

Invasive thymoma leading to pulmonary artery embolism during operation

A case report

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Abstract

Rationale: Invasive thymoma with intraluminal tumor thrombus may cause pulmonary artery thrombus if the tumor thrombus shed off during operation. However, there is no clinical case report focused on such complication.

Patient concerns: A 40-year-old woman presented with repeated chest pain.

Diagnosis: Chest computer tomography showed huge mediastinal mass. Postoperative pathology revealed type B2 and B3 thymoma, with B3 as the main type.

Interventions: The patient underwent tumor resection through midline sternotomy in our hospital on September 17, 2018. She received emergent pulmonary artery exploration because the tumor thrombus in superior vena cava shed off unexpectedly during operation. Postoperative pulmonary computer tomography angiography showed right pulmonary artery embolism. Then emergent right pulmonary artery embolectomy was performed through lateral thoracic incision on September 29, 2018.

Outcomes: The patient recovered well after surgery. D-dimer reduced rapidly and returned to normal 1 month after the second operation.

Lessons: Intraluminal tumor thrombus in invasive thymoma patients has a risk of shedding off during operation. Prevention strategy should be made beforehand. Pulmonary artery exploration is necessary once happened.

Abbreviations: CT = computer tomography, CTA = computer tomography angiography, SVC = superior vena cava.

Keywords: invasive thymoma, pulmonary artery embolism, tumor thrombus

1. Introduction

Thymoma is a common kind of mediastinal tumor, which constitutes about 20% to 50% of all mediastinal tumors in

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adults.^[1] Invasive thymoma sometimes involves great vessels in mediastinum with intraluminal tumor thrombus and causes superior vena cava syndrome in serious cases. Surgical resection can achieve encouraging prognosis in advanced invasive thymoma. Prosthetic graft has been used to replace invaded veins such as superior vena cava and brachiocephalic veins, proven to be effective and safe.^[2,3] Complete resection of advanced invasive thymoma can achieve encouraging prognosis, much better than that of R1 resection.^[2] In patients with intraluminal tumor thrombus, the risk of tumor thrombus shedding off from vessels exists during operation, which may cause serious pulmonary artery thrombus and even leads to death. However, there is no clinical report on the treatment of tumor thrombus shedding off during operation. Herein, we report a case with such emergent condition during operation and share our experience and lesson.

2. Case report

A 40-year-old woman came to our hospital presented with repeated chest pain. No face or upper extremity edema was found. She had no special disease history. Chest computer tomography (CT) showed huge mediastinal mass with superior vena cava (SVC) and left brachiocephalic vein involved (Fig. 1A and B). Computer tomography angiography (CTA) showed mediastinal malignant tumor with tumor thrombus in superior vena cava and left brachiocephalic vein, which extended to the connective part of jugular and left subclavian vein (Fig. 1C and D). She was diagnosed as invasive thymoma, however, other

