MRI Features of Mucosa-Associated Lymphoid Tissue Lymphoma in the Breast

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xtranodal marginal zone B-cell lymphoma of mucosa-associated lymphoid tissue, or MALT lymphoma, is a non-Hodgkin’s lymphoma associated with chronic inflammation. It typically occurs in the gastric mucosa or the thyroid parenchyma, and is rarely reported in the breast [1]. Histologically, MALT lymphoma is characterized by heterogeneous small B-cells infiltrating the marginal zone of reactive lymphoid follicles and extending into epithelial tissues. Although usually indolent, this tumor can be locally aggressive and is treated with local radiation therapy and/or systemic chemotherapy [2]. Breast lymphomas may present as a palpable breast lump or as an irregular solitary mass discovered during a screening mammogram [3]. A few case reports have described the MRI appearance of primary breast non-Hodgkin’s lymphoma, but none to our knowledge have described MALT lymphoma [4, 5]. In this report, we present the MRI findings of MALT lymphoma arising in the breast.

Case Report

A 56-year-old woman with a strong family history of breast cancer enrolled in a clinical trial at our institution to evaluate the use of MRI for breast-cancer screening. Bilateral breast MRI examinations showed multiple nonspecific foci on contrast enhancement. Bilateral breast MRI examinations showed multiple nonspecific foci on contrast enhancement. Subsequent bilateral mammograms and left breast sonogram confirmed a hypoechoic oval 1.0-cm mass in the lower inner left breast possibly corresponding to one of the MRI findings, but did not detect the other lesions. Based on the imaging findings and the patient’s high risk for breast cancer, biopsy of a representative lesion was recommended. Given that an upper inner left breast lesion had the most worrisome MRI appearance (i.e., it was minimally spiculated) the patient underwent MRI-guided needle localized sampling of this lesion.

H and E-stained sections from the lesion showed a patchy lymphoid infiltrate composed of small to medium lymphocytes with slightly irregular nuclear outlines. On immunohistochemistry, these cells were CD20 positive, CD3 negative, and CD43 negative, consistent with MALT lymphoma.

Subsequent staging, including CT scans, bone-marrow biopsy, and gallium scan were negative. Since breast MALT lymphomas are frequently indolent and no signs of extramammary disease were seen, the patient decided on short-term follow-up as a treatment option. Five months after the original MRI scans, repeat bilateral MRI revealed interval progression of right breast lesions. The patient underwent MRI-guided wire localization and biopsy of the largest right breast lesion. H and E stains showed a similar lymphocytic infiltrate invading germinal centers as seen in the previous left breast biopsy, consistent with MALT lymphoma.

The patient decided on a treatment option of bilateral breast irradiation with 3,600 cGy. The patient did not have surgery or chemotherapy. Contrast-enhanced bilateral breast MRI after radiation showed complete resolution of the previous foci of enhancement and no evidence of residual disease or recurrence.

MRI Technique

Images were obtained on the EchoSpeed 1.5-T scanner (GE Healthcare) using a phased-array breast coil (MRI Devices). The sequences obtained included axial T1 large field of view (using a body coil); sagittal T2 fast spin-echo with chemical fat saturation; high-resolution 3D spectral-spatial excitation spoiled gradient echo with magnetization transfer (3DSSMT) before and after contrast enhancement; and T1 3D spoiled gradient echo spiral dynamic MRI every 10.6 sec, with water-selective spectral-spatial excitation repeated 20 times during the wash-in phase and

Supported by NIH grant CA66785.

Received December 3, 2003; accepted after revision September 9, 2004.

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AJR 2005;185:199–202
0361–803X/05/1851–199
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Fig. 1—56-year-old woman presenting with a typical region of MALT lymphoma on MRI. A–D, Sagittal T2-weighted fast spin-echo fat-suppressed MR image of right breast; (TR/TE 4,000/98, slice thickness 3 mm, slice spacing 3 mm; field of view 20 cm, acquisition matrix 256 × 192) shows ovoid 1.6 × 0.7 cm lesion (arrow) in upper breast, with slightly higher signal intensity than adjacent glandular tissue (A). Contrast-enhanced water-specific 3D gradient-echo image (centric 3D spectral-spatial excitation spoiled gradient echo with magnetization transfer [3DSSMT] after 0.1 mmol/kg IV of gadopentetate dimeglumine, TR/TE 31.3/8.73, slice thickness 1.5 mm, field of view 20 cm, matrix 512 × 192) revealed multiple foci of contrast enhancement, largest being 1.6 × 0.7 cm in upper outer quadrant (arrow) (B) that had increased in size and number since previous study 5 months earlier (not shown). Time signal-intensity curves from dynamic 3D spiral MRI (scans repeated every 10.6 sec; see reference [6] for scan parameter details) performed during initial contrast enhancement (“wash-in” phase) and after high-resolution 3DSSMT (“wash-out” phase) revealed rapid initial enhancement during wash-in phase followed by gradual enhancement during wash-out phase (C). MRI localized biopsy of upper breast lesion revealed dense lymphoid infiltrate composed of monomorphous small lymphocytes involving breast parenchyma and surrounding benign breast ducts (D) (H and E stain ×100). Histologic findings were same as MRI-guided biopsy of initial left breast lesion (not shown). (Fig. 1 continues on next page)
26 times during the wash-out phase of enhancement, as described in Agoston et al. [6]. Forty seconds after the start of the wash-in dynamic series, 0.1 mmol/kg of gadopentetate dimeglumine (Magnevist, Berlex) was injected as a bolus at 2.5 mL/sec via an antecubital vein through a power injector, followed by a saline flush.

