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A STUDY OF MASOOD'S AND MODIFIED MASOOD'S CYTOLOGICAL SCORING SYSTEM IN CYTOLOGICAL DIAGNOSIS OF BREAST LESIONS.

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Abstract

Introduction: Fine Needle Aspiration Cytology (FNAC) is a reliable diagnostic tool to distinguish non-proliferative from proliferative breast lesions. The categorization of breast lesions is important in identifying the women who are at risk for the development of breast cancer. So it is essential to segregate the breast lesions by using Masood's Scoring Index (MSI) and its modification (Modified Masood's scoring index; MMSI) based on cytomorphological examination further which helps in the prognosis and management.

Objectives: This study analyses the effectiveness of MMSI over MSI and asses the concordance between cytological scoring and histopathology of breast lesions.

Methodology: A total of 105 patients were included in this prospective study done from June 2023 to May 2024 and the breast lesions were cytologically categorized by conventional and as per both MSI and MMSS criteria, followed by comparison to a histopathological examination, which was taken as a gold standard.

Results: The age of the patients ranged from 24 to 82 years with a mean age of 42.3 ± 14.8 years. Predominently right-sided breast lesions were more common. The overall diagnostic accuracy of the cytological scoring was 98.7%, with 92.4% sensitivity and 100% specificity

Conculsion: Cytological grading system based on MMSS allowed accurate diagnosis compared to the standard histopathological diagnosis. It is essential to differentiate non-proliferative lesions from proliferative lesions as the line of treatment and prognosis varies

Keywords: Non-proliferative breast disease, Proliferative breast disease, Breast carcinoma

Introduction - Breast cancer is the second most common cancer in Indian women. It is one of the leading causes of mortality with nearly 80,000 new cases being diagnosed annually[1].The categorization of breast lesions is important in identifying women who are at increased risk for the development of breast cancer[2]. So it is essential to segregate lesions with low and high risk of malignancy.Fine needle aspiration cytology is the primary tool for evaluation of breast lesion.[2] It

helps in categorizing the breast lesion into proliferative breast disease without atypia and proliferative breast disease with atypia due to differences in prognosis and management[3].One of the best approach to resolve the diagnostic difficulties posed by PBD on FNAC is by applying an objective scoring system.[3]

To address this Masood proposed cytological scoring system for categorization and Masood's Scoring Index (MSI)[4] which was modified later as Modified Masood's scoring index (MMSI)[5]. This study analyses the effectiveness of MMSI over MSI and asses the concordance between cytological scoring and histopathology of breast lesions.

Materials and Methods -

A total of 105 patients were included in this crosssectional study done from June 2023 to May 2024 in the department of pathology at Sri Siddhartha Medical College. The breast lesions were cytologically categorized by conventional and than according to both MSI and MMSS criteria, followed by histopathological examination, which was taken as a gold standard and comparison was done.

Inclusion criteria- all the patients who attended OPD Lab with palpable breast lump with or without imaging and with adequate cytology aspirate with availability of histopathology specimen

The exclusion criteria was inadequate cytology aspirate and cases in which histopathology specimens were not available.

Criteria for adequacy of FNAC smears were defined by the presence of at least four clusters of ductal epithelial cells, each made up of four to six cells.The informed consent was obtained from each patient. The lump was then fixed and FNAC procedure was carried out under aseptic precautions, using 22gauge needle and 2ml or 5 ml syringe. Minimum of 3-4 slides were prepared from the aspirate. Two of these smeared slides were wet fixed for rapid H & E staining and the remaining were air dried for May-Grunwald-Giemsa (MGG) staining.The stained smears were studied and grouped into categories, using MSI [Table1] and MMSI [Table2].

The tissue sections or resected specimens of respective cases were examined and were prepared from formalin fixed, paraffin embedded blocks and stained with Haematoxylin and Eosin stains. These sections were compared with cytological diagnosis after which it was correlated using cytological and histopathological categories.

Table 1 Grading system for interpretation of FNAC (Masood's Scoring System)

Cellular arrangement	Cellular pleomorphism	Myoepithelial cells	Anisonucleosis	Nucleoli	Chromatin Clumping	Score
Monolayer	Absent	Many	Absent	Absent	Absent	1
Nuclear overlapping	Mild	Moderate	Mild	Micronucleoli	Rare	2
Clustering	Moderate	Few	Moderate	Micronucleoli and /or rare macronucleoli	Occasional	3
Loss of cohesion	Conspicuous	Absent	Conspicuous	Predominently macronucleoli	Frequent	4
Total score						
Non proliferative breast disease - 6-10						
Proliferative breast disease without atypia - 11-14						
Proliferative breast disease with atypia - 15-18						
Carcinoma in situ /carcinoma 19-24						

Table 2 Grading system for interpretation of FNAC (Modified Masood's Scoring System)

