Robot-assisted thoracic surgery is effective for right upper lobectomy in cases with a rare variation pattern of the pulmonary veins

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DESCRIPTION
A man in his 70s was referred to our department due to a 1.6 cm solid nodule in the right upper lobe of the lung, detected via CT examination for prostate cancer. Additionally, CT revealed that the pulmonary vein 1 ran posterior to the right main pulmonary artery (figure 1). A surgical biopsy was scheduled under the suspicion of lung cancer.

Robot-assisted thoracic surgery, using five ports, was performed to facilitate the tumour biopsy. Intraoperative rapid diagnosis with a frozen section of the tumour indicated an adenocarcinoma. Thus, we performed a right upper lobectomy with lymph node dissection.

The ports were arranged as follows: the camera port on the eighth intercostal space, midaxillary line; the right-sided port on the seventh intercostal space, anterior axillary line; the left-sided port slightly dorsal to the posterior axillary line in the eighth intercostal space; the third arm port on the dorsal side of the eighth intercostal space; and the assistant port slightly ventral to the midaxillary line in the tenth intercostal space.

The superior pulmonary vein was approached through the ventral side of the pulmonary hilum. A dissection was made around it. At this point, pulmonary veins 2 and 3 were evident, but pulmonary vein 1 was not yet exposed. After dissecting pulmonary veins 2 and 3, the pulmonary artery was slightly dissected. The pulmonary artery was then exposed by an interlobar approach. Dissection was performed centrally along the pulmonary artery, with ventral dissection to create the superior and middle interlobar spaces using Powered Echelon Flex45 gold (New Brunswick, New Jersey, USA). The upper and lower lobes were divided using a vessel sealer (Sunnyvale, California, USA). The ascending A2 perimeter was dissected with the central side double clipped and the peripheral side single clipped. These were cut with a scissors arm.

Further dissection of the pulmonary artery revealed the pulmonary artery truncus, which was cut using a Powered Echelon Flex7. The pulmonary artery truncus was carefully and thoroughly dissected because pulmonary vein 1 was located posteriorly. The dissection of pulmonary vein 1 was initiated by having the first assistant retract the pulmonary artery caudally, while the surgeon performed the dissection. The vein was subsequently ligated centrally and cut with a Powered Echelon Flex7 (figure 2). The patient’s postoperative course was unremarkable, with no noted complications. No cancer recurrence was noted 33 months postoperatively.

This case highlights two essential points. First, pulmonary vein 1 running posterior to the right main pulmonary artery is an anatomical variant. Shimizu et al identified four branching patterns of the right upper pulmonary veins. This case was classified as an anterior with central type (Iab), the most common branching pattern reported (54%). However, pulmonary vein 1 rarely runs between the right bronchus and the right main pulmonary artery. Although it is easier to recognise anatomical variants using three-dimensional CT, axial CT may also be used.

Second, robot-assisted thoracic surgery is helpful for pulmonary resection in complex anomalies of the pulmonary vein. Studies have reported several advantages of the Camera System and Endo Wrist robotic instruments. The Camera System provides a high-resolution field of view (magnified by up to
Images in…

Patient’s perspective

“I had been undergoing regular check-ups and was shocked when I developed a heart condition. However, with subsequent treatment, I am now fine.”

Learning points

► Pulmonary vein 1 running posterior to the right main pulmonary artery is a variant drainage pattern.
► Robot-assisted thoracic surgery is useful for pulmonary resection in complex anomalies of the pulmonary vein.

Furthermore, unlike conventional thoracoscopic cameras, it provides a three-dimensional view. On the other hand, Endo Wrist robotic instruments have a motion scaling system and multi-joint arms. This allows less motion scaling (ie, instrument displacement per surgeon movement), leading to fewer errors. Moreover, the multi-joint arms can move freely. These technologies allow surgeons to perform pulmonary resections quickly and accurately. Furthermore, these systems are expected to improve in the future. The da Vinci Si, which could easily ligate and sever the pulmonary veins; has now evolved to X and Xi, which can perform automatic suturing with robotic assistance. These systems are limited due to the lack of tactile senses. However, we believe that this will be overcome in time. Currently, there is little evidence suggesting the benefits of these technologies for patients’ prognoses. More studies are needed to demonstrate the efficacy of such robot-assisted surgeries.

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Case reports provide a valuable learning resource for the scientific community and can indicate areas of interest for future research. They should not be used in isolation to guide treatment choices or public health policy.

REFERENCES