated VATS for pleural biopsy and effusion management.[7] Early Bangladeshi experiences reflect global benefits, including fewer postoperative complications, shorter hospital stays and avoidance of intubation-related risks, highlighting its relevance in resource-limited settings.[8] Key advantages of awake VATS pleural biopsy include maintaining spontaneous ventilation without single-lung ventilation, reducing risks of ventilator-associated pneumonia, cardiovascular compromise and neuromuscular side effects.[2] Regional anesthesia

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Submitted on : 22.02.2026
Accepted on : 27.03.2026

JCMCTA 2026 ; 37 (1) : 73-78
DOI: https://doi.org/10.3329/jcmcta.v37i1.91582

techniques, including intercostal nerve blocks, paravertebral blocks, and thoracic epidurals, effectively maintain patient comfort and suppress the cough reflex during surgery.[9] Meta-analyses and observational studies report high diagnostic yields of 97–100%, with intubation conversion rates below 10%.[7] Despite these advances, perioperative challenges remain, such as uncontrolled diaphragmatic motion, suboptimal lung collapse, and intraoperative coughing, which can limit exposure and precision.[10] Successful awake thoracic surgery requires advanced surgical expertise, careful perioperative planning, and close collaboration among surgeons, anesthesiologists, and nursing staff. Adjunct techniques like vagal nerve blockade, high-flow nasal oxygen therapy (THRIVE) and targeted intrathoracic nerve blocks are increasingly used to optimize intraoperative stability, enhance patient comfort and reduce complications.[11] With growing global acceptance and emerging local use, there is a strong rationale to systematically evaluate non-intubated VATS pleural biopsy in the Bangladeshi context.[12] Its potential for high diagnostic accuracy, minimal perioperative risk, and cost-effectiveness makes it a promising advancement in thoracic surgery.[13] This study aims to examine perioperative challenges, quantify benefits and assess clinical outcomes of awake VATS pleural biopsy, contributing to evidence-based adoption in similar low-resource healthcare settings.

Materials and methods

A single-centre, prospective, cross-sectional study was conducted in the Department of Thoracic Surgery, National Institute of Diseases of the Chest and Hospital (NIDCH) Dhaka, Bangladesh, from January 2022 to June 2023 to evaluate the feasibility and safety of Non-Intubated Video-Assisted Thoracoscopic Surgery (NI VATS) for pleural biopsy, with emphasis on intraoperative challenges and short-term postoperative recovery. Thirty consecutive adults aged 18 years or older with undiagnosed exudative pleural effusion who met the eligibility criteria were enrolled. All patients underwent standard preoperative assessment, provided written informed consent and the study protocol was approved by the Institutional Review Board of NIDCH. Inclusion criteria required adults fit for awake thoracoscopic surgery with ASA physical status I–III, while exclusion criteria included recent myocardial infarction, significant arrhythmia, decompensated cardiac disease, hepatic or renal failure, pregnancy or known HIV, HBV or HCV infection.

All procedures were performed under local anesthesia with sedation, without endotracheal intubation or mechanical ventilation. Sedation was achieved with pethidine and propofol, while local anesthesia was administered using 0.5% bupivacaine at incision and port sites. Patients received supplemental oxygen via face mask and were continuously monitored. In lateral decubitus position, a 3–5 cm incision was made in the 4th or 5th intercostal space for thoracoscope insertion, and multiple pleural biopsies were obtained either from visible lesions or from 6–8 sites in cases of diffuse thickening or non-specific appearance. A 32 French chest drain was placed at the conclusion, and conversion to general anesthesia was preplanned for complications or intolerance, though rarely required.

Postoperative care included pain management with paracetamol and NSAIDs, early ambulation and oral intake. Patients were followed for 30 days to monitor complications, recovery and satisfaction. Data were collected using a semi-structured checklist covering demographics, clinical characteristics, intraoperative parameters, postoperative outcomes, and histopathological results. Patient-reported outcomes such as satisfaction scores, overall recovery and time to resume daily activities and work were also recorded. Data analysis was performed with SPSS version 26.0, expressing continuous variables as mean ± SD and categorical variables as frequencies and percentages. As a single-arm descriptive study, no intergroup comparisons were made and descriptive statistics summarized perioperative findings.

