Original Research Article

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The Application of Probabilistic Approach and its Diagnostic Accuracy in Reporting Breast Fine Needle Aspirates

Sarda S.D.*, Kanetkar S.R.**

*Resident **Professor and Head, Department of Pathology, Krishna Institute of Medical Sciences, Malkapur Karad (Dist. Satara), Maharashtra 415539; India.

Abstract

Background: Breast cancer is 2nd most common malignancy in Indian women. FNAC is first line of investigation for breast lump. *Aims:* 1)To diagnose and classify breast lesions on cytology according to probabilistic approach. 2) To evaluate accuracy of probabilistic approach by correlating with Histopathological diagnosis wherever possible. *Study Design:* Prospective study of FNACs classified into positive, suspicious, proliferative with atypia, proliferative without atypia and unremarkable categories. *Results:* Total 237 cases were studied. The probability of finding carcinoma on histopathology from positive, suspicious and proliferative with atypia categories were 100%, 80% and 43.75% respectively. All the lesions from proliferative without atypia and unremarkable categories were benign on histology. There were no false positive cases. The specificity and sensitivity were 100% and 90.54%. *Conclusion*: The probabilistic approach with defined diagnostic criteria is an accurate, uniform and reduces inter-observer variability. It minimizes false positives without compromising sensitivity for detecting carcinoma. This scheme of reporting breast FNA provide the rational basis for guidelines for management of breast lesions.

Keywords: Probabilistic Approach; Breast FNAC; Positive for Carcinoma.

Introduction

Breast cancer is the commonest cancer of urban Indian women and the second commonest in the rural women next to cervical cancer A palpable breast lump, whether benign or malignant, is a source of anxiety to the patient. Therefore, accurate pathological diagnosis is crucial for further management and prediction of an outcome [1].

FNAC being a less invasive, simple, easy, less expensive, fast and reliable procedure with high sensitivity rates; is more popular and extensively practiced in many centres. So, FNAC is first line investigation for a diagnosis of breast lump [2] and easily done in outpatient department. The approach which predicts the probability of malignancy in a particular lesion is more important in optimizing further patient management. This is probabilistic approach to the diagnosis of breast carcinoma.

Corresponding Author: Sharda Dilip Sarda, Resident, Department of Pathology, Krishna Institute of Medical Sciences, Malkapur Karad (Dist. Satara), Maharashtra 415539; India.
E-mail: Shardasarda21@gmail.com

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This system categorises breast lesions into five categories viz positive, suspicious, epithelial proliferative lesion with atypia, epithelial proliferative lesion without atypia and unremarkable [3].

Material and Method

The study was conducted over a period of two years from 2013-2015 in Department of Pathology. Total 237 cases were studied, of these 130 were available for Histopathological confirmation and rest lost the follow up. Both males and females were included in the study. Metastases in breast were excluded.

Aspirations were carried out by 23/24 gauge needle with 10 ml disposable syringe. Air dried smears were stained with May-Grunwald Giemsa stain and alcohol fixed smears were stained with hematoxyline and eosin. Tissue sections were obtained from lumpectomy or mastectomy specimens stained with H and E stains.

The cytologic diagnosis was classified into 5 categories according to following criteris [1,5,6]-

1. *Positive for Carcinoma (Figure 1):* Following all four criteria must be met:

- *Hypercellularity*: Refers to atypical cell population only rather than other components such as inflammatory cells or stromal cells.
- *Cellular Dyshesion*: Refers to presence of abundant single epithelial cells (this excludes singly bare bipolar cells and stromal cells).
- *Cytologic Atypia*: May be variable but should at following criteris-nuclear : cytoplasmic ratio and markedly eccentrically located nuclei. Other useful features may not be present depending on the level of pleomorphism, include nuclear membrane irregularity, coarse and clumped chromatin, multiple and irregular nucleoli.
- *One Cellular Population*: Refers to one population of atypical epithelial cells, not a combination of atypical and benign looking epithelial cells. Irregularly shaped, spindly stromal cells do not exclude a diagnosis of carcinoma; however, definitive diagnosis of carcinoma is not given when round to oval stromal (bipolar) cells or nuclei are present.

