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CASE REPORT

A case of secondary pneumothorax due to multiple pulmonary metastases of granulosa cell tumor

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ABSTRACT

Introduction: Ovarian granulosa cell tumor is a relatively rare tumor that accounts for 2-5% of malignant ovarian tumors. This tumor progresses slowly and may recur late in life.

Case presentation: A 70-year-old woman was admitted to our hospital with a left secondary pneumothorax due to metastatic lung tumors of granulosa cell tumor. Reports of secondary pneumothorax due to granulosa cell tumor are rare. Thoracoscopic suturing and pleurodesis using talc were effective in the treatment of this pneumothorax.

Conclusions: We experienced a rare case of secondary pneumothorax due to multiple pulmonary metastases of granulosa cell tumor. It should be noted that pulmonary metastasis of granulosa cell tumor can lead to secondary pneumothorax.

Key words: Granulosa cell tumor; secondary pneumothorax; check valve; thoracoscopic talc poudrage.

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Introduction

An ovarian granulosa cell tumor is a relatively rare tumor that accounts for 2-5% of malignant ovarian tumors [1-4]. The main clinical characteristic of this tumor is its tendency for late recurrence [5-7]. Recurrence with pulmonary metastasis was observed in approximately only 2.5% of recurrent cases [5]. Moreover, it is extremely rare for granulosa cell tumors to cause secondary pneumothorax. Furthermore, the treatment of this secondary pneumothorax has not been clarified. A rare case of secondary pneumothorax due to multiple pulmonary metastases of granulosa cell tumor is reported, and its clinical characteristics are compared to those of three similar cases that have been previously reported.

Case presentation

A 70-year-old woman came to our hospital complaining of left chest pain. On chest computed tomography (CT), a left pneumothorax and multiple metastatic lung tumors were observed. Thirteen years earlier, she was diagnosed with adult granulosa cell tumor of the right ovary, pStage-IA, and surgery was performed. Nine years earlier, she had a recurrence, and multiple lung metastases were observed. An aromatase inhibitor that suppresses endogenous estrogens was started four years earlier. She had a history of osteoarthritis of the knee. She had no smoking history. On admission, SpO_2 was 97% (room air), and breath sounds were attenuated on the left. Blood cell counts and biochemical tests showed no abnormal findings and no elevation of tumor markers including estradiol. The level of CA125 was 15.1 U/ml. A preoperative CT scan 13 years earlier showed a large ovarian tumor in the pelvis. The most recent ^{18}F-fluoro-deoxy-glucose (^{18}F-FDG) positron emission tomography CT (PET-CT) showed no evidence of recurrence in the pelvis. When pneumothorax appeared, collapse was stronger in the left upper lobe than in the left lower lobe. Therefore, the metastatic lesion located just below the pleura in the upper lobe was considered to be the lesion responsible for the pneumothorax.

After hospitalization, the pneumothorax was improved by left thoracic drainage. The patient was discharged without reappearance of the pneumothorax. After discharge from the hospital, mild recurrence of pneumothorax was observed on chest X-ray, but it resolved spontaneously without requiring re-drainage. After 6 months of outpatient follow up, the patient re-developed a left pneumothorax (Figure 1). Thoracic drainage was performed again, and the pneumothorax improved. However, since this left pneumothorax was the second one, surgical treatment was selected. Thoracoscopic suturing and pleurodesis using talc were performed in the upper lobe of the left lung. A leak test showed air leakage from the nodule at the interlobar margin of the lateral left upper lobe, which was speculated to be the responsible lesion (Figure 1 A,D). Two nodules in the apex of the left upper lobe were resected for histopathological examination (Figure 1 B,C,E,F). On pathology, a diffuse growing tumor composed of monotonous spindle cells that was consistent with metastasis of granulosa cell tumor was seen (Figure 2).

