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Original Research Article

The accuracy of core needle biopsy in determining histological type and Scarf-Bloom-Richardson grade in invasive breast cancer

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ABSTRACT

Background: Core needle biopsy provides information not only on the histological diagnosis but also about tumor grade and different prognosis factors for breast cancer. This study was designed to determine the accuracy of percutaneous core needle biopsy (CNB) through comparative analysis of histological diagnosis and SBR tumor grade of invasive breast cancer between CNB and surgical excision specimen (SES).
Materials and Methods: This was a retrospective cross-sectional study from January 2023 to July 2023. All patients with invasive breast cancer diagnosed by CNB and confirmed by surgical excision specimen (SES) examination were included in the study. Patients who received neoadjuvant chemotherapy were excluded.
Results: One twenty-three patients were assessed. All patients were female. The median age was 45 years (37 – 54). Invasive ductal carcinoma (IDC) was the major histological type of breast cancer (95.1%) followed by invasive lobular carcinoma (ILC) (4.9%). SBR grade 2 tumors accounted for 78.1% of cases. The majority of patients presented with locally advanced stage breast cancer (65.9%) or a metastatic disease (31.7%). Concordance for histological type was substantial (k= 0.79; p<0,001) whereas it was moderate (k= 0.45; p<0,001) for Scarf-Bloom-Richardson grade.
Conclusion: Histological type on CNB correlates almost perfectly with that of the surgical excisional specimen in case of breast cancer. Nevertheless, the agreement of tumor grade between CNB and SES remains moderate, with a significant underestimation and overestimation rates.

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1. Introduction

Breast cancer is the most frequent cancer and the main cause of death from cancer in women worldwide.[1–4] Percutaneous core needle biopsy (CNB) of breast masses is increasingly being used for obtaining a preoperative diagnosis.[5,6] It provides information not only on the histological diagnosis but also about tumor grade. Such information is very crucial in planning the therapeutic strategy.[5,7,8] Until surgical excision specimen available (SES), it is the only method to diagnose invasive carcinoma and his prognosis and predictive factors.[9] However, tissue sampling increase the risk of underestimating neoplastic disease.[10] Thus, reliability of this material compared with whole surgical excision specimen (SES) deserves to be questioned.[9] The concordance of histological type and Scarf-Bloom-Richardson's (SBR) tumour grade between CNB and surgical excision has been studied by several authors, but the results vary widely depending on the studies.[7,11] Additionally, to our knowledge, no data on concordance rate between CNB and SES for breast cancer is available in African setting. Therefore, this study was

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designed to determine the accuracy of percutaneous CNB through comparative analysis of histological diagnosis and SBR tumor grade of invasive breast cancer between CNB and SES.

2. Materials and Methods

2.1. Study design

From January 2023 to July 2023, we retrospectively collected data from patients affected by breast cancer 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.

2.2. Selection criteria

All patients with invasive breast cancer diagnosed by CNB and confirmed by surgical excision specimen (SES) examination were included in the study. Patients who received neoadjuvant chemotherapy were excluded.

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 was collected from medical records of patients. Variables of interest were patients' age and gender; histological type of neoplasms, stage of disease and Scarf-Bloom-Richardson (SBR) grade of the breast cancer on both CNB and 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. 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 twenty three patients with a breast cancer diagnosed following core needle biopsy and surgical excision were assessed. All patients were female. The median age was 45 years and 46.4% were under 45 years old. The youngest patients were 21 years. (Table 1).

Table 1: Patients features

Patients characteristics	**N (%)**
Age groups	
(21 – 35)	21 (17.1%)
(35 – 45)	36 (29.3%)
(45 – 55)	36 (29.3%)
(55 – 65)	12 (9.8%)
(65 – 75)	18 (14.6%)
Total	**123 (100%)**
Age statistics	
Median age	45
Interquartile range	(37 – 54)
Minimal age	21
Maximal age	74
Gender	
Female	123 (100%)
Male	0 (0)

Invasive ductal carcinoma (IDC) was the major histological type of breast cancer (95.1%) followed by invasive lobular carcinoma (ILC) (4.9%). All cases of mucinous carcinomas (MC) diagnosed by CNB were revised as IDC after SES examination (Figure 1).

