

## Correlation of Fine Needle Aspiration Cytology and Core Needle Biopsies in Breast carcinoma: Our experience

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### ABSTRACT

**Background:** The management of breast carcinoma relies heavily on the diagnostic parameters. Over the years there has been a steady decline in the usage of fine needle aspiration cytology (FNAC) over more popular core needle biopsy (CNB). The present study was conducted in a tertiary care teaching hospital to evaluate the role of FNAC and CNB in diagnosis of suspicious breast cancer by keeping mastectomies- surgical excision (SE) as gold standard.

**Methods:** A total of 60 patients were subjected to simultaneous on site FNAC and CNB. Histopathological correlation (SE) was available in half of the cases only (30 cases). While the Cytological grading was done according to Robinson grading system; the histopathological grading was done by Nottingham Modification of Scarff-Bloom Richardson method. All the findings were compared and statistical analysis was done.

**Result:** In contrast to FNAC where 29 cases were diagnosed as malignant only 26 cases were diagnosed as malignant on CNB with 3 cases signed out as non diagnostic for malignancy owing to non-sampling from the representative areas. Cytological grading assessment was higher with most of the cases kept in grade 3 (46.6 %) as compared to lower grading ( grade 2) on CNB- 62.07% cases. On comparing, FNAC and CNB; 22 showed agreement but this agreement was not statistically significant ( $p=0.14$ ) Comparison of CNB and SE; in 17 cases agreement were noted for both CNB and SE and statistically the values were highly significant ( $p=0.0001$ ). On comparison of FNAC and SE in 13 cases agreement was noted for both FNAC and SE and the data was statistically significant ( $p=0.035$ ).

**Conclusion:** Thus it was concluded in the present study that FNAC and CNB are comparable and also showed high sensitivity and pick up rate of FNAC as compared to CNB. CNB is however; more accurate for eventual grading and has an advantage that immunohistochemical studies can be applied on them.

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## Introduction

Women worldwide seek medical opinion in setting of breast related problems such as breast masses, nipple discharge, breast pain and abnormal mammograms. Discrete palpable masses are the second most common breast symptom, following mastalgias, which need to be comprehensively distinguished from neoplastic transformation vis-à-vis the normal nodularity of breast.<sup>[1]</sup> The likelihood of palpable mass being malignant increases with age of the patient. About 80% of palpable breast lumps are benign but malignancy can develop in benign breast lesions like fibrocystic diseases. The most common palpable lesions are cysts, fibroadenomas, and invasive carcinomas. Only 10% of breast masses in women younger than age 40 are malignant as compared with 60% of masses in women older than age 50.<sup>[2]</sup> So every woman presenting with a breast mass should be evaluated to exclude/establish a diagnosis of cancer.<sup>[3]</sup>

Breast cancer is the commonest female malignancy worldwide.<sup>[4]</sup> In India, twelve population based cancer registries have shown it to be the most common followed by cervical cancer (ICMR-2004).<sup>[5]</sup>

Increased reporting of breast cancer has led to the changes in modern management for the sole purpose of rapid preoperative diagnosis to allow the planning of a comprehensive therapeutic plan for the patient<sup>[6]</sup> FNAC and radiological imaging-mammography and ultrasonography as conjunction to the clinical examination (triple test) have become the standard approach to the investigation of palpable breast lumps and this has to some extent overcome the limitations of each individual method.<sup>[7]</sup> Minimally invasive biopsy refers to percutaneous techniques of sampling or removing suspicious areas of the breast without open surgery and excisional biopsy. These techniques include fine needle aspiration cytology and core needle biopsy. They are used for preoperative diagnosis of breast mass and has led to reduction of radical mastectomies in a large cohort of patients.<sup>[8]</sup>

Extensive literature search fails to define the superiority of one method over other has not been established and may depend on the nature of the lesion, skill of the individual obtaining the sample and the skill of the pathologist interpreting the specimens.<sup>[9]</sup> It is computed by the studies done elsewhere that FNA biopsy of the breast is a diagnostically accurate procedure, having an average sensitivity of 87% (range of 72–99%), specificity of 98–100%, negative predictive value of 87–99%, and efficiency of 89–99%. Technical difficulties resulting in less than optimal or unsatisfactory FNA specimens include the size of the mass, since both small and large lesions have been

associated with an increased false-negative rate. Breast masses smaller than 1 cm have a false-negative rate with a range of 6–24%.<sup>[10,11]</sup>

Though core biopsy has some limitations, it has gained popularity over last years, replacing FNAC as preferred modality prior to excision. Some authors have advocated the complementary role of synchronous FNAC and CNB in the management of palpable breast masses.<sup>[10]</sup> The present study was conducted in a tertiary care teaching hospital to evaluate the role of FNAC and CNB in diagnosis of suspicious breast cancer by determining the accuracy and compare the results of fine needle aspiration cytology (FNAC) and CNB in the diagnosis of the same.

