Original Article

Short-Term Outcome of Non-intubated Thoracoscopic Assisted Thoracic Surgery in Thailand

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Objective: To reveal the short-term outcome of non-intubated video assisted thoracoscopic surgery (NIVATS) in Thailand.

Materials and Methods: The authors performed a retrospective review of the present study institutional database of 144 consecutive patients that underwent NIVATS between 2019 and 2020. Baseline clinical data such as gender, diagnosis, co-morbidities, and intra- and post-operative data were collected, retrospectively.

Results: Of the 144 patients, 71 were male patients with mean age of 59.1 years old. Most patients were non-smoker. Four (2.8%) patients were performed through subxiphoid approach, 14 (9.7%) were performed bilateral surgery, and 99 (68%) patients were diagnosed as malignant lesion. Median induction time and operative time were 23.5 and 60 minutes, respectively. The lowest oxygenation and peak ETCO2 were 100 and 44, respectively. Median of tube duration and hospital stay were two and five days, respectively. In post-operative outcome, only one patient needed to be converted to general anesthesia and 12 (8.3%) patients had post-operative complications.

Conclusion: Non-intubated general anesthesia is a safe and could be an alternative approach with comparable short-term outcomes.

Keywords: Video assisted thoracoscopic surgery; Non-intubate; Lung surgery

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Non-intubated video-assisted thoracoscopic surgery (NIVATS) has been widely performed in a variety of thoracic procedures such as wedge resection, segmentectomy, lobectomy, and others. It is claimed to be effective as a standard video assisted thoracoscopic surgery (VATS)[1-7]. In the authors' institution, they performed NIVATS technique since 2019. The objective of the present study was to evaluate a short-term outcome of NIVATS surgery in the present study institution.

Materials and Methods

Setting

At Vajira Hospital, Department of surgery, Faculty of Medicine Vajira Hospital, Navamindradhiraj University, Bangkok, Thailand, there were around 300 thoracic surgeries per year. The present study cohort of the surgeries performed solely by a single surgeon during the study period.

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Study design

Non-intubated video assisted thoracic surgery (NIVATS) was introduced in Vajira Hospital in March 2019 for managing thoracic procedures. All consecutive non-intubated operations were collected from the electronic medical records between March 2019 and April 2020. One hundred forty-four consecutive patients that underwent NIVATS were analyzed retrospectively, and their clinical data pertaining the perioperative outcomes were collected. The current study was approved by the Local Research Committee (Institutional Review Board, serial number; 058/63), Vajira Hospital, Navamindradhiraj University.

Selection criteria and data collection

The patient was selected once the patient clinical diagnosis showed a need for thoracic surgery and the patients was informed for surgical consent. The

inclusion criteria for NIVATS were similar to VATS, such as for lung cancer with tumor size less than 6 cm, no bronchus or vascular involvement, and no regional or distant metastasis. For exclusion criteria, those patients' body mass index (BMI) greater than 30, bleeding diathesis, difficult airway, or cerebrovascular disease were excluded from NIVATS. Peri-operative care, protocol, and post-operative orders were similar in both groups.

Operative technique

For the operative technique, the surgery routinely performed uniportal approach with 3 to 4 cm skin at fifth intercostal space. In difficult cases or intra-operative adhesions, an additional port was added at the eighth intercostal space for camera port. After completion of the operation, a thoracic catheter, a 24 or 28 French size chest tube, was routinely placed in the utility port.

Anesthesia technique of non-intubated surgery

All patients were oxygenated via a variety of methods such as facial mask with O_2 10 L/minute or high flow nasal cannula, depending on the anesthesiologist preference. The patients were fully monitored by electrocardiography, pulse oximeter, invasive arterial blood pressure, end-tidal capnography, and bispectral index (BIS). Anesthesia was induced and maintained by infusion of propofol and fentanyl with BIS score of 40 to 50 during operation. In the present series, the surgeon usually did not place an epidural catheter but routinely performed vagal nerve block and multi-level intercostal nerve block.

Sample size and statistical analysis

Categorical variables were presented as frequencies and proportions whereas continuous variables were presented as median (P_{25} to P_{75}). All statistically analysis was performed using PASW Statistics for Windows, version 18.0 (SPSS Inc., Chicago, IL, USA).

Results

The median age of the patients was 59.1 years old, and the predominant gender was female (50.7%). Most patients were non-smoker. Ninety-nine patients (68%) were diagnosed as cancer. Most operation type was wedge, followed by lobectomy and others with 78.5%, 15.3%, and 6.3%, respectively. Nine-point-seven percent of the patients were performed bilateral NIVATS surgery, four patients (2.8%) were performed through subxiphoid approaches. The surgeon performed three cases of tubeless surgery (Table 1).

Table 1. Baseline characteristic in patients who receive non-intubated video assisted thoracoscopic surgery

Characteristics data	n=144
Age (year); median (P_{25}, P_{75})	59.06 (36.3, 66.8)
Male; n (%)	71 (49.3)
BMI; median (P_{25}, P_{75})	22.1 (19.6, 24.7)
Smoking status; n (%)	
Non-smoker	117 (81.3)
Ex-smoker	13 (9.0)
Active-smoker	12 (8.3)
Passive smoker	2 (1.4)
Underlying disease; n (%)	
Diabetes	37 (25.7)
Hypertension	24 (16.7)
Dyslipidemia	4 (2.8)
Cardiovascular disease	6 (4.2)
Stroke	5 (3.5)
COPD	6 (4.2)
Malignant lesion; n (%)	99 (68.8)
Site; n (%)	
Right side	78 (54.2)
Left side	52 (36.1)
Bilateral	14 (9.7)
Type of operation; n (%)	
Wedge	113 (78.5)
Lobectomy	22 (15.3)
Other	9 (6.3)
Approach; n (%)	
Thoracic	140 (97.2)
Subxiphoid	4 (2.8)
Cost (USD); median (P_{25}, P_{75})	3,131.9 (2,118.8, 3,904.7)

BMI=body mass index; COPD=chronic obstructive pulmonary disease

In peri-operative outcome, the median induction time and operation time were 23.5 minutes and 60 minutes, respectively. Only one patient needed blood transfusion, and one for conversion to general anesthesia. The reason to convert was surgical technique (Table 2).

