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ORIGINAL ARTICLE

Diagnostic Accuracy of Fine Needle Aspiration Cytology In Palpable Breast Lump Taking Histopathology As Gold Standard

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Abstract

Background: Problems in the breast can present themselves in different ways like pain in the breast, discharge from nipples, cystic lesions, and most commonly a lump. Breast lump is of great concern to the patients and is also a challenge to the diagnostic acumen and judgment of the surgeon. This will be beneficial in early diagnosis and treatment, reducing its morbidity and mortality this study will provide us with local statistics on the magnitude of breast lump and this will open a window for further research.

Objective: To determine the diagnostic accuracy of FNAC of breast lump with histopathology as a gold standard in the diagnosis of breast cancer.

Material and Methods: The current study was conducted at the Department of General Surgery, Khyber Teaching Hospital, Peshawar for six months (from 2/7/2019 to 27/01/2020). A total of 179 women were observed in which women presenting with palpable breast lump, in age between 35 years to 60 years were included. Fine-needle aspiration cytology (FNAC) of the patients with breast lumps was performed with a 22-gauge needle, mounted on a 10-ml syringe. Excision biopsy was done for small tumors or lumps found benign on fine needle aspiration cytology and histopathology of mastectomy. Histopathological slides of corresponding cytological cases were correlated. The collected data was entered and analyzed in SPSS version 22. Sensitivity, specificity, positive predictive value, and negative predictive value of FNAC were calculated.

Results: Our study shows that among 179 patients, the mean age was 53 years ± 10.45. FNAC had a sensitivity of 90.22%, specificity of 80%, PPV of 99.36%, NPV of 19.04% and diagnostic accuracy was 89.94% in the diagnosis of breast lump keeping histopathology as a gold standard.

Conclusion: Our study concludes that Fine needle aspiration cytology (FNAC) is a simple, safe, and minimally invasive diagnostic test that is accurate in detecting breast lumps, with a high correlation rate to histopathology. When used in conjunction with histopathology, FNAC can ensure an accurate diagnosis and appropriate management of breast lumps.

Keywords: FNAC, histopathology, carcinoma breast

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Introduction

Problems in the breast can present themselves in different ways like pain in the breast, discharge from nipples, cystic lesions, and most commonly a lump. Breast lump is of great concern to the patients and is also a challenge to the diagnostic acumen and judgment of the surgeon. Most palpable breast

Lumps are benign, but 10% of women who present with this finding will have a diagnosis of cancer.[1] Breast lumps are one of the most prevalent presenting complaints in an outpatient department (OPD) in Pakistan.[2] 90% of lumps are benign and of no serious consequences, but malignant lumps
contribute to 10% percentage of all breast lumps.[3]
Histopathological diagnosis is a good standard for the diagnosis of breast lumps, Fine needle aspiration cytology (FNAC) is gaining popularity for diagnosis of breast lumps. FNAC is a quick, simple, reliable, and inexpensive procedure for diagnosing these lumps and helps clinicians to plan management. In India breast cancer is the second most common cancer in women.[4] For the FNAC no anesthesia is required and complications are rare.
FNAC was first introduced in 1930 by Martin and Lewis at Memorial Hospital USA.[5] FNAC is relatively painless, produces rapid results, and is cheap. Its accuracy in many situations when applied by experienced and trained practitioners can approach histopathology in providing equivocal diagnosis.[6]Accuracy of FNAC can be increased by multiple sampling or image guidance.[7] The role of fine needle aspiration cytology (FNAC) in establishing the diagnosis of breast cancer has increased. Recent studies have shown that FNAC has a sensitivity of 89.8% and, a specificity of 99.7% in the diagnosis of Breast lump taking histopathology as the gold standard. The high accuracy and cost-effectiveness of FNAC for identifying cancer in patients with clinically suspicious palpable lesions and small breast tumors.[8] FNAC has been performed on various masses (Ear Nose and Throat lymph node and, thyroid lesions) with a good diagnostic accuracy of 95.7%, 95.3% and, 90%, respectively. However, for breast masses, no adequate studies have been documented as regards the use of FNAC.[9]
No comprehensive study has been conducted in the recent past that emphasizes the significance of such a novel and yet effective investigative tool in the detection of breast lumps. Thus, this study aimed to determine the diagnostic accuracy of FNAC of breast lumps with histopathology as a gold standard. Thus, by using a cheap, non-invasive, non-ionizing modality of investigation, we can detect breast lumps at earlier stages easily. This will be beneficial in early diagnosis and treatment, reducing morbidity and mortality. The results of this study will provide us with local statistics on the magnitude of breast lump and this will open a window for further research.