## Materials and Methods

This was a prospective study done in the department of Pathology of a tertiary care teaching hospital catering to the urban as well as rural population in northern part of India. A total of 60 patients with clinically suspicious lumps in the breast were included in this study. These patients were subjected to simultaneous on site Fine needle aspiration cytology and CNB. Histopathological correlation in the form of follow up excision biopsies (lumpectomies) and mastectomies- surgical excision (SE) were available in half of the cases only (30 cases).

The cytological findings were compared with histopathological findings of both CNB and SE. The cytology slides were stained with May- Grunwald - Giemsa and Pap stains while the biopsy slides were stained with Hematoxylin and Eosin stain. The sensitivity, specificity positive and negative predictive value of FNAC was calculated and compared with that of CNB. Overall efficacy of both procedures was calculated statistically keeping SE as the gold standard. While the Cytological grading was done according to Robinson grading system<sup>[24]</sup> with score 6-11 kept as Grade I; while the scores 12-14 and 15-18 were kept as Grade II and III; the histological grading of H&E stained tissue sections was done by Nottingham Modification of Scarff -Bloom Richardson method<sup>[12]</sup> with score 3-5 kept as Grade I and scores 6-7 and 8-9 kept as Grade II and III respectively.

**Statistical Analysis:** All the findings were compared and statistical analysis was done for sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy. The findings were deemed significant in case p value was < 0.05 by employing chi- square test.

## Result

After noting the brief history and clinical findings in all patients, FNAC and trucut biopsy was performed under aseptic conditions. Out of 60 cases histopathological

specimens were available in only 30 cases as lumpectomy and mastectomy specimens for comparison. Overall material was satisfactory for evaluation in all the cases of FNAC while it was not satisfactory/ inconclusive in 3 cases of CNB. Apart from procedural pain and post procedural swelling ; no major complication was recorded in the present study.

The age range in the present study was 21-80 years with all females and the mean lump size > 2 cm ( 3.8 cm). On FNAC, 29 cases were diagnosed as malignant breast lesion. One case was diagnosed as fibroadenoma on FNAC despite clinically suspicious presentation of the lump (lump in a 50 year old patient; not freely mobile); this was also noted on CNB. In contrast to FNAC, 26 cases were diagnosed as malignant on CNB with 3 cases signed out as non diagnostic for malignancy owing to non-sampling from the representative areas. On SE specimens 29 cases reported as malignant on FNAC, there was 100 % concurrence with the finding of fibroadenoma confirmed. (Table 1) .

**FNAC vs. SE:** Comparing FNAC with SE (keeping it as gold standard diagnostic procedure), FNAC showed 100% agreement with accuracy with 100% sensitivity and 100% specificity.

**CNB vs. SE:** Comparing CNB with SE (keeping it as gold standard diagnostic procedure) , although specificity was 100 % but sensitivity of CNB procedure was 89.67 %. This implies that although PPV was 100 % in CNB procedure but NPV was only 25 %.

**Grading on FNAC:** Out of 58 cases, maximum cases were graded as grade 3 (46.55 %) followed grade 2 (36.21 %) and grade 1 (17.24 %). [Figures 1 A, 1B, 2 A, 3 A and 3B]

**Grading on CNB:** Maximum number of cases i.e.36 (62.07%) was seen in grade 2 followed by 9 cases (15.52%) in grade 3 and 7 cases (12.07%) in grade 1. The grading was not done in 6 cases ( 3 cases of non –diagnostic material and 3 cases of pauci-cellular material where grading was

not feasible to account for the third parameter of mitotic count. [Figures 1 C, 2B, 3 C].

**Grading on SE:** When grading was done on lumpectomy or mastectomy specimens, maximum cases were in grade2 ie14 cases (48.27%), followed by 9 cases (31.03%) in grade1 and 5 cases (17.24%) cases in grade 3.[Figures 1 D and 3 D].

