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ORIGINAL ARTICLE

Open decortication vs VATS Decortication for empyema Thoracis

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ABSTRACT

Background: Empyema thoracis is a severe infection that leads to the accumulation of pus in the pleural space, often requiring surgical intervention when conservative treatments fail.

Objective: This study aims to compare the outcomes of these two surgical approaches in terms of operative time, complications, postoperative pain, recovery, and long-term pulmonary function.

Methods: This retrospective cohort study was conducted at Medical Teaching Institution Lady Reading Hospital Peshawar during January 2018 to March 2023. Data was collected from a cohort of 855 patients. Patients diagnosed with empyema thoracis, irrespective of disease stage, and who underwent one of the two surgical procedures were included in the study. Patients who did not undergo surgery, received alternative treatments such as pleural drainage or antibiotics alone, or had contraindications to surgery were excluded from the study.

Results: The VATS decortication group demonstrated significantly shorter operative times (98 vs. 135 minutes), fewer complications (wound infections 5% vs. 12%, hemorrhage 3% vs. 8%), and lower postoperative pain scores (4.2 vs. 6.8 on the Visual Analog Scale). The length of hospital stay was significantly shorter in the VATS group (6.1 vs. 9.3 days). At 6 months, patients in the VATS group had better pulmonary function (FEV1 86% vs. 82%) and higher rates of pleural space resolution (90% vs. 85%).

Conclusions: It is concluded that VATS decortication offers significant benefits over open decortication in patients with empyema thoracis, including reduced operative time, fewer complications, less postoperative pain, and quicker recovery.

Keywords: Empyema Thoracic, Open Decortication, VATS Decortication

INTRODUCTION

Empyema thoracis typically progresses through three stages: exudative, fibroblastic, and organizing. In the exudative stage, the pleural space becomes filled with inflammatory fluid, which may eventually become infected and evolve into a fibropurulent stage. In the organizing stage, fibrinopurulent material becomes organized into thick fibrous tissue that adheres to the lung, restricting its expansion[1]. This stage of empyema often necessitates surgical intervention, as drainage alone is insufficient to resolve the condition. The goal of surgery in empyema is to remove the pleural thickening, allow for lung re-expansion, and improve respiratory function. Historically, open decortication has been the mainstay of surgical treatment for empyema thoracis[2]. This approach involves making a large thoracotomy incision to access the pleural space and remove the fibrotic tissue directly from the lung and pleura. Open decortication provides the surgeon with direct visualization and tactile feedback, enabling the thorough removal of thick, organized fibrin and facilitating better lung expansion[3]. However, the procedure is associated with significant morbidity, including a longer hospital stay, increased postoperative pain, and a longer recovery period due to the large incisions and trauma to surrounding tissues. In addition, open decortication may carry a higher risk of wound infection and complications such as bleeding, especially in patients who are older or have comorbid conditions[4].

Over the past few decades, the development of video-assisted thoracoscopic surgery (VATS) has revolutionized the management of thoracic diseases, including empyema. VATS is a minimally invasive technique that allows surgeons to perform decortication using small incisions and a thoracoscope to visualize and remove the fibrous tissue. The surgical method provides multiple relevant benefits such as tiny incisions along with minimized pain following surgery and minimized chances of wound infections combined with increased recovery speed[5]. Patient satisfaction increases substantially when hospitalization duration decreases because of the implementation of VATS surgery. Despite its beneficial features VATS decortication presents several difficulties to surgeons. Medical staff must have advanced technical expertise to perform this procedure effectively yet it cannot work for each patient population. The extent of empyema together with certain complications such as severe adhesions might make VATS both difficult to perform and impossible[6]. The complete acceptance of VATS in healthcare depends on specialized equipment requirements and potential surgical opening needs which restrict its use in certain medical centers. Hospital centers led by trained thoracic surgeons now tend to perform VATS decortication as main surgical intervention because modern thoracoscopic technology continues to advance and gain popularity[7].

The examination of open decortication and VATS decortication success involves assessment of operating duration as well as complication incidence and postoperative discomfort together with stay duration and the permanent effect on lung function[8]. Organic research reveals that decortication by VATS leads to decreased postoperative complications and reduced hospital stays as well as decreased pain when compared to standard open decortication surgery. The results from investigation indicate that the total benefits of each surgical approach for survival statistics and prolonged pulmonary functioning appear to match[9]. Medical teams make open or VATS decortication decisions based on patient health conditions together with empyema stage progression as well as surgeon capability with thoracoscopic operations[10].

Objectives: This study aims to compare the outcomes of these two surgical approaches in terms of operative time, complications, postoperative pain, recovery, and long-term pulmonary function.

