Original Article

Accuracy of Preoperative Ultrasound-Guided Axillary Lymph Node Core Needle Biopsy to Predict Axillary Lymph Node Involvement in Breast Cancer

Premkamol Patraithikul MD[1], Wilairat Prasert MD[2], Wanrudee Lohitvisate MD[3]

[1] Department of General Surgery, Faculty of Medicine, Thammasat University Hospital, Pathum Thani, Thailand

[2] Division of Head Neck Breast Surgery, Department of General Surgery, Faculty of Medicine, Thammasat University Hospital, Pathum Thani, Thailand

[3] Division of Breast Imaging, Department of Diagnostic Radiology, Faculty of Medicine, Thammasat University Hospital, Pathum Thani, Thailand

Background: Breast cancer operative management consists of breast surgery and axillary lymph node (ALN) assessment. ALN status is an important prognostic factor and determinant of breast cancer treatment.

Objective: To investigate preoperative ultrasound-guided axillary lymph node core needle biopsy (USACNB) accuracy in predicting ALN involvement for breast cancer.

Materials and Methods: This retrospective cohort study took place between February 2014 and May 2019. One hundred nine consecutive operable breast cancer patients with suspicious ALN involvement were assessed using preoperative USACNB and subsequent breast cancer surgery. Exclusion criteria were insufficient ALN tissue from USACNB for interpretation, previous breast or axillary surgery on the same side. Patients with preoperative histopathology results proving of metastasis underwent ALN dissection (ALND) while those with negative results had sentinel lymph node biopsy (SLNB). When SLNB was positive, ALND was then performed. Preoperative USACNB accuracy was analyzed using SLNB or ALND pathological results as standard tests.

Results: The sensitivity, specificity, PPV, and NPV of preoperative USACNB in evaluating ALN involvement was 87.5%, 100%, 100%, and 80.4%, respectively, with an accuracy of 91.7%.

Conclusion: Preoperative USACNB shows high diagnostic accuracy in ALN metastasis, but its NPV remains too low to completely rule out ALN involvement. Standard SLNB is still necessary in cases of negative USACNB.

Keywords: Breast cancer; Ultrasound guided core needle biopsy; Axillary lymph node

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Breast cancer is the most common cancer among women in Thailand. In 2020, Thailand had 22,158 (22.8%) new female breast cancer cases[1], while worldwide, there were 2,261,419 (11.7%) new female breast cancer cases[2]. Fortunately, treatment has greatly evolved. Less aggressive surgical procedures can now provide equivalent outcomes to the more intensive ones of the past with benefit of reduced morbidity.

Management is generally divided into breast surgery and axillary management. Axillary lymph node (ALN) status is an important prognostic factor and determinant in breast cancer treatment[3], and the two preoperative diagnostic tools used to assess this are fine needle aspiration (FNA) and core needle biopsy (CNB)[4,5]. In many previous studies comparing the diagnostic test of both techniques, FNA technique has false negative of 15% to 40%, sensitivity of 37% to 79%, and an accuracy of 78.8% to 85.4%[6] while CNB technique achieved superior result as 20% to 34%, 42% to 91.6%, and 90.9% to 95.3%, respectively, so CNB has proven superior[7-13]. However, the complications are not different for both procedures and there is no major complication with either method. The only minor complication was found in some cases as pain at procedural site and

Correspondence to:

Prasert W.

Division of Head Neck Breast Surgery, Department of General Surgery, Faculty of Medicine, Thammasat University Hospital No. 95 Moo 8, Phahonyothin Road, Khlong Nueng, Khlong Luang, Pathum Thani 12120, Thailand.

