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Imaging features of breast cancer with marked hemosiderin deposition: A case report

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ABSTRACT

A 63-year-old woman was referred to our hospital for breast cancer treatment. She had a large HER2-positive breast tumor on her left breast, and received neoadjuvant chemotherapy. After treatment, a shrunk spiculated mass with calcification-like high density was detected on mammography, and MRI revealed a large strong susceptibility artifact. Surgical specimen analysis attributed these imaging features to a large marked hemosiderin deposition. This case is herein reported due to its rarity and to the importance of acknowledging that this large marked hemosiderin depositions can present as a calcification-like high density on mammography and shows large susceptibility artifact on MRI imaging.

1. Introduction

Large marked hemosiderin depositions in breast tumors are rare, and reports of related imaging features are limited. Only a few reports have described hemosiderin or some other metallic ions included in tattoo pigmentation showing with high density features on mammography [1–3]. Herein is reported the case of a 63-year-old woman with breast cancer. She had a HER2-positive breast cancer on her left breast, and received neoadjuvant chemotherapy. After treatment, a shrunk spiculated mass with calcification-like high density mass was observed on mammography, and a large susceptibility artifact was observed on MRI. Surgical specimen analysis attributed such imaging features to a large marked hemosiderin deposition. The fact that this large marked hemosiderin deposition can lead to a spiculated mass with calcification-like high densityy on mammography and as a large susceptibility artifact on MRI is important to acknowledge.

2. Case presentation

A 63-year-old woman presented to a local hospital with a palpable mass on her left breast and was submitted to core needle biopsy due to cancer suspicion. Biopsy results revealed high-grade breast cancer, and the patient was referred to our hospital for chemotherapy before surgery. Before presenting to our hospital, the patient experienced a sudden enlargement of the palpable mass. She had no past medical history but had a family history of breast and pancreas cancer in the mother.

Palpation revealed a 60-mm diameter mass in the left upper inner quadrant with diameter of 60 mm. Mammography showed a round, microlobulated mass at the middle-anterior of mediolateral oblique (MLO) view, and at the posterior-middle of craniocaudal (CC) view, with a 48-mm diameter. No calcifications were detected (Fig. 1).

At breast ultrasonogram, mass features were as follows: oval shape; smooth margin; almost parallel to the skin; internal echo mixed with hypo and hyperechoic pattern; slightly enhanced posterior features. A spiculated mass with 22-mm diameter was adjacent to the inner side of the main tumor. Color doppler sonogram showed internal vascularity (Fig. 2).

At gadolinium-enhanced MRI, mass features were as follows: oval shape; smooth margin; heterogenous internal enhancement characteristics; slow/persistent time curve description. Netlike septum with low-signal intensity on T1/T2-weighted image and speckled high intensity

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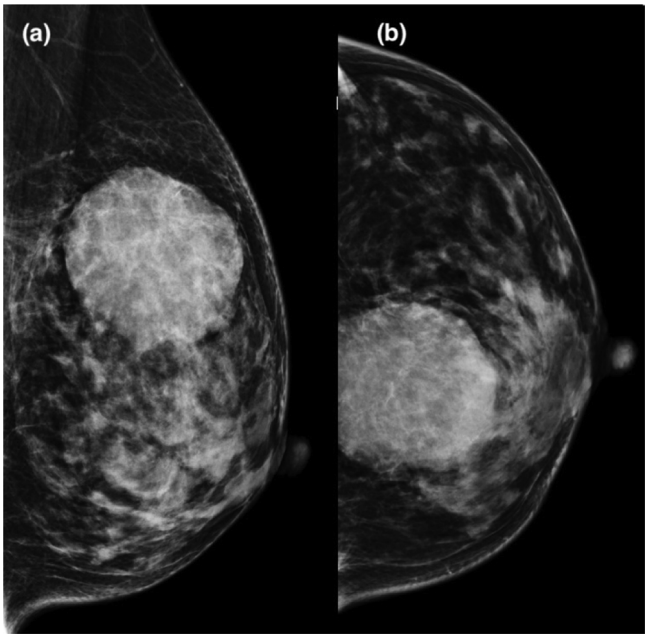

Fig. 1. Mammography of the tumor before treatment.
Mammography showing a round, microlobulated, high-density, 48-mm diameter mass at (a) middle-anterior of mediolateral oblique (MLO) view and (b) posterior-middle at craniocaudal view (CC) view. No calcifications were noted.

