Cytohistological Discordance in Breast Lesions Evaluated by Modified Masood Scoring Index: A Histopathological Correlation Study

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ABSTRACT

Introduction

Fine Needle Aspiration Cytology (FNAC) is widely used in the evaluation of breast lesions because of its simplicity, rapidity, and cost-effectiveness. However, proliferative and atypical breast lesions often show overlapping cytomorphological features, leading to diagnostic gray zones and cytohistological discordance. The Modified Masood Scoring Index (MMSI) was introduced to improve objectivity and accuracy in breast cytology reporting.

Aim

To evaluate cytohistological discordance in breast lesions categorized using the Modified Masood Scoring Index and correlate cytological findings with histopathological diagnosis.

Materials and Methods

This prospective observational study was conducted in the Department of Pathology at Maharishi Markandeshwar Institute of Medical Sciences and Research, Mullana, over a period of 18 months. A total of 200 female patients presenting with palpable breast lesions were included in the study. FNAC was performed and lesions were categorized according to MMSI into non-proliferative breast disease, proliferative breast disease without atypia, proliferative breast disease with atypia, and carcinoma. Histopathological correlation was obtained wherever available, and discordant cases were analyzed for possible causes of discrepancy.

Results

The majority of patients belonged to the middle-aged age group, with breast lump being the most common presenting complaint. High overall cytohistological concordance was observed, with concordant diagnosis seen in 173 cases (86.5%), while discordance was noted in 6 cases (3%). Maximum concordance was observed in clearly benign and malignant lesions, whereas discordance was predominantly associated with proliferative lesions showing atypical cytomorphological features. Major causes of discordance included sampling error, low cellularity, overlapping morphology, and interpretative difficulty.

Conclusion

The Modified Masood Scoring Index is a reliable and effective method for categorizing breast lesions with high cytohistological concordance. However, proliferative breast lesions with atypia continue to represent the major diagnostic gray zone and account for most discordant cases. Histopathological correlation remains essential for definitive diagnosis in atypical and suspicious breast lesions.

Keywords: Breast cytology, Modified Masood Scoring Index, Cytohistological discordance, FNAC, Breast lesions.

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Introduction:

Breast lesions constitute a wide spectrum of benign, proliferative, atypical, and malignant conditions that frequently present as palpable breast lumps in women. Fine Needle Aspiration Cytology (FNAC) has long been considered a simple, rapid, minimally invasive, and cost-effective diagnostic modality for the initial evaluation of breast lesions.(1) It plays an important role in the preoperative assessment of breast masses and helps clinicians in planning further management. However, despite its utility, conventional FNAC is associated with certain diagnostic limitations, particularly in lesions showing overlapping cytomorphological features.(2)

One of the major challenges in breast cytology is the presence of "gray-zone" lesions, especially proliferative breast lesions with or without atypia. These lesions often demonstrate overlapping cytological characteristics, making accurate categorization difficult and increasing the chances of interpretative variability and cytohistological discordance.(3) Sampling errors, low cellularity, hemorrhagic smears, and subjective interpretation further contribute to diagnostic discrepancies between cytological and histopathological findings.(4)

To improve uniformity and reduce observer variability in breast cytology, the Modified Masood Scoring Index (MMSI) was introduced as a semiquantitative scoring system for categorizing breast lesions.(5) MMSI evaluates cytological features such as cellular arrangement, pleomorphism, myoepithelial cells, anisonucleosis, and chromatin pattern to classify lesions into non-proliferative breast disease, proliferative breast disease without atypia, proliferative breast disease with atypia, and carcinoma in situ/invasive carcinoma.(6) The system provides a more structured and objective approach compared to conventional cytology alone.

Although MMSI has shown good diagnostic accuracy in several studies, cytohistological discordance still persists, particularly in atypical proliferative lesions and borderline categories.(7) Identification and analysis of discordant cases are clinically important because they help recognize the limitations of cytology, improve diagnostic interpretation, and minimize false-negative and false-positive diagnoses.(8) Histopathological correlation therefore remains the gold standard for confirmation, especially in lesions categorized within the cytological gray zone.(9)

The present study was conducted to evaluate cytohistological discordance in breast lesions categorized by the Modified Masood Scoring Index and to analyze the possible causes of discrepancy between cytological and histopathological diagnosis.

