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The role of fine-wire localization breast biopsy in the management of BI-RADS category 3-5 non-palpable breast lesions in northeastern Chinese women

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ABSTRACT

A blinded retrospective validation study was performed in a university-based hospital in northeastern China to determine whether the breast imaging reporting and data system (BI-RADS) defines a group of patients with non-palpable breast lesions (NPBLs) in whom fine-wire localization biopsy (FWLB) is appropriate. We reviewed 182 consecutive patients with NPBLs who underwent FWLB. The patients' preoperative mammograms were categorized according BI-RADS by 2 radiologists blinded to the pathological findings. The positive predictive values of BI-RADS categories 3-5 were 3.4%, 42.1%, and 76.9%, respectively. For category 4 NPBLs, the percentage of cancer for those aged < 40 years was significantly lower than those aged ≥ 40 years. For category 3 NPBLs, the percentage of precancerous lesions for those aged < 40 years was significantly lower than those aged ≥ 40 years. Chinese NPBL patients aged ≥ 40 years with category 4 mammographic findings, and all patients with category 5 findings should undergo FWLB. FWLB should be offered as a treatment option for Chinese NPBL patients aged < 40 years with category 4 findings or aged ≥ 40 years with category 3 findings.

Keywords: Non-Palpable Breast Lesions; Mammography; Fine-Wire Localization Biopsy

1. INTRODUCTION

Screening mammography has been shown to reduce breast cancer mortality [1-3]. Unfortunately, traditional mammography has a low positive predictive value (PPV) for breast cancer [4], and thus many women with benign breast lesions undergo open surgical biopsy. In this context, the Breast Imaging Reporting and Data System (BI-RADS) classification scheme was developed by the American College of Radiology to improve mammographic reporting through the use of standardized descriptive terms [5]. An important goal of BI-RADS is to provide a clear management recommendation for women with nonpalpable breast lesions (NPBLs). BI-RADS also offers specific PPV for each category of mammographic lesions and therefore is useful not only for discriminating many benign from malignant lesions but also for potentially reducing the number of unnecessary open breast biopsies performed. We retrospectively evaluated the mammograms of 182 consecutive women who underwent fine-wire localization breast biopsy (FWLB) of NPBLs in a tertiary referral cancer center in northeastern China to investigate whether the fourth edition of BI-RADS [5] is appropriate for patients in northeastern China with NPBLs and identify the BI-RADS-identified patient subgroups appropriate for FWLB.

2. MATERIALS AND METHODS

In adherence to a research protocol approved by the Institutional Review Board and institutional guidelines for ethical human research, we retrospectively reviewed the mammograms, histopathology and medical records of 182 consecutive women with NPBL who underwent FWLB between January 1, 2005 and March 1, 2008 at an affiliated hospital of China Medical University in Liaoning Province of northeastern China. Fine wire localization was guided mammographically. Two trained radiologists [L.Z. and S.L.], who were blinded to the patients' histopathologic diagnoses, categorized the patients' lesions using the fourth edition of BI-RADS. [5]

Histopathological results of FWLB were used as the gold standard to calculate the positive predictive values (PPVs) of malignancy. The PPV for each BI-RADS category was calculated by dividing the number of malignant cases on histopathological examination by the total number of patients who underwent FWLB in that BI-RADS category. All data were analyzed with SPSS statistics software (Version 13.0, SPSS, Inc., Chicago, IL, USA). We used Fisher's exact text for to compare ratios. We considered a *P* value less than 0.05 to be statistically significant.

3. RESULTS

182 consecutive cases were reviewed. The patients' mean age was 45.6 years [range, 24-76 years; standard deviation (SD) = 9.5 years]. According to the histopathologic diagnosis, 40 patients (22%) had malignant lesions and 142 (78%) had benign lesions (**Table 1**). The mean age of patients with malignant lesions was 48.3 years (range, 30-76 years; SD = 8.8 years), and the mean age of the patients with benign lesions was 45.6 years (range, 24-67 years; SD = 9.5 years). The radiologists identified 118 BI-RADS category 3 lesions (65%), 38 category 4 lesions (21%), and 26 category 5 lesions (14%). Four category 3 lesions, 16 category 4 lesions, and 20 category 5 lesions were malignant based on histopathology. The PPVs were 3.4%, 42.1% and 76.9% for category 3, 4, and 5 lesions, respectively (**Table 2**). Among patients with category 4 lesions, the cancer PPV for those aged < 40 years was significantly lower than that for those aged ≥ 40 years (P = 0.02; **Table 3**). Among patients with category 3 lesions, 20 (*i.e.*, 17%) had precancerous lesions on histopathology, and when these patients were subdivided by age < 40 years and ≥ 40 years, the difference in the rate of precancerous lesions between the two age groups was significant (P = 0.002; **Table 4**).

Table 1. Histopathologic diagnoses for 182 patients who underwent fine-wire localization biopsy for nonpalpable breast lesions.

Diagnosis	Number of patients (%)
Benign (n = 142)	
Mastopathy	96 (67.6)
Fibroadenoma	20 (14.1)
Sclerosing adenosis	2 (1.4)
Lymph node	2 (1.4)
Atypical ductal hyperplasia (precancerous)	20 (14.1)
Malignant (n = 40)	
Ductal carcinoma in situ	22 (55)
Infiltrating ductal carcinoma	18 (45)

Table 2. Positive predictive values for cancer of BI-RADS categories in the diagnosis of nonpalpable breast lesions.

BI-RADS category	Histopathologic diagnosis*		PPV
	Malignant	Benign	
3	4	114	3.4%
4	16	22	42.1%
5	20	6	76.9%
Total	40	142	22.0%

* Data are in numbers of patients.

