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Comparative Study of Breast lumps by Fine Needle Aspiration Cytology and Core Needle Biopsy

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Abstract

Breast is the most common site of various lesions that presents as palpable breast lumps including benign, inflammatory and malignant causes. Now a day's incidence of breast cancer is increasing at its pace causing increase in morbidity in female patients particularly. This has called to initiate a diagnostic modality to detect breast cancers in early phases so as to combat the increasing morbidity due to breast cancers. Mammography is taking lead in early suspicion and detection of breast lumps. But Fine needle aspiration cytology is one of the most effective and specific for diagnosis of breast lumps. But fine needle aspiration cytology do have its own drawbacks and grey zone areas which has put core needle biopsy technique forth to obviate excisional biopsy along with giving advantages of tumor grading, staging and immunophenotypic analysis giving parallel results with that of gold standard histopathological diagnosis. Thus the present study has been conducted with the aim of utility of core needle biopsy in diagnosing breast lumps, comparing it with fine needle aspiration cytology results and initiating use of core needle biopsy as a routine technique wherever applicable. Total 107 cases studies showed maximum number of cases in the age group of 31-50 years of age. bethesda system was applied for reporting spiration cytology smears and core needle iopsy sections in 5 categories as benign, atypia, suspicious for malignancy, positive for malignancy, and unsatisfactory and results were compared. Benign lesions outnumbered malignant one both in fine needle aspiration cytology and core needle biopsy, Fibroadenoma was the most common benign and ductal carcinoma was most common malignant diagnosis given. In the category of intermediate or atypical cases proliferative breast disease was common diagnosis offered on aspiration smears. There were few cases which were diagnosed inadequate on cytology has given definitive diagnosis on core needle biopsy. Few cases which has given benign diagnosis out malignant on core needle biopsy. Histopathological diagnosis was available in 80 cases. Thus core needle biopsy has detected more breast carcinomas with sensitivity of 95.4% as compared to 60.5% sensitivity of aspiration cytology. Due to definitive diagnosis offered by core needle biopsy

rate of suspicious lesions decreased replacing use of excisional biopsy.

Keywords breast lumps, core needle biopsy, fine needle aspiration cytology.

Introduction Breast or mammary gland is most important structure [(1)] which is well developed only in female and is sensitive to hormones particularly estrogen and progesterone[(2).] In men remain rudimentary throughout life, due to this the rate of breast cancer is much higher in women than men[(3)] Breast is one of common site for numerous benign, inflammatory and malignant neoplastic lesions. More than half of all women will develop some form of benign breast disease (BBD) after age 20 with risk of developing malignancy.[(4)] Breast cancer is the most common site-specific cancer in women and is the leading cause of death from cancer for women aged 20-59 years worldwide. It is responsible for 14% of the cancer related deaths in women[(5)] with an annual incidence of approximately 1,44,000 in India.[(6)] Currently, India reports roughly 100 000 new cases annually[(7)].

In recent years, the focus on breast carcinoma has shifted from treatment to early diagnosis with the detection of proliferative breast diseases or borderline breast diseases gaining importance in the approach to breast cancer[(8)]. Fine needle aspiration cytology (FNAC) has become popular as a valuable tool in preoperative assessment of breast masses, and it shows high accuracy, sensitivity, and specificity. To differentiate benign from malignant lesions is one of the major goals of FNAC. In the evaluation of breast masses, the time honored triple assessment combines clinical, radiological, and pathological information ie FNAC, together with core needle biopsy (CNB), is the initial pathological investigative method of choice. As it can obviate standard excisional biopsy when all three components of the triple test are conclusively negative or positive[(9)].

A definite “gray zone” does exist in breast cytology where diagnosis cannot be reached out only on FNAC. [(10)] [(11)] Here comes important role of CNB which provide a more exact diagnosis of breast tumors[(12)]. One of the main constraints of conventional FNA smears is limited material available for adjuvant diagnostic investigation including immunocytochemistry. With use of mammography there is increase in tumor detection, particularly small one. [(13)].

Percutaneous CNB is an accurate test for sampling breast lesions and is increasingly replacing FNAC in breast lesions diagnosis. CNB has advantages over FNAC in that it provides histological information, which improves sensitivity and may assist in pre-operative treatment planning. It also has a complementary role to FNAC where FNAC is used as an initial test and where the cytology is atypical subsequent use of CNB in this context can establish a definitive diagnosis [(14)]. Grading, typing of tumors and assessment by immunocytochemistry is also possible in core biopsy [(15)]. In this study, we found out the diagnostic utility of core needle biopsy in palpable breast lumps in comparison with FNAC.

Aims and Objectives

1. To study utility of core needle biopsy in palpable breast lumps.
2. To compare efficiency of FNAC & Core needle biopsy.
3. To introduce core needle biopsy procedure as a routine investigation in inconclusive and borderline cytological samples.

Materials and Methods

Present prospective type of study was done in our institution over a period of 2 years included total 107 patients presented with breast lumps. Patients were

subjected to simultaneous FNAC and CNB. Patients with low platelet count, deranged coagulation profile and unwilling patients were excluded from the study. Out of 107 cases histopathology was available in 80cases.