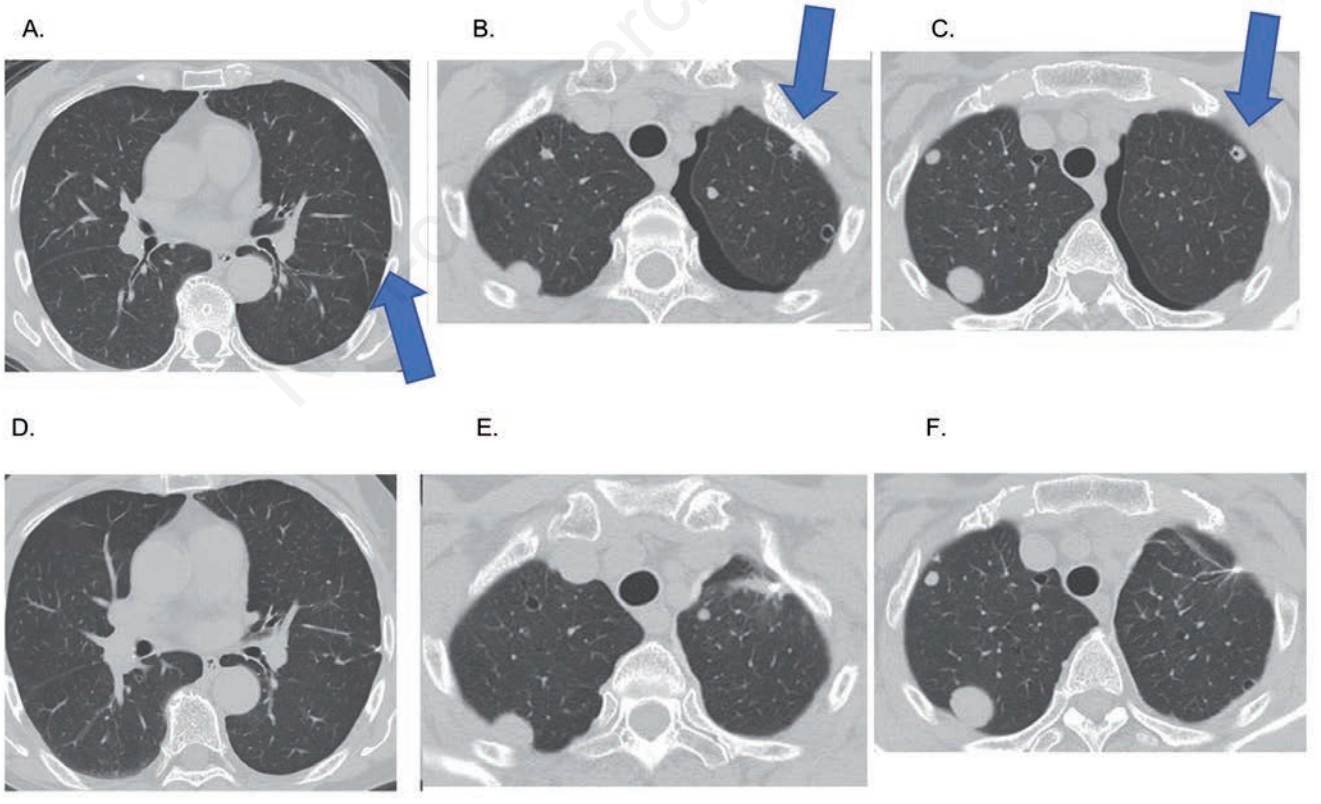

Figure 1. Chest CT findings before and after video-assisted thoracoscopic (VATS) surgery. A) The arrow shows the nodule with a cavity at the interlobar margin of the lateral left upper lobe, which was thought to be the responsible lesion. B,C) Pneumothorax is identified in the left lung; the arrow shows the nodules that were resected for histopathological examination. D) CT image of the left upper lobe after thoracoscopic suturing. E,F) CT images of the left upper lobe after video-assisted thoracoscopic biopsy.

