Case Report

Video-assisted thoracoscopic right anterior, lateral, and medial segmentectomy for primary lung cancer of the middle lobe with incomplete interlobar fissures

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Abstract: A 63-year-old woman was referred to our hospital due to an abnormal shadow in the right middle lung field on chest X-ray. Chest computed tomography revealed a 2.0 cm nodule in the right lateral segment of the middle lobe. The nodule was confirmed to be lung adenocarcinoma by transbronchial lung biopsy. Because the tumor was located near the incomplete interlobar fissures, resection might traditionally be performed by right upper and middle lobectomy. However, we chose a minimally invasive intervention and performed anterior, lateral, and medial segmentectomy under video-assisted thoracic surgery. This technique resulted in complete tumor resection with minimal adverse effects.

Keywords: Video-assisted thoracic surgery (VATS); segmentectomy; minimally invasive surgery

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Introduction

Peripheral right middle lobe lesions located near the incomplete interlobar fissures between the upper and middle lobes are traditionally resected by right upper and middle lobectomy. We reasoned that a minimally invasive approach, that is, segmentectomy performed under video-assisted thoracic surgery (VATS), might achieve complete resection with minimal adverse effects.

Case presentation

A 63-year-old woman treating with hypothyroidism was referred to our hospital due to an abnormal shadow in the right middle lung field on chest X-ray. Chest computed tomography revealed a 2.0 cm × 1.7 cm nodule in the right lateral segment (*Figure 1*). The nodule was confirmed to be lung adenocarcinoma by transbronchial lung biopsy. Brain magnetic resonance imaging and positron emission tomography with ^{18}F-fluorodeoxyglucose revealed no obvious metastases. The clinical stage was T1bN0M0 stage IA2 as categorized by the UICC 8th classification. Spirometry demonstrated $FEV_{1.0}$ of 1.98 L and $FEV_{1.0}$% of 81.8%.

Operative techniques

The patient received epidural anesthesia and general anesthesia. She was intubated with a dual-lumen endotracheal tube and positioned in the lateral decubitus position. A utility incision (3.0 cm) was made in the 7th intercostal space (ICS) on the posterior axillary line and was protected with a wound retractor XS (Applied Medical Resources Corporation). This utility incision is used to remove the resected specimen. The incision can open widely by placing it in the lower ICS. Incisions for a thoracoscopic 12 mm port (Medtronic Company) were made in the 4th and 6th ICS on the anterior axillary line. These are used by a surgeon. A 5 mm port (Medtronic Company) was placed in the 6th ICS under the scapula. This was used by an assistant (*Figure 2*). First, the

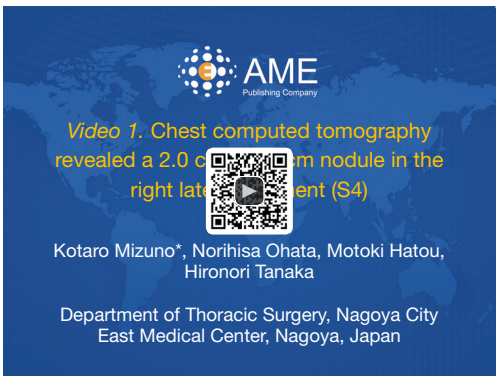

Figure 1 Chest computed tomography revealed a 2.0 cm × 1.7 cm nodule in the right lateral segment (S4). The nodule was located near the incomplete interlobar fissures between the upper and middle lobes (1).
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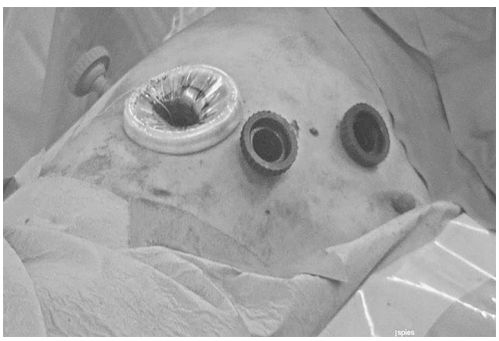

Figure 2 Incisions position.

