Video-assisted thoracoscopic decortication versus open decortication for a better surgery results

Original Article

Ahmed R.M.R. Elbasiouny, Ahmed A. ElNory, Ahmed M. Mostafa and Mostafa A. ElDewer

Department of Cardiothoracic Surgery, Faculty of Medicine, Ain Shams University, Cairo, Egypt.

ABSTRACT

Background: Comparing video-assisted thoracoscopic decortication with open decortication: advantages and disadvantages.

Aim: In this study, we aim to compare the outcomes associated with VTASD and OD in terms of less surgical trauma and improving postoperative pain.

Patients and Methods: We did a prospective comparative study involving 60 patients with thoracic empyema. Patients were randomly allocated to undergo Video-assisted thoracoscopic surgery (VATS) decortication or open decortication. The patients were split up into two groups, each with 30 patients: open thoracotomy (OT) and VATS. We contrasted the frequency of postoperative pain, adjusted length of hospital stay, air leak, incomplete lung inflation, blood transfusion, wound infection, reoperation, and death following surgery.

Results: Postoperative pain score using the visual analogue scale was compared in the two groups. Regarding postoperative pain, the median for VATS was 3 with an interquartile range (IQR) of 2–4, and for OT the median was 8 with an IQR of 7–8 with a highly significant statistical difference. This can be the result of the intercostal neuralgia that occurs due to injury to the intercostal nerves when access is gained to the thoracic cavity by spreading the ribs and dissecting the pleura. Owing to the procedure's short incision, lack of rib spreading required, and minimum intraoperative manipulation, it has been suggested and confirmed in the literature thus far that patients having VATS had less postoperative discomfort and a lower need for analgesics.

In reference to the hospital stay, our analysis showed that the OT group median was 7–9 with an IQR of 7–9 and a high statistically significant. Whereas the VATS group median was 5 with an IQR of 5–6.

Conclusion: Video assisted thoracoscopic decortication is a safe procedure, and provides less postoperative complications, less postoperative pain, and less hospital stay which leads to better surgery results.

Key Words: Decortication, empyema, open, video-assisted thoracoscopic surgery.

Received: 29 May 2024, **Accepted:** 3 July 2024, **Published:** 4 October 2024

Corresponding Author: Ahmed R.M.R. Elbasiouny, MSc, Department of Cardiothoracic Surgery, Faculty of Medicine, Ain Shams University, Cairo, Egypt. **Tel.:** 01027356363, **E-mail:** ahmedrefaat92@hotmail.com

ISSN: 1110-1121, October 2024, Vol. 43, No. 4: 1463-1470, © The Egyptian Journal of Surgery

INTRODUCTION

Lung decortication is a well-known procedure that is mainly recommended for hemothorax, pleural thickening, empyema thoracis, etc. The lung, chest wall, and diaphragm are covered in a thick fibrinous peel whose limiting covering must be removed. the advanced phases of empyema culminate in the thick, fibrinous peel that is caused by the ingrowth of fibroblasts. The primary goals of this surgical technique are to avoid deformity from fibrothorax, remove the source of infection, and restore lung expansion[1].

The presence of infected fluid in the pleural cavity is known as pleural empyema (PE). Both the incidence and the related morbidity and death of PE are increasing globally. Pneumonia is the primary cause of PE. Additional reasons include sepsis, oesophageal disorders, trauma, iatrogenic causes brought on by thoracic procedures, and subdiaphragmatic abscess. In nations where tuberculosis is widespread, tuberculous pleural effusions are frequently observed, and if left untreated, tuberculous empyema is linked to significant morbidity and death[2].

The American Thoracic Society divided the three phases of PE into three categories: Stage I is exudative, Stage II is fibrinopurulent, and Stage III is organizing. Administering sufficient antibiotics, performing fibrinolysis, and removing the contaminated fluid from the pleural region are all part of the initial therapy of PE. Pleural peel and multiloculated empyema are present in the later stages of organizing PE, which makes this noninvasive therapy ineffective. In these circumstances, surgical intervention becomes necessary, and the empyema is drained and decorticated using either standard open thoracotomy (OT) or minimally invasive video-assisted thoracoscopic surgery (VATS)[2].

