

Role of Minimal Invasive Thoracic Surgery in Thai Lung Cancer Patients

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Objective: To assess the outcome of minimal invasive surgery in terms of intra and post-operative complication, length of tube duration, hospital stay, and cost-effective in lung resection of Thai urban population that underwent video assisted thoracoscopic surgery (VATS) and open thoracotomy (OT).

Materials and Methods: The present study was a retrospective cohort between 2006 and 2019. One hundred seventy-eight patients underwent pulmonary resection. All patients were diagnosed either primary or secondary lung cancer. All medical records were collected at Vajira Hospital. All various factors were analyzed to evaluate an outcome between both groups.

Results: One hundred nineteen patients were performed by VATS, whereas 59 patients were performed by OT. Tube duration and length of hospital stay were shorter in VATS groups with five days versus seven days ($p=0.001$) and six days versus eleven days ($p=0.001$). The operative time was longer and more blood loss in OT groups compare to VATS groups with 180 minutes versus 70 minutes ($p=0.001$) and 100 mL versus 20 mL ($p=0.001$). In post-operative outcome, there was no difference in terms of arrhythmia, pneumonia, and 30 days mortality. However, there were slightly higher cost during hospital stay in VATS compared to OT at 3,329.9 USD versus 2,685.7 USD ($p=0.001$).

Conclusion: VATS is associated with shorter length of tube duration, hospital stay, and less blood loss with no difference of post-operative outcome in lung cancer patients.

Keywords: Video assisted thoracoscopic surgery; cancer; open thoracotomy

Received 16 February 2021 | Revised 20 April 2021 | Accepted 21 April 2021

J Med Assoc Thai 2021;104(6):916-20

Website: <http://www.jmatonline.com>

In 1910, the concept of treatment in pleural effusion by thoracoscopy were reported by Jacobaeus. Since then, a technique of video assisted thoracoscopic surgery (VATS) have been improved by advancement of technology and surgical instrument. Currently, VATS become a standard procedure in many procedures in thoracic surgery⁽¹⁻³⁾.

However, there is still limited data about impact of VATS in Thailand especially in cancer patient. Therefore, the objective of the present study was to compare the outcome between VATS and open thoracotomy (OT) in lung cancer.

Materials and Methods

The present study was a retrospective cohort

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How to cite this article:

Laohathai S. Role of Minimal Invasive Thoracic Surgery in Thai Lung Cancer Patients. *J Med Assoc Thai* 2021;104:916-20.

doi.org/10.35755/jmedassocthai.2021.06.12472

between 2006 and 2019. One hundred seventy-eight patients underwent lung resection surgery in the Cardiothoracic Surgery Unit, Department of Surgery, Faculty of Medicine Vajira Hospital, Navamindradhiraj University, Bangkok, Thailand. These patients were diagnosed either primary lung cancer or lung metastasis. All patient's data were retrospectively extracted from the medical recording system. Patients who underwent VATS but were converted to OT were excluded in the present study. The intraoperative parameters and postoperative outcomes were monitored to assess the progress and outcomes of the patients such as duration of tube drainage, duration of hospital stay, intraoperative blood loss, postoperative complications such as arrhythmia, pneumonia, and mortality rate. Cost of the treatment in each method were recorded. The primary outcomes were length of hospital stay and post-operative complication. The present study was approved by the local Institutional Review Board/Ethics Committee (No. 007/62).

Surgical technique

All procedures were performed with general anesthesia using lung isolation technique with a double-lumen endotracheal tube or bronchial blocker.

Table 1. Patient demographic data between video assisted thoracoscopic surgery and open thoracotomy in thoracic surgery patients

Patient demographic data	VATS group (n=119); n (%)	OT group (n=59); n (%)	p-value
Sex			0.371
Male	54 (45.4)	31 (52.5)	
Female	65 (54.6)	28 (47.5)	
Age (year); median (IQR)	63 (14.7)	66 (11.9)	0.067
Smoker			0.487
Non-smoker	98 (82.4)	51 (86.4)	
Smoker	21 (17.6)	8 (13.6)	
Diabetes mellitus	29 (24.4)	12 (20.3)	0.550
Hypertension	57 (47.9)	19 (32.2)	0.047
Dyslipidemia	33 (27.7)	17 (28.8)	0.881
Cardiovascular disease	10 (20.2)	3 (5.1)	0.549
Stroke	8 (6.7)	0 (0.0)	0.054
Diagnosis			
Primary lung cancer	100 (84.0)	52 (88.1)	0.466
Lung metastasis	19 (16.0)	7 (11.9)	
Chronic obstructive pulmonary disease	13 (10.9)	0 (0.0)	0.005
Operation			0.001
Wedge	40 (33.6)	42 (71.2)	
Segmentectomy	12 (10.1)	2 (3.4)	
Lobectomy	67 (56.3)	15 (25.4)	
Cost during hospital stay (USD); median (IQR)	3,330 (2,424.5 to 4,775.8)	2,685.8 (2,290.4 to 3,083.2)	0.001