Review of Literature:

Masood et al.(5) introduced the Modified Masood Scoring Index as a semiquantitative cytological scoring system for breast lesions and demonstrated its usefulness in differentiating proliferative and non-proliferative breast disease. The study showed that MMSI improved diagnostic objectivity and reduced interobserver variability in breast cytology.

Dabbs and Silverman.(2) reported that conventional FNAC of breast lesions is associated with diagnostic limitations in proliferative and atypical lesions due to overlapping cytomorphological features. They emphasized that gray-zone lesions remain a major cause of cytohistological discordance.

Fitzgibbons etal.(3) demonstrated that atypical proliferative breast lesions often exhibit considerable cytological overlap with both benign and malignant categories, resulting in interpretative difficulty and increased false-positive and false-negative rates.

Kline et al.(4) observed that inadequate sampling, low cellularity, and hemorrhagic smears significantly contribute to discordant cytological diagnoses in breast FNAC. The authors highlighted the importance of histopathological confirmation in suspicious and borderline lesions.

Masood.(6) further validated the utility of MMSI and reported that the scoring system provides better stratification of proliferative breast lesions compared to routine cytological interpretation alone. The study emphasized its role in identifying lesions requiring closer histopathological evaluation.

Pandya et al.(7) evaluated cytohistological correlation in breast lesions using MMSI and reported high overall concordance rates; however, discordance was predominantly observed in proliferative lesions with atypia. The authors concluded that MMSI improves diagnostic accuracy but cannot completely eliminate interpretative limitations.

Koss et al.(8) demonstrated that false-negative breast cytology is commonly associated with sampling error and low-grade malignancies, while false-positive diagnoses are more often related to proliferative lesions showing marked atypia.

Bibbo and Wilbur.(9) emphasized that histopathological examination remains the gold standard for definitive diagnosis of breast lesions, particularly in cytologically equivocal and atypical categories. They recommended careful clinicocytological and histopathological correlation in all discordant cases.

In our study we have triedto evaluate cytohistological discordance in breast lesions categorized using the Modified Masood Scoring Index (MMSI) and correlate the cytological findings with histopathological diagnosis.

MATERIALS AND METHODS

This prospective observational study was conducted in the Department of Pathology at Maharishi Markandeshwar Institute of Medical Sciences and Research, Mullana, over a period of 18 months. A total of 200 female patients presenting with palpable breast lumps and undergoing FNAC were included in the study after obtaining informed consent.

Detailed clinical history and relevant examination findings were recorded in all cases. Fine Needle Aspiration Cytology was performed using standard aseptic technique, and smears were prepared and stained with Hematoxylin and Eosin, Papanicolaou,

and May-Grünwald-Giemsa stains wherever required.

Breast lesions were categorized according to the Modified Masood Scoring Index based on cytomorphological parameters including cellular arrangement, pleomorphism, myoepithelial cells, anisonucleosis, and chromatin pattern. The lesions were classified into non-proliferative breast disease, proliferative breast disease without atypia, proliferative breast disease with atypia, and carcinoma.

Histopathological correlation was obtained in available cases by examination of biopsy or surgical specimens, which served as the gold standard for final diagnosis. Cases in which cytological diagnosis did not correlate with histopathological findings were considered discordant cases. These discordant cases were further analyzed to identify possible causes of discrepancy, including sampling error, low cellularity, overlapping cytological features, and interpretative difficulty.

The collected data were compiled and analyzed statistically using appropriate descriptive methods. Cytohistological concordance and discordance rates were calculated and expressed in percentages.

Results:

A total of 200 female patients presenting with breast lesions were included in the study.The majority of patients belonged to the middle-aged group, with maximum casesobserved between 31–40 years of age, followed by the 41–50 years age group as shown in table 1.