DOI: 10.21608/EJSUR.2024.293633.1090

The field of minimally invasive surgery has advanced significantly. These surgical procedures are based on the fundamental idea of minimizing the degree of surgical stress and maximizing patient recovery without sacrificing the desired result. VATS has been used by thoracic surgeons lately for a variety of surgical procedures, including lung biopsies, blebectomy, wedge resection, and pleural biopsies[2].

An increasing number of thoracic problems that formerly needed a sternotomy or OT are being diagnosed and treated via video-assisted thoracic surgery. Keyhole surgery's primary benefits include a smaller incision, a better-looking scar, reduced pain following surgery, and early hospital discharge. Additionally, the method provides the potential for increased safety and a reduction in the physiological harm done to the body during surgery[2].

Objectives

The primary objective was to compare the outcomes associated with VATSD and OD in terms of less surgical trauma and improving postoperative pain.

PATIENTS AND METHODS:

Trial design

We conducted a Prospective comparative clinical study between 2021 and 2023. We enrolled 60 patients with empyema who were referred to Ain Shams University Hospitals for surgical intervention.

The study was approved by the institutional review board, and on October 24, 2021, the Ain Shams University Ethics Committee granted ethics approval (IRB number: FWA 00017585).

Participants

The current study examined 60 individuals, who were included in our final analysis (30 in each group). Before surgical intervention, all patients provided informed written consent to participate in the trial.

Patients were assigned randomly according to a designed operation schedule i.e. first patient to present was assigned to group A (VATS group), and second patient to present was assigned to group B (OT group) and so on, we obtained a baseline computed tomography chest without contrast for each patient enrolled. Follow-up Chest radiography was done immediately postoperative, and then each patient was followed-up for 30 days (Table 1).

Table 1: Inclusion criteria and exclusion criteria

Inclusion criteria	Exclusion criteria
1) Patients of both sexes	1) Refusal of procedure or participation in the study.
2) Patients' age: from 15 to 60 years old	2) Patients diagnosed with malignant effusion or underlying visceral pleural or parenchymal malignancy
Elective, isolated, primary cases of Empyema, Encysted effusion, and hemothorax	3) Vats cases converted into open

Interventions

Patients were operated on under general anesthesia with a double-lumen endotracheal tube and were placed in the lateral decubitus position.

VATS group (A)

Decortication was performed by either uniport (Fig. 1a, b) or multiport VATS decortication (Fig. 1c). The incision was done at the area of the fluid collection identified by preoperative radiology, and the pocket was entered directly with the evacuation of the content and peeling the thickened visceral, parietal, diaphragmatic and mediastinal pleura.

a

b

c

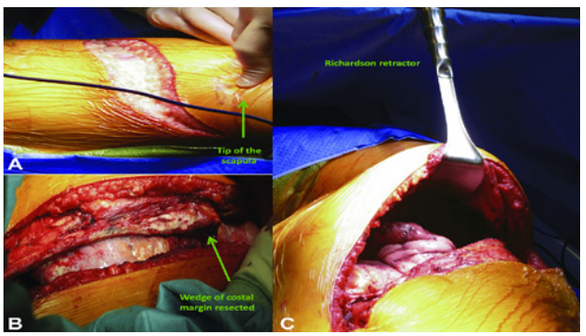

Fig. 1 a, b: Uniport video-assisted thoracoscopic surgery. c: Multiport video-assisted thoracoscopic surgery. d: Posterolateral thoracotomy (open).

Open group (B)

Decortication was performed via an open posterolateral thoracotomy incision (Fig. 1d).

Which was done in the fifth intercostal space. The sac of empyema was opened with the evacuation of the content, followed by decortication.

Chest tubes will be maintained on wall suction for a certain period according to the surgeon's preference. Criteria for removal include the absence of an air leak and less than 200 ml of drainage.

