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CASE REPORT

Pericardial ectopic thymoma presenting with cardiac tamponade: report of a case

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Abstract Ectopic thymoma arising from organs other than the thymus, such as the neck, trachea, thyroid, lung and pericardium, is rare. To date, there have been only seven other cases of pericardial thymoma reported in the English literature. We herein report a case of pericardial ectopic thymoma that presented with cardiac tamponade. A 72-year-old Japanese male noticed body weight gain and leg edema. Chest computed tomography (CT) revealed pericardial effusion and an irregularly shaped mass in the pericardial space compressing the right atrium. He was considered to have cardiac tamponade due to a paracardiac tumor that developed following acute cardiac failure. The intraoperative frozen diagnosis was thymoma. Pericardectomy of the thickened pericardium, tumorectomy and thymectomy via a median sternotomy were performed. The final pathological diagnosis was pericardial ectopic thymoma associated with constrictive pericarditis. The differential diagnosis and complete resection of mediastinal tumors such as this rare case of thymoma are important to obtain a better prognosis, as patients with such tumors often present in a state of shock.

Keywords Thymoma · Pericardium · Ectopic · Cardiac tamponade

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Introduction

Thymoma of unknown etiology, an epithelial tumor arising from a remnant thymus, is a rare tumor located in the anterior mediastinum. The majority of thymomas are located at the base of the heart. However, a few cases of ectopic thymoma have been reported. Ectopic thymomas have been reported in the neck, trachea, thyroid, lung parenchyma, pleural cavity and pericardium. Among the reported cases, thymoma arising from the pericardium is extremely rare. To the best of our knowledge, there have been only seven cases in the English literature (including English abstracts only) reported to date. Moreover, a case of thymoma serving as the catalyst of cardiac tamponade is also extremely rare. We herein report a rare case of pericardial ectopic thymoma presenting with cardiac tamponade and compare this case to the previous literature describing typical thymoma cases.

Case report

A 72-year-old Japanese male visited his personal physician with a complaint of palpitations that had begun 2 months earlier. His electrocardiogram (ECG) showed an atrial flutter with 2:1 atrioventricular conduction and an atrial rate of 150/min. He underwent defibrillation at Yokohama City University Medical Center, following which, his ECG findings returned to normal and his symptoms resolved. He was then referred to the department of cardiology of our hospital (Yokohama City University Hospital) as he was indicated for catheter ablation.

One month later, he noticed increased body weight (+4 kg/2 weeks) and marked bilateral pretibial leg edema. Chest X-rays were suggestive of massive pleural effusion

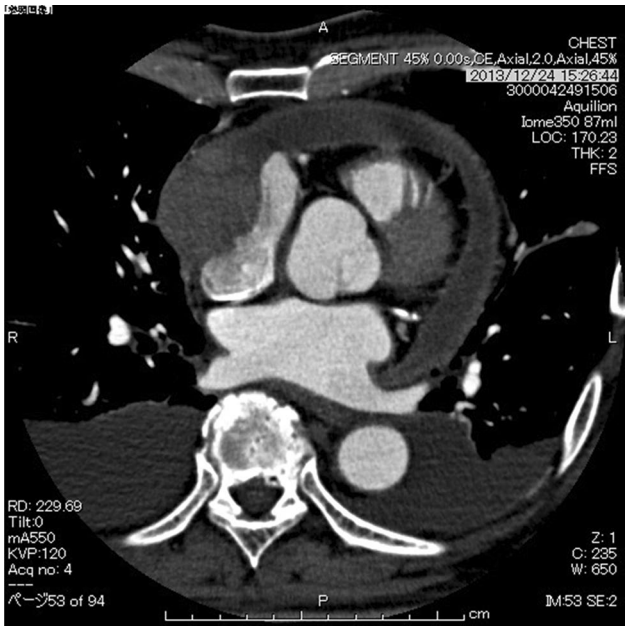

Fig. 1 A chest computed tomography scan showing the shadow of a solid mass in the pericardial space firmly compressing the right atrium, the thickened pericardium and the bilateral pleural effusion

