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Original Article

Management of Empyema Thoracis: VATS vs Open Thoracotomy

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Abstract-

Introduction: Empyema thoracis remains a significant cause of morbidity worldwide, particularly in developing countries. Surgical management is indicated in advanced stages where tube thoracostomy fails. Video-Assisted Thoracoscopic Surgery (VATS) has emerged as a minimally invasive alternative to conventional open thoracotomy. This study compares clinical outcomes between VATS and open thoracotomy in empyema thoracis management. ***Materials and Methods:*** A prospective comparative study was conducted among 120 patients diagnosed with stage II and III empyema thoracis. Sixty patients underwent VATS and sixty underwent open thoracotomy with decortication. Parameters compared included operative time, intraoperative blood loss, duration of chest tube drainage, postoperative pain, hospital stay, complications, and mortality. ***Results***: VATS demonstrated significantly reduced intraoperative blood loss ($p<0.001$), shorter hospital stay ($p<0.001$), decreased postoperative pain scores ($p<0.001$), and earlier chest tube removal ($p<0.001$). Complication rates were lower in the VATS group (10%) compared to open thoracotomy (25%). Mortality was comparable between groups. ***Conclusion***: VATS is a safe and effective alternative to open thoracotomy in selected patients with empyema thoracis, offering reduced morbidity, shorter hospital stay, and improved postoperative recovery.

Keywords: *Empyema thoracis, VATS, Open thoracotomy, Decortication, minimally invasive surgery.*

INTRODUCTION

Empyema thoracis is defined as the accumulation of purulent fluid within the pleural cavity and remains a major health burden globally[1]. It commonly develops as a complication of pneumonia, thoracic trauma, tuberculosis, or postoperative infections[2]. Despite advances in antibiotic therapy and imaging techniques, empyema continues to be associated with significant morbidity and prolonged hospitalization[3].

The pathophysiology of empyema progresses through three stages: exudative (stage I), fibrinopurulent (stage II), and organizing (stage III)[4]. Early-stage empyema may respond to antibiotics and tube thoracostomy; however, advanced stages often require surgical intervention[5]. The organizing phase is characterized by a thick pleural peel restricting lung expansion, necessitating decortication[6].

Traditionally, open thoracotomy with decortication has been the gold standard surgical treatment for advanced empyema[7]. Although effective, open thoracotomy is associated with significant postoperative pain, prolonged recovery, higher morbidity, and longer hospital stay[8]. With advancements in minimally invasive techniques, Video-Assisted Thoracoscopic Surgery (VATS) has gained popularity as an alternative approach[9].

VATS offers improved visualization, reduced surgical trauma, less postoperative pain, shorter hospital stay, and faster recovery[10]. Several recent studies suggest comparable efficacy of VATS to open thoracotomy in terms of lung re-expansion and infection control[11]. However, concerns remain regarding its effectiveness in late-stage empyema with dense adhesions[12].

Recent guidelines increasingly support early surgical intervention, particularly using VATS in stage II empyema[13]. Conversion to open thoracotomy may be required in cases with dense fibrous peel or uncontrolled bleeding[14]. Comparative evaluation of both approaches is necessary to optimize patient outcomes.

This study aims to compare VATS and open thoracotomy in terms of operative parameters, postoperative recovery, complications, and overall outcomes in patients with stage II and III empyema thoracis.

MATERIALS AND METHODS

This prospective comparative study was conducted in the Department of Cardiothoracic Surgery at a tertiary care hospital over a period of two years.

Study Population

A total of 120 patients diagnosed with stage II or stage III empyema thoracis were enrolled. Diagnosis was confirmed by clinical examination, chest radiography, ultrasonography, and CT thorax.

