

Diffuse Pulmonary Metastases from a Giant Cell Tumor of Bone: A Rare Situation (About Case Report)

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Abstract

Case Report

Giant cell tumor of bone (GCTB) is a rare, locally aggressive bone neoplasm with exceptional metastatic potential. Distant metastases occur almost exclusively in the lungs and are reported in approximately 1-9% of cases, with rates closer to 2-3% in large contemporary series. We report the case of a 37-year-old woman with a dedifferentiated GCTB of the proximal left tibia with a sarcomatous component, treated with chemotherapy followed by surgery. Two years after the initial diagnosis, she presented with a cough, an hemoptysis, left-sided chest pain, and dyspnea. Chest computed tomography revealed a large left pulmonary mass associated with bilateral pulmonary nodules, a pleural effusion, and osteolytic lesions of vertebrae L1, L3, L4, L5, and S1. Transthoracic biopsy of the pulmonary mass confirmed metastatic GCTB on the immunohistochemical analysis. The case was discussed at a multidisciplinary team meeting, where treatment with denosumab and pleural talc pleurodesis was indicated. However, the clinical course deteriorated rapidly, and the patient died before these treatments could be initiated. This case is noteworthy not only because pulmonary metastases from GCTB are rare, but also because they were diffuse, symptomatic, and rapidly progressive in the setting of a dedifferentiated primary tumor with a sarcomatous component. It highlights the need a long-term follow-up, particularly in biologically aggressive forms.

Keywords: Giant Cell Tumor of Bone, Pulmonary Metastases, Sarcomatous Component, Tibia.

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INTRODUCTION

Giant cell tumor of bone (GCTB) is a rare bone tumor, classically locally aggressive, occurs predominantly in young adults, and preferentially involves the epiphyses of long bones. Although it has long been considered as a benign tumor, its biological behavior is unpredictable, with a risk of local recurrence and, less commonly, metastatic spread [1, 2].

We report an unusual case of diffuse, symptomatic pulmonary metastases occurring two years after the diagnosis of a dedifferentiated tibial GCTB with a sarcomatous component. This case is notable both for the rarity of pulmonary dissemination in GCTB and for its rapidly aggressive course, in contrast to the often indolent pulmonary metastases described in conventional GCTB.

CASE PRESENTATION

A 37-year-old woman, had been followed for 2 years for a dedifferentiated giant cell tumor of the proximal left tibia with a sarcomatous component. The

tumor was classified as Enneking stage III and was treated with neoadjuvant chemotherapy followed by surgical resection (Figure 1).

Two years after the initial diagnosis, the patient presented with cough associated with hemoptysis, a moderate left chest pain and dyspnea stage III according to the modified Medical Research Council (mMRC) scale.

On admission, the patient was in a good general condition, with a performance status of 1. The temperature was 36.7 °C, the respiratory rate was 22 breaths/min and the oxygen saturation was 94% on room air, without signs of respiratory distress. Her heart rate was 119 beats/min and the blood pressure was 110/70 mmHg. The body mass index was 19.6 kg/m². Pleuropulmonary examination revealed a left pleural effusion.

The patient walked with crutches. The surgical scar of the left knee was well healed, without local inflammatory signs or tenderness. There was no bone or

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muscle pain on palpation. The left knee was fixed in full extension at 0°, with complete inability to flex.

Chest X-ray showed a near-complete opacification of the left hemithorax, with signs of mass effect (Figure 2).

Chest computed tomography demonstrated a soft-tissue density lung mass occupying most of the left hemithorax and causing mass effect, associated with multiple bilateral pulmonary nodules, a left pleural effusion, and osteolytic vertebral (L1, L3, L4, L5, S1) and iliac lesions (Figure 3).

Pleural fluid analysis revealed serofibrinous pleurisy with a predominantly lymphocytic component 80% and a protein concentration of 49 g/L; bacteriological cultures were sterile. Cytological examination and pleural biopsy were non-specific. Flexible bronchoscopy demonstrated extrinsic

compression of the left bronchial tree without an endobronchial tumor, and the bronchial biopsies were non specific and without malignant cells.