One patient needed re-intubation due to aspiration pneumonia from undetected hiatal hernia. One patient had hoarseness due to recurrent nerve injury during an operation. Nine (6.3%) patients had persistent air leak. One patient died within 30 days after surgery because of his advanced lung cancer disease.

Discussion

In recently year, a novel technique called a non-intubated VATS had been studied with the benefit

Table 2. Peri- and Ppst-operative outcomes in patients who underwent non-intubated video assisted thoracoscopic surgery

Peri- and post-operative data	n=144
Induction time; median (P_{25}, P_{75})	23.5 (16.25, 30)
Operative time; median (P_{25}, P_{75})	60 (40, 80)
Anesthesia result; median (P_{25}, P_{75})	
Lowest SpO_2	100 (96.8, 100)
Peak $ETCO_2$	44 (40, 48)
Estimate blood loss; median (P_{25}, P_{75})	10 (6.25, 30)
Blood transfusion; n (%)	1 (0.7%)
Post-operative complication; n (%)	
Re-intubation	1 (0.7)
Pneumonia	1 (0.7)
Hoarseness	1 (0.7)
Other	9 (6.3)
Hospital stays; median (P_{25}, P_{75})	5 (4, 7)
Tube duration; median (P_{25}, P_{75})	2 (1, 3)
30 days mortality rate; n (%)	1 (0.7)
Conversation to GA; n (%)	1 (0.7)

SpO_2=peripheral oxygen saturation; $ETCO_2$= end-tidal carbon dioxide; GA=general anesthesia

of less effects of general anesthesia, mechanical ventilation, and intubated related injury[8,9]. However, despite of the benefit, surgery under video-assisted thoracoscopic surgery under NIVATS is challenging and technically demanding due to the movements of the mediastinum. The mechanism of NIVATS is to create an artificial pneumothorax. When the pleural cavity is entered, the lung will gradually be collapsed due to the artificial pneumothorax. To perform this technique, a good cooperation between the surgeon and the anesthesiologist is needed to find a balance of anesthesia that could maintain oxygenation that ensured adequate surgical field.

Conversion to intubated general anesthesia is difficult during the procedure due to the patient position. An incidence of conversion was reported between 2% to 10%, which were caused by factors such as surgery or anesthesia. The anesthesiologist needs to be very skillful to place the double-lumen tube to secure the airway in the lateral decubitus position. The surgeon usually converts to general anesthesia when the patient develops sustain hypoxemia or has unstable hemodynamic, or in problematic surgery such as bleeding or dense pleural adhesion. In the present series, the surgeon had to converted to GA due to problematic surgery.

In conclusion, NIVATS is safe and feasible and could become an alternative approach for thoracic surgery.

What is already known on this topic?

Non-intubated video assisted thoracoscopic surgery had been advocated with a new technique for thoracic surgery that has a safe outcome. This study confirms that this approach could be an alternative for thoracic surgery.

What this study adds?

This study is claimed to be a first report to present a case series of outcome in non-intubate video assisted thoracoscopic surgery in Thailand.

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Conflicts of interest

The authors have no conflicts of interest to declare.

References

1. Pompeo E, Mineo D, Rogliani P, Sabato AF, Mineo TC. Feasibility and results of awake thoracoscopic resection of solitary pulmonary nodules. Ann Thorac Surg 2004;78:1761-8.
2. Pompeo E, Rogliani P, Cristino B, Schillaci O, Novelli G, Saltini C. Awake thoracoscopic biopsy of interstitial lung disease. Ann Thorac Surg 2013;95:445-52.
3. Pompeo E, Tacconi F, Mineo TC. Awake video-assisted thoracoscopic biopsy in complex anterior mediastinal masses. Thorac Surg Clin 2010;20:225-33.
4. Pompeo E, Tacconi F, Frasca L, Mineo TC. Awake thoracoscopic bullaplasty. Eur J Cardiothorac Surg 2011;39:1012-7.
5. Pompeo E, Mineo TC. Awake pulmonary metastasectomy. J Thorac Cardiovasc Surg 2007;133:960-6.
6. Tacconi F, Pompeo E, Fabbi E, Mineo TC. Awake video-assisted pleural decortication for empyema thoracis. Eur J Cardiothorac Surg 2010;37:594-601.
7. Chen KC, Cheng YJ, Hung MH, Tseng YD, Chen JS. Nonintubated thoracoscopic lung resection: a 3-year experience with 285 cases in a single institution. J Thorac Dis 2012;4:347-51.
8. Kim JH, Park SH, Han SH, Nahm FS, Jung CK, Kim KM. The distance between the carina and the distal margin of the right upper lobe orifice measured by computerised tomography as a guide to right-sided double-lumen endobronchial tube use. Anaesthesia 2013;68:700-5.
9. Campos JH, Massa FC, Kernstine KH. The incidence of right upper-lobe collapse when comparing a right-sided double-lumen tube versus a modified left double-lumen tube for left-sided thoracic surgery. Anesth Analg 2000;90:535-40.