Video-assisted Thoracic Surgery with a Kirschner Wire Traction for an Anterior Mediastinal Tumor : A Case Report

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Currently, there are three main approaches to surgery for anterior mediastinal tumors : median sternotomy, video-assisted thoracic surgery (VATS), and robotic-assisted thoracic surgery (RATS). We describe one of the surgical options for anterior mediastinal tumors. A 79-year-old woman with a mediastinal tumor was referred to our hospital. Computed tomography revealed a small-sized tumor that did not invade the surrounding tissue in the left of the anterior mediastinum. We performed surgical resection of the tumor via VATS with a Kirschner wire. The Kirschner wire was inserted into the subcutaneous tissue approximately 10 cm in the third intercostal space across the sternum. Then, the wire was connected with the Kirschner Traction Bow®. The bow was lifted using the Octopus Retractor® to elevate the anterior chest wall as much as possible to obtain a better operative field in the limited mediastinal space. The pathological diagnosis was mediastinal hemangioma, and the patient has been recurrence-free for 2 years postoperatively. These combined procedures seem to be safer than VATS alone and more cost effective than RATS. Altogether, VATS with elevation of the anterior chest wall using a Kirschner wire may be an effective treatment option for anterior mediastinal tumors, as it is minimally invasive, simple, affordable, and safe. *Shinshu Med J 67 : 205—208, 2019*

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Key words : elevation, anterior chest wall, Kirschner wire, mediastinal hemangioma, VATS

Ⅰ Background

The traditional approach for mediastinal tumors is to perform a median sternotomy (MS). However, recent developments in video-assisted thoracic surgery (VATS) and robotic-assisted thoracic surgery (RATS) have improved the minimally invasive approaches for the resection of mediastinal tumors in a limited mediastinal space. In Japan, RATS has recently started being covered by health insurance for mediastinal tumors and malignant lung tumors since April 2018. However, the high costs of RATS associated with advances in medical technology are still important considerations. Herein, we describe a case of mediastinal hemangioma resected via VATS with a Kirschner wire.

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Ⅱ Case Presentation

A 79-year-old woman was referred to our hospital because of a mediastinal tumor. Single-phase contrast-enhanced computed tomography (CT) showed a heterogeneous, lobulated tumor (41×26 mm) with scattered calcifications in the left anterior mediastinum **(Fig. 1)**. To make a definitive diagnosis, we decided to perform surgery. The left lobe of the thymus, including the tumor, was resected via VATS, and the anterior chest wall was elevated using a Kirschner wire and a rigid endoscope with variable visual field directions. First, we inserted the Kirschner wire (ϕ2.4 mm) into the subcutaneous tissue approximately 10 cm in the third intercostal space across the sternum while the patient was in a slightly left-side-up position. Then, the wire was connected with the Kirschner Traction Bow®. Finally, the bow was lifted using the Octopus Retractor® to elevate the anterior chest wall as much as possible **(Fig. 2A-D)**.

