Robotic-assisted thoracoscopic thymectomy for thymic carcinoid: case report

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Background: Thymic carcinoid is an exceedingly rare and potentially aggressive malignant tumor of the thymus, accounting for approximately 2.0–4.0% of thymic tumors. It has been reported that 5-year survival rates ranged 68–85% in cases of complete resection, which suggests that local control has a strong effect on prognosis. Recently, the advantages of a minimally invasive approach to thymectomy, robotic-assisted thoracoscopic (RATS) thymectomy, have been widely accepted. While RATS group shows similar length of hospital stay and frequency of complications compared with video-assisted thoracoscopic (VATS) group, it is reported to have significantly shorter surgical time.

Case Description: This case report describes a 56-year-old man with locally advanced anterior mediastinal tumor involving the right upper lobe that was resected completely using RATS thymectomy. The surrounding adipose tissue was also removed as lymph node dissection. The patient had an uneventful postoperative recovery without any complications. A histopathological examination revealed a typical thymic carcinoid of Masaoka-Koga stage III, pT3N0M0 stage IIIa (TNM, 8th edition). The patient is still alive with no recurrence of the disease.

Conclusions: There have been few reports of patients who received RATS thymectomy for thymic carcinoid. RATS thymectomy might be considered a standard approach for the treatment of thymic tumors.

Keywords: Thymic carcinoid; robotic-assisted thoracoscopic (RATS) surgery; thymectomy; case report

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Introduction

Carcinoid tumors originating in the thymus were first reported by Rosai *et al.* (1) in 1972. They are relatively rare, accounting for approximately 2.0–4.0% of thymic tumors (2). The clinicopathological characteristics of the disease are not fully understood, and there is no definitive view on treatment; however, local control is reported to be important for prognosis (2). With the advantages of minimal invasiveness and rapid recovery, video-assisted thoracoscopic (VATS) thymectomy has been adopted more often in recent years to treat thymic tumors. And now, the role of robot-assisted thoracoscopic thymectomy in the treatment of thymic tumors has been growing (3-5).

Here, we describe a case of a locally advanced thymic carcinoid involving the right upper lobe, treated using robotic-assisted thoracoscopic (RATS) thymectomy, and briefly discuss the advantages of the robotic technique for the treatment of mediastinal lesions.

Case presentation

A 56-year-old man presented with intermittent chest tightness. He did not have any history of chemical, fumes, or dust exposure and no history of smoking or alcohol abuse. Chest computed tomography (CT) revealed a 36.9 mm soft tissue mass in the right anterior mediastinum (*Figure 1A*). There was no invasion of the surrounding tissues, such

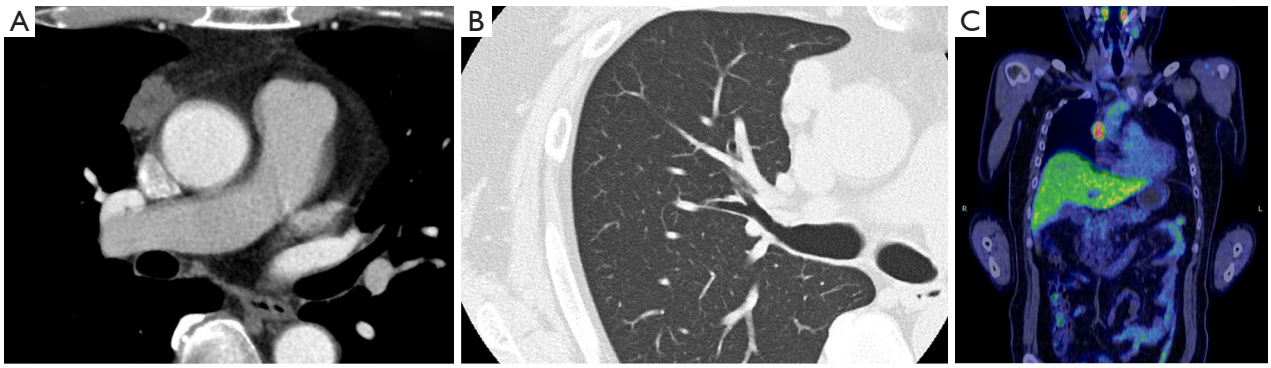

Figure 1 Preoperative images. (A) Chest CT frontal section: a 36.9-mm soft tissue mass was located in the right anterior mediastinum. (B) Chest CT images with lung window: there was no clear invasion of surrounding tissues such as the lungs, pericardium, or local blood vessels. (C) Positron emission tomography-CT images: strong F-18 fluorodeoxyglucose accumulation in the same area was shown with a maximum standardized uptake value of 9.09. CT, computed tomography.

as the lungs, pericardium, or local blood vessels and lymph nodes on chest CT (*Figure 1B*). Positron emission tomography CT showed strong F-18 fluorodeoxyglucose accumulation in the same area; the maximum standardized uptake value of the mass was 9.09 (*Figure 1C*). There was no abnormal accumulation in mediastinal or hilar lymph nodes, or other organs. Blood tests revealed no abnormalities. Acetylcholine receptor antibody as not detected, and the soluble IL-2 receptor level was 348 U/mL. The tumor was suspected to be a Masaoka-Koga stage I, cT1N0M0 stage I (TNM, 8th edition) thymoma. We initially proposed thymectomy through a median sternotomy median sternotomy approach. However, the patient did not give his consent, so we performed RATS surgery as a less-invasive surgery.

