Original Article

Role of Video-Assisted Thoracoscopic Surgery in the Management of Pleural Empyema

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Abstract

Background: Video-assisted thoracoscopic surgery (VATS) has revolutionized surgical management of patients with empyema. Thoracoscopic management of empyema includes VATS debridement and decortication. VATS debridement has been employed by many centres as the primary treatment option for early-stage empyema.

Objective: To evaluate the outcome of VATS over open thoracotomy.

Methods: This cross-sectional study was conducted in the department of Thoracic Surgery of Combined Military Hospital Dhaka from 01 January 2017 to 30 May 2018 among 30 patients (20 patients underwent VATS and 10 patients underwent open decortication/OD). The results were viewed with respect to baseline characteristics, preoperative management, operative and postoperative course.

Results: Operative time and median in-hospital length of stay were shorter for the VATS group: 128 vs 140 minutes ($p < .001$), and 14 vs 11 days (p .03), respectively. The median postoperative length of stay was 12 days for the VATS group vs15 days for the OD group ($p < .001$). Complications after Video Assisted Thoracic Surgery is less like prolonged air leakage, infection and atelectasis.

Conclusions: VATS decortications for empyema thoracis, complex effusion, haemothorax yields better results than open decortications. Patients treated with VATS have less postoperative complications. VATS debridement and decortication is safe and effective treatment in the management of empyema thoracis.

Key-Words: Video-assisted thoracoscopic surgery (VATS), Open decortications (OD), Empyema, Haemothorax.

Introduction

Empyema thoracis is a collection of pus within the pleural cavity cavity. It is the common complications of pneumonia. It is due to spread of pulmonary infection, penetrating thoracic trauma, and postoperative pleural infection[1]. McLaughlin, Krasna[2] in 2005 described three phases of empyema, exudative (stage I), fibrinopurulent (stage II), and organizing (stage III), represent a progressive disease that can be stopped by early intervention. The initial exudative stage can often be managed by closed-chest drainage and appropriate antibiotic coverage. VATS is very difficult and sometimes ineffective in chronic stage because of thick pleural peel. When intercostal chest drain fails to cure patient with exudative phase of effusion then thoracotomy is performed. Early and aggressive management of empyema provides rapid relief from sepsis and may shorten the hospital stay[3,4]. VATS is now an established surgical approach for a variety of benign and malignant conditions[5]. To date, smaller studies have addressed the feasibility of VATS compared with OD[6-10].

Materials and Methods

This cross-sectional study was conducted during the 02 years period between 01 January 2017 to 30 May 2018 among 30 adult patients who underwent VATS or OD. The data were collected from Thoracic surgery database to identify patients for inclusion in the study and medical records were reviewed to identify patients who fulfilled the inclusion criteria. The study population included who suffered from empyema thoracis, loculated empyema, recurrent effusion and haemothorax. The study excluded patients who underwent decortication for malignant effusion or visceral pleural malignancy, diagnosed preoperatively.

Data regarding patient demographics, preoperative and postoperative diagnoses, comorbidities, intraoperative details and postoperative events were available in the database. The following postoperative complications were recorded within 30 days after operation: re-operation, prolonged air leak, atelectasis, pneumonia, atrial or ventricular arrhythmia, need for blood transfusion, wound infection, sepsis and readmission.

Surgical Technique: Operations were performed under general anesthesia by one lung ventilation with double-lumen endotracheal tube. Thoracotomy was done by postero-lateral incision with rib spreader to open the pleural cavity. Principles of VATS for removing of thick pleural peel same as open decortication. Single port 3cm to 4cm incision located anteriorly in the fifth intercostal space was used for VATS decortication. Under thoracoscopic guidance, instruments were introduced through the single port and the lung was decorticated. For single port VATS

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wound protector was used frequently. All pleural peel were separated carefully by sharp and blunt dissection to avoid any parenchymal leak.

Chest wall bleeding was managed using electrocautery and sometimes packing. Adequacy of lung expansion by inflation of the operating lung. When possible, patients were extubated in the operating room and transferred to a postoperative ward where postoperative laboratory samples and chest x-ray were obtained. Principles of early mobilization and chest physiotherapy were the same for all patients regardless the procedure.

Statistical Analysis: The statistical significance of differences in continuous variables between groups was assessed by unpaired t tests, in categorical variables by the Chi-square test and chest tube duration in "Mean ± SD" form. Statistical analysis was performed using the SPSS 9.0 for Windows statistical package (SPSS Inc, Chicago, IL).

Results

Thirty patients were undergoing decortications from 01 January 2017 to 30 May 2018 in Combined Military Hospital, Dhaka. Among them, 20 underwent VATS, 10 were OD procedure, included for statistical analysis. Table-I shows the preoperative characteristics and management associated with each group in the study. About 25% of VATS patients and 30% of OD patients had thoracentesis as attempted preoperative management. In the OD group, 10% had undergone prior surgical intervention aimed at treating the underlying problem vs 15% in the VATS group (p = .01). No prior intervention before decortications was noted in 20% of the OD group and 25% of the VATS group. Most common indication for surgery in OD was chronic empyema 50% and for VATS group, 45% followed by complex effusion, haemothorax, recurrent effusion. All decortications were performed by thoracic surgeons.