In one case grading was not possible as there were only few tumor cells because the patient underwent chemotherapy for de-bulking after FNAC and CNB diagnosis.

**Comparison of FNAC and CNB:** Out of 58 cases, 10 cases were diagnosed as grade 1 on FNAC but the number was reduced to 7 cases on CNB whereas the grade 2 cases increased markedly from 21 cases on FNAC to 36 cases on CNB. Grade 3 was given in 27 cases on FNAC, which got reduced to 9 cases on CNB. Out of 58 cases in diagnostic yield was adequate in both the procedures, 22 showed agreement but this agreement was not statistically significant (p=0.14) (Table 2).

**Comparison of CNB and SE:** Out of 29 cases, grade 1 was given in 6 cases on CNB but it increased to 9 cases on SE. Thirteen cases were given grade 2 on CNB but it was 14 cases on SE. Grade 3 was given in 6 and 5 cases on CNB and SE respectively. Despite material being non diagnostic in one case on CNB, in 17 cases agreement were noted for both CNB and SE and statistically the values were highly significant (p=0.0001). (Table-3).

**Comparison of FNAC and SE:** Out of 29 cases, cytological grade 1 was seen in 7 cases whereas on SE, it increased to 9. Seven cases were given grade 2 on FNAC but number was increased to 14 on SE whereas grade 3 was given in 15 cases on FNAC and it was reduced to 5 cases on SE. Despite owing to pauci -cellular nature of one of the biopsies on CNB, in 13 cases agreement was noted for both FNAC and SE and the data was statistically significant (p=0.035). (Table 4).

**Table 1: Showing comparison of FNAC, CNB and histopathology (SE).**

	FNAC	CNB	SE
Malignant	29	26	29
Fibroadenoma	1	1	1
Material non diagnostic	0	3	0
<b>Total</b>	<b>30</b>	<b>30</b>	<b>30</b>

**Table 2: Showing comparison of FNAC and CNB grading.**

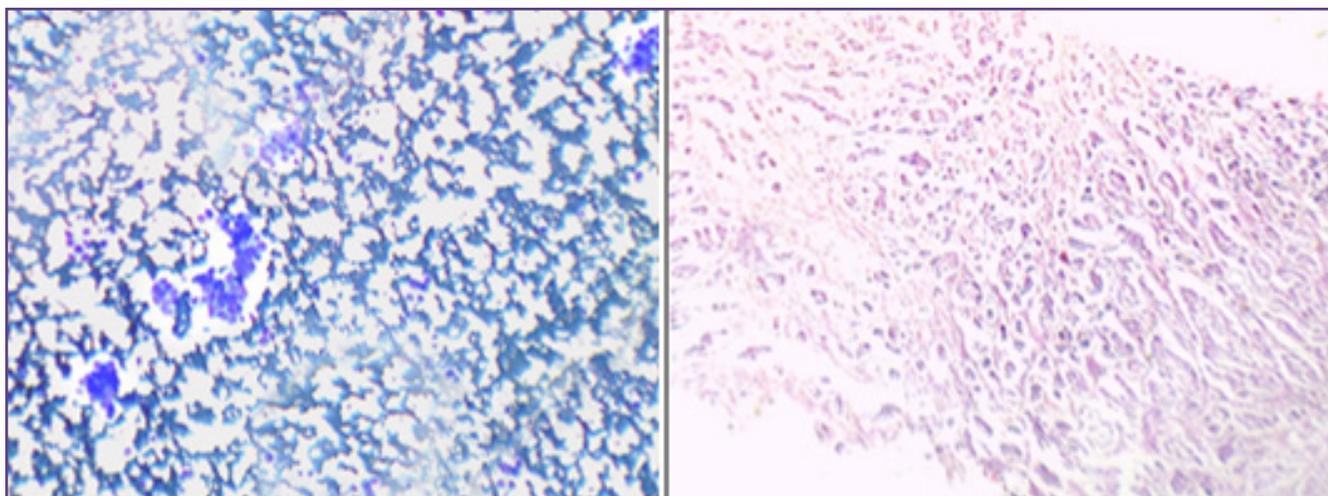
FNAC	CNB					Total
	Grade 1	Grade 2	Grade 3	Non Diagnostic	Grading Not Possible	
Grade 1	3	5	2	0	0	10
Grade2	2	14	2	2	1	21
Grade 3	2	17	5	1	2	27
<b>Total</b>	<b>7</b>	<b>36</b>	<b>9</b>	<b>3</b>	<b>3</b>	<b>58</b>