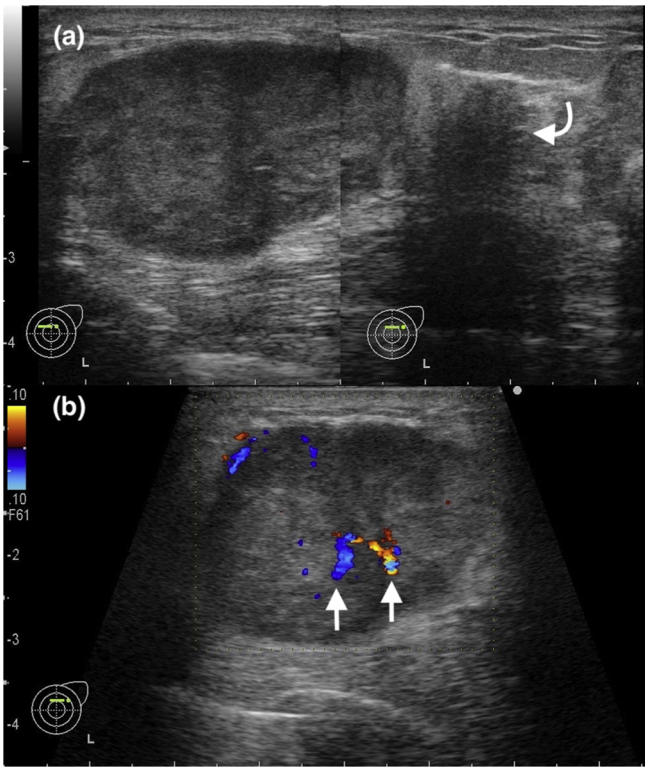

Fig. 2. Ultrasonography of the tumor before treatment.
(a) Ultrasonogram showing a mass with the following characteristics: oval shape; irregular margin; almost parallel to skin; internal echo mixed with hypo and hyperechoic pattern; and slightly enhanced posterior features. The spiculated, 22-mm diameter mass was adjacent to the inner side of the main tumor (curved arrow).
(b) Color doppler sonogram showing internal vascularity (arrows)

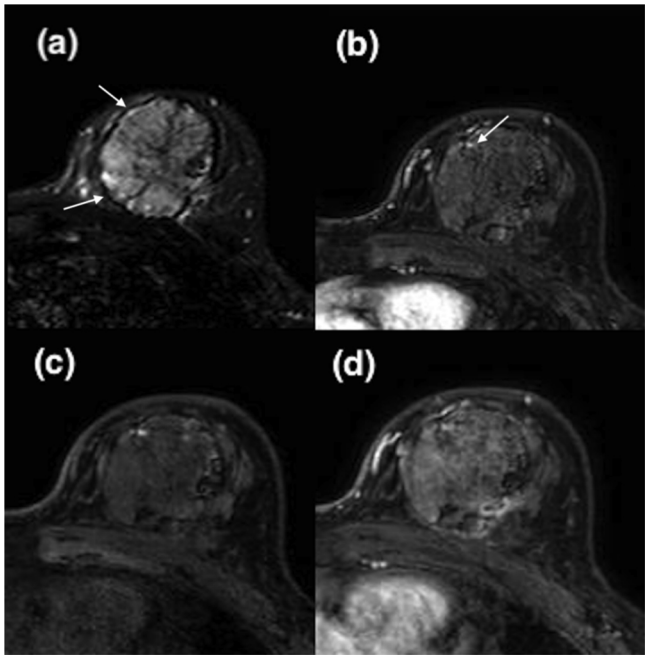

Fig. 3. MRI images of the tumor before treatment.
(a) T2-weighted image showing a smooth mass with inhomogeneous high-intensity signal surrounded by strong hypointense rim (arrows).
(b) Non-contrast enhanced T1-weighted image with fat saturation showing speckled high-intensity signal inside the mass (arrow).
(c) (d) Gadolinium-enhanced T1-weighted image with fat saturation 20 s and 85 s after contrast media injection showing very weak and heterogenous enhancement.