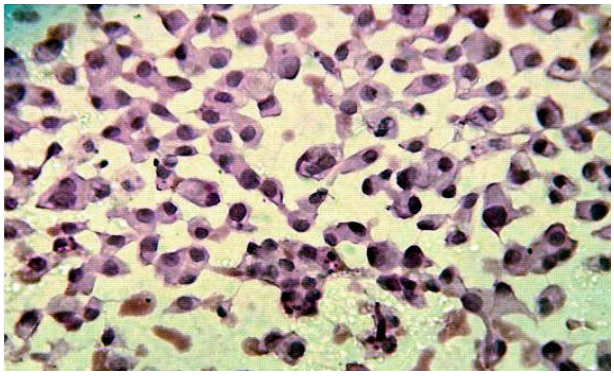

Fig. 1: Photomicrograph showing predominantly singly scattered neoplastic cells. These cells are large and have highly pleomorphic nuclei – A case of Positive for carcinoma. (H & E- 400x). The Histopathological diagnosis was invasive breast carcinoma

2. *Suspicious for Carcinoma (Figure 2):* When three of these four features are present, a suspicious diagnosis should be rendered.

3. *Epithelial Proliferative Lesion with Atypia (Figure 3)*

When a specimen consists of many epithelial cells and the epithelial cells in groups show significant crowding and overlapping and/or the specimen shows one other feature of carcinoma, a diagnosis of atypical epithelial proliferative lesion should be rendered. Atypical ductal hyperplasia, ductal carcinoma in situ, etc come under this category, where tissue architecture is needed for diagnosis

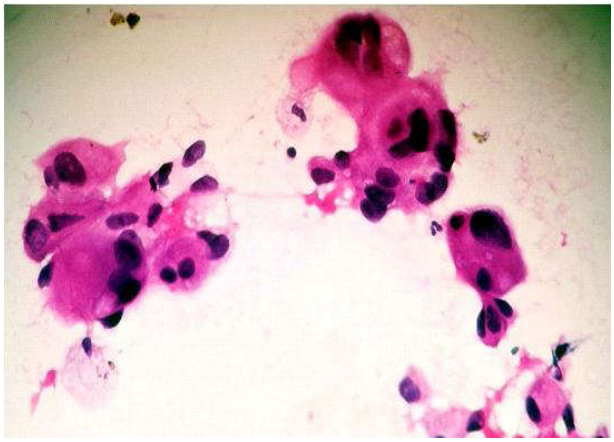

Fig. 2: Photomicrograph showing hypocellular smear with ductal epithelial cells in loosely cohesive clusters and occasional singly scattered with severe cytological atypia- reported as Suspicious for carcinoma (H&E, 400X). The histopathologic diagnosis was invasive breast carcinoma

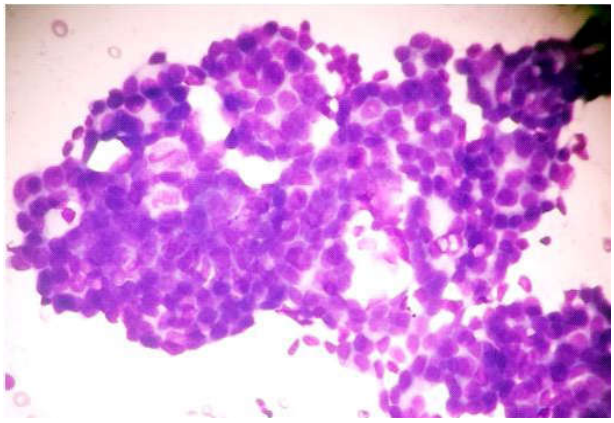

Fig. 3: Photomicrograph showing ductal epithelial cells in loosely cohesive sheet and shows significant overcrowding and overlapping with moderate to severe atypia. A case of epithelial proliferative lesion with atypia. (H & E- 400X). The Histopathological diagnosis was invasive breast carcinoma

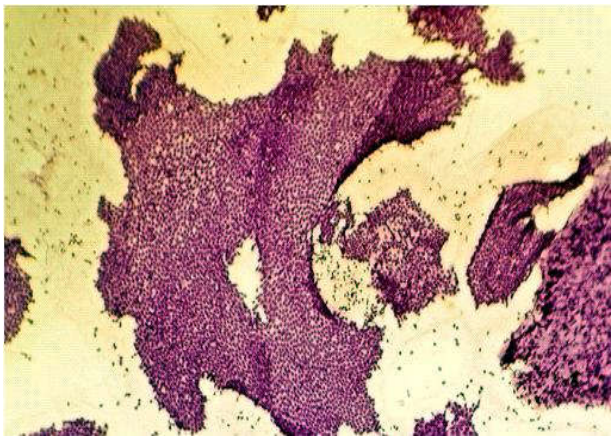

Fig. 4: Photomicrograph showing branched monolayered sheets of uniform ductal epithelial cells. Background shows many benign bare bipolar nuclei and stromal fragment. A case of epithelial proliferative lesion without atypia. (H & E- 100X). The histological diagnosis was fibroadenoma

4. Epithelial Proliferative Lesion without Atypia (Figure 4)

When a specimen consists of many epithelial cells and epithelial cells in groups show no or mild crowding and overlapping with obvious myoepithelial cells and no other feature of carcinoma, then the lesion should be categorised as an epithelial proliferative lesion without atypia.