Table 1: Age distribution among study patient Group

Age Group	Number of patients	Percentage (%)
<20	9	4.5
20-29	67	33.5
30-39	74	37
40-49	34	17
50-59	6	3
60-69	6	3
70-79	3	1.5
80+	1	0.5
Total	200	100
Chi-square (χ^2)=164.48, **p-value**=<0.0001		

Breast lump was the most common presenting complaint among the study subjects, with few patients presenting with associated pain, nipple discharge, or tenderness.

Breast lesions were categorized according to the Modified Masood Scoring Index into non-proliferative breast disease, proliferative breast disease without atypia, proliferative breast disease with atypia, and carcinoma. Proliferative breast disease without atypia constituted the most common category in the present study as shown in table 2.

Table 2: MMSI Category Score among study Patient group

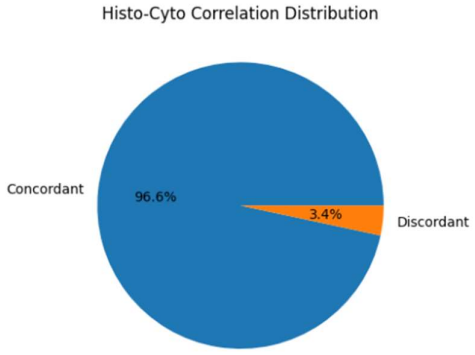
MMSI Category (Score Range)	Number of Patients (n)	Percentage (%)
Non-proliferative breast disease (Score 6–10)	128	64
Proliferative without atypia (Score 11–14)	11	5.5
Proliferative with atypia (Score 15–18)	3	1.5
Carcinoma (Score ≥19)	58	29
Total	**200**	**100**
Chi-square (χ^2)=148.92, **p-value**=<0.0001		

Histopathological correlation demonstrated a high overall cytohistological concordance rate. Concordant diagnosis between cytology and histopathology was observed in 173 cases (86.5%), while discordance was noted in 6 cases (3%) as shown in Table 3 and Figure 1.Maximum concordance was seen in clearly benign and malignant lesions, whereas discordance was predominantly observed in proliferative lesions with atypical cytomorphological features.

Table 3: Histocyto Corelation Concordant among study patient group

Histo-Cyto correlation	Number of Patients (n)	Percentage (%)
Concordant	173	86.5
Discordant	6	3
Chi-square (χ^2)=155.80, **p-value**=<0.0001		

Figure 1: Histocyto Correlation among study Patient Group



This substantial predominance of concordant cases highlights the reliability and diagnostic accuracy of

cytological evaluation, particularly fine-needle aspiration cytology (FNAC), in the assessment of breast lesions.

The high concordance rate suggests that FNAC is an effective and dependable preliminary diagnostic tool, capable of accurately predicting histopathological outcomes in the majority of cases. This is especially important in clinical settings where rapid, minimally invasive, and cost-effective diagnostic methods are required. The small proportion of discordant cases may be attributed to factors such as sampling error, interpretative variability, or overlapping cytological features between benign and malignant lesions. The chi-square analysis reveals a highly statistically significant difference in the distribution of concordant and discordant cases ($\chi^2 = 155.80$, $p < 0.0001$)

Most discordant cases belonged to proliferative breast lesions with overlapping cytological features. Gray-zone lesions demonstrated difficulty in accurate cytological categorization due to the presence of mild atypia, variable cellularity, and overlapping benign and malignant characteristics.

Proliferative lesions with atypia represented the most problematic category and showed occasional mismatch on histopathological examination.

The major causes contributing to cytohistological discordance in the present study included sampling error, low cellularity of smears, overlapping cytomorphological features, and interpretative difficulty in atypical proliferative lesions. Hemorrhagic background and uneven distribution of atypical cells also contributed to diagnostic discrepancy in a few cases.

