

# Comparative evaluation of FNAC, core needle biopsy and excisional biopsy in subtyping of breast lesions

Mitra Shaila K<sup>1</sup>, Rajesh R<sup>2</sup>, Mishra RK<sup>3</sup>, Rai P<sup>4</sup>, Vahikar S<sup>5</sup>, Singhal P<sup>6</sup>

<sup>1</sup>Dr. Mitra Shaila K, Associate Professor, Department of Pathology <sup>2</sup>Dr. Rai Rajesh, Associate Professor, Department of Pathology, <sup>3</sup>Dr. Misra Rajiv K, Professor and Head, Department of Pathology, <sup>4</sup>Dr. Rai Priyanka Resident, Department of Pathology, <sup>5</sup>Dr. Shilpa Vahikar, Associate Professor, Department of Pathology, <sup>6</sup>Dr. Singhal Pallavi, Resident, Department of Pathology. All are affiliated with B.R.D. Medical College, Gorakhpur. UP, India

**Address for Correspondence:** Dr. Mitra Shaila K, Email: shaila.prasad14@yahoo.in

## Abstract

**Background:** Although available literature on Fine needle aspiration cytology (FNAC) and core needle biopsy (CNB) in breast lesions are enormous but studies regarding the comparison of CNB and FNAC in palpable breast lumps within the same patients are very few in eastern part of Uttar Pradesh (Gorakhpur region). Therefore, the present study has been undertaken to evaluate the diagnostic utility of CNB over FNAC and to compare the two with their histopathological examination as an gold standard. **Material and Methods:** 68 patients with palpable breast lumps were subjected to FNAC and CNB simultaneously and their findings are correlated with their histopathology. Smears were stained by H&E, MGG and Papanicolau stains and reported using Standard National Health Service Breast Screening Programmes (NHSPSB) guidelines. **Results:** On comparing various parameters for FNAC and CNB shows absolute sensitivity (84.6% vs 89.7%), specificity (72.4% vs 96.5%), PPV for C4/B4 (66.6% vs 100%), PPV for C3/B3 (14.28% vs 0%), FNR (2.56% vs 0%), inadequate FNAC/B1 for cancer (0% vs 2.5%), suspicious rate (19.1% vs 4.4%) and diagnostic accuracy (79.4% vs 92.6%). On analyzing Z values of all parameters it was found to be statistically significant in specificity ( $Z=2.56; p<0.01$ ), suspicious rate ( $Z=27; p<0.01$ ) and diagnostic accuracy ( $Z=2.45; p<0.01$ ). **Conclusion:** CNB was more specific than FNAC in correctly typing breast lesions and avoids unnecessary surgical management. It can be used as an alternative to open biopsy for specific diagnosis.

**Key words:** Breast lumps, Core needle biopsy, FNAC

## Introduction

Diseases of breast constitute a significant proportion of surgical cases in both developed and developing countries. Frequently the need arise to distinguish benign from malignant lesions prior to definitive treatment. Fine needle aspiration cytology (FNAC) of breast lump is accepted and established method to determine nature of lump with sensitivity ranging from 82%-97.5% and specificity >99%. [1,2].

However there are diagnostic pitfalls in cytological diagnosis of poorly circumscribed breast lesions. Core needle biopsy (CNB) is an important tool in assessment of palpable and non-palpable breast lesions with sensitivity around 90% and specificity 100%. [3,4] Grading of tumour and assessment of estrogen receptor

is also possible in CNB and so CNB is now increasingly used for preoperative assessment of breast lesions. Studies regarding the comparison of CNB and FNAC in palpable breast lumps within the same patient population are relatively scarce especially in eastern part of Uttar Pradesh (Gorakhpur region) whereas published literature related to screen-detected breast lesions are plenty. With this view the present study has been undertaken to establish the utility of CNB as compared to FNA in palpable breast lump considering histopathological examination of excisional biopsy as gold standard.

## Material and Methods

This study was conducted on 68 patients with palpable breast lump attending outpatient and inpatient department of surgery from July 2014-December 2015.