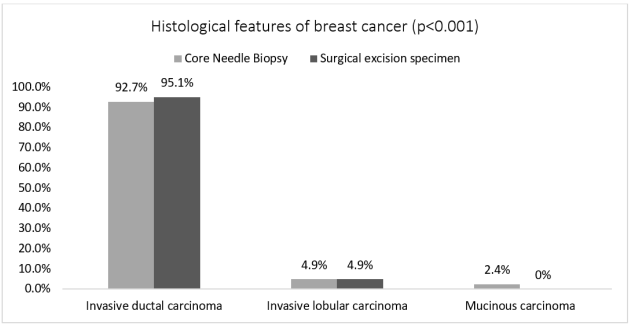

Figure 1: Histopathological features of cancers

The SBR grades of invasive breast neoplasms were in order of decreasing occurrence grade 2, grade 3 and grade 1 with 78.1%, 19.5% and 2.4% respectively. There was a significant difference between CNB-SBR grade and SES-SBR grade (p<0.001) (Figure 2).

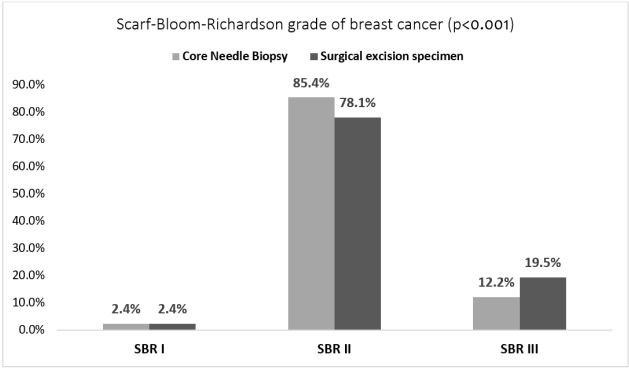

Figure 2: Scarf-bloom-richardson grade of breast cancer

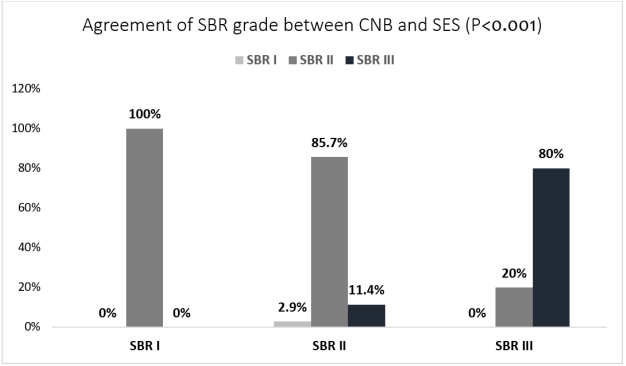

Figure 4: Concordance of SBR grade between CNB and SES

The majority of patients presented with locally advanced stage breast cancer (65.9%) or a metastatic disease (31.7%) (Figure 3).

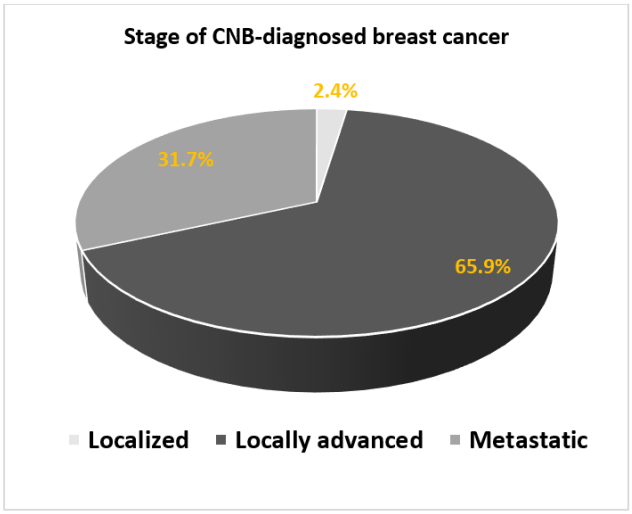

Figure 3: Stage of breast cancer at CNB diagnosis

Concordance regarding the histological type was substantial (k= 0.79; p<0,001). All cases of both IDC and ILC diagnosed by CNB were confirmed by SES. Nevertheless, all cases of CNB-diagnosed MC were revised as IDC. Regarding the Scarf-Bloom-Richardson grade, there was a moderate concordance between CNB and SES (k= 0.45; p<0,001). The concordance rates between CNB and SES for grade 1, grade 2 and grade 3 were 0%, 85.7% and 80% respectively (Table 2).

All SBR grade 1 cases reported by CNB were upgraded to grade 2 after SES examination. Regarding SBR grade 2 reported by CNB, 2.9% of cases were downgraded to SBR grade 1 and 11.4% were upgraded to SBR grade 3 after SES examination. Additionally, 20% of cases of SBR grade 3 diagnosed by CNB were downgraded to SBR grade 2 after SES examination.

