

Positive Predictive Value of BI-RADS 4 and 5 Mammography in Patients with Non-palpable Breast Mass

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Abstract

Background and Objective: Breast cancer is the most common cause of death in Thai women. The BIRADS system is commonly used to categorize the risk of cancer for breast lesions seen on mammography and breast ultrasound. BI-RADS 4 category indicates a cancer risk of 2% to 95% and for BIRADS 5 the risk is over 95%. Most breast lesions found on screening mammogram are non-palpable. The purpose of this study was to determine the positive predictive value (PPV) of non-palpable breast lesions classified as BIRADS 4 or 5, to help decide whether excisional biopsy is worth doing at Chiang Mai University Hospital.

Materials and Methods: This retrospective study collected data from a hospital database (Digicard) from January 2009 to December 2014. We reviewed the indications for mammography, radiologic findings, BIRADS category, and pathology, and calculated the PPV.

Results: There were 168 women who underwent radiology-guided excision of non-palpable breast lesions during the study period. These lesions were detected by screening (43%), surveillance (10%), and diagnostic mammograms (46%). Of the 171 lesions identified, 145 (85%) were BIRADS 4, and 13 (8%) were BIRADS 5. Twenty-nine of the BIRADS 4 lesions (PPV 20%) and 13 of the BIRADS 5 lesions (PPV 77%) were malignant. The most common radiographic finding for invasive cancers was speculated mass, and for DCIS, microcalcifications.

Conclusion: Non-palpable breast lesions detected by mammography had a 20% malignancy risk if categorized as BIRADS 4, and 77% if categorized as BI-RADS 5. Spiculated mass and microcalcifications were radiologic findings highly associated with cancer. For a benign lesion with radiologic findings of malignancy, a radiology-guided biopsy is still recommended.

Keywords: Non-palpable breast mass, BI-RADS category 4 & 5, positive predictive value

INTRODUCTION

Breast cancer is a common cause of death in women worldwide. It is the most common cause of death in Thai women¹. Breast cancer screening is a standard screening program in Thailand. For early

detection, women over 40 years should undergo mammography. The earlier the cancer is detected, the better the treatment outcome. In reporting mammogram and ultrasound results, the BIRADS system is used to categorize the cancer risk of breast

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lesion. The BIRADS 4 category indicates a cancer risk of 2 to 95% and BIRADS 5 category a risk higher than 95%^{2,3}. The most common breast lesions found during screening mammography are non-palpable. If these lesions are categorized as BIRADS 4 or 5 a biopsy is recommended for diagnosis. The most common biopsy procedure at Chiang Mai University Hospital is fine needle aspiration. For palpable lesions, the biopsy is conducted in the FNA clinic, for non-palpable lesions, it is conducted in the X-ray unit by a radiologist. If there is a discordant triple assessment, an excisional biopsy is required. For non-palpable lesions, an excisional biopsy requires a radiologic guide, such as an ultrasound marker or needle localization^{4,6}. After surgery, a specimen radiograph should be taken to confirm the completeness of excision. Because this process is time consuming and increases the workload of radiologists and surgeons, it also increases hospital costs. Therefore, the purpose of this study was to determine the positive predictive value (PPV) for non-palpable breast lesions classified as BIRADS 4 or 5 to help decide whether excisional biopsy is worthwhile at Chiang Mai University Hospital.

MATERIALS AND METHODS

The present retrospective study collected data from the hospital database (Digicard) from January 2009 to December 2014. During this period, 168 women had non-palpable breast lesions excised under radiologic guide using both ultrasound markers and needle localization. Radiologists marked the site on the patient either the day before or on the morning of operation. After removal, the specimen was sent to the X-ray unit for a specimen radiograph to confirm completeness of excision. If the excision was not complete, a re-excision was done; if the excision was complete, the surgical wound was closed. We reviewed the data on the indications for mammography,

Table 1 Indications for mammography in patients with non-palpable breast lesions.

Indication	Number of patients
Breast mass	59
Breast pain	5
Nipple discharge	12
Screening	72
Surveillance	17
Axillary mass	1
Brain metastasis	1
Nipple retraction	1
Total	168

Table 2 BIRADS category of all patients

BIRADS classification	N (lesion) (%)
BIRADS 2	1 (1)
BIRADS 3	12 (7)
BIRADS 4	145 (85)
BIRADS 5	13 (8)
Not classified	1 (1)
Total	171 (100)

radiologic findings, BIRADS category, tissue pathology, and calculated the PPV.

