

ULTRASOUND GUIDED FINE NEEDLE ASPIRATION CYTOLOGY OF BREAST MASSES IN ADO-EKITI, SOUTHWESTERN NIGERIA: A RADIOPATHOLOGIC CORRELATION

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Running Title: Ultrasound guided FNAC of breast masses

ABSTRACT

Background: in order to enhance diagnostic accuracy, the role of a multidisciplinary approach in the evaluation of breast masses cannot be overemphasized.

Objective: this study sought to evaluate radiopathologic correlation of breast masses using ultrasound guided FNAC in a tertiary health institution in southwestern Nigeria.

Methods: a prospective study was carried out on 47 patients with clinical suspicion of breast lesions referred to the FNAC Clinic at Ekiti State University Teaching Hospital, Ado-Ekiti, Nigeria. The study was conducted between February 2014 and October 2017. The FNAC was done by the Anatomic Pathologist under imaging guidance provided by the Radiologist using a 7.5 Megahertz ultrasound probe. Sonographic and cytology findings were correlated and data was analyzed using SPSS version 20.

Results: A total of 47 patients were recruited into the study out of which 95.7% were females and 4.3% were males. The age range was between 16 and 73 years with a mean age of 45.12±14.8years. Significant proportions (55.3%) of the masses were located in the left breast. On ultrasonographic examination of the breast masses, the predominant echotexture was hypoechoic (n=25, 53.1%), the predominant composition was solid (n=31, 66%) and the most common additional imaging finding was axillary lymphadenopathy(n=15,31.9%). Majority of the lesions were radiologically classified as BIRADS 5 (n=17,36.2%) while majority of the FNAC diagnosis were Benign(C2)(n=17,36.2%).

There was a strong radiopathologic Spearman correlation coefficient value of 0.845.

Conclusion: ultrasound guided FNAC should be encouraged in order to engender optimum patient care.

Keywords: Ultrasonography, FNAC, breast masses

INTRODUCTION

Breast swellings constitute the bulk of lesions subjected to Fine needle aspiration cytology (FNAC) in our environment and this may not be unconnected with a rise in cancer incidence. Recent report from a population based cancer registry based in our centre revealed a rise cancer incidence particularly, breast cancer in our environment¹. Globally, one million new breast cancer cases are diagnosed each year². The current lifetime risk of a woman is 10%². According to reports from population based cancer registries in Nigeria, breast cancer is the commonest malignancy affecting all women^{1,4}. Most of the cases affect women in the age group of 30-50 years. In this context, there is a need for breast awareness, regular screening, detection and treatment of cancer of the breast in early stage in order to prevent the high mortality associated with late presentation which is the hallmark of the disease in Nigeria and other developing countries.

FNAC is often required to determine the nature of the mass before further medical and /or surgical intervention. When done under ultrasound guidance it can be of great value in the evaluation of breast masses. Ultrasound reliably differentiates between solid and cystic lesions. Small lesions that may not be overtly palpable are better localized while large masses are better delineated. Incidence of wrong or inadequate tissue sampling by the pathologist is also minimized. Ultrasound guided FNAC thus provides an avenue for characterization of masses by both the radiologist and the pathologist and this translates to better patient care in the diagnostic arena. The primary objective of this study is to evaluate the radiopathologic correlation of breast masses using ultrasound guided FNAC. Similar studies have been conducted in different settings⁵⁻⁷ but this is the first study to look at the role of ultrasound guided FNAC in the diagnostic evaluation of breast masses in this centre.

RESEARCH METHODS AND DESIGN

Ethical Approval

Ethical approval was obtained from Ethics and Research Committee, Ekiti State University Teaching Hospital, Ado-Ekiti, Nigeria. Protocol Number: EKSUTH /A67/2014/09/006 issued on 20th September, 2014.

This is a prospective study on cases with a clinical suspicion of breast lesions referred to the FNAC Clinic of the Department of Anatomic Pathology of Ekiti State University Teaching Hospital, Ado-Ekiti. The study was conducted between February 2014 and October 2017. Patients recruited into the study were scheduled to have the procedure done by the Anatomic pathologist under ultrasound guidance provided by the Radiologist.

