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## Pleural nodule with osteal protrusion anterior to the rib tubercle: a case report <sup>☆</sup>

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### ABSTRACT

Pleural soft tissue density nodules with osteal protrusions are often detected at their characteristic site, the anterior portion of the rib tubercle. Herein, we report a pathologically proven case of this lesion. A 65-year-old man underwent surgery for primary lung cancer in the right middle lobe. Preoperative computed tomography showed a 10-mm pleural soft tissue density nodule with osteal protrusion anterior to the tubercle of the right sixth rib, and this lesion was concomitantly resected. Intraoperative findings showed that this pleural lesion originated from the parietal pleura and was pathologically diagnosed as a benign fibrous tissue. We can avoid unnecessary invasive examinations such as biopsies by recognizing these benign fibrous lesions.

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### Introduction

Differential diagnoses of pleural nodules include pleural dissemination of malignant disease, malignant pleural mesothelioma, malignant lymphoma, fibrous tumor, pleural plaque related to asbestos, thoracic splenosis, and thoracic endometriosis [1–4]. The diagnostic approach for undetermined pleural nodules comprises history taking, physical examination, imaging, and biopsy [5]. Knowing whether pleural nodules are benign or malignant is important for clinicians to determine the treatment plan.

We have often recognized pleural soft tissue density nodules on chest computed tomography (CT) images at their char-

acteristic site, the anterior portion of the rib tubercle (Fig. 1). In addition, these pleural nodules always accompanied osteal protrusion of the adjacent rib and showed no increase in size compared to that in the previous examination. Herein, we report a pathologically proven case of pleural soft tissue density nodule with osteal protrusion anterior to the rib tubercle.

### Case report

A 65-year-old man was referred to our hospital due to findings suggestive of primary lung cancer. He had a medical history of right renal pelvis cancer 12 years ago and bladder cancer 11 years ago. He was a current smoker (45 pack-years) and

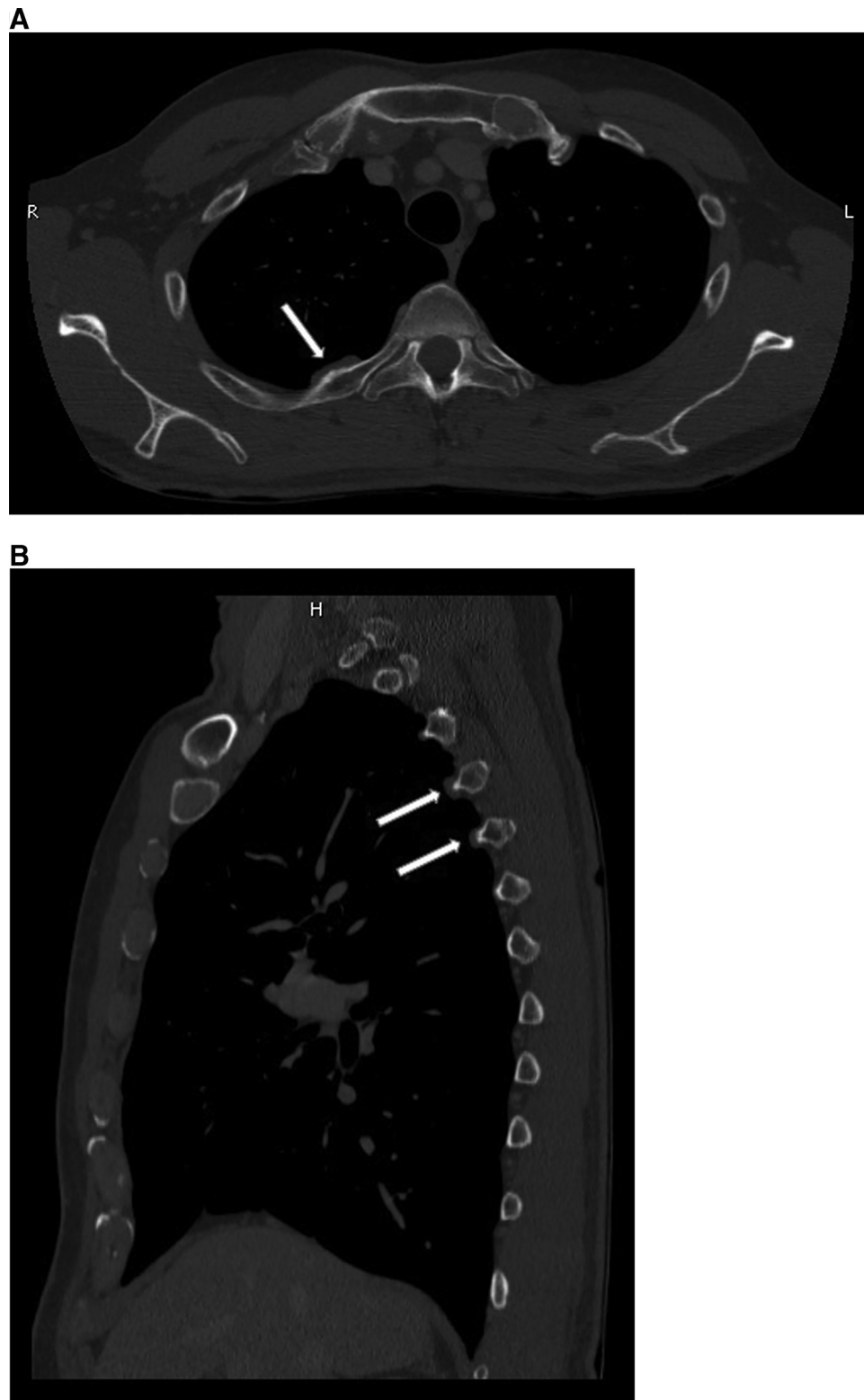
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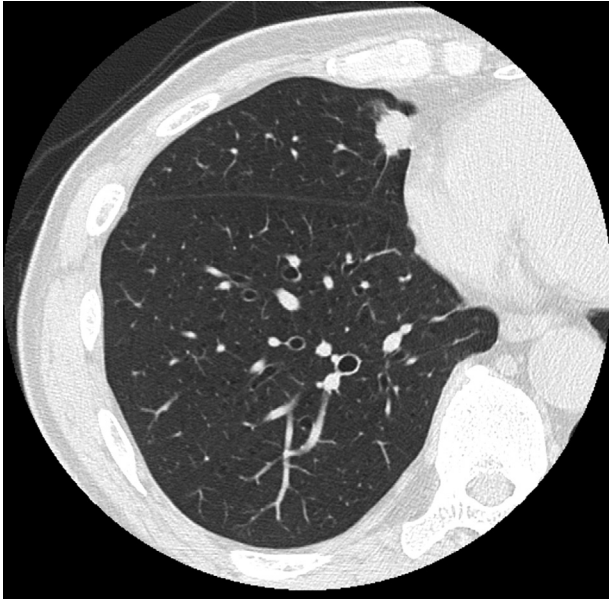
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**Fig. 1** – Pleural nodules with osteal protrusion. (A) Axial computed tomography (CT) image in bone window showing a lesion on the tubercle of the fifth rib (arrow). (B) Sagittal CT image of the same case showing lesions on the tubercle of the fourth and fifth ribs accompanying osteal protrusion (arrows).



