

Diagnostic Sharpness of Ultrasound guided needle True -Cut biopsy in diagnosis of breast lesions

Sahar Basim Ahmed ,Theer Jwad Kadhim

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Address for Correspondence:

Dr. Sahar Basim Ahmed, Department
of Radiology, Al-Yarmuk Teaching
Hospital

Abstract

Objective : The objective of our study was to determine the diagnostic accuracy of sonographically guided core needle biopsy for breast masses **Materials and methods :** In this retrospective study , 65 patients undergo Ultrasound guided needle core biopsy for breast lesions performed between March 2013 and April 2015 at dedicated breast clinic in AL-Yarmook teaching hospital .The histological agreement between the core pathology and subsequent excision pathology , and 2 years follow up for cases of benign cases were studied .

Results: A sixty -five tru-cut biopsies were performed during the study period , histopathology show 55 (84.6) malignant lesions , 9 (13.8 %) benign lesions and 1 (1.5%) case inconclusive (suspicious) . Repeat True -cut biopsies were done on 2 of the malignant cases which confirmed to be malignant , 1 of benign cases also proved to be benign , and 1 inconclusive specimen was found to be malignant on repeat TCB . Trucut biopsy had a sensitivity of 98.2 % , specificity of 100% , positive predictive value of 100% ,negative predictive value of 90% , and diagnostic accuracy of 98.4 % .

Conclusion : Ultrasound guidance should be used to perform core biopsies in evaluating all breast abnormalities visible on ultrasound . Adherence to principles of triple assessment following biopsy allows for early recognition of the majority of false negative cases .

Key words: Ultrasound , True -Cut biopsy , breast lesions

INTRODUCTION

Breast cancer is the most common type of cancer in Iraqi women , breast screening is a method of detecting breast cancer at a very early stage . The first step is a mammogram that can detect small changes in breast tissue that may indicate cancers that are too small to be felt either by the women herself or by a doctor , most of the lesions detected by screening are not malignant . the suspicious abnormalities detected on mammography require further evaluation with biopsies . (1,2,3)

Nowadays ,percutaneous imaging breast biopsy is a reliable alternative to surgical biopsy for histological diagnosis . Percutaneous biopsy is less invasive than

surgery , can be performed quickly , does not deform the breast , causes minimal scarring , complications (hematoma and infection) are infrequently found (less than one case in 1000) fewer surgeries are needed for patients who undergo percutaneous biopsies and therefore the cost of diagnosis is lower (4,5,6,7,8) .

Virtually any breast lesion that is clearly seen on Ultrasound can be sampled under Ultrasound guidance (9) .All lesions classified as BI-RADS 4 and 5 ,clearly visible on Ultrasound are amenable to Ultrasound CNB , this technique can also be used for some BI-RADS 3 lesions under certain circumstances : genetic or family risk , medical or social difficulties for follow up

,pregnancy ,extreme anxiety and others ,including the patient decision .^(10,11)

The process of p of significant breast lesions involve the correlation of clinical imaging and the histological findings . This is best achieved with a multidisciplinary open forum with the clinician , radiologist and pathologist reaching a consensus on the management of each case using predefined protocols . The highest levels of diagnostics accuracy are achieved if such triple approach of imaging , clinical diagnosis and biopsy is used . In cases where cancer is reported such an approach allows for preoperative counselling of the women regarding treatment options and may assist in the planning of single stage surgery ^(12,13,14) .In cases where a benign diagnosis is reported or confirmed the need for excision biopsy is eliminated , the women can be reassured and appropriate management options discussed ⁽¹⁵⁾ .

There are many advantages of Ultrasound guidance include :

Ultrasound involve non ionizing radiation .

full control of the needle position in real time .

Ultrasound equipment is widely available and cost effective technique ⁽¹⁶⁾ .