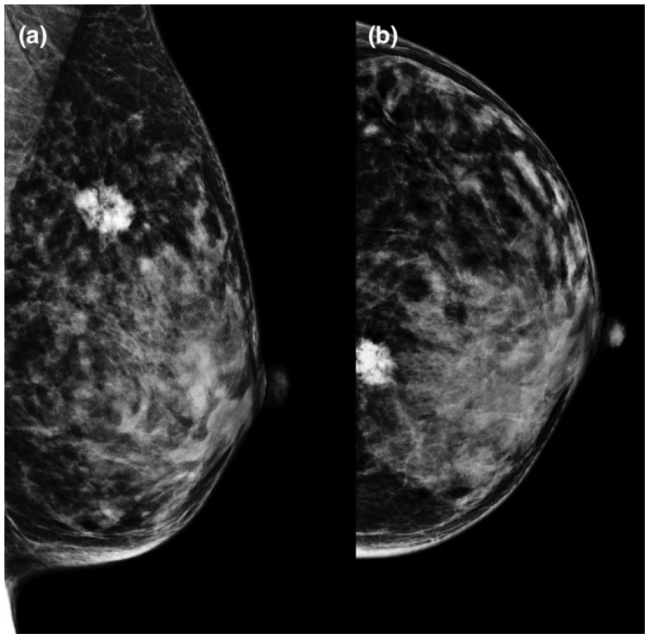

Fig. 4. Mammography of the tumor after neoadjuvant chemotherapy.
(a)(b) Mammography after neoadjuvant chemotherapy showing a spiculated mass with calcification-like high density.

area on T1-weighted image were observed inside the tumor (Fig. 3). Additionally, tumor was surrounded by strong hypointense rim on T2-weighted image.

Compared with computed tomography (CT) performed immediately before biopsy by the previous doctor, tumor maximum diameter increased from 30 to 45 mm within one month.

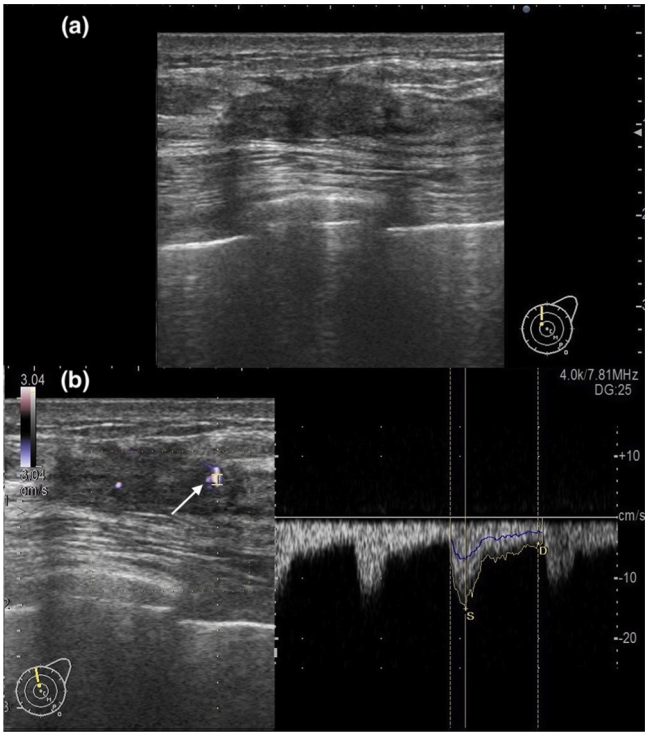

Fig. 5. Ultrasonography of the tumor after neoadjuvant chemotherapy.
(a)(b) Ultrasonogram after neoadjuvant chemotherapy showing an oval, spiculated mass with internal vascularity (arrow).

Expression of estrogen receptor (ER) and progesterone receptor (PgR) were both negative and human epidermal growth factor receptor 2 (HER2) expression was positive. Ki-67 expressed on 80% of tumor cells in biopsy specimen. The patient was therefore treated with neoadjuvant chemotherapy consisting of epirubicin/cyclophosphamide followed by trastuzumab/pertuzumab/docetaxel.

After neoadjuvant chemotherapy, tumor shrunk remarkably. Mammography showed a 16-mm spiculated mass with calcification-like high density (Fig. 4). Ultrasonogram also revealed tumor shrinkage, as well as oval, spiculated, and internal vascularity features (Fig. 5). At gadolinium-enhanced MRI, a large susceptibility artifact was observed at tumor location, precluding interpretation of MRI image (Fig.6).

Total mastectomy and sentinel lymph biopsy were subsequently performed. Axillary lymph node dissection was omitted after confirmation of negative lymph node metastases through rapid intraoperative pathological diagnosis.

The surgical specimen confirmed tumor pathological complete response. Hemosiderin deposition and macrophage cell accumulation at the interstitial space were largely marked. No calcification was observed (Fig. 7).

3. Discussion

Large marked hemosiderin depositions in breast tumors are rare, and reports of related imaging features are limited.