Manuscript received: 15<sup>th</sup> March 2016  
Reviewed: 25<sup>th</sup> March 2016  
Author Corrected: 15<sup>th</sup> April 2016  
Accepted for Publication: 28<sup>th</sup> April 2016

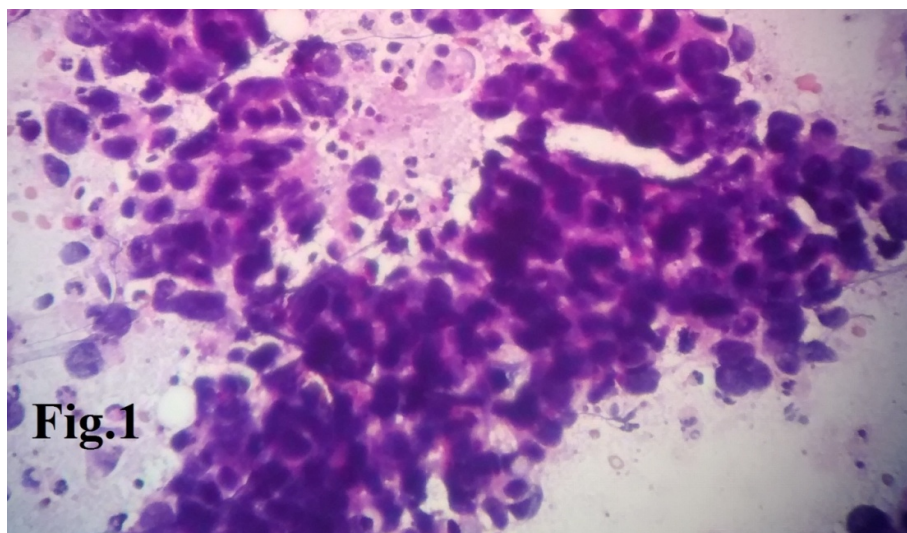
A detailed clinical history and examination was done using standardized proforma. Patient with positive clinical examination were subjected to simultaneous FNAC and CNB. The FNAC was performed in each patient by the technique of Martin and Ellis [5] using 21-22G needle attached to 20 ml disposable syringe and smear prepared both wet fixed in 95% ethanol and air dried. All cytology smears were stained by May Grunwald Giemsa, Papanicolaou, and hematoxylin and eosin stain. CNB was performed freehand/unguided on breast lump in a single session as FNA with 18G Trucut biopsy needle after informed consent and coagulation profile. Core biopsy was done as per the procedure described [6]. The specimen was fixed in 10% neutral buffered formalin for a minimum of 6 hours as

recommended [7]. Typically 3 to 5 samples were taken through different part of lesion to ensure adequacy of sampling. Whenever possible cores were arranged in parallel arrays. All the core needle biopsies were submitted for microscopic examination. The outcome of FNAC and CNB were reported using the standard NHSBSP criteria.[8] (Table-1)The diagnosis offered were subsequently compared by histopathology as gold standard. The present study comprises only those cases in which all three procedures were carried out. All the data were statistically analysed and the findings of FNAC and CNB were compared to find out the utility of core biopsy in the diagnosis of breast lesions, applying Z-test for significance of difference between two population proportions.

**Table 1: Reporting categories for FNAC and for CNB.**

	<b>Cytology Reporting</b>		<b>Core biopsy reporting</b>
C1	Unsatisfactory	B1	Unsatisfactory/normal tissue only
C2	Benign	B2	Benign
C3	Atypia probably benign	B3	Benign, but of uncertain malignant potential
C4	Suspicious of malignancy	B4	Suspicious of malignancy
C5	Malignant	B5	Malignant
			B5a Noninvasive cancer
			B5b Invasive cancer
			B5c Cancer of non assessable invasiveness

CNB-core needle biopsy ; FNAC-fine-needle aspiration cytology.



**Figure1: Microphotograph of FNAC smear of invasive ductal carcinoma breast showing clusters and groups of pleomorphic cells with high nuclear - cytoplasmic ratio, hyperchromatism, irregular chromatin and moderate amount of cytoplasm.**