Following informed consent, complete clinical history and local examination, FNAC was performed as per standard procedure, stained with H&E, Pap and MGG stains and examined under microscope. Core biopsy was performed as described by Bishop J et al,(2004).[16] The specimen which was fixed in 10% buffered formalin submitted in histopathology section, stained with H&E stain and observed under microscope. In some cases US guided FNAC and core biopsy was performed to yeild maximum cellularity where lession was not well defined or deep seated.

Diagnostic Categories Communication within the multidisciplinary team was enhanced by the use of standardized diagnostic categories as described by Bishop J et al (2004) were applied for reporting FNAC and CB samples as follows. [16]

Diagnostic category#	Corresponding numerical code*
• Inadequate/insufficient	1
• Benign	2
• Atypical/indeterminate	3
• Suspicious of malignancy	4
• Malignant	5

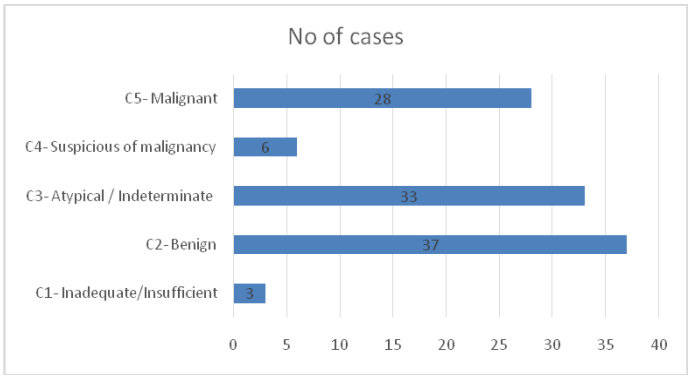
(# The diagnostic category represents the interpretation of the findings on the slides for that case, but may or may not be representative of the underlying target lesion.The diagnostic category may be qualified with further comments as considered appropriate by the reporting pathologist. * The numerical code was not used without a diagnostic category.)

Numerical coding did not substitute the reporting categories, and was not included in the main body of the report. Bethesda system of reporting breast lesion was taken in consideration for both procedures of diagnosis and correlated with each other. Histopathology was taken as a gold standard to calculate sensitivity, specificity and diagnostic accuracy for both techniques.

Results

In this study a total of 107 cases of breast lesions were subjected to FNAC and CNB, of which histopathology was available for 80 cases. Out of total 107 cases studied clinical diagnosis was benign in 67 cases (62.6%) while 40 cases (37.4%) had a malignant diagnosis. Most of the patients in the study were in between 31-50 years of age followed by 41-50 years. Out of 107 cases, 8 lumps (07.5%) were non palpable while 99 lumps (92.5%) were palpable.

Figure No. 1 Distribution of cases according to FNAC diagnosis.



On FNAC a maximum number of cases were diagnosed in the category of C2 (benign) accounting for 34.6% followed by category C5 (malignant) of 26.2%.

Table No.1 Category wise distribution of cases according to FNAC diagnosis- Category C2

Diagnosis	No of cases	Percentage
Inflammatory	07	18.9
Benign breast lesion	08	21.6

Fibroadenoma	17	46.0
Benign phyllodes tumor	05	13.5
Total	37	100

Maximum number of cases (46%) were diagnosed as Fibroadenoma in category C2.

Table No. 2 Category wise distribution of cases according to FNAC diagnosis- Category C3.

Diagnosis		No of cases	Percentage
PBD	With Atypia	12	36.4
	Without Atypia} 30	18	54.6
Papillary Lesion		1	03.0
Low cellularity with atypia		2	06.0
Total		33	100

Note :PBD – Proliferative Breast Disease

Maximum number of cases in category C3 were diagnosed as proliferative breast disease (90.9%).

Table No. 3 Category wise distribution of cases according to FNAC diagnosis- Category C4.

Diagnosis	No of cases	Percentage
ADH/DCIS	3	50
Suspicious of malignancy	3	50
Total	6	100

Note: ADH/DCIS : Atypical ductal hyperplasia / Ductal carcinoma in situ

Out of the 6 cases in category C4, 3 cases (50%) we can reach to a diagnosis of atypical ductal hyperplasia / ductal carcinoma in situ (ADH/DCIS).

Table No. 4 Category wise distribution of cases according to FNAC diagnosis- Category C5.

