Thoracoscopic Thymectomy with Tangential Partial Resection of the Innominate Vein

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We herein report a case in which thoracoscopic thymectomy with partial resection of the brachiocephalic vein was performed using a subxiphoid approach. We suggest the usefulness of the subxiphoid approach in thymectomy. We could extend the indications of thoracoscopic thymectomy for invasive tumors. Thoracoscopic thymectomy with the combined resection of part of the brachiocephalic vein was possible. The pathological diagnosis of the tumor was diffuse large cell B-cell lymphoma. Since the postoperative complications were minimal, postoperative adjuvant chemotherapy could be initiated without delay. This operation might be unnecessary. However, we could decrease the invasiveness of surgery using our procedures without sternotomy. Thoracoscopic thymectomy using subxiphoid approach seems to be an ideal procedure for the surgical treatment of invasive lesions.

Keywords: subxiphoid approach, thymectomy, thoracoscopic surgery, video-assisted thoracic surgery

Case Report

A 33-year-old woman was referred to our hospital due to the findings, an anterior mediastinal mass on a chest computed tomography (CT). The mass, with a maximal tumor diameter measuring 7.0 cm, was enhanced by contrast CT and diagnosed to be thymoma, although the patient was without any symptoms and negative for anti-acetylcholine receptor antibody. The contrast CT and reconstructed three-dimensional images revealed that the mass was completely attached to the right and the left brachiocephalic veins (Fig. 1A). Especially, the left brachiocephalic vein was partially compressed by the tumor, but obvious invasion was not observed (Figs. 1B and 1C). Preoperative biopsy was difficult because the tumor was covered by the sternum. As the preoperative diagnosis was thymoma, we selected a thoracoscopic operation. Thymectomy was initiated under general anesthesia with the patient in the lithotomy position using a single-lumen tracheal tube. A 3 cm transverse skin incision was made 1 cm below the lower edge of the xiphoid. We dissected on the reverse side of the xiphoid by the finger. A GelPOINT Mini (Applied Medical,
Rancho Santa Margarita, CA) (access platform of single port surgery) was inserted and fixed. A long 5-mm thoracoscope with a 30-degree angle was inserted through a port of the GelPOINT Mini. Using carbon dioxide insufflation of 8 mmHg, the view was rapidly extended. A LigaSure Maryland (Covidien, Mansfield, MA) was also inserted through the second port of the GelPOINT Mini. The connective tissue between the sternum and pericardium was cut using the LigaSure Maryland. The bilateral pleura and the lower edges of the thymus were revealed by repeating this procedure. The pleura was opened using the tip of the LigaSure Maryland. A thoracic 5-mm port was inserted at the 6th intercostal space on the right anterior axillary line. Although a part of the tumor was exposed through the mediastinal pleura to the right thoracic cavity, pulmonary invasion was not present. The lower edge of the thymus, the connecting pericardial fat and the right phrenic nerve were easily visualized through the thoracic port. A portion of the pericardial fat tissue surrounding the lower edge of the thymus is typically resected. Dissection of the lateral edge of the thymus was performed using the LigaSure Maryland running along the phrenic nerve. Using the same procedures, the left lower edge of the thymus with the pericardial fat was dissected. As the big tumor occupied the space between both the left and right phrenic nerves, sternum, and both the left and right brachiocephalic veins and interfered the view of the left phrenic nerve, another thoracic 5-mm port was inserted at the 5th intercostal space on the left anterior axillary line.

The view was improved and the traction of the thymus became easier. The thymic artery was easily exposed and cut using the LigaSure Maryland. The bilateral upper edges of the thymus were dissected using the LigaSure Maryland. An expanded thymic vein that flowed the internal thoracic vein was sealed and cut using the
LigaSure Maryland. Also expanded inferior thyroid vein that was invaded by the tumor was sealed and cut using the LigaSure Maryland. A part of the left brachiocephalic vein was not dissected and judged to be involved by the tumor. We tangentially resected a part of the left brachiocephalic vein using a stapler (Fig. 2 and Video 1). Extended thymectomy was completed. Rapid diagnosis of pathology with snap frozen sections was thymoma. The blood loss was minimal and the operation time was 143 min. The chest drain was removed on the first postoperative day. The patient was discharged on the fourth postoperative day without any postoperative complications. Final pathological diagnosis of the tumor was diffuse large cell B-cell lymphoma (Fig. 3). Postoperative fluorine-18-2-fluoro-D-glucose positron emission tomography revealed no evidence of the other lesions. The patient was given 6 courses of R-CHOP (rituximab, cyclophosphamide, doxorubicin, vincristine, and prednisone) and additional 2 courses of rituximab as a postoperative adjuvant therapy. There was no evidence of recurrence of the lymphoma 9 months after the operation.

Discussion and Conclusion

We have completed thoracoscopic thymectomy with partial resection of the brachiocephalic vein using a subxiphoid approach. Although the running of the bilateral phrenic nerves was difficult to be recognized because of the large tumor, the visualization was made easier by the lateral view through the additional ports on the bilateral thorax. The extended thymectomy was completed without any injury of the bilateral phrenic nerves.

Primary mediastinal large B-cell lymphoma of thymus is an aggressive lymphoma probably arising from the rare native B lymphocytes of the thymus. It accounts for about 2%–3% of non-Hodgkin lymphomas and occurs in young adults with a female predominance. It presents with a bulky anterior mediastinal mass which shows aggressive behavior as compared with other lymphomas. The specimen for pathological diagnosis is usually obtained by biopsy from the bulky mass. Following pathological diagnosis, chemotherapy is usually selected. It is rare that a patient with a large B-cell lymphoma is referred to the department of thoracic surgery such as this case. This patient was diagnosed as with thymoma clinically and underwent extended thymectomy. This operation should not have been carried out if the pathological diagnosis was possible before the operation. However, preoperative biopsy was difficult because the width of the mass was only 3 cm. We performed thymectomy for the purpose of both treatment and diagnosis. Following the pathological diagnosis, for a large B cell lymphoma, chemotherapy using rituximab, cyclophosphamide, doxorubicin, vincristine, and prednisolone was added postoperatively. As macroscopic complete resection was performed and no other lesions were detected on the systemic fluorine-18-fluorodeoxyglucose positron...
emission tomography, the planned number of course of chemotherapy could be reduced in this case. Chemotherapy was induced on the schedule. The role of surgical resection was uncertain in primary mediastinal large B-cell lymphoma. At least, it was certainly beneficial for this case to undergo thoracoscopic thymectomy even with the combined resection of the left brachiocephalic vein without sternotomy. Median sternotomy is conventionally selected for large anterior mediastinal tumors. Thoracoscopic thymectomy often converts to sternotomy or open thoracotomy when the tumor invasion to the left brachiocephalic vein becomes apparent. We have established minimally invasive thymectomy for anterior mediastinal tumors using the subxiphoid approach and the extended indications for video assisted thoracic surgery (VATS) for invasive anterior mediastinal tumors. Before the combined resection of the left brachiocephalic vein, complete dissection of the thymus except the site of invasion to the left brachiocephalic vein should be completed. The traction of the resected thymus and tumor toward the left thoracic cavity can extend the left brachiocephalic vein. The extent of the tumor invasion becomes apparent and we can judge whether we can complete thoracoscopic combined resection of the left brachiocephalic vein or convert to sternotomy. We are able to recognize that minimally invasive thymectomy using the subxiphoid approach results in many advantages for the patients with an anterior mediastinal malignant tumor without pathological diagnosis.

**Disclosure Statement**

All authors declare no conflicts of interest in the present study. None of the contributors had interests to disclose with regard to commercial support.

**References**