**Results**

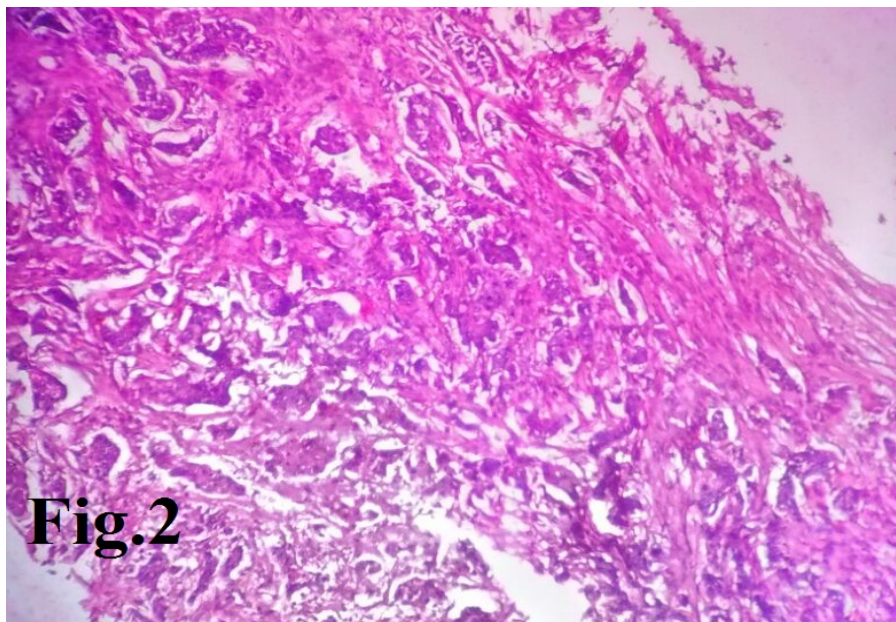
Out of 68 cases, 29 cases (42.6%) were benign and 39cases (57.3%) were malignant lesions of breast after histopathological examination. Among benign cases, maximum number of cases were of fibroadenoma (29.4%) followed by fibrocystic disease(7.3%), fibroadenosis(2.9%), granulomatous mastitis(1.5%) and tubercular mastitis(1.5%) while in malignant lesions, majority were invasive ductal carcinoma(52.9%), followed by invasive lobular carcinoma (1.5%),invasive papillary carcinoma(1.5%) and medullary carcinoma(1.5%). The age of the patient ranged from 15 to 69 years with maximum incidence (36.8%) was in age group of 30-40 years. Breast lumps measured 2.5-10 cm, out of which 33 cases had lump < 3 cm and 35 cases >3 cm.

On comparing categorization (C-category) done through FNAC with histopathological findings revealed that out of 22 cases of C2 category, 1 case turned out to be malignant and other 21 cases were benign; out of 7cases of C4 category, 2 cases were benign and 4 cases were malignant; all the C5(33 cases) category turned out to be malignant histologically. (Table-2) Diagnostic accuracy of FNAC for breast lesions was 79.4%. The absolute sensitivity, complete sensitivity, specificity, positive predictive value (PPV)(C5), PPV(C4), PPV(C3), false negative rate (FNR), false positive rate (FPR) were 84.6%, 97.4%, 72.4%, 100%, 66.6%, 14.28%, 2.56% and 0% respectively (Table- 4).

**Table 2: Distribution of FNAC and CNB diagnosis.**

FNAC	CASES	%	Specific Cytology Diagnosis					CNB	CASES	%
C1	--	---	--	--	--	--	--	B1	02	03
C2	22	32.4	FA (16)	FCD (02)	FAD (02)	GM (01)	P (01)	B2	28	41.2
C3	07	10.3	FA-A(05)		PT(01)	AM-A(01)		B3	00	00
C4	06	8.8	DH(06)					B4	03	4.4
C5	33	48.5	DC(32)			MC(01)		B5	35	51.4
Total	68	100							68	100

\*FA: Fibroadenoma, FCD: Fibrocysticdisease, FAD: Fibroadenosis, GM: Granulomatous mastitis, P:Papilloma, PT:Phyllodes tumour, AM:acute mastitis, DH: ductal hyperplasia, DC:ductal carcinoma, MC:Medullary carcinoma