Outcomes

Postoperative both groups were compared regarding the pain, adjusted length of hospital stay, air leak duration and severity, incomplete lung inflation, wound infection, blood transfusion, reopening, and mortality.

Follow-up Chest radiography was done immediately postoperatively, and then each patient was followed-up after 30 days.

Sample size

Sample size: 60 patients (30 in each group).

The sample size was calculated using the STATA program, setting the type-1 alpha error at 5% (0.05) and the power (1-beta) at 90% (0.9).

Randomization

Patients were randomized according to a designed operation schedule i.e., the first patient to present was assigned to group A (VATS group), and the second patient to present was assigned to group B (OT group), and so on.

Blinding

The patients were not made aware of their assignment to a research group. To maintain the study group's anonymity during the evaluation, the recorded data were not orally communicated.

Statistical methods

The collected data will be revised, coded and introduced to a PC using a statistical package for social science (SPSS 15.0.1. for Windows; SPSS Inc, Chicago, IL, 2001).

Data will be presented as mean and standard deviation (±SD) for quantitative parametric data, median and range for quantitative nonparametric data, and as numbers and percentage for qualitative data. Suitable analysis will be done according to the type of data obtained. *P* and lt; 0.05 will be considered significant.

RESULTS:

Baseline data

This prospective comparative clinical study was conducted on 60 patients that were classified into two groups, 30 patients each.

Groups were comparable in demographic data (in terms of age and sex) and there were no statistically significant differences between groups (*P value >0.05*) (Table 2, Fig. 2).

Table 2: Comparison between groups as regard demographic data

Demographic data	Group VATS (*n*=30)	Group OT (*n*=30)	*P* value
Age (years)	35.3±9.1	37.4±9	0.364[t]
Sex, *n* (%)			
Male	15 (50)	19 (63.3)	0.297[x2]
female	15 (50)	11 (36.7)	

Data expressed as mean±SD, proportion, T=student t test, X^2=chi square.

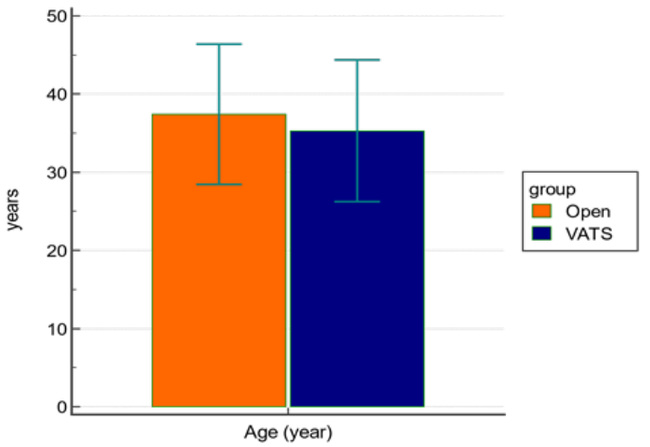

Fig. 2: Bar graph between groups as regards age.

Postoperative pain score using the visual analogue scale was compared in the two groups. Regarding postoperative pain, the median for VATS was 3 with an interquartile range (IQR) of 2–4, and for Open the median was 8 with an IQR of 7–8 with a highly significant statistical difference due to *P value* less than 0.0001 (Table 3, Fig. 3).

Table 3: Comparison between groups as regards postoperative pain

	Group VATS (*n*=30)			Group open (*n*=30)			
	Range	Median	IQR	Range	Median	IQR	*P* value [z]
Pain postoperative	2–4	3	2–4	6–9	8	7–8	**<0.001**

