

VIDEO-ASSISTED THORACOSCOPIC SURGERY WITHOUT CHEST DRAIN PLACEMENT

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Abstract

Background: Placement of chest drain following thoracoscopic procedures has been the gold standard. Nevertheless, a drainless approach may be safe and feasible in selected patients and procedures. In this study we aim to report our clinical experience after drainless video-assisted thoracoscopic surgery.

Methods: We retrospectively analyzed data of all subjects submitted to drainless video-assisted thoracoscopic surgery at our centre between January 1, 2010 and December 31, 2019. The preoperative clinical and surgical data and the immediate postoperative data were retrospectively evaluated through the consultation of the clinical processes and the computer registry system. We used descriptive statistics: mean or median, according to data distribution, and absolute or relative frequencies.

Results: We included 161 patients, mean age of 31 years (min:15; max:78). We analyzed data from patients submitted to: thoracic sympathectomy (67.1%), wedge resection, for lung biopsy, metastasis or small nodules resection (21.7%), mediastinal cysts removal (6.2%), pleural lesions resection (3.7%) and emphysematous bullae resection (1.2%). The average length of stay was 1 day. Residual pneumothorax was noted in 15 patients (9.3%). Postoperative pleural drain placement due to pneumothorax occur in 4 patients (2.5%). There was no intra-hospital mortality.

Conclusions: Video-assisted thoracoscopic surgery without postoperative chest drain seems to be valid and safe according to our results.

Keywords: chest drain, thoracic surgery, video-assisted thoracoscopic surgery, drainless, sympathectomy, wedge resection.

INTRODUCTION

Routine placement of an intercostal chest drain has been an established part of thoracic surgery, preventing postoperative accumulation of air, blood and/or fluid in the pleural space.¹⁻⁴

Nevertheless, chest tubes are often reported as the main cause of postoperative pain and can induce morbidities such as immobilization and increase risk of wound infection.^{2,3,5} The duration of chest tube insertion is known to be one of the main factors influencing hospitalization length of stay and consequently increasing medical costs.^{4,6,7} Additionally, unnecessary chest tube placement is thought to reduce the potential advantages of thoracoscopic surgery.^{3,8} Several studies have described that omission of chest tube placement after various thoracoscopic procedures is a safe and feasible approach that may help reduce postoperative pain and shorten hospital stay, allowing an earlier recovery.^{2,7,9}

The purpose of this study is to determine the validity and feasibility of avoiding chest drain following video assisted thoracoscopic surgery (VATS).

METHODS

This is a single-center and retrospective study including all subjects without pleural drainage following uniportal VATS at Centro Hospitalar Vila Nova de Gaia/Espinho, between January 1, 2010 and December 31, 2019. Procedures in which drain placement was waived include: thoracic sympathectomy, mediastinal cysts removal, pleural lesions, emphysematous bullae resection and wedge resection for lung biopsy, small peripheral lung nodules or metastasis. The preoperative, surgical and immediate postoperative data were retrospectively evaluated through the access of clinical files and computer registry system.

Table 1

Variables	Description
Age	in years, at the time of the surgery
Gender	female/male
Residual pneumothorax	yes/no, apical air is observed on postoperative X- Ray
Subcutaneous emphysema	yes/no, if air is detected beneath the skin
Postoperative chest drain placement	yes/no, chest drain placement after surgery
In hospital mortality	yes/no, at the hospital admission to surgery or up to 30 days after surgery

Demographic data were recorded. Postoperative early complications were evaluated, namely residual pneumothorax, subcutaneous emphysema and need of postoperative chest drain placement as well as results of the immediate postoperative period: hospitalization time and in-hospital mortality. Variables description is shown in Table 1.

Categorical variables are presented in absolute values and in valid percentage and the continuous variables as mean and standard deviation, or median and minimum and maximum, according to data distribution.

The IBM–SPSS Statistics version 26.0 (IBM, United States of America) program was used in data management and statistical analysis.

RESULTS

During the study period, 161 surgeries were performed without chest drain placement following uniportal VATS at our center. Median age was 31.0 (15;78) years, 62.1% being female.

Most frequent procedure allowing drainless approach was sympathectomy (67.1%), following wedge resection either for lung biopsy, metastasis or small nodules resection (21.7%), mediastinal cysts removal (6.2%), pleural lesions resection (3.7%) and emphysematous bullae resection (1.2%). Procedures performed are detailed in Table 2.

Residual pneumothorax was noted in 15 patients (9.3%). Postoperative pleural drain placement due to pneumothorax occurred in 4 patients (2.5%). Subcutaneous emphysema was noted in 15 patients. None required reoperation. Postoperative early complications are detailed in Table 3.

Median length of stay was 1.0 (1;7) days. In-hospital mortality did not occur. Two patients required readmission after discharge, one due to pneumothorax and another due to hemothorax.