interlobar fissure between the middle and lower lobes was separated bluntly until the pulmonary artery was exposed. The lateral segmental and superior segmental arteries were identified. The interlobar fissure between the upper and lower lobes was divided with a tissue sealer (Johnson and Johnson Medical Company, JJMC). The interlobar (11s) lymph node was dissected and confirmed to be free of metastasis by intra-operative pathological diagnosis. The lateral segmental artery was ligated at the proximal end with a 3-0 silk thread and then resected. The interlobar fissure between the middle and lower lobes was divided completely with a tissue sealer. The interlobar (11i) and middle lobe lymph nodes were dissected. The middle lobe vein was transected with a vascular 35 mm (white) endostapler (JJMC). The middle lobe bronchus was exposed and transected with a 60 mm (gold) endostapler (JJMC). The medial segmental artery was exposed by lifting the middle lobe cephalad, and was transected with a 35 mm (white) endostapler (JJMC). The mediastinal pleura near the superior pulmonary vein were opened along the phrenic nerve, and the apical vein was exposed. The posterior vein and the anterior vein (intersegmental and intrasegmental part) were separated each other. The anterior vein was resected after ligation of the proximal end with a 3-0 silk thread. The superior lobar artery was exposed by tracking the apical vein caudally. Then the anterior segmental artery was separated and transected with a 35 mm (white) endostapler (JJMC). After the hilar and upper lobe lymph nodes were dissected, the anterior bronchus was exposed. The anterior bronchus was resected after ligation of the proximal end with a 1-0 silk thread. Finally, the anterior segment intersegmental fissure was separated using four 60 mm (two green and two blue) endostaples (JJMC). The specimen was removed to a bag (Cook medical). Mediastinal lymphadenectomy was performed, including the tracheobronchial and subcarinal lymph nodes. A wash of the thoracic cavity confirmed the absence of bleeding. The residual lungs were well inflated. A 24 Fr chest drain (Medtronic Company) was placed, and the incisions were closed (*Figure 3*).

Operative data and hospital course

The operative time was 250 minutes. Blood loss was approximately 30 mL. The chest drain was removed 2 days after the operation and the postoperative hospital time was 6 days. There were no complications. The pathological stage was T1bN0M0 stage IA2 as categorized by the UICC 8th classification.

Discussion

With recent advancements in diagnostic technology, the detection of small and early-stage lung cancers has significantly improved, increasing the opportunities for minimally invasive interventions (3). Peripheral solid nodules without ground-glass components are accompanied by lymph node metastases or lymphatic invasion to more central areas in about 20% of patients (4). Given the early detection of these lesions, it has become even more important to develop surgical procedures that both cure the disease and preserve pulmonary function. Pulmonary segmentectomy is frequently used for early-stage lung cancers because it

Figure 3 Video-assisted thoracoscopic right anterior, lateral, and medial segmentectomy (2).
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allows for systemic lymph node dissection (5). According to some reports of segmentectomy versus lobectomy in early stage lung cancers, no significant difference in overall survival and disease-free survival (6-8). In addition, segmentectomy can preserve pulmonary function better than lobectomy, it can contribute to the maintenance of postoperative quality of life (5). So segmentectomy can be done positively or it is a valid alternative to lobectomy especially for high-risk operable patients.

Patients who undergo VATS segmentectomy have a shorter length of hospital stay and equivalent lymphadenectomy results as patients who undergo open segmentectomy (8,9). Furthermore, VATS segmentectomy is equivalent to VATS lobectomy in terms of overall and disease-free survival, 30-day mortality, and postoperative complications (10). It is thus our practice to perform VATS segmentectomy in patients with early-stage lung cancer.

Video-assisted thoracoscopic segmentectomy is a minimally invasive and curative technique, even for tumors located near incomplete interlobar fissures. In this report we have described specific technical points for VATS segmentectomy of the anterior, lateral and medial segment, highlighting the port design and dissection methods for the segmental vessels, bronchus, and intersegmental lung parenchyma. VATS segmentectomy is safe and reliable and may further broaden the indications for VATS.

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None.

Footnote

Conflicts of Interest: The authors have no conflicts of interest to declare.

Informed Consent: Written informed consent was obtained from the patient for publication of this manuscript and any accompanying images.

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