**Table 3: Showing comparison of CNB and SE grading.**

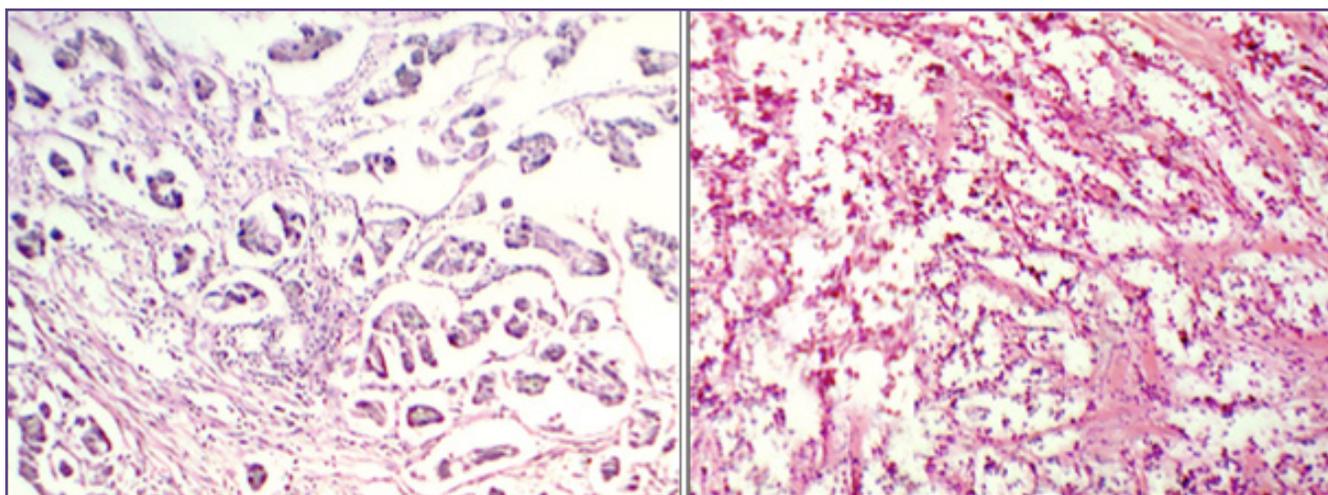
CNB	SE				Total
	Grade 1	Grade 2	Grade3	Grading not possible	
Grade1	5	1	0	0	6
Grade 2	2	9	1	1	13
Grade 3	1	2	3	0	6
Grading not possible	1	1	1	0	3
Material non diagnostic	0	1	0	0	1
<b>Total</b>	<b>9</b>	<b>14</b>	<b>5</b>	<b>1</b>	<b>29</b>

**Table 4: Showing comparison of FNAC and SE grading.**

FNAC	SE				Total
	Grade 1	Grade2	Grade3	Grading not possible	
Grade 1	4	2	1	0	7
Grade2	2	5	0	0	7
Grade3	3	7	4	1	15
	9	14	5	1	29



**Fig. 1: A and 1 B Carcinoma Breast –FNAC Grade 1 (MGG 100X)Vs CNB Grade 1 (H&E 40 X).**



**Fig. 1: C and 1 D Carcinoma Breast –CNB Grade 1 (H&E 400X) and SE (mastectomy) Grade 1 ( H& E 100 X).**

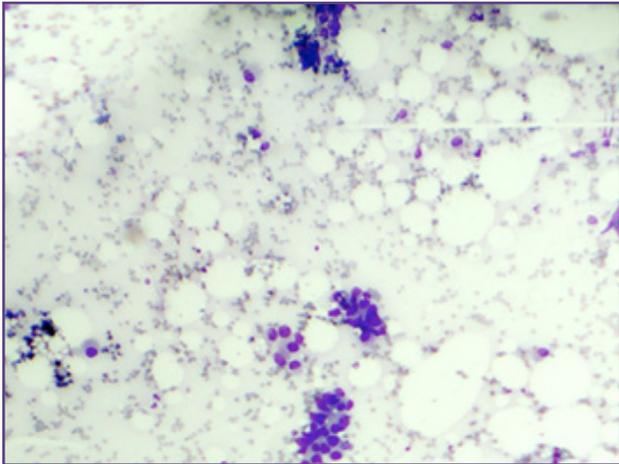


Fig. 2: A Carcinoma Breast -FNAC Grade 2 (MGG 100X).