The patient was placed in the supine position, with the arms positioned along the body as far back as possible to provide enough space for the robotic arms. An 8-mm port was inserted through the 5th intercostal space (ICS) in the middle axillary line, and a thoracoscope was inserted into the right thoracic cavity. Two 8-mm thoracic ports were inserted in the anterior axillary line of the 3rd and 7th ICS. An AirSeal/12-mm port was inserted in the posterior axillary line of the 7th ICS. There were no adhesions, pleural effusion, or pleural dissemination. The tumor was identified in front of the right atrium. A Da Vinci surgical robot (Xi) was rolled in front of the left side of the patient. Carbon dioxide (CO_2) with 10 mmHg of pressure was infused to increase this pleural space further. Fenestrated bipolar forceps in the left arm and a permanent cautery spatula in the right arm were mainly used during the procedure. The pleura under the sternum and mediastinal pleura were dissected along the right phrenic nerve. The tumor invaded the right upper lobe (*Figure 2A*), and partial resection was performed using autosuture devices (Endo-GIA purple 60 mm ×1 and purple 45 mm ×1) (*Figure 2B,2C*). The thymus was isolated from the pericardium while moving superiorly from the lower pole of the thymus mainly using a cautery spatula; the thymic vein was dissected from the right innominate vein and cut using a VesselSealer. The thymus, including the tumor, was extirpated (*Figure 3A*). The surrounding adipose tissue was also removed, including the mediastinal lymph nodes, as lymph node dissection. The operative time was 170 min, and the intraoperative blood loss was 50 mL.

Histopathological examination revealed that the tumor had a proliferation of uniform atypical cells, arranged in nested and rosette patterns (*Figure 3B*). The tumor cells invaded the surrounding adipose tissue and the visceral pleura of the lung. Immunohistochemical investigation found the following in this patient: chromogranin A (+), synaptophysin (+), CAM5.2 (+), CD56 (+), CK(AE1/AE3) (+), and CK19 (+) (*Figure 3C*). Finally, the tumor was diagnosed as a typical thymic carcinoid of Masaoka-Koga stage III, pT3N0M0 stage IIIa (TNM, 8th edition). The postoperative course was regular with resolution of the symptoms. The chest tube was removed 3 days after surgery. The patient was discharged on postoperative day 7. The patient is still alive after 6 months of follow-up with no recurrence of the disease.

All procedures performed in this study were in accordance with the ethical standards of the institutional

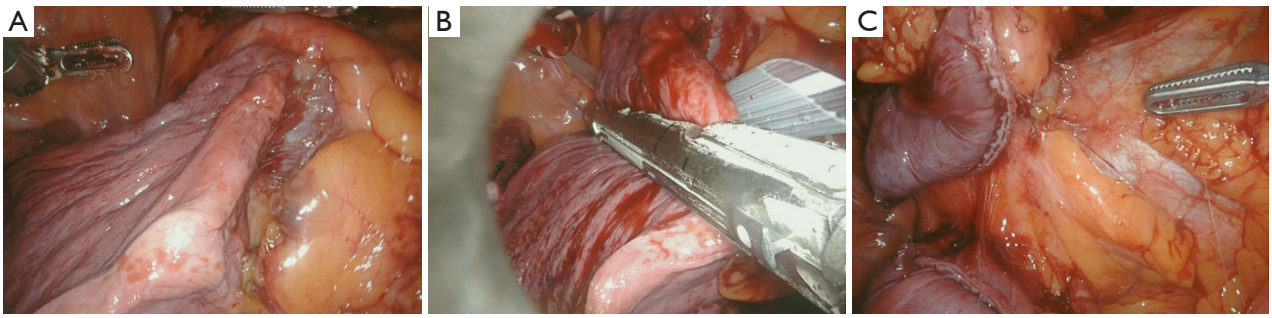

Figure 2 Thoracoscopic images. (A) The tumor invaded the right upper lobe. (B,C) Partial resection was performed using autosuture devices.