**Fig. 2 – Preoperative computed tomography (CT). A spiculated nodule detected in the right middle lobe.**

was not exposed to asbestos. CT showed an 18-mm spiculated nodule in the right middle lobe (Fig. 2), and primary lung cancer was suspected. On the same preoperative CT, a 10-mm pleural soft tissue density nodule with osteal protrusion anterior to the tubercle of the right sixth rib (Fig. 3A, 3B, and 3C) was detected in addition to the pulmonary nodule in the right middle lobe. Preoperative surveillance revealed no apparent metastasis, and surgery was planned. The pleural nodule was also planned to be resected to deny the pleural dissemination. Intraoperative findings revealed that the pleural lesion arose from the parietal pleura, not the visceral pleura, and showed a whitish lobulated shape (Fig. 3D). Macroscopic pathological findings for the resected pleural lesion showed a 10-mm whitish solid nodule (Fig. 3E). Microscopic examination with hematoxylin and eosin staining of the resected pleural lesion revealed benign fibrous tissue (Fig. 3F). Collagen fibers were layered, and the lesion did not appear encapsulated; therefore, the lesion was diagnosed as a reactive fibrous tissue rather than a fibrous tumor. The spiculated nodule in the right middle lobe was pathologically diagnosed as papillary adenocarcinoma.

## Discussion

This is the only case that could be pathologically proved; however, many other similar cases without pathological confirmation are detected by CT. Those cases have the same characteristics: pleural soft density nodule, located at the anterior portion of the rib tubercle, accompanying osteal protrusion of the adjacent rib. Therefore, we presume that those cases are the same lesion as that of our pathologically proven case.

