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CASE REPORT

# Case report of death from falling: Did heart tumor cause syncope?

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**Abstract** A healthy man in his 30s was working on the balustrade of stairs on the second floor. He suddenly fell downstairs without saying anything. On emergency hospitalization, chest echogram showed left hemothorax. Cardiac echogram showed a floating mass from the mitral valve in the left ventricle and severe mitral regurgitation. Surgery for hemothorax and pulmonary contusion was immediately undertaken. However, bleeding from pulmonary contusion could not be controlled and he underwent cardiopulmonary arrest. Autopsy showed a white, elastic, pendulous mass in the left atrium and a white mass in the lower lobe of the left lung. Tumor histology showed a reticular pattern, Schiller–Duval bodies, eosinophilic hyaline globules, and positive staining for α-fetoprotein. We diagnosed primary lung yolk sac tumor with metastatic intracardiac yolk sac tumor, a rare and highly malignant germ cell tumor. It usually arises in the ovaries and testes, and intracardiac yolk sac tumor is rare. Intracavitary tumors induce obstruction of inflow into and outflow from the ventricular cavity. The most common clinical presentation is dyspnea and syncope. In the present case, metastatic cardiac yolk sac tumor might have disturbed cardiac outflow and affected hemodynamics, probably causing syncope. Unfortunately, he was in a high place at that time and fell to receive pulmonary contusion that led to death. Autopsy may sometimes reveal latent diseases which might be related to the cause of death. We should perform autopsy thoroughly to diagnose not only the cause of death but also the factors leading to death.

**Keywords** Primary lung yolk sac tumor · Metastatic intracardiac tumor · Syncope · Latent disease

## Introduction

Yolk sac tumor (YST) is a particular germ cell tumor (GCT) of histologic subtype and was first described by Teilum in 1959 [1]. YST is a rare and highly malignant GCT. It usually arises in the ovaries and testes and relatively rarely occurs at extragonadal sites. Intracardiac YST, even if it is metastatic, is much rarer.

Here, we report an autopsy case of a man in his 30s with lung and intracardiac YST. He fell from the stairs at work and subsequently died from bleeding as a result of pulmonary contusion.

## Case report

A 34-year-old man who had no past history was working on the balustrade of stairs on the second floor (height 3.7 m). He suddenly fell downstairs without saying anything. The emergency service was called and he was admitted to a hospital. In the emergency unit, his consciousness was unclear (Glasgow coma scale, E3V4M6), heart rate was 71 bpm, and blood pressure was 103/59 mmHg. Chest echogram showed left hemothorax and thoracic drainage yielded 1,180 ml of fluid. Cardiac

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echogram showed a floating mass from the mitral valve in the left ventricle (Fig. 1) and severe mitral regurgitation. A large hemothorax and pulmonary contusion were diagnosed and surgery was immediately undertaken. However, bleeding from pulmonary contusion could not be controlled and he underwent cardiopulmonary arrest during surgery.

Autopsy was performed 26 h after death. The deceased was 163 cm tall and weighed 79 kg. He was in a post-thoracotomy operative state. On external examination, there was hardly any postmortem lividity. Small abrasions and subcutaneous hemorrhages were seen on the left side of the body. Internal examination revealed small amounts of blood in the left thorax. The heart weighed 418 g and the right lung weighed 871 g. The left lung weighed 599 g, but it had already been surgically resected and fixed in formalin. On dissection of the heart, a 6×2.5×2.5-cm white, elastic, pendulous mass was found in the left atrium (Fig. 2a). No embolization was seen in both pulmonary arteries. No pathological change was seen in the valves or coronary arteries. Cardiac muscle was normal. There was a 3.8×5.5-cm white mass in the lower lobe of the left lung, which was clearly separated from the surrounding normal lung (Fig. 2b). Other organs including the testes demonstrated no significant finding. No alcohol or drugs was detected.

Histology of the left lung tumor showed a reticular pattern [hematoxylin and eosin (H & E) staining], Schiller–Duval bodies (H & E staining), and eosinophilic hyaline globules [diastase-resistant periodic acid-Schiff (D-PAS) staining] (Fig. 3a, b and c), as well as staining positively for α-fetoprotein (AFP) (Fig. 3d) and negatively for human chorionic gonadotropin (HCG)-β (Fig. 3e). Cardiac tumor histology showed the same pattern (data not shown). There were no macrophages in alveoli of normal lung.