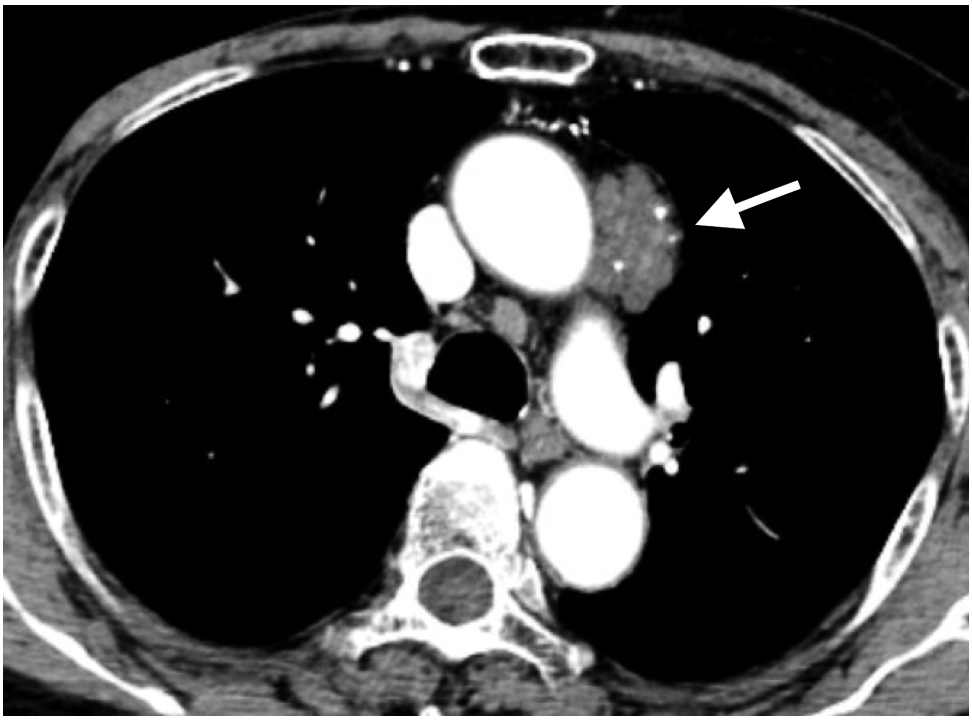

Fig. 1 Contrast-enhanced computed tomography scan showing a lobulated tumor with slight heterogeneous enhancement and calcifications in the left side of the anterior mediastinum (arrow).

We then used three ports at the third and fifth intercostal spaces of the left anterior axillary line, and the sixth intercostal space of the left anterior axillary or midclavicular line. The tumor had a hypervascular appearance and showed no invasion of surrounding tissues and great vessels. Microscopically, several dilated vessels were covered with normal endothelial and smooth muscle cells, and some fibrin thrombi and phleboliths were observed **(Fig. 3)**. The pathological diagnosis was mediastinal venous hemangioma. The patient has been recurrence-free for 2 years postoperatively.

Ⅲ Discussion

MS, VATS, and RATS are the main surgical approaches for treating mediastinal tumors. Among these approaches for early-stage thymomas, RATS and VATS, which utilize an artificial pneumothorax with carbon dioxide (CO_2) insufflation to gain a better surgical field in the mediastinal space, are more feasible and safer for resection than MS[1]. Furthermore, RATS is less invasive than VATS, with shorter postoperative pleural drainage duration, reduced drainage volume, and shorter hospital stay. However, the hospitalization cost for RATS is higher than that for VATS[2], and RATS requires performing more than 300 operations per year in each institution to avoid financial deficit with the current robotic surgical management[3]. Moreover, intraoperative artificial pneumothorax with CO_2 insufflation poses a potential risk of difficult ventilation with a double-lumen endotracheal tube[4].

The preoperative diagnosis of anterior mediastinal tumors is difficult because of similar radiological findings and the risks of preoperative biopsy, which are related to their location near the great vessels and heart. Calcifications, called phleboliths, in the tumor are the one of the features of mediastinal hemangioma and represent organized thrombosis[5]. In addition, the features on dynamic CT have been reported as persisting and gradually increasing enhancement[6], and early peripheral nodular enhancement and progressively centripetal fill-in[7]. In our case, mediastinal hemangioma was first considered based on the presence of scattered calcifications. Thus, we performed resection of the left thymus lobe, including the tumor, by VATS with a Kirschner wire for reaching a definitive diagnosis.

