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Thoracoscopic resection of primary mediastinal liposarcoma: a case report and literature review

Yanhui Yang[1], Ji Li[1], Sipeng Cheng[1], Jinyuan Mei[3], Xin Cheng[1], Min Jing[2] and Yi Wang[1*]

Abstract

Background Primary mediastinal liposarcomas (PLMs) are extremely rare. Patients typically present with symptoms caused by tumor size, as the mass can compress surrounding tissues and organs. Here, we report a case of a large primary mediastinal liposarcoma that was successfully resected thoracoscopically. By reviewing the available literature on mediastinal liposarcomas and sharing perioperative insights, we aim to provide guidance on the diagnosis and surgical management of large mediastinal liposarcomas.

Case presentation A 38-year-old male presented to our hospital with complaints of dysphagia after meals. Chest computed tomography (CT) revealed a large space-occupying lesion in the posterior upper mediastinum, and gastroscopy identified esophageal compression without evidence of new growth. The patient underwent thoracoscopic resection, resulting in significant improvement of his dysphagia postoperatively. He experienced no postoperative complications and was discharged one week following surgery.

Conclusion The incidence of PLM is very low. Due to the proximity of vital structures such as the vena cava, esophagus, trachea, and subclavian artery, surgical resection presents elevated risks and complexity. While minimally invasive thoracoscopic techniques offer both safety and efficacy, careful preservation of surrounding organs is essential during the procedure.

Keywords Liposarcoma, Mediastinum, Thoracoscopic

Background

Liposarcoma and malignant fibrous histiocytoma are both prevalent soft tissue malignancies [1]. Liposarcomas primarily affect adults and are typically found in the thigh or retroperitoneum [2, 3]. Primary mediastinal liposarcomas are rare, representing less than 1% of all mediastinal tumors [2]. In the early stages, mediastinal liposarcomas are often asymptomatic. As the tumor enlarges, it can compress or invade nearby structures such as the esophagus, trachea, and sympathetic nervous system, leading to diverse symptoms [4]. Giant mediastinal tumors, generally defined as those exceeding 10 cm in diameter, are uncommon, with giant posterior mediastinal

*Correspondence:
Yi Wang
182310202@qq.com
[1]Department of Cardiothoracic Surgery, The First People's Hospital of Neijiang, No. 1866, West Section of Hanan Avenue, Shizhong District, Neijiang, Sichuan 641000, P.R. China
[2]Department of Pathology, The First People's Hospital of Neijiang, Neijiang Affiliated Hospital of Chongqing Medical University, Neijiang, Sichuan 641000, P.R. China
[3]School of Clinical Medicine, Southwest Medical University, Luzhou City, Sichuan 646000, P.R. China

liposarcomas being even rarer. When such tumors have poorly defined boundaries with adjacent tissues, surgical visualization becomes challenging, heightening the risk and difficulty of resection. Consequently, surgical intervention for these large tumors requires highly skilled surgeons with thorough anatomical knowledge. Previous studies [5–7] indicate that mediastinal liposarcomas are typically located in the posterior mediastinum or retroperitoneum, often necessitating open-chest surgery. However, the literature on thoracoscopic minimally invasive resection for mediastinal liposarcomas is limited. Additionally, comprehensive reviews on mediastinal liposarcoma management are scarce. In this report, we describe a complete thoracoscopic resection of a giant mediastinal liposarcoma and review relevant literature on the surgical management of mediastinal tumors, aiming to provide guidance for future diagnosis and treatment of giant mediastinal liposarcomas.

Case report

A 38-year-old man presented with postprandial dysphagia

He reported no fatigue, dyspnea, hemoptysis, or exertional dyspnea, and denied smoking, alcohol use, or any history of cardiovascular, respiratory, hypertensive, diabetic, or malignant conditions. Upon admission, his vital signs were within normal limits: body temperature of 36.5 °C, heart rate of 72 beats/min, blood pressure of 129/71 mmHg, and respiratory rate of 20 breaths/min. Chest CT showed a fat-density mass in the mediastinum, approximately 9.1×6.8×16.0 cm, with clear borders (Fig. 1A-B). The mass appeared inseparable from the trachea, indicating potential invasion. Esophagoscopy and fiberoptic bronchoscopy revealed compression of the esophagus and bronchi without neoplastic growth. Neck and chest MRI displayed a large mass with slightly hyperintense T2 and hypointense T1 signal characteristics, located at the base of the neck and in the right