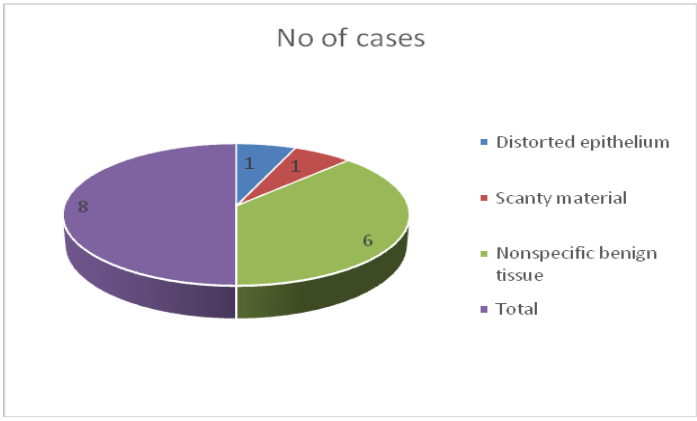
Diagnosis	No.of cases	Percentage
Ductal carcinoma	20	71.4
Lobular carcinoma	3	10.7
Metaplastic carcinoma	1	03.6
Undifferentiated carcinoma	1	03.6
Squamous cell carcinoma	1	03.6
Papillary carcinoma	1	03.6
Malignant Mesenchymal tumor	1	03.6
Total	28	100

28 cases were placed in C5 (malignant) category of FNAC. Out of the 28 cases, majority of the cases i.e. 20 cases (71.4%) were of ductal carcinoma.

On CNB, category B2 (benign) included 51.4% of cases, while 38.3% were included in category B5 (malignant). In 8 cases (7.47%) in which either the epithelium present was too distorted or its volume was too scanty or it did not co-relate with the imagining or clinical findings, were placed in B1 (inadequate/insufficient) category.

Figure No 2 Distribution of cases according to CNB diagnosis.

Figure No 3 Category wise distributions of cases according to CNB diagnosis- Category B1.



Maximum number of cases in B1 (inadequate/insufficient) category of CNB showed non specific benign tissue.

Table No. 5 Category wise distribution of cases of CNB diagnosis- Category B2.

Diagnosis	No of cases	Percentage
Benign breast lesion (BBL)	08	14.6
Fibrocystic change (FCC)	06	10.1
Sclerosingadenosis(SA)	05	09.1
Fat necrosis	01	01.8
Inflammatory	5	09.1
Duct ectasia	01	01.8
Lipoma	01	01.8
Fibroadenoma	19	35.6
Benign phyllodes tumor	05	09.41
Epithelial hyperplasia – usual type	04	07.3
Total	55	100

Maximum number of cases in B2 (benign) category was fibroadenomas, which was followed by benign breast lesions.

Category B3: One case (00.9%) was classified under this category of CNB where it was not possible to make a specific diagnosis on the tissue received.

Category B4: Two cases (01.9%) were included in B4 category of CNB which were strongly suspicious of malignancy.

Category B5: 41 cases (38.3%) were placed in this category of CNB. Maximum number of cases in this category i.e. 30 cases (73.2%) belonged to infiltrating duct carcinoma (IDC) followed by infiltrating lobular carcinoma (ILC) ie 3 cases (07.3%). 2 cases each were of metaplastic carcinoma and malignant mesenchymal tumor. 1 case each of intracystic papillary carcinoma, medullary carcinoma, squamous cell carcinoma and malignant phyllodes tumor was included in this category.

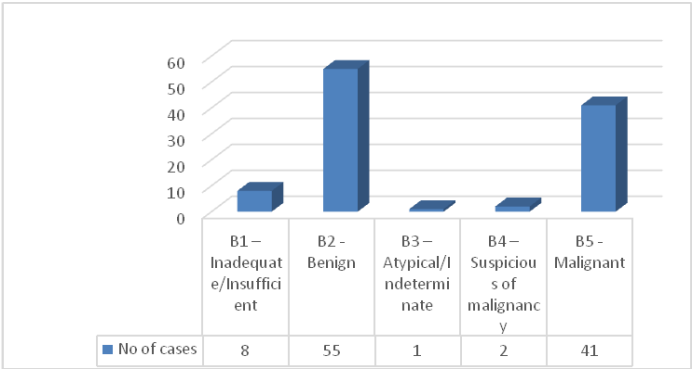


Figure No 4 Category wise distribution of cases of CNB diagnosis- Category B5.

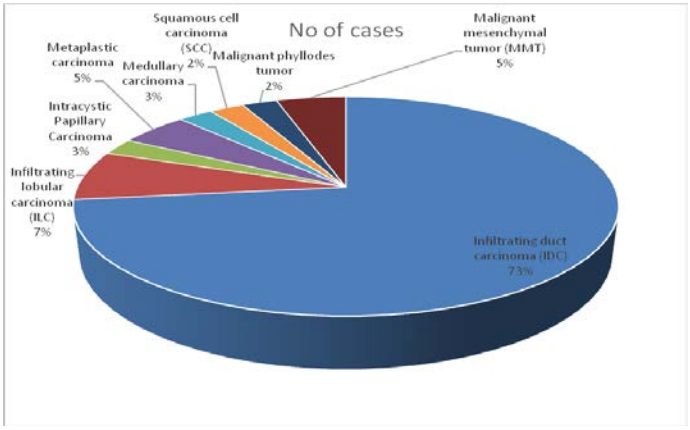


Table No. 6 Comparative study of FNAC and CNB

FNAC	CNB					
	B1	B2	B3	B4	B5	TOTAL
C1		1		1	1	03 (02.8%)
C2	4	31			2	37 (34.6%)
C3	4	20	1	1	7	33 (30.8%)
C4		1			5	06 (05.6%)
C5					28	28 (26.2%)
TOTAL	8 (7.47%)	55 (51.4%)	1 (00.9%)	2 (01.9%)	41 (38.3 %)	107 (100%)

Above table shows 5 categories of FNAC and their corresponding CNB category findings.