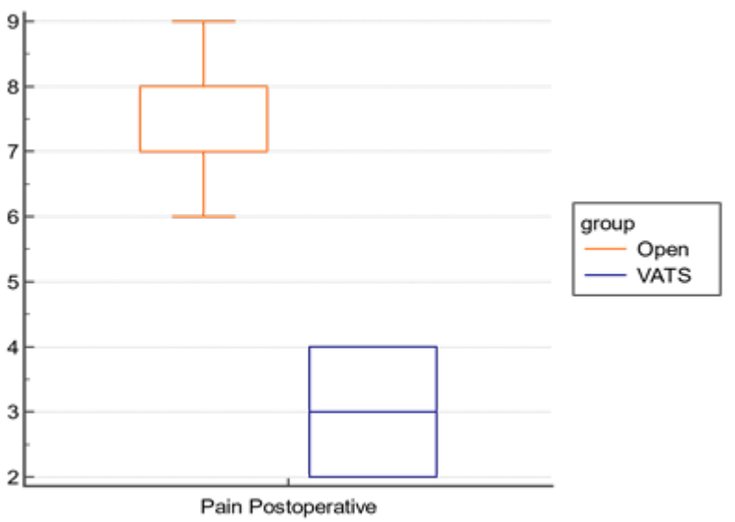

Fig. 3: Bar graph between groups as regard Postoperative pain.

Regarding the Adjusted length of Hospital stay, our study revealed that the median for the VATS group was 5 with an IQR of 5–6 while the OT group median was 7–9 with an IQR of 7–9 resulting in high statistical significant *P value* less than 0.0001 (Table 4, Fig. 4).

Regarding the air leak duration, our study found that there was no significant difference between both groups with *P value* of 0.194 (Fig. 5, Table 5).

Regarding air leak severity there was no significant difference between both groups with a *P value* of 0.143 (Fig. 6, Table 5).

Moreover, incomplete lung inflation results between both groups in our study were nonsignificant of *P value* 0.701 as the VATS group had 6 (20%) cases and the OT group has 7 (24.1%) cases (Fig. 7, Table 5).

Superficial wound infection results in our study showed that for VATS there was 1 (3.3%) case of wound infection while for OT there were 4 (13.3%) reported cases with no significant difference between both groups of *P value* 0.165 (Fig. 8, Table 5).

Regarding blood transfusion, 10 (33.3%) VATS cases versus 15 (50%) open cases required postoperative transfusion with nonsignificant difference of *P value* 0.190 (Fig. 9, Table 5).

Table 4: Comparison between groups as regard adjusted length of hospital stay

	Group VATS (*n*=30)			Group open (*n*=30)			
	Range	Median	IQR	Range	Median	IQR	*P* value[z]
Adjusted length of Hospital stay (day)	4–6	5	5–6	7–9	8	7–9	<0.0001

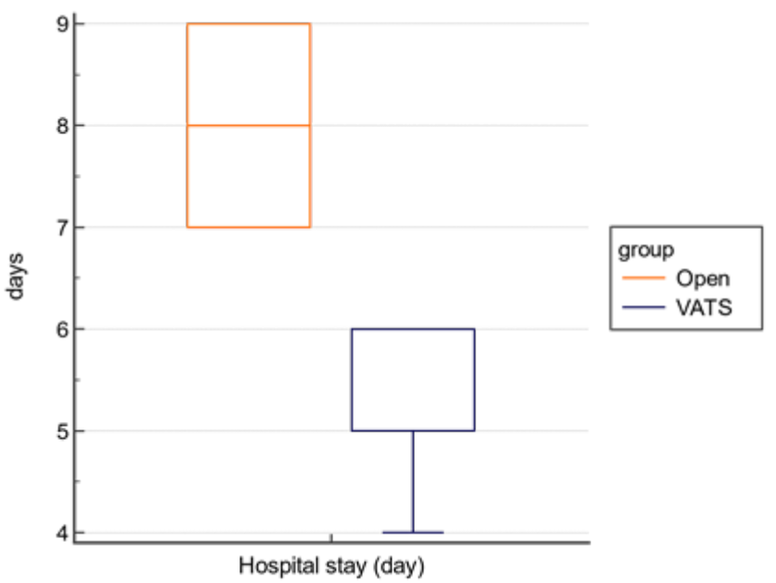

Fig. 4: Bar graph between groups as regard the adjusted length of hospital stay.

