Extended thoracotomy with subcostal incision for giant solitary fibrous tumor of the diaphragm

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Abstract: Solitary fibrous tumors of the pleura (SFTPs) are rare spindle cell neoplasms. The standard treatment is complete resection, but this may be challenging if the tumor is extremely large and originates from the diaphragm. We experienced a case of a giant solitary fibrous tumor originating from the diaphragm. A 74-year-old man presented with an asymptomatic giant mass on the right diaphragm suspicious of a solitary fibrous tumor. We performed a subcostal incision following posterolateral thoracotomy for complete resection. This surgical approach provided a better field around the diaphragm and facilitated radical and safe complete *en bloc* resection. The pathological diagnosis was a malignant solitary fibrous tumor. The patient survived for 1 year postoperatively without recurrence. We conclude that extended thoracotomy combined with a subcostal incision is a useful approach for surgical removal of giant tumors of the diaphragm.

Keywords: Solitary fibrous tumor; surgery; thoracotomy

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Introduction

Solitary fibrous tumors of the pleura (SFTPs) are relatively rare, and complete resection is the preferred treatment (1). *En bloc* resection is necessary for giant SFTPs because an increased tumor size suggests malignant potential (2). We experienced a giant SFTP originating from the diaphragm. The patient underwent complete resection via extended posterolateral thoracotomy combined with a subcostal incision. We herein report the resection technique for giant SFTP of the diaphragm.

Case presentation

A 74-year-old asymptomatic man presented to our hospital with an abnormal chest radiograph. Computed tomography revealed an 18-cm-diameter giant mass in his right thorax (*Figure 1A*). A T2-weighted magnetic resonance image suggested that the tumor contained a cystic lesion (*Figure 1B*). No detectable malignant lesions were present in other organs. Positron emission tomography showed abnormal uptake by the tumor (*Figure 1C*). An ultrasonography-guided needle biopsy suggested a solitary fibrous tumor. The patient underwent surgery. A posterolateral incision was extended along the costal arch (*Figure 2*), and we cut the sixth cartilage. Because the tumor was located on the diaphragm and adhered to the right lower lobe of the lung, partial resection of the diaphragm and right lung was performed using a linear mechanical stapler. We also sutured and reinforced the staple line of the diaphragm. The transected sixth cartilage was fixed by synthetic absorbable suture. We achieved *en bloc* resection without rupturing the cystic lesion (*Figure 3*) (3). The postoperative course was uneventful. Pathological examination revealed a malignant solitary fibrous tumor. There were no signs of invasion of the right lung, and the surgical margin was negative. The patient developed no recurrence for 1 year postoperatively.