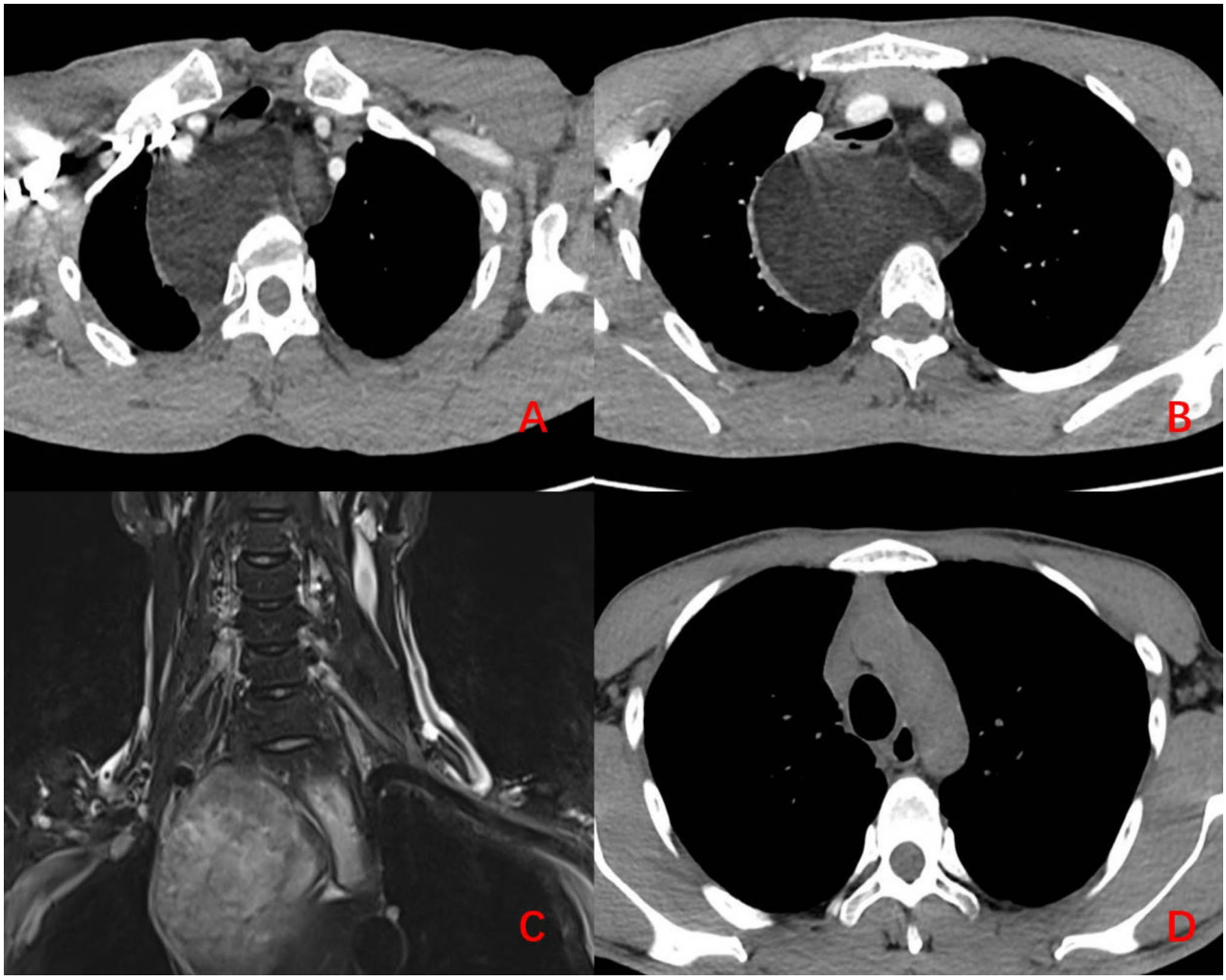

Fig. 1 **A-B**) Plain and enhanced chest scans show a large mediastinal mass. **C**) MRI of the neck and chest shows a large mediastinal mass. **D**) Follow-up chest CT scan one month after surgery

mediastinum, measuring 7.7×7.6×14.3 cm (Fig. 1C). The mass, primarily composed of fat, was compressing and displacing adjacent structures.