Phone: +66-80-5006012, **Fax**: +66-2-9269530

Email: wlrsurg@yahoo.co.th

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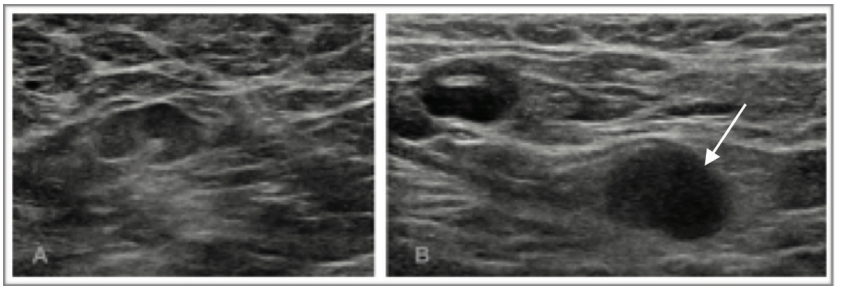

Figure 1. Axillary ultrasonography shows abnormal features of suspicious axillary lymph nodes.

A: cortical thickening, B: arrow shows absence of fatty hilum

rarely in bleeding[14]. Thus, CNB is now the standard for preoperative axillary status exams. The purpose of the present study was to investigate the accuracy of preoperative ultrasound-guided axillary lymph node core needle biopsy (USACNB) for predicting ALN involvement in breast cancer at the authors' practice.

Materials and Methods

Study design

The present study was a retrospective cohort study, approved by the Medical Ethics Committee, Contact No. MTU-EC-SU-1-081/61, the Faculty of Medicine, Thammasat University Hospital.

Patients

One hundred nine consecutive patients with operable breast cancer were retrospectively identified at the Head Neck Breast Division of the General Surgery Department at Thammasat University Hospital between February 2014 and May 2019. Patients with suspicious ALN involvement determined by clinical examination or breast imaging studies were assessed. Abnormal characteristics that indicated a suspected metastatic node were cortical thickness greater than 3 mm, loss of fatty hilum, irregularity of nodal shape, node taller than it is wide, or internal hypervascularity (Figure 1). All the following inclusion criteria had to be met, single primary operable breast cancer with clinically suspicious ALN metastasis, suspicious node receiving USACNB, and case proceeding to primary breast cancer surgery. Exclusion criteria included insufficient lymph node tissue for interpretation, previous history of breast or axillary surgery on the same side, and prior neoadjuvant chemotherapy or radiotherapy.

Preoperative evaluation and axillary core needle biopsy

Breast cancer patients with suspicious ALN were sent to see a breast radiologist who evaluated axillary status before proceeding to primary breast surgery. Ipsilateral suspicious ALN based on clinical exams or ultrasound findings were examined by preoperative USACNB. Biopsy was performed using a 14-Gauge BARD® MAGNUM® instrument as in Figure 2. Patients with preoperative histopathology results showing axillary metastasis underwent axillary lymph node dissection (ALND) while those with a negative result underwent sentinel lymph node biopsy (SLNB) using 1% isosulfan blue dye for lymph node mapping. If the SLNB result was positive, complete ALND was then performed in the same operation. The histopathological results of all preoperative CNBs were compared with final histopathology from gold standard procedures. The gold standard procedures were defined as SLNB or ALND.

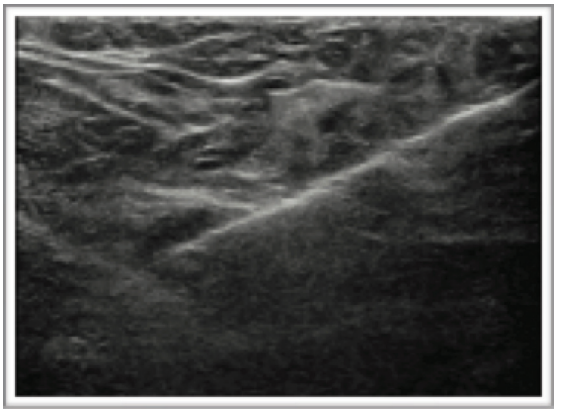

Figure 2. Core needle biopsy of suspicious axillary lymph node under ultrasound guidance.