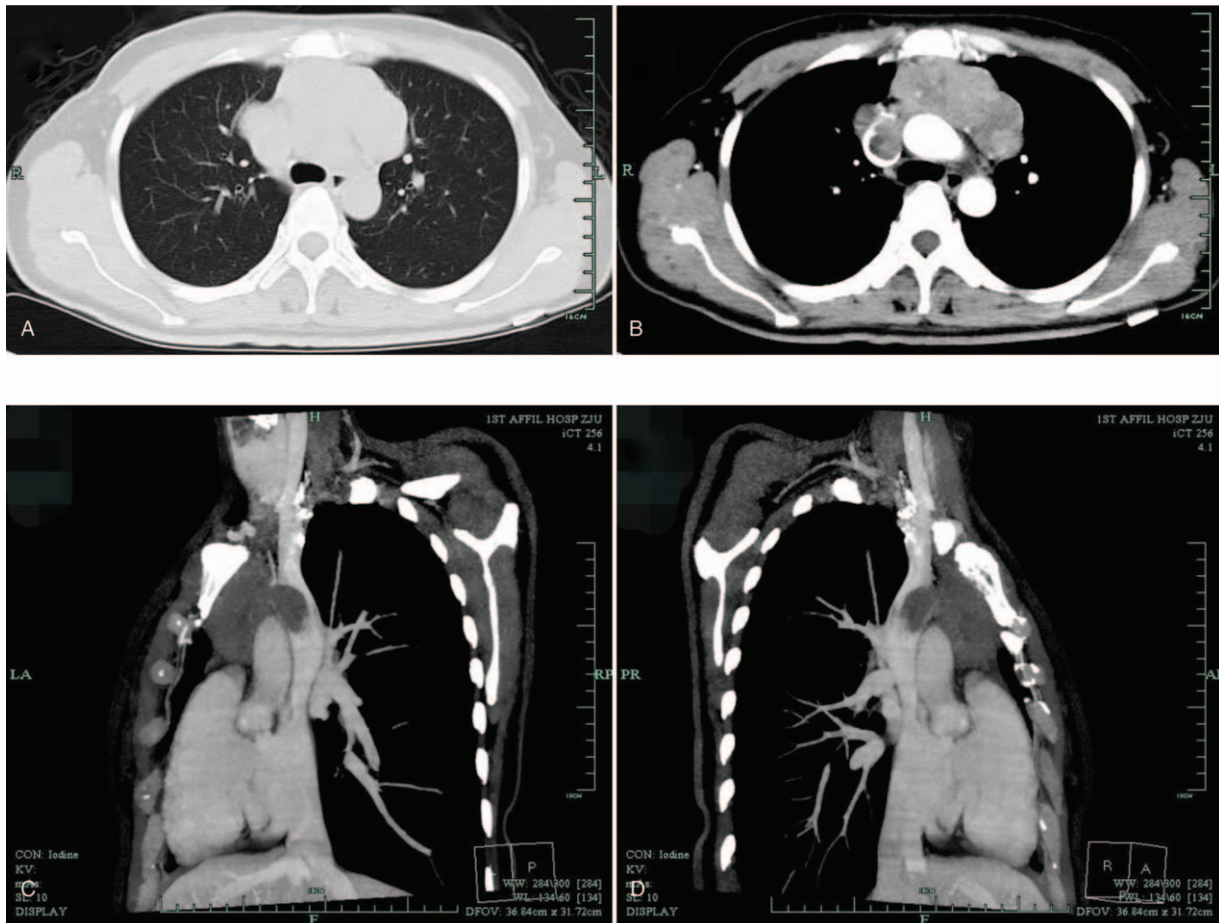


Figure 1. Image examination before operation. (A and B) Contrast computer tomography of the tumor before surgery. (C and D) Computer tomography angiography (CTA) showed tumor thrombus in superior vena cava and left brachiocephalic vein.

differential diagnosis such as teratoma can not be excluded. She underwent tumor resection through midline sternotomy in our hospital on September 17, 2018. The tumor thrombus in superior vena cava shed off unexpectedly during operation when dissecting the tumor from the outer membrane of SVC. Vital signs such as heart rate, blood pressure, and oxygen saturation remain stable, however end-tidal carbon dioxide pressure reduced from >30 mmHg to around 20 mmHg. Then cardiopulmonary bypass was established through cannulation of ascending aorta artery, superior and inferior vena cava. Right atrium was explored and no thrombus was found inside. Pulmonary artery exploration was performed through incision on common trunk. Asking anesthetist to perform lung recruitment maneuver, tumor thrombus was taken out from left pulmonary artery. No thrombus was found in the right pulmonary artery during operation. Left brachiocephalic vein and partial wall of SVC was resected and pericardium was used to repair SVC. Both sides of lung tissue were also invaded and wedge resected. Pathological examination after operation revealed type B2 and B3 thymoma, with B3 as the main type. Her tumor stage was III according to Masaoka stage.