So Ultrasound -guided True-cut needle biopsy is a well tolerated and reliable procedure for providing a tissue diagnosis of malignancy before definitive treatment and obviating the need for formal excision biopsy of lesions for which there is a low index of suspicion ⁽¹⁷⁾ .As well as diagnostic objectives , ultrasound guidance allow us to perform other interesting therapeutics procedures such as evacuation of liquid or semi-solid collectins and placement of markers or coils for neoadjuvant chemotherapy . More recently , ultrasound guidance has been usefull for tumor ablation using radiofrequency, cryoablation , laser therapy or focused ultrasound ⁽¹⁸⁾ . The complications of Ultrasound CNB are infrequent and not significant .Both hematomas and infections are very rare accounting for less than 1 /1000 biopsies ⁽⁸⁾ .The possibility of pneumothorax exists but it is very rare using the free -hand technique and a horizontal approach . Patients should be informed about a possible complications of the technique.

Aim of this research is to study the diagnostic value effectiveness of the true cut needle biopsy under Ultrasound guidance for suspicious breast lesion .

PATIENTS AND METHODS

This is retrospective study looking at Ultrasound guided automated true cut needles biopsies (TCNB) of breast lesions performed between March 2013 and April 2015

. sixty five patients attend a dedicated breast clinic at Al-Yarmook Teaching Hospital .Clinical findings were recorded as normal , benign , suspicious or malignant . Breast imaging either by mammography or Ultrasound was usually performed on the same day of patient attendance , with the TCNB performed within a few days of patients diagnosis . Radiological findings were also classified as benign , suspicious or malignant . True cut needle biopsy was performed under local anesthesia using a needle mounted in a automated firing device employing a spring loaded mechanism (Bard products) , this can be operated with one hand , facilitating simultaneous Ultrasound scanning performed using a 7.5 MHz linear array real time probe . The biopsy device automatically advances the cutting needle into the biopsy site , the needle tip appear as a bright echo and its track during biopsy is demonstrated to confirm that the correct area has been sampled . Usually three passes were made in each patient .

The approach to the lesion should be as parallel to the chest wall as possible to avoid pneumothorax . Moreover the transducer should be oriented parallel to the needle in order to facilitate the needle visualization .

The biopsy were fixed in 10% formalin and embedded in paraffin wax , and stained with haematoxylin and eosin for histological examination . Additional immunohistochemistry was performed on selected samples if felt to be appropriate .

The histology obtained on TCNB was compared with a final diagnosis obtained from subsequent excision biopsy, wide local excision or mastectomy .

Each true cut biopsy (TCB) diagnosis was matched with the histopathology results and labeled as follows : true positive (TP) when positive TCB result for malignancy is confirmed in the histological study of the post surgical specimen , false positive (FP) when positive TCB result for malignancy is not confirmed in the histological study of the post -surgical specimen , true negative (TN) when negative TCB result for malignancy is obtained and no carcinoma in the histological study of the post-surgical specimen is found ,and false negative (FN) when negative TCB result for malignancy is obtained but carcinoma is detected in the histological study of the post-surgical specimen .

sensitivity (SN) was measured as the proportion of patients with an associated carcinoma and a positive TCB result for malignancy . The formula used for sensitivity was ; $SN = TP / (TP + FN)$. While specificity (SP) was based on the proportion of patients without associated carcinoma and a negative TCB result for malignancy . the formula used for specificity was $SP = TN / (TN + FP)$. Positive predictive value (PPV) was

considered as the proportion of patients with a positive TCB result and histopathological confirmation of malignancy of the post surgical specimen , the formula used for positive predictive value was $PPV = TP / (TP + FP)$.Negative predictive value (NPV) was defined as the proportion of patients with negative TCB results and without carcinoma in the histological study of the post surgical specimen . the formula is $NPV = TN / (TN + FN)$. Diagnostic accuracy (DA) was based on the proportion of patients diagnosed correctly using the diagnostic test .The formula used for diagnostic accuracy was $DA = (TP+TN) / (FP +FN+TP+TN)$.