Most of the fibroadenomas come under this category.

5. Unremarkable-

When none of the four features of carcinoma is present, they describe the findings, unremarkable ductal cells and apocrine metaplastic cells.

Observations

Out of 241 cases, cytological diagnoses of 237 cases were studies as 4 samples were inadequate so excluded from the study.

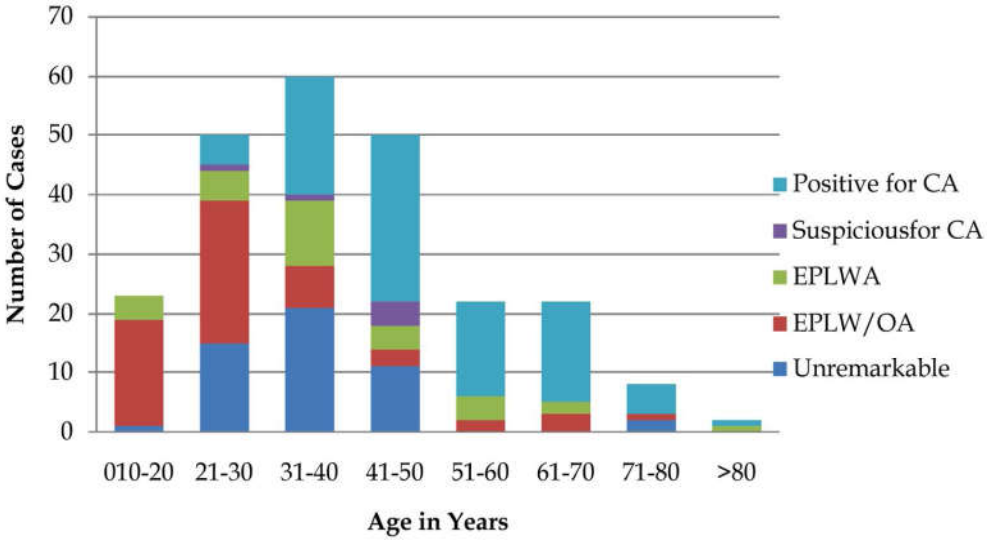

Fig. 5: Shows distribution of cases according to age and cytodiagnosis

Table 1: Distribution of cases on aspiration cytology and histological examination available in each category

Categories	CYTO No	Histopath Available	
		No of Cases	%
Positive For Ca	92	63	68.47 %
Suspicious For Ca	6	5	83.33 %
Eplwa	31	16	51.61 %
Eplw/Oa	58	35	60.34 %
Unremarkable	50	11	22%
Total	237	130	54.85 %

EPLWA- Epithelial proliferative lesion with atypia, W/OA- without atypia

Table 2: Correlation of cytologica and histologic diagnosis of breast FNAC along with probability of carcinoma in histology for each category

CYTO Diagnosis	No of Case	Histopathological Correlation			CYTO-Histo Correlation	Probability of Carcinoma in Histology
		Benign Lesion	DCIS	IBC		
Unremarkable	50	50	-	-	50/50 (100%)	0%
E P L W/O A	35	35	-	-	35/35 (100%)	0 %
E P L W A	16	5	4	7	9/16 (56.25%)	43.75%
Suspicious for CA	5	-	1	4	4/5 (80%)	80%
Positive for CA	63	-	-	63	63/63 (100%)	100%

IBC- invasive breast carcinoma, DCIS- ductal in situ ca, EPLWA- eithelial proliferative lesion with atypia, w/oa- without atypia

Table 3: Diagnostic accuracy of probabilistic aproach in reorting breast fnac

Cytology	Histopathology		Total
	Malignant Lesions	Bening Lesions	
Malignant Lesions + Suspicious	67 (True positive) (a)	00 (False positive) (b)	67
EPLWA + EPLW/OA+ Unremarkable	07 (False negative) (c)	56 (True negative) (d)	63
Total	74	56	130

- Sensitivity: Actual positive = true positive/total malignant lesion= a/(a+c) = 90.54%
- Specificity : True negative/confirmed benign cases = d/(b+d) = 100%
- Positive predictive value : a/(a+b)= 100%
- Negative predictive value: d/(c+d)= 88.88%
- Accuracy = TP+TN/total= 94.61%

