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CASE REPORT

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Management of a malignant solitary fibrous tumor of lung by uniportal video-assisted pneumonectomy: a case report

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Abstract

Background Solitary fibrous tumor (SFT) is a rare condition first described by Klemperer and Robin in 1931. Malignant SFTs account for approximately 80% of all SFT cases, and the five-year survival for malignant SFTs is 81%. Few reports have described SFT management using uniportal video-assisted pneumonectomy.

Case presentation A 35-year-old male patient with a tumor in the left pulmonary was assessed using preoperative three-dimensional computed tomography (3D-CT) reconstruction and treated via uniportal video-assisted pneumonectomy. A pathological diagnosis of SFT was confirmed.

Conclusions The 3D-CT reconstruction may help to provide an appropriate operative strategy for surgeons. It is necessary to control the main pulmonary arterial trunk to avoid hemorrhage when preoperative evaluation does not exclude the possibility of intraoperative hemorrhage. The choice of surgery area is affected by SFT size and location.

Keywords Solitary fibrous tumor, 3D-CT reconstruction, Case report

Introduction

Solitary fibrous tumor (SFT) was first described by Klemperer and Robin in 1931 [1]. It is a rare condition that originates from dendritic stromal cells. Most patients have no obvious symptoms. However, some individuals with a large tumor may have diverse syndrome, such as thoracalgia, dyspnea, and cough. Patients with SFT of the lung are treated using surgical options, including lung wedge resection and lobectomy, but rarely pneumonectomy. In the present case report, a 35-year-old patient with a low malignant SFT was assessed using three-dimensional computed tomography (3D-CT) reconstruction before surgery and underwent a complete surgical resection via uniportal video-assisted pneumonectomy.

Case history

A 35-year-old male patient complained of mild thoracalgia and dyspnea lasting for more than a month that did not respond to oral medication. There were no other obvious findings during a physical examination. The patient had no relevant previous medical and family history. The patient also reported a large 6.7 × 4.8 cm lesion located in the left lung lobe, which was closely related to the left pulmonary arteries on an enhanced chest CT evaluation (Fig. 1A, B). A 3D-CT reconstruction [2]

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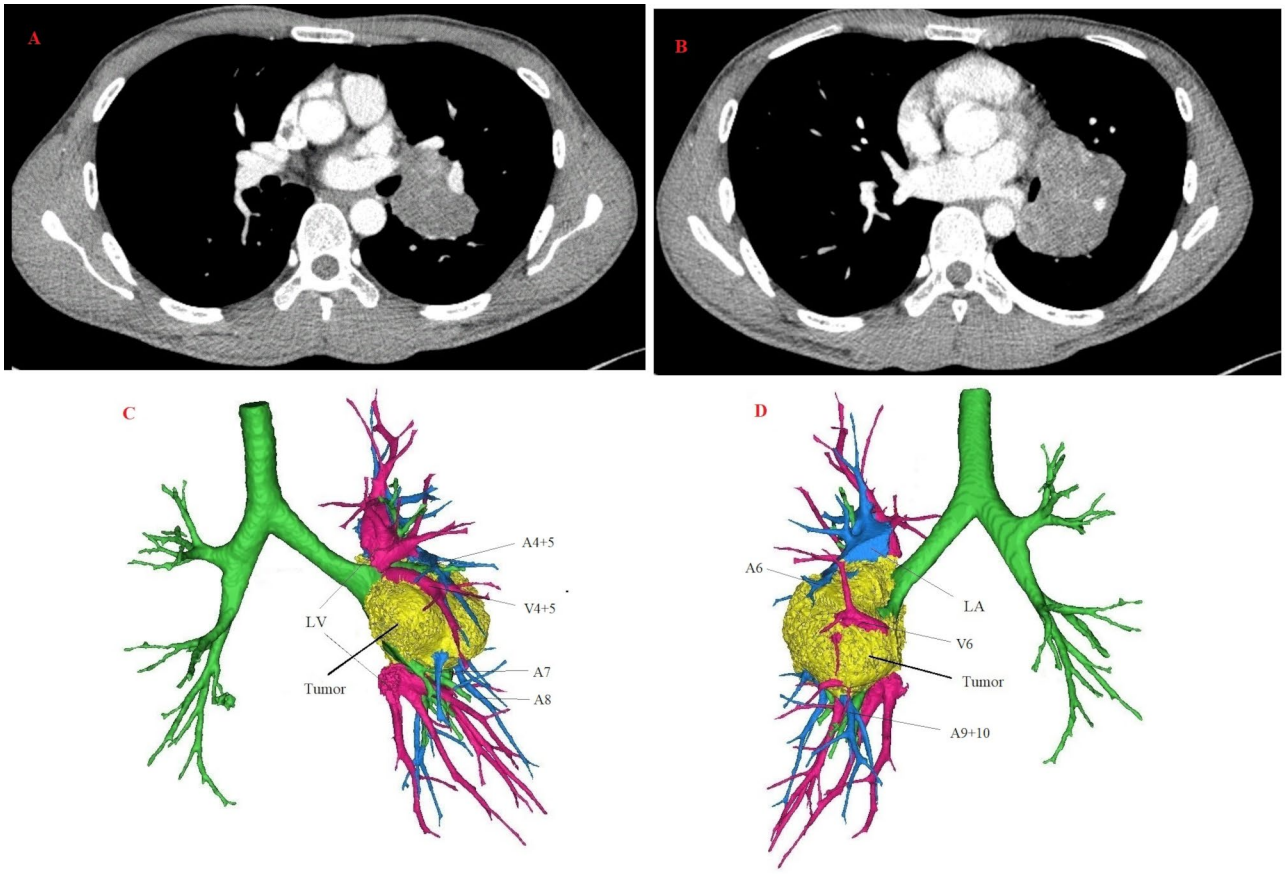

