Myeloid osseous metaplasia of the lung: A case report

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Abstract. Pulmonary osseous metaplasia is a disease in which mature bone is found within the parenchyma of the lung. The current study presents a case of pulmonary osseous metaplasia in a 64-year-old female. The patient was previously diagnosed with transitional cell carcinoma (TCC) of the lower ureter. During a routine check-up, an enhancing basal lung nodule was found on chest computed tomography scan, which was suspected to be metastatic lung disease. The patient underwent a thoracoscopic resection of the nodule. The histopathological examination of the specimen confirmed it to be myeloid osseous metaplasia. The disease usually has no significant complications and can also be found in association with other pulmonary diseases. Very limited information is available on the phenomenon; therefore, there is no exact treatment guide for clinicians to follow. In conclusion, myeloid osseous metaplasia of the lung is a rare finding, and based on this report, it may be associated with TCC.

Introduction

Pulmonary osseous metaplasia or ossification of the lung is the presence of mature bone tissue within the lung parenchyma; it is a rare entity and is usually associated with some other form of chronic pulmonary disease, such as bronchiectasis, pneumonia or pulmonary fibrosis (1,2). Pulmonary osseous metaplasia is mostly observed as a post-mortem finding in autopsies of patients who were not diagnosed during their lifetime (3). The bone metastases could be localized or spread throughout the lungs (1). Unless associated with other diseases, they usually tend to be asymptomatic, and various imaging techniques (such as chest radiography and computed tomography) and bone scans are required for their diagnosis (2). Disseminated ossification of the lung generally seems to have two main patterns, namely the dendriform and nodular patterns. Branching along the terminal airway with marrow islands is observed in the dendriform pattern; however, the nodular pattern is more often found in the alveolar space and is usually more localized (4). A study found that in autopsies, diffuse pulmonary ossification occurs at a rate of 1.63 per 1,000 cases. Nevertheless, there is an absence of information concerning the occurrence of both types in living cases (3).

The pathophysiology of the condition is not well known, but there have been some associations reported in the literature, such as the association with other lung diseases (2). As the disease tends to be extremely rare in living patients, little knowledge is available on whether or not it has a sexual predominance or even its preferred age group. With this in mind, it is worth noting that in one study, among 10,426 autopsy cases of diffuse pulmonary ossification, there was a predilection for males (88%) (3).

The aim of the current study is to present a case of pulmonary osseous metaplasia recorded in a 64-year-old female. The present report discusses the diagnosis and treatment of such a rare entity that was initially suspected to be a metastatic condition.

Case report

Patient information. A 64-year-old woman who had previously been diagnosed with transitional cell carcinoma (TCC) of the lower ureter was referred to Smart Health Tower (Sulaymaniyah, Iraq) in July 2023 for the management of a pulmonary nodule found during a routine check-up [chest-abdomen-pelvic computed tomography (CT) scan]. The patient was asymptomatic.

Clinical findings. Cardiovascular, respiratory and genitourinary examinations were normal. All vital signs were within the normal ranges. There were no signs of tuberculosis (TB) and the past medical history for TB was negative.

Diagnostic assessment. A CT scan of the chest revealed a well-demarcated pleural-based solid hyperdense nodule

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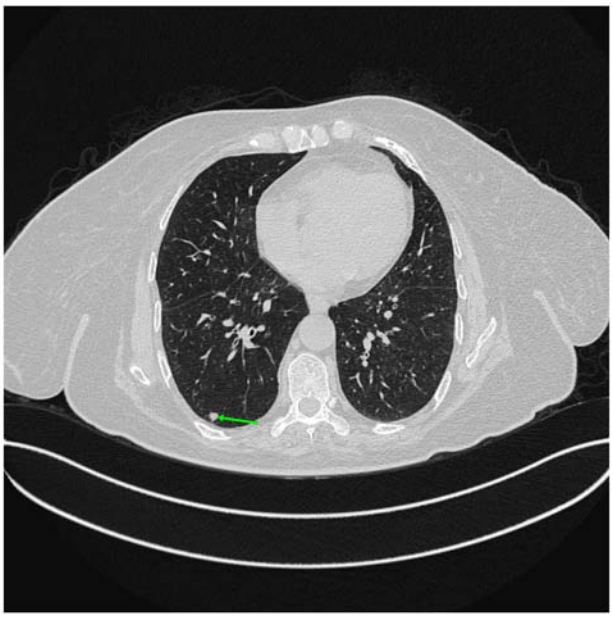

Figure 1. Chest high-resolution computed tomography scan showing a 5-mm peripheral nodule (green arrow) in the posterior segment of the right lung lobe that was suspicious for metastasis.