Procedure

Under general anesthesia with unilateral lung ventilation using a single-lumen endotracheal tube, the patient was placed horizontally with a 90° rotation, and soft padding was applied under the upper and lower ribs to enhance space. A thoracoscopy observation port was created at the anterior axillary line of the 7th rib, with main and secondary ports at the 3rd and 9th ribs of the anterior and posterior axillary lines, respectively. An additional auxiliary incision was made at the 5th rib of the axillary line for optimal exposure. A 30° Storz thoracoscope and incision protector were used. The primary surgeon stood ventrally, the mirror holder on the same side, and the assistant dorsally. The surgeon controlled the suction device with the left hand and energy instruments, such as electrocoagulation hooks or ultrasound knives, with the right hand. Intraoperative findings revealed a large upper right mediastinal mass with indistinct borders, causing deformation from esophageal, azygos vein, and bronchial compression (Fig. 2A).

The energy device was employed to progressively dissect the mediastinal pleura, exposing the tumor. The azygos vein was resected, and part of the esophageal outer membrane was clipped to manage tumor-associated vessels, allowing complete excision (Fig. 2B). Postoperative pathology confirmed an adipose-origin tumor consistent with well-differentiated liposarcoma (Fig. 2C-D), with immunohistochemistry positive for CDK4, MDM2, P16, P53 (wild-type), Ki-67 (5%), and negative for CD34. Dysphagia improved significantly after surgery. The right chest tube was removed on day 5, and the patient was discharged on day 7. He received no adjuvant therapy

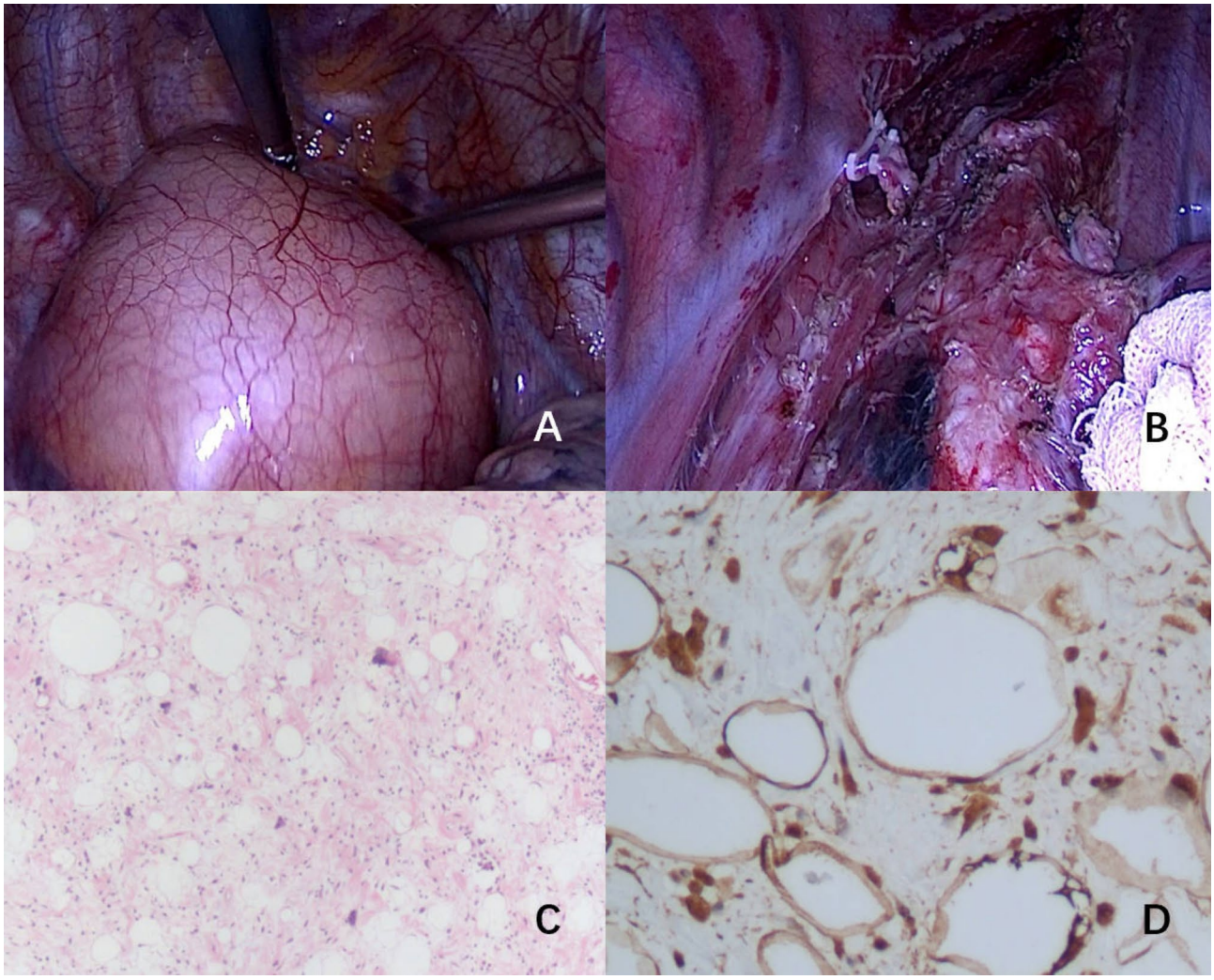

Fig. 2 **A**) Thoracoscopy revealed a large space-occupying lesion in the right posterior upper mediastinum. **B**) Postoperative thoracic wound condition after thoracoscopic surgery. **C-D**) HE staining and immunohistochemistry results show that it is consistent with a well-differentiated liposarcoma