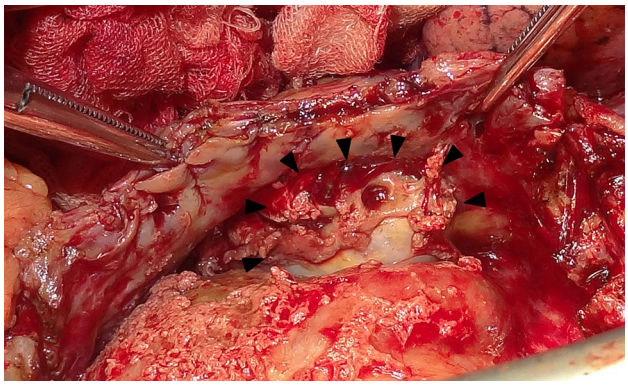

Fig. 2 The intraoperative findings of the pericardial ectopic thymoma. The tumor arising from the thickened pericardium was recognized, with no apparent invasion of the right atrium *(arrowheads)*

and cardiomegaly. Chest computed tomography (CT) revealed a large amount of pericardial effusion, thickening of the pericardium, bilateral pleural effusion and passive lung atelectasis. A paracardiac mass firmly compressing the right atrium was also recognized. This irregularly shaped solid mass was about 50 mm in diameter, and was thought to be located in the pericardial space (Fig. 1). A small amount of ascites was noted, but no other abnormal findings were seen in the chest cage or in the abdominal cavity. A [^{18}F] fluorodeoxyglucose positron emission tomography (FDG-PET) scan showed increased uptake of FDG (maximum standard uptake value [SUVmax] = 3.4) due to the tumor. No FDG uptake was seen in other body areas. Echocardiography revealed mild hypokinesis of the anteroseptal region of the left ventricle, trivial tricuspid valve regurgitation and circumferential pericardial effusion. The ejection fraction (EF) and percent fractional shortening (%FS) were 51 and 25 %, respectively. Taken together, his condition was considered to be cardiac tamponade due to a malignant neoplasm, such as pericardial mesothelioma, thymoma or thymic cancer that had developed following acute cardiac failure.

He was then referred to our department of surgery to improve his condition and to diagnose the unidentifiable tumor. At the initial visit to our outpatient department, he had a blood pressure of 94/68 mmHg, heart rate of 89/min with regular sinus rhythm and 98 % percutaneous oxygen saturation (room air). By chest auscultation, the breathing sounds were slightly decreased. He had marked edematous lower extremities suggesting cardiac failure. A full blood examination showed slight anemia; his hemoglobin was 10.9 g/dl and his lactase dehydrogenase was slightly elevated to 308 IU/l (normal range 125–225). The brain natriuretic peptide (BNP) level was also elevated to 181.6 pg/ml (normal range $\leq$ 18.4). The findings of other biochemical examinations were relatively normal, including the renal and liver function. No blood tumor markers were tested. According to his medical history, he was previously treated for acute myocardial infarction by catheter-based therapy at 67 years old, and he had never smoked.

An emergency median sternotomy was performed because he was suffering from orthopnea when he was admitted to the hospital. When the thickened pericardium was fenestrated, pericardial effusion spilled out. A large, solid mass was found on the right lateral pericardium (Fig. 2). To determine the diagnosis and decide on the surgical plan, we performed an intraoperative frozen diagnosis of the tumor and pericardium, which revealed thymoma and pericarditis, respectively. Complete resection was established as the goal for the best possible prognosis. There was no invasion to the right atrium; however, focal invasion to the superior vena cava (SVC) was observed. At this point, the tumor was incompletely resected, and the operation resulted in positive margins. The remnant thymus was located in the normal location and had no morphological aberrations.