C1 category 3 cases (02.8%) which were assigned a diagnosis of inadequate / insufficient (C1) on FNAC were interpreted as lipoma (B2) (confirmed on histopathology), suspicious of malignancy (B4) (turned out to be IDC-Grade II on histopathology) and malignant (B5) on CNB (which proved to be malignant (IDC-Grade II) on histopathological examination) respectively.

C2 category : Out of the 37 cases (34.6%) which were diagnosed as benign (C2) on FNAC, 31 cases were

confirmed to be benign (B2) on CNB, 2 cases turned out to be malignant (B5) (ie IDC and malignant phylloides tumor on CNB and confirmed on histopathology) and 4 cases were inadequate (B1) on CNB (histopathology was not available for co-relation)

C3 category 33 cases (30.8%) diagnosed as atypical/indeterminate (C3) on FNAC were assigned a benign diagnosis (B2) in 20 cases { Histopathology is available for 19 cases. 9 cases were diagnosed as fibrocystic change (FCC), 3 cases diagnosed as sclerosingadenosis,4 cases diagnosed as epithelial hyperplasia of usual type on CNB. All were confirmed histopathologically. 1 case diagnosed as benign breast lesion on CNB turned out to be hamartoma on histopathology. } while 5 cases were proved to be malignant (B5) on CNB {6 cases were IDC on CNB, with 2 cases of Grade 1, 2 cases of Grade II and 2 cases of Grade III on subsequent histopathology. 1 case which was given a diagnosis of papillary neoplasm on FNAC was given a diagnosis of papillary carcinoma on CNB and turned out to be intracystic papillary carcinoma on histopathology.} 1 case was diagnosed as suspicious of therefore assigned to atypical / indeterminate category (B3) on CNB. 4 cases were inadequate and were therefore placed in B1 category of CNB (subsequent histopathological diagnosis of all the 4 cases turned out to be fibrocystic change (FCC)) 1 case diagnosed as C3 (Atypical / indeterminate) on FNAC remained the same (B3) on CNB and could not be further classified. This patient was lost to follow up. 1 case diagnosed as suspicious of malignancy (B4) on CNB turned out to be malignant, IDC – Grade II on histopathology. 1 case diagnosed as C3 (Atypical / indeterminate) on FNAC remained the same (B3) on CNB and could not be further classified. This patient was lost to follow up.

C4 category: Out of the 6 cases (05.6%) diagnosed as suspicious of malignancy on FNAC, 5 cases were proved to be malignant (B5) on CNB { IDC which were confirmed on histopathology.} 1 case was diagnosed as sclerosing adenosis (B2) on CNB and was proved to be same on histopathology.

C5 category Out of the 28 cases (26.2%) diagnosed as malignant on FNAC, all of the cases were proved to be malignant (B5) on CNB. Histopathology was available for 26 cases. On histopathology, 20 cases were of IDC, 2 cases each were of ILC and metaplastic carcinoma,1 case each of squamous cell carcinoma and medullary carcinoma was present.

Table no 7: Discrepancy between malignant lesions diagnosed on FNAC and CNB

FNAC	CNB						
	IDC	ILC	Metaplastic Ca	Medullary Ca	MMT	SCC	Total
Ductal Ca	18	-	1	1	-	-	20
Lobular Ca	1	2	-	-	-	-	3
Metaplastic Ca	-	-	1	-	-	-	1
Undifferentiated Ca	-	-	-	-	1	-	1
MMT	-	-	-	-	1	-	1
SCC	-	-	-	-	-	1	1
Papillary Ca	1	-	-	-	-	-	1
Total	20	2	2	1	2	1	28

Note :2 cases histopathology was not available. IDC – Infiltrating Duct Carcinoma, ILC – Infiltrating Lobular Carcinoma, MMT – Malignant Mesenchymal Tumor, SCC – Squamous Cell Carcinoma, Ca- Carcinoma. There was slight discrepancy in diagnosis of malignancy on FNAC and CNB as in table no 8.

Table No. 8 Statistical Analysis for FNAC

FNAC	HISTOPATHOLOGY		
	Malignant (+)	Benign (-)	Total
M(+)	26	00	26
B(-)	17	37	54
Total	43	37	80

Note :M= Malignant (C5 category), B= Benign (C1-C4 category)

Using histopathology as the gold standard, the sensitivity of FNAC in detecting malignancy was 60.5%. The specificity and positive predictive value of FNAC was found to be 100% i.e. the cases which were assigned to C5 (malignant) category in fact proved to be malignant on subsequent histopathology. The negative predictive value of FNAC in this study was 69.8%, which corresponds with the sensitivity of the test. On statistical analysis by using McNemars chi square test, p=0.00 i.e. highly significant p value was obtained. It indicates there was a statistical difference between the diagnosis offered by histopathology and FNAC.

