Video-Assisted Thoracoscopic Surgery in Patients with Clinically Resectable Lung Tumors

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To investigate the feasibility of thoracoscopic resection, a pilot study was performed in patients with clinically resectable lung tumors. In 40 patients, Video-assisted thoracic surgery (VATS) was performed because of suspicion of malignancy. There were 29 men and 11 women with a median age of 54.8 years (range 18 to 78). Preoperative indications were suspected lung cancer and tumor in 27 patients, assessment of tumor resectability in 7 patients, and probability of metastatic tumors in 6 patients. The final diagnoses in the 27 patients with suspected lung cancer were 12 primary lung cancers, 6 lung metastases, and 9 benign lesions. The success rates for VATS (no conversion to thoracotomy) were of 12 (8.3%) for resectable stage I lung cancer, 8 of 12 (66.7%) for metastatic tumors, and 9 of 9 (100%) for benign tumors. With VATS, 6 of 7 patients (85.7%), possible stage III non-small cell lung cancer, an explorative thoracotomy with was avoided, significantly reducing morbidity. The reasons for conversion to thoracotomy were 1) oncological (N2 lymph node dissection and prevention of tumor spillage) and 2) technical (inability to locate the nodule, central localization, no anatomical fissure, or poor lung function requiring full lung ventilation). The ultimate diagnoses were 19 lung cancers, 12 metastatic lung tumors, and 9 benign lung tumors. Our data show the limitations of VATS for malignant tumors in general use. These findings, together with the fact that experience in performing thoracoscopic procedures demonstrates a learning curve, may limit the use of thoracoscopic resection as a routine surgical procedure, especially when strict oncological rules are respected.

KEY WORDS: Lobectomy, lung cancer, thoracoscopy, video-assisted thoracic surgery (VATS)

INTRODUCTION

Thoracoscopy has been performed by pulmonologists and thoracic surgeons for more than 80 years. In 1910 the first thoracoscopy was performed by H. C. Jacobaeus, using a modified cystoscope. Initially, thoracoscopy was used for diagnostic purposes in the parietal pleura, diaphragm, pericardium, mediastinum, and most of the lung. Then, therapeutic applications, such as talc poudrage, for spontaneous pneumothorax became possible. But interest in thoracoscopy decreased due to the development of safer operative techniques and the introduction of antituberculous drugs.

In the 1970s, new interest in thoracoscopy emerged due to the development of video imaging technology and new endoscopic instruments. In 1980 Boutin organized the First International Symposium on Thoracoscopy. Many thoracic surgeons have since extended the applications of this procedure to include therapeutic interventions such as mechanical pleurodesis, pleurectomy, bullectomy for pneumothorax, wedge resection, lobectomy and mediastinal mass exploration, and resection for benign and malignant tumors. Even pneumonectomy has been reported to be feasible.

For resectable lung tumors, surgery is the first treatment of choice. However, the morbidity for thoracotomy is considerable. Thoracoscopic lobectomy may improve postoperative recovery and reduce the period of hospitalization, which may decrease health care costs.

At present, many surgeons are interested in thoracoscopic lobectomy for lung cancer, but its efficacy has not been clearly demonstrated. Two major issues are important: the risk of inadequate nodal staging, re-
sulting in residual tumor, and possible incomplete resec-
tion and tumor spillage.\textsuperscript{24}

To investigate the feasibility of thorascoscopic lobec-
tomy, a pilot study was performed using video-assisted
thoracoscopic surgery (VATS) in 40 patients with clini-
cally resectable lung tumors, with the use of anterior util-
ity thoracotomy.

**MATERIALS AND METHODS**

**Patients**

Forty patients with suspected malignant lung tumors were
entered into this study. There were 29 men and 11 women,
and the median age was 54.8 years (range 18 to 78).
Preoperative diagnoses were tumors suspected to be ma-
lignant in 27 patients and probable metastatic lung lesions
in 6 patients; in another 7 patients with advanced lung can-
cer, thoracoscopy was used to assess the resectability of
the tumor (Fig. 1).

**Pretreatment Investigation**

The standard work-up procedure for clinical staging of
lung cancer was performed including chest X-rays, com-
puted tomographic scans of the lung and mediastinum,
bronchoscopy, and lung function studies.

**Surgical Procedure**

VATS was performed under general anesthesia with a dou-
ble lumen tube to collapse the ipsilateral lung. The patient
was placed in the lateral position to prepare for a possible
thoracotomy. In most patients, three trocars (sixth inter-
costal middle axillary line, fourth intercostal anterior, and
posterior axillary lines) were introduced to examine, dis-
sect, and finally resect the tumor. An anterior utility tho-
racotomy (3 to 10 cm) was performed to aid the
thoracoscopic procedure for dissection and removal of the
resected specimens when necessary.

**RESULTS**

Resection of four of six lung tumors suspected of being
metastatic was performed thoracoscopically. In the other
two patients, a conversion to thoracotomy was necessary
(Fig. 1).