Table 3. Relationship between the patients' age and the percentage of malignancy in BI-RADS category 4 nonpalpable breast lesions.

Age	Ratio of cancer to the total number of cases in the subgroup	Percentage of cancer *
< 40 years	2/16	12.5%
≥ 40 years	14/22	63.6%
Total	16/38	42.1%

* P = 0.002, Fisher's exact test

Table 4. Relationship between the patients' age and the percentage of precancerous lesions in BI-RADS category 3 nonpalpable breast lesions.

Age	Ratio of precancerous lesions to the total number of cases in the subgroup	Percentage of precancerous lesions *
< 40 years	2/48	4.2%
≥ 40 years	18/70	25.7%
Total	20/118	16.9%

* P = 0.02, Fisher's exact test

4. DISCUSSION

In our study of patients with NPBLs who underwent FWLB, the PPVs for category 3, 4 and 5 lesions were 3.4%, 42.1%, and 76.9%, respectively. For comparison, a retrospective Pakistani study reported PPVs of 5% for category 3 lesions, 34% for category 4 lesions and 83% for category 5 lesions [6]. A retrospective Singaporean study reported PPVs of 27% for category 4 lesions and 84% for category 5 lesions [7]. In a U.S. prospective study of mammographically detected NPBLs that were biopsied surgically, carcinomas were present in 34% of category 4 lesions and in 81% of category 5 lesions [8]. Therefore, our results are in agreement with published results from various geographic and ethnic backgrounds, and the BI-RADS classification is appropriate for women with NPBLs in northeastern China.

As a screening tool, traditional mammography provides high-sensitivity and low specificity for identifying breast cancer [9]. By providing distinct PPVs for each final assessment category, BI-RADS [5] offers a probability of carcinoma for each category of mammographic

findings. Category 5 lesions must be biopsied and treated. Categoreis 1 and 2 lesions do not require biopsy or surgical intervention. Category 3 and 4 lesions are in the grey zone where the ideal management strategy is controversial. Given the low probability of malignancy in category 3 and 4 and the imperative to limit the morbidity associated with cancer screening, a conservative and minimally invasive approach in certain subgroups within these 2 BI-RADS categories may be appropriate. For discrete lesions with category 3 mammographic findings, a stepwise approach of fine needle aspiration biopsy (FNAB) followed by core biopsy if FNAB is nondiagnostic would reduce the proportion of cases requiring surgical biopsy [9]. Core needle biopsy is highly accurate and safe in the diagnosis of mammographically detected breast lesions [10]. Close periodic mammographic surveillance is also an alternative way to manage NPBLs that are probably benign based on mammographic findings [11]. Among patients with category 4 lesions in our Asian population, the cancer PPV for those aged < 40 years was 12.5% compared with 63.6% for those aged ≥ 40 years (**Table 3**). A Canadian study recommended that stereotactic core needle biopsy should be applied to BI-RADS categories 3 and 4 patients who are < 50 years of age, and FWLB should be reserved for category 4 (> 50 years of age) and category 5 cases. However, this recommendation was partially based on an unusually low rate of malignancy in category 3 lesions (0%) which might be due to a small sample size of category 3 patients (10 cases) in this study [12].

FWLB is more invasive than FNAB and core biopsy, but FWLB is an accurate technique for diagnosis of mammographically-detected NPBLs, and may also be therapeutic for the NPBLs that are malignant or precancerous. In our study of women in northeastern China, there was a significantly higher incidence of precancerous lesions in category 3 patients aged ≥ 40 years than in those aged < 40 years. Taking into account other factors, such as patient anxiety, patient preference, and future breast cancer risk, surgeons may recommend for patients aged ≥ 40 years with category 3 lesions to undergo FWLB and for patients aged < 40 years with category 3 lesions to undergo stereotactic core needle biopsy.

There are many differences between breast cancer patients in Asia and those in Western countries. Compared with Caucasians, the incidence of breast cancer and the mortality from breast cancer are lower, and the age of peak incidence is younger in Asian women. The median age at diagnosis is 62 years for Swedish patients while the median age at diagnosis is 50 years for Singaporean patients [13]. With striking similarity to the Singaporean patients, the median age at diagnosis of breast cancer is 49.5 years for Taiwanese women [14]. These differences in incidence, mortality and the age of peak incidence may be due to differences in certain modifiable risk factors (e.g., diet, life style and environmental factors), differences in the biology of breast cancer (e.g., the prevalence of BRCA1/BRCA2 mutations) or differences in breast cancer screening and treatment. The age of peak breast cancer incidence is the most important difference that would change the positive predictive value of BI-RADS for Asian women. Since there is a difference of about 10 years between the age of peak incidence, we subdivided our patients with category 3 lesions into two groups using a cutoff at 40 years of age instead of 50 [12], *i.e.*, age < 40 years vs. ≥ 40 years. We found only two malignant lesions in patients aged < 40 years, and the difference in PPV between the two groups was significant (**Table 3**). Except for the cutoff used in age grouping, our findings are similar to those reported by Ball *et al.* [15] who found that the PPV of category 4 was 4.5% for women aged < 50 years.

5. CONCLUSIONS

Therefore, BI-RADS categories appropriately predict the risk of malignancy of NPBLs and aid in the decision-making process for biopsy in patients in northeastern China. We recommend that Asian NPBL patients aged ≥ 40 years with category 4 mammographic findings, and all patients with category 5 findings should undergo FWLB. FWLB should be offered as a treatment option, the risks and benefits of which to be discussed with the patient for Asian NPBL patients aged < 40 years with category 4 and aged ≥ 40 years with category 3 mammographic findings.

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