VATS=video assisted thoracoscopic surgery; OT=open thoracotomy; IQR=interquartile range

Surgical operations, performed by board-certified cardiovascular thoracic surgeons, depended on surgeon preference whether VATS or OT.

For OT, standard technique of posterolateral thoracotomy was routinely used. For VATS, the number of ports depended on the surgeon techniques, routinely performed uniportal VATS with 3 to 4 cm incision was incised at the fifth ICS at anterior axillary line for utility port.

After finishing the surgery, single small chest tubes (24-French or 28-French) were routinely inserted through at incision site placed under endoscopic vision in superior and posterior chest wall, respectively. Patients were extubated immediately after the operation if possible. Chest X-ray was done within 8 to 12 hours postoperatively. Routine postoperative cares included adequate pain control, pulmonary toilet exercise, and early mobilization. A Chest drain was removed if the content drainage was clear with no fresh blood or pus, was less than 200 mL/day, and there was no air leakage. All patients were followed with chest X-ray and evaluated for clinical symptoms at the cardiovascular thoracic clinic two weeks after discharged.

Statistical analysis

Categorical variables were presented as frequency and percentage. Continuous variables were presented as median with standard chi-square test was used to compare categorical variables and Mann-Whitney U test was used comparing continuous variables. A p-value of less than 0.05 was considered statistically significant. All statistical analyses were performed using PASW Statistics for Windows, version 18.0 (SPSS Inc., Chicago, IL, USA).

Results

Between 2006 and 2019, 178 patients underwent surgery, either VATS or OT in Vajira Hospital, where 119 patients were performed by VATS approach and 59 patients were performed by OT. There was no difference in term of gender, smoking history, and diagnosis. Wedge resection operation were performed under OT more than VATS at 71.2% versus 33.6% (p=0.001). Cost during hospital stay in VATS were higher than OT at 3,329.9 USD versus 2,685.7 USD (p=0.001). Patients' demographic data are shown in detail in Table 1.

Table 2. Intra- and post-operative data between video assisted thoracoscopic surgery and open thoracotomy in thoracic surgery patients

Peri-operative data	VATS group (n=119); n (%)	OT Group (n=59); n (%)	p-value
Operative time (minutes); median (IQR)	70 (45 to 120)	180 (140 to 240)	0.001
Intra-operative blood loss (mL); mean±SD	20 (98.8)	100 (774.8)	0.001
Length of hospital stay (days); median (IQR)	6 (5 to 8)	11 (8 to 14)	0.001
Length of tube duration drainage (days); mean±SD	5±4.8	7±4.1	0.001
Blood transfusion	3 (5.6)	0 (0.0)	0.334
Arrhythmia	1 (0.8)	0 (0.0)	0.483
Immediate extubation	115 (96.6)	56 (94.9)	0.687
Reintubation	1 (0.8)	0 (0.0)	0.053
Pneumonia	2 (1.7)	0 (0.0)	0.075
Reoperation	2 (1.7)	0 (0.0)	0.075
30 days mortality	1 (0.8)	0 (0.0)	0.105

VATS=video assisted thoracoscopic surgery; OT=open thoracotomy; IQR=interquartile range; SD=standard deviation

