Radiologic Features of Granulomatous Mastitis

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Abstract: Granulomatous mastitis (GM) is a recognized, but an uncommon cause of breast mass. Awareness of this condition is important, because it can clinically as well as radiologically mimic breast carcinoma. In this study, we present the imaging features of a series of 10 cases with proved diagnosis of granulomatous mastitis with emphasis on magnetic resonance (MR) findings. All those patients who were histologically proven to have GM of the breast were analyzed. Their files were reviewed and data recorded for demographic, clinical presentation and imaging appearances. The imaging features of the lesions by mammography, ultrasound, and magnetic resonance imaging were analyzed. Of the 305 patients who were surgically treated, 10 (3%) cases proved to have GM. All the patients were females with age ranging from 27 to 53 years (average 38 years and median age 36 years). Guided core biopsy was performed in all cases for confirmation of diagnosis followed by either excision biopsy (in five cases) or lumpectomy (in five cases). The final histopathologic results were chronic granulomatous inflammation consistent with tuberculosis in four cases and GM with acute inflammation, but unknown etiology in four cases and GM due to duct ectasia in two cases. GM, a rare breast condition, should be considered in the differential diagnosis of patients with a breast mass associated with inflammatory change. Routine breast imaging with US, MG, or MRI, the condition from malignant lesions and biopsy, still remains the only method of definite diagnosis.

Key Words: granulomatous mastitis, idiopathic granulomatous mastitis (IGM), inflammatory breast carcinoma, MRI breast, TB

PATIENTS AND METHODS

Between 2004 and 2009, 305 patients were surgically treated for breast disorders at Al-Amiri hospital, Kuwait. Those patients with histologically proven GM were analyzed. Their files were reviewed and data recorded for demographic, clinical presentation and imaging appearances. The imaging features of the lesions by mammography (MG), ultrasound (US) and magnetic resonance imaging (MRI) were analyzed. The images were retrieved from our PACS (Agfa, Impax 4, Belgium) and retrospectively analyzed. The mammograms were performed on the digital mammography (Lorad, Selenia) system. Two views (craniocaudal and medio-lateral oblique) were obtained in all cases with additional views when required. Ultrasonography was performed on a high-resolution scanner (Phillips, Invisor) with 7–10 MHz linear transducer. MR imaging was done on 1.5T closed magnet (GE Excite, SC, USA) using a dedicated 4-channel breast coil. The following MR sequences were obtained: Axial T1W 3D SPGR volume images (slice thickness 4 mm, 44 loc per slab,
FOV 30, matrix 416X256, NEX 1, flip angle 35, bandwidth 41.67) and Sagittal fat saturated T2W 2D FRFSE images (slice thickness 5 mm, space 1 mm, FOV 36, matrix 320x224, NEX 3, TE 85, TR 5625, echo train length 16, Bandwidth 22.73) are obtained prior to contrast injection. Either Sagittal or axial fat saturated T1W high-resolution 3D SPGR dynamic images using vibrant software (slice thickness 4 mm, 66 loc per slab, matrix 256x160, NEX 1, flip angle 12, bandwidth 31.25, phase, ZIP 2 with effective slice thickness of 2.0 mm) are then obtained with a scan time that should not exceed 60 seconds per scan. Seven acquisitions of both breasts are obtained simultaneously. The first acquisition is obtained before contrast is injected and is used as a mask, and the other six acquisitions are obtained following contrast injection. The post contrast acquisitions should be finished within 6 minutes. The contrast used is 0.1 mmol/kg of gadolinium-DTPA (Ominscan) intravenously, usually injected as a bolus using an automatic injector at a rate of 2mL/sec, and is followed by 20 cc saline flush. The last sequence obtained post contrast is a high T1W spatial resolution sequence; axial 3D SPGR volume fat saturated T1 (slice thickness 4 mm, 44 loc per slab, FOV 30, matrix 416X256, NEX 1, flip angle 35, bandwidth 41.67) which is done at almost 7–8 minutes post contrast.

Following imaging, guided core biopsy was performed in all cases for confirmation of diagnosis.