Table 1 Previous reports of surgical cases of liposarcoma of the mediastinum

Study	Age(y)	Sex	Symptom	Location	Size(cm)	Diagnosis	AD	TIST	adjuvant therapy	PFUT (m)	OC
Marouf [26]	69	M	No	MM	10×9×6	X/CT	NA	NA	NA	24	S
Boatright [13]	67	M	No	AM	4.6	PET/CT	Yes	Yes	NA	NA	NA
Chen [4]	49	M	Cough/difficulty breathing	PM	10×8×7	CT/MRI	NA	Yes	Radiotherapy	14	S
Gaikwad [17]	53	F	Cough/difficulty breathing	AM	20×21×21	X/CT	Yes	NA	NA	24	S
Keita [12]	64	M	difficulty breathing	AM	13.2×10.4×14.4	X/CT/MRI/PET/CT	Yes	Yes	No	36	S
Krishnasamy [10]	55	M	difficulty breathing	NA	4.6×4.5×5.0	X/CT/MRI	NA	Yes	Radiotherapy	6	S
Liu [23]	34	F	difficulty breathing/Chest pain	AM	1.5×3×4	CT	NA	No	NA	396	R
MA [6]	28	M	Chest tightness	PM	23×15×10	CT	NA	No	Radiotherapy	12	R
PLUKKER [24]	5	M	difficulty breathing/Chest pain	NA	NA	X	NA	No	Chemotherapy	17	D
Rao [21]	63	F	Cough/Chest pain	PM	24×15×24	X/CT	NA	No	NA	19	S
Rena [19]	58	M	Hoarseness/difficulty swallowing	PM	18×9.4	X/CT	NA	NA	NA	24	S
Soeroso [18]	54	M	difficulty breathing	NA	50×30	X/CT	NA	Yes	Chemotherapy	6	R
Sugiura [16]	50	M	difficulty breathing	AM	NA	CT	No	NA	No	36	S
Taki [20]	39	M	Chest pain	PM	40×30×15	CT/PET/CT/MRI	No	Yes	NA	14	S
Toda [22]	64	M	difficulty breathing	AM	36×18×10	X/CT	NA	Yes	NA	20	S
Yang [3]	63	M	Cough/difficulty breathing	AM	20×13×18	CT	No	NA	NA	24	S
Yoshino [7]	76	F	No	PM	11×9×8	X/CT/MRI	Yes	Yes	Radiotherapy	42	S
Fukuhara [25]	77	M	difficulty breathing	AM	36×20×6.5	CT	NA	NA	No	24	S
Wang [27]	49	M	No	PM	10.6*8.9	CT	NA	NA	Immune and targeted therapy	12	R

F female, M male, AM anterior mediastinum, MM middle mediastinum, PM Posterior mediastinum, NA information not available, AD Associated diseases, TIST Tumor invades surrounding tissues, PFUT, postoperative Follow up time, m month, OC outcome, S survival status, R recurrent, D Death, y year

post-surgery, and at six-month follow-up, showed no recurrence or metastasis.