METHODOLOGY

This retrospective cohort study was conducted at Medical Teaching Institution Lady Reading Hospital Peshawar during January 2018 to March 2023. Data was collected from a cohort of 855 patients. Patients diagnosed with empyema thoracis, irrespective of disease stage, and who underwent one of the two surgical procedures were included in the study. Patients who did not undergo surgery, received alternative treatments such as pleural drainage or antibiotics alone, or had contraindications to surgery were excluded from the study.

Data Collection: Data for the study were collected retrospectively from patient records, focusing on a range of demographic, clinical, and postoperative variables. It includes patient age, sex, and the

presence of comorbidities such as diabetes or heart disease, which could influence surgical outcomes. The clinical severity of the empyema was documented, including the stage of the disease at the time of surgery, as well as the approach chosen for surgery. Outcome measures focused on operative time (the duration of the procedure), complication rates (such as wound infections, bleeding, pneumonia, and reoperation rates), postoperative pain (measured using a standardized pain scale like the Visual Analog Scale [VAS]), and the length of hospitalization. Long-term outcomes such as pulmonary function recovery was assessed at a 6-month follow-up using spirometry and radiographic evaluation to gauge lung expansion and pleural space resolution. Mortality rates, including both in-hospital and 6-month post-surgery deaths, were also recorded.

Statistical Analysis: Data were analyzed using SPSS v18. For comparing continuous variables, such as age, operative time, and length of hospital stay, independent t-tests were used. Categorical variables, including gender, complications, and reoperation rates, were analyzed using Chi-square tests.

RESULTS

Data were collected from 855 patients. The mean age of patients in the open decortication group was 59.4 ± 8.2 years, while the VATS decortication group had a mean age of 58.7 ± 7.9 years. The gender distribution was also similar, with 63% of patients in the open decortication group and 65% in the VATS group being male. Regarding comorbidities, 40% of open decortication patients had hypertension, 30% had diabetes, and 10% had chronic obstructive pulmonary disease (COPD). In the VATS group, these figures were 38%, 32%, and 12%, respectively.

Table 1: Demographic Characteristics of Patients Undergoing Open Decortication vs VATS Decortication

Characteristic	Open Decortication (n = 428)	VATS Decortication (n = 427)
Mean Age (years)	59.4 ± 8.2 (range: 38–85)	58.7 ± 7.9 (range: 37–84)
Gender		
- Male (%)	63%	65%
- Female (%)	37%	35%
Comorbidities		
- Hypertension (%)	40%	38%
- Diabetes (%)	30%	32%
- COPD (%)	10%	12%

Wound infections occurred in 12% of the open decortication patients, compared to only 5% in the VATS group. Additionally, hemorrhage requiring reoperation was observed in 8% of open decortication patients, while only 3% of VATS patients required reoperation for hemorrhage. Other complications, including pneumonia (6% vs. 3%), pleural fistula (4% vs. 2%), and sepsis (3% vs. 1.5%), were also more prevalent in the open decortication group. Reoperation due to complications was higher in the open decortication group (6%) compared to the VATS group (2%).

Table 2: Comparison of Postoperative Complications Between Open Decortication and VATS Decortication

Complication	Open Decortication (n = 428)	VATS Decortication (n = 427)
Wound Infection (%)	12%	5%
Pneumonia (%)	6%	3%
Hemorrhage Requiring Reoperation (%)	8%	3%
Reoperation Due to Complications (%)	6%	2%
Pleural Fistula (%)	4%	2%
Sepsis (%)	3%	1.5%

The mean FEV1 % of predicted was 86 ± 5.8% in the VATS group, compared to 82 ± 6.4% in the open decortication group. Additionally, radiographic lung expansion and pleural thickening resolution were higher in the VATS group (90% vs. 85%). The BODE index, which measures postoperative disability, was lower in the VATS group (5.6 ± 1.0) compared to the open decortication group (6.2 ± 1.1), indicating better functional recovery. Satisfaction with surgery was also higher in the VATS group, with 85% of patients reporting satisfaction, compared to 80% in the open decortication group.

Table 3: Long-Term Pulmonary Function and Resolution Outcomes at 6-Month Follow-up

Outcome	Open Decortication (n = 428)	VATS Decortication (n = 427)
FEV1 % of Predicted	82 ± 6.4% (range: 68–95%)	86 ± 5.8% (range: 72–98%)
Lung Expansion (Radiographic)	85%	90%
Pleural Thickening Resolution (%)	85%	90%
Postoperative Disability (BODE Index)	6.2 ± 1.1 (range: 4–9)	5.6 ± 1.0 (range: 3–8)
Satisfaction with Surgery (%)	80%	85%

He operative time for open decortication was significantly longer (135 minutes) compared to VATS decortication (98 minutes). In terms of complications, the open decortication group had higher rates of wound infection (12% vs. 5%), hemorrhage requiring reoperation (8% vs. 3%), and pneumonia (6% vs. 3%). Postoperative pain, as measured by the Visual Analog Scale (VAS), was also significantly higher in the open decortication group (6.8 vs. 4.2), and the length of hospital stay was longer (9.3 days vs. 6.1 days). Regarding long-term outcomes, pulmonary function recovery (FEV1) and pleural space resolution were both higher in the VATS group, with FEV1 at 86% (vs. 82%) and pleural space resolution at 90% (vs. 85%). Mortality rates were low in both groups, with no significant differences: in-hospital mortality was 2% for open decortication and 1.5% for VATS, while 6-month mortality was 0.5% for open decortication and 0.2% for VATS.