Table-I: Preoperative Patient Characteristics

Variable	Thoracotomy No (%) [a]	VATS No (%)[a]	[a]*p* Value
Patient No	10	20	-
Age-years	40±10	35± 10	.4
Male **:** Female	7:3(70:30)	15:5(75:25)	.3
Hypertension	02(20)	03(15)	.001
DM	02(20)	04(20)	.71
COPD	02(20)	5(25)	.83

[a]Continuous data (age) is presented as mean±standard deviation. VATS-video-assisted thoracoscopicsurgery

Table-II: Preoperative Management

Variable	Thoracotomy No (%) [a]	VATS No (%)[a]	[a]*p* Value
None	02(20)	5(25)	.07
Thoracentesis	03(30)	07(35)	.45
Chest Tube	03(30)	5(25)	.32
Prior operation	01(10)	03(15)	.01

[a]Continuous data (age) is presented as mean±standard deviation. VATS-video-assisted thoracoscopicsurgery.

Table-III: Indication for operation

Variable	Thoracotomy No (%) [a]	VATS No (%)[a]	[a]*p* Value
Empyema	05(50)	9(45)	.005
Complex effusion	03(30)	6(30)	.03
Recurrent effusion	01(10)	02(10)	.40
Haemothorax	01(10)	03(15)	.05

[a]Continuous data (age) is presented as mean±standard deviation. VATS-video-assisted thoracoscopicsurgery.

Table-IV: Operative Time, Length of Stay and Chest Tube Duration

Variable	Thoracotomy No (%) [a]	VATS No (%)[a]	[a]*p* Value
Mean operative time, min	140	128	.001
Median LOS, days	14	11	.003
Median post-op LOS, days	5	3	.001
Chest tube duration	5.7± 2	4.0 ± 1.5	.12
Median in-hospital, days	14	11	.008

LOS =length of stay, VATS =video-assisted thoracoscopic surgery

Table-II shows the mean operative time for VATS cases 128 minutes and 140 minutes for OD cases (p = .001). The median over all hospital length of stay was 14 days for OD group vs 11 days for VATS group (p = .003). Postoperatively, the median length of stay was 5 days for the OD group and 3 days for the VATS group (p = .001). The median number of days patients had indwelling chest tubes was also different between the groups, 5.7±2 days for the OD group and 4.0±1.5 days for the VATS group.

Table-V: Postoperative Complications

Variable	Thoracotomy No (%) [a]	VATS No (%)[a]	[a]*p* Value
Reoperation	1(10)	1(5)	.4
Prolonged air leak	2 (20)	3(15)	.03
Atelectasis	2(20)	3(15)	.06
Pneumonia	1(10)	1(5)	.87
Atrial arrhythmia	2(20)	5(25)	.07
Blood transfusion	5(50)	10(40)	.02
Wound infection	2(20)	2(10)	.59
Sepsis	1(10)	1(5)	.03
Readmission	1(10)	2(10)	.71

Table-III shows the frequency of recorded postoperative complications. The need for reoperation was similar between the two groups, but the incidence of postoperative pneumonia, cardiac arrhythmia, wound infection, and need for readmission less in VATS group than OD group. VATS group had a lower incidence of prolonged air leak, 15% v. 20% (p .01). Perioperative blood transfusions were required in 50% of the VATS group compared with 50% the OD group (p .02). Also, the incidence of post-operative sepsis was lower in the VATS group than the OD group, 5% vs 10% (p .03).

Discussion

Lung expansion was decreased due to the visceral and parietal pleural adhesion, significantly. All patients in stage II and stage III are mainly suffering from difficulty in breathing. As a result, VATS is a suitable and effective approach for them. Empyema and complex pleural effusions are commonly managed by Thoracic Surgeon. Evacuation of pleural effusion and removal pleural peel allow expansion of the lung is not changed significantly in principle for the last few decades, but new technique has developed to reduce morbidity and mortality. Results of VATS in management of organized effusion is better than thoracotomy[10-12]. There are lot of advantages of VATS which includes less trauma, improved visualization and early return to work. This series show results of 30 patients, where 20 who underwent VATS and 10 who had OD. In the VATS group, the proportion of patients with 20% hypertension, 15% diabetes mellitus did not affect the incidence of postoperative complications.

A higher proportion of patients in the VATS 35% group had thoracentesis as preoperative management; in contrast, in OD 30% had a prior operation. Both groups are different in their disease, preoperative management and also operative technique. The OD group had a higher number of empyema and prior surgical management. Also, 10% of patients in the OD group had undergone prior general thoracic surgical procedures. Patients who underwent multiple procedure earlier they were elective candidates for open decortication. Operative time was shorter and morbidity much less in VATS group for management of empyema or loculated pleural empyema. Thoracotomy was required where VATS found insufficient decortication for lung expansion.

This study examination of a variety of variables reinforced many of the established benefits of VATS procedures compared with thoracotomy. For instance, the VATS group had a lower incidence of pulmonary complications such as atelectasis, pneumonia. This is because of less invasive technique that consistent with data whom underwent VATS procedure, reported significantly lower pain than those who had open thoracotomy[13-15]. With lower pain and improved respiratory mechanics, it follows that patients in the VATS group had a shorter postoperative length of hospital stay. This study indentified VATS patients had shorter operative time, hospital stay than OD patients which consistent with Cardillo and colleagues[16]. The mean number of chest tube 4 days for VATS and 5 days for OD, corresponds well with published means of 4.1 to 10 days[7,10,17]. The rate of reoperation, considered to be a surrogate for adequacy of decortication, was 5% for VATS and 10% for OD. These results are similar to other published series[17,18].

Conclusion

It can be seen that VATS is superior to OD in the aspects of operative time, hospital stay, prolonged air leak, chest tube duration, morbidity and mortality. Sometimes, VATS may have to converted to OD. But, we can conclude that conversion to an open surgical procedure should not be considered as a failure of thoracoscopy, but rather a mature judgment.

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