Table 5: Comparison between groups as regards postoperative outcomes

	Group VATS (*N*=30) [*n* (%)]	Group open (*N*=30) [*n* (%)]	*P* value[x2]
Air leak Duration			
<5 days	20 (66.6)	15 (50)	0.194
>5 days	10 (33.3)	15 (50)	
Air leak severity			
Mild	15 (50)	13 (43.3)	0.143
Moderate	10 (33.3)	9 (30)	
Severe	5 (16.6)	8 (26.6)	

Incomplete lung inflation	6 (20)	7 (24.1)	0.701
Superficial wound infection	1 (3.3)	4 (13.3)	0.165
Blood transfusion	10 (33.3)	15 (50)	0.19
Deep wound infection		No cases detected	
Reopening			
Mortality			

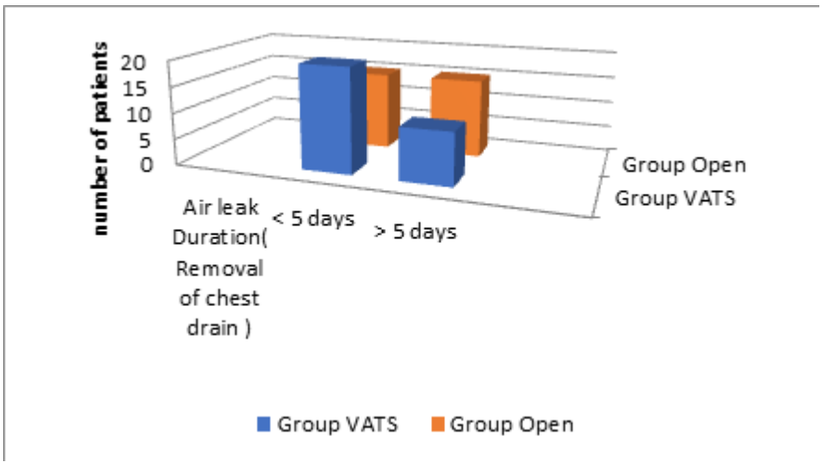

Fig. 5: Bar graph between groups as regards air leak duration.

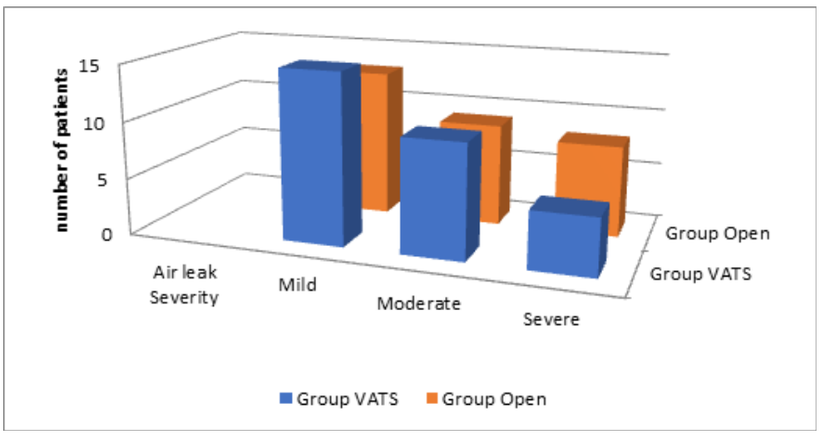

Fig. 6: Bar graph between groups as regards air leak severity.

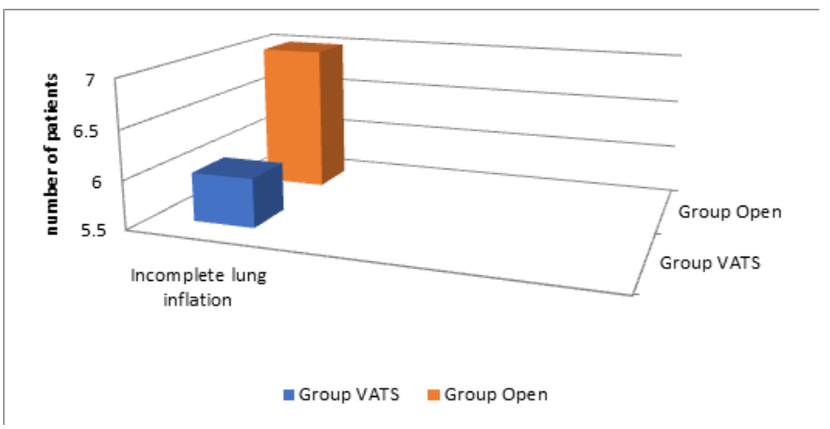

Fig. 7: Bar graph between groups as regards incomplete lung inflation.