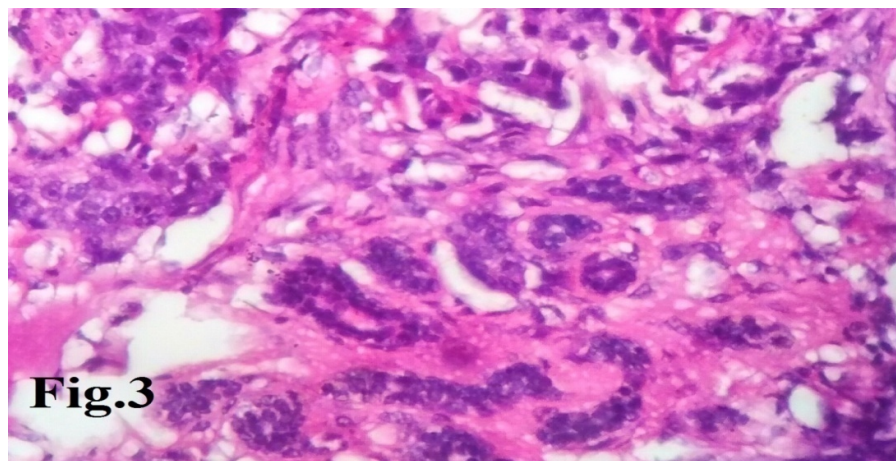


**Figure 2-Core needle biopsy sections of same case showing atypical tumor cells form tubules or nests, penetrate the basement membrane of the duct and infiltrate the surrounding tissue.**

**Table -3: Distribution of cases according to CNB diagnosis category B2 and B5.**

Diagnosis B2	No. of Cases	Diagnosis B5	No. of Cases
FA	20	IDC	33
FCD	05	MC	01
FAD	01	ILC	01
GM	01		
CM	01		

\*FA: Fibroadenoma, FCD: Fibrocystic disease, FAD: Fibro adenosis, GM: Granulomatous mastitis, CM: chronic mastitis, , IDC: invasive ductal carcinoma, MC:Medullary carcinoma, ILC: invasive lobular carcinoma



**Figure 3:** H &E stained section showing that atypical tumors cells are arranged in nests, cords and acini infiltrating surrounding stroma. Cells are pleomorphic with high nuclear-cytoplasmic ratio, hyperchromatism, irregular chromatin, conspicuous nucleoli and moderate amount of cytoplasm.

**Table- 4: Comparison of quality assurance values of fna and cnb and their statistical significance**

Parameters	FNAC%	CNB%	P-VALUE
Absolute sensitivity	84.6	89.7	NS
Complete sensitivity	97.4	97.4	NS
Specificity	72.4	96.4	<0.01
PPVB4/C4	66.6	100	NS
PPV(B5/C5)	100	100	NS
PPVB3/C3	66.6	100	NS
FNR	2.56	0	NS
Inadequate FNA/B1 RATE	0	2.9	NS
Inadequate FNA/B1 rate from cancer	0	2.5	NS
Suspicious Rate	19.1	4.4	<0.01
Diagnostic Accuracy	79.4	92.6	<0.01

\*PPV; Positive predictive value, FNR; False negative rate, NS; Non-significant.

On comparison of core needle biopsy findings with excisional histopathological results, out of 2 cases of B1 category, one case came out to be benign and another case was malignant; out of 28 cases of B2, all were benign finally; all cases of B4 (03 cases) and B5 (35cases) category turned out to be malignant.(Table 3)

The diagnostic accuracy of CNB was 92.6%.The absolute sensitivity, complete sensitivity and specificity were 89.7%,97.4% and 96.5%.PPV was 100% for B5 and B4 category while for B3 category PPV was 0%. FNR and FPR were 0%. Inadequate CNB rate was 2.9% while that of FNAC was 0% (Table 4).



Percent positivity of Malignant diagnosis on CNB (B5) was 51.4% while that of FNAC was 48.5%. The suspicious rate for FNAC (C3 and C4) was 19.1% as compare to suspicious rate of CNB (B3 and B4) of just 4.4%. Percentage of benign cases diagnosed on FNAC (C2) was 32.4% while that on CNB (B2) was 41.2%. Thus there was a 11.2 % increase in definite benign diagnosis of CNB over FNAC. Of suspicious lesions of C3 and C4, five cases diagnosed as fibroadenoma with atypia turned out to be fibroadenoma in 3 cases, fibrocystic disease in 1 case and one case as invasive ductal carcinoma. One case diagnosed as phyllode tumour was fibroadenoma on histology. A case of acute mastitis with atypia was found to be tubercular mastitis on final histological diagnosis. 6 cases of ductal hyperplasia diagnosed on FNAC turned out to be fibrocystic disease in 2 cases, invasive ductal carcinoma in three cases and invasive lobular carcinoma in one case. Thus in cytology comment on invasive or insitu character of ductal carcinoma is not possible. On comparing CNB diagnosis with excisional histopathological diagnosis 2 inadequate cases of B1 category turned out to be one case of fibroadenoma and another invasive ductal carcinoma. B2 category well correlates with their histopathological diagnosis regarding specific typing of breast lesions. Of 3 cases of B4 in which no specific diagnosis can be made, when compared, found that 2 cases turned out to be invasive ductal carcinoma and one as invasive papillary carcinoma on histology. The statistical significance was calculated by Z test. On analysing Z values of all parameters it was found to be statistically significant in specificity ( $Z=2.56$ ;  $p<0.01$ ), suspicious rate ( $Z=2.7$ ;  $p<0.01$ ) and diagnostic accuracy ( $Z=2.45$ ;  $p<0.01$ ). Although FNAC is a feasible, simple, less cumbersome and cost effective method for diagnosis but CNB is more specific, accurate and with less suspicious rate. If both techniques are performed together better diagnostic accuracy can be achieved.