Table 4: Percentage of malignancy in histopathology from cytological suspicious and atypical lesions in various studies

Sr. No.	Name of study	% of malignancy in histology from suspicious category	% of malignancy in histology from atypical category
1	Wang[5] et al (1998)	93	36
2	Ayata[4] et al (1999)	84	27
4	Jennifer[7] et al (2004)		37
6	Pandya[1] et al (2013)	94.11	75
7	Present study	80	43.75

Table 5: Distribution of cases according to cytodiagnosis in male breast lesion with cyto-histo correlation

Category	No of cases on cytology	Percentages	Histo available	Cyto-histo correlation
Positive for carcinoma	4	33.33	3	3/3
Suspicious for carcinoma	-		-	-
E P L W A	-		-	-
E P L W /O A	6	50	1	1/1
Unremarkable	2	16.66	1	1/1
Total	12	100	5	5/5

Table 6: Comparison of diagnostic accuracy of FNAC in various studies

Parameter	Sensitivity	Specificity	Positive predictive value	Negative predictive value	Accuracy
Pant[9] et al (2003)	93.10	97.06	96.43	-	95.24
Pinto[10] et al (2004)	97.8	100	100	98.6	95.9
Pandya[1] et al (2013)	93.1	97.06	96.43		95.24
Present study	90.66	100	100	86.00	94.11

Table 1 shows distribution of cases on cytology and their histological follow up.

In the present study, malignant lesions and suspicious lesions were common in 5th decade. Maximum numbers of cases from E P L W A were seen in 4th decade. Maximum numbers of E P L W/O A cases were from 2nd and 3rd decade. Unremarkable cases were more common in 3rd and 4nd decade.

Table 2 shows there is no false positive diagnosis on cytology. Around 80% and 43.75% cases from suspicious and atypical category show carcinoma on histology. No cases from epithelial proliferative lesion without atypia and unremarkable category show carcinoma.

Discussion

For early detection of breast carcinoma triple assessment is helpful, which is combination of clinical examination, mammography and FNAC. Diagnostic accuracy of this is 99%. Definitive treatment is generally based on FNAC diagnosis unless there is disagreement between cytological and clinical or mammographic diagnosis [1]. Therefore, a uniform reporting system with high reproducibility should be adopted for reporting breast FNA.

The reporting scheme – probabilistic approach was introduced by Wang and Ducatman, which gives definite criteria for diagnosis which helps in reducing inter-observer variability. Also provides rational basis for guidelines for management of breast lesion. It categories lesion according to probability of likelihood of being a carcinoma on FNAC finding. Positive for carcinoma has highest specificity and lowest false positive rates. Suspicious and EPLWA categories have high sensitivity and require additional diagnostic procedure for confirmation.

The gray zone in FNAC- atypical category is due overlapping features of benign and low grade carcinoma and borderline breast lesion [4]. Diagnosis of this category on FNAC causes no delay in further investigation and treatment of the lesion. Necrosis, moderate atypia, low number of benign bipolar nuclei, high N:C ratio predicts malignancy from atypical category [6].

In present study, from suspicious and atypical lesions 80% and 43.75% cases turned out as carcinoma on histology. Findings are compared with other studies in Table 4.

Significant number of cases from atypical category shows malignancy on histology. Possibility of carcinoma from suspicious category was higher than atypical category. So it is important to keep these two categories as a separate category.

Histology from suspicious category revealed one case of ductal carcinoma in situ, rest all were malignant. Similarly from atypical category, 4 cases were of ductal carcinoma in situ, 7 cases were malignant and 5 cases were benign on histology.

There is no false positive case in this study. All the cases from positive category were malignant on histology and all the cases from EPLW/OA and unremarkable categories were benign.

We have made attempt to categorise male breast lesions according to probabilistic approach.

We found, it is equally reliable, accurate and reproducible in male breast lesions also. Similar findings were noted by MacIntosh et al [8].

Diagnostic accuracy of FNAC by using probabilistic approach is compared with other studies in Table 6.

It shows probabilistic approach for FNAC reporting provides the reliable information about possibility of carcinoma and provides standardised guidelines for breast aspiration reporting.

Conclusion

Probabilistic approach proposed by Wang and Ducatman has definite cytological criteria for each category and correlated well with the likelihood of histopthogical finding of carcinoma. It is easy to apply, accurate, reliable and provides uniform approach for reporting. It is equally reliable for reporting male breast lesions. It minimizes false positives without compromising the sensitivity for detecting carcinoma.

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