In 27 patients with probable primary lung tumors, re-
section of the lesion was performed by VATS in 14. In 13
patients a conversion to thoracotomy was necessary. Final
diagnoses in these patients were 12 primary lung cancers,
6 lung metastases, and 9 benign lesions.

All conversions to a thoracotomy were in patients with
malignant lesions; 11 with primary lung tumors and 2 with
lung metastases. This means that in only 1 of 12 patients
with lung cancer was VATS possible. This patient had
stage I disease. The other 11 patients had stage I (n = 7),
stage II (n = 1), and stage IIIA (n = 3) disease. The rea-
sons for conversion both for patients with lung metastasis
(4 of 12) and lung cancer (11 of 12) are described in Table
1. According to our data, conversion to thoracotomy oc-
curred in 7 of 11 patients due to technical difficulties (no
anatomical fissure in 1, impossible to find the nodule
and/or centrally located in 5, and poor lung function re-
quiring whole lung ventilation in 1) (Table 1). In another
4 patients conversion to thoracotomy occurred due to de-
finite N2 positive in 1 and to prevent tumor spill in 3
(Table 1).

The success rates for VATS were 1 of 12 (8.3%) for lung
cancers, 8 of 12 (66.7%) for metastatic lung tumors, and
9 of 9 (100%) for benign lung tumors.

With VATS, in 6 of 7 (85.7%) patients with possible
stage III non-small cell lung cancer, an explorative thora-
cotomy was avoided. Reasons for inoperability were N2
positive tumor (3 patients), N3 positive tumor (1 patient),
and 14 tumor (2 patients) (Fig. 2).

The overall duration of thoracoscopic lobectomy was
3.5 hours. The duration for metastatectomy was 1.8 hours
and resection of benign lung tumors was 1.3 hours.

**DISCUSSION**

Twelve of 40 patients in whom VATS was performed had
clinically resectable non-small cell lung cancers. We could
perform thoracoscopic lobectomy in only 1 patients (1 of
12 = 8.3%). Hazelrigg et al.\textsuperscript{22} reported in their VATS study
group data that in 439 patients (439 of 1820 = 24.1%) event-
tual conversion to a thoracotomy occurred. Video-assisted
lobectomy was reported in 38 patients and 91 patients un-
derwent lobectomy after a VATS proce-
dure.\textsuperscript{22} The success rate for thoracoscopic lobectomy was
therefore 38/(38 + 91 = 29.5%). But it is unclear in how
many patients conversion to wedge resection or pneu-
monectomy occurred or how many tumors turned out to
be inoperable. The success rate for thoracoscopic lobec-
tomy must therefore be less than 29.5%.

Hazelrigg et al.\textsuperscript{22} also described their inability to find
the lung tumor as a frustrating problem. This occurred in
7.5% of patients, resulting in thoracotomy. In our pilot
study, this was the reason for conversion in 4 of 33 (12%)
patients. In another 3 patients conversion to thoracotomy
was due to technical difficulties (no anatomical fissure,
centrally located nodule, or poor lung function requiring
whole lung ventilation in 1 patient) (Table 1). Many tumor
VATS FOR RESECTABLE LUNG TUMORS

Table 1  Reasons for Conversion to Thoracotomy

<table>
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<tr>
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<th>MLT</th>
<th>BLT</th>
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<td>N2 positive</td>
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<td>3</td>
<td>4</td>
<td>8</td>
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<tr>
<td>Prevent tumor spill</td>
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<td>2</td>
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<tr>
<td>Poor lung function</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>3</td>
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<tr>
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<td>Total</td>
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<td>12</td>
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NSCLC, non-small cell lung cancer; MLT, metastatic lung tumor; BLT, benign lung tumor.

Figure 1  VATS in patients with clinically resectable lung tumors. In 40 patients, VATS were performed for suspected malignant lung tumors. The success rate for VATS (no conversion to thoracotomy) in clinically resectable non-small cell lung cancers was 8.3%. VATS prevented explorative thoracotomies in 85.7% of the patients, significantly reducing morbidity.

Table 1  Reasons for Conversion to Thoracotomy

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localization techniques have been published in which wire localization and endoscopic ultrasound seemed to be somewhat useful.25,26 (Fig. 3). It is very important, however, to apply oncological principles in thoracoscopic resection of malignancies.

Our data clearly show the limitations of VATS for malignant tumors in general. This is in contrast with the more optimistic results of proponents of thoracoscopic resection as previously reported, in which patient selection may influence the success rate of the thoracoscopic approach.

VATS did prevent explorative thoracotomies in 85.7% of the patients, significantly reducing morbidity. Therefore, thoracoscopic resection of malignancies is expected to be of only limited usefulness in patients with clinically resectable malignant pulmonary nodules.

These findings together with the fact that thoracoscopic procedures demonstrate a learning curve may limit their use as routine surgical procedures for lobectomy in the
Figure 2  With VATS, we diagnosed N2 positivity, which was not diagnosed before operation. An explorative thoracotomy was avoided in 85.7% of patients.

Figure 3  Many tumor localization techniques have been published. We tried to localize the tumor with endoscopic ultrasound.

suspicion of a malignancy, especially if strict oncological rules are followed.

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REFERENCES