RESULTS

Of the 305 patients who were surgically treated, 10 (3%) patients proved to have GM. All these patients were females. The age range at presentation was 27–53 years (average 38 years and median age 36 years). Eight patients were from the Middle East (Kuwaitis) and two were Asians (one each from Srilanka and India).

Table 1. Clinical Presentation of Patients

| Symptoms                      | No. of patients |
|-------------------------------|-----------------|
| Breast pain                   | 10 (1- to 4-week duration) |
| Tenderness                    | 7               |
| Palpable lump                 | 10 (in two cases, lump was mobile) |
| Axillary lymphadenopathy      | 6               |
| Skin thickening               | 6               |
| Bilateral disease             | 1               |

The clinical presentation of the patients is summarized in Table 1. There was no nipple change or nipple discharge in any of the patients.

Based on the clinical features, an inflammatory breast condition was considered in all 10 patients and these patients were given a course of antibiotics (Intravenous Pipercillin and Tazobactam [Tazocin]) 4.5 gm three times daily. None of the patients responded to the antibiotic treatment following which the patients were referred for imaging with provisional diagnosis of inflammatory carcinoma. Mammography, ultrasound, and MRI examination was performed in seven patients. In two patients, only MG and US was done, and in one, only US was done (age 27 years) because they presented with ultrasonic features of abscess. In the seven patients, the imaging features suggested carcinoma of breast and these patients were subjected to US or MRI guided core biopsy. This was followed by either excision biopsy (in four cases) or lumpectomy (in three cases) because the imaging findings were highly suspicious of malignancy. In the other three cases in which only mammography and ultrasound were performed, the ultrasound features suggested breast abscess. These patients were subjected to guided aspiration, which revealed suppurative inflammation with granulomatous reaction. The imaging features of the patients are summarized in Table 2.

The final histopathologic results were chronic granulomatous inflammation consistent with tuberculosis.

Table 2. Radiologic Findings Identified by Ultrasound (US), Mammogram (MG), and Magnetic Resonance Imaging (MRI) of the Breast for the Cases Included in the Study

| Findings                        | No. |
|---------------------------------|-----|
| Ultrasound (n = 11)             |     |
| Heterogamous parenchyma         | 6   |
| Focal mass                      | 8   |
| Abscess                         | 3   |
| Skin thickening by US           | 6   |
| Mammography (n = 9)             |     |
| Dense parenchyma                | 6   |
| Focal mass                      | 4   |
| Skin thickening                 | 4   |
| MRI (n = 8)                     |     |
| Nonmass enhancement             | 4   |
| Focal mass                      | 4   |
| Type of enhancement curve       |     |
| II                              | 2   |
| II–III                          | 1   |
| III                             | 5   |
| Extension to the chest wall     | 2   |
in five cases and granulomatous mastitis with acute inflammation, but unknown etiology in three cases, and granulomatous inflammation due to duct ectasia in two cases. Surgical excision of the lesion was done in all the cases with antituberculosis chemotherapy given to the relevant patients.

**DISCUSSION**

GM is a rare inflammatory disease of the breast characterized by granulomas and abscess formation. To date, only about 120 cases have been reported in literature, the largest series of 14 cases reported by Ahmed et al. (4). It is reported to represent between 0.025% and 3% of all the breast diseases treated surgically (1,2,4). In this study, the disease represented 3% of the breast conditions.

In most reported cases, the disease is unilateral and generally occurs in young parous women <50 years of age who usually present during lactation or within 6 years of pregnancy. In our series also, the age of all the patients, except in one case, was <50 years, whereas the disease was bilateral in one case.

The disease is difficult to differentiate from carcinoma, both clinically as well as by imaging, as both conditions are reported to present overlapping features of malignancy (5–8). Clinically, these patients may present with one or more of the findings like breast mass with or without skin changes like “peau d’orange” skin, ulceration, and nipple inversion (5,6). Regional lymphadenopathy is reported in >50% of cases (5,6). We noted regional lymphadenopathy in 60% of our cases. In a study done by Jorgensen et al. (6), in >50% of the reported cases, the initial diagnosis was considered malignant or suspicious for breast carcinoma.