Material and Method:

This descriptive cross-sectional study was carried out in the Surgery Department, Khyber Teaching Hospital, Peshawar from 2/7/2019 to 27/01/2020 for 6 months. The sample size was 179 prevalence of breast cancer at 25.1%9, 89.8% sensitivity, and 99.7% specificity (assuming 95%) for FNAC. The margin of error for sensitivity is 9% and specificity is 5%. The sample size was calculated using Dr. Linnaing's sample size calculator for diagnostic accuracy. Sampling was done with a nonprobability consecutive method. Women aged between 35 years to 60 years with palpable breast lumps were included while patients diagnosed with breast abscess, pregnancy, breastfeeding, and younger than 35 years were excluded from the study.
The study was conducted after approval from CPSP's ethical committee. After informed consent, all patients meeting the inclusion criteria were included in the study. All the women in age between 35 years to 60 years presenting with palpable breast lumps of any duration were included while women having breast abscesses, Pregnant women, breastfeeding women and those younger than 35 years, patients having fungating growth, breast lumps with skin ulceration or necrosis were excluded.
All patients were subjected to detailed history (family history of breast cancer, previous breast biopsy history, current use of oral contraceptives), followed by clinical breast examination, diagnostic mammography, and FNAC. Physical examination of the whole breast and axillary region was performed by a consultant with the patient in the sitting position with arms both lowered and raised and in the supine position with arms raised. Fine-needle aspiration cytology (FNAC) of the patients with breast lumps was performed with a 22-gauge needle, mounted on a 10-ml syringe. The mass was immobilized between the index and middle fingers of the dominant hand. The needle was inserted into the breast lump and the piston of the syringe was retracted to create suction.

Authorship Contribution: [1,6]Substantial contributions to the conception or design of the work; or the acquisition, Data analysis, Literature review, [2]Drafting the work or revising it critically for important intellectual content, [3,4,6]Final approval of the version to be published, Topic Selection & Supervision

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The needle was moved back and forth inside the mass using rapid excursion. The material was expelled into a glass slide, fixed by air drying, and stained with Giemsa, hematoxylin, and eosin. The slide was examined by the consultant pathologist and the cytological diagnosis of the breast masses was given. Excision biopsy was done for small tumors or lumps found benign on fine needle aspiration cytology and histopathology of mastectomy. Histopathological slides of corresponding cytological cases were correlated. Based on these findings, the sensitivity, specificity, positive predictive value, and negative predictive value of Fine Needle Aspiration Cytology as a test was calculated. In-hospital complications were recorded during the procedures. All the above-mentioned information including demographic features was recorded in a pre-designed Proforma. Strictly exclusion criteria were followed to control confounders and bias in the study results.

The collected data was entered and analyzed in SPSS version 22. Mean and standard deviation were calculated for quantitative variables like age, duration of lump, parity, gravidity, and size of lump. Frequency and percentage were calculated for qualitative variables like marital status, family history, site of tum, or, Malignancy on FNAC and Histopathology. A 2x2 table was generated for calculating sensitivity, specificity, PPV, NPV, and accuracy. Effect modifiers like age, duration of lump, parity, gravidity, size of the tumor, marital status, family history, and site of breast lump was addressed through stratification. Post stratification 2x2 table was used to calculate sensitivity specificity positive predictive value and diagnostic accuracy taking Histopathology as gold standard.

Results:

Among 179, most of the patients 74(41%) patients were in age range 56-65 years followed by 66(37%) patients were in age range 46-55 years and 39(22%) patients were in age range 35-45 years. Mean age was 53 years ± 10.45. 127(71%) patients had duration of lump ≤1 month, 52(29%) patients had duration of lump >1 month. Mean duration of lump was 1 month with SD ± 1.73. 63(35%) patients were primi para and 116(65%) patients were multi para. 59(33%) patients were primi gravida and 120(67%) patients were multi gravida. All the 179(100%) women were married. 4(2%) patients had positive family history of breast cancer while 175(98%) patients had negative family history of breast cancer. (Table No 1) 147(82%) patients had size of lump ≤ 4 cm while 32(18%) patients had size of lump >4 cm. 132(74%) patients had lump on upper outer quadrant while 47(26%) patients had lump on inner middle outer quadrant.

