

Controversies in Thoracoscopic Lobectomy for Lung Cancer

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Video-assisted thoracic surgery (VATS) for benign intrathoracic lesions has been widely accepted since the beginning of the 1990s. At present, bullectomy for spontaneous pneumothorax, resection of benign tumors or inflammatory lesions, and excisional biopsy of lung nodules or pleura are commonly performed by VATS. The major advantage of VATS is that it is less invasive than open procedures. Besides cosmetic considerations, VATS is associated with a shorter hospital stay¹⁾ and reduced postoperative chest pain²⁾ than conventional thoracotomy is.

VATS also has been used for the resection of primary lung cancers. When a "PubMed" search was done using the key words "VATS + lung cancer" in September 2006, a total of 173 citations were found, and 94 of them (54%) were reports from Japanese institutions. This suggests that Japanese thoracic surgeons are especially interested in thoracoscopic surgery for lung cancer. In the United States, 18.3% of the 65,256 lobectomies performed in 2005 were performed with VATS.³⁾ In Japan, the percentage of VATS lobectomies varies according to the policy of the individual institution, from 0% to nearly 100%. Small noninvasive bronchioloalveolar carcinomas showing focal pure ground-glass opacity (GGO) on chest-computed tomography can be completely resected by a VATS wedge resection without lymph node dissection if clear surgical margins are secured.^{4,5)} However, the indications for VATS lobectomy, when lymph node dissection is required, remain controversial, and several points require clarification before this issue can be resolved.

First it is essential to precisely define "VATS lobectomy" because it can include a wide variety of procedures. Some surgeons⁶⁾ perform a VATS lobectomy without the initial utility incision. The creation of the utility incision is the final step of the operation and is used only

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to deliver the resected lobe. In Japan this method is called a "complete endoscopic operation."⁷⁾ In contrast, the importance of a direct observation of the surgical field to manipulate the lung via the utility incision has been emphasized by another surgeon.⁸⁾ The presence or absence of the initial utility incision is a critical point to consider when evaluating the safety of surgical procedures because this incision is usually used to control a sudden massive hemorrhage from the pulmonary artery.⁹⁾ Further, the size of the skin incision in thoracotomy is becoming smaller. Differences in the surgical invasiveness of muscle-sparing minithoracotomic lobectomy (8- to 12-cm incision) and VATS lobectomy (5- to 8-cm utility incision + 2 cm × 3 ports) are now unremarkable. Actually, thoracoscopic lobectomy and the limited thoracotomy procedure are similar in terms of intraoperative blood loss, duration of chest tube drainage, and recovery of respiratory muscle strength.¹⁰⁾ Operative methods cannot be appropriately evaluated or compared without precise definitions of the technical terms used.

Concern over incomplete lymph node dissection is another problem in VATS lobectomy. Previous studies¹¹⁻¹³⁾ have compared the efficacy of a lymph node dissection of a VATS lobectomy with standard thoracotomy and have demonstrated that the results are similar. In some institutions, however, preoperative or intraoperative lymph node metastasis is a contraindication for a VATS lobectomy.¹⁴⁾ It seems that even surgeons who have a positive attitude toward a VATS lobectomy still prefer a systematic lymphadenectomy by standard thoracotomy when metastatic disease is present.

Cancer cell dissemination around the trocar insertion sites was reported early in the development of thoracoscopic surgery.¹⁵⁾ This complication has also been reported when a plastic bag is used to remove the lobe.¹⁶⁾ An implantation is very likely to occur when a large lobe is delivered through a tight incision. All these technical aspects should be analyzed to determine whether specific VATS lobectomy techniques are oncologically acceptable.

Patient selection criteria for VATS lobectomy is another important area to consider. Technical contraindications

of a VATS lobectomy include (i) lobar bronchial lesions, (ii) atelectasis, and (iii) infiltration of the parietal pleura.¹⁴⁾ Reviews of published data do not make it clear whether VATS is suitable for all resectable lung cancers (stages IA to IIIA). Indeed the selection criteria varies from series to series. VATS lobectomies are performed for clinical stages IA and IB in some institutions.^{14,17)} However, more-advanced tumors^{9,18)} or only small tumors ≤ 2 cm⁶⁾ were resected by VATS lobectomies in other series. The subgroups of lung cancer patients who would benefit from a VATS lobectomy should be clearly defined.

In conclusion, the value of a VATS lobectomy must be determined based on long-term survival. As mentioned elsewhere,¹⁴⁾ the 5-year survival rates among stage IA patients range from 70%¹⁴⁾ to 91%,¹⁸⁾ suggesting that bias in patient selection rather than the surgical procedure itself most affects the outcome. We obtained a 94% 5-year survival rate for a simple wedge resection without lymph node dissection for selected cN0 adenocarcinomas ≤ 2 cm.⁵⁾ Thus the prognosis depends more on the biological malignant grade of the tumor than on the surgical procedures. Some authors^{19,20)} have reported that the prognosis following a VATS lobectomy is better than that following an open lobectomy in nonrandomized studies. It was suggested that better survival was due to superior postoperative immunological status in the VATS group. This hypothesis was supported in part by clinical studies demonstrating reduced levels of inflammatory cytokines²¹⁾ or increased cellular immunity.²²⁾ However, it is still unclear whether these immunological differences reflect anything more than differences in the length of the skin incision or whether they really correlate with long-term survival. This potential advantage must be balanced with the increased risk of hematogenous dissemination during a VATS lobectomy.²³⁾ Thus the controversy continues.

The goal of surgery for lung cancer is a complete resection of the tumor. Surgical approaches are merely steps to the goal. Therefore the question of whether open thoracotomy or VATS is not essentially important. If we require a scientific conclusion, however, a well-designed, multicenter, randomized clinical trial to compare a "precisely defined VATS lobectomy" with a "precisely defined thoracotomic lobectomy" is needed.

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