Original Research Article

Concordance between core needle biopsy and surgical excision specimen in the diagnosis of malignancy and benignity for patients with breast tumours

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ARTICLE INFO

ABSTRACT

Background: Core Needle Biopsy (CNB) has been widely used as a diagnostic tool for breast tumors. However, this technique involves tissue sampling as opposed to complete surgical lesion excision, introducing the possibility of underestimation of disease. The purpose of this study was to assess the reliability of CNB in breast tumors.

Materials and Methods: This was a retrospective cross-sectional study from January 2023 to July 2023. All included patients underwent Core Needle Biopsy (CNB) and subsequent Surgical Excision (SE) of a breast tumor.

Results: One hundred fifty patients were assessed. All patients were female. The median age for malignancies was 45 years and 31 years for benign tumors. Concordance regarding the tumor type was globally moderate (k= 0.67; p<0,001) with a rate of 97.6% for CNB-diagnosed malignant tumors and 62.5% for CNB-diagnosed benign tumors. Concordance for histological types was perfect for CNB-diagnosed ILC (rate= 100%; k= 1; p<0,001) and almost perfect for IDC (rate= 96.7%; k= 0.94; p<0,001).

Conclusion: The concordance between Core Needle Biopsy (CNB) and surgical excision specimen in the diagnosis of malignancy and benignity of breast tumors is almost perfect for CNB-diagnosed malignancies and moderate for benign tumors.

1. Introduction

Breast lesions constitute a heterogeneous group of diseases, with aetiologies ranging from inflammatory, benign tumors, to malignancies.[1] Although a lot of studies have been conducted on breast malignancies, the benign breast diseases have been somewhat neglected. In addition, a breast lump is a source of great anxiety due to the fear of malignancy.[1] Core needle biopsy (CNB) has been widely used as a diagnostic tool for breast lesions to provide information not only on the histological diagnosis but also on various predictive factors because such information is very important when deciding the therapeutic strategy.[2,3] However, this technique involves tissue sampling as opposed to complete surgical lesion excision, introducing the possibility of underestimation of disease.(3,4). Thereby, it sometimes happens in oncological daily practice that breast lesions diagnosed as benign on CNB-histological examination appear to be malignancies at surgical excision (SE) and vice versa.[4] This underestimation has a remarkable impact on the management and overall prognosis of the patient. The purpose of this study was to assess the reliability of CNB in breast tumors by analyzing concordance between CNB and SE specimen in the diagnosis of malignancy and benignity of those lesions.

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2. Materials and Methods

2.1. Study design

From January 2023 to July 2023, we retrospectively collected data from patients affected by breast tumor presenting to the surgical oncology unit of the Dalal Jamm University Hospital. In that retrospective cross-sectional study, all patients underwent core needle biopsy (CNB) and subsequent surgical excision (SE). The local institutional review board approved this retrospective analysis, which waived the requirement to obtain written informed consent from patients.

2.2. Inclusion criteria

The inclusion criteria for the study were histological diagnosis of Breast tumor (benign or malignant) on 14 Gauge (14-G) CNB, and available complete histological reports of CNB and SES. Patients who received primary chemotherapy were also included, due to its no influence on the histological type of the tumor.

2.3. Sampling procedure

Percutaneous CNB were performed under local anesthesia with a 14-gauge semi-automated biopsy device with a 10 cm long needle. An average of 4 core samples per lesion (range 3 – 6) were obtained. In cases of both tumor size less than 3×3 cm long or early inflammatory swelling, an ultrasonography guidance was used. The specimens were fixed in 10% formalin for 24h.

2.4. Data collection

Data were collected from medical records of patients. Variables of interest were patients age and gender; administration of primary chemotherapy, nature (benign or malignant) of the tumor and histological type in both CNB and surgical excision specimen (SES).

2.5. Statistical analysis

All statistical tests were carried out using the SPSS statistical software package version 25.0 (Statistical Package for Social Sciences). Age of patients was described by median, interquartile range and age groups. Gender and other categorical variables were presented by effectives and percentages in frequency tables. The concordance or discordance between core biopsy and surgical specimen was analyzed using Cohen's kappa (k) statistics. Cohen's kappa coefficient value must be interpreted as follows: A k value of less than zero is considered poor, 0–0·20 slight, 0·21–0·40 fair, 0·41–0·60 moderate, 0·61–0·80 substantial and 0·81–1·00 almost perfect agreement.[5] The relation between categorical variables was tested using Chi-2 and Fischer Exact tests and a p-value less than 0.05 was considered as statistically significant.

