

# Comparative Evaluation of Parameters of Robinson Cytological and Histopathological Grading System in Breast Carcinoma and its Role in Prognosis: An Institutional Experience

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## ABSTRACT

**Background:** Fine-needle aspiration cytology (FNAC) is still an important first line diagnostic procedure in developing countries where core needle biopsy still is not used as a standard practice to sample breast carcinoma and is quite specific and sensitive investigation and the results are comparable to histopathology. **Methods:** The study was conducted for 2-years, comprising of 46 patients with ductal carcinoma breast, diagnosed on FNAC and subsequently confirmed histopathologically. The patients who received neoadjuvant chemotherapy were excluded from the study. The cytological smears were graded using Robinson grading system and the results of cytological grade (CG) were compared with modified Scarff–Bloom–Richardson histological grading (HG) system. In addition, parameters of cytological grading system were compared with histological grade and also the cytological and histological grades were compared with lymph node metastasis. **Results:** The cytological and histological grades were positively correlated [correlation coefficient- 0.78, p value- 0.004, concordance rate-76%]. A positive correlation was found between each feature/parametre of the cytologic grade and the histologic grade and highly statistically significant association was there between the parametres of cytology grade and histological grade( p value< 0.05) Also a significant association was found between the nuclear size in cytology and histological nuclear grade( p value< 0.05). Out of 46, 42 cases were correlated for nodal metastasis, however, no correlation was there between the grading and lymph node metastasis. **Conclusion:** Robinson's cytologic grading system has a good correlation with Elston–Ellis modification of Scarff–Bloom–Richardson grade in invasive ductal carcinoma of breast and cytological nuclear grade provides important prognostic information hence should be done in breast aspirates.

**Keywords:** Aspiration cytology, biopsy, carcinoma breast, grading.

## INTRODUCTION

Breast carcinoma is the most common malignancy and the leading cause of death from cancer among women.<sup>[1]</sup> It is now the most common cancer both in developed (794,000 cases) and developing regions (883,000 cases). Breast cancer ranks as the fifth cause of death from cancer, but it is still the most frequent cause of cancer death in women in developing regions.<sup>[2]</sup> Prognosis of breast carcinoma depends on various parameters, such as tumor type, histological grading, hormone receptor status, DNA ploidy, cell proliferation markers and expression of different oncogenes.<sup>[3]</sup> Histological grade of breast carcinoma using the Elston-Ellis modification of

Scarff-Bloom-Richardson (SBR) grading system is a widely accepted tumor grading system and has been found to have good prognostic correlation.<sup>[4]</sup> Now a day much focus is being given to grading of tumors on fine-needle aspiration cytology (FNAC) and neoadjuvant therapy has become increasingly popular as primary medical treatment of breast cancer. The evaluation of cytological features is valuable because it would allow assessment of tumor in situ and prognosis of tumor so that the most suitable treatment could be selected and the morbidity associated with overtreatment of low grade tumors can be avoided.<sup>[5]</sup>

## MATERIALS AND METHODS

A total of 46 cases of invasive ductal carcinoma of breast, where preoperative FNAC evaluation followed by subsequent resection were performed, were studied retrospectively and cases receiving neoadjuvant therapy were excluded from the study.

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Cytological grades were assigned using the Robinson's system [Table 1].<sup>[4]</sup> The grades assigned were based on the sum of the numerical score for each individual parameter of the six cytological features, giving a total score range between 6 and 18. A summation score of 6 to 11 was graded as 1, 12 to 14 as 2, and 15 to 18 as 3. Nuclear size was measured by comparison with adjacent red blood cells (RBCs).

**Table 1: Robinson's grading system**

Features	Score 1	Score 2	Score 3
Dissociation	Cell in clusters	Single, with cell clusters	Mostly single cells
Nuclear size	1-2×RBC size	3-4×RBC size	≥5×RBC size
Cell uniformity	Monomorphic	Mildly pleomorphic	Highly pleomorphic
Nucleoli	Indistinct	Noticeable	Prominent/abnormal
Nuclear margins	Smooth	Folds	Clefts/buds
Chromatin	Vesicular	Granular	Clumped and cleared

Grade 1: 6-11; Grade 2: 12-14; Grade 3: 15-18

Hematoxylin and eosin-stained slides of primary tumor were then analyzed for histological grade by the Elston–Ellis modification of Scarff–Bloom–Richardson grading system and statistical analysis was performed. The cytological grades were correlated with the histological grades using correlation coefficient.<sup>[6]</sup> The individual features/parameters of the cytological grades were correlated with the histological grades and individual features of cytological and histological grades were correlated. Also lymph node metastasis was correlated with the histological grades. Values were considered significant with P value < 0.05.

## RESULTS

In the current study, the number of female patients with ductal carcinoma breast enrolled was 46 having mean age of 54 years. The minimum and maximum age of these patients was 34 years and 80 years respectively.