RESULTS

Sixty five TCB procedures were performed between June 2013 and July 2015 at AL-Yarmook teaching hospital in Baghdad . The median age of patients was 52 years old range (28 to 72 years) (table 1) . The histopathological diagnosis of the TCB specimen showed 55 cases (84.6 %) to be malignant lesions , 9 cases (13.8 %) as benign lesions and 1 case (1.5%) as inconclusive . A repeat TCB was done on 2 of the malignant cases , 1 of the benign cases also on the 1 inconclusive TCB specimens .Of the two malignant cases ,in which repeat TCB was performed , were found to be malignant on the second TCB . the result of the one benign case in which repeat TCB was performed , turned out to be benign also . The one inconclusive specimen was found to be malignant on repeat TCB . The indication for those repeat TCBs was inadequate samples or for confirmation of a diagnosis rendered on a scanty or hypocellulalr specimen . Final diagnosis of TCB specimen after repeat TCB showed a total of 56 (86.1 %) malignant cases and 9 (13.9 %) benign cases .Comparison of core biopsy and final diagnosis on excision biopsy was made (Table 2) , there were 55 true-positive cases , 9 true negative cases , 1 false negative case and no false positive cases , TCB reveal a sensitivity of 98.2% , 100 % specificity , PPV of 100% , NPV of 90% , and DA of 98.4% , it also provided a definitive histological type and grade that correlate with the final histopathology report in 33 (60%) of the 55 malignant cases .

Table 1. Age distribution of the patients

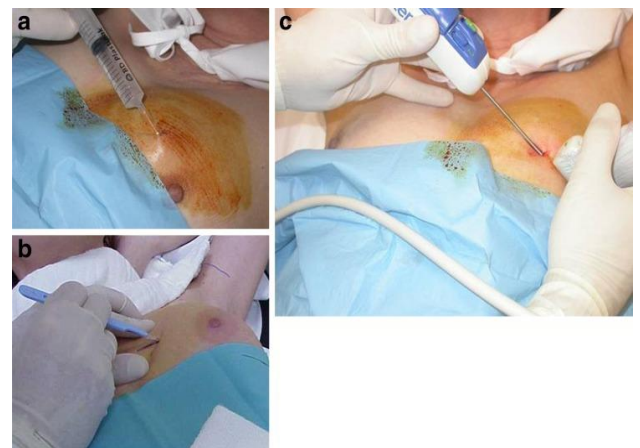
Age	Number	Percentage
20-29	2	3 %
30-39	6	9.2 %
40-49	16	24.6 %
50-59	29	44.6 %
60-69	11	16.9 %
≥70	1	1.5 %

Table 2. Tru-Cut biopsy VS final histology

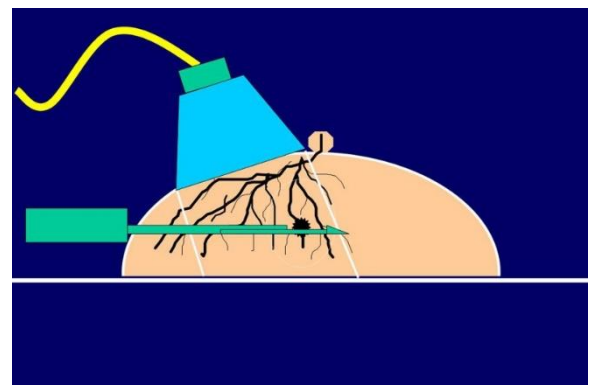
Findings	Core biopsy		Final diagnosis	
	Number	%	Number	%
Benign	9	13.8	9	13.9
Malignant	55	84.6	56	86.1
Inconclusive	1	1.5	-	-
Total	65	100.0	65	100.0



Types of true cut biopsy needles



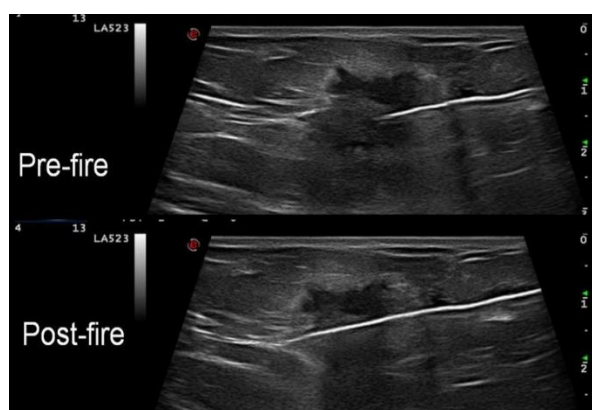
The few steps in performing Ultrasound guided needle guided biopsy after local anesthesia .