3. Results

One hundred fifty patients with a breast tumor (both benign and malignant) diagnosed following core needle biopsy and surgical excision were assessed. All patients were female. The median age for malignant tumors was 45 years and 59.1% were under 50 years old. For benign tumors, the median age was 31 years and 50% were under 30 years old (Table 1).

With CNB, 84% of breast tumors was diagnosed as malignancies while this rate was upgraded to 88% after SES histological examination. Invasive ductal carcinoma (IDC), invasive lobular carcinoma (ILC) and mucinous carcinoma (MC) were the major histological types with 72.7%, 4.5% and 2.3% respectively, while fibroadenoma (FA), fibrocystic changes (FC) and benign phyllodes tumor (BPT) were the major benign tumors with 66.6%, 16.7% and 16.7% respectively (Table 2).

The majority of patients presented with locally advanced stage breast cancer (66.6%) or metastatic disease (31%) (Figure 1).
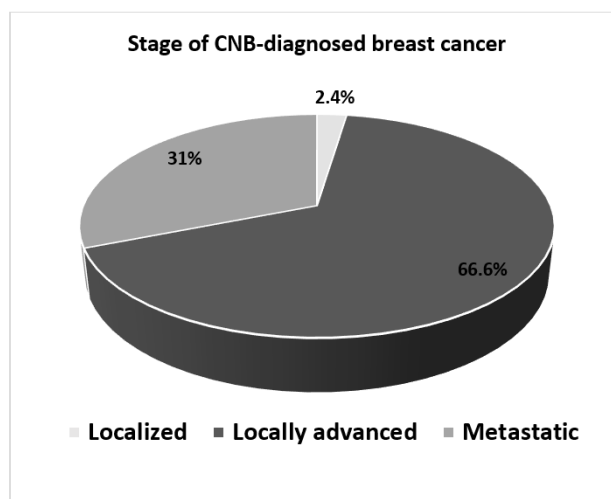

Figure 1: Patients rate who received a neoadjuvant chemotherapy

After breast neoplasms diagnosed by CNB, 79% of patients received preoperative chemotherapy, among which all patients with stage 3 and stage 4 disease and 22.2% of patients with stage 2 disease (Figure 2).

Concordance regarding the tumor type was globally substantial (k= 0.67; p<0,001) with a rate of 97.6% for CNB-diagnosed malignant tumors and 62.5% for CNB-diagnosed benign tumors. Regarding females under 40 years of age, the concordance was almost perfect (k= 0.86; p<0,001) with a rate of 100% for CNB-diagnosed malignant tumors and 80% for CNB-diagnosed benign tumors. Nevertheless, for females over 40 years of age the

Table 1: Patients features

Age groups	Malignant tumor	Benign tumor	Total
Age groups			
[18 – 30]	9 (6.8%)	9 (50%)	18 (12%)
[30 – 40]	36 (27.3%)	3 (16.7%)	39 (26%)
[40 – 50]	33 (25%)	0 (0%)	33 (22%)
[50 – 60]	30 (22.7%)	6 (33.3%)	36 (24%)
[60 – 70]	6 (4.5%)	0 (0%)	6 (4%)
[70 – 80]	18 (13.6%)	0 (50%)	18 (12%)
Total	**132 (88%)**	**18 (12%)**	**150 (100%)**
Age statistics			
Median age	45	31	
Interquartile range	(37 – 54)	(19 – 51)	
Minimal age	21	18	
Maximal age	74	55	
Gender			
Female	132 (88%)	18 (12%)	150 (100%)
Male	0 (0)	0 (0)	

Table 2: Histopathological features of breast tumors

Histopathological features	Core needle biopsy N (%)	Surgical excision specimen N (%)
Tumor type		
Malignant tumor	126 (84.0)	132 (88.0)
Benign tumor	24 (16.0)	18 (12.0)
Histological types for malignant tumors		
Invasive ductal carcinoma (IDC)	117 (92.9)	96 (72.7)
Invasive lobular carcinoma (ILC)	6 (4.8)	6 (4.5)
Mucinous carcinoma (MC)	3 (2.4)	3 (2.3)
Fibrosis (after chemotherapy)	0 (0.0)	27 (20.5)
Histological types for benign tumors		
Fibroadenoma (FA)	9 (37.5)	12 (66.6)
Fibrocystic changes (FC)	6 (25.0)	3 (16.7)
Benign phyllodes tumor (BPT)	3 (12.5)	3 (16.7)
Conjunctival epithelial hyperplasia (CEH)	3 (12.5)	0 (0.0)
Granulation tissue (GT)	3 (12.5)	0 (0.0)
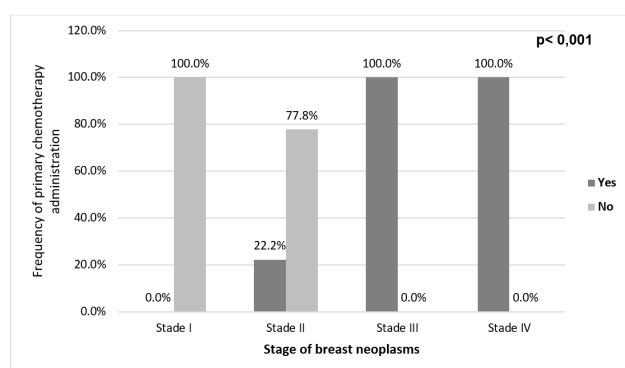
Figure 2: Administration of preoperative chemotherapy according to the stage of malignant breast tumor