The clinical history of symptoms related to the breast such as mastalgia, lumpy feel, nipple discharge, retraction, skin changes and generalized breast discomfort were noted. The breast was examined for lump with special reference to site, size, tenderness, mobility, consistency and fixation to underlying wall. Ultrasonographic examination of the masses was conducted by the Radiologist with a 7.5 MHz linear ultrasound probe (Ultrasound unit: Mindray real time ultrasound scanner model DCN-2; Shenzhen, China) which is used for sonographic imaging of superficial structures. With the patient lying supine on the examination couch, the arm on the side of the breast for FNAC is placed above the patient's head on the pillow. This is to give room for adequate exposure of the breast and axilla in a comfortable position. Ultrasound gel is applied on the breast and the probe is slowly moved across the breast. The sonographic examination of the breast for lesions are carried out with special reference to

site, size, echogenicity, heterogeneity, margins, and presence or absence of calcification. The sonographic findings were categorized using the American College of Radiology (ACR) guidelines for Breast Imaging Reporting And Data System (BIRADS). The assessment categories of sonographic findings are as follows:

BIRADS 0: Inconclusive study (additional imaging required); BIRADS 1: Normal study; BIRADS 2: Benign findings; BIRADS 3: Probably benign findings; BIRADS 4: Suspicious lesion; BIRADS 5: Highly suspicious lesion; BIRADS 6: Biopsy proven malignancy.

Ultrasound guided FNAC was done by free hand technique using 23 G needles and without local anaesthesia. The skin was disinfected and the needle was inserted by the anatomic pathologist under ultrasound guidance provided by the Radiologist. The needle was clearly visualized on the ultrasound monitor as it advances in the lesion, and the presence of the tip within the lesion was sonographically confirmed by the Radiologist. Once the needle has penetrated the mass, aspiration was done and the needle tip is moved in different directions to collect multiple samples. The aspirated material was expressed at least on two previously numbered glass slides and thin smears were prepared with the help of 0.4mm thickness cover slip. The smears were prepared as wet and air dried before staining with Haematoxylin and Eosin stains. Accompanying axillary lymph nodes were sonographically delineated and FNAC samples were sometimes additionally taken from the site. The evaluation of the cytology was done with special reference to adequacy of sampling and nature of cellular yield. The cytological diagnosis was done independently and classified using the National Cancer Institute guideline as follows: C1 (Inadequate), C2 (Benign), C3 (Atypical, probably benign), C4(Suspicious, favour malignancy) and C5(Malignant).

The final diagnosis of the breast lesion was offered comprehensively and on critical evaluation of clinical, sonographic and cytological findings. The correlation of sonographic diagnosis and cytological diagnosis was done and data was analyzed using both simple statistical methods and SPSS version 20.

RESULTS

A total of 47 patients were recruited into the study out of which 45(95.7%) were females and 2(4.3%) were males. The age range was between 16 and 73 years with a mean age of 45.12 ± 14.8 years. Age group 50-59 (29.8%) had the highest frequency followed by age group 30-39 (23.4%) (Table 1). The most frequent clinical indication was breast lump which was seen in the request card presented by 40(85.1%) of the patients (Table 2). In terms of location, the right breast was affected in 18(38.3%) cases, left breast in 26(55.3%) cases and bilateral in the remaining 3(6.4%) cases. Three patients three 3(6.4%) had bilateral breast involvement. On ultrasonographic examination of the breast masses (Table 3), the predominant echotexture was hypoechoic (n=25, 53.1%), the predominant composition was solid (n=31, 66%) with irregular margins (n=17,36.2%) and the most common additional imaging finding was axillary lymphadenopathy (n=15,31.9%). The BIRADS classification of the sonographic findings is displayed in Table 4. Majority of the lesions were sonographically classified as BIRADS 5 (n=17,36.2%) following high suspicion of malignancy based on the sonographic features. This was closely followed by benign lesions classified as BIRADS 2 which includes simple breast cyst (n=1, 2.1%), fibroadenoma (n=11, 23.4%), breast abscess (n=1, 2.1%) and ductal ectasia (n=2,4.2%). Lesions classified under the BIRADS 3 category includes fibrocystic disease (n=3, 6.4%) and a probably mass benign breast mass (n=1, 2.1%). Six of the lesions were suspicious (n=6, 12.8%) which is under BIRADS IV Category. One (2.1%) of the lesions was categorized as BIRADS 0 (Inconclusive study requiring additional imaging) while 4(8.5%) were BIRADS 1(Normal study).Majority of the FNAC