To the best of our knowledge, this is the first report describing a benign fibrous parietal pleural nodule with an osteal protrusion anterior to the rib tubercle. Differential diagnoses of pleural soft tissue nodules include both benign and malignant lesions [1–4]. Our case represents a benign lesion; therefore, malignant diseases can be excluded. Pleural plaque [6], calcifying fibrous tumor of the pleura [7–9], and solitary fibrous tumor of the pleura [10–12] are fibrous lesions derived from the pleura. Pleural plaque is related to asbestos [6]; however, our patient was not exposed to asbestos. Our case had characteristics indicative of a calcifying fibrous tumor of the pleura: fibrous lesions derived from the pleura, and calcification or osteal formation in the lesion. However, calcifying fibrous tumors of the pleura are not always located at the anterior portion of the rib tubercle [7–9], the characteristic site in our case. Solitary fibrous tumors of the pleura also have characteristics similar to those seen in our case; however, several characteristics were different. Solitary fibrous tumor of the pleura is not always located at the anterior portion of the rib tubercle [10–12]; it is located on the visceral pleura rather than the parietal pleura [11,12] and has malignant potential in some cases [11,12]. Moreover, our case was pathologically diagnosed as reactive fibrous tissue rather than a fibrous tumor, such as calcifying fibrous tumor of the pleura and solitary fibrous tumor of the pleura. Therefore, we assume that pleural plaque, calcifying fibrous tumor of the pleura, and solitary fibrous tumor of the pleura are disease entities different from our case. Hence, our case was not compatible with the above differential diagnoses.

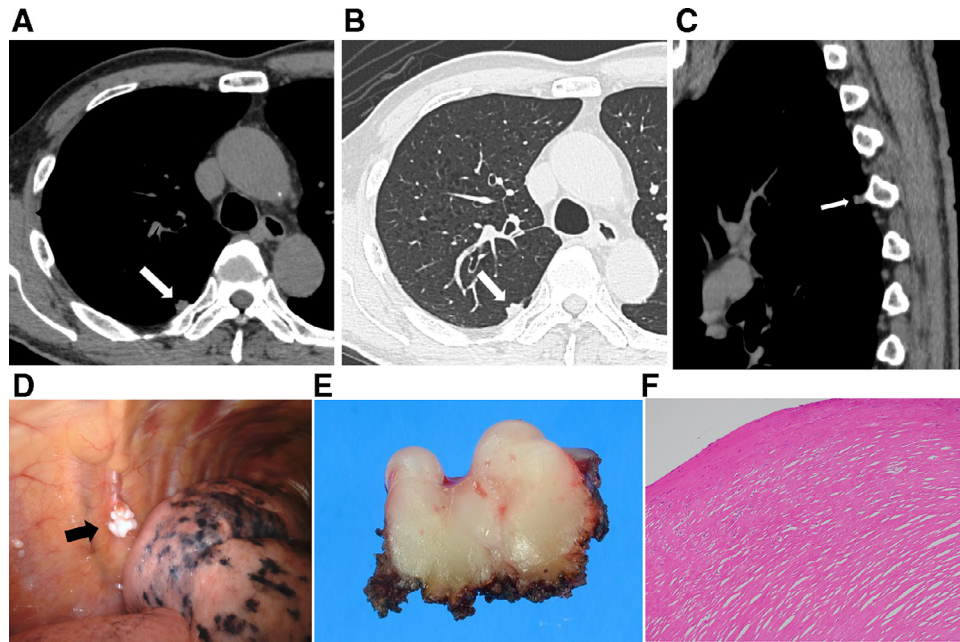
The rib tubercle is a prominence on the posterior surface of the rib and articulates with the transverse process of the vertebra, forming a costotransverse joint. Ankylosing spondylitis has been reported to affect this site [13]. However, lesions of ankylosing spondylitis affect the posterior side of the rib, while lesions in our case affected the anterior side of the rib. Therefore, although the lesions were located near the rib tubercle, our case is thought to have no relation with articulation.

Mechanical stress is thought to be a cause of fibrosis [14]. The visceral and parietal pleurae are rubbed together through respiratory motion. The mechanical stress of this pleural rubbing will concentrate at the restricted portion when there is protrusion under the pleura. This may be the etiology in our case. We presume that through respiratory motion, rubbing of the parietal pleura against osteal protrusion promotes the formation of reactive fibrous tissue at the characteristic site.

In conclusion, pleural soft tissue density nodules with osteal protrusion anterior to the rib tubercle are likely to be benign fibrous tissues. We can avoid unnecessary invasive examinations such as biopsies by recognizing these benign fibrous lesions.

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**Fig. 3 – Pathologically proven case of a pleural nodule with osteal protrusion. (A) Axial computed tomography (CT) image in the mediastinal window showing a soft tissue density nodule on the tubercle of the sixth rib (arrow). (B) Axial CT image in the lung window showing the same lesion (arrow). (C) Sagittal CT image in the mediastinal window showing osteal protrusion to the soft tissue density nodule (arrow). (D) Intraoperative finding revealing the lesion belonged to the parietal pleura (arrow). (E) Macroscopic finding of the lesion showed a whitish solid nodule. (F) Microscopic examination with hematoxylin and eosin staining of the lesion revealing a benign fibrous tissue.**

### Patient Consent

The institutional review board of our hospital approved the study and allowed using the opt-out method.

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