

Ewing's sarcoma metastasis into the breast

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ABSTRACT

The metastasis of extramammary malignancies into the breast is very unusual. Lymphoma, malignant melanoma, and rhabdomyosarcoma are the most common tumors that metastasize into breast tissue. The histological spectrum of breast masses in children and adolescents is different from that of adults. Imaging findings are useful for performing a diagnosis, but in a patient with a known malignancy, any enlarging breast mass, even one with a benign radiological appearance, should be investigated with a biopsy. In this article, we present the imaging findings of a 12-year-old female patient with breast metastasis of Ewing's sarcoma.

Key words: • sarcoma, Ewing's • neoplasm, metastasis
• radiology • breast

The spectrum of breast lesions in children and adolescents differs markedly from that of adults, with the former lesions being mostly benign. After the onset of puberty, most cases of breast enlargement arise from benign fibroadenoma in girls and gynecomastia in boys. Other causes of masses include infections, trauma, and cyst formation. In children, benign lesions usually appear as well-circumscribed, hypoechoic masses in ultrasonography (US) and exhibit diffuse enhancement, except for nonenhancing septations found in magnetic resonance imaging (MRI). Both primary and secondary malignant breast lesions are rare in children. The most common primary breast malignancies are malignant phyllodes tumors (1).

The metastasis of extramammary malignancies into the breast is very unusual. Lymphoma, malignant melanoma, and rhabdomyosarcoma are the most common tumors that metastasize into breast tissue. The metastasis of Ewing's sarcoma into the breast is very rare, and only a few cases have been reported in the literature (2). In this article, we present the imaging findings of a patient with breast metastasis of Ewing's sarcoma.

Case report

In December 2008, a 12-year-old female patient was diagnosed with Ewing's sarcoma in the right iliac wing and subjected to chemotherapy. In May 2009, at the time of her fifth dose of the chemotherapy regimen, the patient was referred to our breast-imaging department with a firm, mobile, painless and palpable mass in her left breast. Gray-scale US revealed a well-defined, spherical, heterogeneous, and hypoechoic solid mass (35×30×25 mm) in the outer portion of the lower quadrant of her left breast. There were a few millimetric hypoechoic foci in the central portion of the lesion, which may have represented pre-necrotic foci (Fig. 1a). Cranial and pelvic MRI and thorax computed tomography (CT) scans were also performed to evaluate the primary lesion and locate any additional metastatic lesions. There were multiple metastatic foci in both iliac wings, both femora, the sacrum and both parapharyngeal soft tissue regions. A partial thoracic MRI was performed using a body coil and only axial STIR and post-contrast T1-weighted (T1W) sequences during the same session as the pelvic MRI. The breast lesion was hyperintense in the STIR sequence and showed peripheral enhancement in the post-contrast T1W images (Fig. 2a and 2b). The imaging characteristics of this lesion were very similar to the patient's metastatic parapharyngeal lesions. The thoracic CT revealed metastatic parenchymal nodules along with the soft tissue mass in the left breast (Fig. 2c).

Eight days after the end of the fifth chemotherapy treatment, the gray-scale and Doppler breast US examinations were repeated. Although the lesion was the same size as in the previous examination, the