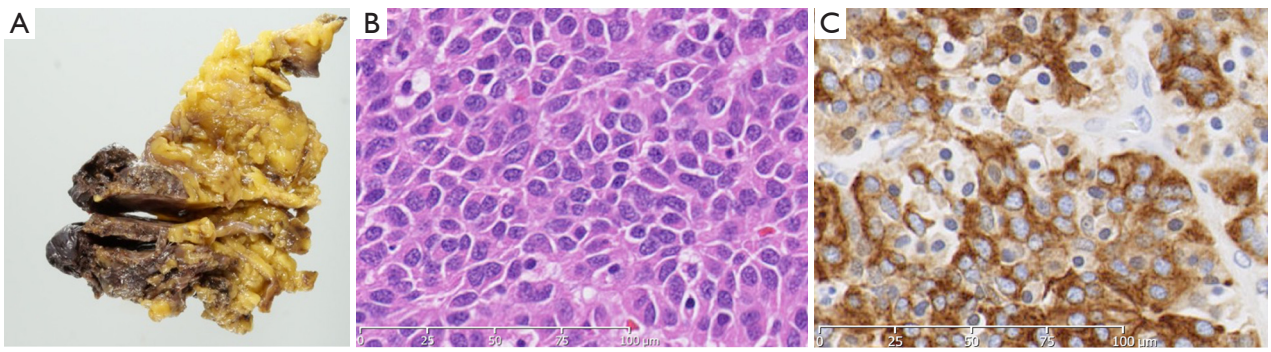

Figure 3 Pathological findings. (A) The tumor partially infiltrated the right upper lobe. (B) A proliferation of uniform atypical cells with polygonal to oval nuclei was shown, arranged in nested and rosette patterns (hematoxylin and eosin staining at ×1 magnification). (C) Immunohistochemistry was positive for CAM5.2, which is a marker for the diagnosis of neuroendocrine tumors (original magnification ×40).

and/or national research committee(s) and with the Helsinki Declaration (as revised in 2013). Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the editorial office of this journal.

Discussion

We report a case of a locally advanced thymic carcinoid involving the right upper lobe. The tumor was successfully resected using RATS thymectomy. Carcinoid tumors originating in the thymus are exceedingly rare neoplasms. Clinically, patients may be asymptomatic or show local symptoms because of compression or invasion of mediastinal structures, or systemic symptoms secondary to the tumor's ability to produce hormones or cytokines (2). Thymic carcinoids are found predominantly in males (male to female ratio of 3:1) and in the fourth or fifth decade of life (6). Typical definitive histological findings include an unusual appearance such as spindle cell features, abundant oncocytic cytoplasm, mucin-rich stroma, and microfilamentous inclusions (7). The cells produce abundant neurosecretory granules, as reflected in the strong and diffuse immunohistochemical expression of neuroendocrine markers such as CAM5.2, synaptophysin, and chromogranin, all of which were found in the current case (6,7).

Thymic carcinoids are divided into two categories: typical carcinoid with fewer than two mitoses per 10 high power fields (HPFs) and absence of necrosis, and atypical carcinoid with 2–10 mitoses per 10 HPFs and the presence of necrosis (7). Thymic carcinoid has a worse prognosis because chemotherapy and radiotherapy do not actively lengthen survival, with 5-year survival rates of 28–39% (8). However, it has been reported that 5-year survival rates ranged 68–85% in cases of complete resection, which suggests that local control has a strong effect on prognosis (8).

The use of mini-invasive surgery to treat malignant

thymic disease is now widely accepted, and it has advanced to include RATS thymectomy. The use of a robotic technique, due to its three-dimensionality and easy maneuverability of the instruments, offers an advantage in providing more control in situations that may appear technically more complex and dangerous over VATS thymectomy (3). In the current case, the robotic technique allowed us to perform precise movements within mediastinal structures. In addition, despite the narrow space at the apex of the lung, the infiltration of the lung was easily controlled with flexible movement of the robot's arms, contributed to the absence of vascular accidents or the need for surgical conversion. To our knowledge, complete resection of thymic typical carcinoid using a robotic approach is rarely reported. While RATS group shows similar length of hospital stay (4.48±2.376 and 4.68±2.740, P=0.65) and frequency of complications compared with VATS, it is reported to have significantly shorter surgical time (102.10±14.13 and 106.22±13.24, P=0.042). Moreover, the progression-free survival (PFS) in the RATS group tended to be longer than that in the VATS group for thymic malignancies (81.5% and 75.4%, P=0.095) (3). Therefore, RATS thymectomy might be considered a standard approach for the treatment of thymic tumors.

We reported rare case of thymic typical carcinoid that was able to be completely resected using RATS approach. Thymic carcinoid is an extremely rare disease with poor prognosis and RATS thymectomy may be considered an effective treatment from the perspective of local control.

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Footnote

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Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at https://amj.amegroups.com/article/view/10.21037/amj-22-12/coif). The authors have no conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee(s) and with the Helsinki Declaration (as revised in 2013). Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the editorial office of this journal.

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