Discussion

We have herein reported the successful resection of a

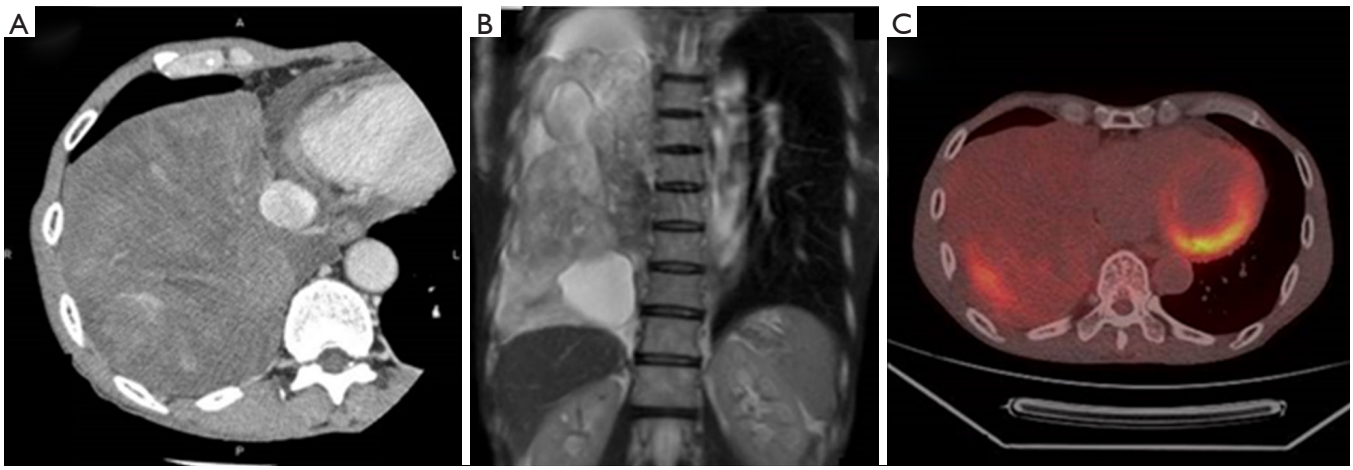

Figure 1 Preoperative images of the giant tumor. (A) Computed tomography revealed an 18-cm-diameter giant mass in the right thorax; (B) a T2-weighted magnetic resonance image showed hyperintense and hypointense areas, suggesting that the tumor contained a cystic lesion; (C) positron emission tomography showed abnormal uptake by the tumor.

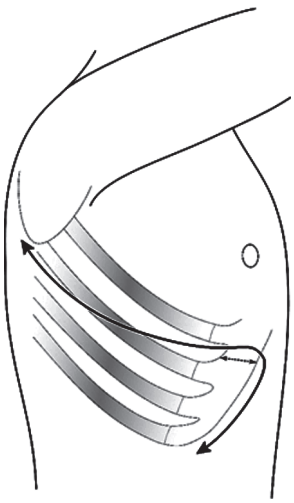

Figure 2 Schema of the skin incision.

Figure 3 This video demonstrates surgical removal of a giant solitary fibrous tumor of the pleura originating in the diaphragm (3). We initially confirmed no dissemination via thoracoscopy. Right posterolateral thoracotomy was performed through the sixth intercostal space. The sixth cartilage was transected. The skin incision was extended along the costal arch. The abdominis oblique muscles were dissected from the costal arch. Because the tumor was located on the diaphragm and adhered to the right lower lobe of the lung, we partially resected the right lung and diaphragm using a linear stapler. To prevent tumor rupture, we removed the tumor with a disposable specimen pouch.
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giant SFTP via extended thoracotomy with a subcostal incision. This operative technique is useful for resection of diaphragmatic tumors. The approach provides better visualization the costophrenic angle, allowing safer and more reliable surgical manipulation around the diaphragm.

Solitary fibrous tumors originating from the diaphragm are very rare. To the best of our knowledge, only five cases of SFTPs arising from the diaphragm have been described in the literature (4-8). Treatment of giant SFTPs requires complete resection (1). SFTPs are usually benign; however, large tumors are reportedly more likely to be malignant (2). A positive surgical margin is predictive of not only worse local recurrence-free survival but also worse metastasis-free

survival (9). One study showed that patients with malignant SFTPs treated with incomplete resection did not survive beyond 5 years after surgery, with a striking difference from patients who underwent complete resection (10). Thus, complete *en-bloc* resection is necessary for the treatment of solitary fibrous tumors, especially giant SFTPs with malignant potential.

To achieve complete resection of the giant SFTP originating from the diaphragm in the present case, we made a subcostal skin incision following a posterolateral incision (*Figure 2*). This approach provides the surgeon a wide visual field for the costophrenic angle, allowing safer and more reliable surgical manipulation around the diaphragm. This procedure is useful for complete resection of tumors arising from the diaphragm. Moreover, our surgical approach also has an advantage in pulmonary resection. When additional pulmonary resection is needed, the skin incision can be extended dorsally. Extending the posterior thoracotomy dorsally makes it easy to perform pulmonary resection procedures such as lobectomy.

Our surgical approach differs from lower door open (LDO) thoracotomy (11). Our procedure involves transection of only one costal cartilage, whereas LDO thoracotomy requires transection of five cartilages. We consider that fixation of the costal cartilage is easier in our surgical procedure than in LDO thoracotomy. Mild paradoxical respiratory movement is seen after LDO thoracotomy (12). However, our patient did not experience paradoxical respiratory movement because we only cut one cartilage, and our procedure does not affect postoperative thoracic movement. LDO thoracotomy is useful for extrapleural pneumonectomy because it requires reconstruction of the diaphragmatic and pericardial defects. In the present case, we only performed direct suturing following mechanical suturing for the diaphragm; no reconstruction was needed. Thus, our surgical approach is appropriate for giant SFTPs of the diaphragm.

In conclusion, extended thoracotomy with a subcostal incision is an effective surgical approach for surgical removal of giant tumors originating from the diaphragm.

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Footnote

Conflicts of Interest: The authors have no conflicts of interest to declare.

Informed Consent: Written informed consent was obtained from the patient to publish this manuscript and any accompanying images.

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