diagnosis (Table 5) were Benign (C2)(n=17,36.2%), closely followed by malignant (C5)(n=16,34%). Out of the 47 cases, only 15 had significant lymphadenopathy that necessitated ultrasound guided FNAC on them . All of the 15 cases were reported as malignant (Table 5). The sonographic and cytologic features of each lesion were compared (Figure 1, 2 and 3).

Diagnostic performance diagnostic accuracy was calculated as 93.6%, sensitivity of 88.2% and the specificity of 85.1%.

There was a strong radiopathologic correlation (Spearman correlation coefficient value of 0.845).

DISCUSSION

It is quite unfortunate that in Sub-Saharan Africa , the concept of multi-disciplinary approach to patient management especially between the Radiologists and Pathologists is still at the primitive level. Although, both are in the diagnostic armamentarium arm of Medicine , both specialists still operate independently even in the tertiary health care facilities in this region. In most centres in Nigeria, Fine Needle Aspiration Cytology (FNAC) is usually done blindly (without image guidance) by the Pathologists. This probably accounted for some cases of sampling errors and inadequate sampling associated with blindly done FNAC in my centre and other centres in this region. Yusuf et al reported that false negative results of FNAC can be linked to sampling errors and / or inadequate sampling⁸. The most common cause of false negative results was report as aspiration miss⁹. FNAC of the breast serves two main goals namely to confirm benign lesions thus avoiding unnecessary surgery targeted to remove the entire breast (mastectomy) , and to confirm malignant diagnoses thus enabling definitive treatment planning , management and interventions¹⁰. In this regard, breast cytology has been shown to be highly sensitive and specific¹¹. Image guided procedures provide an opportunity for dual diagnostic appraisal of lesions by both the Radiologist and the Anatomic pathologist. The use of imaging guidance increases the likelihood of obtaining a representative sample from the lesion.¹² In our study, there was no case of inadequate tissue sampling. Ultrasonography is an affordable, readily available, easy to use imaging modality that does not utilize ionizing radiation. Fine-needle aspiration of a breast lesion for cytological analysis requires optimal, stable visualization of the lesion, and ultrasound guidance is the method of choice for achieving this end.^{13,14} With the use of ultrasound guidance, the extent and margins of the lesions are well delineated, the tip of the needle is sonographically confirmed to be within the lesion and this reduces incidence of inconclusive results or repeated procedures due to inadequate tissue samples and thereby reduce the patients' psychological stress and additional financial burden.

The most common clinical presentation of breast pathology in this study is breast lump. A definite diagnosis of breast lump is very important for the surgeon to decide on the final course of treatment and also saves the patient from unnecessary physical, emotional and psychological trauma if there is a definite preoperative diagnosis of benign lesion¹⁵. Ultrasonography can effectively characterize masses and reliably differentiate between cystic and solid lesions. Small lesions that cannot be grossly palpated are sonographically detected. It also gives room for some interventional procedures such as cyst drainage under image guidance.

FNAC is both diagnostic and therapeutic in a cystic mass¹⁶. Cytological analysis of fine-needle aspirates can also be used to characterize cysts, solid nodules (palpable and nonpalpable) and axillary lymph nodes⁷. Malignancy can be diagnosed with certainty⁷ if the FNAC smear shows abundant cellularity, unequivocal signs of malignancy and evidence of poor cohesion (Figure3) In newly

diagnosed breast cancer, it has already been shown that FNAC can achieve high accuracy, sensitivity and specificity to predict lymph node metastases^{17,18,19}.