Despite the absence of a smoking history, emphysematous changes were observed around the tumor. After this surgical treatment, the pneumothorax has been cured without recurrence.

Discussion and Conclusions

A rare case of secondary pneumothorax due to multiple pulmonary metastases of granulosa cell tumor was described. Pulmonary metastasis of granulosa cell tumor is rare, and there are few reports of secondary pneumothorax due to this tumor. To the best of our knowledge, there have been three previous reports of granulosa cell tumor with secondary pneumothorax [8-10]. The cause of the development of secondary pneumothorax varied from case to case (Table 1). Two cases developed secondary pneumothorax after chemotherapy or hormonal therapy for granulosa cell tumor. In the present case, the patient also had a secondary pneumothorax after hormonal therapy; it was assumed that the pneumothorax was caused by the shrinkage of a metastatic lung tumor that was located just below the pleura due to the hormonal therapy.

The incidence of secondary pneumothorax in metastatic lung tumors is about 1-2% of all pneumothoraces, and sarcoma, especially osteosarcoma, is the most common malignant tumor causing pneumothorax, at approximately 31.4% [11]. Several mechanisms have been proposed for the development of pneumothorax associated with metastatic lung tumors. Stein et al. reported that tumor cells that metastasize just below the pleura become necrotic due to angiogenesis during growth and introduction of chemotherapy, leading to pneumothorax when the pleura fails [12]. In fact, there have been reports of secondary pneumothorax after or during chemotherapy for metastatic lung tumors, and most of these cases were histopathologically attributed to pleural disruption due to necrosis of tumor cells just below the pleura [12-14]. Other reports suggest that the check valve mechanism of tumor infiltration into the bronchi causes alveolar hyperinflation and rupture [15], or that pneumothorax occurs as a result of tumor cells infiltrating the walls of existing lung cysts [16]. In the present case, the detailed mechanism was unknown, but two mechanisms were hypothesized. First, as described above, hormonal therapy caused necrosis of the metastatic tumor just below the pleura, resulting in pneumothorax. Second, a metastatic tumor located just below the pleura grew and obstructed the bronchi, causing a check valve. The check valve caused compensatory hyperinflation of the alveoli, leading to rupture and pneumothorax. The present patient had no history of smoking and no emphysema on chest CT. Therefore, the emphysematous changes around the tumor in the pathological findings might indicate the effect of the check valve, although the details were not clear [17-19].

There is a significant rate of recurrence of both primary pneumothorax and secondary pneumothorax [20]. In fact, in the present case, the patient had repeated episodes of pneumothorax of the left lung. Therefore, efforts to reduce recurrence by instilling various sclerosants *via* a chest drain, video-assisted thoracoscopic (VATS) surgery, or open surgery are often attempted [20]. In particular, thoracoscopic talc poudrage has been used successfully in secondary pneumothorax [20,21]. Lee *et al*. reported that thoracoscopic talc poudrage was effective for pneumothorax prevention and can be performed with acceptable mortality in patients with advanced COPD [21]. In addition, a meta-analysis of the success rates of talc pleurodesis in the treatment of pneumothorax has shown an overall success rate of 91% [22]. In the present case, thoracoscopic talc poudrage was also effective for repeated episodes of pneumothorax. Moreover, it was possible to identify the responsible lesion by performing thoracoscopy. Since the metastatic lung tumors could worsen, and the pneumothorax could recur in the future, it was considered reasonable to perform thoracoscopic talc poudrage to prevent pneumothorax. In the previous 3 reports, chest tube insertion was performed in 2 cases (Table 1). A case of secondary pneumothorax due to multiple pulmonary metastases of granulosa cell tumor was presented. It should be noted that pulmonary metastasis of granulosa cell tumor can lead to secondary pneumothorax. In addition, thoracoscopic talc pleurodesis could effectively treat this kind of pneumothorax caused by a metastatic lung tumor.