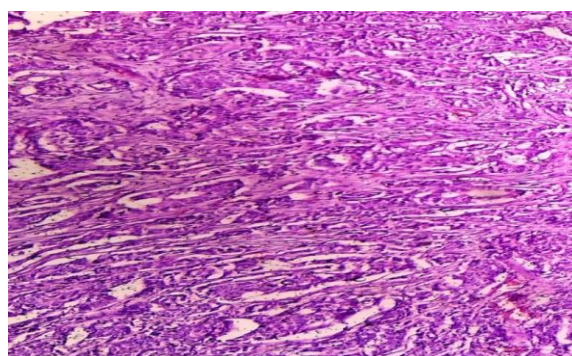
**Table 2: Cytological and histological grading in breast carcinoma patients**

Grading	Histological 1	Histological 2	Histological 3	Total	P value	Correlation coefficient	Concordance rate (%)
Cytological 1	23	6	0	29	0.004	0.78	79
Cytological 2	2	7	1	10			78
Cytological 3	0	2	5	7			71
Total	25	15	6	46			76

**Table 3: showing correlation between features of cytological grading system and histological grade**

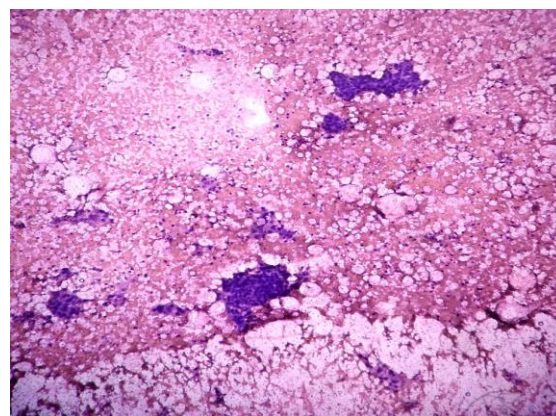
Cytological features score	Correlation coefficient with histological grade	P value
Cell dissociation	0.43	0.003
Nuclear size	0.41	0.005
Cell uniformity	0.44	0.003
Nucleoli	0.56	0.0003
Nuclear membrane	0.55	0.017
Chromatin	0.58	0.01

2. There was a highly positive correlation (correlation coefficient = 0.78) and statistically significant correlation (p value-0.004) between the cytological grade & the subsequent histological grade [Table 2]

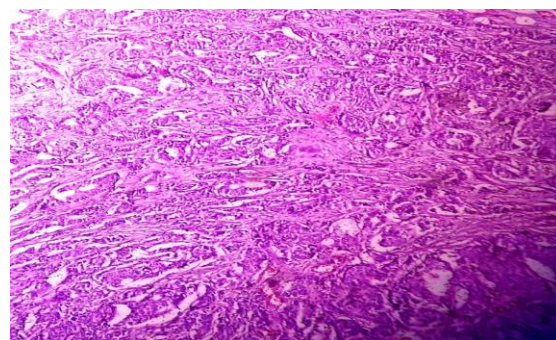


**Figure 1: SBR Grade I invasive ductal cell carcinoma histology**

Of 29 cases graded as 1 on cytology, 23 were subsequently found to be grade 1 on histology, while the remaining turned out to be grade 2. Out of 10 cases graded as 2 on cytology, 7 were reported as grade 2 on histology, 2 as grade 1 and 1 case reported as grade 3 on histology. Out of 7 cases graded as 3 on cytology, 5 were found to be of grade 3 on histology and remaining turned out to be grade