Axillary lymph nodes are also sonographically evaluated. In our study, axillary lymphadenopathy is the most common additional ultrasound imaging finding. The diagnostic role of breast sonography has been expanded to include morphological differentiation of benign and malignant lymph nodes and imaging guidance for the biopsy of those that are pathological. Ultrasonography combined with FNAC has displayed excellent specificity (up to 100%) in diagnosing metastases, and it can significantly reduce the number of unnecessary biopsies of sentinel lymph nodes⁷. In this study, we found the diagnostic performance accuracy to be at 93.6%, sensitivity at 88.2% and specificity at 85.1%. This high diagnostic performance accuracy recorded for ultrasound guided FNAC of breast lesion in this study, suggests that the procedure will be very useful in diagnosing breast lesions. The values of both sensitivity and specificity are within the currently published ranges in the literature, from 78.1% to 99.3% and 67 % to 100%, respectively²⁰.

In our study, both breasts and axillae were sonographically examined by the Radiologist irrespective of the area of clinical concern. This was done to ensure best clinical practice. The ultrasonography conducted revealed unilateral breast lesions in majority of the cases while only 3(6.4%) had bilateral breast involvement. A similar pattern was seen in the study conducted by Sagale⁴ et al.

Ultrasound guided FNAC has emerged as the optimal guidance technique for palpable breast lumps and non-palpable sub-clinical lesions⁵ For best results it is advisable that surgeon, radiologist and anatomic pathologist collaborate closely and work as a team^{5,7}. In four instances in this study, there was a clinical suspicion of a breast lesion, no breast mass was seen sonographically and FNAC samples taken from the region of clinical concern were also normal. The radiopathologic correlation of these cases helps the surgeon to take well informed decisions regarding the management of the patient.

Generally, in our own experience, ultrasound guided FNAC of breast lesions is a safe procedure which is well tolerated by the patients, the associated discomfort is minimal. This has been corroborated by some other researchers^{5,21,22}. It is also fast, cost effective and the reports are usually obtained earlier than that of core biopsy. Ultrasound-guided automated Tru-cut needle biopsy may be used as an alternative to fine needle aspiration cytology for the assessment of discrete mass lesions of the breasts^{23,24}. Further research on this will be carried out at our centre.

CONCLUSION

Ultrasound guided FNAC provides a sound multidisciplinary approach for the diagnostic evaluation of breast masses where the expertise and facilities are available and should be encouraged in order to engender optimum patient care.

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TABLES

Table 1: Social Demographic Characteristics

Variables	Mean	SD
<u>Age in years:</u>	45	± 14.8
<u>Age group (in years):</u>	Frequency	Distribution (%)
< 30	8	17.0
30-39	11	23.4
40-49	8	17.0
50-59	14	29.8
≥60	6	12.8
<u>Sex:</u>		
Male	2	4.3

Female	45	95.7
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Table 2: Clinical Indications

	Frequency	Percentage
Breast Lump	40	85.1
Breast pain	3	6.4
Nipple discharge	3	6.4
Breast skin changes	1	2.1
Total	47	100.0

Table 3: Ultrasonography Findings

Variable (%)	Frequency	Distribution (%)
Abnormal findings present		
Yes	43	91.5
No	4	8.5
Echotexture		
Hyperechoic	6	12.8
Hypoechoic	25	53.2
Anechoic	4	8.5
Isoechoic	1	2.1
Margins		

Well defined, regular	15	31.9
Irregular/speculated	17	36.2
Ill defined	3	6.4
Composition of lesions		
Cystic	5	10.6
Solid	31	66.0
Additional Findings		
Dilated ducts	6	12.8
Intraductal masses	1	2.1
Axillary lymphadenopathy	15	31.9
Soft tissue oedema	4	8.5

Table 4: BIRADS Classification of Ultrasound Diagnosis

	Frequency	Percentage
0	1	2.1
I	4	8.5
II	15	31.9
III	4	8.5
IV	6	12.8
V	17	36.2
Total	47	100.0