Finally, pericardectomy above the bilateral phrenic nerves, tumorectomy and thymectomy were performed. The operation took 243 min, with a blood loss of 423 ml, including the pericardial effusion and pleural effusion. The postoperative clinical course was uneventful. The patient was discharged from the intensive care unit on postoperative day 7, and was discharged from the hospital on postoperative day 14. He underwent additional radiation therapy as an outpatient for the residual tumor on the SVC. The

postoperative anti-acetylcholine receptor antibody value was within the normal range (normal range ≤0.2 ng/ml).

The tumor, which measured 50 × 40 × 32 mm in size, appeared to have arisen from the pericardium and bulged out into the pericardial space. On sectioning, the cut surface was solid, whitish-yellow and elastic hard (Fig. 3). Microscopically, the tumor consisted of small clusters of polygonal thymic epithelial cells accompanied by numerous lymphocytes and nests of spindle cells (Figs. 4a–d). These findings were compatible with type AB thymoma (World Health Organization [WHO] classification). The tumor was not well encapsulated and invaded into the surrounding fat tissue and resection stump (the adventitia of the SVC; Masaoka's classification III). No neoplasm was found in the remnant thymus. The non-tumorous part of the pericardium was affected by fibrous inflammation. No malignant cells were cytologically detected in the pericardial effusion (class II).

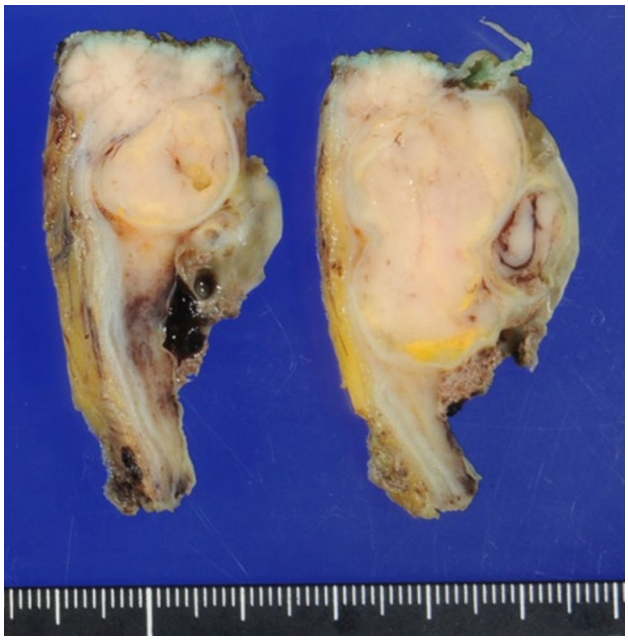

Fig. 3 The cut surface of the tumor. The solid, whitish-yellow and elastic hard mass arose from the pericardium and bulged out into the pericardial space

Discussion

Thymoma is the most common primary tumor, and can be either benign or low-grade malignant, arising from the thymic epithelial cells in the anterior mediastinum. This tumor is relatively rare; its overall incidence has been reported to be 0.13–0.15 cases per 100,000 [1, 2]. In Japan, 4,463 cases of mediastinal tumors were surgically treated in 2011; among them, 1,798 were cases of thymoma (40.3 %) [3]. Generally, thymomas arise from thymic rests, and the majority of thymomas (about 90 %) are found in the anterior mediastinum [4]. Ectopic thymoma (e.g., neck, trachea, thyroid, lung, pleural cavity or pericardium) is even rare [4]. These tumors are considered to arise from remnant