Histopathological examination of discordant cases revealed that most discrepancies were associated with proliferative lesions and atypical ductal hyperplasia-like changes. Some lesions categorized cytologically within proliferative groups showed malignant transformation on histopathological evaluation, emphasizing the importance of tissue diagnosis in gray-zone breast lesions.

The Modified Masood Scoring Index demonstrated high diagnostic accuracy in categorizing clearly benign and malignant breast lesions. However, limitations were observed in intermediate proliferative categories where significant cytomorphological overlap existed. Despite these limitations, MMSI provided a more structured and objective approach to breast cytology and improved overall cytohistological correlation.

Discussion:

Fine Needle Aspiration Cytology (FNAC) is widely used as an initial diagnostic tool for breast lesions because of its rapidity, cost-effectiveness, and minimally invasive nature.(10) Despite its usefulness, breast cytology continues to face diagnostic challenges, particularly in proliferative and atypical lesions where considerable cytomorphological overlap exists.(11) To minimize subjective interpretation and improve diagnostic uniformity, semiquantitative scoring systems such as the Modified Masood Scoring Index (MMSI) have been developed.(5)

In the present study, most patients belonged to the middle-aged age group, with breast lump being the most common presenting complaint. Similar findings have been reported by Singh et al.(12), who observed that benign and proliferative breast lesions are more frequently encountered in women of reproductive and perimenopausal age groups.

The present study demonstrated high overall cytohistological concordance, supporting the diagnostic reliability of MMSI in breast cytology. Maximum concordance was observed in clearly benign and malignant lesions, whereas discordance was predominantly seen in proliferative lesions with atypia. A study conducted by Khanna et al.(13) similarly reported that MMSI improves categorization of breast lesions but that diagnostic overlap persists in atypical proliferative lesions.

Proliferative breast lesions constituted the major diagnostic gray zone in the present study. Cytological overlap between proliferative lesions with atypia and low-grade carcinoma contributed significantly to cytohistological discrepancy. Similar observations were made by Rosai et al.(14), who emphasized that atypical ductal proliferative lesions frequently demonstrate overlapping features that complicate accurate cytological interpretation.

The major causes of discordance identified in the present study included sampling error, low cellularity, hemorrhagic smears, and interpretative difficulty. Chaiwun et al.(15) observed that inadequate sampling and poor smear quality are among the leading causes of false-negative diagnosis in breast FNAC. Likewise, Yu et al.(16) reported that focal atypia and uneven cellular distribution contribute significantly to cytological misinterpretation in proliferative breast lesions.

The present study also highlights the usefulness of MMSI in providing a structured approach for breast cytology reporting. By applying defined cytological criteria, MMSI helps reduce observer variability and improves reproducibility.(5) However, complete elimination of diagnostic discrepancy remains difficult in borderline lesions with overlapping morphological features.

Histopathological examination remains the gold standard for definitive diagnosis, particularly in equivocal and atypical breast lesions.(17) In the present study, histopathological correlation was essential for identifying discordant lesions and confirming final diagnosis. These findings reinforce the importance of combined clinicocytological and histopathological evaluation in all suspicious breast lesions.

Overall, the findings of the present study are consistent with previous literature and support the utility of MMSI as an effective adjunctive tool in breast cytology. However, proliferative lesions with atypia continue to represent the major source of cytohistological discordance and require careful evaluation with mandatory histopathological confirmation whenever indicated.

Conclusion:

The present study demonstrates that the Modified Masood Scoring Index is a reliable and effective method for categorizing breast lesions on cytology with high overall cytohistological concordance. MMSI showed excellent diagnostic utility in clearly benign and malignant lesions and improved structured cytological interpretation.

However, cytohistological discordance was predominantly observed in proliferative breast lesions with atypia due to overlapping cytomorphological features, sampling limitations, and interpretative difficulty. These lesions continue to represent the principal diagnostic gray zone in breast FNAC.

The study emphasizes the importance of careful cytological assessment along with histopathological correlation, particularly in atypical and suspicious lesions. Although MMSI significantly enhances diagnostic accuracy, histopathology remains essential for definitive diagnosis in discordant and equivocal cases.

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