Discussion

Liposarcoma, a malignancy originating from primitive mesenchymal cells, is most frequently encountered in the limbs and retroperitoneum [8, 9]. Primary mediastinal liposarcoma is exceptionally rare, accounting for less than 1% of mediastinal tumors and approximately 2% of all liposarcomas [10]. This condition is typically observed in individuals aged over 40 years [11–13]. These tumors can develop in any region of the mediastinum and may consist of both mature and immature adipose tissue. Based on histological characteristics, liposarcomas are classified into five subtypes: mucinous liposarcoma (or small round cell liposarcoma), atypical (well-differentiated) liposarcoma, dedifferentiated liposarcoma, pleomorphic liposarcoma, and mixed liposarcoma [11, 14, 15]. We reviewed the surgical management of mediastinal liposarcoma, incorporating data from 19 studies involving 15 male and 4 female patients. Among these, 15 patients presented with symptoms such as cough, breathlessness, chest tightness, chest pain, and dysphagia, likely due to the tumor's size, which compresses or invades adjacent tissues and organs [3, 4, 6, 10, 12, 16–25]. Four patients were asymptomatic preoperatively and were diagnosed via imaging revealing a mediastinal mass [7, 13, 26, 27]. The longest postoperative follow-up was 33 years, during which four additional surgeries were performed due to recurrent disease, as detailed in Table 1. Gaikwad [17] reported a female patient with an anterior mediastinal liposarcoma, where preoperative CT revealed a tumor with a maximum diameter of approximately 21 cm. The patient underwent open thoracotomy, with no recurrence or metastasis observed during a 24-month follow-up. Marouf [26] described a 69-year-old patient with mediastinal liposarcoma treated using a partial sternotomy combined with a right anterior chest wall incision (right half clam shell surgery), successfully achieving complete tumor resection. This approach improved access to the anterior mediastinum, aortic arch, and major blood vessels, enhancing intraoperative visualization. We present a case of a 38-year-old male with dysphagia following meals. Chest CT revealed a large space-occupying lesion in the mediastinum, with significant tumor-induced compression, which aligns with findings in the literature.

Rena [19] highlighted that long-term survival in mediastinal liposarcoma is primarily influenced by tumor size, capsule integrity, and the success of complete resection. Yang et al. [3] demonstrated that complete surgical

resection remains the cornerstone of treatment for mediastinal liposarcoma. Although various prognostic factors may influence outcomes, the pathological tissue type plays a crucial role in survival prognosis. Achieving an R0 resection, whenever feasible, can significantly improve long-term survival. Soerso [18] reported a case where intraoperative findings revealed tumor invasion into large blood vessels, making radical surgery unfeasible. The tumor recurred six months postoperatively. Chen [4] described a case of primary mediastinal pleomorphic liposarcoma, with intraoperative invasion into the right phrenic nerve, superior vena cava, and unnamed veins. The tumor and involved vessels were resected together, with a superior vena cava replacement, and follow-up at 14 months revealed no recurrence or metastasis. Due to the rarity of mediastinal liposarcoma and its frequent involvement with surrounding vital structures, complete resection may not always be possible. In such cases, adjuvant radiotherapy and chemotherapy may improve long-term survival outcomes. In our case, we successfully removed a large primary mediastinal liposarcoma using thoracoscopic minimally invasive techniques, with the patient discharged one week post-surgery and recovering rapidly. During surgical exploration, we found that the tumor closely associated with the esophagus and azygos vein, with both poles of the tumor passing through the azygos vein. Dissecting the mediastinum and resecting the azygos vein helped clear the surgical field, allowing for complete tumor excision. Rao et al. [21] employed thoracoscopic surgery for a posterior mediastinal liposarcoma, with postoperative histopathological examination revealing poorly differentiated liposarcoma, CDK4 and MDM2 positivity, and MDM2 gene amplification. In contrast, our case involved a well-differentiated liposarcoma, with immunohistochemistry showing positivity for CDK4 and MDM2. The Ki-67 index, a marker of tumor cell proliferation, was approximately 5%, indicating the degree of differentiation, invasion, metastasis, and prognosis [28–31]. Six-month follow-up revealed no recurrence or metastasis. Few reports have addressed the use of video-assisted thoracoscopy for mediastinal liposarcoma resection. Our four-port thoracoscopic approach provided excellent intraoperative visualization, ensuring a safe and effective procedure. Postoperatively, the patient's dysphagia improved significantly, with no complications, thus demonstrating the safety and feasibility of thoracoscopic treatment for mediastinal liposarcoma.

Conclusion

In conclusion, patients with primary mediastinal liposarcoma (PLM) may present with symptoms such as dysphagia and chest tightness resulting from tumor compression. A combined approach using CT and MRI enables comprehensive preoperative diagnosis. Video-assisted thoracoscopic surgery has been demonstrated to be a safe and feasible option for treating PLM.

Abbreviations

PLM primary liposarcomas of the mediastinum
CT computed tomography
VATS video-assisted thoracoscopic surgery

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Author contributions

Yanhui Yang and Ji Li conceived the method. Yi Wang designed themethod. Sipeng Chen and Jinyuan Mei wrote the main manuscript text. Xin Cheng and Min Jing prepared figures. All authors reviewed the manuscript.

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Data availability

No datasets were generated or analysed during the current study.

Declarations

Consent for publication

Informed consent for publication was obtained.

Competing interests

The authors declare no competing interests.

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