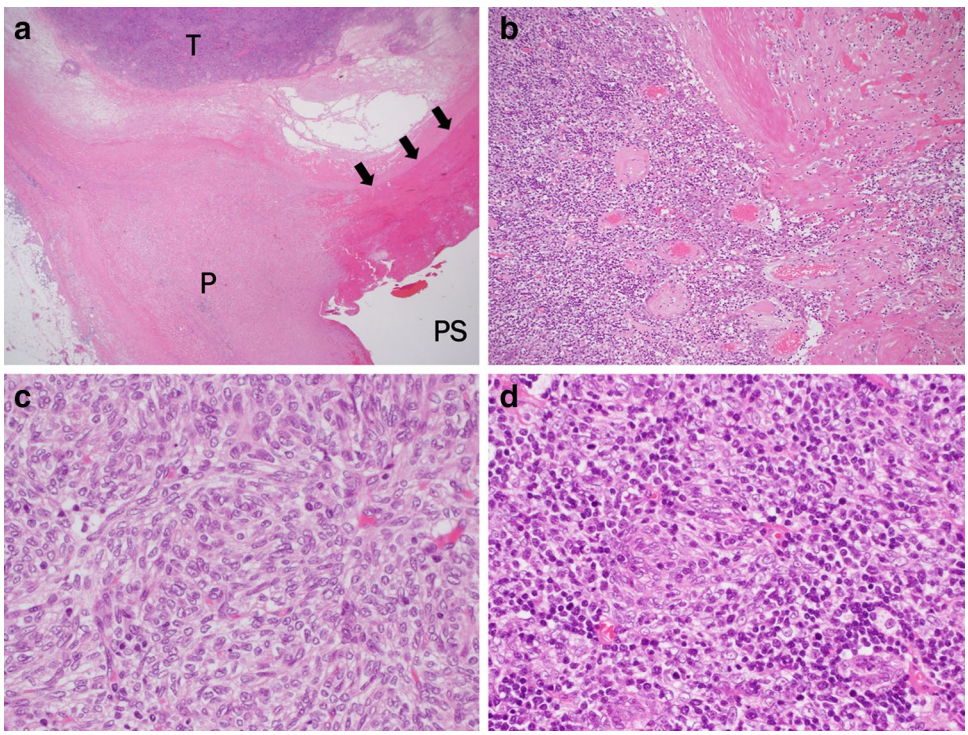

Fig. 4 The microscopic findings of the tumor. **a** The tumor (*T*) arose from the pericardium (*P*) and bulged out into the pericardial space (*PS*). The tumor surface was covered with eosinophilic fibrinous exudate *(arrows)*. (×12.5 magnification). **b** The outline of the tumor; the tumor was not well circumscribed and focally invaded into the surrounding tissue. (×100 magnification). **c** The type A component of the tumor; spindle-shaped neoplastic cells were arranged in solid nests with a *striaform pattern*. (×400 magnification). **d** The type B component of the tumor; polygonal epithelioid cells formed small clusters in a pool of lymphoid cells. (×400 magnification)

thymic tissue that fails to migrate into the anterosuperior mediastinum.

Embryologically, the thymus gland originates from the pouch and cleft of the third pharyngeal structure. During the eighth gestational week, the primordial thymus elongates from the third brachial arch caudally, forming two epithelial bars that fuse along the midline to occupy their final position at the base of the heart [5]. Ectopic locations of the thymus might be the result of the process not descending or over-descending, or the result of migration to other organs. For the purpose of diagnosing ectopic thymoma, the possibility of metastasis from a thymoma in the thymus should be completely ruled out.

Pericardial ectopic thymoma is extremely rare. The origin of pericardial thymoma has been ascribed to this misplacement of thymic remnants during its phase of embryonic descent. Although the exact incidence is unknown, to the best of our knowledge, there have been only seven other cases reported to date [6–11]. The clinical features of these eight cases, including our case, are summarized in Table 1. The patients (three males and five females) ranged in age from 27 to 82 years (mean age, 60.9 ± 16.5 years). Two cases (Nos. 3 and 4) were autopsy cases; both patients died from "chronic illness," not the thymoma (the detailed causes of death were not described) [8]. Two cases presented with chest pain (Nos. 1 and 2), one case was asymptomatic (No. 5), and one case manifested symptoms of myasthenia gravis (dyspnea and dysphonia) (No. 7). One case presented with body weight loss (No. 6), and our present case presented with symptoms of cardiac tamponade and cardiac failure. According to the WHO classification, there were two cases of type A, one of type B2, two of type AB, one unclassified (including a component of rhabdomyomatous spindle cells), and two cases of unknown type. Five out of the six living cases underwent tumorectomy, and two patients received chemotherapy. The clinicopathological features were similar to those of typical thymomas [1], and the treatment strategy for pericardial ectopic thymoma was also the same. The prognosis of each case was not provided.