Table 5: FNAC Diagnosis

	Frequency	Percentage
Normal	4	8.5
C2	17	36.2
C3	2	4.3
C4	8	17.0
C5	16	34.0
Total	47	100.0

FIGURES AND LEGENDS

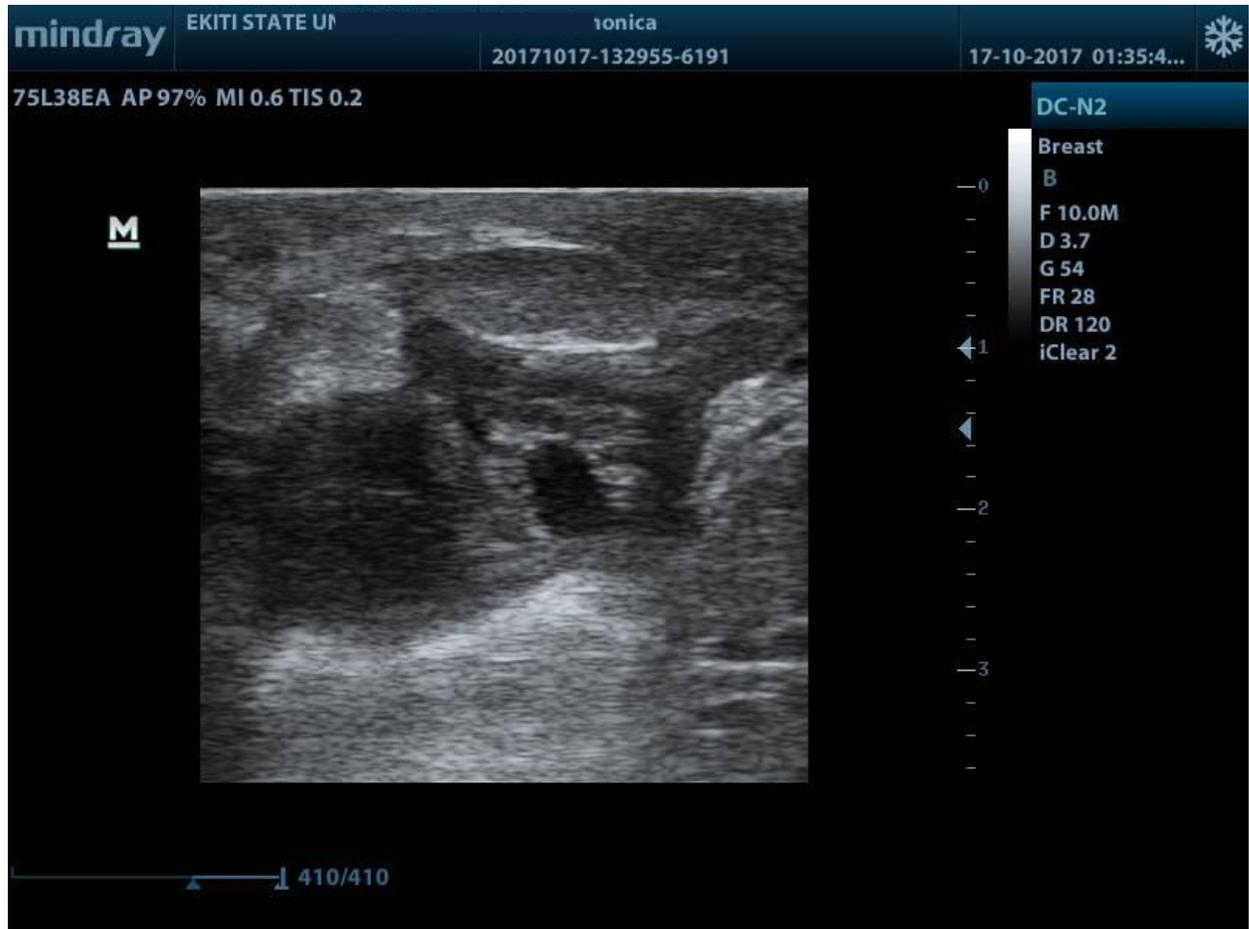


Figure 1: Ultrasonography scan showing a breast mass with heterogenous echotexture and irregular margins. BIRADS category 5