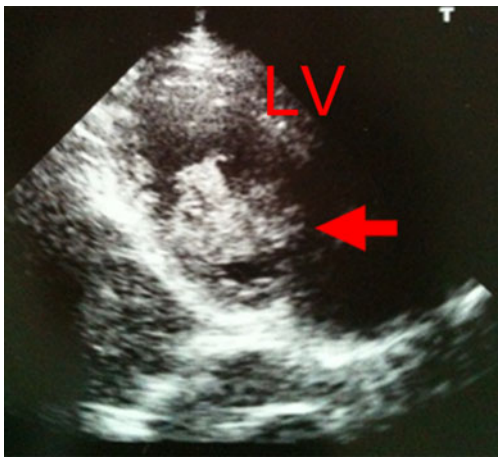


**Fig. 1** Cardiac echogram on hospitalization. Cardiac echogram showed a floating mass (*red arrow*) from the mitral valve in the left ventricle

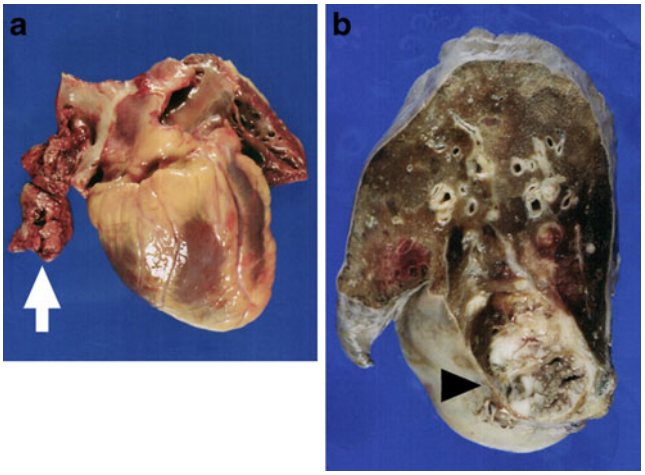


**Fig. 2** Macroscopic examination. **a** Heart showed a 6×2.5×2.5-cm white, elastic, pendulous mass (*white arrow*) in the left atrium. **b** Left lung showed a 3.8×5.5-cm white mass in the lower lobe, which was clearly separated from the surrounding normal lung (*black arrowhead*)

Laboratory tests showed that serum AFP was highly elevated and serum HCG-β was normal (Table 1). Serum brain natriuretic peptide (BNP) was 19.2 pg/ml, which was normal.

## Discussion

In the present case, the tumor showed a reticular pattern of malignant germ cells with typical Schiller–Duval bodies and eosinophilic hyaline globules. The tumor was partially positive on immunohistochemical staining for AFP and negative for HCG-β. Laboratory tests also showed that serum AFP was highly elevated and serum HCG-β was normal. The diagnosis was pure YST without other GCT components.

The testes were normal. The lung tumor was big and was not multiple. This appearance is consistent with primary lung tumor. It is possible that the tumor might have arisen from ectopic thymic tissue; however, this was ruled out as the tumor did not develop outside the parietal pleura but within the lung parenchyma. We therefore diagnosed primary lung YST with metastatic intracardiac YST. Primary lung YST is very rare and only few cases have ever been reported [2–7].

Cardiac expression of a primary noncardiac tumor is rare, with only 1% showing intracavitary or intramyocardial involvement. Intracavitary tumors can induce obstruction of inflow into and outflow from the ventricular cavity [8]. Left-sided cardiac tumor may present with signs of mitral stenosis and insufficiency [9]. In adults, the most common clinical presentation is dyspnea and syncope [9, 10]. Intracardiac GCT has been reported to cause seizure in

