

Accuracy of Fine Needle Aspiration Cytology in Comparison with Histopathology in the Diagnosis of Breast Lesion 2016-2017

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ABSTRACT

Background : Breast lump is a common presentation in the surgical outpatient department with increasing awareness of both patient and clinician . The diagnosis of nature of a breast lump was based on the triple assessment protocol which includes clinical examination , radiological imaging and histopathologic examination . Despite that the histopathological diagnosis is a gold standard method for nature of breast lump diagnosis , fine needle aspiration cytology is easy , rapid , reliable and less expensive method with high sensitivity , specificity and accuracy rate .

Objective :To assess the diagnostic accuracy of fine needle aspiration cytology in palpable breast mass.

Methods : A total of 73 female patients with palpable breast mass were included in this prospective cross sectional study which was performed in Al-Zahraa Teaching Hospital , College Of Medicine , University Of Wassit from September 2016 to February 2017 .All female patients were selected randomly irrespective of their age , marital status , occupation and social status .All female patients underwent fine needle aspiration cytology in the department of pathology by expert pathologists, then every patient underwent a definitive surgical procedure (excisional biopsy)and sent for histopathology .The results of fine needle aspiration cytology were interpreted as unsatisfactory , benign ,suspicion of malignancy, and malignant lesion .Then fine needle aspiration cytology results were correlated with those of histopathology to give an assessment of diagnostic accuracy of fine needle aspiration cytology .

Results : A total of 73 female patients with palpable breast mass were included in this study . In 41 patients ,the breast lumps were malignant while in 32 patients the breast lumps were diagnosed as benign .No patient had false positive results but,4 patients had false negative results .

The sensitivity and specificity of fine needle aspiration cytology for detecting malignancy were 90.24 % and 100 % respectively. The positive predictive value (PPV) and negative predictive value (NPV) of fine needle aspiration cytology for malignancy were 100 % and 88.88 % respectively. The accuracy of fine needle aspiration cytology was 94.52 %.

Conclusion : FNAC has high accuracy for the diagnosis of the pathologic nature of breast lump. Thus, we conclude that FNAC is an ideal method of investigation of palpable breast lump if being performed by expert hands and the results show high degree of correlation with the histopathologic results.

Keywords : Fine needle aspiration cytology, Histopathology, breast cancer.

Introduction

The breast lump is one of the most common presenting feature in the surgical outpatient department of all major hospitals ^[1]. Although a detailed history and clinical examination are important in breast lump diagnosis, there are many investigations that help to confirm the diagnosis. These include; A-imaging (mammography, ultrasound, and MRI), B- tissue sampling by either cytological (fine needle aspiration cytology) or histological analysis, the so called (triple assessment) ^[2]. The tissue sampling involves many invasive methods such as: excisional biopsy which is made under anesthesia and need hospital admission. On the other hand, there is a minimally invasive method of tissue sampling which is called fine needle aspiration cytology (FNAC). Fine needle aspiration cytology is an important mode of diagnosis of breast lump. It is regarded as a part of triple assessment ^[1]. It is a simple procedure with no need for special instruments, also it

gives a rapid result with high diagnostic accuracy ^[3]. There are different studies show that sensitivity of FNAC ranging from 80% -98% and specificity ranging from 99%-100% ^[4].

FNAC has replaced open biopsy due to its accuracy, simplicity, less complication, cost effectiveness and the patient can tolerate it well ^[4].

Aim of this study: The aim of this study was to evaluate the diagnostic accuracy of fine needle aspiration cytology in palpable breast mass in comparison with histopathology.