Fig. 1 (**A**, **B**) CTA scan showed a large 6.7 × 4.8 cm lesion in the left lower lung lobe and closely related to left pulmonary arteries. (Mediastinal window); (**C**, **D**) 3D-CT reconstruction appeared to be obvious compression and invasion of the surrounding blood vessels, mediastinal and tracheal shift. (**C**. Anterior view, **D**. Posterior view)

carried out by Mimics Medical 21.0 indicated an obvious compression and invasion of the surrounding blood vessels and a mediastinal and tracheal shift (Fig. 1C, D). Bronchoscopy showed that the tracheobronchial airway was compressed by an extratracheal lesion.

Uniportal video-assisted thoracoscopic surgery was carried out through a 3.5-cm incision in the fifth intercostal anterior axillary space after administering general anesthesia with a right double-lumen tube. A tumor was discovered on the left interlobar fissure. It invaded the great vessels in the hilus region of the lung and grew across the interlobar fissure. Since a frozen section tumor biopsy indicated malignancy during the operation, the left pneumonectomy was selected as the appropriate treatment procedure. Then, the left pulmonary arterial trunk (LPAT) was dissected, exposed, and controlled proximally using a vascular tourniquet. The left superior pulmonary vein and inferior pulmonary vein were also exposed and similarly controlled proximally using a vascular tourniquet (Fig. 2A–C). Although the interlobar pulmonary artery was inadvertently injured during the surgery, the LPAT was already controlled proximally to avoid uncontrolled arterial bleeding. The left pulmonary arteries and veins were ligated and left principal bronchus was clamped using staplers. The tumor was then removed (Fig. 3A) and a pathological diagnosis of malignant SFT was confirmed (Fig. 3B). Tumor cells were spindle-shaped and arranged in whorls or demonstrated a hemangiopericytoma-like conformation. Atypia and mitotic figures were found. Immunohistochemistry showed positive CD34 and STAT6 expression. Mediastinal lymph node dissection was identified.

Discussion

SFTs typically occur when mesenchymal cells are located beneath the mesothelial lining of the pleura [3]. Therefore, the majority of SFTs grow slowly. Malignant SFTs account for approximately 80% of all SFTs cases and their five-year survival is 81% [4]. Most patients with benign SFTs are asymptomatic. However, malignant SFTs are usually more aggressive than benign tumors and may cause chest tightness, pain, dyspnea, and respiratory insufficiency when compressing the adjacent trachea and lung tissue [5].