## Discussion

Breast cancer is the most common cancer in women all over India. Due to lack of awareness and almost non-existent breast screening practices, patients present with palpable breast cancers [9]. Studies regarding the comparison of CNB and FNAC in palpable breast lumps within the same patients are relatively scarce especially in eastern parts of Uttar Pradesh (Gorakhpur region) whereas those of screen-detected breast lesions are plenty.

Many surgeons are reluctant to plan surgery on the

basis of cytological report alone as it is not possible to differentiate between infiltrating and non infiltrating carcinomas and also because certain cases of diagnostic apparent malignancies require preoperative estrogen progesterone receptor status and c-erb B2 status. [10,11] CNB can detect the above efficiently and so is increasingly replacing FNAC in diagnosis of breast lesions. The age of patients ranged from 15-69 years with maximum incidence in age group of 30-40 years. Hussain et al reported maximum patients in the age group of 31-50 years in their study [12]. Out of total 68 cases, 57.4% were malignant and majority (52.9%) were invasive ductal carcinoma 29 cases (42.6%) were benign with maximum of cases were fibroadenoma (29.4%) followed by fibrocystic disease (7.3%). Our findings are in accordance with the study of Alexandre et al [13].

The size of lumps varied from 2.5-10 cm. 71.4% of breast lumps of >3cm of size were malignant. Out of 33 breast lumps (48.5%) with <3 cm, 57.5% were benign and 42.5% were malignant. Ballo et al found that 73.8% of breast lumps with large size (>2 cm) were malignant and 28.38% of lumps with smaller size (<2cm) were malignant suggesting that lumps of larger size had more chances of being malignant than of smaller size lumps [14].

In the present study, absolute sensitivity and specificity of FNAC was 84.6% and 72.4% respectively. Mohammed et al reported the range of sensitivity 79-99% and that of specificity 60-100% in their study. [15] Hatada et al reported sensitivity of 86.9% and specificity 78.6%. [16] Nagi et al reported lower sensitivity of FNAC 66.6% and specificity 81.8% [17]. FNR was 2.56% and FPR was 0% in the present study. Shannon et al [18] documented both parameters 0% while Westend et al [19] reported 6% FNR and 0% FPR. The case which was diagnosed falsely negative on FNA was papilloma which turned out to be invasive papillary carcinoma on histological examination. Medina-Franco et al found that lobular and papillary carcinoma were the most common diagnosis of false negative cases in their study [20]. PPV for C5, C4 and C3 were 100%, 66.5% and 28.5% respectively. This is in accordance with many studies [18,20].

The absolute sensitivity, complete sensitivity and specificity were found to be 89.7%, 97.4% and 96.5% respectively. In comparison with study of Westend et al, we report a higher sensitivity for CNB in diagnosis of breast cancer [19]. This is largely due to inclusion

criteria (only palpable masses) and explained by the experience of the person performing and reporting CNB. The FPR and FNR was 0% which is similar to other studies. PPV of CNB was calculated for B5, B4 and B3 was found to be 100%, 100% and 00%. PPV of B5 and B4 implies that all cases categorized in this group were malignant on histopathological examination therefore allow us to establish definitive therapy on the basis of result of B4 and B5 category.