Patients and Methods

This is a prospective cross sectional study performed in the breast clinic at Al-Zahraa Teaching Hospital, Medical College, University of Wasit, Iraq during the period from September 2016 to February 2017. A total of 73 female patients with palpable breast mass or

suspicious breast area were included in this study . Some of them were randomly selected irrespective of their age , marital status , occupation or social status . FNAC was performed for every patient selected in this study , then every patient underwent surgical procedure (excisional biopsy was taken and sent for histopathology). Some patients of this study were examined in the private clinic and admitted directly for the operative room for doing excisional biopsy or mastectomy where immediately preoperative FNAC was performed and sent with specimen for histopathology .The interpretations of FNAC were : unsatisfactory ,benign ,suspicion of malignancy , and malignancy .Then results of FNAC were compared with those of histopathology and correlation was performed depending on the statistical analysis .Statistically sensitivity , specificity and accuracy rate were calculated .

Exclusion criteria were : 1- patient was not willing . 2-Frank malignant mass with skin infiltration . 3- Male patient with breast cancer and gynecomastea . 4-Patints who underwent fine needle aspiration cytology ,but they did n't do histopathology ^[5] .

Equipments :

Needles : single use disposable needles Gauge 23 .

Syringes : 5 -10 milliliter (ml) single use disposable syringes were used for

aspiration .(CHANGZHOU KANGFULAI MEDICAL THING CO. CHINA) .

Slides : 2 – 3 clean dry slides were used for smear preparation . Every slide was labeled with glass pencil and air dried .(AFCO. CHINA) .

Fixatives : 95% alcohol for routine fixation of all smears .

Stains : staining of all slides with eosin (BIOMAR. India) and heamatoxyllin (DAKO .Danmark) stains .special stains were used if required.

Fine Needle Aspiration Cytology Procedure:

This procedure was performed by using 5 ml or 10 ml single use disposable syringe for each prick and patient . There is no need for anesthesia . The skin overlying the breast mass was sterilized with povidon iodine 10 % . The lump was stabilized by holding it with fingers .The needle was inserted into the palpable mass , then many insertions with negative pressure were made in the mass till sufficient material was obtained into the syringe that was smeared on the slides . Two to three slides slides were prepared for each patient . A small or medium sized drop of aspirate was put near the frosted cessation of the slide. A second slide was prepared for spreading of aspirated material ,then fixation of smear was performed in 95% alcohol and stained with heamatoxyllin and eosin .Then ,

Giemsa stain was used to stain air dried smears .The reports were obtained within 3 – 5 days [4] .

Histopathology Procedure :

The specimens and biopsies were fixed in 10% formalin for 24 hours . Then the histopathologist performed a gross

examination and he will note the gross and cut section. Many pits were taken from opportune locations for processing and paraffin embedding . The pathologist cut sections from every block at 4 – 5 microns thickness and stained them with hematoxyllin and eosin [4] .

RESULTS

A total of 73 patients presenting with breast lumps or suspicious breast area were included in this study. FNAC and histopathologic examination were performed . The patients' ages ranged from 15 – 83 years .The mean of their age was 42.13 . SD 16.29 years . Benign breast lesions were common in younger ages (15 – 29 years) while malignant lesions were common in older ages (> 30 years) .Most Patients's ages ranged 40 -49years . The age distribution of this study was shown in table 1 .

Table 1. (Age distribution)

Total	Malignant lesion N=41	Benign lesion N=32	Age (Years)
4	0	4	15
16	0	16	20
10	8	2	30
20	12	8	40
11	9	2	50
8	8	0	60
2	2	0	70
2	2	0	80 -89

Ductal carcinoma was the commonest cause of breast lesion confirmed in 37 Patients (50.68 %) . Benign breast lumps were diagnosed in 32 patients (43.83 %) .The benign breast lumps were categorized into : 23 patients (31.5 %) had fibroadenoma , 4

patients (5.47 %) had acute inflammatory mastitis , 3 patients (4.1%) had chronic granulomatous mastitis , one patient (1.36%) had ductectesia and one patient (1.36%) had benign proliferative breast disease . Forty one patients (56.16%) had malignant breast lumps .These malignant breast lumps were distributed as following : 37 patients (50.68%) had ductal carcinoma , two patients (2.73%) had lobular carcinoma ,one patient (1.36%) had mixed ductal and lobular carcinoma and one patient (1.36%) had malignant phyllodes as shown in Table . 2.

