

## Primary breast osteosarcoma with pulmonary metastases

Guillaume Fahrni<sup>1,2,\*</sup>; Rami Hajri<sup>1</sup>; Quoc Duy Vo<sup>2</sup>; Naik Vietti-Violi

<sup>1</sup>Department of Diagnostic and Interventional Radiology, Lausanne University Hospital and University of Lausanne, Lausanne, Switzerland.

<sup>2</sup>EHC Hospital, Morges, Switzerland.

**Received Date** : Dec 08, 2021  
**Accepted Date** : Jan 19, 2022  
**Published Date** : Jan 26, 2022  
**Archived** : [www.jcmimagescasereports.org](http://www.jcmimagescasereports.org)  
**Copyright** : © Guillaume Fahrni 2022

**\*Corresponding Author:** Guillaume Fahrni, Department of Diagnostic and Interventional Radiology, Lausanne University Hospital and University of Lausanne, Lausanne, Switzerland.  
 Email: [guillaume.fahrni@chuv.ch](mailto:guillaume.fahrni@chuv.ch)

### Abstract

Primary breast osteosarcoma is a rare malignant tumor, with only small series reported. We report the case of an 89-year-old woman presenting with a large calcified tumor of the left breast, associated with calcified lung metastases. After non-conclusive biopsy, osteosarcoma was proven at tumorectomy.

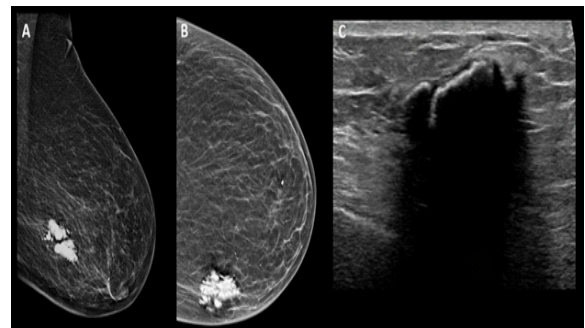
**Keywords:** Osteosarcoma; breast tumor; calcified cancer; lung metastases; breast surgery.

### Background

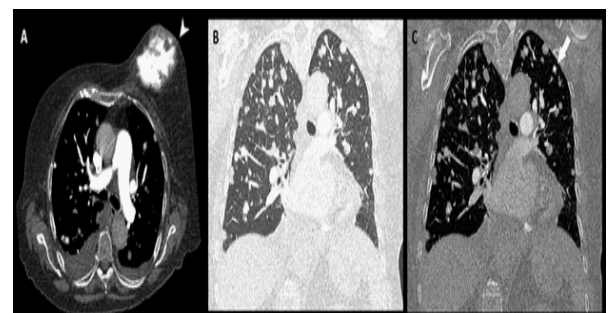
Breast sarcomas are uncommon malignant tumors. Among them, primary breast osteosarcoma is rare with less than 200 cases reported in the literature, representing 12.5% of all breast sarcomas and 1% of all breast tumors [1]. It is a very aggressive tumor that typically produces bone and osteoid matrix. It usually affects elderly patients, with a median age at diagnosis of 64.5 years [3]. The clinical presentation is a palpable mass sometimes associated with a cutaneous rash. Complete resection is the treatment of choice in case of limited disease extension [4]. Survival rate is poor, under 40% at 5 years [5].

### Case summary

An 89-year-old woman without relevant past medical history was hospitalized for cardiac failure. While performing routine physical examination, a palpable firm and irregular mass of the left breast was evidenced, seemingly unnoticed by the patient. This finding motivated the realization of a mammography showing a regional area of coarse heterogeneous calcifications in the internal quadrants of the left breast. Correlation with ultrasound demonstrated a subcutaneous mass with posterior acoustic shadowing (Figure 1). A fine needle biopsy was performed, however it was not contributive due to the large calcifications within the sample. Due to the high suspicion of primary breast neoplasm, a thoracoabdominal CT was performed that revealed a large heterogeneous and calcified mass of the left breast associated with diffuse and partially calcified lung nodules (Figure 2).

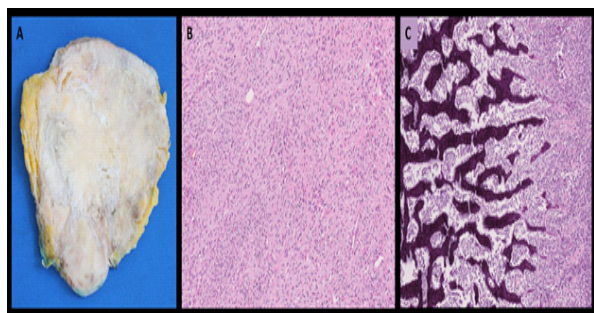


**Figure 1:** Mammography with medio-lateral oblique (A) and cranio-caudal (B) incidences views of the left breast evidencing a regional area of coarse heterogeneous calcifications at the union of the internal quadrants. Breast ultrasound (C) showing a subcutaneous mass with large posterior acoustic shadowing limiting further analysis.