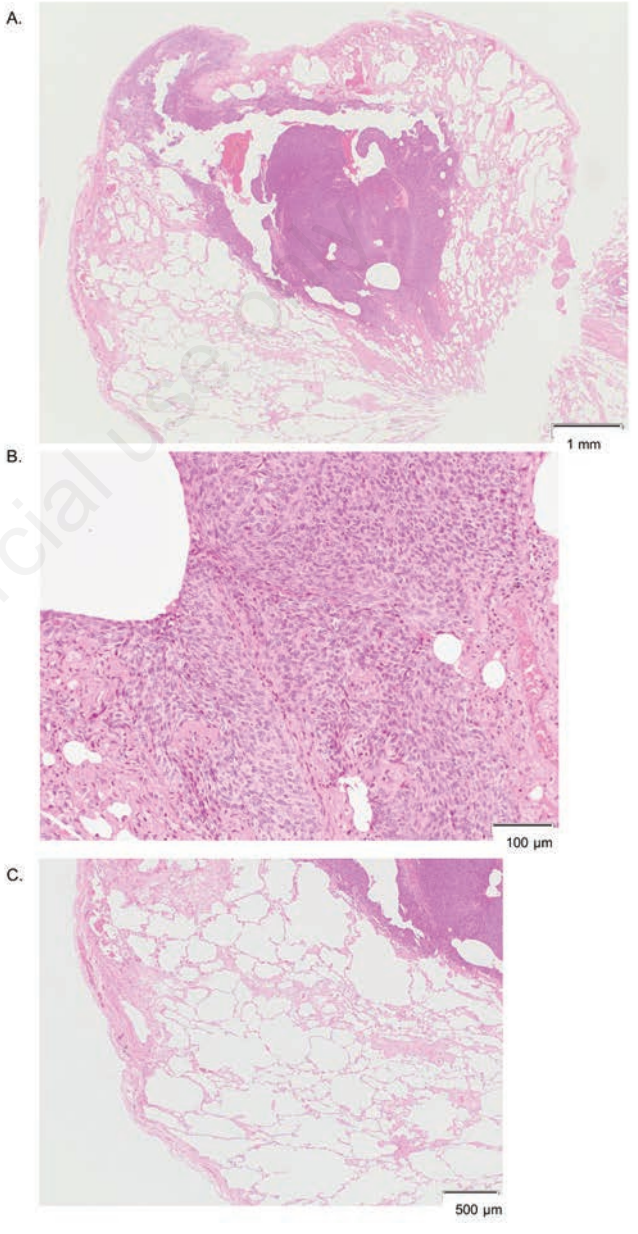

Figure 2. Pathological findings of specimens obtained by video-assisted thoracoscopic (VATS) surgery. A) Neoplastic lesions are found in the emphysematous lesions (Hematoxylin & Eosin stain, original magnification x 20). B) High-power micrograph of tumor showing a sarcomatoid pattern of monotonous spindle tumor cells; some cells show nuclear grooves (Hematoxylin & Eosin stain, original magnification x 200). C) Emphysematous changes are observed around the tumor (Hematoxylin & Eosin stain, original magnification x 40).

Table 1. **Comparison of cases with secondary pneumothorax due to multiple pulmonary metastases of granulosa cell tumor.**

Reference	Age at the onset of pneumothorax (y)	Time from GCT diagnosis to the onset of pneumothorax (y)	Treatment of GCT at the onset of pneumothorax	Treatment for pneumothorax
Schulman *et al.* [8]	19	1	Chemotherapy	Chest tube
Davidson *et al.* [9]	67	17	No treatment	Median sternotomy and bilateral pleurodesis
Alkhatib *et al.* [10]	84	27	Hormonal therapy	Chest tube
Present case	69	13	Hormonal therapy	Chest tube, thoracoscopic talc poudrage

GCT, granulosa cell tumor.

Abbreviations

GCT, granulosa cell tumor
PET-CT, ^{18}F-fluoro-deoxy-glucose (^{18}F-FDG) positron emission tomography CT.

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