**Figure 2: Robinson Grade I breast carcinoma cytology**



**Figure 3: SBR Grade II Invasive ductal cell carcinoma histology**

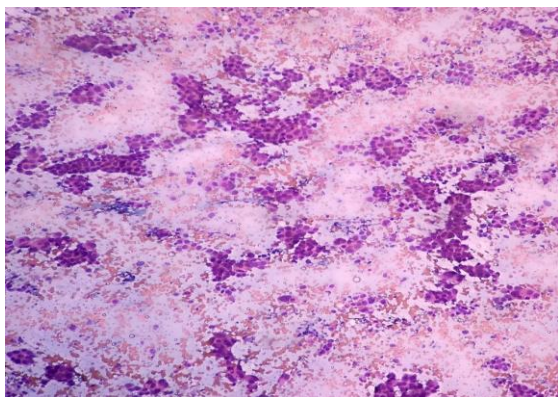


Figure 4: Robinson Grade II breast carcinoma cytology

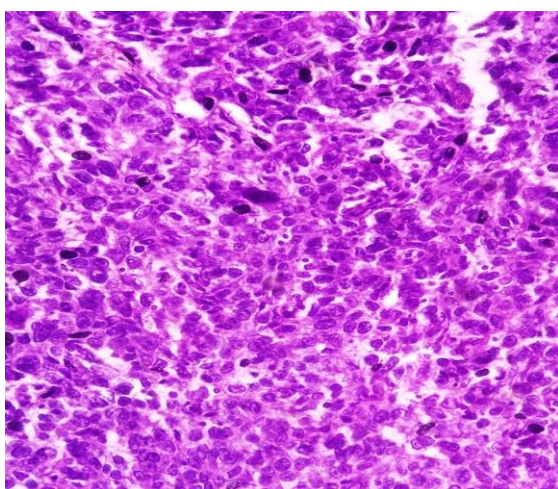


Figure 5: SBR Grade III invasive ductal cell carcinoma histology

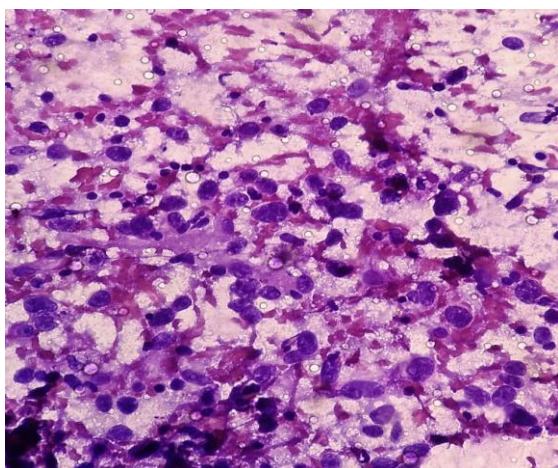


Figure 6: Robinson Grade III breast carcinoma cytology

In addition, each feature of Robinson's cytological grading system showed a positive correlation with the histological grade [Table 3]. Among these, nuclear chromatin, nuclear membrane and nucleoli (correlation coefficient = 0.58, 0.56 and 0.55,  $p$  value  $< 0.05$ ) showed a better correlation with histological grade. Also nuclear feature scores of both cytological and histological grading showed statistically significant correlation ( $p$  value  $< 0.05$ ),

however, no correlation was found between grading and lymph node metastasis.

## DISCUSSION

Histopathological grading using Elston–Ellis modification of Scarff–Bloom–Richardson grading system is the gold standard for evaluation of grade of carcinoma breast. A number of studies have confirmed the prognostic value of histological grade in invasive ductal carcinoma of breast.<sup>[6]</sup> Cytological studies, on fine-needle aspirated breast carcinoma material, have developed a number of scoring systems with results similar to those obtained from histological sections.<sup>[7,8]</sup>

In our study, we compared each component of Robinson's cytological grading system and the overall grade achieved by this grading system for breast carcinoma with histological grading using Elston–Ellis modification of Scarff–Bloom–Richardson grading system. In addition, we compared each component of histologic and cytological grade.

The study has shown an agreement between cytological and histological grades with a significant correlation ( $P$  value- 0.004, correlation coefficient = 0.78) between the two grading systems. The discrepancy observed in grading may have resulted due to the inability of the cytological grading system to objectively assess the degree of tubule formation and mitotic index, both of which are components of the histological grade.

The significant correlation between the cytological and the histological grades as observed in our study is supported by the studies of Frias et al. who had used the same grading system as us.<sup>[8]</sup> Moroz et al. and Khan et al., using their respective cytological grading systems, have demonstrated similar results.<sup>[9,10]</sup>

In addition, our study showed a significant correlation ( $P < 0.05$ ) between the score of each cytological feature and the corresponding histological grade. Khan et al and Pal S et al, in their studies, have found similar results.<sup>[10,11]</sup> This would be expected because each of the cytological features reflects two of the three parameters evaluated in the histological grade.

Of the six cytological features evaluated in our study, nuclear chromatin (correlation coefficient = 0.58) and large, abnormal nucleoli (correlation coefficient = 0.56) were found to have a better correlation with the histological grade. Cell uniformity, as reflected by nuclear pleomorphism, has been found to be a significant feature in Moroz's and Robles-Frias' study.<sup>[8,9]</sup> Nuclear features are straightforward to assess and correlates with nuclear grade on histology, which is one of the components of the Bloom Richardson system.

Regarding concordance of Robinson's CG with HG, the present study showed 79% concordance in grade

1, and 78% concordance in grade 2 and 71 % in grade III. The overall concordance of CG with HG is 76% which is comparable with Frias et al, Das et al and Meena et al.<sup>8,12,13</sup> found 97%, 71.2%, and 83.10% concordance between CG and HG respectively. [Table 4]

**Table 4: Comparison of absolute concordance of RBS cytology and SBR histology by various workers**

Study	Year	Absolute concordance
Das et al.	2003	71.2
Robles Frias et al.	2005	97.0
Meena et al.	2005	83.10
Chandanwale Shirish et al.	2008	82.76
Present study	2019	76.0

## CONCLUSION

Our study has shown that cytological grading of breast carcinoma by Robinson's system reliably correlates with histological grading by Elston–Ellis modification of Scarff–Bloom–Richardson grading system, and therefore, it is possible to accurately grade invasive ductal carcinoma of breast on FNAC. This study has identified the most reliable cytological features of Robinson's system in grading of FNAC smears of invasive duct carcinomas, i.e., nuclear features. This allows accurate prognostic evaluation, in addition to diagnosis on simple FNAC material, without additional morbidity or expense to the patient. This is particularly valuable in resource-constrained healthcare facilities where patients are exposed to neoadjuvant therapy prior to definitive surgery based on preoperative FNAC diagnosis.

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