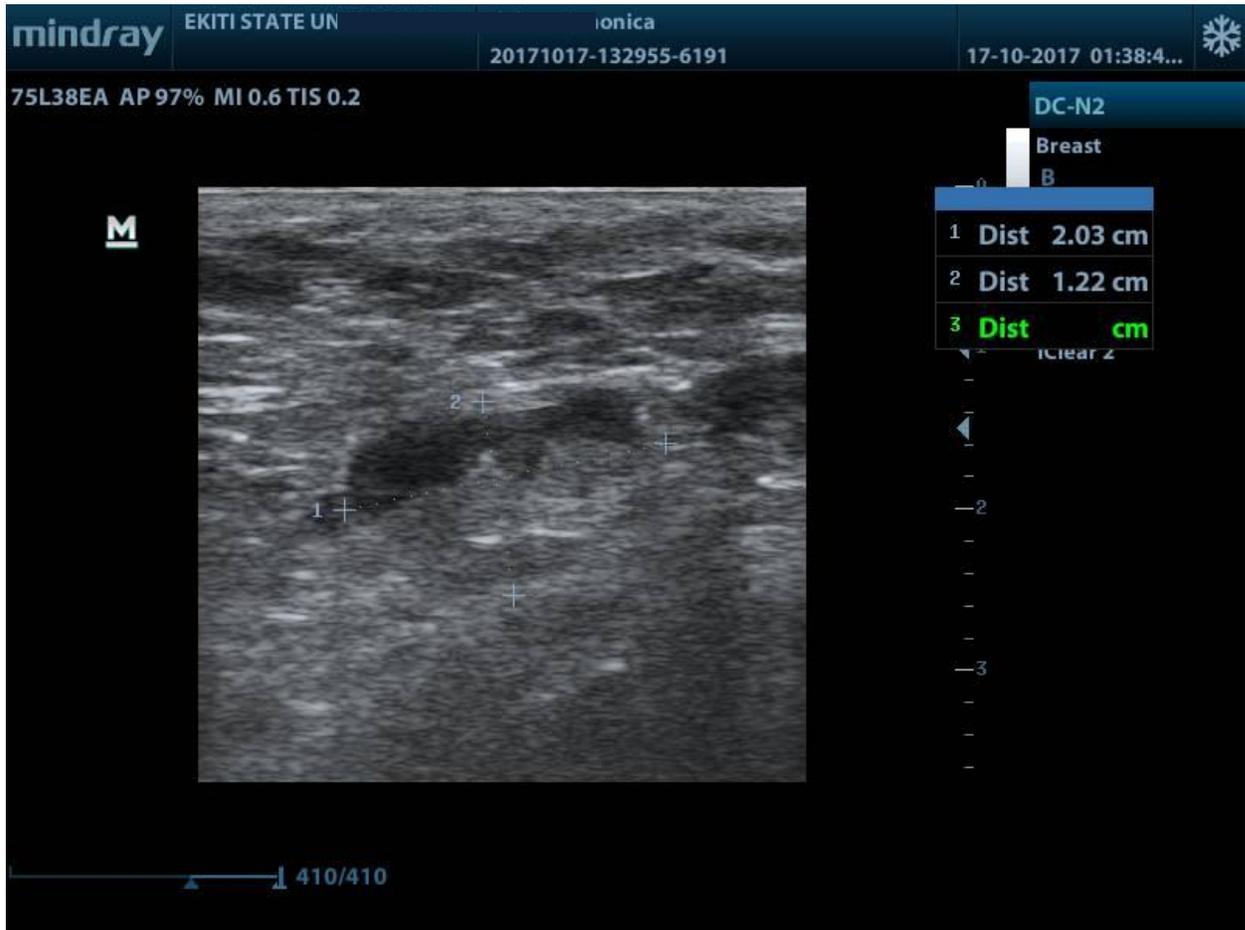


Figure 2: Ultrasonography scan showing the ipsilateral axillary lymph node accompanying the breast mass in figure 1, measuring 2.03 x 1.22cm, the central hilum is no longer preserved.