The diagnosis was established by a transthoracic biopsy of the pulmonary mass showing a sheet-like tumor proliferation composed of cells with anisokaryosis, abundant eosinophilic cytoplasm, and irregular nuclei, with atypical mitoti. Immunohistochemical analysis demonstrated expression of p63 and CD68, making the diagnosis of pulmonary metastases from the giant cell tumor of bone (Figure 4).

The case was discussed at a multidisciplinary team meeting, where treatment with denosumab and thoracoscopy with talc pleurodesis were proposed. The clinical course rapidly deteriorated in 10 days, with a progressive decline in the patient's general condition, and she died from respiratory distress.

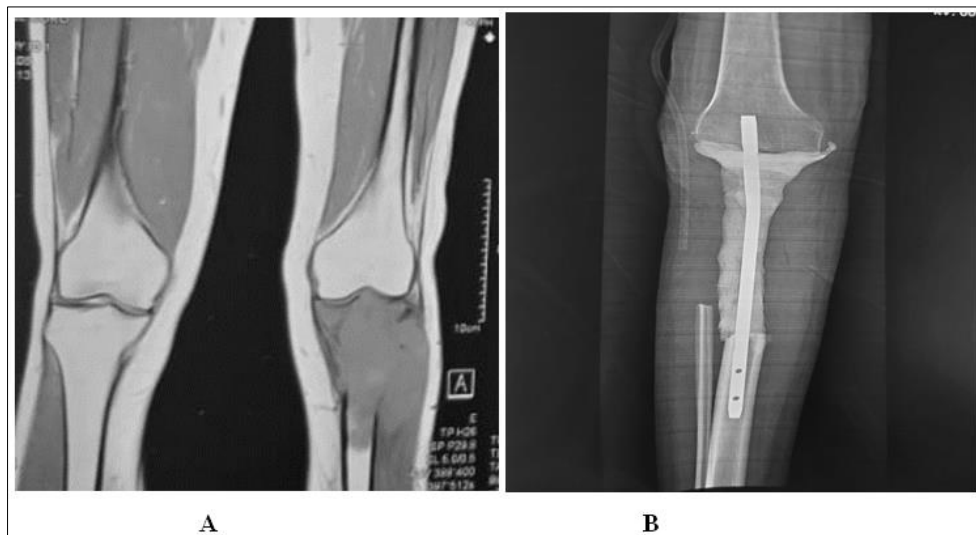


Figure 1: Imaging of the primary tibial tumor. A, coronal MRI of the left knee shows an epiphyseal-metaphyseal lesion involving the proximal tibia. B, postoperative radiograph shows reconstruction with transarticular fixation hardware after tumor resection



Figure 2: Chest X ray. Near-complete opacification of the left hemithorax with signs of mass effect



Figure 3: Axial chest CT images. Large soft-tissue density lung mass occupying most of the left hemithorax and causing mass effect, associated with bilateral pulmonary nodules and a left pleural effusion

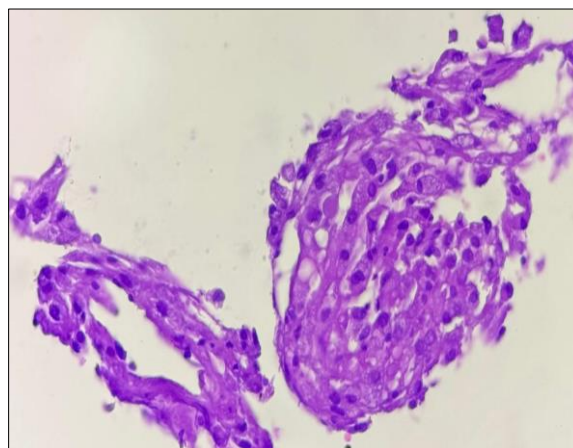


Figure 4: Transthoracic biopsy of the pulmonary mass. Histological examination shows a sheet-like tumor proliferation composed of atypical mitotic cells with anisokaryosis, abundant eosinophilic cytoplasm, and irregular nuclei. Immunohistochemical expression of p63 and CD68

DISCUSSION

GCTBs account for approximately 4-5% of primary bone tumors and occur mainly in young adults. They preferentially involve the epiphyses of long bones, particularly around the knee, most commonly the distal femur and proximal tibia [1-3].

