General Thoracic and Cardiovascular Surgery (2019) 67:723–725
https://doi.org/10.1007/s11748-018-1018-7

CASE REPORT

Left upper pulmonary vein connected to the persistent left superior vena cava and the left atrium

Ryunosuke Maki[1] · Masahiro Miyajima[1] · Taijiro Mishina[1] · Atsushi Watanabe[1]

Received: 4 August 2018 / Accepted: 29 September 2018 / Published online: 6 October 2018

Abstract
Persistent left superior vena cava (PLSVC) is the most common anomalous thoracic venous drainage. A PLSVC usually drains into the right atrium through a dilated coronary sinus. It is rare that a PLSVC flows directly into the left atrium, and even rarer that it connects to the left upper pulmonary vein (LUPV). We report a case, wherein the LUPV connected to both the PLSVC and the left atrium.

Keywords Lung cancer · Left upper pulmonary vein · Persistent left superior vena cava · Partial anomalous pulmonary venous connection

Introduction

Persistent left superior vena cava (PLSVC) is a malformation that occurs if the left common cardinal vein fails to close during the fetal period. It is one of the most common thoracic venous anomalies, occurring in 0.3–0.5% of all individuals [1]. During thoracic surgery, vessel anomalies such as PLSVC are often encountered. These abnormalities can cause unexpected complications during video-assisted thoracoscopic surgery (VATS) lung cancer treatment, as they interfere with the operative field. In a VATS left upper lobectomy (LUL) and mediastinal node dissection (MND), particular care must be taken not to damage the PLSVC while cutting the left upper pulmonary vein (LUPV) and MND. While these instances are rare, when the PLSVC connected with the LUPV [e.g., a partial anomalous pulmonary venous connection (PAPVC) coexists with PLSVC], it can be disconnected when cutting the LUPV. PLSVC can be easily confirmed with preoperative computed tomography (CT) scanning, but locating the PAPVC is a typically challenging endeavor. Here, we describe a case of VATS LUL and MND for the treatment of left lung cancer with coexisting PLSVC and PAPVC.

✉ Atsushi Watanabe
atsushiw@sapmed.ac.jp

[1] Department of Thoracic Surgery, Sapporo Medical University School of Medicine and Hospital, South 1, West 16, Chuo-ku, Sapporo 060-8543, Japan

Case report

A 75-year-old man presented to our hospital with an abnormal chest radiograph. A CT scan revealed a 21 × 20 mm nodule in the apical-posterior segment of the left lung (S^{1+2}), and visceral pleural invasion of the tumor was suspected (Fig. 1). The patient was clinically diagnosed with left lung cancer.

The patient underwent a video-assisted thoracoscopic surgery left upper lobectomy (VATS LUL), partial resection of a superior segment of the left lung (S^{6}), and mediastinal node dissection (MND). From an operative view, it could be seen that the PLSVC passed lateral to the aortic arch and connected with the left upper pulmonary vein (LUPV) (Fig. 2). After confirming that the LUPV drained into the left atrium, it was cut using an autosuture. At the time of MND, especially dissection number 5, the surgical field was preserved owing to the reverse retraction of the PLSVC stump (Fig. 2). The postoperative course of the patient was good, and he was discharged home.

Comment

The left internal jugular vein and the left subclavian vein join to form the PLSVC, which runs in front of the aortic arch and the left hilum, and then penetrates the pericardium. In 92% of cases, the PLSVC drains into the right atrium through a coronary sinus; in the rest, it drains into

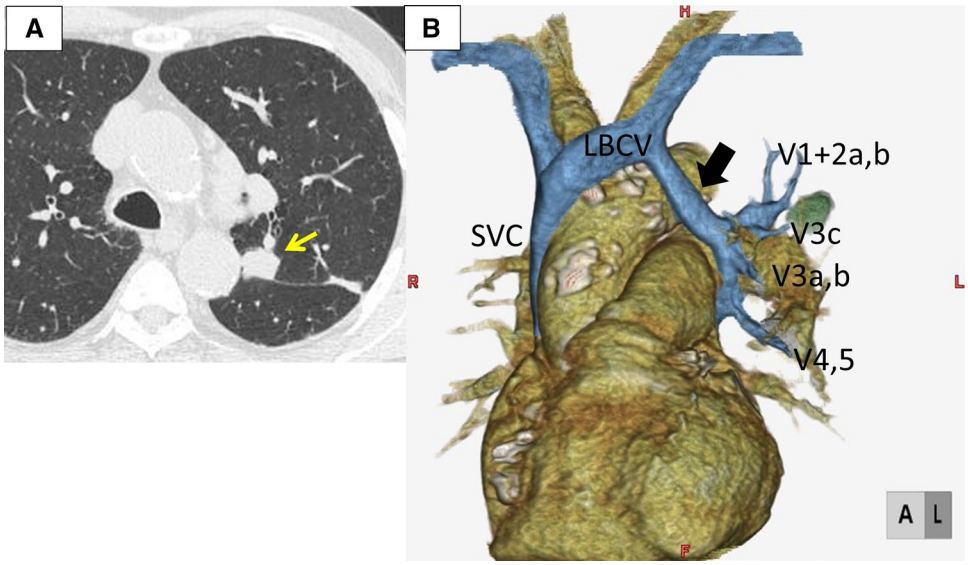

Fig. 1 Computed tomography (CT) revealed (**a**) a 21 × 20-mm nodule (arrow) in the left upper lobe. In three-dimensional CT (**b**), double superior vena cava was observed. Persistent left superior vena cava (arrow) connected with the left upper pulmonary vein. *SVC* superior vena cava, *LBCV* left brachiocephalic vein, *V1 + 2a,b* pulmonary vein of segment 1 + 2a,b, *V3c* pulmonary vein of segment 3c, *V3a,b* pulmonary vein of segment 3a,b, *V4,5* pulmonary vein of segment 3a,b