**Imaging Findings**

The morphology of the abnormal areas of contrast enhancement on MRI was nonspecific. All had slightly irregular borders (Figs. 1A and 1B), except for the slightly spiculated left breast lesion that prompted the initial biopsy. No suspicious architectural features were seen, such as rim enhancement, enhancing septations, or skin thickening, nor were specifically benign features such as nonenhancing septations seen. Fat-saturated T2-weighted precontrast images of the lesions showed slightly higher signal intensity than surrounding glandular tissue, but not high enough to suggest a benign cause. On dynamic imaging, all foci of enhancement showed rapid initial enhancement during the wash-in phase followed by gradual sustained enhancement during the wash-out phase (Fig. 1C), a pattern that was not specific for malignancy. The typical microscopic appearance of the lesions with standard H and E staining is shown in Figure 1D. MRI images performed before and after bilateral whole breast irradiation showed complete resolution of all areas of abnormal contrast enhancement after treatment (Figs. 1E and 1F).

**Discussion**

The incidence of primary breast lymphoma is less than 0.6% of all breast malignancies [4]. Among the types of breast lymphomas, MALT lymphomas constitute a variable subgroup with frequencies ranging from 0% to 44% in the literature [2]. The 5-year survival rate for all primary breast lymphoma is 70% and the relapse-free rate is 42% [7]. MALT lymphomas tend to be indolent and have a good prognosis [2]. On mammography, primary breast lymphomas are reported as a unilateral diffuse involvement (25%), bilateral diffuse involvement (8.3%), or masses (soli-
tary, 58%; multiple unilateral masses, 8.3%), with irregular (50%), partially defined (37.5%), or well-defined borders [3]. They are usually mistaken for primary breast cancers since primary breast lymphomas are rare.

Using contrast-enhanced breast MRI, Dar- nell et al. [4] described a 6.0-cm well-circum-
scribed non-Hodgkin’s lymphoma in the outer upper breast, which was hyperintense on T2 images, isointense on T1 images, and showed a strong and rapid enhancement, reaching four-fifths of its peak enhancement within 3 minutes of contrast injection on 3D dynamic images [4]. Demirkazik [5] describes the MRI findings of recurrent breast lymphoma after local excision and chemotherapy showing multiple well-defined rapidly enhancing, hy-
pointense (T1-weighted) masses, the largest being 2.0 × 1.0 cm, consistent with findings on mammography and sonography. Stoutjesdijk et al. [8] describe a case series comparing MRI with mammography for detecting early cancer in women with a hereditary risk for breast can-
cer. Among the subjects, one patient with MALT lymphoma was detected with MRI but not with mammography. The authors do not comment on the extent or MRI features of this lesion.

Our case report is the first to our knowl-
edge to describe the breast MRI features of bi-
lateral breast MALT lymphoma at primary diagnosis, progression, and after treatment. In our case, primary breast MALT lymphoma
presented as nonspecific irregular enhancing foci on 3DSSMT postcontrast images, isointense on T1-weighted images, and hyperintense on T2-weighted images. The lesions displayed a relatively brisk initial enhancement during the wash-in phase of dynamic imaging, an enhancement pattern similar to that described in previous case reports of non-MALT-type lymphomas [4, 5]. However, in our case, the extent of breast abnormality and the presence of extensive bilateral disease were clearly shown by MRI, while only a single lesion in one breast was seen by sonography and mammography. When comparing therapy MRI scans before and after irradiation, complete resolution of the lower inner quadrant focus of lymphoma occurred. Given these findings, MRI may be useful to detect and stage multifocal breast MALT lymphoma that might be underrepresented on mammography and sonography. Moreover, MRI may be useful to monitor the progression of the MALT lymphoma and its response to irradiation or chemotherapy.

In our case, the diagnosis was established by preoperative needle localization and surgical excision biopsy. Given advances in MRI-guided core biopsy, it is possible that future diagnoses of lymphoma may be established by this method rather than surgery.

Acknowledgment
The authors thank Daniel Margolis for his assistance in the preparation of the figures.

References