Cellular arrangement	Cellular pleomorphism	Myoepithelial cells	Anisonucleosis	Nucleoli	Chromatin Clumping	Score
Monolayer	Absent	Many	Absent	Absent	Absent	1
Nuclear overlapping	Mild	Moderate	Mild	Micronucleoli	Rare	2
Clustering	Moderate	Few	Moderate	Micronucleoli and /or rare macronucleoli	Occasional	3
Loss of cohesion	Conspicuous	Absent	Conspicuous	Predominantly macro nucleoli	Frequent	4
Total score						
Non proliferative breast disease - 6-8						
Proliferative breast disease without atypia - 9-14						
Proliferative breast disease with atypia - 15-18						
Carcinoma in situ /carcinoma 19-24						

STATISTICAL ANALYSIS

The data collected in this study were of categorical type and so the descriptive statistics of the data are shown as proportions and/or percentages. Diagnostic accuracy of the cytological scoring method was assessed by using standard parameters of sensitivity, specificity, positive and negative predictive values. Fisher's-exact test was employed to test the statistical significance of difference between the observed concordance rates of MSI versus MMSI for the various categories of cytological diagnosis. Inter-test agreement analysis for comparing the diagnostic accuracy of MSI and MMSI with reference to Histopathology was performed by calculating Cohen's Kappa statistic. The level of acceptable alpha error was kept as 5%. All of the statistical analyses were done using Graph Pad Prism Version 6.0 for Windows.

Results-The patients included only females in the age range of 24 to 82 years. A 60.12% of cases were in the age range of 26-55 years (mean age - 42.2 years). A total of 50 (46.31%) cases had involvement of upper outer quadrant.The size of breast lump ranged from 2cm to 7 cm (Mean - 2.51cm). Table 3 shows the histopathological diagnosis included under each category

Table 3 Histopathological lesion included under each category

Sl no	Category	Lesions included
1.	Non proliferative lesion	Fibrosis Cysts Adenosis Duct ectasia Lipoma, hamartoma, haemangioma

2.	Proliferative lesion without atypia	Usual ductal hyperplasia Fibroadenoma Benign phyllodes tumor Multiple papilloma Sclerosing adenosis
3.	Proliferative lesion with atypia	Atypical ductal hyperplasia Atypical lobular hyperplasia
4.	Carcinoma in situ /carcinoma	Carcinoma in situ (all types) Carcinoma (all types)

Table 4 Comparison of cytological (Masoods scoring index) and Histopathological diagnosis

Cytology		Histopathology				
NPBD	No of cases	NPBD	PBD without atypia	PBD with atypia	CA Insitu	Carcinoma
Non-Proliferative breast disease	13	05	08	-	-	-
Proliferative breast disease without atypia	40	-	33	04	-	03
Proliferative breast disease with atypia	05	-	-	02	-	03
Carcinoma in situ/Carcinoma	47	-	-	-	-	47
Total	105	05	41	06	-	53

Table 5 Comparison of cytological (Modified Masoods scoring index)and Histopathological diagnosis

Cytology		Histopathology				
NPBD	No of cases	NPBD	PBD without atypia	PBD with atypia	CA Insitu	Carcinoma
Non-Proliferative breast disease	11	05	06	-	-	-

Proliferative breast disease without atypia	42	-	40	01	-	01
Proliferative breast disease with atypia	05	-	-	02	-	03
Carcinoma in situ/Carcinoma	47	-	-	-	-	47
Total	105	06	45	03	-	51

Concordance analysis was done between cytological and histological diagnosis and the results were expressed in percentages.
Present study found a statistically significant (p=0.040) higher concordance rate (90.52%) for category 1 of MMSI as compared to MSI (72%).
Additionally, Cohen's Kappa coefficients were estimated to assess the agreement between cytological scoring methods and histopathology across all the diagnostic categories.
MMSI showed better agreement with histopathology ($\kappa = 0.92$ CI {0.85 – 0.95}) than MSI ($\kappa = 0.81$ CI {0.78 – 0.90}).

Non-Proliferative Breast Disease (NPBD)
In 13/105 cases, the cytologic findings indicated NPBD and the histologic diagnosis agreed in 5 cases. The rest 08 cases with discrepancy were included in proliferative breast disease without atypia, histopathologically in MSI. Of these 8 cases, 2 had a score of 9 or 10 by MSI, thereby shifting those 2 cases to proliferative disease without atypia by MMSI. The remaining 2 discrepant cases showed fibroadenoma features see table 4 &5.