4. Discussion

Breast cancer is the most prevalent cancer in African women.[12] The incidence of breast cancer in Africa is projected to double by 2050.[12] The use of core needle biopsy (CNB) is quite widespread for preoperative diagnosis of breast tumors.[5] The purpose of this study was to determine the accuracy of percutaneous CNB through comparative analysis of histological diagnosis and SBR tumor grade of invasive breast cancer between CNB and SES.

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 mainly found in females(2,13). In males, the breast is a less developed structure and relatively insensitive to endocrine influences. This may be the reason for this gender disparity.[13] Breast cancer patients in black African populations present at a relatively younger age compared to Caucasians.[12] In this study as well as other sub-Saharan Africa series, the mean age of breast cancer is around 45 years.[1,2,12,14] Yet, in Caucasians, this age is over 50 years old.[4,5,7,9,15] This findings highlights an interracial difference in populations at risk for breast cancer.

Publications on breast cancer in Africa setting reveal that a large fraction of patients get hospitals when the disease has progressed to an advanced stage.[12] We found in this study that the majority of patients with CNB-diagnosed malignancy presented with locally advanced stage breast cancer (65.9%) and metastatic disease (31.7%). Vanderpuye et al reported that 89.6% and 72.8% of breast patients in Kenya and Nigeria respectively presenting with advanced stage disease.[12] Ranaivomanana et al in Madagascar reported that 55% of breast neoplasms were diagnosed at stage 3 and 32% at stage 4.[4]

In agreement with the recent literature on the topic(1,2,5,7,8,13,15), the major histological types of breast cancer in this study were invasive ductal carcinoma (IDC) followed by invasive lobular carcinoma (ILC) with 95.1% and 4.9% of cases respectively. Furthermore, grade

Table 2: Concordance analysis table for histological type and SBR grade

Core needle biopsy	Surgical excision specimen		Kappa Value	P value
	Concordance rate	Discordance rate		
Histological type				
Invasive ductal carcinoma	100%	0%		
Invasive lobular carcinoma	100%	0%	0.79	<0.001
Mucinous carcinoma	0%	100%		
SBR Grade				
I	0%	100%		
II	85.7%	14.3%	0.45	<0.001
III	80%	20%		

2 and grade 3 were in majority regarding to the Scarf-Bloom-Richardson grade with 78.1% and 19.5% of cases respectively. Same findings have been reported in many studies.[1,2,15]

Motamedolshariati et al and Ricci et al reported in their respective cohorts that histological types determined on CNB were exactly correlated with the types determined in SES(5,7). In this study, the concordance rates were 100% for both IDC and ILC. In the same vein, Usami et al reported a perfect agreement regarding histological patterns of breast neoplasms.[8] These findings demonstrate that the histological features of breast cancer in core biopsy specimens accurately reflect those on SES.[7]

Knuttel et al reported in a meta-analysis of the concordance of histological grade of breast cancer between CNB and SES that the level of agreement of tumour grade on CNB and surgical excision ranged from 59·3 to 94%.[11] Those data are consistent with those of Motamedolshariati et al who reported that tumor grade was concordant in 66.6% of cases, with a kappa coefficient of 0.45.[5] Similarly to those findings, the concordance rates between CNB and SES in this study for grade 1, grade 2 and grade 3 were 0%, 85.7% and 80% respectively with Kappa coefficient of 0.45. Additionally, Petrau et al demonstrated that the level of agreement for SBR grade was fair.[9] The main reason for this observed discordance for tumour grade between CNB is probably undersampling by CNB.[6,10,11] The amount and the quality of tissue obtained is limited and tumours are sampled randomly with CNB.[6,10,11] Consequently, the most representative and relevant tumour areas may be occulted, especially in histologically heterogeneous tumors.[11] Knuttel et al furthermore reported in their study that underestimation of grading by CNB occurred in 19·1% of patients, whereas overestimation occurred in only 9·3 per cent.[11] This finding is almost similar to that revealed in this study, which demonstrated an underestimation rate of 20% and an overestimation rate of 11.4%. Thus, surgical excision is considered the reference standard for grade assessment of breast neoplasms.

5. Limitations

This study has few potential limitations. First, it was retrospective in design. 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

Histological type on CNB correlates almost perfectly with that of the surgical excisional specimen in case of breast cancer. Nevertheless, the agreement of tumor grade between CNB and SES remains moderate, with a significant underestimation and overestimation rates. Yet, incorrect tumour grading may have substantial clinical implications in further management of a breast cancer patient.

7. Funding Support

No specific funding was disclosed.

8. Conflict of Interest

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

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