**Figure 2:** Thoracoabdominal contrast-enhanced CT revealing a large calcified mass involving the internal quadrants of the left breast (A, arrowhead) and diffuse partially calcified pulmonary nodules consistent with lung metastasis (B-C). Note the calcified aspect of the lung metastasis (C, arrow).

**Citation:** Guillaume Fahrni. Primary breast osteosarcoma with pulmonary metastases. *J Clin Med Img Case Rep.* 2022; 2(1): 1070.



**Figure 3:** Macroscopic examination (A) evidencing a voluminous calcified mass with central necrosis. Microscopic examination (B-C) showed a peripheral zone containing a dense proliferation of spindle-shaped cells (B), and a central zone composed of ossification foci, osteoclastic cells and cartilage (C).

The patient's case was discussed at the tumor board and a breast tumorectomy was decided and performed without any immediate complication following surgery. On gross observation, the tumorectomy piece (16.5 x 13.5 x 9.5cm) contained a well-defined mass measuring 10. x 8.5 x 7.5 cm, heterogeneous, partially calcified and containing areas of central necrosis (**Figure 3**). Microscopic examination showed a peripheral zone containing a dense proliferation of spindle-shaped cells. There was a central zone composed of ossification foci, osteoclastic cells and cartilage, as well as a transition zone with osteoid formations and sclerous tissue (Figure 3). Immunohistochemistry was performed, with spindle-shaped cells showing a strong expression of MYC, a moderate expression of MDM2, a heterogenous expression of p63 and no expression of epithelial markers CKAE1/AE3, CK5/6, EMA, MNF-116, CK7, CK19. An intra-mammary lymph node (2.2 cm) was also identified, containing metastatic tissue. The aforementioned findings were consistent with the diagnosis of high-grade malignant mesenchymal neoplasm compatible with an extraskeletal osteosarcoma of the breast with lung metastasis. Patient outcome was unfavorable with rapid decline and death due to advanced metastatic disease progression.

## Discussion

Primary breast osteosarcoma is a type of breast tumor with bone producing osteoid matrix [6]. It is not only a very rare breast malignancy but also an unusual location for an extraskeletal sarcoma [7]. Although rare, its diagnosis is important as the imaging features, treatment and prognosis differ from other breast cancers. As with all sarcomas, it is defined by the underlying type of tissue with the most common subtype including fibrohistiosarcoma, myxofibrosarcoma and angiosarcoma [2].

Primary breast osteosarcoma has to be differentiated from metaplastic carcinoma and cystosarcoma phyllodes, that can both present with similar imaging features [8]. The clinical presentation is a breast mass, with rapid growth but rarely associated with pain [9]. Nodal involvement is uncommon, but metastases are frequent. Lung is the most commonly organ involved, followed by bone. The survival is poor, with an overall 5-year survival rate of 38% [10]. On mammography, the primary lesion is usually a large, dense, calcified mass [11].

However, in some cases, calcifications can be absent [12]. Ultrasound is helpful for lesion characterization, staging and biopsy guidance and usually shows important acoustic shadowing limiting analysis [2]. MRI is useful to assess the extent of the mass within the breast, to search out for other masses, assess for chest wall invasion usually showing a high T2 signal mass with enhancement [1]. Whole-body contrast-enhanced CT scan or 18FDG PET-CT are of interest to detect metastatic extension [6]. The final diagnosis of primary breast osteosarcoma is made on pathology, demonstrating osteosarcomatous matrix and showing that the lesion does not arise from adjacent bone (sternum or ribs) [13]. Immunohistochemistry is helpful to establish the diagnosis, with the use of epithelial markers such as CKAE1/AE3, CK5/6, EMA, SMA, CK7, vimentin, MAC-387 and others [14]. Excisional biopsy (complete tumorectomy), as this was done in our patient, is preferred to fine needle biopsy, as the mass can be very firm due to the presence of calcifications that can lead to inconclusive results as in our case [6]. As with any subtype of sarcoma, the treatment is the complete surgical excision with large margins [11]. Local recurrence rates were reported as high as 67% after tumorectomy and 11% after mastectomy [5, 15]. If no local node involvement is seen, axillary node dissection is not recommended, since this type of sarcoma does not spread via lymphatic route [16]. In this regard, our case was unusual as a pathologic intra-mammary lymph node was found. There is no consensus about the administration of adjuvant chemotherapy. However, it is generally recommended as it evidenced to improve survival rates, but no standard dose has been established yet [10]. For more advanced cases with metastasis, chemotherapy is the main treatment. Drugs used are the same as with other sarcomas and include cisplatin, doxorubicin, ifosfamide and methotrexate [17].