concordance was fair (k= 0.35; p=0,011) with a rate of 66.7% for CNB-diagnosed benign tumors (Table 3).

Concordance assessment for histological types (Table 4) shows a perfect concordance for CNB-diagnosed ILC (rate= 100%; k= 1; p<0,001), an almost perfect concordance for IDC (rate= 96.7%; k= 0.94; p<0,001), a substantial concordance for FA (rate= 66.7%; k= 0.79; p<0,001) as well as for FC (rate= 50%; k= 0.66; p<0,001).

The comparison of histological type of breast tumors between CNB and SES (Table 5) shows that 3.3% of CNB-diagnosed IDC were FA, 50% of CNB-diagnosed FC were IDC, 100% of CNB-diagnosed GT were IDC, 33.3% of CNB-diagnosed FA were MC and 100% of CNB-diagnosed MC were IDC.

4. Discussion

Breast lesions constitute a heterogeneous group of diseases, with etiologies ranging from inflammatory, benign lesions, to malignancies.[1] A lot of studies have been conducted on breast malignancies while benign breast diseases have

Table 3: Concordance analysis table for nature of tumor

Core needle biopsy	Surgical excision specimen		Kappa Value	P value
	Concordance rate	Discordance rate		
All patients				
Malignant tumor	97.6%	2.4%	0.67	<0.001
Benign tumor	62.5%	37.5%	0.67	<0.001
Females < 40 ans				
Malignant tumor	100%	0%	0.86	<0.001
Benign tumor	80%	20%	0.86	<0.001
Females ≥ 40 ans				
Malignant tumor	96.4%	3.6%	0.35	0.011
Benign tumor	66.7%	33.3%	0.35	0.011

Table 4: Concordance analysis table for Histological types

Core needle biopsy	Surgical excision specimen		Kappa Value	P Value
	Concordance rate	Discordance rate		
Invasive lobular carcinoma	100%	0%	1	<0.001
Invasive ductal carcinoma	96.7%	3.3%	0.94	<0.001
Fibroadenoma	66.7%	33.3%	0.79	<0.001
Fibrocystic changes	50%	50%	0.66	<0.001
Conjunctival epithelial Hyperplasia	0%	100%	-	-
Benign Phyllods tumor	0%	100%	-	-
Granulation tissue	0%	100%	-	-
Mucinous carcinoma	0%	100%	-	-

Table 5: Comparison of histological type in CNB and surgical excision

Core Needle Biopsy	Surgical Excision Specimen					
	IDC	ILC	FC	BPT	FA	MC
IDC	96.7%	0	0	0	3.3%	0
ILC	0	100%	0	0	0	0
FC	50%	0	50%	0	0	0
CEH	0	0	0	100%	0	0
BPT	0	0	0	0	100%	0
GT	100%	0	0	0	0	0
FA	0	0	0	0	66.7%	33.3%
MC	100%	0	0	0	0	0

been somewhat neglected.[1] The purpose of this study was to assess the reliability of CNB in breast tumors by analyzing concordance between CNB and SE specimen in the diagnosis of malignancy and benignity of those lesions.

All the patients in this study were females. This finding is in agreement with most studies available in the recent literature, which reveal that lesions of the breast are predominantly confined to females.[1,6–9] In males, the breast is a rudimentary structure, relatively insensitive to endocrine influences. This may be the reason for the strong affinity between breast lesions and females.[1] The peak incidence age range for breast benign tumors in various African studies is the second and third decade with most patients aged under 30 years old.[7,9,10] Those reports are consistent with our findings. Indeed, in this study, the median age was 31 years and 50% were under 30 years old. Breast cancer patients in black African populations present at a relatively younger age compared to white-skinned populations.[11] In this study as well as other sub-Saharan Africa series, the mean age of breast cancer is around 45 years.[6,11,12] Yet, In white-skinned populations, this age is around 52 years old.[8,13,14] This finding highlights an interracial difference in populations at risk for breast cancer.