Since in 2 cases, CNB was inadequate for any comment therefore categorized in B1 group, thus giving inadequate rate 2.9%. Out of these 2 cases, 1 case was found to be malignant and other benign, thus giving inadequate rate from cancer 2.5%. The findings were much similar to Shannon et al. [18]. Inadequate sampling is one of the CNB limitations as seen in various studies [4,18].

In the present study suspicious rate for CNB was 4.4% which was markedly lower than that of FNAC of 19.1%. Alexandre et al also observed markedly higher suspicious rate of FNAC (14.4%) than that of CNB (3.0%) thus concluding that all suspicious cases should be reviewed by the cytopathologist in an attempt to reduce this group and thus reducing the surgeons dilemma for further management in breast lesions.

In present study one case was diagnosed as invasive papillary carcinoma on histopathology which was not definitely diagnosed by CNB and therefore placed in suspicious category B4. Another case of invasive lobular carcinoma was not definitely diagnosed in FNAC and placed in suspicious group C4 while with CNB diagnosis of invasive lobular carcinoma was correctly made. It can be interpreted that efficacy of CNB was more than FNAC for diagnosis of lobular carcinoma. In present study invasive ductal carcinoma was diagnosed in 33 cases out of which 32 cases were diagnosed as only ductal carcinoma and one case was placed in suspicious group (C4) in FNAC thus CNB was able to differentiate between invasive and insitu ductal carcinoma. Shannon et al also documented that CNB can diagnose the presence and absence of invasion in carcinoma [18]. Out of 28 benign cases of B2 (benign) CNB was able to type the lesion in 27 cases (96.4%) and among 35 malignant cases of B5 correct typing was made in 33 invasive ductal carcinoma, 1 medullary carcinoma and 1 lobular carcinoma giving 100% correct diagnosis in malignant cases. On comparing FNAC and CNB, it was found that both work equally well for absolute sensitivity, complete sensitivity and both

inadequate rates but there was significant statistical difference in specificity of CNB and FNAC (96.5% versus 72.4%;  $p < 0.01$ ), suspicious rate which is much reduced with CNB (4.4% versus 19.1%;  $p < 0.01$ ) and more diagnostic accuracy of CNB than FNAC (92.6% versus 79.4%;  $p < 0.01$ ). Similar findings were observed by many authors. [12,13,18,19]

Diagnostic accuracy of CNB was 92.6% similar to other researchers. [17,21] Homesh et al [17] reported diagnostic accuracy of 93.4% while Alfonso et al [22] observed 91% diagnostic accuracy of CNB. Higher diagnostic accuracy (CNB versus FNAC: 92.6% versus 79.4%;  $p < 0.01$ ) provides a definitive diagnosis and treatment.

## Conclusion

CNB was found to be superior to FNAC in diagnosis of breast lesions in terms of specificity, suspicious rate, diagnostic accuracy and correct typing of benign and malignant cases. However we can thus say that CNB is more specific in giving a definitive histopathological diagnosis therefore avoiding unnecessary surgical management and can be used as an alternative to open biopsy.

**Funding:** Nil, **Conflict of interest:** Nil

**Permission from IRB:** Yes

## References

1. Yong WS, Chia KH, Poh WT, Wong CY. A comparison of trucut biopsy with fine needle aspiration cytology in the diagnosis of breast cancer. Singapore Med J. 1999 Sep;40(9):587-9.
2. Dutta SK, Chattopadhyaya A, Roy S. Evaluation of fine needle aspiration and imprint cytology in the early diagnosis of breast lesions with histopathological correlation. J Indian Med Assoc. 2001 Aug;99(8):421-3.
3. Bdour M. Comparison between fine needle aspiration cytology and tru-cut biopsy in the diagnosis of breast cancer. J Sur Pak. 2008; 13(1):19-21.
4. Karimian F, Aminian A, Hashemi E, Meysamie AP, Mirsharifi R, Alibakhshi A. Value of core needle biopsy as the first diagnostic procedure in the palpable breast masses. Shi Med J. 2008;9(4):188-192.
5. Martin HE, Ellis EB. BIOPSY BY NEEDLE PUNCTURE AND ASPIRATION. Ann Surg. 1930 Aug;92(2):169-81.