TABLE NO 1. DEMOGRAPHIC DATA(n=179)		
AGE	**FREQUENCY**	**PERCENTAGE**
35-45 years	39	22%
46-55 years	66	37%
56-65 years	74	41%
DURATION OF DISEASE		
≤ 1 month	127	71%
> 1 month	52	29%
PARITY		
Primi para	63	35%
Multi para	116	65%
GRAVIDITY		
Primi gravida	59	33%
Multi gravid	120	67%
MARITAL STATUS		
Married	179	100%
FAMILY HISTORY		
Positive	4	2%
Negative	175	98%

(Table No 3) 158(88%) patients histopathology findings were positive while in 21(12%) patients histopathology findings were negative. 158(88%) patients FNAC findings were positive while in 21(12%) patients FNAC findings were negative. More over FNAC has sensitivity 90.22%, specificity 80%, Positive predictive value 99.36%, Negative predictive value 19.04% and diagnostic accuracy 89.94%.(Table No 3).

TABLE NO 2. INVESTIGATIONS(n=179)		
SIZE	**FREQUENCY**	**PERCENTAGE**
≤ 4 cm	147	82%
> 4 cm	32	18%
SITE		
Upper Outer Quadrant	132	74%
Inner Middle Quadrant	47	26%

TABLE NO 3. COMPARISON OF FNAC AND HISTOLOGICAL DIAGNOSIS(n=179)			
	HISTOPATHOLOGY		
	Yes	No	Total

FNAC	Yes	157 TP	1 FN	158
	No	17 FP	4 TN	21
	Total	174	5	179

Sensitivity=90.22%; Specificity = 80%;PPV = 99.36%, NPV= 19.04%; Accuracy = 89.94%.

TABLE NO 4. STRATIFICATION OF SENSITIVITY, SPECIFICITY, PPV, NPV AND ACCURACY OF FNAC VERSUS HISTOPATHOLOGY WITH EFFECT MODIFIERS (n=179)

AGE	Sensitivity	Specificity	PPV	NPV	Diagnostic accuracy
35-45 years	89.47%	100%	100%	20%	89.74%
46-55 years	96.62%	100%	100%	25%	90.90%
56-65 years	88.88%	50%	98.46%	11.11%	87.43%
Duration Of Disease					
≤ 1 month	90.24%	75%	99.10%	20%	89.76%
> 1 month	92%	100%	100%	33.33%	92.30%
Parity					
Primi para	88.52%	50%	98.18%	12.5%	87.30%
Multi para	89.38%	66.66%	99.01%	14.28%	88.79%
Gravidity					
Primi gravida	91.22%	100%	100%	28.57%	91.52%
Multi gravid	90.51%	75%	99.05%	21.42%	90%
Marital Status					
Married	90.22%	80%	99.36%	19.04%	89.94%
Family History					
Positive	75%	100%	100%	0%	75%
Negative	89.41%	60%	98.70%	14.28%	88.57%
Size					
≤ 4 cm	89.51%	75%	99.22%	16.66%	89.11%
> 4 cm	90.32%	100%	100%	25%	90.62%
Site					
Upper Outer Quadrant	89.84%	75%	99.13%	18.75%	89.39%
Inner Middle Quadrant	89.13%	100%	100%	16.66%	89.36%

Discussion:

Breast lumps are one of the most prevalent presenting complaints in an outpatient department (OPD) in Pakistan. About 90% are benign and of no grave consequences, but malignant lumps contribute to a consequential percentage of all breast lumps. With growing vigilance in the general population, especially about breast pathologies, and the associated solicitude and stress that this condition may lead to, the knowledge that breast cancer can have grim consequences compels patients to seek medical advice. FNAC is an easily diagnostic method for determining the causes of a breast lesion. Its success is due to its accuracy and cost effectiveness for a breast lump. Therefore, it has many advantages for patients and physicians. This study was conducted to determine the sensitivity and specificity of fine needle aspiration cytology (FNAC), by comparing the results with histopathology.