Proliferative Breast Disease (PBD) without Atypia
A 33/40 of cases were cytologically diagnosed as PBD without atypia, out of which histologic diagnosis agreed in 33 cases. The 7 cases with discrepancy included 4 PBD without atypia and 3 cases showed IDC in MSI, where as in MMSI 40/42 cases showed 2 cases discrepency in which 1 case showed atypical ductal hyperplasia and 1 showed infiltrating ductal carcinoma histopathologically see table 4&5

Proliferative Breast Disease (PBD) with Atypia
Cytomorphological features of this group are presented in 2/5 cases showed proliferative breast disease with atypia by both scoring methods showed same out of which 3 cases were concordant with histologic diagnosis (60%). 3 cases reported as carcinoma (Infiltrating ductal carcinoma by histopathologically were missed by cytology. The remaining 2 cases showed a typical ductal hyperplasia which was similar MMSI see table 4 &5.

Carcinoma in situ/Invasive Carcinoma
Of 47/47 cases diagnosed as carcinoma in situ/ Carcinoma by cytology. There was 100% agreement between cytology and histopathology in category 4.

Table 6 Diagnostic accuracy of cytological scoring

Positive predictive value	100%
Negative predictive value	93.6%
Sensitivity	94.8%
Specificity	100%
Diagnostic accuracy	97.1%

Diagnostic Accuracy of Cytological Scoring

The parameters of diagnostic accuracy were computed by categorizing the cases based on presence or absence of carcinoma. The overall diagnostic accuracy was 97.5% with sensitivity of 94.5% and specificity of 100%. The positive and negative predictive values were 100% and 95.83% respectively.

Discussion

Present study showed six parameters proposed by Masood et al.[6,7], for cytological scoring of breast lesions. This demonstrates that the MSI and MMSI allows an accurate diagnosis of the standard histopathological categories of benign and neoplastic breast diseases. It also provides guide for separating non proliferative from proliferative breast disease with and without atypia.

Nandini et al[8], showed that a modification in the MSI by shifting score 9 and 10 of NPBD to PBD without atypia, will increase the diagnostic accuracy of first two categories of MSI.Similarly Present study showed statistically significant higher concordance rate (90.52%) for category 1, cytologically diagnosed by MMSI as compared to MSI (72%). The category 2 based on MMSI also showed a higher concordance rate than MSI which was not statistically significant.

Thus, MMSI was found to be potential index compared to MSI, and improves the diagnostic accuracy of NPBD and PBD without atypia cases. This is important as the prognosis and treatment of these cases varies.

In category 1 - out of 13 cases, we got discrepant results by MSI in 8 cases, thus reducing its accuracy to 76%, while Masood[6;7], in her study got an accuracy of 90%. This could be accounted to the differences in the sample size. Out of these 8 cases of discrepancy, 2 were shifted to category 2 by MMSI, which increased the diagnostic accuracy of Category 1.

In category 1 - out of 13 cases, we got discrepency results by MSI in 8 cases, thus reducing its accuracy to 76%, while Masood[6;7], in her study got an accuracy of 90%. This could be accounted to the differences in the sample size. Out of these 8 cases of discrepancy, 2 were shifted to category 2 by MMSI, which increased the diagnostic accuracy of Category 1.

This diagnostic accuracy was compared with the study of Nandini et al[8]. Rest of the 2 discrepant cases in this category included 2 cases of fibroadenoma .The rest 2 cases of typical Fibroaednoma were missed by MSI as well as MMSI in this study and were placed in category 1. in such cases cellularity is one of the criteria which should be considered to form a accurate categorization of proliferative lesions.

In Category 2- 7/40 discrepant cases were there, 4 case each of PBD with atypia (atypical ductal hyperplasia)and 3 cases of Invasive ductal carcinoma. Since Masood's criteria does not include cellularity and background material as parameters, there is a higher chance of being mistakenly categorized into atypical ductal hyperplasia by MSI, as occurred in the present study.

The other 3 cases of invasive carcinoma were microscopic foci and this could be due to the blind hit by needle which may not have hit the malignant foci.
Category 3-The 3 discrepant cases of invasive carcinoma encountered in this group were of low grade in histopathology, which remains as a 'grey zone' area in cytology.

Category 4
No histologically diagnosed Carcinoma in situ and Carcinoma cases were missed cytologically using MSI. Thus there were no false-positive results in this study, which is generally considered to be the most important error to be avoided.
The concordance rate of this category was 100%, which is similar to that discussed by Masood et al[6,7] and Nandini et al[8] in their studies.
Also, the study confirmed that MSI/MMSI is a specific test (specificity 100%) to predict malignant lesion correctly (PPV 100%). The sensitivity and negative predictive value in finding malignancy in cytology by MSI were 93.2% and 96.72% respectively, with an overall diagnostic accuracy of 97.1% also comapred with study done by Takiar R[9], Zagorianakou P[10].
The limitations of the present study showed relatively smaller number of samples in PBD with atypia category in comparison to other categories.

Conclusion
Though both MSI and MMSI were found effective in subcategorizing breast lesions
MMSI was found to have better concordance with histopathology. The present study concludes that Modified Masood scoring index has better diagnostic accuracy than conventional Masood scoring index in the cytological diagnosis of palpable breast lump aspirates.

No conflicts of interest.

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