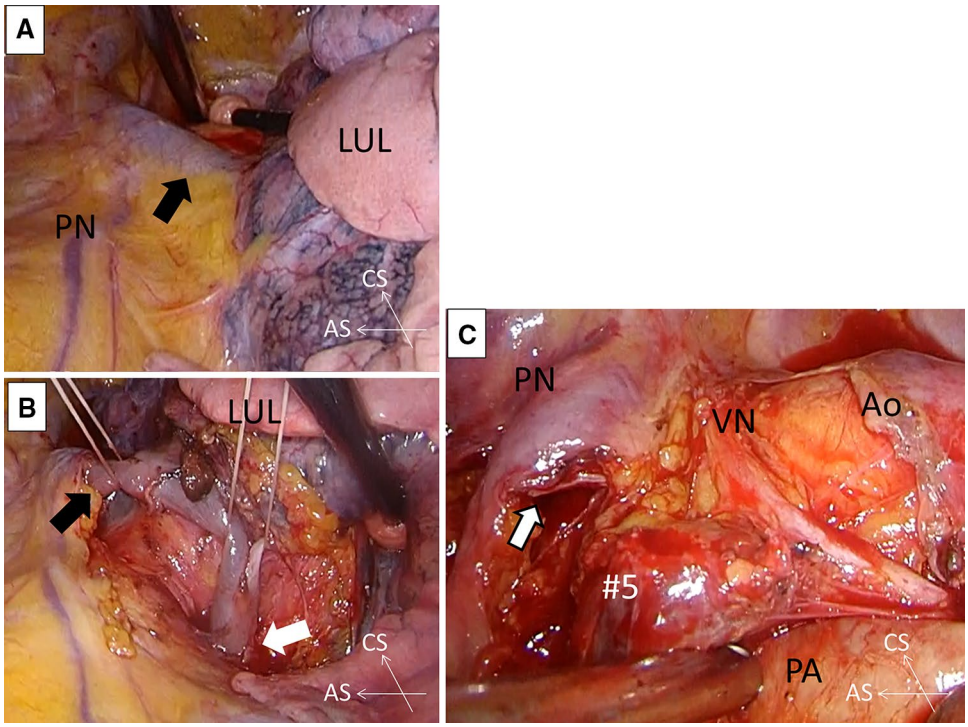

Fig. 2 Thoracoscopic view. **a** Persistent left superior vena cava (PLSVC, arrow) run in front of the aortic (Ao) arch. **b** After dissecting the mediastinal pleura, the left upper pulmonary vein connect with the left atrium (white arrow) and PLSVC (black arrow). **c** At the time of dissection number 5, the PLSVC stump (arrow) was retracted. *LUL* left upper lobe, *PN* phrenic nerve, *VN* vagus nerve, *PA* left main pulmonary artery, *#5* subaortic node, *CS* cranial side, *AS* anterior side

the left atrium. When flowing into the right atrium, it is usually asymptomatic, but, when flowing into the left atrium, symptoms may occur due to the right-to-left shunt of the blood flow [2]. About 10–20% of cases of PLSVC have been reported to lack the right superior vena cava. In cases with left and right superior vena cava, a left brachiocephalic vein (LBCV) is missing in about 65% of these individuals [3]. In our case, the PLSVC connected with the right superior vena cava through this LBCV, and it additionally drained into the left atrium through the LUPV (Fig. 1). Rowe et al. classified PLSVC into three types according to the drainage site; compared to such cases, our case showed a rare type of PLSVC [4].

The VATS approach provides the operator with a limited surgical field of view through the monitor screen. Surgical instruments are then inserted into the thoracic cavity within a limited range of angles. In this approach, the operator should pay attention to avoid vascular injury when dissecting the mediastinal pleura and exposing the LUPV, because the PLSVC hinders the field of view in front of the

left hilum. Extreme care should be taken during the VATS MND. Maiko et al. [5] suggested that additional care must be taken during the subaortic node (#5) dissection, because the PLSVC runs in front of the Botallo ligament. Since, in our case, the PLSVC stump was retracted backward, we could perform a standard #5 dissection.

PLSVC can be confirmed easily via a CT scan. Before surgery, in case of PLSVC, the destination of PLSVC drainage should be checked.

Compliance with ethical standards

Conflict of interest The authors have no conflicts of interest to disclose.

References

1. Campbell M, Deuchar DC. The left-sided superior vena cava. Br Heart J. 1954;16:423–39.
2. Goyal SK, Punnam SR, Verma G, Ruberg FL. Persistent left superior vena cava: a case report and review of literature. Cardiovasc Ultrasound. 2008;6:1–4.
3. Couvreur T, Ghaye B. Left superior vena cava. In: RemyJardin M, Remy J, editors. Integrated cardiothoracic imaging with MDCT. Medical radiology:diagnostic imaging and radiation oncology. Berlin: Springer; 2009. pp. 289–305.
4. Rowe RD. Anomalies of venous return. In: Keith JD, Rowe RD, Vlad P, editors. Heart disease in infancy and childhood. 2nd ed. New York: Macmillan; 1967. pp. 493–542.
5. Maiko N, Yuki N, Mitsuro F, Hiroyasu K, Yoshihiro M, Hidetaka U. A case of left lower lobectomy with PLSVC. Jpn J Chest Surg. 2016;30:76–9.