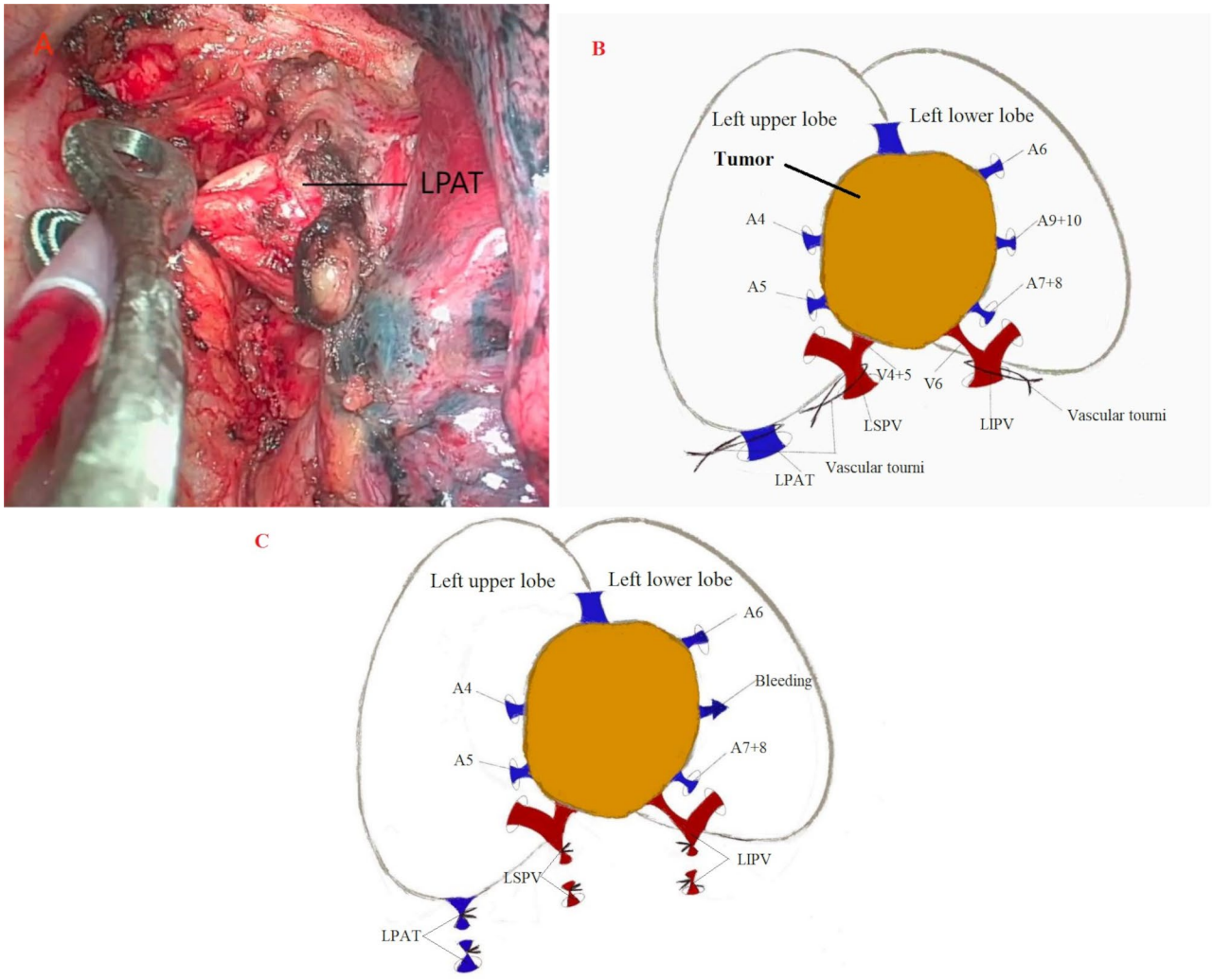

Fig. 2 (**A**) Intraoperative external phase of solitary fibrous tumor. The aortopulmonary was dissected to expose the left pulmonary arterial trunk (LPAT), which was controlled proximally by using a vascular tourniquet; (**B**, **C**) Sketch profle of the solitary fibrous tumor

A malignant SFT showing invasion and severe peritumoral adhesion or originating from the visceral pleural fold at the interlobar fissure may resemble a malignant pulmonary mass rather than a pleural tumor [6]. Because the tumor was located in the hilus of the left pulmonary in the present case, a CT-guided puncture before surgery was dangerous and unnecessary. It is difficult to distinguish between a malignant SFT and lung cancer before the surgery. Therefore, performing frozen section biopsy during the operation is critical.

Three aspects of the treatment described in the present case were noteworthy. First, 3D-CT technology helped to illustrate the relationship between the tumor and its adjacent organs and important blood vessels. Because 3D-CT reconstruction revealed that the great vessels in the hilus region of the lung were infiltrated by a tumor, a lobectomy or pneumonectomy had to be chosen for the treatment. Precise 3D-CT reconstructions can analyze the risks before the surgery and predict an appropriate operative strategy for the surgeons.

Second, because the tumor invaded left pulmonary arteries and veins and preoperative evaluation did not exclude the possibility of intraoperative hemorrhage, controlling the left pulmonary trunk allowed the distally involved pulmonary parenchyma to be safely resected during the surgery. Therefore, it is necessary to control the main pulmonary arterial trunk during such an operation.