Table 2

Procedures	Frequency (%)
Sympathectomy	108 (67.1)
Wedge resection	35 (21.7)
Mediastinal cysts removal	10 (6.2)
Pleural lesions resection	6 (3.7)
Emphysematous bullae resection	2 (1.2)

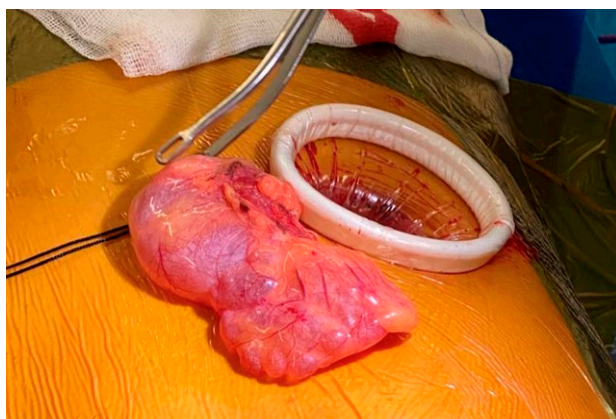
Table 3

Postoperative early complications	Frequency (%)
Residual pneumothorax	15 (9.3)
Subcutaneous emphysema	15 (9.3)
Postoperative pleural drain placement	4 (2.5)
Reoperation	0 (0.0)

DISCUSSION

Routinely, a chest tube is placed in the pleural cavity to monitor and treat any air leaks and to remove blood or fluid accumulation.⁸ However, chest tube management is determined mainly by personal experience rather than standardized criteria. In 2011, the Society of Thoracic Surgeon, the American Association for Thoracic Surgery, European Society of Thoracic Surgeons, and the General Thoracic Surgery Club produced a consensus guidelines in order to unify management of chest tube.¹⁰ Unfortunately, selection criteria for patients who do not require chest tube placement following VATS was not approached.

A plethora of studies had reported that the potential benefits of uniportal VATS might be undervalued by unnecessary chest drainage after surgery.^{5,7} Postoperative chest tube itself may adversely impact on the respiratory system, since it contributes to increased postoperative pain, worsened ventilation capacity, preventing patient ambulation, increasing risk of infectious complications and thus, prolonging length of stay.^{1,5,11,12} Furthermore, early chest drain removal is one of the strategies that is thought to prevent or reduce post-operative chronic neuralgia incidence.² Sienel *et al* conducted a prospective randomized study in which they confirmed that the need for analgesia is reduced in the absence of an intercostal drain.¹³ Although the effect of avoiding chest tube placement on postoperative pain was not analyzed in our study, it is our belief that avoiding postoperative chest tube placement has several advantages with respect to pain management.


Figure 1

Uniportal VATS, mediastinal cyst removal without postoperative chest drain placement.

The concerns associated with omitting chest tube drainage after pulmonary resection refer to the risk of symptomatic pneumothorax, bleeding, and pleural effusions.^{2,7,8} Due to notable improvements in recent years in instruments and devices used in VATS, there should be very few air leaks and little bleeding from the stapler line [8]. Nevertheless, residual pneumothorax was revealed on post-operative X-Ray in 15 patients (9.3%) and subcutaneous emphysema occurred in 15 patients (9.3%). The majority of these patients were asymptomatic and these findings had, therefore, no clinical impact. However, 4 out of 15 patients in whom residual pneumothorax was noted required chest tube placement: one after wedge resection, one after thoracic sympathectomy and two after emphysematous bullae resection due to primary pneumothorax.

In a study conducted by Watanabe *et al*, the presence of bullas or emphysema forbid drainless approach, because of an increased risk of postoperative development of new air leaks from the staple line.⁸ Additionally, patients routinely received mechanical pleurodesis by pleural abrasion to prevent recurrence, and so, these patients probably need chest tube placement because of oozing of injured pleura.⁴


Figure 2

Postoperative X-ray after mediastinal cyst removal without postoperative chest drain placement.

On the other hand, in a prospective randomized trial, Park *et al* demonstrated that patients undergoing VATS wedge resection for primary pneumothorax can be treated without postoperative chest tube.⁷ Further investigation on this field is needed. For instance, Zhang *et al*, conducted a study in which double-lumen catheter was inserted for prophylactic and remedial air-extraction in patients who have undergone thoracoscopic wedge resection, which can be an interesting strategy to reduce incidence of postoperative pneumothorax after drainless surgery.^{14,15}

According to our retrospective data review, the most frequent procedure allowing drainless approach was thoracic sympathectomy. In this surgery, sympathetic chain is interrupted (clipped, cut, or cauterized), theoretically without parenchymal lung injury. Rare complications include pneumothorax requiring chest tube drainage, pleural effusion, hemothorax, chylothorax, and persistent intercostal neuralgia.^{16,17} As previously mentioned, within 4 patients (2.5%) who needed postoperative pleural drain placement due to pneumothorax, 1 was after sympathectomy. We hereby can conclude that drainless approach is safe and effective for this procedure.

Another potential advantage of omitting chest drain placement is reduction on postoperative length of stay and thus potential cost savings.^{1,2,9,11,18} Our median length of stay was 1.0 (1;7) day. Post-operative management without a chest drain is thought to diminish morbidity and enhance recovery, with patients been discharged within less than 24 hours. Moreover, selective intercostal drain placement on the basis of air leak opens up for the possibility of outpatient surgery.^{19,20} Omission of chest drain has even been described after major lung resection as segmentectomy or lobectomy by VATS in multiple studies. In these trials, careful pneumostasis with alveolar air leaks sealed with bioabsorbable mesh and/or fibrin glue allowed the omission of chest tube drainage in the majority of patients without increasing the risk of adverse events.^{5,6}

Our data therefore, support that uniportal VATS without chest drain placement does not compromise postoperative length of stay and can be performed effectively without increased risk of major complication or death.

STUDY LIMITATIONS

There are some limitations in our study: 1) retrospective, single center experience limiting external validity and 2) relatively small sample size. Our analysis lacked assessment on postoperative quality of life, pain management and patient satisfaction. Future investigations with more patients and a longer follow-up would be interesting to confirm potential improvement of these outcomes with drainless approach.

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