Computed Tomography Guided Thoracoscopic Segmentectomy for Lung Cancer with Variant Bronchus

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Lung segmentectomy with bronchial variation has rarely been reported. We report the case of a lung cancer patient with variant anatomy of the right upper lobe bronchus. Thoracoscopic posterior segmentectomy of the right upper lobe was performed. Variant bronchus and related blood vessels were confirmed preoperatively by three-dimensional multidetector computed tomography (3D-MDCT), which facilitated visualization of the patient’s anatomy during surgery.

Keywords: computer applications, bronchial disease, lung cancer surgery, thoracoscopy/VATS

Introduction

Thoracoscopic lobectomy of lung cancer has been increased in many countries. Even thoracoscopic pulmonary segmentectomy is gradually adopted in thoracic surgery.1) Various anatomical variants in bronchi and vessels can present serious challenges during lung surgery, especially during thoracoscopic surgery. Preoperative detailed evaluation of the patient’s anatomy using the computed tomography is essential. Recently, advancing radiological imaging technology presents us detailed three-dimensional lung anatomy of the bronchi and vessels to the surgeons.

Here, we report the case of a lung cancer patient with variant anatomy of the right upper lobe bronchus. Thoracoscopic posterior segmentectomy of the right upper lobe was performed using three-dimensional multidetector computed tomography (3D-MDCT), which allowed good visualization of the patient’s anatomy during surgery.

Case Report

A 75-year-old man complained of transient hemoptysis for few days in July 2011. An abnormal chest shadow was detected by CT in July 2011. He was referred to our hospital for further evaluation. CT scan showed an abnormal shadow of ground-glass opacity measuring 1.9 × 1.2 cm in the right upper lobe compatible with lung carcinoma (Fig. 1). 3D-MDCT revealed a variation in the anatomy of the right upper lobe bronchus into the apicoposterior (B1+2) and anterior bronchi (B3) (Fig. 2). 3D-MDCT provided good visualization of the variant bronchus and related blood vessels. Although the tumor location was not confirmed during surgery, the patient underwent thoracoscopic posterior segmentectomy of the right upper lobe with sampling of the regional lymph nodes (Fig. 3). The central vein (V1) ran between the apical (B1) and posterior bronchi (B2) to the right and lateral of the anterior bronchus (B3). The apicoposterior artery (A1+2) was located ventral to the upper bronchus, branching into the posterior artery (A2) dorsally. The posterior bronchus (B2), artery (A2), and vein (V2b) were separated (Fig. 2). The postoperative course was...
uneventful, and the patient was discharged on post-operative day 8. Pathological analysis of the resected specimen revealed adenocarcinoma, Noguchi’s classification A, pT1N0M0, stage IA.

Discussion

Although Yamashita reported variations of the bronchopulmonary trees, and the bifurcating types that divided into B⁸ and B¹⁺² comprises 27% as for the orifice of the right upper lobe bronchus,³ bronchial variation has rarely been reported in papers,³ ⁴ and variant bronchi with lung cancer is even more rare.⁵ ⁸ Advances in radiological imaging technology allow excellent visualization of pulmonary bronchi and related vessels.⁹ ¹² Patients scheduled for thoracic surgery at our hospital are routinely examined by CT (Aquilion 64; Toshiba, Tokyo, Japan) after intravenous administration of iodinated contrast medium. Tailor-made virtual lungs are constructed from 3D-MDCT images of the pulmonary vessels and bronchi for each patient.⁹ ¹⁰ Variant bronchi were detected in our patient prior to thoracoscopic surgery. 3D-MDCT technology allowed us to create a detailed model of the precise anatomy of the bronchi and associated pulmonary vessels, reducing intra-operative evaluation time and thus facilitating rapid treatment. 3D-MDCT may contribute to safe and precise pulmonary segmentectomy, especially during thoracoscopic surgery. The B¹⁺² variation in this patient may have been mistaken for B² without clear visualization obtained with the 3D-MDCT. Because the right upper lobe bronchus had been bifurcated, the configuration of accompanying blood vessels was more confusing, making thoracoscopic segmentectomy more challenging and potentially dangerous.

According to the radiological findings, the abnormal shadow in the present case appeared to be malignant. Preoperative bronchoscopic diagnosis of the tumor seemed to be difficult, because it was peripheral and showing ground-glass opacity. Thus, the patient was scheduled for surgery. Diagnosis and treatment of lesions appearing as ground-glass opacity on CT have been recently discussed; however, management of such lesion remains controversial. However, we and others believe that early intervention with fine-needle aspiration biopsy or surgery is recommended in patients with intermediate or high likelihood for malignancy.¹³
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Bronchoscopic examination is a good method to evaluate the segmental bronchi, but it is sometimes difficult to know the precise relation between bronchi and its related pulmonary parenchyma. 3D-MDCT shows not only bronchial tree and the distributed parenchyma. So we used 3D-MDCT in this case.

Conclusion

Bronchial variation has rarely been reported, and variant bronchi with lung cancer is even more rare.1,2 Variant bronchi were detected prior to thoracoscopic surgery. 3D-MDCT technology allowed us to create a detailed model of the precise anatomy of the bronchi and associated pulmonary vessels. 3D-MDCT may contribute to safe and precise pulmonary segmentectomy, especially during thoracoscopic surgery.

Disclosure Statement

We have no conflict of interest.

References