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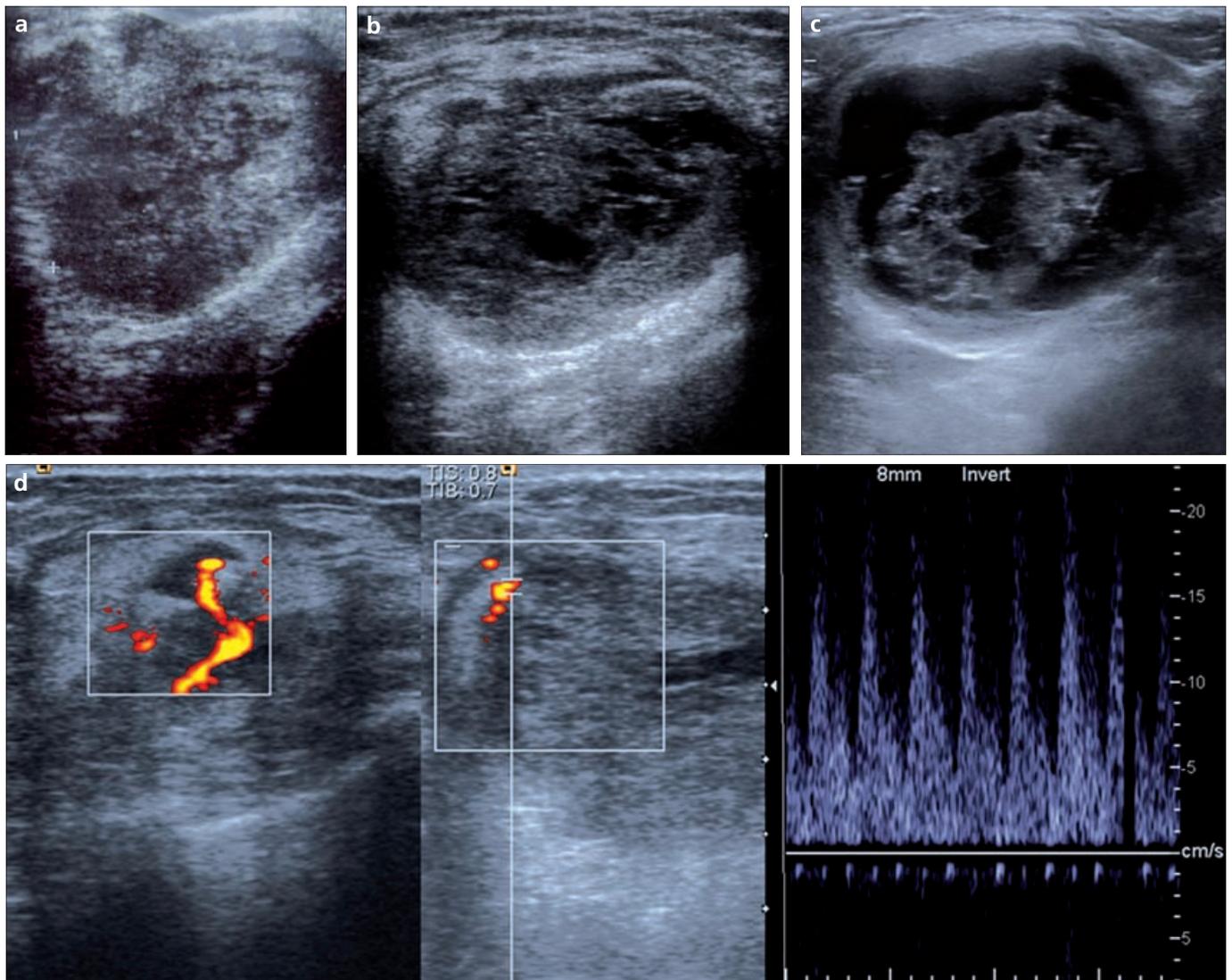


Figure 1. a–d. Gray-scale and color Doppler ultrasonography of the breast showing a well-defined, spherical, heterogeneous, and hypoechoic solid mass (35×30×25 mm in size) in the lower quadrant of the left breast. There are millimetric hypoechoic pre-necrotic foci (a). After the fifth chemotherapy treatment, the lesion was the same size as in the first evaluation, but there was an increase in the central anechoic portion of the lesion due to necrosis (b). After the end of the seventh chemotherapy treatment, the necrotic portion of the lesion had become more prominent (c). The Doppler examination revealed an arterial flow pattern in the solid portion of the lesion (d).

solid component had decreased, and the central portion had become anechoic secondary to the development of necrosis (Fig. 1b).

In the intervening period, the patient's medical condition worsened, and she was hospitalized. At the end of the seventh chemotherapy treatment, the gray-scale breast US (Fig. 1c) and thoracic CT examinations were repeated (Fig. 2d). Although there was no change in its size, the necrotic portion of the lesion had become more prominent. A power Doppler examination revealed an arterial flow pattern in the solid portions of the lesion (Fig. 1d).