Third, surgical resection is an acceptable treatment for SFT. In the present case, the SFT invaded the hilus of the left pulmonary blood vessels and interlobar fissure and the left pneumonectomy was chosen as the treatment. Recurrence and metastasis via hematogenous and lymphogenous routes are both typical features of malignant SFTs [7]. Mass excision with a tumor-negative margin is typically suggested due to the SFT's malignant and

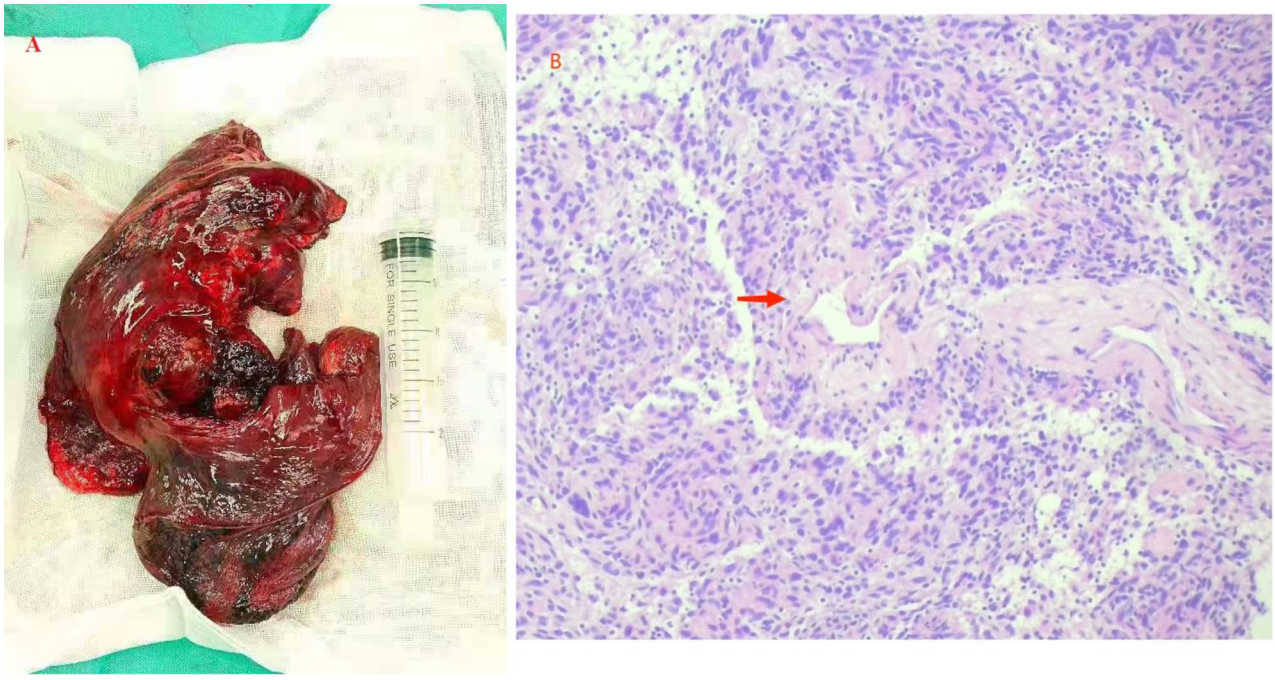

Fig. 3 (**A**) The postoperative photo of malignant solitary fibrous tumor; (**B**) A pathological diagnosis of solitary fibrous tumor

recurring capacity. Larger and more aggressive tumors are associated with malignancy, making tumor size indicative of malignancy potential [8]. In addition, if the tumor invades the lung parenchyma, chest wall, pericardium, and diaphragm, resection of a part of the chest wall, pericardium, and diaphragm, lobectomy, and even pneumonectomy are recommended [9, 10]. Thus, the choice of surgery area is affected by SFT size and location as well as the state of tumor invasion.

Conclusions

In general, an SFT is a rare condition. The 3D-CT reconstruction may help to identify an appropriate operative strategy for surgeons. It is necessary to control the main pulmonary arterial trunk to avoid hemorrhage when preoperative evaluation does not exclude the possibility of intraoperative hemorrhage. The choice of surgery area is affected by SFT size and location.

Abbreviations

SFT	Solitary fibrous tumor
3D-CT	Three dimensional-computed tomography
CT	Computed tomography
LPAT	Left pulmonary arterial trunk
LIPV	Left inferior pulmonary vein
LSPV	Left superior pulmonary vein

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Author contributions

Ranhua Li is the first author of the manuscript. Yong Zhou andYanlong Yang made the 3D-CT reconstruction. Xiaochuan Yin, Jing Zhang, Yunping Zhao and Xiaobo Chen performed the operation, and substantially contributed to the drafting and revision of the manuscript. Ranhua Li, Guosheng Xiong, Yanan Bao and Yue Cui treated the patient after surgery. Xiaobo Chen and Xiaochuan Yin are equal contributors and co-corresponding authors to this paper. All authors read and approved the final manuscript.

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Data availability

No datasets were generated or analysed during the current study.

Declarations

Ethics approval and consent to participate

Ethical approval was requested by the main author and granted by the hospital where he was operated on.

Consent for publication

Written informed consent was obtained from the patient 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.

Competing interests

The authors declare no competing interests.

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