RESULTS

From January 2009 to December 2014, 168 women underwent radiologic guide excision of non-palpable breast lesions. These were detected by screening mammograms (43 %), surveillance mammograms in cases of breast cancer (10%) and diagnostic mammograms for patients with symptoms (46%) (Table 1). As some women had more than one lesion, 171 lesions were identified by mammography. Of these, 145 lesions (85%) were BIRADS 4 and 13 (8%) were BIRADS 5 (Table 2). Twenty-nine of the BIRADS 4 lesions (PPV 20%) and 10 of the BIRADS 5 lesions

Table 3 Summary of pathology results according to BIRADS category

Pathology	BIRADS				Total
	2	3	4	5	
Cancer (invasive/in situ)	-	-	29	10	39
Benign	1	12	116	3	132
Total	1	12	145	13	171

Table 4 Pathologic results of all patients

Pathology	Number of lesions
Benign	
Atypical ductal hyperplasia	7
Fibroadenoma	48
Fibrocystic change	62
Intraductal papilloma	28
Atypical papilloma	3
Sclerosing adenosis	13
Radial scar	6
Epithelial hyperplasia	6
Lobular hyperplasia	1
Florid hyperplasia	8
Ductal hyperplasia, ectasia	15
Ductal adenoma	1
Chronic inflammation	2
Dilated cystic space with fibrosis	1
Hamartoma	1
Adenomatosis	1
Apocrine metaplasia	1
Intramammary node	1
Calcified nodule	1
Malignant	
Ductal carcinoma in situ	28
Invasive ductal carcinoma	18
Invasive tubular carcinoma	2
Total	254

(77%) were malignant (Table 3). The pathology of all lesions is shown in Table 4. Most lesions were fibrocystic changes and fibroadenoma. Forty-eight malignant lesions included invasive ductal carcinoma, invasive tubular carcinoma, and ductal carcinoma in situ. The most common radiographic finding for invasive lesions was spiculated mass (Table 5) and for DCIS, microcalcifications (Table 6).

DISCUSSION

In the present study of non-palpable breast lesions that were excised using imaging guidance, we found the PPV of BIRADS 4 category to be 20% and the PPV of BIRADS 5 category to be 77%. Compared with other studies, the PPVs of the present study are at the lower end of the range. For BIRADS 4, the PPVs from other studies are between 23 to 34%, and the PPVs for BIRADS 5 are between 81 to 92%^{7,8}.

Most non-palpable lesions that required excision were BIRADS 4, most of the rest were BIRADS 5. Fibrocystic change and fibroadenoma were the first and second most common lesions categorized as BIRADS 4, respectively. However, invasive cancers and in situ cancers were found in 23% of all lesions, similar

Table 5 Imaging findings in invasive cancer, according to BIRADS

Imaging finding	BIRADS 4	BIRADS 5	Number
Irregular/spiculated mass with calcifications	3	3	6
Irregular/spiculated mass	5	3	8
Architecture distortion	1	-	1
Complex cyst	2	-	2
Microcalcifications	2	-	2
Focal asymmetrical density	1	-	1
Clumps and linear enhancement	1	-	1
Total	15	6	21

Table 6 Imaging findings in carcinoma in situ, according to BIRADS

Image finding	BIRADS 4	BIRADS 5	Number
Architecture distortion	2	-	2
Microcalcifications	9	2	11
Mass with microcalcifications	3	3	6
Irregular mass	4	-	4
Increased focal asymmetrical density	1	-	1
Clumps and linear enhancement	1	-	1
Duct dilatation with internal echogenic content	3	-	3
Total	23	5	28

to the result of a study of non-palpable lesions excised under radiologic guide, by Lacquement et al.⁸, who also found the most common histology to be fibrocystic change (24.9%) and fibroadenoma (23.1%). In Thailand, Malai et al.⁹ studying in Chiang-Mai and Somruk in Lampang¹⁰ found that the most common histology of BIRADS 4 and 5 lesions was fibroadenoma. However, these two studies collected both palpable and non-palpable lesions. Our study showed the difficulty of separating benign from malignant lesions by mammogram only. This is why biopsies are recommended before definitive treatment.

The spiculated or irregular mass was the most common radiologic finding in invasive cancer, and spiculated mass with microcalcifications was the second most common. This is the same result as in Leura et al.⁷ who found that lesions with spiculated margins, and Zhu et al.¹¹ who found irregular masses, to be the most common radiologic findings in malignant lesions. In DCIS the first and second most common radiologic findings were microcalcifications, and mass with microcalcifications, respectively.

Our study was limited by its small sample size. However, we found some interesting trends. There were only 22 cases of non-palpable lesions excised using a radiologic guide from 2009 to 2010, increasing to 43 cases in 2014 alone. This reflected the increasing awareness of breast cancer in Thai women which led to an increased rate of screening mammograms and a corresponding increase in the number of non-palpable lesions that need to be biopsied.

CONCLUSION

At Chiang Mai University Hospital, non-palpable lesions has a malignancy risk of 20% if categorized as BIRADS 4, and 77% if categorized as BIRADS 5. Spiculated mass and microcalcifications were the radiologic findings highly associated with cancer. Even for benign lesion with a radiologic finding of

malignancy, a radiology-guided biopsy is still recommended.

Conflict of interest

No potential conflict of interest relevant to this article was reported.

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