The cross-sectional imaging findings, the accompanying metastatic involvement at other sites and the increased degree of central necrosis after the chemotherapy regimens indicated the metastatic nature of the lesion. A fine needle-aspiration biopsy was performed, and the diagnosis of malignancy was confirmed cytologically. Unfortunately, the patient's medical condition deteriorated, and she died during her hospitalization period.

Discussion

Metastases into the breast from extramammary malignant neoplasms are unusual. They may be detected during

treatment for a known malignancy, or they can be the first manifestation of a malignant disease. Metastases are sometimes multiple and bilateral, but they are more commonly large, solitary tumors (3). Metastatic cancer in the breast is often discovered as a superficial solitary mass (85%) in the upper outer quadrant (66%). These metastases manifest clinically as well-defined, mobile, and rapidly enlarging masses. Pain, tenderness, and/or discharge are usually absent (2).

Breast metastasis can occur in two different forms: bloodborne and lymphatic. Lymphatic metastases mostly arise from breast carcinoma metastasis

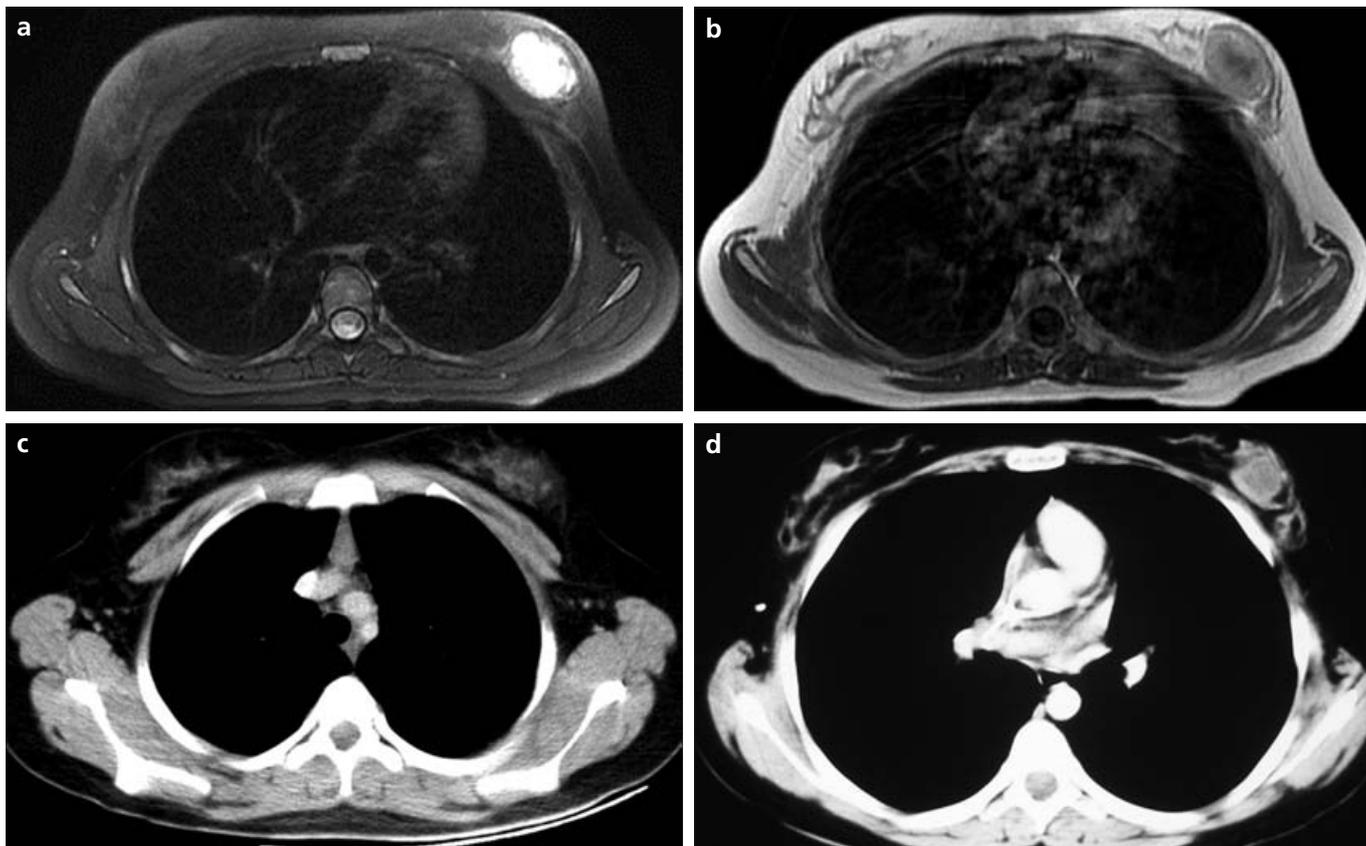


Figure 2. a–d. Thoracic axial STIR MR image shows a hyperintense lesion in the left breast (a). In the axial post-contrast T1W MR image, there is a hypointense central necrotic region, and the peripheral portion is hyperintense due to contrast enhancement (b). Thorax CT at mediastinal window reveals a solid soft tissue mass in the left breast (c). After the seventh chemotherapy treatment, the necrotic portion of the lesion has become more prominent on CT (d).

into the contralateral breast via the lymph nodes localized along the anterior thoracic wall. Lymphatic metastases are usually found in the medial portion of the breast. In this form, the skin of the breast becomes diffusely thicker, and the breast parenchyma becomes denser in mammography, with many irregular masses. Bloodborne metastases are bilateral, with well-defined and spherical metastatic masses (4). Melanoma is the most common source of bloodborne metastases into the breast (2). The next most common sources are lung carcinoma and the lymphoma/leukemia group. Other reported carcinoma sources include those originating from the stomach, prostate, ovaries, kidneys, cervix, mouth, thyroid, and rarely, sites such as the gastrointestinal and genitourinary tracts and the skin. Sarcomas are an extremely rare tumor sources of breast metastases, and those that do present are mainly from fibrosarcomas and myosarcomas. Other primary tumors that may metastasize into the