Pulmonary metastasis is a rare event in the course of GCTB. Older series reported frequencies ranging from 1% to 9% [2-4], whereas literature reviews suggest generally lower rates in large cohorts. The literature review by Trovarelli *et al.*, published in 2024 emphasized that GCTB can metastasize to the lungs in a small proportion of cases, while a cohort published in 2026 identified pulmonary metastases in only 6 of 271 patients (2.2%) [3-5]. This low incidence is one of the main points of interest in our case.

The lung is the most common site of metastasis. In the contemporary review by Trovarelli *et al.*, pulmonary metastases developed after a mean interval of approximately 26 months following treatment of the primary tumor and were frequently multiple and bilateral [3], which is the case for our patient, in whom lung metastases was diagnosed two years after the initial diagnosis. Most pulmonary metastases from conventional GCTB are asymptomatic and detected during the follow-up; however, advanced disease may present with cough, dyspnea, chest pain, or hemoptysis [2-6].

The presentation was symptomatic and diffuse for our patient, with a large left pulmonary mass, multiple bilateral pulmonary nodules, a pleural effusion, and secondary bone lesions. Presentation as a bulky thoracic mass with respiratory symptoms is unusual compared with the more typical pattern of multiple pulmonary nodules, which are often incidentally detected.

Several factors have been associated with an increased risk of pulmonary metastases, including local recurrence, an aggressive local stage (Campanacci III or Enneking III), younger age, and certain primary tumor locations [6, 7]. Local recurrence and locally advanced disease are among the most consistently reported risk factors [3-7]. In the cohort published in 2026, local recurrence was the only factor significantly associated with pulmonary involvement [5]. In our case, the primary tumor was classified as Enneking stage III, reflecting particularly aggressive local behavior.

An important point of discussion is the distinction between pulmonary metastases from conventional GCTB and malignant or dedifferentiated forms. Pulmonary metastases from histologically conventional GCTB are generally morphologically similar to the primary bone tumor and may follow an indolent course. However, malignant variants of GCTB have a different natural history and prognosis. A series

published in 2025 that distinguished histologically benign metastatic GCTB from primary or secondary malignant GCTB showed that these entities should be considered separately in terms of prognosis [8]. The presence of a sarcomatous component and dedifferentiation at the time of diagnosis, associated with rapid and fatal thoracic progression in our patient, suggests a more aggressive biological profile than classical pulmonary metastases from conventional GCTB.

The diagnosis of pulmonary metastases relies on correlation of clinical, radiological, and histopathological findings. Pleural fluid analysis, pleural biopsies, and flexible bronchoscopy were initially non-specific in our patient, whereas transthoracic biopsy of the pulmonary mass provided diagnostic confirmation. In diagnostically challenging situations, histological confirmation is essential, particularly to distinguish metastatic GCTB from another pulmonary process or a giant-cell-rich neoplasm. Molecular analysis of H3F3A, when available and clinically typical, can also help to confirm within the GCTB spectrum [8, 9].

Management of pulmonary metastases should be individualized according to their number, size, growth kinetics, resectability, and the histological behavior of the primary tumor. For pulmonary metastases from conventional GCTB, close surveillance may be considered for asymptomatic, stable lesions; surgery remains an important option for resectable lesion, whereas denosumab is used in unresectable or progressive disease through inhibition of the RANK/RANKL pathway [3-11]. Recent data nevertheless emphasize that no single strategy has demonstrated superiority across all clinical scenarios [3-10]. In our case, the large pulmonary mass, bilateral nodules, and pleural effusion made a curative surgical approach difficult to consider; denosumab was therefore selected in the setting of extensive disease.

CONCLUSION

Pulmonary metastases from giant cell tumors of bone are rare but have potentially serious complications. This case illustrates the unpredictable and occasionally aggressive clinical behavior of GCTB, particularly in biologically aggressive variants. It highlights the importance of prolonged clinical and radiological surveillance after treatment. The development of respiratory symptoms in these patients should research for pulmonary metastases. Diagnosis requires a multidisciplinary approach integrating imaging and histopathological confirmation. Treatment should be individualized according to disease extent and lesion resectability.

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