Table .2. : Histopathology of breast lumps according to FNAC diagnosis .

Histopathology by category of FNAC	No=73
Benign FNAC	36
Fibroadenoma	23
Acute inflammatory Mastitis	4
Chronic granulomatous mastitis	3
Ductectesia	1
Benign proliferative breast disease	1
Ductal carcinoma	2
Lobular carcinoma	1
Malignant phyllodes tumor	1
Suspicious FNAC for malignancy	7
Ductal carcinoma	7
Malignant FNAC	30
Ductal carcinoma	28
Lobular carcinoma	1
Mixed ductal and lobular carcinoma	1

Histopathology of breast masses according to FNAC which shows no patients with unsatisfactory amount of FNAC . FNAC results revealed : 36 patients with benign breast lumps ,32 of them had actually benign lumps on histopathology ,but 4 patients were noted to have malignant lump on histopathology (false negative).Seven patients interpreted by FNAC as having suspicious malignancy , were proved to have malignant tumours by histopathology. Thirty patients were proved to have malignant breast lumps by both FNAC and Histopathology .

Statistical analysis of FNAC results revealed that: Thirty seven patients (50.68%) had true positive (cases that were diagnosed as malignant by both FNAC and Histopathology). Thirty two patients (43.83%) had true negative results (cases that were

diagnosed as benign by both FNAC and Histopathology). Four patients (5.47%) had false negative (cases that were diagnosed by FNAC as benign , but they were diagnosed as malignant by Histopathology). No patient (0%) had false positive (cases that were diagnosed as malignant by FNAC but they were diagnosed as benign by Histopathology). As shown in table 3.

Table .3. :Comparison of FNAC versus Histopathology.			
FNAC	Histopathology		
	Malignant	Benign	Total
Malignant	True Positive	False Positive	37
	37 (50.68%)	0 (0%)	
Benign	False Negative	True Negative	36
	4 (5.47%)	32 (43.83%)	
Total	41	32	73

The sensitivity and specificity of FNAC for diagnosis of malignancy were calculated in this study by standard statistical formula . The sensitivity of FNAC for malignancy can be calculated by using the formula:

$$\text{Sensitivity} = \frac{\text{true positive} \times 100}{(\text{true positive} + \text{false negative})} = \frac{37 \times 100}{(37 + 4)} = \mathbf{90.24 \%} .$$

The specificity was calculated by the formula :

$$\text{Specificity} = \frac{\text{true negative} \times 100}{(\text{true negative} + \text{false positive})} = \frac{32 \times 100}{(32 + 0)} = \mathbf{100 \%} .$$

The Positive Predictive Value (PPV) of the test is the probability that the patient with positive test has , in fact ,the disease in question .

$$\text{PPV} = \frac{\text{true positive} \times 100}{(\text{true positive} + \text{false positive})} = \frac{37 \times 100}{(37 + 0)} = \mathbf{100 \%} .$$

The Negative Predictive Value (NPV) is the probability of patient with a negative test not having a disease in question .

$$\text{NPV} = \frac{\text{true negative} \times 100}{(\text{true negative} + \text{false negative})} = \frac{32 \times 100}{(32 + 4)} = \mathbf{88.88 \%}$$

The Accuracy of the test = (true positive +true negative) $\times 100$ / total cases
 =(37+32) $\times 100$ /73 =**94.52 %** .

Table 4 shows the diagnostic performance of FNAC for palpable breast lump.

Table 4 : Diagnostic performance of FNAC in our study.	
Statistical parameters	Value
Accuracy	94.52 %
Sensitivity	90.24 %
Specificity	100 %
Positive predictive value	100 %
Negative predictive value	88.88 %

In this study , there were no false positive results but 4 patients had false negative results .All false negative FNAC results were interpreted as many inflammatory cells , few benign looking epithelial cells , and no malignant cells , while the histopathologic results of them were different as following ; 2 patients had invasive ductal carcinomas , one patient had lobular carcinoma and one patient had a malignant phyllodes tumor .

