Institutional report - Pulmonary

Video-assisted thoracoscopic lobectomy vs. conventional lobectomy via open thoracotomy in patients with clinical stage IA non-small cell lung carcinoma

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Abstract

The aim of this study was to evaluate our personal experience with video-assisted thoracoscopic lobectomy and compare survival between this procedure and conventional lobectomy via open thoracotomy in patients with clinical stage IA non-small cell lung carcinoma. Between May 1997 and December 2004, 140 patients with clinical stage IA non-small cell lung carcinoma had either VATS lobectomy (VATS group, 84 patients) or standard lobectomy via open thoracotomy (open group, 56 patients) performed in our hospital. We compared overall survival, disease-free survival and recurrence between the two groups. The overall survival rate five years after surgery was 72% in the open group and 82% in the VATS group. There were no significant differences in the overall survival rate between the two groups. The disease-free survival rate five years after surgery was 68% in the open group and 80% in the VATS group. There were no significant differences in the disease-free survival rate between the two groups. Five patients in the open group developed distant recurrence, whereas one patient developed regional recurrence. In the VATS group six patients developed distant recurrence, whereas one patient developed regional recurrence. We consider VATS lobectomy to be one of the therapeutic options in patients with clinical stage IA non-small cell lung carcinoma.

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Keywords: Video-assisted thoracoscopic surgery; Conventional lobectomy via open thoracotomy; Non-small cell lung carcinoma; Lobectomy; Survival

1. Introduction

Reports on video-assisted thoracoscopic (VATS) lobectomy first appeared in 1992 [1]. In 1993, the reports were published that were either preliminary or involved a small number of patients that indicated the feasibility and safety of VATS lobectomy were published [2–4]. Thereafter, VATS lobectomy series involving a large number of patients were reported [5–8]. The indication for VATS lobectomy is controversial. We introduced techniques for VATS lobectomy in 1997. In the present study, we retrospectively compare VATS lobectomy with standard lobectomy through an open thoracotomy in patients with clinical stage IA non-small cell lung carcinoma.

2. Patients and methods

Between May 1997 and December 2004, we experienced 200 cases in stage IA non-small cell carcinoma. Twenty-six cases were performed by lobectomy and extended lymph node dissection of bilateral mediastum. These cases were excluded in this study. Thirty-four cases were performed by partial resection of lung with VATS procedure, because of the high-risk group. Also these cases were excluded in this study. Of them, 84 patients had VATS lobectomy (VATS group) and 56 patients had standard lobectomy via open thoracotomy (open group) with clinical stage IA non-small cell lung carcinoma in our hospital. This included 84 men and 56 women, with a mean age of 65 years (range, 23–81 years). All patients underwent computed tomography (CT) scan of the abdomen, bone scintigraphy scan and magnetic resonance imaging (MRI) of the brain to rule out the extrathoracic spread of disease prior to surgery. Pathologic evidence of lung cancer was obtained in all patients by transbronchial biopsy, sputum cytology, transcutaneous biopsy under CT guidance or lung biopsy under VATS. None of the patients underwent a mediastinoscopy preoperatively. Patients with enlarged lymph nodes > 10 mm in maximal diameter on CT, which suggested metastasis, were excluded. Patients with a tumor size of 3 cm, and no evidence of invasion into neighboring organs were included. Patients with pure gland glass opacity (Noguchi type A or B) were excluded.

In our hospital, selection of the operative procedure is a shared decision made by the physician and patient. The physician explains the indication for surgery to the patient,
and explains the benefits and risks of both video-assisted thoracoscopic lobectomy and conventional lobectomy via open thoracotomy. We perform shared decision making at our department following policies of providing the same information to the patients at all times, not handling any patients differently, and physicians not providing any opinions regarding which surgery is better, since that could influence the patients. The patient chooses either video-assisted thoracoscopic lobectomy or conventional lobectomy via open thoracotomy.

The postoperative patients were examined for the tumor markers and chest X-ray every three months. Chest CT was performed at least once (or more) per year. Brain MRI, abdominal CT and/or bone scintigraphy were performed once a year for the patients. Follow-up periods were 12–60 months. The median follow-up periods were 24.9 months and 35.6 months in VATS group and open group, respectively.