Results

A total of 30 patients underwent awake Video-Assisted Thoracoscopic (VATS) pleural biopsy under local anesthesia with sedation. The mean age of the participants was 57.4±12.3 years, with an equal distribution of males and females (50% each). The average BMI was 24.6±3.2 kg/m², indicating a predominantly normal to slightly overweight population. Regarding smoking history, 43.3% were former smokers, 30% were current

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smokers and 26.7% had never smoked. COPD was the most prevalent comorbidity, affecting 36.7% of patients, followed by diabetes and hypertension, both at 10% (Table I). Most patients were classified as ASA II (50%) and ASA III (40%) indicating moderate systemic illness (Figure 1). Table II presented that all patients received local anesthesia with sedation, with a mean operative time of 38.6±5.8 minutes. Conversion to intubation was required in only 2 patients (6.7%) and surgical time exceeded 60 minutes in 13.3% of cases. Intraoperative complications included coughing (10.00%) desaturation (6.7%) and hypotension (3.3%). Postoperatively, 56.7% of patients reported pain. Early recovery was observed, with ambulation achieved at a mean of 5.4±2.2 hours, oral intake resumed at 3.8±1.5 hours and hospital discharge by day 5.3±1.1 on average. Most patients (76.7%) experienced no postoperative complications. The most common postoperative events were air leaks and fever (10% each) followed by nausea/vomiting in one patient (3.3%) (Table III). Histopathology revealed a diverse diagnostic spectrum, with tuberculous pleuritis (30%) being the most common finding, followed by malignant mesothelioma (23.3%) metastatic carcinoma (20%) nonspecific inflammation (16.7%) and organized empyema/effusion (10%) (Table IV). Table V showed that functional recovery outcomes were favorable. Patients reported a high satisfaction score (8.9±0.7) resumed daily activities within 3.1±1.6 days and returned to work by 5.6±2.8 days. The overall recovery score was notably high at 9.0±0.8.

Table I Demographic and clinical characteristics of the patients (n=30).

Variable	Frequency (n)	Percentage (%)
Age (Years), (Mean ± SD)	57.4 ± 12.3	
Gender		
Male	15	50.00
Female	15	50.00
BMI (kg/m², Mean ± SD)	24.6 ± 3.2	
Smoking Status		
Current	9	30.00
Former	13	43.33
Never	8	26.67
Comorbidities		
COPD	11	36.67
Diabetes	3	10.00
Hypertension	3	10.00

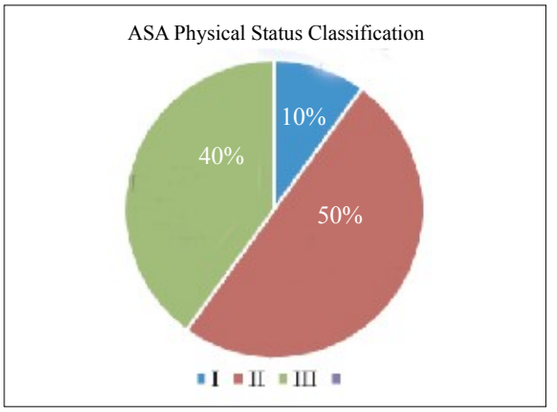

Figure 1 ASA physical status classification among participants (n=30)

Table II Intraoperative parameters of the study population (n=30)

Parameter	Frequency (n)	Percentage (%)
Type of Anesthesia (Local + Sedation)	30	100
Mean Operative Time (Minutes) (Mean ± SD)	38.6 ± 5.8	
Conversion to Intubation	2	6.67
Surgical Duration > 60 minutes	4	13.33
Intraoperative Complications		
Desaturation	2	6.67
Coughing	3	10.00
Hypotension	1	3.33

Table III Postoperative outcomes among patients (n=30)

Parameter	Frequency (n)	Percentage (%)
Postoperative Pain	17	56.67
Time to Ambulation (Hours) (Mean ± SD)	5.4 ± 2.2	
Time to Oral Intake (Hours) (Mean ± SD)	3.8 ± 1.5	
Length of Hospital Stay (Days) (Mean ± SD)	5.3 ± 1.1	
Postoperative Complications		
None	23	76.67
Air Leak	3	10.00
Fever	3	10.00
Nausea/Vomiting	1	3.33

Table IV Histopathological diagnosis of patients (n=30)

Diagnosis	Frequency (n)	Percentage (%)
Tuberculous Pleuritis	9	30.00
Malignant Mesothelioma	7	23.30
Metastatic Carcinoma	6	20.00
Nonspecific Inflammation	5	16.70
Empyema/Organized Effusion	3	10.00

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Table V Patient satisfaction and functional recovery

Parameter	Value
Patient Satisfaction Score (1–10)	8.9 ± 0.7
Return to Daily Activity (days)	3.1 ± 1.6
Return to Work (days)	5.6 ± 2.8
Overall Recovery Score (1–10)	9.0 ± 0.8