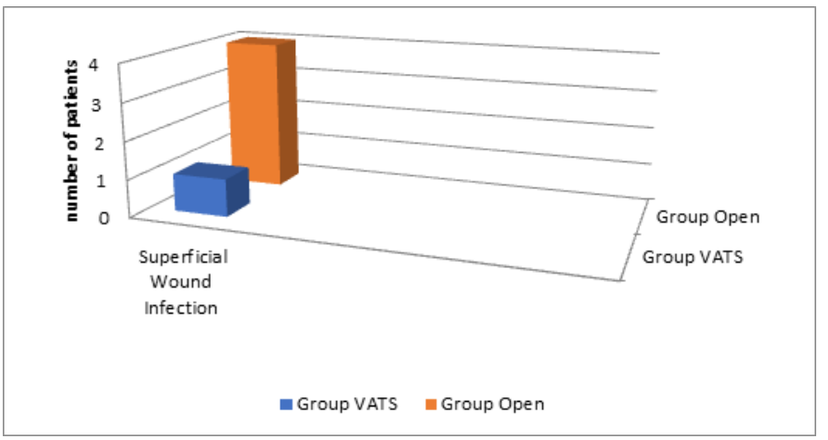

Fig. 8: Bar graph between groups as regards Superficial Wound infection.

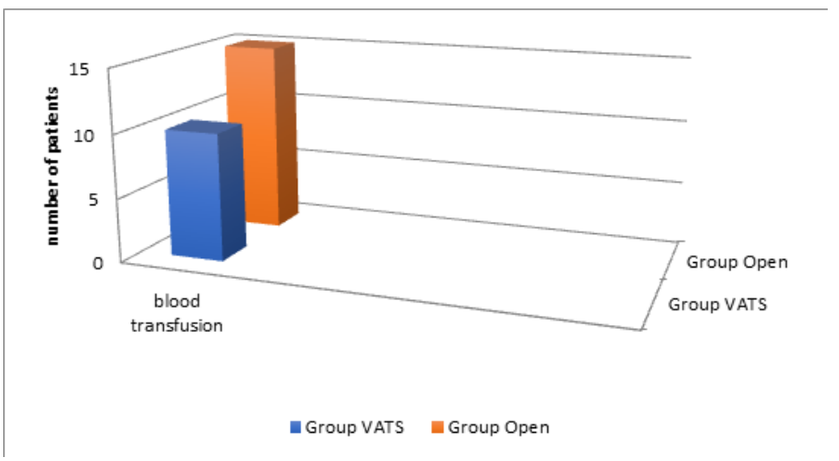

Fig. 9: Bar graph between groups as regard Blood transfusion.

DISCUSSION

Interpretation

Our statistics regarding postoperative results showed that The thoracoscopic method may have benefits for better vision, reduced surgical trauma, and better postoperative quality of life. Regarding the minimally invasive approach's effectiveness in terms of surgical outcomes and the necessity of recurrent procedures, there is still disagreement.

In our investigation, the clinical results of 60 patients who were split evenly with 30 patients who had either OT or VATS were compared.

Postoperative pain score using the visual analogue scale was compared in the two groups. Regarding postoperative pain, the median for VATS was 3 with IQR of 2–4 and for OT the median was 8 with IQR of 7–8 with highly significant statistical difference due to a P value less than 0.0001. This may be the outcome of intercostal neuralgia, which is caused by damage to the intercostal nerves when the thoracic cavity is accessed by splitting the pleura and extending the ribs.