Statistical analysis

All data were collected from the patient database. Patient background, ultrasound history, preoperative

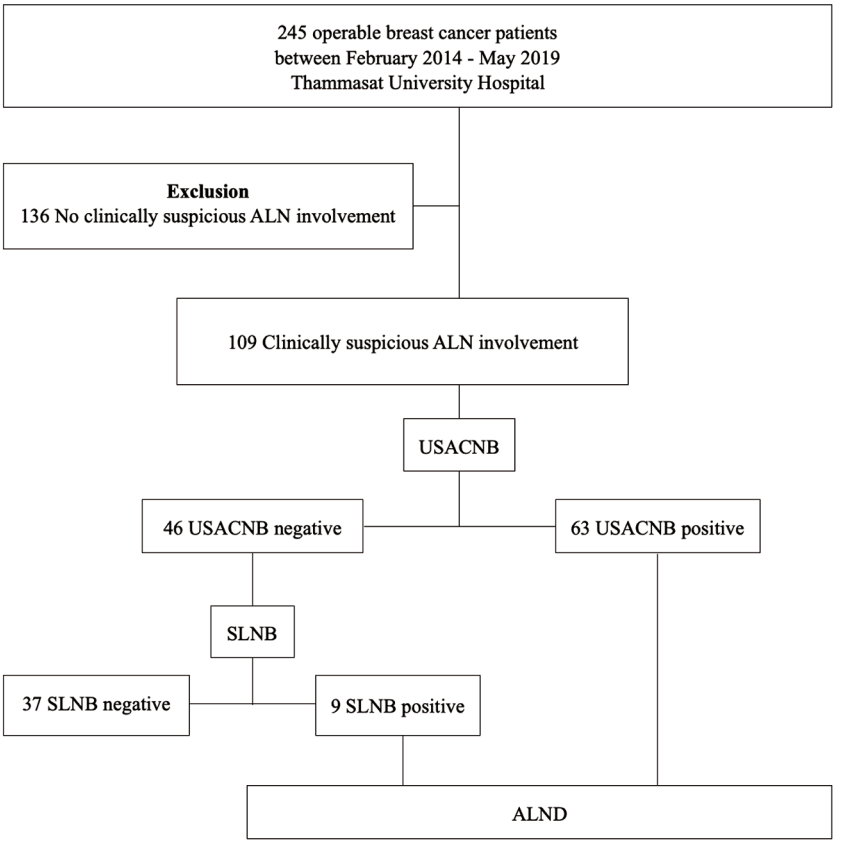

Figure 3. Diagram of this study.

USACNB=ultrasound-guided axillary lymph node core needle biopsy; SLNB=sentinel lymph node biopsy; ALND=axillary lymph node dissection

axillary status, primary tumor size, surgical procedures, and final histopathology were recorded. The diagnostic accuracy of preoperative USACNB was calculated with the final histopathological results of either SLNB or ALND by statistical analysis of diagnostic test.

Results

In the present study institute, 245 cases of primary breast cancer were recorded, and 136 cases without clinically suspicious ALN involvement were excluded. Thus, 109 operable breast cancer patients with clinically suspicious ALN involvement were enrolled (Figure 3). There were 63 cases of diagnosed axillary metastasis who had completed ALND at the time of primary breast surgery. The remaining 46 cases with negative results underwent SLNB. Nine of these then proved positive for SLNB and subsequently had ALND performed. The background characteristics of the participants are shown in Table 1.

Accuracy of USACNB

The present study demonstrated that the diagnostic test had a sensitivity, specificity, positive predictive values (PPVs), and negative predictive values (NPVs) of 87.5%, 100%, 100%, and 80.4%, respectively, with an accuracy of 91.7%. Statistical outcomes are given in Table 2 and 3.