Table 4: Comparison of Outcomes Between Open Decortication and VATS Decortication for Empyema Thoracis

Outcome Measure	Open Decortication (n = 428)	VATS Decortication (n = 427)
Operative Time (minutes)	135 (110–180)	98 (80–130)
Wound Infection (%)	12%	5%
Hemorrhage Requiring Reoperation (%)	8%	3%
Pneumonia (%)	6%	3%
Reoperation Rate (%)	6%	2%
Postoperative Pain (VAS score, 72 hrs)	6.8 (4–10)	4.2 (2–7)
Length of Hospital Stay (days)	9.3 (5–14)	6.1 (3–10)
Pulmonary Function (FEV1 % of predicted)	82% (68–95%)	86% (72–98%)
Pleural Space Resolution (%)	85%	90%
In-Hospital Mortality (%)	2%	1.5%
6-Month Mortality (%)	0.5%	0.2%

DISCUSSION

This study compared the outcomes of open decortication and video-assisted thoracoscopic surgery (VATS) decortication for the treatment of empyema thoracis, aiming to evaluate the effectiveness and safety of both techniques. The results suggest that VATS decortication offers several advantages over open decortication, including shorter operative times, fewer complications, less postoperative pain, and a quicker recovery time. However, open decortication remains a valuable option in specific clinical situations, particularly for patients with extensive disease or severe adhesions that make VATS technically difficult. A key finding of this study was the significantly shorter operative time for VATS decortication compared to open decortication[11]. The

mean operative time in the VATS group was 98 minutes, compared to 135 minutes in the open decortication group. This aligns with previous studies that have demonstrated the efficiency of VATS procedures due to the minimally invasive nature of the technique, which reduces tissue dissection and the need for large incisions[12]. The shorter operative time not only benefits the patient by reducing anesthesia exposure but also allows for a quicker overall procedure, which can be particularly important in critically ill patients. Complication rates were notably lower in the VATS decortication group, which showed fewer instances of wound infection, hemorrhage requiring reoperation, and other postoperative complications. In contrast, open decortication was associated with a higher incidence of wound infections (12% vs. 5%) and hemorrhage requiring reoperation (8% vs. 3%)[13]. These findings are consistent with prior research suggesting that VATS offer a lower risk of wound complications due to the smaller incisions used and less tissue trauma. Moreover, the reduced need for reoperation in the VATS group likely contributes to shorter hospital stays and better overall recovery. The research data demonstrated substantial statistical significance regarding hospital duration because patients received early discharge after VATS (6.1 days average) versus open decortication patients (9.3 days average). The postoperative hospital duration becomes shorter when performing VATS decortication because this approach leads to reduced surgery effects and better postoperative recovery with fewer complications[14]. The cost-benefit analysis of VATS becomes favorable because it decreases hospital costs and resource requirements thus making this procedure economically beneficial in suitable situations. VATS patients experienced better long-term pulmonary results compared to open thoracotomy patients as FEV1 measurements and pleural space resolution showed better outcomes (86% of predicted vs. 82% of predicted and 90% vs. 85% respectively)[15]. The minimal invasiveness of VATS helps patients recover more functional lung operation due to its reduced impact on lung expansion. At the 6-month mark both treatment groups demonstrated substantial improvement in pulmonary function while most patients in each group experienced full pleural thickening regression together with expanded lungs[16]. The death rate among empyema thoracis patients remains low when surgical techniques are modern while both open and VATS decortication stand as secure procedures. Surgical treatment requires patients to undergo proper selection because those suffering from serious medical conditions or severe empyema cases might face increased surgical risks[17]. The advantages of VATS decortication for empyema thoracis patients include decreased operative time along with minimized complications and reduced pain and shorter hospital stay which make it a preferred method of treatment for these patients. The open decortication procedure continues being necessary for cases presenting extensive disease or severe adhesions and patients who cannot tolerate minimally invasive procedures. Patient evaluation and surgical expertise together with disease stage should determine the surgical approach selection.

CONCLUSION

It is concluded that video-assisted thoracoscopic surgery (VATS) decortication offers significant advantages over open decortication in the treatment of empyema thoracis. VATS decortication is associated with shorter operative times, fewer complications, less postoperative pain, and a quicker recovery period, making it a favorable option for many patients. In contrast, open decortication remains an important surgical approach for patients with extensive disease, severe adhesions, or other conditions that make VATS technically difficult.

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