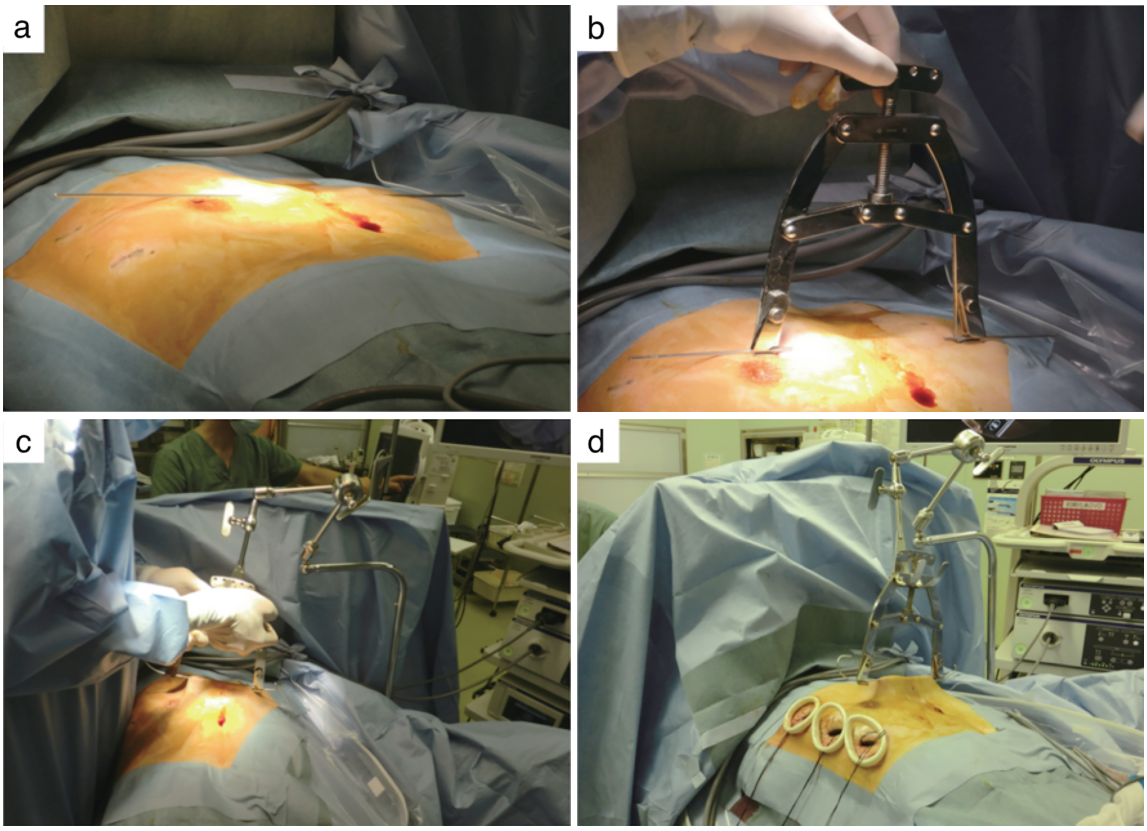

Fig. 2 This figure depicts the right-side approach. (a) A Kirschner wire penetrated the subcutaneous tissue. (b) The wire was connected with a traction bow. (c) The bow was lifted using the Octopus Retractor® to elevate the anterior chest wall as much as possible. (d) Three ports were utilized in this case.

This method has been adapted for anterior mediastinal tumors with no invasion of surrounding tissues, and is used even in extended thymectomy for myasthenia gravis with thymoma in our hospital. The right side approach is convenient because the right thoracic cavity is larger than the left thoracic cavity. In this case, the reason for approaching from the left side was the location of the tumor. If necessary, one port under the xiphoid process is added, and we sometimes use a total of four ports. To approach from the right side, the same procedure must be performed as for the left side. Moreover, using a rigid endoscope with variable visual field directions is also effective in obtaining a better surgical field in the limited mediastinal space. Compression of the anterior chest wall for a few minutes is necessary after removing the wire to prevent subcutaneous bleeding.

Such instruments are sterilizable and reusable and help conserve medical resources. These procedures lead to stress reduction and improve the ease of intraoperative performance.