Discussion

Awake thoracic surgery, particularly non-intubated VATS, represents a growing subset of minimally invasive techniques that forego general anesthesia and endotracheal intubation.[14]The current study assesses perioperative and postoperative outcomes in patients undergoing non-intubated Video-Assisted Thoracoscopic Surgery (VATS) pleural biopsy, demonstrating the safety, feasibility and patient-centered benefits of awake thoracic surgery. The cohort had a mean age of 57.4 years with a balanced gender distribution, aligning with previous studies on patients undergoing pleural biopsy.[15] A considerable proportion of patients had comorbidities, including COPD (36.7%) which can complicate general anesthesia and intubation. The ASA physical status classification showed that 50% of patients were ASA II and 40% were ASA III (Figure 1) indicating that awake thoracic procedures were performed even in patients with moderate systemic disease. This is consistent with previous findings showing that non-intubated thoracic surgery is increasingly applied in ASA II–III patients due to its tolerability and reduced anesthetic burden.[16] All procedures in our study were performed under local anesthesia with sedation, without general anesthesia or muscle relaxants. This approach, central to awake VATS, reduces airway trauma, lowers postoperative nausea, and allows faster recovery. The conversion to intubation rate was 6.67%, consistent with reported ranges in similar studies; for instance, Chiang et al. reported conversion rates of 2–11%, mainly due to hypoxia or excessive coughing.[17] Intraoperative complications were minimal, including two cases of desaturation (6.67%), one episode of hypotension (3.33%) and three instances of coughing (10%). These findings indicate that awake thoracic surgery is well-tolerated even in patients with comorbidities, consistent with Chen et al. who reported low intraoperative complication rates in a series of 285 non-intubated thoracic procedures.[18] Postoperative recovery metrics were favorable, with a mean time to ambulation of 5.4±2.2 hours and time to oral intake of 3.8±1.5 hours. These outcomes demonstrate the benefits of avoiding general anesthesia and intubation, including earlier mobility and reduced gastrointestinal disruption. Postoperative complications occurred in 23.3% of patients, most commonly air leaks and fever, comparable to rates reported in traditional VATS under general anesthesia, indicating that the awake approach does not increase postoperative morbidity.[19]Patient satisfaction was high (Mean 8.9±0.7) with return to daily activities and work in 3.1±1.6 and 5.6±2.8 days, respectively, demonstrating the benefits of minimally invasive approaches in promoting faster recovery, consistent with Enhanced Recovery After Surgery (ERAS) principles.[20] Histopathology showed a diverse spectrum, with tuberculous pleuritis (30%) and malignant mesothelioma (23.3%) most common. Achieving tissue diagnosis through a minimally invasive, non-intubated approach demonstrates the technique's diagnostic efficacy, especially in resource-limited settings.[21]

Limitation

This study was conducted at a single tertiary care center, which may limit generalizability to settings with different infrastructure and expertise. The lack of a control group undergoing conventional intubated VATS restricts direct comparison of perioperative outcomes. Follow-up was limited to 30 days, potentially overlooking long-term complications or delayed diagnostic issues. Additionally, only ASA I–III patients were included, excluding those with more severe systemic disease who might respond differently.

Conclusion

Non-intubated VATS pleural biopsy was safe, with 6.67% requiring conversion and minimal complications (Desaturation 6.67%, hypotension 3.33%). Early recovery was noted, with ambulation at 5.4±2.2 hours and oral intake at 3.8±1.5 hours. Diagnostic accuracy exceeded 70% for tuberculous pleuritis or malignancy. Short hospital stay (Mean 5.3 days) and high satisfaction (8.9±0.7) support awake pleural biopsy as an effective, resource-efficient approach with minimal anesthesia risk.

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Recommendation

Awake non-intubated VATS pleural biopsy is a safe, effective alternative for high-risk patients, reducing complications, hospital stay and improving satisfaction. Success relies on careful patient selection, skilled teams, and standardized perioperative protocols.

Acknowledgement

We sincerely thank our parents for their love, encouragement, and support throughout this study. We also acknowledge all the patients who participated and the staff of the Department of Thoracic Surgery, National Institute of Diseases of the Chest and Hospital, Dhaka, for their assistance in patient care and data collection.

Contribution of authors

MAR-Conception, acquisition of data, manuscript drafting, data analysis & final approval.

DH-Data Analysis, manuscript drafting & final approval.

MRC-Design, acquisition of data, manuscript drafting & final approval.

SB- Acquisition of data, drafting & final approval.

MKH-Acquisition of data, data Analysis, data interpretation, critical revision & final approval.

MLR-Data Analysis, data interpretation, critical revision & final approval.

Disclosure

All the authors declared no conflict of interest.

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