Survival rate and disease-free survival rate were calculated by the Kaplan–Meier method, and survival curves were compared between groups using a log-rank test. A P-value of <0.05 was considered statistically significant.

### 3. Operative procedure

One-lung ventilation was used and the patient was placed in the lateral decubitus position. A posterolateral or lateral incision (20 cm) was performed in the 4th or 5th intercostal thoracotomy without rib resection. For right lung resection, mediastinal lymphadenectomy was performed completely. For left lung resection, the Botalio ligament and hilial and carinal lymph node were dissected (ND2a). The surgical technique of VATS lobectomy is described below. We placed a thoroscope in the 6th or 7th intercostal space in the anterior axillary line and a main access portion (a 5 cm incision) was placed along the anterior axillary line in the 4th intercostal space or posterior axillary line in the 5th intercostal space, and one or two access ports were added. Mediastinal lymphadenectomy was also performed. However, when the tumor was in the upper lobe, carinal lymphadenectomy was omitted and when the tumor was in the lower lobe, highest pre- and para-tracheal lymphadenectomy was omitted. If the adhesion was firm in the thoracic space or the lymph node sample was positive, VATS lobectomy was converted to open thoracotomy. Converted cases were included in the open-thoracotomy group. Actually, seven cases were converted to open thoracotomy, because of severe adhesion in four cases or hilial lymph node metastasis in three cases.

### 4. Results

The characteristics of the patients in the two groups are shown in Table 1. There were no significant differences in terms of age, gender, tumor size and tumor histology between the two groups. Pathologic N1 and N2 disease was found in six (11%) and three patients (5%) in the open group and in six (7%) and four patients (5%) in the VATS group, respectively. Pathologic N3 disease was found in two patients (4%) in the open group. Pathologic p2 (visceral pleural invasion) disease was found in 11 (20%) and 10 patients (12%) in the open and VATS group, respectively. Only in the open group was pulmonary metastasis found in the same lobe in two patients.

The overall survival rate five years after surgery was 72% in the open group and 82% in the VATS group. There was no significant difference in the survival rate between the two groups (log-rank test, P=0.933) (Fig. 1). The disease-free survival rate five years after surgery was 68% in the open group and 80% in the VATS group. There was no significant difference in the disease-free survival rate between the two groups (log-rank test, P=0.654) (Fig. 2). There were no cases of operative death or death within 30 days of the operation in either group. The mortality rate was 0% in both groups.

During the follow-up period, five patients in the open group developed distant recurrence (two in the bone, one in the contralateral lung and two in the supraclavicular lymph nodes), whereas one patient developed regional recurrence in pleural dissemination. In the VATS group six

### Table 1

<table>
<thead>
<tr>
<th>Patient characteristics</th>
<th>VATS (n=84)</th>
<th>Open (n=56)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>40–81 (66)</td>
<td>23–81 (63)</td>
<td>0.1097</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>51</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>33</td>
<td>23</td>
<td>0.9999</td>
</tr>
<tr>
<td>Tumor size (mean) (mm)</td>
<td>20.6</td>
<td>22.9</td>
<td>0.0954</td>
</tr>
<tr>
<td>Histology</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adenocarcinoma</td>
<td>67</td>
<td>42</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>17</td>
<td>14</td>
<td>0.5062</td>
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<tr>
<td>Pathological stage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T1N0M0 (IA)</td>
<td>64</td>
<td>34</td>
<td></td>
</tr>
<tr>
<td>T2N0M0 (IB)</td>
<td>10</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>T1N1M0 (IIA)</td>
<td>5</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>T2N1M0 (IIB)</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>TanyN2 or 3M0 (IIA-IIIIB)</td>
<td>4</td>
<td>5</td>
<td>0.0516</td>
</tr>
<tr>
<td>IA: other</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Fig. 1. Kaplan–Meier survival curve for patients with clinical stage IA non-small lung carcinoma in the VATS group (solid line) and the open group (dotted line). The adjusted hazard ratio for death in the VATS group, as compared with the open group, was 1.04 (95% CI, 0.382–2.851; P=0.933).
patients developed distant recurrence (two in the brain, one in the bone, one in the liver, one in the adrenal gland and one in the supraclavicular lymph nodes), whereas one patient developed regional recurrence in pleural dissemination. There was no significant difference in recurrence rate between the two groups (log-rank test; \( P = 0.2091 \)).