Table No. 9 Satstical Analysis for CNB

CNB	Histopathology		
	Malignant (+)	Benign (-)	Total
M(+)	41	00	41
B(-)	2	37	39
Total	43	37	80

Note :M = Malignant(B5 category), B= Benign (B1 – B4 category)

Using histopathology as the gold standard, the sensitivity of CNB in detecting malignancy was 95.4%. The specificity and positive predictive value of CNB in this study was 100%. The negative predictive value for CNB was 94.9% in this study, which corresponds with the sensitivity of the test.On statistical analysis, by using McNemars Chi square test, p=0.4795i.e. the p value obtained was insignificant. It indicates that there was no statistical difference between the diagnosis offered by histopathology and CNB.

Discussion

Breast cancer is the leading cause of cancer in women worldwide. In India it is the second most common cancer after cervix, accounting for 19% of the total cancer burden in women..[17] In spite of the widespread use of cytological smears for diagnosis of breast cancer lesions, many surgeons are still reluctant to accept the cytological report as the only criterion for performing definitive surgery since no distinction is possible between infiltrating and non infiltrating lesions.[13] The diagnostic “Triple Test”, including clinical diagnosis, cytology and mammography, even if concordant, can only be theoretically considered completely satisfactory because it does not resolve the above mentioned problem of diagnostic differentiation between infiltrating and non infiltrating lesions.Percutaneous CNB is an accurate test for sampling breast lesions and is increasingly replacing FNAC in breast diagnosis. CNB has advantages over FNAC in that it provides histological information, which improves sensitivity and may assist pre-operative treatment planning. It also has a complementary role to FNAC where FNAC is used as an initial test and where the cytology is atypical subsequent use of CNB in this context can establish a definitive diagnosis[14].

In this study, the aim was to evaluate the utility of CNB as a routine diagnostic procedure for breast lesions, to compare the diagnostic value of CNB with FNAC and to determine the accuracy of CNB as compared to surgical biopsy in breast lesions.

The FNAC and CNB of 107 palpable and nonpalpable breast lesions were performed and the diagnosis was

confirmed with histopathology in 80 cases. In the present study the clinical diagnosis made was benign in 67 cases (62.6%) and malignant in 40 cases (37.4%) , most of the patients were in between 31-50 years of age. The youngest patient was 13 years old, while the oldest was 75 years of age. Out of the total 107 breast lumps, 8 lumps (07.5%) were non palpable, whereas 99 lumps (92.5%) were palpable. For non palpable lumps USG guidance was used, while FNAC and CNB was done freehand / unguided in cases of palpable lumps. The UK NHSBSP has published guidelines and statistical data for quality assurance audit of cytology. According to those guidelines, the inadequate rate i.e. the number of C1 cases expressed as a percentage of the total number of cases should be less than 25%. In this study the inadequate rate (C1 category) comprised 02.80% of the total 107 cases, which is quite impressive[18]. For the suspicious rate i.e. the number of C3 and C4 cases expressed as a percentage of the total number of cases, the recommended target is <20%. In this study the suspicious rate was 36.5%, which is quite high as compared to the target. This is because the guidelines required C3 cases also to be included in the suspicious category. In this study, C3 (atypical / indeterminate) cases comprised of 30.8%, while C4 (suspicious of malignancy) category had 05.6% of the total cases.

The percentage of C2 (benign) category cases was 34.6, while that of C5 (malignant) cases was 26.2%. FNAC category C2 included a total of 37 cases (34.6%) from cases of mastitis , fibroadenoma to benign phyllodes and benign breast lesions.[18].

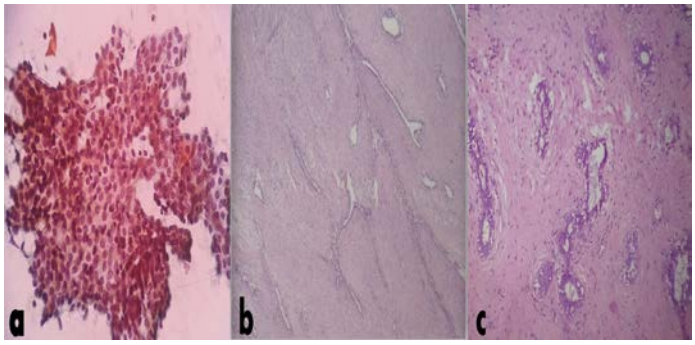


Figure no 5 Fibroadenoma: a) FNAC smears showing monolayered sheet of benign ductal epithelial cells (pap 10x) b) core needle biopsy section showing compressed ducts and surrounding fibrous stroma (H&E 10x) c) Histopathology sections showing patent ducts surrounded by fibrous stroma (H&E 10x).

33 cases (30.8%) included in C3 category of FNAC showing 30(90.9%) cases of proliferative breast disease (epithelial hyperplasia). 2 cases (06.0%) showing low cellularity with subtle cytologic atypia were also placed in this category[16].