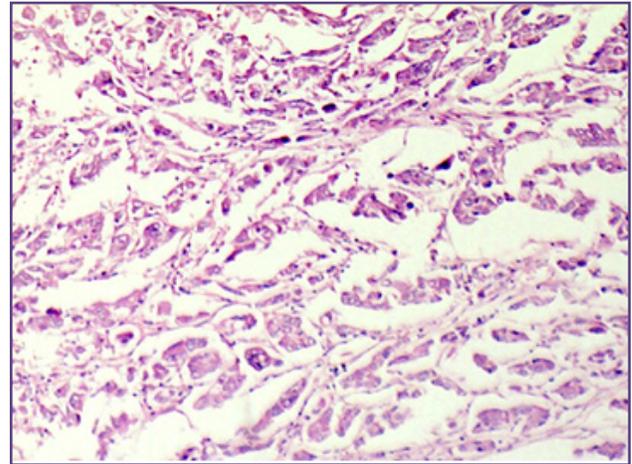


Fig. 2: B Carcinoma Breast -CNB Grade 2 (MGG 200X).

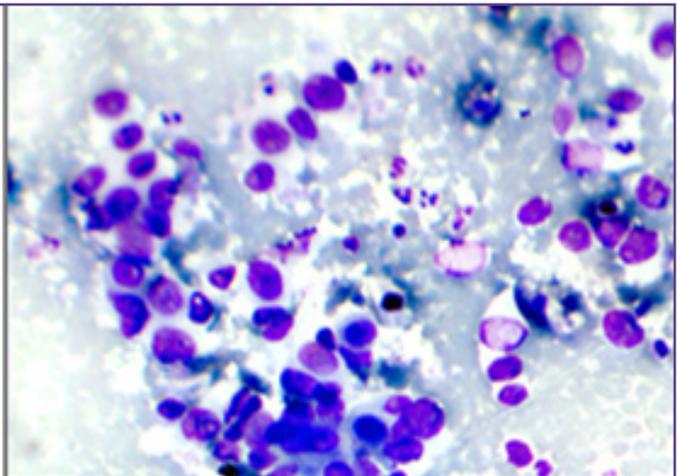
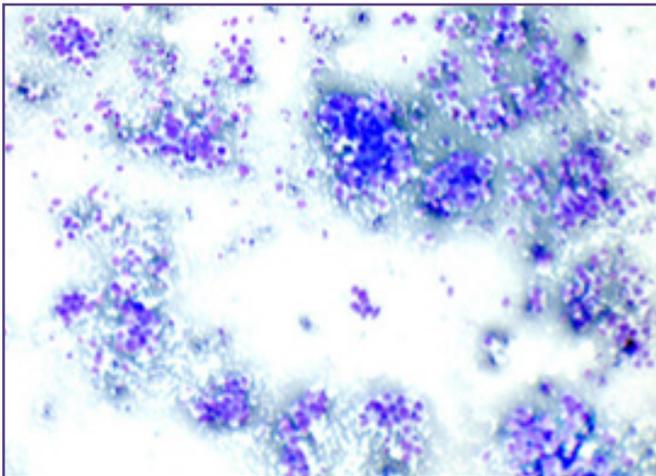


Fig. 3: A and 3 B Carcinoma Breast -FNAC Grade 3 (MGG 100X) Vs CNB Grade 1 (H&E 40 X).