The patient felt chest distress after operation, however, vital signs of the patient were stable. Coagulation function test showed progressively rising of d-dimer from 1008 to $8460 \mu\text{g/L}$ after surgery. She received emergent pulmonary CTA examination and

right pulmonary artery embolism was diagnosed (Fig. 2). Then emergent right pulmonary artery embolectomy was performed through lateral thoracic incision on September 29, 2018 and tumor thrombus was taken out from apical-anterior branch and basilar branch. She recovered well after surgery and reexamination of pulmonary CTA showed the main branches were all good filled in images (Fig. 3). There was transient slight left upper extremity edema after surgery and recovered immediately with diuretic therapy. Low molecular heparin was used 4250IU twice a day through subcutaneous injection. Warfarin was used to replace low molecular heparin after discharge. Routine coagulation function was tested to keep international normalized ratio around 2. D-dimer reduced rapidly and returned to normal 1 month after the second operation.

3. Discussion

Thymoma is a common mediastinal tumor with malignant potential. Invasive thymoma sometimes involves great vessels such as SVC, left and right brachiocephalic vein, even right atrium,^[4] leading to superior vena cava syndrome in serious cases. Complete resection with prosthetic graft replacement for invaded great vessels in advanced thymoma patient was reported to be safe and effective.^[5] In patients with intraluminal tumor thrombus, the risk of tumor thrombus shedding off from vessels

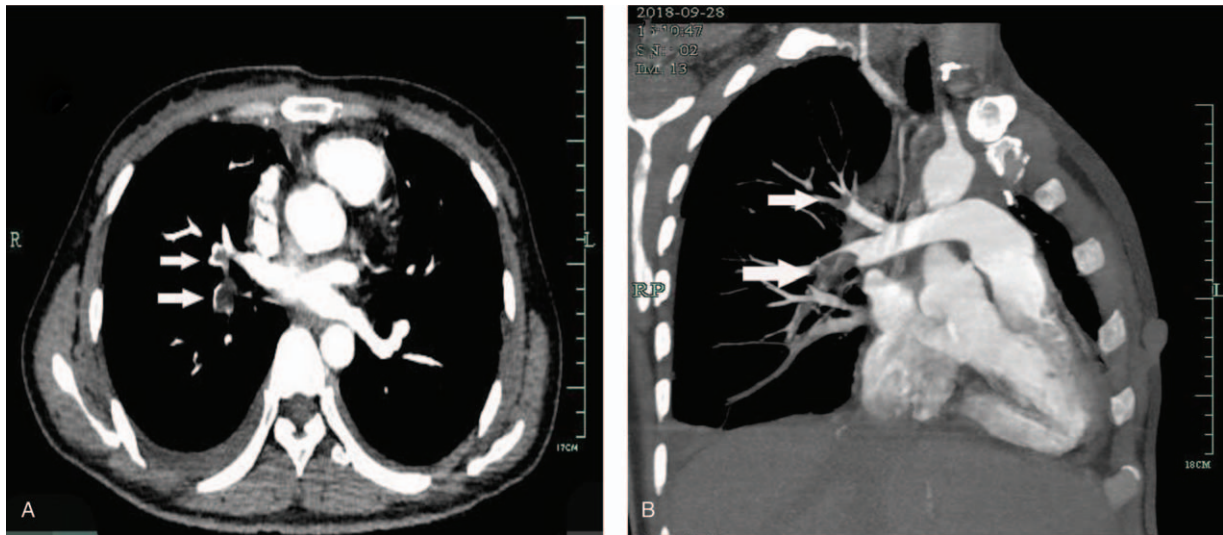


Figure 2. Pulmonary computer tomography angiography after the first operation. A and B showed right pulmonary artery embolism (arrow).

exists during operation. Once happened, the thrombus can cause pulmonary embolism and leads to mortality. However, no relative reports were found.

We reported a 40-year-old woman who was diagnosed as thymoma with tumor thrombus inside SVC and left brachiocephalic vein. The tumor thrombus shed off unexpectedly during operation and caused pulmonary embolism immediately. The tumor thrombus in left pulmonary artery was taken out during operation, however, those in right pulmonary artery was ignored and needed reoperation. There were several lessons we can learn from this case.