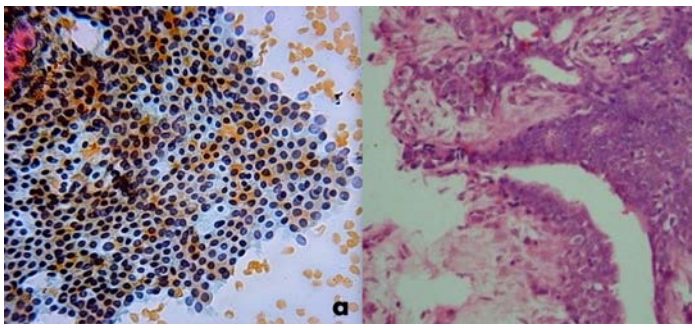


Figure no 6: a) FNAC smears of PBD showing monolayered sheet of benign ductal epithelial cells showing nucleomegaly and nuclear crowding at places (pap 10x) b) Core needle biopsy section showing ductal epithelial hyperplasia with atypia and invading into adjacent stroma given a diagnosis of IDC (H&E 10x).

6 cases (5.60%) were included in C4 (suspicious of malignancy) category of FNAC. 3 cases (50%) fulfilled the criteria of ADH/DCIS according to the cytological criteria given by Venegas R et al[19],and NHSBSP

guidelines[18]. The remaining 3 cases (50%) showed features suggestive of, but not diagnostic of malignancy.

28 cases (26.2%) classified as malignant on FNAC and placed in category C5. Most common was ductal carcinoma comprised 71.4% (20 cases) which correlated with 41 and 75% of published series[20]. Followed by 3 cases (10.7%) of lobular carcinoma According to Elis IO et al[21], the reported frequency of ILC varies widely from 2% - 15%.

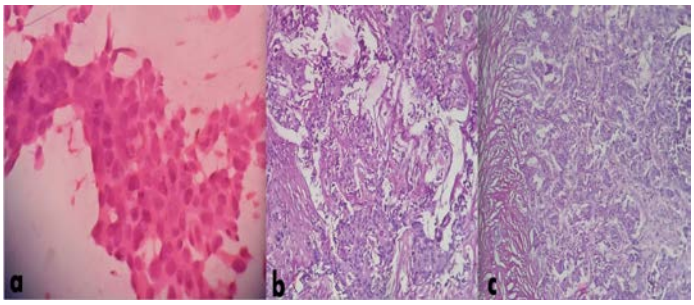


Figure no 7 IDC: a) FNAC smears showing sheet of benign ductal epithelial cells with marked nuclear pleomoprhism and peripheral dissociation (pap 10x) b) core needle biopsy section showing groups and sheets of malignant ductal epithelial cells invading in surrounding stroma stroma (H&E 10x) c) Histopathology sections showing malignant ductal epithelial cellsforming tubules (H&E 10x)

1 cases each (03.6%) of metaplastic carcinoma, undifferentiated carcinoma, squamous cell carcinoma, papillary carcinoma and malignant mesenchymal tumor were diagnosed on FNAC and placed under this category.

CNB findings showed inadequate/insufficient rate (category B1) of CNB in this study was 7.47%. This was slightly higher than the inadequate rate of 4.63% in the study of Shannon J et al[15]. In comparison the inadequate rate (C1 category) by FNAC is 2.80% which is well below the criteria set by UKNHSBSP of 25%. Comparing the inadequate rate i.e. B1 and C1 categories of CNB and FNAC, by Pearson's Chi square test (p=0.122) i.e. is there is no statistical difference between CNB and FNAC.

The percentage of cases in B2 (benign), B3 (atypical/indeterminate), B4 (suspicious of malignancy) & B5 (malignant) category in this study was 51.4%, 00.9%, 01.9%, and 38.3% respectively corresponding to B2-34.20%, B3-1.44%, B4-3.47% and B5-58.84% in the study of Shannon J et al[15].

In B1 (inadequate/insufficient) category of CNB total of 8 cases (7.47%) were included. This inadequate rate was slightly higher than that seen in the studies of Shannon J et al[15],and Lieske B et al[22],who report an inadequate rate of 4.63% and 5% respectively. This was probably because in both of the above studies the core needle biopsies were performed under either mammographic or ultra sonographic guidance. In present study, the majority of core needle biopsies were clinically guided and this may have accounted for the increased inadequate rate. The maximum number of cases i.e. 6 cases (75%) in B1 category were given a diagnosis of nonspecific benign tissue, while 1 case each (12.5%) was given a diagnosis of distorted epithelium and scanty material. **B2 (benign) category** of CNB included 55 (51.4%) cases. Fibroadenoma was the most common diagnosis to be made in the B2 (benign) category correlating with the study of Kaufman CS et al[23] Other specific benign diagnoses that were offered include fibrocystic change, sclerosing adenosis, epithelial hyperplasia, benign phyllodes tumor, fat necrosis, duct ectasia and lipoma. Lesions where definitive diagnosed was not possible, were categorized as BBL although it is possible in the majority of cases [24]. One case was included under **B3 (atypical/indeterminate) category** of CNB and two cases were included in **B4 (suspicious of malignancy) category.** Lee AH et al[25], states that the positive

predictive value for carcinoma is high following a B4 core (86%). 41 cases (38.3%) included in **B5** (**malignant**) **category** of CNB. In this study, typing of carcinomas was done on CNB specimens, while grading was not attempted. Of the various carcinomas diagnosed on CNB, IDC comprised the maximum number of cases i.e. 30 accounting to 73.2%. ILC comprised of 3 cases (07.3%)