## Acknowledgments

The authors declare no conflict of interest.

## References

1. Dekkers IA, Cleven A, Lamb HJ, et al. Primary Osteosarcoma of the Breast. *Radiographics.* 2019; 39(3):626-29. [DOI: 10.1148/rg.2019180181] [published Online First: 2019/05/07]
2. Voutsadakis IA, Zaman K, Leyvraz S. Breast sarcomas: current and future perspectives. *Breast.* 2011;2 0(3):199-204. [DOI: 10.1016/j.breast.2011.02.016] [published Online First: 2011/03/15]
3. Kim J, Woo HY, Kim EK, et al. Metastatic Osteosarcoma to the Breast Presenting as a Densely Calcified Mass on Mammography. *J Breast Cancer.* 2016; 19(1):87-91. [DOI: 10.4048/jbc.2016.19.1.87] [published Online First: 2016/04/12]
4. Burk KS, Fang Y, Porembka JH. Diagnostic evaluation and treatment of primary breast osteosarcoma: A case report. *Breast.* 2019; 25(4):709-11. [DOI: 10.1111/tbj.13305] [published Online First: 2019/05/12]
5. Silver SA, Tavassoli FA. Primary osteogenic sarcoma of the breast: a clinicopathologic analysis of 50 cases. *Am J*

Surg Pathol. 1998; 22(8):925-33. [DOI: 10.1097/00000478-199808000-00002] [published Online First: 1998/08/26]

6. Yoon CS, Kang SS. Primary osteosarcoma of the breast: a case report. *Ann Surg Treat Res.* 2017; 93(1):57-60. [DOI: 10.4174/astr.2017.93.1.57] [published Online First: 2017/07/15]

7. Chung EB, Enzinger FM. Extraskeletal osteosarcoma. *Cancer.* 1987; 60(5):1132-42. [DOI: 10.1002/1097-0142(19870901)60:5<1132::aid-cncr2820600536>3.0.co;2-l] [published Online First: 1987/09/01]

8. Rizzi A, Soregaroli A, Zambelli C, et al. Primary osteosarcoma of the breast: a case report. *Case Rep Oncol Med.* 2013; 2013:858705. [DOI: 10.1155/2013/858705] [published Online First: 2013/05/22]

9. Jakovljevic SD, Spasic MB, Milosavljevic MZ, et al. Pure primary osteosarcoma of the breast: a case report. *Eur J Gynaecol Oncol.* 2013; 34(5):476-9. [published Online First: 2014/01/31]

10. Kurata K, Anan K, Ishikawa N, et al. A case of primary extraskeletal osteosarcoma of the breast. *Surg Case Rep.* 2018; 4(1):121. [DOI: 10.1186/s40792-018-0530-4] [published Online First: 2018/09/21]

11. Crevecoeur J, Jossa V, Gennigens C, et al. Primary osteosarcoma of the breast: a case report. *Clin Case Rep.* 2016; 4(1):62-6. [DOI: 10.1002/ccr3.450] [published Online First: 2016/01/20]

12. Conde DM, Morais LC, Pacheco CF, et al. Primary osteosarcoma of the breast: pathological and imaging findings. *Rev Assoc Med Bras (1992).* 2015; 61(6):497-9. [DOI: 10.1590/1806-9282.61.06.497] [published Online First: 2016/02/04]

13. Ogundiran TO, Ademola SA, Oluwatosin OM, et al. Primary osteogenic sarcoma of the breast. *World Journal of Surgical Oncology.* 2006; 4(1):1-4.

14. Gull S, Patil P, Spence RA. Primary osteosarcoma of breast. *BMJ Case Rep.* 2011; 2011 [DOI: 10.1136/bcr.03.2011.4015] [published Online First: 2011/01/01]

15. Bahrami A, Resetkova E, Ro JY, et al. Primary osteosarcoma of the breast: report of 2 cases. *Archives of pathology & laboratory medicine.* 2007; 131(5):792-95.

16. Khan S, Griffiths EA, Shah N, et al. Primary osteogenic sarcoma of the breast: A case report. *Cases J.* 2008; 1(1):148. [DOI: 10.1186/1757-1626-1-148] [published Online First: 2008/09/12]

17. Longhi A, Bielack SS, Grimer R, et al. Extraskeletal osteosarcoma: A European Musculoskeletal Oncology Society study on 266 patients. *Eur J Cancer.* 2017; 74:9-16. [DOI: 10.1016/j.ejca.2016.12.016] [published Online First: 2017/02/09]