breast include Ewing's sarcoma, primitive neuroectodermal tumors and renal cell carcinoma (3).

Ewing's sarcoma is a highly malignant primary bone tumor derived from the red bone marrow (5). This tumor is most frequently observed in children and adolescents (4–15 years of age) and rarely develops in adults older than 30. Ewing's sarcoma can originate from any bone in the body; the most common sites are the pelvis, thigh, lower leg, upper arm, and ribs. Ewing's sarcoma can also arise in soft tissues (extra-skeletal). The usual sites of metastasis are the lung, pleura and other bones, but lymph node, central nervous system and liver metastasis occasionally occur (6). The metastasis of Ewing's sarcoma into breast tissue is extremely rare, and only a few cases have been reported in the literature (2).

The US appearance of breast metastasis is variable, but most masses exhibit lobulated or irregular margins and a heterogeneous, hypoechoic internal echotexture with hyperechoic

foci. Posterior acoustic shadowing is also typically seen (3). In the case of our patient, the gray-scale US findings differed from those described in the literature. The lesion was solid, and there was no prominent necrosis or posterior acoustic shadowing in the initial US investigation. After chemotherapy, necrotic areas developed in the center of the lesion.

In our case, the lesion had an arterial vascular pattern. Doppler studies on metastatic Ewing sarcoma into the breast have not been reported in the literature; however, some metastatic tumors, such as angiosarcomas, are known to be hypervascular in Doppler US images (7).

The MRI features of metastatic Ewing's carcinoma reported in the literature include T2 hyperintensity and rapid ring enhancement in the lesion, which represent central necrosis and peripheral angiogenesis (8). In our case, the MRI scans performed during the chemotherapy regimen showed similar findings.

CT is not typically used to evaluate breast masses, but breast metastases may be first noted during surveillance CT scans in children with a known primary cancer. The metastases may manifest as well- or ill-defined masses accompanied by breast swelling (9). In our case, thoracic CT images clearly identified the metastatic mass in the left breast.

In a patient with a known malignancy, any enlarging breast mass (even one with a reassuringly benign radiological appearance) should be promptly investigated with an initial fine-needle aspiration or core-needle biopsy. Breast metastases are usually accompanied by disease elsewhere, and the prognosis is generally poor.

Conflict of interest disclosure

The authors declared no conflicts of interest.

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