Shannon J et al[15],attempted typing of tumors and found that accuracy of typing is 93.6%. In this study, typing of breast carcinomas on CNB was found to be accurate with histopathological diagnoses. It is observed that CNB is detecting 12.1% more malignant cases were either missed or under diagnosed on FNAC. This result is comparable with the study of Poon C and Koojan G.[26]

The suspicious rate for FNAC i.e. the number of C3 & C4 cases was 36.4%, compared to the suspicious rate of CNB (B3 & B4 categories) of just 02.8%. This drastic reduction of suspicious rates on CNB was due to the ability of CNB to categorize the suspicious lesions on FNAC into either benign or malignant categories comparable with the study of Shannon J et al[15]. There was a 16.8% increase in definitive benign diagnoses by CNB (B2) over FNAC (C2). This implies that core biopsies are more likely to give a definitive biopsy result..

3 cases (02.8%) which were inadequate for interpretation on FNAC and were placed in C1 category. On CNB, 1 case was diagnosed as lipoma (CNB category B2) and was confirmed histopathologically. This emphasizes the importance of clinical and imaging co-relation which should be made while interpreting any smear[16],[27]. One case was diagnosed as suspicious of malignancy (B4) on CNB and other was was placed in B5 (malignant) category. Both these cases turned out to be IDC Grade II on histopathology. Katja H et al[28],states that core biopsy is the preferred method for preoperative diagnosis when sampling FNAC provides scarce material.

37 cases (34.6%) included in C2 (benign) category of FNAC. Histopathology was available for 14 cases, out of which 12 were benign and 2 were malignant. Out of the 37 cases, 4 cases were placed in B1 (inadequate/insufficient) category of CNB for which histopathology was not available (patients lost to follow up). Out of the 4 cases in B1 category, 2 cases were given a diagnosis of cellular fibroadenoma and benign phyllodes tumor on FNAC. For both of these cases the CNB diagnosis was nonspecific benign tissue, probably because the lesions were missed by the core biopsy needle. 2 cases were given a nonspecific diagnosis of benign breast lesion (C2) on FNAC and were given a diagnosis of scanty material and distorted epithelium respectively on CNB.

31 cases turned out to be benign and were placed in B2 (benign) category on CNB. Histopathology was available for 12 cases (fibroadenoma for 7 cases, benign phyllodes tumor for 4 cases, and fat necrosis for 1 case) correlated well with previous CNB findings.

2 cases which were classified as benign on FNAC (false negative) came out to be IDC and the other was malignant phyllodes tumor, both were confirmed by histopathology. The case of malignant phyllodes tumor which was diagnosed as benign phyllodes tumor on FNAC, reflects a sampling error in case of FNAC, where the malignant change was picked up by CNB. As stated by Jacklin RK et al[29],accuracy of FNAC in diagnosis of phyllodes tumor of the breast depends upon an adequate and representative sample.

33 cases (30.8%) placed in C3 (atypical/indeterminate) category of FNAC. CNB was available for all the 33 cases while histopathology was done for 31 cases (23 benign and 8 malignant cases). 2 cases for which histopathology

was unavailable the CNB diagnosis was chronic mastitis and benign breast lesion. Out of the 31 cases for which histopathology was available,4 cases were placed in B1 (inadequate/insufficient) category. For all these cases the histopathological diagnosis was fibrocystic change. Howat A and Coghill S[27],states that the fibrous elements frequently present in fibrocystic change is difficult to aspirate. 1 case each of fibroadenoma and benign phyllodes tumor on CNB turned out to be the same on histopathology. 1 case diagnosed as benign breast lesion on CBN turned out to be hamartoma on histopathology. 4 cases of epithelial hyperplasia of usual type were identified on CNB and later were proved to be the same on histopathology.

Out of the total 31 cases classified as C3 (atypical/indeterminate) on FNAC, 7 cases were placed in B5 (malignant) category of CNB and confirmed histopathologically. 1 case diagnosed as C3 (atypical/indeterminate) on FNAC remained the same (B3) on CNB and could not be further classified. This patient was lost to follow up. 1 case placed in B4 (suspicious of malignancy) category of CNB turned out to be IDC –Grade II on histopathology. CNB was able to categorize correctly 19 cases (61.29%) as benign and 7 cases (22.58%) as malignant, which were placed in C3 (atypical/indeterminate) category of FNAC. This is similar to the study of Poon C and Kocjan G[26],in which 14% of C3 cases were malignant on core needle biopsy. Suvradeep Mitra et al[30],in their study, states that CNB has the obvious advantage in diagnosing gray zone lesions of the breast as in lesions such as ADH and in situ carcinoma.