In previous reports, percutaneous tattoo pigmentation containing variable metallic ions showed high-density punctate similar to calcifications, with suspicious morphology typically observed in breast cancer [1,2]. Sato et al. reported an extremely rare case of solid tubular carcinoma with coarse calcification typically seen on benign breast tumors [3]. These reports suggest that hemosiderin and other metallic ions can

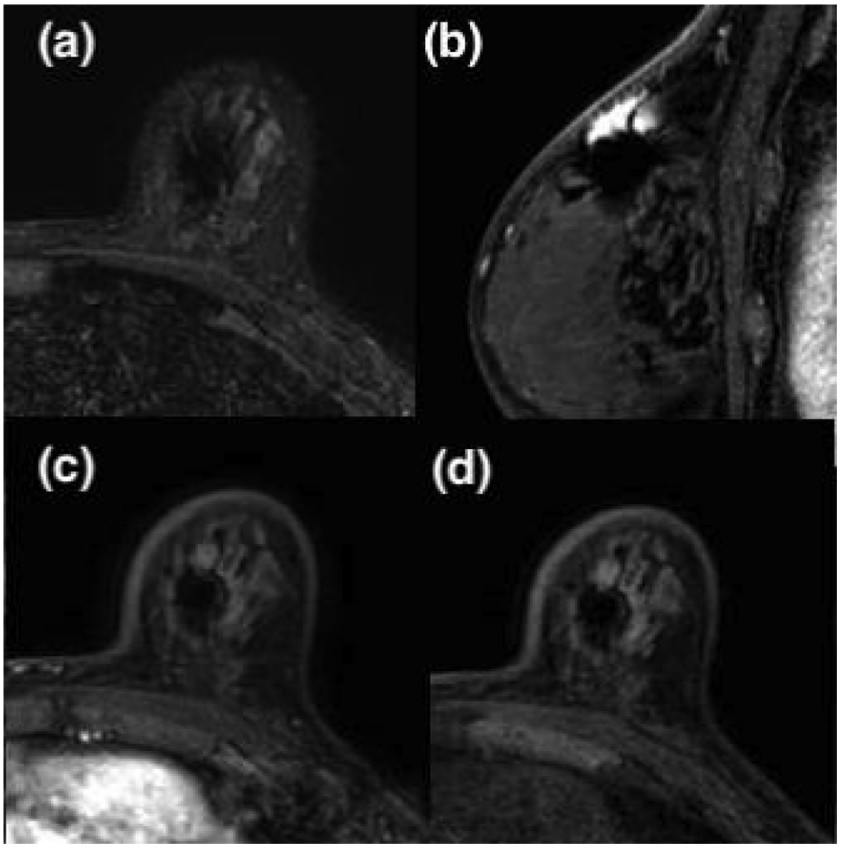

Fig. 6. MRI images of the tumor after neoadjuvant chemotherapy.
(a) T2-weighted image, (b) non-contrasted T1-weighted image with fat saturation, (c)(d) gadolinium-enhanced T1-weighted image with fat saturation 20 s and 85 s after contrast media injection showing strong susceptibility artifact.