Our study shows that mean age was 53 years with SD ± 10.45. Thirty five percent patients were primi para and 65% patients were multi para. Thirty three percent patients were primi gravida and 67% patients were multi gravida. FNAC has sensitivity 90.22%, specificity 80%, positive predictive value 99.36%, negative predictive value 19.04% and diagnostic

accuracy 89.94% in the diagnosis of breast lump keeping histopathology as a gold standard.

Similar results were observed in another study conducted by Homesh NA et al in which the patient age ranged from 15-74 years with a mean of 33.77 ± 11.91 years.10 Married patients were 69.3% and the most common presentation was breast lump(s) (88.5%). The mean size of the tumor was 3.47 +/- 1.43 cm in diameter. The FNAC sensitivity was 66.66%, 81.8% specificity, 75.7% accuracy, positive predictive value (PPV) 100% and negative predictive value (NPV) 90%, while in core needle breast biopsy sensitivity was 92.3%, 94.8% specificity, 93.4% accuracy, PPV 100% and NPV 100%. The diagnostic accuracy of CNB was higher than the FNAC, which was statistically significant ($p<0.05$).

Similar results were observed in another study conducted by Rahman MZ et al in which 222 patients were included in the study and FNAC was done in all the patients.[11] Mammography was done in 112 cases. Among these 112 patients 32 cases were found malignant. Histopathology was done in total 89 cases. Among 112 patients who were underwent mammography only 43 were found for histopathology. Finally, 36 cases were found malignant. Fibroadenoma is mostly found in below 20 years group and malignancy is mostly occurring in older age group. Mammography shows total 8 false positive and 5 false negative cases. FNAC shows only 1 false positive and 1 false negative case. On analysis mammography showed 82.76% sensitivity, 90.36% specificity, 75% Positive predictive value (PPV), 93.75% Negative predictive value (NPV) and 88.39% accuracy. FNAC showed 97.22% sensitivity, 99.46% specificity, 97.220% PPV, 99.46% NPV and 99.095% accuracy. Mammography was found to be less sensitive, specific and accurate in the diagnosis of breast lump though there is highly significant correlation among them. However, the study has shown a much higher performance of FNAC than other previous studies indicating the improved skill in cytological diagnosis to a satisfactory level.

Similar results were observed in another study conducted by Saha A et al in which FNAC showed sensitivity, specificity, positive predictive value, negative predictive value, and diagnostic accuracy were 69%, 100%, 100%, 38.1%, and 74% respectively in diagnosing carcinoma.[12] CNB had sensitivity, specificity, positive predictive value, negative predictive value, and diagnostic accuracy of 88.3%, 100%, 100%, 53.3% and 86%. Both FNAC and CNB showed statistically significant correlation with confirmatory HPE of excision specimen (p-value <0.05) in the diagnosis of breast carcinoma.

Similar results were observed in another study conducted by Usman K et al in which 200 patients with breast lump were included in this study. Mean age of the patients was 35.45±8.57.[13] All the patients were divided into different age groups. Ninety (45%) patients were in age group 20-30 years, 47 (23.5%) in age group 31-40 years, 32(16%) were in age group 41-50 years, 29(14.5%) were in age group 51-60 years and 2(1%) patients were in age group >60 years. Gender distribution was done and found 7(3.5%) male patients and 193(96.5%) female patients. Histopathological diagnosis of breast lesions shows 53(26.5%) malignant and 147(73.5%) benign cases. Table 3 shows result of FNAC taking histopathology as gold standard. True positive (TP) were recorded as 49(24.5%), 16(8%) false positive (FP), 8(4%) false negative (FN) and 127(63.5%) as true negative (TN), sensitivity was 85.96%, specificity was 88.81%, positive predictive value (PPV) was 75.38% and negative predictive value (NPV) was 94.07%.

Similar results were observed in another study conducted by Iqbal MH et al in which FNAC has been performed on various masses (Ear Nose and Throat lymph node and, thyroid lesions) with good diagnostic accuracy of 95.7%, 95.3% and, 90%, respectively.[14]

Conclusion:

Our study concludes that Fine needle aspiration cytology (FNAC) is a simple, safe, and minimally invasive diagnostic test that is accurate in detecting breast lumps, with a high correlation rate to histopathology. When used in conjunction with histopathology, FNAC can ensure an accurate diagnosis and appropriate management of breast lumps.

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