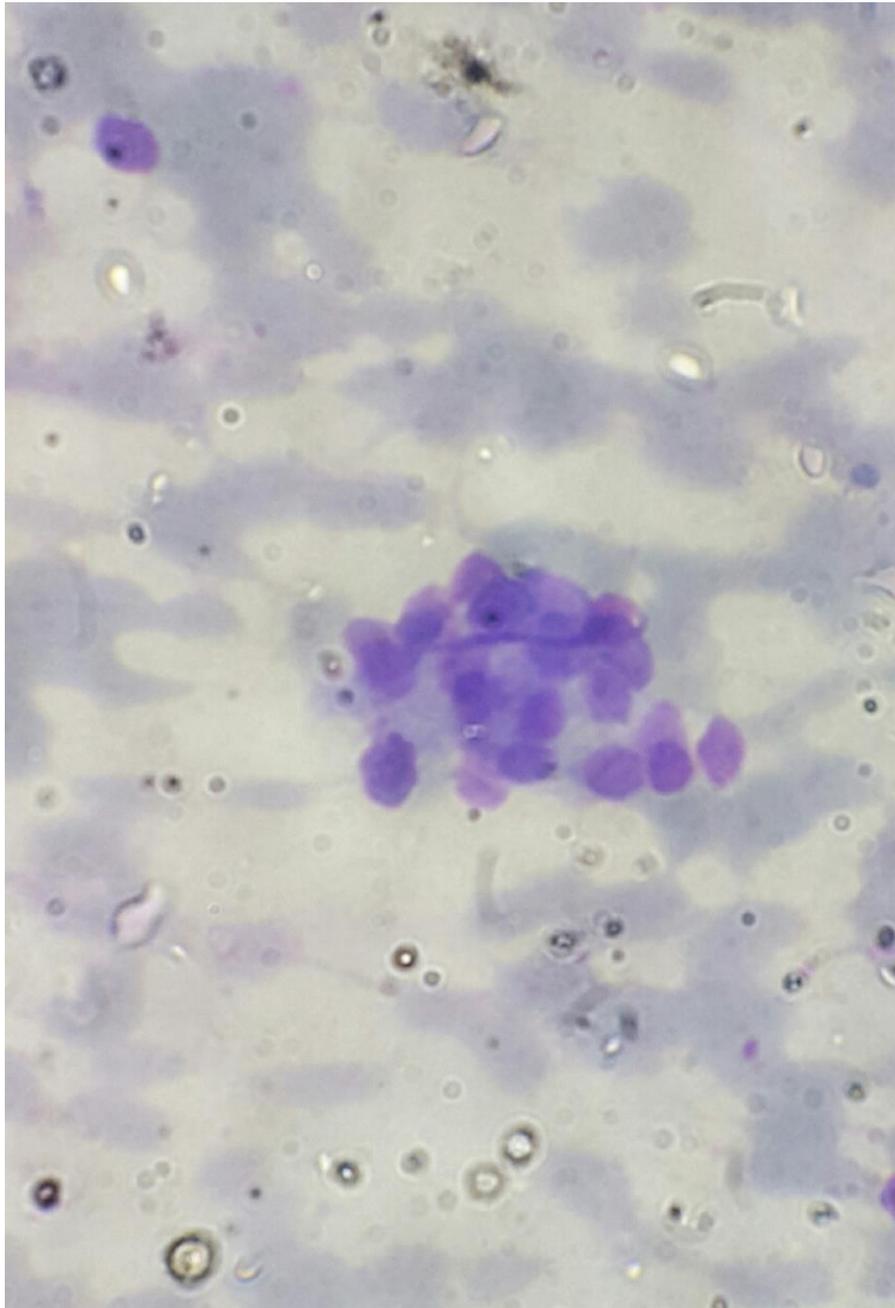


Figure 3. A photomicrograph of a Breast FNAC smear showing discohesive clusters of ductal epithelial cells with pleomorphic and hyperchromatic nuclei with moderate cytoplasm. These features are consistent with malignant cells of the breast. (100X H& E Stain).