Thoracoscopic Lobectomy for Treating Cancer in a Patient with an Unusual Vein Anomaly

Tadashi Akiba, MD,1 Hideki Marushima, MD,1 Noriteru Kamiya, MD,2 Makoto Odaka, MD,2 Satoki Kinoshita, MD,1 Hiroshi Takeyama, MD,2 Susumu Kobayashi, MD,1 and Toshiaki Morikawa, MD2

Various anatomical variants in pulmonary veins can have a serious effect on patients undergoing lung surgery. We present a case of a patient with an unusual pulmonary vein variation. Preoperative review of the patient’s three-dimensional 64-row multidetector computed tomography imaging allowed us precise simulation and good orientation of the patient’s vascular variant anatomy during surgery. Upper lobectomy through thoracoscopic approach was performed successfully in the case where the middle lobe vein might have been divided without preoperative anatomical evaluation by 3D CT images.

Keywords: computed tomography, CAT scan, lobectomy (lung), lung cancer surgery, pulmonary arteries/veins, thoracoscopy/VATS

Introduction

Various anatomical variants in pulmonary veins can have a serious effect on patients undergoing lung surgery.1, 2 We report the case of a patient with lung cancer who had an unusual pulmonary vein anomaly. The patient underwent thoracoscopic lobectomy; the variant was confirmed by preoperative three-dimensional multidetector computed tomography (3D-MDCT) images that assisted the safe orientation of the patient’s vascular anatomy during surgery.

Case

An abnormal chest shadow was detected on a roentgenogram of an asymptomatic 60-year-old woman during an annual work up. A computed tomography scan showed an abnormal lesion measuring 2.0 × 1.1 cm in size in the right upper lobe spreading to the middle lobe; this finding was compatible with lung carcinoma, cT1aN0M0, stage IA. 18F-fluorodeoxyglucose positron emission tomography (FDG-PET) showed accumulation of radioisotope, but no malignant cells were obtained under transbronchial biopsy. A review of the patient’s 3D-MDCT images showed that the right three pulmonary vein ostia: the superior pulmonary vein (upper lobe vein and middle lobe vein draining into it), the superior segment of right lower lobe vein (V6), and the inferior pulmonary vein (Fig. 1). In the anterior view, it was observed that the superior segment of right lower lobe vein ostium (V6) drained into the left atrium just below the superior pulmonary vein, and could possibly have been mistaken as the middle lobe vein during surgery. Although there was the fissure between the upper lobe and middle lobe, they were adhesed. And the superior pulmonary vein could have possibly been mistaken to be the upper lobe vein (Fig. 2). A right upper lobectomy with combined resection of part of the middle lobe and the lymph nodes was completed with thoracoscopic surgery. We were able to divide the upper lobe vein while preserving the middle...
lobe vein because of a preoperative review of the 3D-MDCT. Without 3D-MDCT, the superior pulmonary vein, which drained from the upper and middle lobe veins, might have been resected for the upper lobectomy in this case. The operation time and amount of bleeding were 275 min and 300 ml. The pathological diagnosis of the specimen was adenocarcinoma, pT1aN2M0, stage IIIA. The postoperative course was uneventful, and the patient was discharged on postoperative day 7.

Discussion

In this patient, the right upper and middle lobe veins could be divided because V6 appeared to be a middle lobe vein from the anterior view of hilar lesion during the thoracoscopic operation.

Patients scheduled for thoracic surgery in Jikei University Kashiwa Hospital are routinely examined by computed tomography (Aquilion 64; Toshiba, Tokyo, Japan) after intravenous administration of an iodinated contrast
medium. After constructing each patient’s 3D-MDCT images of the pulmonary vessels and bronchus (according to Akiba’s tailor-made virtual lung)\(^3\),\(^4\) the data are transferred to the picture archiving and communication system (PACS).

As part of our preoperative procedure, we routinely confirm the orientation of the vessels using the tailor-made virtual lung, especially at the point where the vessels divide, and simulate the surgery. Furthermore, we can refer to the structure of the patient’s vessels using PACS during the surgery. Anomalies of pulmonary veins are difficult to find using transverse section computed tomography, but 3D-MDCT enables us to clearly detect and rapidly confirm the existence of anomalies.

Few surgical cases of lung cancer with variant pulmonary veins have been reported. A left lower lobectomy in a patient with an inferior part of lingular vein (V5) that drained into the ventral trunk of the inferior pulmonary vein,\(^5\) and a right lower lobectomy in a patient with an anterior part of basal vein (V8) that drained into the superior pulmonary vein have been reported.\(^6\) Cases of middle lobe veins draining into the right inferior pulmonary vein have also been reported.\(^7\)-\(^9\)

Cronin et al. analyzed 200 patients.\(^10\) Among these patients, 12% had three atrial ostia in the right vein and in 9% of the patients the middle lobe vein drained into the left atrium, and 6.5% of those patients had a single left pulmonary vein ostium. In 2.5%, the superior segment of the right lower lobe accessory pulmonary vein, and in 1.5%, there was a combined left single vein ostium with the right superior segment (the same type of anomaly as in our patient). Marom et al. analyzed 201 patients.\(^11\) In 1% of these patients, there were right three atrial ostia for the upper, superior segment, and lower lobe veins, the same type as in our patient.

Three-dimensional MDCT technology allows rapid and detailed views of the anatomy of the pulmonary vessels, and it shortens the evaluation time for surgeons. Therefore, 3D-MDCT contributes to the safety of thoracic surgery, especially to that of thoracoscopic surgery.

**Acknowledgments**

We thank Professor Junta Harada, Mr. Daisuke Nakagawa and colleagues, Department of Radiology, Jikei University Kashiiwa Hospital, for their assistance with 3D-MDCT imaging.

**Disclosure Statement**

We have no conflicts of interest.

**References**