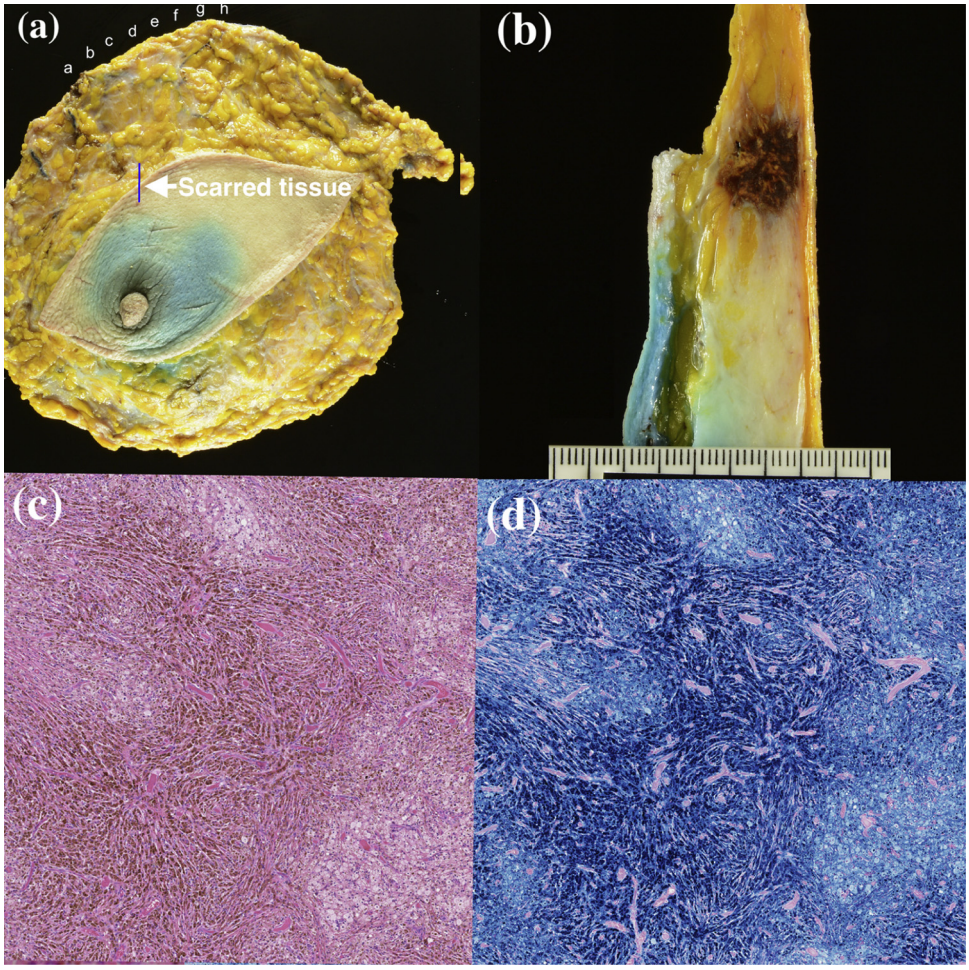

Fig. 7. Pathological findings of resected specimen.
(a) Macroscopic findings and (b) cut specimen showing spiculated rust-colored mass. (c) Histopathological findings and (d) Prussian blue iron stain showing blue massive hemosiderin deposition granules at interstitial space. The surgical specimen confirmed tumor pathological complete response. No calcifications were noted.

show various findings on mammography.

Response to chemotherapy is difficult to evaluate with non-invasive imaging modalities. In the present case, partial treatment response was presumed after a shrunk spiculated mass with calcification-like high density was observed on mammography. However, the final pathologic diagnosis revealed that complete response was achieved. Hemosiderin deposition was assumed as the cause for the high density observed on mammography due to the following reasons: the pathologic specimen showed large marked hemosiderin deposition; no calcifications were observed; and a large susceptibility artifact was observed on MRI. In the present case, the high density observed on mammography was more evident after neoadjuvant chemotherapy. We surmise that the reason for this was the massive hemosiderin deposition inside the shrunk tumor.

The true cause of hemosiderin deposition in this case is unknown. From previous reports, appearance of hemosiderin-laden macrophages is a normal reaction after chemotherapy [4,5]. However, large marked depositions as here reported are rare. We hypothesize two reasons for this: (i) occurrence of an intratumoral hemorrhage after biopsy; or (ii) tumor hypervascularity with occurrence of spontaneous intratumoral hemorrhage. Since the tumor increased after biopsy, the former reason may be more plausible. Furthermore, before chemotherapy, T2-weighted image showed a mass with strong hypointense rim. Nakashima et al. reported that hypointense rim on T2-weighted image in malignant tumors is mainly caused by hemosiderin deposition in tumor periphery [6]. This report supports the hypothesis that hemosiderin deposition was present before treatment.

Recognition that hemosiderin deposition presents with high density on mammography is important, because it can mimic calcification of benign breast tumors such as fibroadenomas and teratoma, or dystrophic calcification. When newly-appeared coarse calcification is observed, particularly in elderly women, dystrophic calcification normally caused by surgery or trauma is most likely. However, in absence of such triggers, tumors with hemosiderin deposition can be considered in differential diagnosis. Sato et al. reported a rare case of solid tubular carcinoma with large marked hemosiderin deposition resembling a mass with coarse calcifications [3]. Clue characteristics to diagnose this tumor as malignant were lacy, high-density calcification and strong intratumoral vascularity at ultrasonogram.

In conclusion, the present report shows that it is important to acknowledge that large marked hemosiderin depositions appear as calcification-like high density calcifications on mammography and as large susceptibility artifacts on MRI.

Declaration of Competing Interest

The authors have no conflicts of interest directly relevant to the content of this article.

Acknowledgements

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