6. Bishop J, Coleman M, Cooke B, Davies R, Frost F, Grace J, Reeves L, Rickard M, Wetzig N, Zorbas H. National breast cancer centre. Breast FNA cytology and core biopsy: A guide for practice. 1st ed. Camperdown: National Breast Cancer Centre; 2004.
7. Rosai J, editor. Rosai and Ackerman's surgical pathology. 9<sup>th</sup> ed. Volume 2. New Delhi: Mosby Elsevier; 2005:1763-876.
8. NHSBSP. Guidelines for non-operative diagnostic procedures and reporting in breast cancer screening. Sheffield: NHSBSP Publication No. 50, June 2001.
9. Tikku G, UMAP P. Comparative Study of Core Needle Biopsy and Fine Needle Aspiration Cytology in Palpable Breast Lumps: Scenario in Developing Nations. Turk Patoloji Derg..2016; 32(1):1-7.
10. Caruso ML, Gabrieli G, Marzullo G, Pirrelli M, Rizzia E, Sorino F. Core Biopsy as Alternative to Fine-Needle Aspiration Biopsy in Diagnosis of Breast Tumors. Oncologist. 1998;3(1):45-49.
11. Kocjan G. [Needle aspiration cytology of the breast: current perspective on the role in diagnosis and management]. Acta Med Croatica. 2008 Oct;62(4):391-401.
12. Hussain MT. Comparison of fine needle aspiration cytology with excision biopsy of breast lump. J Coll Physicians Surg Pak. 2005 Apr;15(4):211-4.
13. Barra Ade A, Gobbi H, de L Rezende CA, Gouvêa AP, de Lucena CE, Reis JH, Costa e Silva SZ. A comparison of aspiration cytology and core needle biopsy according to tumor size of suspicious breast lesions. Diagn Cytopathol. 2008 Jan;36(1):26-31.
14. Ballo MS, Sneige N. Can core needle biopsy replace fine needle aspiration cytology in the diagnosis of palpable breast carcinoma: A comparative study of 124 women. Cancer. 1996; Aug 15;78(4):733-777.
15. Mohammed AZ, Edino ST, Ochicha O, Alhassan SU. Value of fine needle aspiration biopsy in preoperative diagnosis of breast lumps. Ann Afric Med. 2005;4(1):19-22.
16. Hatada T, Ishii H, Ichii S, Okada K, Fujiwara Y, Yanamura T. Diagnostic value of ultrasound guided fine needle aspiration cytology, core-needle biopsy, and evaluation of combined use in the diagnosis of breast lesions. J Am Coll Surg. 2000;190(3):299-303.
17. Homesh NA, Issa MA, El-Sofiani HA. The diagnostic accuracy of fine needle aspiration cytology versus core needle biopsy for palpable breast lump(s). Saudi Med J. 2005 Jan;26(1):42-6.
18. Shannon J, Douglas-Jones AG, Dallimore NS. Conversion to core biopsy in preoperative diagnosis of breast lesions: is it justified by results? J Clin Pathol. 2001 Oct;54(10):762-5.
19. Westenend PJ, Sever AR, Beekman-De Volder HJ, Liem SJ. A comparison of aspiration cytology and core needle biopsy in the evaluation of breast lesions. Cancer. 2001 Apr 25;93(2):146-50.
20. Medina-Franco H, Abarca-Pérez L, Cortés-González R, Soto-Germes S, Ulloa JA, Uribe N. [Fine needle aspiration biopsy of breast lesions: institutional experience]. Rev Invest Clin. 2005 May-Jun; 57(3): 394-8.
21. Andreu FJ, Sentís M, Castañer E, Gallardo X, Jurado I, Díaz-Ruiz MJ, Méndez I, Rey M, Florensa R. The impact of stereotactic large-core needle biopsy in the treatment of patients with nonpalpable breast lesions: a study of diagnostic accuracy in 510 consecutive cases. Eur Radiol. 1998; 8 (8):1468-74.
22. Bolívar AV, Alonso-Bartolomé P, García EO, Ayensa FG. Ultrasound-guided core needle biopsy of non-palpable breast lesions: a prospective analysis in 204 cases. Acta Radiol. 2005 Nov;46(7):690-5.

.....

**How to cite this article?**

Mitra Shaila K, Rajesh R, Mishra RK, Rai P, Vahikar S, Singhal P. Comparative evaluation of FNAC, core needle biopsy and excisional biopsy in subtyping of breast lesions. J Path Micro 2016;2(1):9-15. doi: 10.17511/jopm.2016.i01.03

.....