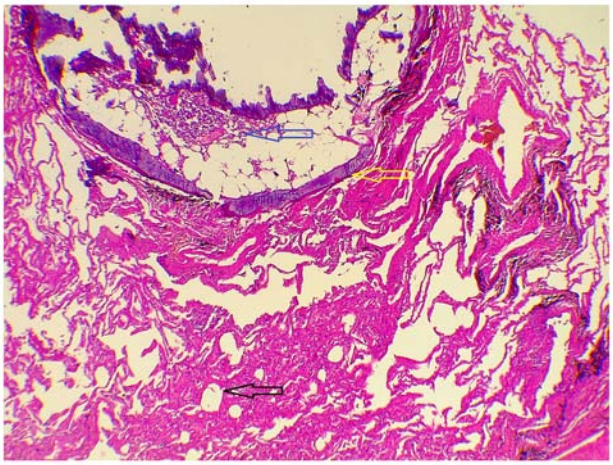

Figure 2. Lung parenchymal tissue (black arrow) with a nodule composed of bone trabeculae (yellow arrow) with marrow elements (blue arrow) (hematoxylin and eosin; x400 magnification).

measuring 4x4 mm in the posterior segment of the right lower lobe of the lung. After 6 weeks, the CT scan was repeated and showed a slight increase in the nodule size to 5 mm. The radiologist suspected a metastasis (Fig. 1).

Therapeutic intervention. The patient was prepared for general anesthesia, in the lateral position, and the nodule was resected through uniport video-assisted thoracoscopic surgery (VATS). Four enlarged mediastinal lymph nodes were also resected, with the largest lymph node being 1 cm in size. The histopathological examination of the nodule and nodal specimens revealed myeloid-osseous metaplasia of the lung (Fig. 2). Specimens were fixed in 10% neutral buffered formalin at room temperature for 24 h, section to a 4-μm thickness, and stained using hematoxylin and eosin for 1-2 min at room temperature. Slides were observed under a light microscope (x400 magnification).

Follow-up and outcomes. The patient remained in the hospital for 2 days receiving intravenous antibiotic (400 mg ciprofloxacin twice per day) and oral analgesics (1 g acetaminophen and 1 g ketorolac, both three times per day). The post-operative period was uneventful. The patient has been followed up for 3 months, and the prognosis remains good.

Discussion

The finding of well-developed bone tissue within the parenchyma of the lung is not a common phenomenon (5). If the pulmonary ossification is seen to be diffuse and not localized, then it is more likely a protective mechanism arising to shield the lung from chronic irritation and injury (6). Despite its association with pulmonary infections, in a previous study, diffuse dendriform ossification of the lung was observed in only 5 out of 75 patients with previously diagnosed interstitial pneumonia proven by biopsy (7). The nodular pattern of osseous metaplasia, such as that in the present case, tends to be even rarer, with no statistics recorded.

Due to the limited information available in the literature with regard to osseous metaplasia, its exact etiology and pathophysiology remain unclear. Ossification has been reported in avascular bronchial cartilage along with other abnormalities such as calcification and fibrovascular ingrowth in patients who have undergone a lung transplantation (8). Osseous metaplasia has also been suggested to be induced by bacterial infections that arise due to cystic fibrosis, which also eliminates the bronchial cartilage (9). Pulmonary bone metaplasia has also been reported in patients with TB infection (10). Previous lung injury, hypercalcemia and an environment with elevated pH are other factors involved in the etiology (2). The alkaline environment due to scar tissue injury facilitates the precipitation of calcium (11).

A definite diagnosis requires histopathological confirmation, while a high-resolution CT scan might suggest the condition (1). The dendriform pattern is observed as branching shadows of dense calcification usually appearing similar to bronchiectasis and fibrosis formed from a scar, whereas the subpleural nodular pattern with more than one nodule smaller than 1 cm is characteristic of a previous infection (4). The current patient had the nodular subtype with an enhancing basal lung nodule that appeared to be <5 mm in diameter. The diagnosis was confirmed by histopathological examination, which revealed small calcified nodules in the parenchymal tissue consisting of mature bone trabeculae with elements of the marrow found within their medullary spaces.

Due to the rarity of the disease, no consensus has been found in the literature regarding its management (1). In the current case, after waiting for 6 weeks, repeating the CT scan and discussing the condition with the tumor board, uniport VATS resection was recommended, as the provisional diagnosis was pulmonary metastasis from the TCC (12).

The primary limitations of this report include the absence of data on the TNM stage and previous management of the urinary tract tumor, which was handled at another

medical center. This absence prevents the investigation of the potential emergence of pulmonary calcification as a side effect of the treatment. Additionally, the case lacks data on blood calcium and vitamin D levels, and a blood gas analysis of pH.

In conclusion, myeloid osseous metaplasia of the lung is a rare finding. Based on this report, it may be associated with TCC.

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Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Authors' contributions

FHK was a major contributor to the conception of the study, as well as to the literature search for related studies. ASA and PMK were involved in the literature review, study design and writing the manuscript. SHT, RJR, JIH and BJHA were involved in the literature review, the design of the study, the critical revision of the manuscript and the processing of the figures. FHK and PMK confirm the authenticity of all the raw data. AMA was the pathologist who performed the histopathological diagnosis. All authors have read and approved the final manuscript.

Ethics approval and consent to participate

Written informed consent was obtained from the patient for participation in the present study.

Patient consent for publication

Written informed consent was obtained from the patient for the publication of the present case report and any accompanying images.

Competing interests

The authors declare that they have no competing interests.

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