All these 4 patients were referred for mastectomy , but one of them refused mastectomy .

In the this study , sensitivity , specificity , positive predictive value , negative predictive value , and accuracy of FNAC were 90.24 % ,100 % ,100% ,88.88% , and 94.52 % respectively .These values were compared with other studies as shown in Table . 5 .

Table . 5. :Comparison Between The Results Of Our Study And Other Studies.

Name of study	Sensitivity	Specificity	Positive predictive value	Negative predictive value
A.Khemka et al.[1]	96%	100%	100%	95.12%
Ishikwa et al. ^[9]	86.3%	98.2%	97.9%	-
Sangita et al. ^[8]	96%	100%	-	-
Sudarat et al. ^[10]	92.5%	90.2%	88.1%	93.9%
Choi et al. ^[11]	77.7%	99.2%	98.4%	88
Rubin et al. ^[12]	87%	100%	100%	89%
Sonali et al. ^[13]	98.27%	99.49%	98.92%	97.8%
Tiwari et al. ^[14]	83%	100%	-	-
S.H.Shah et al. ^[3]	89.2%	86.1%	93%	88.2%
A.Ghosh et al. ^[15]	90.2%	100%	100%	-
Aziz et al. ^[16]	85.29%	100%	100%	98.79%
Hussain et al. ^[17]	90.9%	100%	-	-
Somers et al. ^[18]	78%	100%	100%	-
Yeoh et al. ^[19]	79%	98%	92%	94%
Ariga II et al. ^[20]	98%	97%	99%	86%
Medina et al. ^[21]	82.6%	-	100%	92%
our study	90.24%	100%	100%	88.88%

Discussion

In most major hospitals , the breast lump is a common presenting complaint in the surgical outpatient clinic . The rapid diagnosis of the pathologic nature of breast lump is essential because there is anxiety of possible malignancy . There are many factors that should be regarded in the diagnostic method of breast lump which are : requirement for anesthesia , performance of the diagnostic procedure , histopathologic , cytologic or radiologic examination t and need for hospital admission ^[1] .FNAC is a commonly used diagnostic procedure for breast masses because it is safe , less invasive , cost effective , rapid and excellent results and no need for hospital admission or anesthesia . So , FNAC reduces the need for open breast biopsy ^[6,7] .

There are another advantages of FNAC which are : very low false positive , it can be used as diagnostic and therapeutic in the breast cysts . FNAC can diagnose recurrent breast carcinoma .The complications FNAC include : hematoma formation ,pain and rarely there is a chance of tumor seeding along the needle .Limitations of FNAC include : inability to diagnose if aspirate is scanty due to deep lesion ,very small amount of aspirated tissue and inexperienced hand .Also there is inability of FNAC diagnosis if the aspirate is from the center of necrotic tumor . Another limitation of FNAC is that grading and classification of malignancy are impossible ^[1] .

There are multiple factors that increase accuracy of FNAC which include : image guidance , multiple sampling and performance by experienced pathologist ^[8] .The size of the needle used for FNAC is of importance , because finer needle has disadvantage of inadequate aspirate ,but it causes less pain and less possibility of hematoma. On the other hand , wide pore needle has disadvantage of pain and hematoma , but it has advantage of adequate aspirate ^[1] .In this study , gauge 23 needle was used for all patients without any complications .

In this study , all breast lumps that were diagnosed by FNAC as malignant lumps ,they were also proved to be malignant by histopathology , so there was no false positive cases . There were four cases reported as false negative (benign lumps) by FNAC ,they were proved to be malignant by histopathology .