Shannon J et al[15], reported a reduced suspicious rate from 13% to 3% in symptomatic breast lesions using core biopsy. Bulgaresi P et al [31] states that C3 is the least predictive of malignancy and even when associated with suspicious findings on imaging and/or palpation its positive predictive value is 83.3% C3 FNAC should therefore prompt pre-operative core biopsy.

6 cases (5.60%) placed in C4 (suspicious of malignancy) category of FNAC. Out of the 6 cases, 1 case was given a diagnosis of sclerosing adenosis on CNB which was confirmed on histopathology. Maximum number of cases i.e. 5 cases placed in C4 category of FNAC were diagnosed as IDC (4 cases) and ILC (1 case). All confirmed on subsequent histopathological examination.

28 cases (26.2%) placed in C5 (malignant) category of FNAC. All of the 28 cases were given a malignant diagnosis on CNB and 26 cases were correlated on histopathology. For 2 cases histopathology was not available. Though all the cases diagnosed as malignant on cytology, proved to be malignant on CNB, there was a difference in categorization of the malignant cases between FNAC and CNB, as proved by subsequent histopathology in 26 cases.

There was discrepancy between FNAC and CNB malignant diagnosis. Out of the 20 cases diagnosed as ductal carcinoma on FNAC, 18 cases were confirmed on CNB as IDC and were subsequently given a similar diagnosis on histopathology. But 2 cases diagnosed as ductal carcinoma on FNAC were given a diagnosis of medullary carcinoma and metaplastic carcinoma on CNB, which was confirmed histopathologically. 3 cases which were diagnosed as lobular carcinoma on FNAC, 2 cases were proved to be ILC on CNB and histopathology, but one case was diagnosed as IDC on CNB and histopathology. 1 case diagnosed as undifferentiated carcinoma on FNAC was given a diagnosis of malignant mesenchymal tumor (MMT) on CNB. 1 case which was diagnosed as malignant mesenchymal tumor (MMT) on

FNAC was proved to be the same on CBN. Histopathology was not available for both of these cases. 1 case which was given a diagnosis of papillary carcinoma on FNAC was given a diagnosis of IDC with papillary features on CNB and turned out to be the same on histopathology. As seen in the study by Suvradeep M et al[30],core needle biopsy improved diagnostic categorization over FNAC, even in this study.In this study, typing of breast carcinomas was done on CBN with precision and was comparable with the final histopathology results.

Using histopathology as the gold standard, the sensitivity of FNAC in detecting malignancy was 60.5%, which is similar to the study done by Abhijit S et al,[32] who reported 69% sensitivity. The negative predictive value of FNAC in this study was 69.8%, which corresponds with the sensitivity of the test. The specificity and positive predictive value of FNAC was found to be 100% i.e. the cases which were assigned to C5 (malignant) category in fact proved to be malignant on subsequent histopathology, which obviates the need for biopsy after a C5 (malignant) diagnosis on FNAC.

On statistical analysis by using McNemars Chi square test, p=0.00 i.e. highly significant p value was obtained. It indicates that there was a statistical difference between the diagnosis offered by histopathology and FNAC. This implies that the lesions diagnosed as borderline or suspicious (C3,C4) on FNAC should be confirmed by a biopsy either open biopsy or minimally invasive core biopsy. [33] Using histopathology as the gold standard, the sensitivity of CNB in detecting malignancy was 95.4%, which is comparable with the sensitivity of 99% seen in the study of Shannon J et al,[15] Bukhari and Akhter[34]and 98.7% in the study of Agarwal T et al.[35] The negative predictive value for CNB was 94.9% in this study, which corresponds with the sensitivity of the test. The specificity and positive predictive value of CNB in this study was 100% which is similar to the study of Caruso ML et al[36]and Bukhari and Akhter[34]The positive predictive value for the diagnosis of invasive carcinoma on core biopsy has been verified at 98-99.8% in the studies of Harris G et al[37], Poon C and Kocjan G.[26] It shows that CNB can detect more malignancies and can give a more definitive benign diagnosis over FNAC in a substantial number of cases. Statistical analysis showed that there was no statistical difference between the diagnosis offered by histopathology and CNB. This indicates that CNB can be employed as a minimally invasive procedure in place of open biopsy for diagnosing lesions which are inadequate, atypical or suspicious on FNAC. [38]

Conclusion

CNB can detect more breast carcinomas as compared to FNAC as sensitivity of CNB in detecting malignancy is high as compared to FNAC. CNB can categorize the suspicious lesions of FNAC into either benign or malignant histopathological categories resulting in a reduction in the suspicious rates.Typing of benign lesions and grading of malignant lesions is possible with CNB. As CNB is an OPD procedure, it can replace open biopsy in diagnosis of inadequate, atypical or suspicious breast lesions on FNAC.

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