In our study, there were higher-stage cancers in 22 cases (39%) and 20 cases (24%) in the open group and the VATS group, respectively. There were nine lymph node positive cases (16%) in the open group and ten cases (12%) in the VATS group.

5. Discussion

At our hospital, we have performed two types of operative procedures: a procedure in which extent of lymph node dissections are reduced such as in the VATS group, and another procedure involving extended lymph node dissection through a median sternotomy. The present study examined whether or not there are differences in recurrence and prognosis between the approaches of VATS lobectomy and open thoracotomy, and whether or not VATS lobectomy should be acceptable for patients in stage IA non-small cell lung carcinoma. The differences between the two procedures at our hospital include not only surgical invasiveness, which is generally expected, but also the extent of lymph node dissection. In the present study, we examined whether or not there are differences in recurrence and prognosis between the open group, in which a systematic lymph node dissection was performed by open thoracotomy, and the VATS group, in which the extent of lymph node dissections were reduced. That is, we examined whether or not the reduction of the extent of lymph node dissection should be acceptable for patients with primary lung carcinoma in stage IA.

There are some patients in whom surgeries are started as VATS lobectomy, but these patients are diagnosed positive in the rapid intraoperative diagnosis of lymph nodes and are converted to open thoracotomy. Normally, such patients are classified into the VATS group. However, in our hospital they were divided into two groups depending on the degree of lymph node dissection. Therefore, three patients, who were converted from VATS lobectomy to open thoracotomy and underwent systematic lymph node dissection, were included in the open group.

As a result, the survival rate five years after surgery was 72% for the open group and 82% for the VATS group. There was no significant difference between these groups. In a previous study, the survival rate five years after surgery was reported to be 70–80% for patients in clinical stage IA. Therefore, there were no differences between the results of this study and various previous studies [9–11]. The disease-free survival rate five years after surgery was 68% for the open group and 80% for the VATS group. There was no significant difference between the two groups. There were recurrences in seven patients (13%) for the open group and seven patients (8%) in the VATS group. There was no difference in the recurrence rates between this study and other reported studies [12, 13].

Our results showed that surgery in which the extent of lymph node dissections are reduced, such as in the VATS group, can be fully acceptable for patients in clinical stage IA. If so, the issue is whether or not mediastinal lymph node dissection is unnecessary for patients in clinical stage IA. As a postoperative result, there were 11 patients (20%) in the open group and 10 patients (12%) in the VATS group in which lymph node metastases were observed. These results were consistent with various previous reports in which 10–25% of the T1 patients were found to have lymph node metastasis [14, 15]. It indicated that the frequencies were relatively high. Lymph node metastasis is one of the important prognostic factors, and the frequency of metastasis is also relatively high for clinical stage IA. Therefore, when considering a postoperative adjuvant therapy, we do not think the mediastinal lymph node dissection can be omitted.

The limitation of the present study was firstly the bias in the selection of the operative method. The present study is a non-randomized study and the group assignment of patients was determined through a shared decision made by the physicians and patients. Therefore, it cannot be said that there was absolutely no bias as in a randomized study. However, the selection of the operative method was performed by the will of the patients and their families after past results at our hospital, nationwide results in Japan, and advantages and disadvantages of both operative methods were presented to them. From this aspect, there might have been some bias but the section was thought not to be highly partial.

Secondary, there was a difference in the postoperative follow-up period in the present study. This result was speculated to have occurred due to the small number of patients who selected VATS lobectomy in the initial period of the study. In recent years, an increasing number of patients have been selecting VATS lobectomy. The total number of patients in the VATS group is increasing. Since the follow-up period differed by approximately one year, the possibility remains of recurrent and fatal cases in the
VATS group. Therefore, we plan to perform careful follow-up examinations.

References