Conclusion

Fine needle aspiration cytology is a simple , easy , reliable , and repeatable diagnostic method .Its diagnostic accuracy is very high when performed by expert hands .The positive FNAC results have high diagnostic accuracy that can be proved by histopathology , thus FNAC has high sensitivity and high positive predictive value . There is also high accuracy of negative results of FNAC for malignancy in patients in whom malignancy is clinically not suspected . Thus , results of this study show high degree of correlation FNAC

with histopathology . So we can conclude that FNAC is an ideal method of investigation of palpable breast lumps if being performed by expert pathologist .

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دقة عينة سحب الخلايا بالابرّة الدقيقة بالمقارنة مع الفحص النسيجي في تشخيص اصابات الثدي

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الخلاصة

المقدمة: تعتبر اورام الثدي من الاعراض السريرية الشائعة في الاستشارات الجراحية والتي تزيد من قلق المريض والطبيب بسبب احتمالية كونها اوراما خبيثة. ان تشخيص طبيعة ورم الثدي يعتمد على نظام التقييم الثلاثي والذي يتكون من الفحص السريري والتصوير الشعاعي والفحص النسيجي. بالرغم من ان تشخيص الفحص النسيجي يعتبر الطريقة المثالية لمعرفة طبيعة ورم الثدي، لكن عينة سحب الخلايا بالابرّة الدقيقة تعتبر طريقة سهلة وسريعة و اقل تكلفة ويمكن الاعتماد عليها بالاضافة الى كونها ذات حساسية و خصوصية ودقة عالية لتشخيص اورام الثدي.

الهدف: لغرض تقييم الدقة التشخيصية لعينة سحب الخلايا بالابرّة الدقيقة في اورام الثدي الملموسة.

الطريقة: تم اجراء هذه الدراسة في مستشفى الزهراء التعليمي في كلية الطب جامعة واسط للفترة من ايلول ٢٠١٦ الى شباط ٢٠١٧. في هذه الدراسة تم اختيار ٧٣ مريضة تعاني من اورام ملموسة في الثدي، حيث ان الاختيار تم بشكل عشوائي بغض النظر عن العمر والحالة الزوجية والعمل والحالة الاجتماعية. تم اخضاع جميع المريضات الى عينة سحب الخلايا بالابرّة الدقيقة ثم بعدها خضعت جميع المريضات الى عملية جراحية (خزعة قطعية) ثم ارسلت الى الفحص النسيجي. بعد ذلك اجريت مقارنة بين نتائج عينة سحب الخلايا بالابرّة الدقيقة مع نتائج الفحص النسيجي للحصول على للدقة التشخيصية لعينة سحب الخلايا بالابرّة الدقيقة.

النتائج: من اصل ٧٣ مريضة مصابة بورم ملموس في الثدي وجدنا ان ٤١ مريضة كانت تعاني من ورم خبيث، اما الاورام الحميدة فكانت موجودة في ٣٢ مريضة. النتيجة ايضا تضمنت وجود ٤ حالات سلبية كاذبة بينما لا توجد حالات ايجابية كاذبة. حساسية وخصوصية ودقة التشخيص لعينة سحب الخلايا بالابرّة الدقيقة كانت كالتالي وحسب التسلسل ٩٠,٢٤% و ١٠٠% و ٩٤,٢٤%. اما القيمة التنبؤية الايجابية والسلبية فكانت كالتالي حسب التسلسل ١٠٠% و ٨٨,٨٨%،

الاستنتاج: نستنتج من هذه الدراسة ان عينة سحب الخلايا بالابرّة الدقيقة تمتلك دقة عالية في تشخيص طبيعة ورم الثدي لذلك يمكن اعتبارها طريقة معتمدة في فحص اورام الثدي الملموسة اذا اجريت بواسطة ايادي خبيرة. نتائج الدراسة اوضحت درجة عالية من الترابط بين نتائج عينة فحص الخلايا بالابرّة الدقيقة ونتائج الفحص النسيجي.