Generally, about one-third of thymoma cases are asymptomatic, while one-third of cases present with local symptoms, i.e., chest pain, neck mass, SVC syndrome, etc. The remaining one-third of thymoma cases are associated with myasthenia gravis [1]. Thymoma complicated by cardiac tamponade, as in our case, is very rare. One report has summarized such previous cases [12]. In that report, there were 14 cases associated with cardiac tamponade, including those due to bleeding from a thymoma [12], and the author advocated the need for emergency treatment (including pericardial drainage), which could prove to be life-saving.

Table 1 The characteristics of the patients with pericardial ectopic thymoma reported in the English literature

Case no.	Year	First author	Ref	Age	Sex	Presentation	Myasthenia gravis	Cardiac tamponade	Component of neoplastic cells	WHO classification	Masaoka's classification	Treatment
1	1984	Iliceto	[6]	27	F	Chest pain	Absent	Absent	Polygonal spindle cells	NA	Unknown	Surgery
2[a]	1996	Hami	[7]	54	M	Chest pain	Absent	NA	Spindle and large polygonal cells, lymphocytes	AB	Unknown	Chemotherapy
3	1997	Mirra	[8]	61	F	Autopsy	Absent	Absent	Spindle cells, lymphocytes	A	Unknown	–
4	1997	Mirra	[8]	82	F	Autopsy	Absent	Absent	Spindle cells, lymphocytes	A	Unknown	–
5	2001	Deveci	[9]	57	M	None	Absent	Absent	Rhabdomyomatous spindle cells	–	Unknown	Surgery
6	2004	Theodore	[10]	62	F	Body weight loss	Absent	Absent	Lympho-epithelial type cells	NA	Unknown	Surgery
7	2005	Azoulay	[11]	72	F	Dyspnea, dysphonia	Present	Absent	Mixed lymphocytic and polygonal epithelial cells	B2	Unknown	Surgery
8	Present case			72	M	Body weight gain, leg edema, orthopnea	Absent	Present	Spindle cells and polygonal epithelial cells	AB	III	Surgery and radiation therapy

NA not available

[a] English abstract only

In our case, we presumed that an inflammatory process during tumor expansion caused pericarditis, pericardial effusion and the subsequent cardiac tamponade. If the tumor had been detected a little later, the patient might have presented in a state of shock. Although thymoma is clinically categorized as a low-grade malignancy, local recurrence of a pericardial thymoma after surgery could compress or invade the surrounding organs, including the heart. Therefore, in such cases, thorough, long-term follow-up is necessary.

In conclusion, although rare, thymoma can occur anywhere in the chest cage. Thymomas often require emergency treatment due to their association with complications such as cardiac tamponade and cardiac failure following tumor progression. A tissue diagnosis before surgery is often difficult, especially in cases with a pericardial ectopic thymoma. If an unidentifiable mass is recognized in the pericardial space on chest CT, a thymoma should be suspected, and an intraoperative frozen diagnosis should be performed. Upon confirmation of the thymoma, a complete surgical resection should be considered for the best prognosis. Our case of pericardial ectopic thymoma represents one of the important differential diagnoses of mediastinal tumors, which are often associated with shock and/or death.

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Conflict of interest The authors have no conflicts of interest or financial ties to disclose in association with this study.

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