The incidence of benign breast diseases (BBDs) is far more common than malignancies and also the most common cause of breast problems in females.[1] Uwaezuoke et al reported in Nigeria that on out of 334 histopathologically diagnosed breast lesions, 228 (68.3%) were benign in nature and the ratio of benign to malignant lesions was 2.2:1.[7] However, in our study, malignancies were far more common (88%) than benign tumors. This may be due to the fact that the study was conducted in a surgical oncology department.

After CNB and surgical excision, fibroadenoma was the most common BBD in this study, accounting for

67% of all the cases. Our finding was in agreement with most of the studies in the available literature on benign breast lumps.[1,7,9,10] Regarding malignancies, after final diagnosis by surgical excision, invasive ductal carcinoma was the most common breast cancer followed by invasive lobular carcinoma, accounting for 72.7% and 4.5% of all cases respectively. Note that 20.5% of CNB-diagnosed invasive ductal carcinoma which received neoadjuvant chemotherapy have presented fibrosis after surgical excision. These findings are concordant with numerous studies in the literature.[2,6,8,12,13,15]

In low- to middle-income countries (LMIC), 50%-70% of patients present with advanced-stage disease, contributing to high mortality rates.[11] Publications on breast cancer in Africa start by describing a large number of patients presenting with advanced disease.[16] We found in this study that the majority of patients with CNB-diagnosed malignancy presented with locally advanced stage breast cancer (66.6%) and metastatic disease (31%). Vanderpuye et al reported that 89.6% and 72.8% of breast patients in Kenya and Nigeria respectively presenting with advanced stage disease.[16] Ranaivomanana et al in Madagascar reported that 55% of breast neoplasms were diagnosed at stage 3 and 32% at stage 4.[14] In our cohort, 79% of patients with CNB-diagnosed malignancy received preoperative chemotherapy and all patients with stage 3 and stage 4 advanced-disease received neoadjuvant chemotherapy. Similarly, Vanderpuye et al reported that for locally advanced breast cancer, 95% of institutions implemented neoadjuvant chemotherapy.[11]

Core needle biopsy (CNB) specimens provides adequately sized samples permitting a histological diagnosis.[13] The diagnoses obtained from the pathologic examination of CNB and surgically excised specimens have been shown to be similar, with a sensitivity of 90% to 100% for the detection of breast cancer in several studies.[2,13] This observation is consistent with that of our study in which the concordance rate between CNB and SES was of 97.6% for breast cancers. Nevertheless, this concordance was moderate for CNB-diagnosed benign tumors with a rate of 62.5%, revealing an upgrade rate of 37.5% to malignancy after surgical excision. This upgrade rate is 8.2 to 25.6% in the literature depending on the studies.[4,17,18] This difference may be explained both by inter-observer variability and the quality level of materials used for histological diagnosis in this low-income country.

For breast neoplasms, the histological type on CNB was almost perfectly correlated with that of SES. The rates were 100% and 96.7% for invasive lobular carcinoma and invasive ductal carcinoma respectively. Ricci et al. as well as Usami et al found similar results in their studies.[2,13] Studies on concordance between CNB and SES for patients with breast lumps are rare in the available literature. Choi et al. made a comparative study of histological features between CNB and SES on 90 cases of benign phyllodes tumor in which they demonstrated that the concordant rate of diagnosis between CNB and surgical excision was about 60%.[19] In this study, we found no concordance probably because the number of phyllodes tumor cases was very limited in our cohort. Additionally, a global comparison of histological type of breast tumors between CNB and SES in this study found that 3.3% of CNB-diagnosed IDC were FA at SES, 50% of CNB-diagnosed FC were IDC, 100% of CNB-diagnosed GT were IDC, 33.3% of CNB-diagnosed FA were MC and 100% of CNB-diagnosed MC were IDC.

5. Limitations

This study has few potential limitations. First, it was retrospective in design, and therapy or lack of therapy was not determined on a randomized basis. Next, any discordance between CNB and surgically resected specimens may be due to various factors, including tumor sampling, technical preparation, fixation time, or inter-observer variability.

6. Conclusion

The concordance between core needle biopsy (CNB) and surgical excision specimen in the diagnosis of malignancy and benignity of breast tumors is almost perfect for CNB-diagnosed malignancies and moderate for benign tumors. Nevertheless, physicians should be cautious about both a CNB-diagnosed benign tumor in women over 40 years and a histological diagnosis of fibrocystic mastopathy on core needle biopsy.

7. Funding Support

8. Conflict of Interest

Authors declared no conflict of interest in relation to this article.

Acknowledgements

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