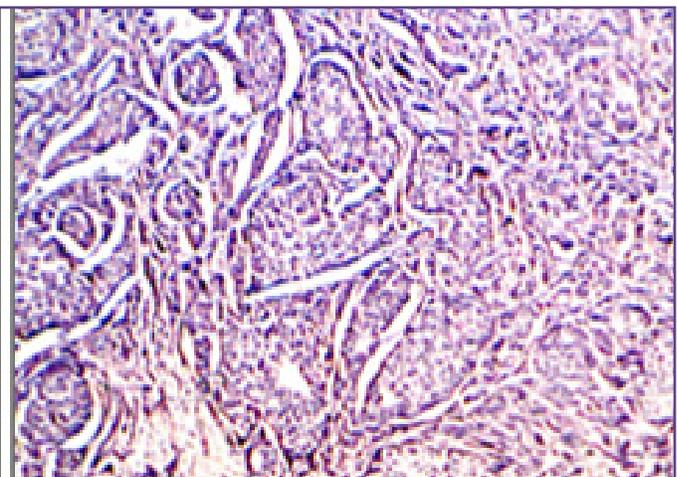
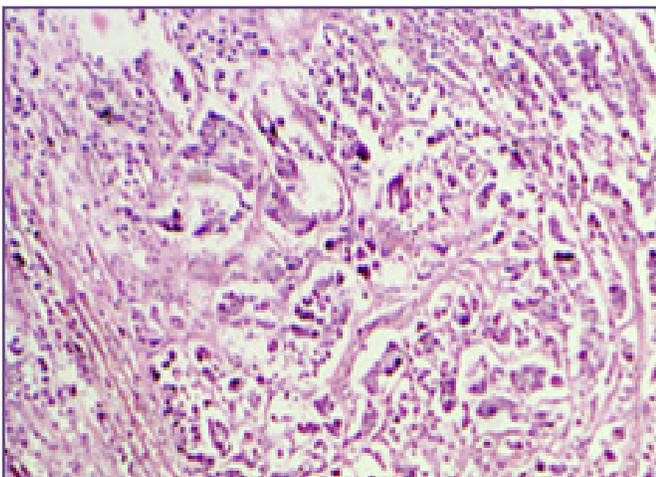


Fig. 3: C and 3 D Carcinoma Breast -CNB Grade 3 (H&E 400X) and SE (mastectomy) Grade 1 ( H& E 400 X).

## Discussion

In the present study on morphological typing, 28 cases were typed as ductal carcinoma-not otherwise specified (IDC-NOS) and 1 was typed as mucinous carcinoma. All of these cases were confirmed on CNB and SE except for mucinous carcinoma, which was not diagnosed correctly on CNB as no mucin could be demonstrated on CNB but at the same time it was diagnosed correctly on FNAC. Several studies have compared the utility of both FNA and CNB in differentiating benign from malignant mucinous breast lesions such as Lam et al who have shown FNAC as 56% sensitive and CNB as 100% accurate in diagnosis of mucinous carcinoma but this was not in our study.<sup>[13]</sup> The fact that there was only one case of mucinous carcinoma in the spectrum of 60 breast malignancies is also to be kept in mind and probably no conclusion can be drawn regarding accuracy of CNB vis a vis mucinous carcinoma in our study.

Although in the present study conducted of consecutive 60 cases of clinically suspicious breast carcinoma the diagnostic yield was 100 % but in large case series review for clinical audit/ quality assurance program especially the one undertaken by the College of American Pathologists (CAP) which had included a retrospective assessment of more than 13,000 FNA biopsy specimens of the breast from 294 institutions, some 82% of the cases were satisfactory for evaluation, with one-third having histologic correlation that served as the basis for determining diagnostic accuracy. The cases for diagnostic accuracy in our study were a little higher accounting for half of the cases.<sup>[11]</sup>

### Statistical parameters of FNAC

Various studies have been done to determine the efficacy and usefulness of both FNAC and CNB; and the results vary. When SE was taken as diagnostic procedure, sensitivity of FNAC was calculated as 100% which was similar to those seen by Ballo and Sneige et al<sup>[10]</sup> and others<sup>[14, 15]</sup> but was much higher in comparison than those reported by others<sup>[4, 16, 17]</sup> [Table-5].

Using similar statistical parameters the specificity calculated in the present study of FNAC was 100% which is in concordance with the work done by Khanna et al<sup>[15]</sup> but higher when compared with other researchers. Positive predictive value (PPV) of 100% also was similar to that reported by Homesh et al<sup>[4]</sup> and Scopa et al.<sup>[18]</sup> Negative predictive value (NPV) of 100% which is much higher when compared with other studies.<sup>[4, 18]</sup> [Table no 5] False positivity on FNAC was seen in 0% cases, which were same to that seen by Westenend et al<sup>[7]</sup> Berner et al showed false positivity of 1.7%, which is much higher than present study. False negativity was reported as 0%,

which was much lower when compared with others.<sup>[16, 19, 20]</sup> [Table-5] Other researchers such as Ducatman et al who have extensively reviewed the various studies conducted world wide state that false-positive results in FNAC of breast occur in 0 to 2% of cases while False-suspicious result rates are higher, ranging from 1% to 13%.<sup>[21]</sup>

**Statistical parameters of CNB:** Taking SE as diagnostic procedure, sensitivity of CNB was calculated as 89.67% which was similar to that reported by many researchers [Table 6] but was lower when compared with the study of Mohammed et al<sup>[22]</sup> who reported sensitivity of 97% respectively. While specificity and PPV of CNB calculated in present study was 100% which is in concordance with the work conducted by many researchers<sup>[10, 15, 17, 18, 22, 23, 24, 25, 26]</sup> but calculated NPV value of 25 % in comparison was much lower than studies done elsewhere. [Table-6].