It is necessary to have a sufficient working space within the mediastinum to perform safe and comfortable surgery for anterior mediastinal tumors. Altogether, VATS with elevation of the anterior chest wall using a Kirschner wire may be an effective treatment option for anterior mediastinal tumors, as it is minimally invasive, simple, affordable, and safe.

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.

Acknowledgement

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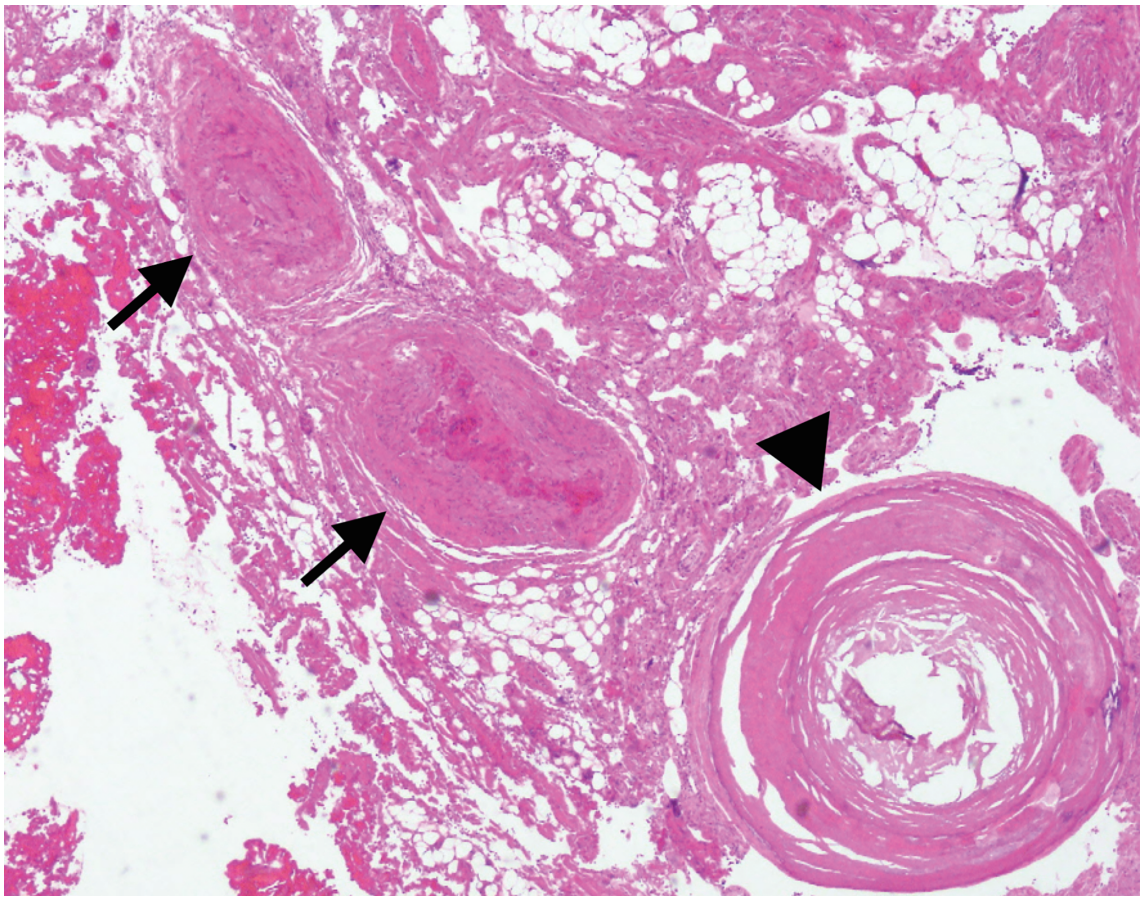

Fig. 3　Hematoxylin-eosin-stained sections (high power field) showing dilated vessels covered with normal endothelial cells and smooth muscles and some fibrin thrombus (arrows) and phleboliths (arrowhead).

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