Owing to the procedure's short incision, lack of rib spreading required, and minimum intraoperative manipulation, it has been suggested and confirmed in the literature thus far that patients having VATS had less postoperative discomfort and a lower need for analgesics.

Consistent with our findings, multiple studies are agreeing with our results including Manouchehr et al.[3] found that the pain was less in the VATS group with *P value* of 0.015, also Rohit et al.[2] reported the same result regarding less postoperative pain in the VATS group with a *P value* less than 0.001, as well as Giuseppe et al.[4] who found that postoperative pain was more in the OT group.

Regarding the Adjusted length of Hospital stay, our study revealed that the median for the VATS group was 5 with an IQR of 5–6 while the OT group median was 7–9 with an IQR of 7–9 resulting in high statistical significant P value less than 0.0001. Matching our study, Manouchehr et al.[3] reported less hospital stay duration with a *P value* of 0.015. Additionally, Giuseppe et al.[4]. Found the same result regarding a

shorter period of hospital stay in favor of VATS with a significant *P value* of 0.02.

Regarding the Air leak duration, our study found that there was no significant difference between both groups with a *P value* of 0.194, and the same for Air leak severity with a P value of 0.143. Enforcing our study, Rohit et al.[2] showed also no significant difference between both groups with a *P value* of 0.718.

Moreover, incomplete lung inflation results between both groups in our study were nonsignificant of *P value* 0.701 as the VATS group had 6 (20%) cases and the OT group had 7 (24.1%) cases. Agreeing with our results, Waseem et al.[5] found no significant differences between both groups with a *P value* of 0.347.

Regarding blood transfusion, 10 (33.3%) VATS cases versus 15 (50%) open casesrequired postoperative transfusion with nonsignificant difference of *P value* 0.190. Favoring our study, Rohit et al.[2] showed also nonsignificant difference of *P value* 0.718.

Superficial wound infection results in our study showed that for VATS there was 1 (3.3%) case of wound infection while for open there were 4 (13.3%) reported cases with no significant difference between both groups of *P value* 0.165, favoring our study Baloch et al.[6] found that there was no wound infection in the VATS group compared with two cases of the OT group with *P value* more than 0.05.

Regarding deep wound infection, reoperation, and mortality, there were no cases reported in our study with both operative outcomes.

According to the research, VATS is a treatment method that is safe, practical, and efficacious. According to our observations, VATS is better than OT in terms of intraoperative blood loss, reduced discomfort following surgery, fewer hospital admissions, and an early return to regular activities.

CONFLICT OF INTEREST

There are no conflicts of interest.

REFERENCES

1. Kumar A, Anand S. Lung Decortication. [Updated 2022 Nov 7]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK564375/

2. Jindal R, Nar AS, Mishra A, Singh RP, Aggarwal A, Bansal N. Video-assisted thoracoscopic surgery versus open thoracotomy in the management of empyema: A comparative study. J Minim Access Surg 2021; 17:470–478.

3. Aghajanzade M, Karimi B, Torabi H, Shirini K, Katebi S. Comparative study of open thoracotomy and thoracoscopy on the efficacy of treatment and complications of patients with stage II thoracic empyema. J Clin Investig Surg 2022; 7:20–24.

4. Cardillo G, Carleo F, Carbone L, Di Martino M, Salvadori L, Petrella L, Martelli M. Chronic postpneumonic pleural empyema: comparative merits of thoracoscopic versus open decortication. Eur J Cardiothorac Surg 2009; 36:914–918.

5. Hajjar WM, Ahmed I, Al-Nassar SA, Alsultan RK, Alwgait WA, Alkhalaf HH, Bisht SC. Video-assisted thoracoscopic decortication for the management of late stage pleural empyema, is it feasible? Ann Thorac Med 2016; 11:71–78.

6. Baloch I, Umair B, Asghar A, Khan MI, Hanif MS, Bilal A. outcomes of video assisted thoracoscopic, decortication versus conventional open decortication in patients with stage II or stage III empyema. Pak Armed Forces Med J 2021; 71:1261–1264.