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Teaching Case

Skin recurrence in the radiation treatment of breast cancer

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Clinical presentation

A 34 year old premenopausal, nulliparous, BRCA-negative woman was referred to our department after surgical excision and a pathological diagnosis of a breast cancer recurrence at the previous lymph node biopsy and lumpectomy scar. At age 30 years, the patient detected a small palpable mass in the left upper outer quadrant and was subsequently diagnosed with pT1bN0, Stage IA breast cancer. An ultrasound detected a hypoechoic nodule that measured $0.5 \times 0.6 \times 0.5$ cm^3 at the 2 o'clock axis, which was approximately 3 cm from the nipple. The initial ultrasound recorded the mass as BIRADS-4, for which a biopsy is recommended. Due to the density of both breasts, the mass appeared occult on the mammography. An ultrasound-guided core biopsy was performed and the test results revealed mixed, moderately differentiated, invasive, ductal and lobular carcinoma.

The patient underwent a left breast lumpectomy and sentinel lymph node biopsy in early 2013. The surgical pathology demonstrated a 1 cm, well differentiated, invasive, ductal carcinoma with negative margins (>0.5 cm) and no evidence of lymphovascular invasion. Intermediate-grade ductal carcinoma in situ of the solid type was present in 1 of 9 blocks. An immunohistochemistry showed estrogen-receptor positivity at 99%, progesterone receptor positivity at 99%, a Ki-67 of 10%, and HER2/Neu negativity at 1+.

The patient had a dense and relatively small breast. She was treated with hypofractionated radiation,[1] 4256 cGy in 16 fractions using 6 MV photon beam.[2-4] She was treated in the prone position. No boost was delivered because the 5-year outcomes of the institutional prone technique was comparable with that of standard treatment.[5] No bolus or other skin dose augmentation was used. Figure 1a shows the dose distribution with isodose lines. Figure 1b shows dose color wash, which appears to bring a bit more clarity for evaluation with a clearer skin dose representation and indicates that the skin dose was only 60% of the prescribed dose (Fig 1c). Figure 1d shows that the 90% prescription coverage begins at 0.5 cm from the skin surface. The patient received adjuvant tamoxifen as of March 2013 but did not receive chemotherapy.

Investigations/imaging findings

The patient was closely followed. Magnetic resonance imaging (MRI) was performed in 2014 and demonstrated a 0.6 cm area of subcutaneous enhancement that was contiguous with the postsurgical scar in the left breast and believed to represent postsurgical changes (Fig 2a). An ultrasound was performed in 2015 and showed a $1.0 \times 0.3 \times 0.8$ cm^3 oval mass with a circumscribed margin in the left-breast peri-areolar region at the site of the

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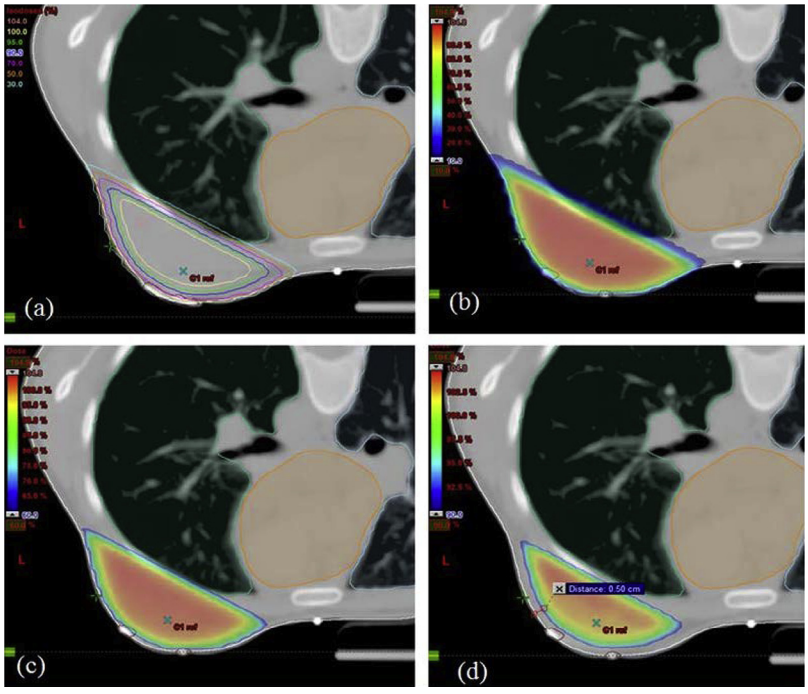

Figure 1 Original treatment plan of patient treated in 2013 for left breast in prone position. (A) Isodose distributions. (B) Color wash that indicates default setting. (C) Color wash that shows 60% coverage. (D) Color wash that shows 90% coverage 0.5 cm from the surface.

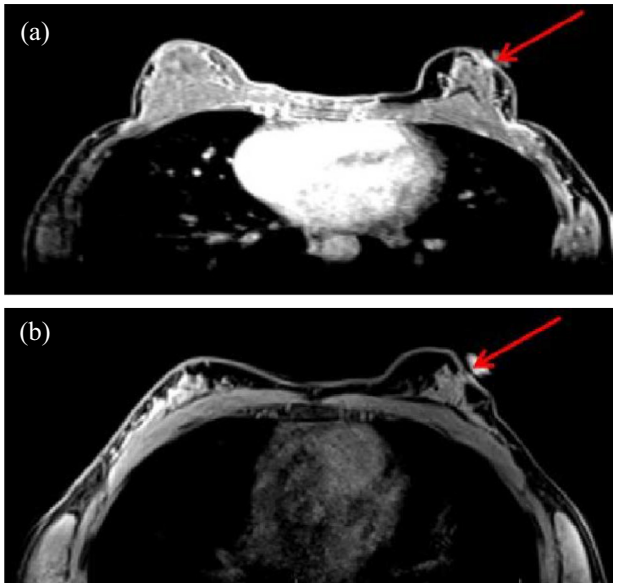

Figure 2 Magnetic resonance image of patient in 2014. Vitamin marker E overlies the left upper breast and shows the site of the prior lumpectomy. The red arrow (superimposed on vitamin E marker) indicates the area of subtle architectural distortion without abnormal enhancement. (B) Magnetic resonance image from 2016 with a 0.6 cm area of subcutaneous enhancement that is contiguous with the postsurgical scar.

patient's scar, which corresponds to the enhancement on prior MRI scans. These changes were thought to be most likely benign in nature; however, an MRI scan in 2016 confirmed the previous findings of the 0.6 cm area of subcutaneous enhancement contiguous with the postlumpectomy scar and again noted that it likely represents evolving postsurgical changes as shown in Figure 2b.

In September 2016, two superficial masses were palpated on the lateral aspect of the sentinel, lymph-node, biopsy incision as well as the lateral aspect of the prior breast surgery incision, which corresponds to the imaging abnormalities that were described on the prior ultrasound and MRI scan. A fine-needle aspiration at the sentinel, lymph-node biopsy incision showed metastatic adenocarcinoma that was morphologically consistent with the known breast primary.

Treatment

The patient subsequently underwent left breast lumpectomy, resection of the left axillary mass, and a sentinel lymph-node biopsy. The pathology of the left lumpectomy specimen demonstrated recurrent invasive ductal carcinoma that involved the dermis and superficial mammary parenchyma with invasive carcinoma that extended to the lateral margin and 0.1 cm from the superior margin. The left axillary incision revealed a 0.5 cm recurrent, invasive, ductal carcinoma that involved the dermis and subcutis. Two lymph nodes were removed and tested