

Case Report

## Right Upper-lower Bilobectomy for Double Primary Non-small Cell Lung Cancer

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### Abstract

**Introduction:** Right upper-lower bilobectomy is rarely performed for non-small cell lung cancer. The prevention of middle lobe torsion is an important aspect of this procedure.

**Presentation of case:** The patient was 68-year-old man. He had double primary Stage1B non-small cell lung cancer, and requiring right upper-lower bilobectomy. The residual middle lobe was rotated approximately 90° in spite of sutured to the diaphragm. This event leads to pooling of sputum and the subsequent development of bacterial pneumonia in the middle lobe. Moreover, acute respiratory distress syndrome developed in the left lung arising secondarily to bacterial pneumonia. The patient died on postoperative day 42 due to respiratory failure.

**Conclusion:** Fixation of the residual middle lobe is important during right upper-lower bilobectomy.

**Keywords:** upper-lower bilobectomy; middle lobe torsion; acute respiratory distress syndrome

**Abbreviations:** NSCLC: non-small cell lung cancer; CT: computed tomography; PET: positron emission tomography

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**Competing Interests:** The authors have declared that no competing interests exist.

**Consent:** Consent was taken from the patient for publication of this case report.

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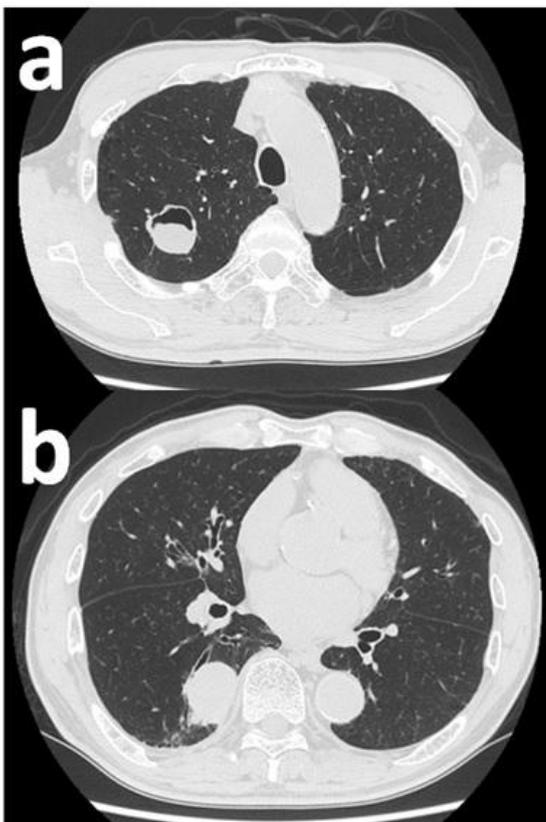
## Introduction

Right upper-lower bilobectomy is rarely performed for non-small cell lung cancer (NSCLC). We believe prevention of middle lobe torsion is an important aspect of this procedure. Here we report a case of double primary NSCLC requiring right upper-lower bilobectomy.

## Case presentation

A 68-year-old asymptomatic Japanese male visited our hospital for the treatment of lung tumors detected on chest computed tomography (CT). He was a smoker (47 pack years), with no significant previous medical history. Pulmonary function testing demonstrated an obstructive pattern with decreased lung diffusion capacity (FVC, 2560 ml; %FVC, 86.2%; FEV 1.0, 1770 ml; FEV 1.0%, 70.5 %; %DLco, 68.0%). Testing for exercise-induced stress was not performed due to difficulty in walking because of previous trauma.

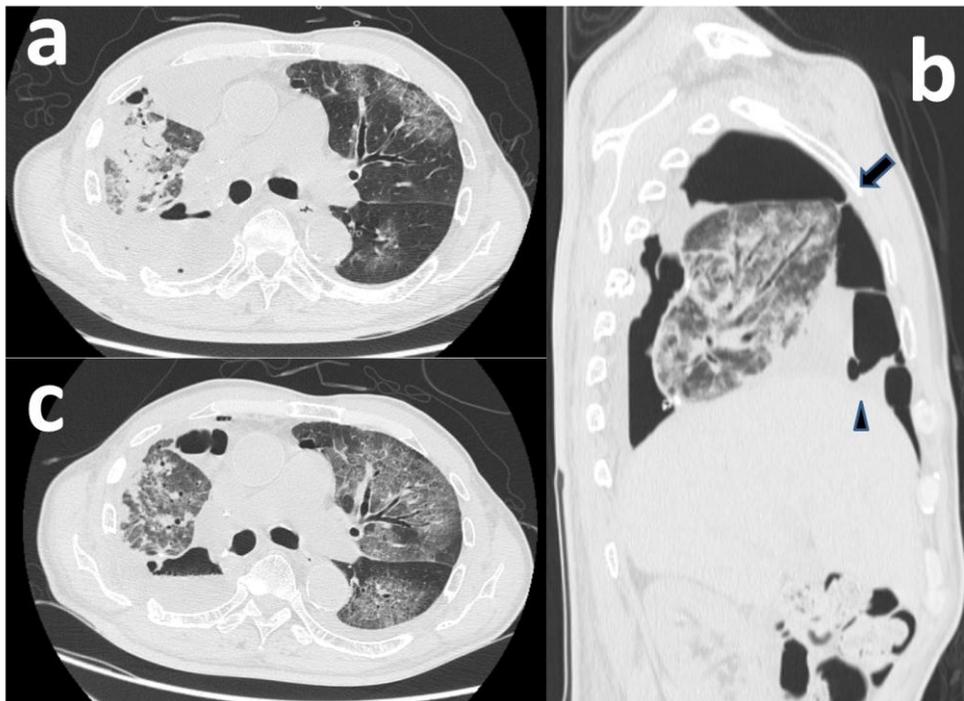
Chest CT scan demonstrated two solid lesions; a 35-mm cavitating lesion in the right upper lobe (Fig. 1a), and a 38-mm lesion in the right lower lobe (Fig. 1b). On bronchoscopic examination, both lesions were confirmed as squamous cell carcinoma. Positron emission tomography CT (PET-CT) demonstrated no lymph node or distal metastasis. Double primary lung cancer (cT2a N0 M0, Stage IB) was diagnosed.