Discussion

The present study result of 80.4% NPV, reflecting a 19.6% false negative rate, is slightly higher than the previous reports, which had NPVs from 91.2 to 92.9%[8,9]. Thus, the authors would believe that all negative USACNB should proceed to SLNB, which is a standard procedure in detecting ALN metastasis. Of note in regard to surgical option decision, the present study also observed a high accuracy rate of 91.7% in predicting ALN metastasis in operable breast cancer patients. This greatly helps in designing operative procedures and in communicating potential breast cancer treatment steps with the patients.

Table 1. Patient background and characteristics

Characteristics	CNB (109 cases); n (%)
Age (years); median (range)	57.5 (30 to 85)
pT (primary tumor) staging	
T1a, b	4 (3.7)
T1c	21 (19.3)
T2	81 (74.3)
T3	3 (2.7)
Primary tumor histology	
Invasive ductal carcinoma	104 (95.4)
Invasive lobular carcinoma	2 (1.8)
Other	3 (2.8)
Histological grade	
Grade I	13 (11.9)
Grade II	65 (59.6)
Grade III	31 (28.5)
Hormonal receptor (ER or PR)	
Negative	28 (25.7)
Positive	81 (74.3)
HER-2	
Negative	74 (67.9)
Positive	25 (22.9)
Equivocal	10 (9.2)
Ki67	
≤20%	14 (12.8)
>20%	33 (30.3)
Unknown	62 (56.9)

CNB=core needle biopsy; ER=estrogen receptor; PR=progesterone receptor; HER-2=human epidermal growth receptor 2

Table 2. Number of patients and pathological outcomes

Ultrasound-guided core needle biopsy results	Histopathology results (gold standard)		Total
	+	–	
+	63	0	63
–	9	37	46
Total	72	37	109

Table 3. Statistical outcomes of breast cancer patients with suspicious axillary lymph node involvement who underwent ultrasound-guided axillary core needle biopsy compared with final histopathological results from sentinel lymph node biopsy and axillary lymph node dissection

Tests	Ultrasound-guided axillary core needle biopsy	
	%	95% CI
Sensitivity	87.5	77.6 to 94.1
Specificity	100	90.5 to 100.0
Positive predictive value	100	94.3 to 100.0
Negative predictive value	80.4	66.1 to 90.6
Accuracy	91.7	

CI=confidence interval

The present study sensitivity and accuracy rates appear similar to the results from comparable prior studies. Nakamura et al[9] reported 87.5% sensitivity and 95.3% accuracy while Rautiainen et al[8] had 88.2% sensitivity and 90.9% accuracy. The authors would recommend preoperative staging using USACNB in operable breast cancer with suspicious ALN involvement. This technique is reliable with sufficient accuracy in diagnosing axillary metastasis. A positive USACNB reduces the required procedures and surgeries. However, the authors would caution that negative results maintain the chance of axillary metastasis up to 19.6%.

Limitation

As the present study was a retrospective cohort study, there were inherent design limitation affiliated with it such as the integrity of the data recorded because some necessary information was at times incomplete. Due to the study setting of a single center over a short duration, with a smaller study population, the results may not reflect the overall accuracy throughout Thailand. Further prospective studies for longer durations at larger multi-centers are needed to gain more information, accurate outcomes, and confirm the present study results.

Conclusion

USACNB is an essential preoperative procedure for assessment of operable breast cancer with a suspicious ALN. At Thammasat University Hospital, the authors observed a 91.7% accuracy rate for USACNB, which is a satisfactory outcome. The authors hope this data will help practitioners prepare and plan breast cancer surgery. If the USACNB was positive, patients can go on to have ALND. However, if the USACNB was negative, it is essential that patients proceed to SLNB due to the high false negative rate for USACNB. It would be prudent to observe and compare more results with other studies in different hospital contexts

What is already known on this topic?

Previous study in Japan was to provide accuracy of ultrasound-guided CNB for patients with suspicious node positive breast cancer.

What this study adds?

At Thammasat University Hospital, the authors observed a 91.7% accuracy of USACNB.

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Conflicts of interest

All authors have declared no conflicts of interest relevant to this article.

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