Value of US imaging following mastectomy

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Materials and methods

Our patient population included 251 post-mastectomy patients with 505 unilateral mammograms over a 5 year period. All patients underwent US of the residual breast and mastectomy site. The mean patient age was 56.88 years (range: 30-86 years). The mean number of mammogram per patients was 2 (range: 1-5). The mean time interval between mastectomy and examination was 7.5 years (range: 1-15 years) with a standard deviation of 4.8 years. All US examinations were performed on a Logic 500 unit (General Electric Medical Systems, Milwaukee, USA) using a 7-11 MHz linear transducer. The imaging and clinical charts of all patients were reviewed. The following were recorded:

a) indication for the examination (screening, palpable nodule, tenderness, etc.);
b) initial treatment of the patient: type of mastectomy, adjuvant treatment, TNM stage and Scarff-Bloom-Richardson (SBR) grade;
c) for lesions at the mastectomy site: features of the lesion (cystic, cyst with thick fluid, well-defined hypoechoic, macro-

The purpose of our retrospective study is to determine the value of routine US follow-up at the mastectomy site at the time of mammography of the contralateral breast.

lobulated or microlobulated, suggesting of node, edema, etc.). The long axis diameter of the lesion and its orientation relative to skin. The short axis diameter of the lesion and ratio with the long axis diameter. The presence of echogenic foci suggesting calcifications;

- BIRADS classification at the mastectomy site based on US. Because no specific guidelines are available for lesions in that location, we have elected to use the following criteria with regards to the risk of malignancy in light of our own experience and data from the literature (2, 3):
  - BIRADS 1: normal appearance or modest edema;
  - BIRADS 2: prominent edema or cystic lesion (fig. 1);
  - BIRADS 3: well-defined oval shaped hypoechoic lesion with echogenic center suggesting a node or sufficiently hypoechoic to suggest a cyst with slightly echogenic fluid (fig. 2);
  - BIRADS 4: well-defined hypoechoic lesion with or without macrolobulation (fig. 3);
  - BIRADS 5: hypoechoic lesion with ill-defined or microlobulated margin, or suspicious node with small fatty sinus and/or non-oval shape (long axis to short axis < 2);

- the BIRADS classification for the contralateral residual breast based on mammography and US, according to standard published guidelines.

Lesions were classified as malignant or benign based on BIRADS guidelines:

A lesion is malignant if detected within a year from cancer with biopsy proof (histology or cytology).

A lesion is considered benign in the absence of biopsy proven cancer in the following year (benign biopsy with follow-up or follow-up only).

**Results**

Patients were divided based on the BIRADS classification at the mastectomy site (table I). Chest wall US was always normal in 220 patients (BIRADS 1). Fourteen patients had at least one exam classified BIRADS 2, 6 patients had at least one exam classified BIRADS 3, and 11 patients had at least one exam classified BIRADS 4. No patients was classified BIRADS 5 on US.

**BIRADS 1:** Two hundred and twenty patients were classified BIRADS 1; 5 were lost to follow-up and 215 had a final benign diagnosis.

**BIRADS 2:** Fourteen patients were classified BIRADS 2; 6 were lost to follow-up and 8 had an uneventful follow-up.

**BIRADS 3:** Six patients were classified BIRADS 3; 3 were lost to follow up and no local or regional recurrence was detected at follow-up for the remaining three.

**BIRADS 4:** Eleven patients were classified BIRADS 4; one was lost to follow-up. The lesion was benign in 3 cases, based on follow-up in 2 cases and surgery in 1 case. The lesion was malignant in 7 cases based on surgery; only one of these lesions had been palpated prospectively prior to US, whereas all were retrospectively palpable.

All 11 lesions were well-defined and oval-shaped with lonx axis parallel to the skin.

Four showed regular macrolobulations (three malignant and one benign).

All lesions were located underneath the surgical scar, except for the patient lost to follow-up where the lesion was 3 cm away from the scar.

In one case of benign lesion, the initial lesion was a high grade carcinoma in situ treated by modified radical mastectomy with lymph node dissection without adjuvant treatment. For the other two cases of benign lesion, the initial lesion was a stage II invasive ductal carcinoma with SBR II/III; the patients were treated by modified radical mastectomy with lymph node dissection and chemotherapy, with additional hormonotherapy and radiotherapy in one case.

The initial tumors in the 7 patients with malignant lesion were a stage I mucin-
nous ductal carcinoma in 1 case, and invasive ductal carcinoma SBR III/III (stage II to IV, median stage III) in six cases. All patients were treated by modified radical mastectomy with lymph node dissection, radiotherapy, chemotherapy and hormonotherapy, except for one patient who did not undergo radiotherapy and one patient who did not receive chemotherapy or hormonotherapy.

Not all clinical data was available to the radiologist at the time of examination. The time interval between mastectomy and detection of the lesion at the mastectomy site ranged between 1 and 7 years for malignant lesions (mean: 3.29 years) and 2 and 6 years for benign lesions (mean: 4 years). The mean age of patients at the time of mastectomy was 50 years (range: 29-71 years) for malignant lesions and 58 years (range: 55-61 years) for benign lesions.