The needle pass horizontal to skin surface , nearly perpendicular to Ultrasound beam .

Table 3. Comparison of studies conducted to determine the usefulness of TCB in the diagnosis of breast mass.

Authors	Year	sensitivity	Specificity	PPV	NPV	Diagnostic Accuracy
Basim et al	2015	98.2%	100 %	100%	90 %	98.4 %
Husain and Rikabi ⁽²⁰⁾	2013	98.1 %	100 %	100 %	98.9 %	99.3 %
Lacambra et al ⁽²²⁾	2011	96%	99%	99%	94 %	-
Ahmed et al ⁽²⁴⁾	2010	94.6%	91.3%	-	-	94.8 %
Bdour et al ⁽²¹⁾	2009	97%	100 %	-	-	-
et al ⁽²³⁾ Brunner	2009	95 %	100%	100%	90%	-
Homesh et al ⁽³⁰⁾	2005	92.3 %	94.8 %	100%	100%	93.4 %
Gukas et al ⁽³¹⁾	2000	88.9 %	96.8 %	-	-	93.5%



Inpre-fire :needle tip put in proximity to lesion margin to be sure that at post fire the needle cut from the margin & cenral core of the mass also .

DISCUSSION

Accurate preoperative assessment of breast cancer is crucial for treatment planning , including operative procedures as well as neoadjuvant preoperative therapies . Core needle biopsy has been shown to be an excellent tool , working with true tissue specimen using an automated firing gun under ultrasound control in conjunction with clinical and radiological assessment provides an accurate , reliable and safe of establishing the diagnosis of patients with breast lesions^(19) .Our result yielded a high sensitivity of 98.2% with 100 % specificity and a PPV , NPV , and DA of 100% , 90 % , 98.4% respectively .In fact there were no false positive results .This means that TCB provides a breast cancer diagnosis with a high degree of confidence . Any patient with TCB results that are consistent with breast carcinoma should be referred to surgery and oncology for immediate management and treatment , compared to several studies that were conducted on the diagnostic usefulness of TCB in the diagnosis of breast masses^(20,21,22,23) (table 3) . our specimens contained a single

FN case (1.5%) of inconclusive result in compare to 1.7 % inadequacy rate has been reported⁽¹⁹⁾ , 2.2 %⁽²⁰⁾ & 6.2 %⁽²⁴⁾ in other studies. After repeat TCB reveal a malignant specimen , which lower the diagnostic accuracy to 98.4 % , the most probable explanation for the false negative in the current study could be sampling error ,slide misinterpretation or small size of needle used , many studies used a 14 g needle size for biopsy and number of samplings per patient shown that a minimum of 4-5 cores are necessary to obtain definitive diagnosis and decrease the false negatives cores^(25,26) .

however false negative diagnosis are unavoidable and may delay the diagnosis and treatment of breast cancer .For reducing them , the imaging -histological correlation is of critical importance in percutaneous imaging -guided breast biopsy to confirm that tissue was retrieved from the target lesion^(27,28,29) .

The main disadvantage of Ultrasound CNB is the limitation of performing biopsy for lesions not seen on Ultrasound . Most clustered micro calcifications ,especially if they are not inside a mass , cannot be identified on Ultrasound . However high resolution transducer can demonstrate some clustered microcalcifications even in the absence of mass .

Although most Ultrasound CNB procedures are easy to perform , in some special situations (deeply located lesions , patients with implants , axillary lesions , etc) a high level of experience is needed to get reliable results

In conclusion, this study has shown that Ultrasound - guided biopsy is highly accurate in obtaining a histological diagnosis in breast cancer. We would recommend that this modality is used in patients who have breast lesions visible on Ultrasound. All BI-RADS 4 and BI-RADS 5 , and some BI-RADS 3 ones , should be percutaneously punctured ,and in cases with

benign results ,surgery can be avoided if there a good radiological - pathological correlation and no borderline result is obtained .Careful adherence to the principles of triple assessment following biopsy and the support of multidisciplinary review is essential to avoid delay in diagnosis of breast cancer in patients with false negative core biopsies .

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