Inclusion Criteria

- Age ≥18 years
- Radiologically confirmed stage II or III empyema
- Failure of conservative management (antibiotics + chest tube)
- Fit for general anesthesia

Exclusion Criteria

- Stage I empyema
- Malignant pleural effusion
- Severe cardiopulmonary comorbidities contraindicating surgery
- Coagulopathy
- Recurrent empyema after previous thoracic surgery

Patients were divided into two groups:

- **Group A (n=60):** Underwent VATS decortication
- **Group B (n=60):** Underwent Open thoracotomy with decortication

Surgical Procedure

VATS was performed under general anesthesia with double-lumen endotracheal intubation using 2–3 ports. Purulent material was evacuated, adhesions lysed, and pleural peel removed.
Open thoracotomy involved posterolateral thoracotomy incision with complete decortication and lung re-expansion.

Outcome Measures

- Operative time (minutes)
- Blood loss (ml)
- Duration of chest tube (days)
- Postoperative pain (VAS score)
- Hospital stay (days)
- Complications (air leak, wound infection, bleeding)
- Mortality

Statistical Analysis

Data were analyzed using SPSS version 25. Continuous variables were compared using Student's t-test. Categorical variables were analyzed using Chi-square test. A p-value <0.05 was considered statistically significant.

RESULTS

Table 1: Demographic Characteristics

Variable	VATS (n=60)	Open (n=60)	p-value
Mean Age	42 ± 12	44 ± 10	0.32
Male (%)	70%	72%	0.81

No significant demographic difference between groups.

Table 2: Operative Parameters

Parameter	VATS	Open	p-value
Operative Time (min)	95 ± 15	120 ± 20	<0.001
Blood Loss (ml)	150 ± 50	400 ± 100	<0.001

VATS significantly reduced operative time and blood loss.

Table 3: Postoperative Recovery

Parameter	VATS	Open	p-value
Chest Tube Duration (days)	4 ± 1	7 ± 2	<0.001
Hospital Stay (days)	6 ± 2	10 ± 3	<0.001

VATS patients recovered faster with shorter hospital stay.

Table 4: Pain Scores (VAS)

Day	VATS	Open	p-value
POD 1	4	7	<0.001
POD 3	2	5	<0.001

Postoperative pain significantly lower in VATS group.

Table 5: Complications

Complication	VATS	Open
Prolonged Air Leak	4	8
Wound Infection	1	5
Bleeding	1	2

Complications were lower in VATS group.

Table 6: Mortality

Outcome	VATS	Open
Mortality	1 (1.6%)	2 (3.3%)

Mortality comparable between groups.

DISCUSSION

This study demonstrates that VATS offers superior perioperative outcomes compared to open thoracotomy in the management of empyema thoracis. Reduced operative time and blood loss observed in the VATS group align with findings from recent meta-analyses[15],[16]. Minimally invasive access limits muscle division and rib spreading, thereby reducing surgical trauma[17].

Postoperative pain was significantly lower in the VATS group, consistent with reports by Scarci et al.[18] and Tong et al.[19]. Reduced pain facilitates early ambulation, improved pulmonary function, and lower pulmonary complications[20].

Shorter chest tube duration and hospital stay in the VATS group corroborate findings by Chambers et al.[21] and Stefani et al.[22]. Early lung re-expansion and efficient pleural clearance contribute to rapid recovery.

Complication rates were significantly lower in the VATS group, particularly wound infections, likely due to smaller incisions[23]. However, in advanced stage III empyema, conversion to open thoracotomy may be necessary due to dense pleural peel[24].

Mortality rates were comparable between groups, similar to findings in recent systematic reviews[25]. Overall, VATS provides equivalent efficacy with reduced morbidity.

Limitations include single-center design and moderate sample size. Larger randomized controlled trials are required for stronger evidence.

CONCLUSION

VATS is a safe, effective, and minimally invasive alternative to open thoracotomy for stage II and selected stage III empyema thoracis. It offers reduced blood loss, less postoperative pain, shorter hospital stay, and lower complication rates. Open thoracotomy remains important in advanced cases with dense adhesions.

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