In our series, although initially we were suspicious of some inflammatory breast disease, failure to respond to treatment made us to suspect breast carcinoma in all the cases. In one case, ductal carcinoma in situ was suspected based on MRI, and MR guided biopsy proved the diagnosis to be GM due to duct ectasia. Bilateral disease was found in one case in our study, which is considered to be a rare phenomenon as reported by other investigators (4,9).

The etiology of this condition can be unknown, in which case it is also referred to as idiopathic granulomatous mastitis (IGM), originally described by Kessler and Wolloch in 1972 (5). Of the infective causes, mycobacterium tuberculosis is thought to be the most common cause, even though the organism may not be identified. In a series by Ahmed et al. (4), in only five of the 14 cases, the mycobacterium was isolated, but all their patients improved on antituberculosis treatment. In our series, tubercle bacilli were isolated in five cases, whereas in the other five cases only granulomas were noted on histology. Other reported causes of GM include fungal infections, actinomycosis, histoplasmosis and brucellosis, Wegener granulomatosis and sarcoidosis [2,3].

The clinical presentation, imaging features, and the cytological findings are often unable to resolve the differential diagnosis of inflammatory process and malignancy. The imaging findings of GM are not well documented and often mimic breast carcinoma. Mammographic examination may show a mass with definable margin in a fatty breast, whereas in patients with dense breast parenchyma, mammography may show an asymmetrically increased parenchymal density (Fig. 1), but no specific breast mass (10,11). Like others (10,11) our series showed an ill-defined dense heterogeneous parenchyma in all cases. An associated speculated focal mass (Fig. 1) was seen in four cases, one of these with extension to the chest wall. Skin thickening with subareolar involvement was noted in three cases. None of the cases had microcalcifications.

A number of reports on US features of the disease have been published, essentially describing the disease as a large mass or multiple small ill-defined masses, inhomogeneous and hypoechogenic in nature with or without a distinct margin (11). The Doppler ultrasound examination is shown to reveal increased vascularity of the lesions and the surrounding tissue (10,12,13). US may sometimes be useful in differentiating TB from carcinoma appearing as a heterogeneous hypoechogenic lesion, with irregular margins, posterior acoustic enhancement, and mobile internal echoes suggesting an abscess (8). Like others (10,13), the US features in our cases also showed heterogeneous parenchymal distortion and discrete complex irregular hypoechogenic masses with or without acoustic shadowing. In addition, three patients in our series showed features of breast abscesses.

On MRI, these lesions are reported to be indistinguishable from malignancy. Like malignant lesions, these lesions are reported to appear as enhancing focal heterogeneous masses with irregular margins (7,11). Dynamic contrast-enhanced MRI by virtue of its ability to reveal the vascular nature of the lesion, can
Figure 1. A 27-year-old woman. A RT and a LT. On medio-lateral mammogram of both breasts, a focal asymmetrical density with indistinct margins in the outer quadrant of the right breast is seen. (b) Precontrast and (c) dynamic contrast-enhanced MR shows the irregular nonmass enhancement with heterogeneous and ring patterns. (d) Type III enhancement curve is seen on time intensity curve. Histopathology proven to be TB.
discriminate benign neoplastic lesions from malignant lesions (10,11), but it cannot discriminate between a malignant lesion and an inflammatory lesion (14). It has been shown that on dynamic breast MRI, enhancement curves demonstrated variations not only from patient to patient but also from lesion to lesion in the same patient (10,11,14). This is attributed to different stages of inflammation and the presence of focal abscesses. In our study too, the enhancement curves were nonspecific and differed from lesion to lesion, revealing type II–III enhancement. The most frequent MR imaging pattern noticed in our study was heterogeneously enhancing ill-defined masses or nodules (Fig. 2) skin thickening, and edema.

CONCLUSION

Granulomatous mastitis, a rare breast condition should be considered in the differential diagnosis of patients with a breast mass associated with inflammatory change. Magnetic resonance imaging in addition to the routine breast imaging can help to distinguish benign inflammatory breast disorders from malignant lesions, but biopsy still remains the only method of definite diagnosis. In view of the possible link with TB as observed by Ahmed et al. (4), course of anti-TB treatment should be considered in these patients.

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