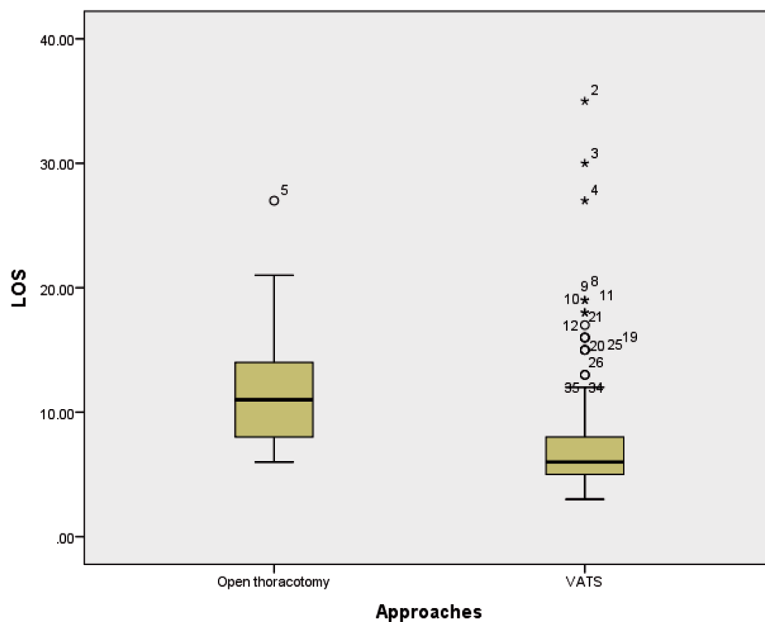


Figure 1. Mann-Whitney test comparing video assisted thoracoscopic surgery (VATS) with open thoracotomy (OT) in pulmonary resection in term of hospital stay.

Peri-operative results

In operative data, the operative time was longer in OT groups compared to VATS groups at 180 minutes versus 70 minutes ($p=0.001$), and more intra-operative blood loss at 100 mL versus 20 mL ($p=0.001$). Length of hospital stay, and tube duration drainage were both significant shorter in VATS groups at six days versus eleven days ($p=0.008$) and four days versus seven days ($p=0.014$). In post-operative outcome, there was no difference in terms of blood transfusion, arrhythmia, pneumonia, re-intubation, re-operation,

and 30-days mortality between VATS and OT. There were three cases in the VATS groups that needed blood transfusion. There were two patients that needed re-operations due to massive bleeding after operation. One patient died due to sepsis with renal failure (shown in Table 2, Figure 1).

Discussion

In the past decade, there have been changing trend in thoracic surgery. Many procedures in OT had been replaced by VATS. These approaches have

become standard and were reported in numerous studies^(1,2,4). However, in 2020, VATS has been performed only one-third of all thoracic procedures in Thailand. The authors believe that there are many reasons that VATS was not popular in Thailand. First, VATS demanded superior surgical skill. Secondly, this approach is limited in many difficult procedures such as sleeve resection or pulmonary artery reconstruction and need of a lot of specific surgical instrument. In many hospitals in Thailand, OT is still preferred as a standard procedure.

The principle of VATS approach is to reduce chest wall and lung manipulation. The benefit of VATS is associated with less tissue trauma, less post-operative pain, and less hospital stays. Incidences of post-operative complications were reported in approximately 30% to 50% of patients after pulmonary resection^(5,6). The Society of Thoracic Surgeons General Thoracic Database (STS-GTD) demonstrated that VATS approach was associated with significantly fewer complications than OT approach^(7,8). The present study had similar results in terms of post-operative complications.

Current evidence of management in lung cancer shows that VATS is preferred over an open approach to lobectomy or segmentectomy for clinical stage I lung cancer in an experience center⁽⁹⁾.

The cost of VATS is another main concern about cost benefit especially in developing country. Many studies described that the extra cost of VATS could be saved due to shortened length of hospital stay and fewer complications⁽¹⁰⁾. On the contrary, Miller demonstrated that VATS was associated with higher cost than OT⁽¹¹⁾. In the present series, the authors demonstrated that there was only a slightly higher cost in VATS comparing to OT.

Conclusion

The present study reported a benefit of VATS procedure in pulmonary resection in terms of shortened length of post-operative and hospital stay, lesser operative time and intra-operative blood loss, with no difference of post-operative complications.

However, there were several limitations such as the small sample size, the retrospective data and the limited long-term outcome. A large national registry or randomized control trial may help to identify the benefit of VATS approach.

What is already known on this topic?

VATS had become a standard procedure for all thoracic surgery with comparable outcome and a

benefit of reduced hospital stays and complications. The present study could confirm that VATS could be an alternative approach for all thoracic procedure.

What this study adds?

This study is claimed to be a first report to compare an outcome between VATS and OT in thoracic surgery in Thailand. This study also showed that VATS were associated with slightly higher cost but had a benefit of reducing length of hospital stay and blood loss.

Conflicts of interest

The author had no funding and conflicts of interest to declare.

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