No false positive case was reported on CNB which was comparable with study done by Cusick et al<sup>[23]</sup> and Berner et al.<sup>[20]</sup> Gukas et al<sup>[27]</sup> however has reported false positive cases to be higher (4.8%). 10% cases were reported as false negative which was similar to study done by other author<sup>[19]</sup> but was much higher than reported by Berner et al.<sup>[20]</sup>

**Statistical Comparison FNAC and CNB:** In the present study, it was found that FNAC and CNB do equally well for specificity (100% in both) and PPV (100% for both). But statistical difference was found in sensitivity (100% for FNAC vs 89.67% for CNB), NPV (100% for FNAC and 25% for CNB) and diagnostic accuracy (100 % for FNAC and 90 % for CNB). These were comparable with studies done by Ballo and Sneige et al<sup>[10]</sup> and Scopa et al.<sup>[18]</sup> [Table 7].

As noted above in the present study no major life threatening complication was encountered apart from pain and swelling, mild bleeding and bruising associated with the procedure. However, a major life threatening complication attributable to the breast FNAC is pneumothorax owing to its location is described in literature, which was first described by Orr and Margarey in 1978.<sup>[28]</sup> The complication rate of pneumothorax has been reported as 1 in 10,000 cases (0.01%) in a large Italian study of 2,00,000 FNAC procedures to 1 in 1000 by Gateley to as high as 1 in 417 by Kaufman.<sup>[29]</sup> However; it is also thought that these figures could be just a tip on the proverbial iceberg due to many unrecognized and asymptomatic cases of pneumothoraces occurring post FNAC or CNB procedures.

## Conclusion

Thus it was concluded in the present study that FNAC and CNB are comparable and as it was evident that none of the

**Table 5: Comparison of various parameters of FNAC with other studies.**

Reference	Sensitivity (%)	Specificity (%)	Accuracy	PPV	NPV
Karin et al <sup>6</sup>	84	99	-	97	-
Khanna et al <sup>13</sup>	96.8	100	-	-	-
Ballo and Sneige et al <sup>9</sup>	97.5	100	-	-	-
Scopa et al <sup>16</sup>	90	100	94	100	86
Aristo et al <sup>12</sup>	94.6	99.9	98.8	-	-
Kim et al <sup>14</sup>	64.5	71.9	-	98.4	-
Homesh et al <sup>3</sup>	66.66	81.8	75.7	100	90
Randa et al <sup>15</sup>	56.1	80.9	63.8	-	-
Present study	100	100	100	100	100

**Table 6: Comparison of various parameters of CNB with other studies.**

Reference	Year of publication	Sensitivity	Specificity	Accuracy	PPV	NPV
Cusick et al <sup>20</sup>	1990	89	100	88	-	-
Khanna et al <sup>13</sup>	1991	100	100	-	-	-
Scopa et al <sup>16</sup>	1996	89	100	90	100	58
Caruso et al <sup>23</sup>	1998	92	100	86	100	-
Gukas et al <sup>24</sup>	2000	88.9	96.8	93.5	95.2	-
Homesh et al <sup>3</sup>	2005	92.3	94.8	93.4	100	100
Mohammed et al <sup>19</sup>	2008	97	100	-	-	-
Present study	-	89.67	100	90	100	25

case was negative on FNAC but three cases had a false negative report on CNB, which shows high sensitivity and pick up rate of FNAC as compared to CNB.

Hence in the today's diagnostic world where CNB is replacing FNAC, we still recommend that FNAC can be an important quick, cost effective and relatively painless procedure in comparison to CNB. In FNAC one can perform the procedure from various directions even in smaller lumps whereas CNB in very small lump is not feasible, local anesthesia is required, the needle may not hit the representative area especially if it is small, freely mobile and patient is non cooperative. Thus it was concluded in the present study that as FNAC gives 100% results, it is quite reliable investigation and CNB should be done as an adjunct if needed especially for grading of the tumor and for immunohistochemistry.

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### Competing Interests

None Declared

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