First, despite of the stable vital signs, pulmonary artery and atrium exploration were necessary once tumor thrombus was assumed shedding off. In this case, only end-tidal carbon dioxide pressure reduced while heart rate, blood pressure, and oxygen saturation kept stable, which may mislead the surgeons that only

tiny emboli exist and further exploration was given up. However, there was huge tumor thrombus in our case and may lead to mortality if not taken out because the tumor thrombus may turn larger due to thrombosis around it which may block both sides of pulmonary artery. Second, we should take prevention measures to avoid such emergent event in patients with intraluminal tumor thrombus. We suggest the proximal end of SVC be blocked first when touching the tumor thrombus inside vessels. It would be better to block SVC upon arch of azygos vein if possible to allow partial blood flow back. If prosthetic graft should be used, anastomosis between graft and right atrium can be performed prior to clamping of SVC, which may reduce the clamping time. If SVC clamping time was estimated to be long in inexperienced centers, venovenous shunt technique can be considered. Dai et al^[6] reported 6 patients who underwent SVC replacement combined with venovenous shunt which can be divided into external or

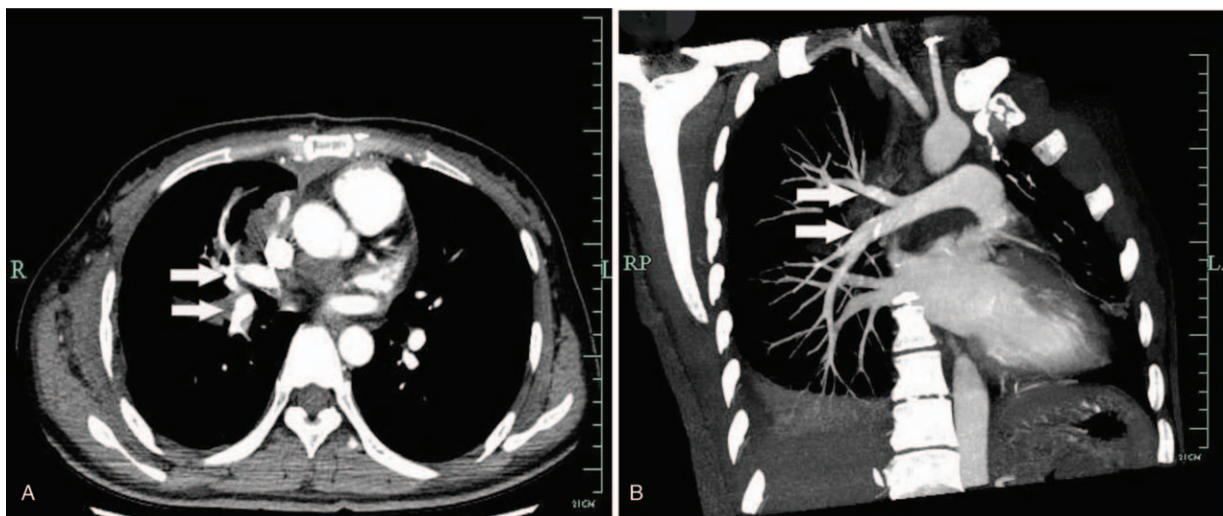


Figure 3. Pulmonary computer tomography angiography after embolectomy. A and B showed the main branches of right pulmonary artery were good filled (arrow) in pulmonary CTA after embolectomy. CTA=computer tomography angiography.

internal kind. External venovenous shunt was performed before surgery between internal jugular vein with femoral vein, while internal venovenous shunt was instituted during surgery between right brachiocephalic vein and right atrium. This technique can reduce central venous pressure and prolong the safe SVC clamping time. The median SVC clamping time reported was 75 minutes and all patients recovered well after surgery. Third, pulmonary angiography can be performed during operation in hospitals with relative conditions. In our hospital, there was hybrid operation room which allows us to perform pulmonary angiography during operation. The second operation may be avoided if pulmonary angiography was performed during operation.

In conclusion, intraluminal tumor thrombus in invasive thymoma patients has a risk of shedding off during operation and often cause pulmonary embolism. Prevention strategy should be made beforehand. Pulmonary artery exploration is necessary once happened and pulmonary angiography during operation should be performed if possible to ensure no emboli remain and avoid reoperation.

Author contributions

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