**Figure 1** Lesions were detected in the right upper lobe (a) and lower lobe (b) on chest CT. Each lesion was subsequently confirmed as squamous cell carcinoma on preoperative bronchoscopy.

Right upper-lower bilobectomy and lymph node dissection were performed via a posterolateral approach, with the bronchial stumps covered with intercostal muscle. The residual middle lobe was fixed to the diaphragm using absorbable sutures at two locations. The patient's postoperative course was good until postoperative day 7; however, his oxygenation levels progressively worsened thereafter.

On postoperative day 8, chest CT showed pneumonia in the residual middle lobe and the appearance of diffuse ground-glass opacities in the left lung (Fig. 2a). Sutures were removed and the middle lobe was rotated approximately 90° (Fig. 2b). However, blood flow to the middle lobe was adequate with no evidence of middle lobe torsion. The patency of the middle lobe bronchus was confirmed by bronchoscopy; however, a large amount of sputum was pooling in the middle lobe bronchus. Antibacterial therapy was immediately initiated; however, oxygenation levels worsened further. On postoperative day 10, CT imaging demonstrated worsening of the left lung diffuse ground-glass opacities, and left lung acute respiratory distress syndrome caused by middle lobe pneumonia was diagnosed accordingly. Pulsed steroid therapy (methylprednisolone 1,000 mg/day, 3 days) was started.



**Figure 2** On postoperative day 8, CT imaging demonstrated bacterial pneumonia in the right middle lobe and diffuse ground-glass opacities in the left lung (a). The middle lobe had been fixed to the diaphragm at the point indicated by the arrow and the arrow head (b), however, sutures were removed and the middle lobe was rotated approximately 90°. On postoperative day 40, left lung consolidation had worsened, as seen on CT imaging (c).

At this time, his oxygen saturation levels were <90% while on 10 L of oxygen via a mask and was therefore intubated and attached to a ventilator. Further, two rounds of pulsed steroid therapy were administered before maintenance steroid therapy (prednisolone, 50 mg/day) was initiated. However,

his respiratory condition declined and the left lung consolidation progressively worsened (Fig. 2c). The patient subsequently died on postoperative day 42 due to respiratory failure.

## Discussion

As right upper-lower bilobectomy is a relatively rare operative procedure, there is a lack of literature on associated complications, prognosis, and methods of middle lobe fixation. Bilobectomy is reportedly associated with a high complication rate; Kim, *et al.* [1] reported major postoperative complications of bilobectomy of 31% and 51% for upper and middle bilobectomy and of lower bilobectomy, respectively. However, this study did not report the major complication rate of middle and lower bilobectomy. We experienced only two cases requiring right upper-lower bilobectomy between 2001 and 2015 at our institution, equivalent to just 0.14% of all lung cancer cases treated with surgical resection. In the other case, that patient had an uncomplicated postoperative course with good fixation of the residual middle lobe. As the residual middle lobe was relatively large, it was firmly fixed to the thoracic wall.

We believe the method chosen for middle lobe fixation represents the most important aspect of right upper-lower bilobectomy. In the present case, the sutures fixing the middle lobe to the diaphragm were cut early in the postoperative period. We believe deformation of the middle lobe bronchus led to pooling of sputum and bacterial pneumonia, potentially contributing to the subsequent ARDS development in the left lung. The residual middle lobe was relatively small and could not be fixed to the thoracic wall and was instead fixed to the diaphragm. On reflection, more extensive and stronger suturing may have been required.

Moriyama *et al.* [2] reported a case of right upper and lower sleeve lobectomy. They proposed utilizing of latissimus dorsi flap, and the preserved middle lobe was well fixed to the upper portion of the thoracic cavity. Although this method has not been established, it should be discussed extremely. Le Pimpec-Barthes *et al.* [3] proposed a number of fixation methods for the prevention of middle lobe torsion following right upper lobectomy. The application of Sepla-Film (Genzyme Biosurgery, Framingham, USA) to middle and lower lobe surfaces was recommended after upper lobectomy. In addition, the use of bioglue and Tachocomb, were suggested for prevention of middle lobe torsion [4][5]. These materials may facilitate strong fixture of the residual middle lobe to surrounding tissues.

Conversely, right pneumonectomy is reportedly one of the highest-risk pulmonary surgical procedures [6]. As his preoperative respiratory function, particularly FEV1.0% and %DLco, were poor, the middle lobe had to be retained. We believe right pneumonectomy should be considered only in extraordinary cases.

## Conclusion

Here we report our experience of right upper-lower bilobectomy with residual middle lobe bacterial pneumonia occurring as a result of middle lobe bronchus deformation, subsequently leading to left lung ARDS. We believe the fixation of the residual middle lobe is an important aspect of right upper-lower bilobectomy and should be considered in all cases.

## Consent

Written informed consent was obtained from the patient's family for publication of this case report and any accompanying images. A copy of the written consent is available for review by the Editor-in-Chief

of this journal.

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