Additional US data (long axis, long axis/short axis ratio, orientation, calcifications)

For the seven BIRADS 4 lesions that were diagnosed as malignant, the long axis diameter ranged from 4 to 22 mm with a mean of 12 mm and a median of 10 mm. The long axis to short axis ratio, when available, ranged between 1.40 and 2.83, with a mean of 2.03.

For the six BIRADS 4 or BIRADS 3 lesions that were diagnosed as benign, the long axis diameter ranged from 5 to 15 mm with a mean of 8.42 mm and a median of 7.75 mm. The long axis to short axis ratio, when available, ranged between 1.79 and 4, with a mean of 2.94. For the six cystic BIRADS 2 lesions that were diagnosed as benign, the long axis diameter ranged from 5 to 50 mm with a mean of 17.50 mm and a median of 7 mm. The long axis to short axis ratio, when available, ranged between 1.75 and 5, with a mean of 3.19.

In the cases above, the long axis of the lesion was parallel to skin. No lesion demonstrated echogenic foci to suggest calcification.

Contralateral residual breast

Three malignant lesions were detected in the contralateral breast. Two lesions classified BIRADS 4, including a palpable lesion, were associated with normal US of the mastectomy site (BIRADS 1). The third one, classified BIRADS 5, palpable, was associated with a 4 mm non-palpable malignant lesion at the mastectomy site, classified BIRADS 4.

Discussion

This is the first study to evaluate routine systematic US at the mastectomy site. A study published in 1993 (4) had shown that clinical examination was superior to mammography in the detection of recurrent tumor at the mastectomy site, which is understandable since it is difficult to perform mammography in these circumstances and to include a small tumor in the radiographed tissue. Ultrasound is much more adapted to this clinical situation.

From the 251 patients included in the study, 220 patients always had a normal US examination at the mastectomy site and were classified BIRADS 1. Fourteen patients showed benign changes such as marked edema or anechoic cystic lesions and were classified BIRADS 2. Six patients had lesions that were probably benign such as a benign node or cyst with mildly echogenic content. All six were classified BIRADS 3; none of these lesions was malignant. Eleven patients had indeterminate well-defined hypoechoic lesions. This type of lesion (well-defined hypoechoic) is generally considered benign in normal breasts without history of surgery and is classified BIRADS 3, with probability of malignancy less than 2%. However, studies evaluating US features of recurrent malignancy after mastectomy (2, 3) and our results indicate that this appearance is typical of recurrent tumor after mastectomy and that ill-defined lesions are rare (none in our series). Lesions with these imaging features have a positive predictive value...
of 70% and are thus classified BIRADS 4 (fig. 3 and 4).

Current guidelines recommend clinical follow-up at the mastectomy site, with imaging only performed as a second line measure. An argument supporting this approach is that all seven malignant lesions detected in this study were, in retrospect, palpable. However, only one was prospectively palpated, and detection of the other six would probably have been delayed if the lesion had not been detected on US. The lack of prospective detection of these lesions at palpation may be due to two reasons. First, patients frequently present for follow-up mammography and US before they are seen by their physician. Second, clinical evaluation of the mastectomy site may be difficult. The scar and surrounding tissues must be examined. It may be difficult to distinguish between fat lobule, deformity due to the scar, or induration from a rib. Systematic examination by the radiologist with US and palpation allows differentiation between true lesions and pseudonodules.

With regards to characterization of BIRADS 4 lesions, some morphological US and clinical features, detailed below, may suggest a malignant or benign lesion, but cytology or histology is required in all cases. With regards to US findings, all lesions at the site of mastectomy, whether benign or malignant, had their long axis parallel to the skin and well-defined margins. There was much overlap for lesion size, with a median diameter of 10 mm for malignant lesions versus 7.75 mm and 7 mm respectively for benign hypoechoic and anechoic lesions. The mean long axis to short axis ratio for malignant lesions was 2 compared to 3 for benign lesions, with some overlap. Four lesions showed regular macrolobulations (3/7 malignant and 1/3 benign).

With regards to clinical data, the stage and SBR grade of the initial lesion, not available to the radiologist at the time of examination, tended to be higher for recurrent tumors, whereas mean patient age was younger, with some overlap. This confirms the difficulty in differentiating benign and malignant for well-defined lesions and the need to classify them as BIRADS 4 lesions.

This study has multiple limitations. It is spread over a relatively short time period (5 years) with regards to follow-up of patients after mastectomy. The number of exam per patient is variable, ranging between 1 and 5 with a mean of 2 and median of 1. This is because patients present at variable time intervals for their follow-up exams, and some patients go to other facilities for follow-up.

In spite of these pitfalls, of which we are well aware, our results tend to strongly indicate that routine systematic US evaluation of the mastectomy site, at the time of follow-up imaging of the residual contralateral breast, appears necessary, and should be performed even if not formally requested by the treating physician. The radiologist would then be in a position to first detect local tumor recurrence thus allowing early treatment with impact on prognosis. Indeed, local tumor recurrence at the mastectomy site does not always imply the presence of systemic or metastatic disease. Several studies have demonstrated that a number of patients will remain in complete remission at 5 and 10 years (5, 6).

In conclusion, routine systematic US evaluation of the mastectomy site at the time of mammographic follow-up of the residual contralateral breast would allow early detection and management of local tumor recurrence.

References