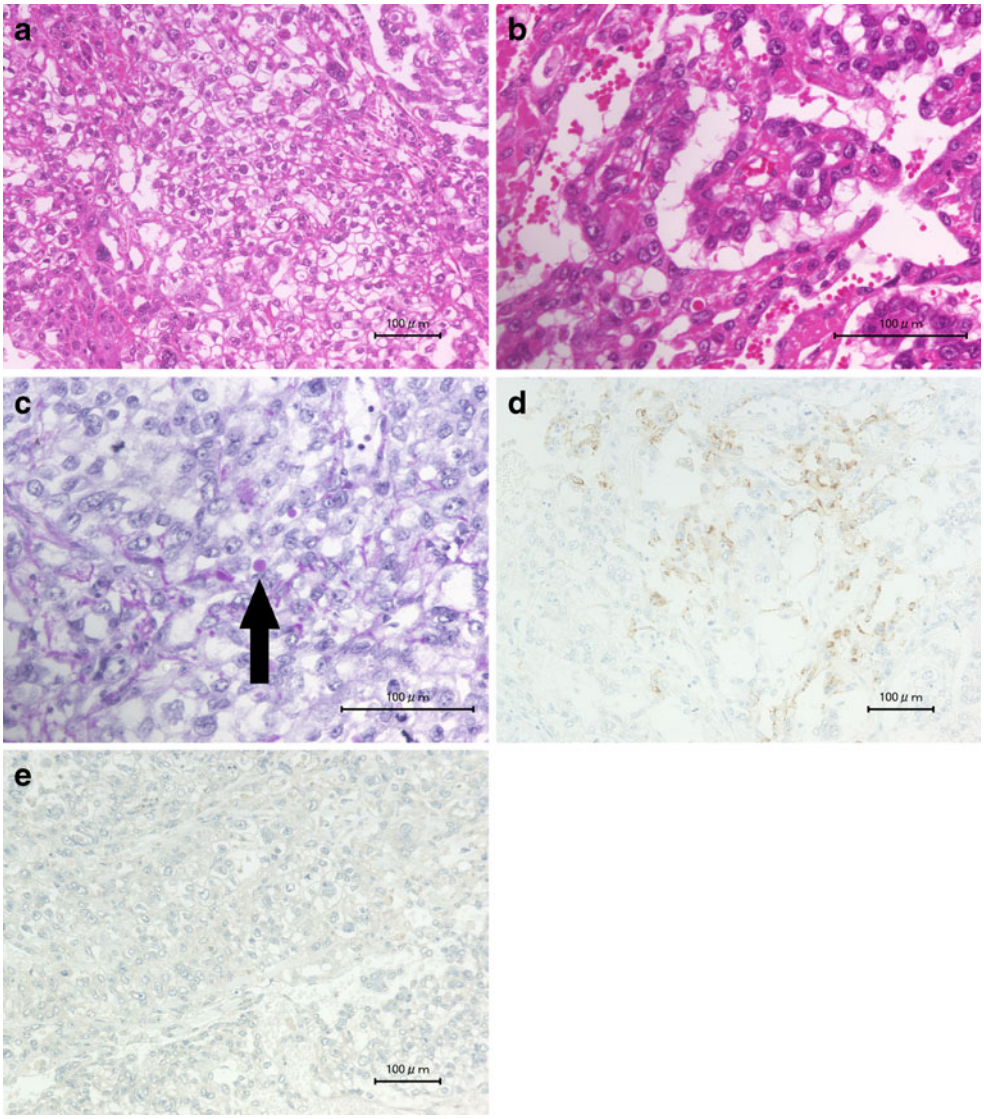


**Fig. 3** Histological examination of lung tissues. **a** Reticular pattern (H & E staining); **b** Schiller–Duval bodies [H & E staining]; **c** eosinophilic hyaline globules (*black arrow*) [D-PAS staining]; **d** positive staining for α-fetoprotein; and **e** negative staining for human chorionic gonadotropin-β for lung tumor tissue

some cases [11, 12]. Pedunculated tumor can move through the atrioventricular valves and cause sudden death [9, 13]. There have been some reports of sudden death resulting from cardiac tumor [9, 14, 15]. Most of them were myxoma, which is a benign cardiac neoplasm, and the cause of death is variable, e.g., coronary or pulmonary embolization.

In the present case, the different diagnoses are an accidental fall, cerebral tumor embolism, chronic heart failure, and respiratory failure, in addition to cardiac output dysfunction caused by intracardiac tumor. The possibility of an accidental fall cannot be absolutely ruled out. However, he said nothing while he was falling and no defensive posture was seen in his body, which raised the suspicion of the fall being caused by disease. There was no tumor embolism in cerebral vessels. No large vessel was embolized and no organ was infarcted. According to these appearances, the possibility of cerebral infarction was decreased. As there was no infiltration by heart failure cells in alveoli of normal lung and serum BNP was normal, the deceased did not have chronic heart failure. The tumor of the left lung was big, but it was not sufficient so as to affect respiratory function. Cardiac echogram on hospitalization showed a floating mass from the mitral valve in the left ventricle and severe mitral regurgitation. Mitral regurgitation decreases the amount of ventricular volume and thus causes the cardiac output dysfunction from the left ventricle. Given these facts, it is considered that he lost

**Table 1** Serum tumor markers

| Tumor markers | Serum concentration (ng/ml) | |
|---|---|---|
| | Present case | Normal range |
| α-Fetoprotein | 2,110 | <10.0 |
| Human chorionic gonadotropin-β | <0.1 | <0.1 |

consciousness from cerebral ischemia due to cardiac output dysfunction and consequently fell downstairs.

In the present case, the deceased was a sole proprietor. In such a case, the principal contractor has to make him undertake medical checkup and he has to obey it. In Japan, medical checkup includes a blood test or X-ray examination. If an abnormal result is detected, further detailed examination is needed. However, he did not undertake medical checkup. The reason is now unclear and the locus of responsibility is hard to say. However, at least, if he had undertaken medical checkup, X-ray examination would have detected the lung tumor and further examination could have revealed the cardiac tumor.

In conclusion, we report a case in whom metastatic cardiac YST might have disturbed cardiac outflow and affected hemodynamics, probably causing syncope. Unfortunately, he was in a high place at that time and fell to receive pulmonary contusion that led to death. It is sometimes difficult to decide the cause of a fall at autopsy. However, in the present case, it cannot be denied that the manner of death originated from natural disease. Autopsy may sometimes reveal latent diseases which might be related to the cause of death. We should perform autopsy thoroughly to diagnose not only the cause of death but also the factors leading to death.

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