Evaluation of Robinson's cytological grading by comparing it with modified Bloom-Richardson's histological grading for infiltrating ductal carcinoma of Breast

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Abstract

Introduction: For Microscopic Grading of Infiltrating Ductal Carcinoma of Breast, various scoring systems are available in Cytology. In our present study, we have selected Robinson's scoring or grading system for comparison with Modified Bloom-Richardson's histological grading system in terms of concordance rate between both.

Material and Methods: The present study is done at the Department of Pathology, GMERS Medical College-Junagadh (Gujarat, India) from January 2015 to June 2018 and includes 50 diagnosed cases of Infiltrating Ductal Carcinoma of Breast. Diagnosis is based upon both cytological & histological evaluation and includes microscopic grading, done by Robinson's System in Cytology and Elston & Ellis modification of Bloom-Richardson System in Histology.

Result: Out of 50 cases, 8, 24 and 18 cases are of grade I, II and III tumor respectively on cytological evaluation and 6, 25 and 19 cases are of grade I, II and III tumor respectively on histological evaluation. The concordance rates between both systems for grade I, II and III tumor are 50.00%, 83.33% and 94.44% respectively with Absolute concordance rate of 82.00%.

Conclusion: Robinson's system is easy, effective & comparable with Modified Bloom-Richardson's system. Both are helpful in Microscopic Grading of infiltrating ductal carcinoma of breast as an indicator of tumor behavior or aggressiveness.

Keywords: Cytological Grade, Histological Grade, Concordance Rate.

Introduction

Microscopic grading of Infiltrating Ductal Carcinoma of breast is essential as a part of laboratory diagnosis & for prognosis. For the same, various histological & cytological scoring or grading systems are available nowadays. For histological grading, Elston & Ellis modification of Bloom and Richardson system is a widely accepted tumor grading system[1] while various grading systems have been evolved based on the cytological features.[2-4] Out of various cytological grading systems, the system described by Robinson *et al*.[2] is found to be useful in grading breast carcinoma on fine needle aspiration (FNA).[5-7]

In this present study, we have evaluated Robinson's system for its easiness and effectiveness by comparing it with Modified Bloom-Richardson's system in terms of concordance rate between both. For statistical analysis in terms of Strength of Agreement, we have included Kappa (κ) statistics in our present study.

Material and Methods

The present study is done at the Department of Pathology, GMERS Medical College-Junagadh (Gujarat, India) from January 2015 to June 2018. It includes a total number of 50 cases of Infiltrating Ductal Carcinoma of Breast diagnosed on both cytological as well as histological basis & showing a definite cyto-histological correlation. Those cases that show no definite correlation between cytological & histological diagnosis are not included in this present study. Cytological Diagnosis is based upon Patients' relevant clinical history, Gross examination of their breast lumps followed by fine needle aspiration (FNA) & Microscopic examination of stained FNA smears while Histological Diagnosis is based upon Gross examination of Modified Radical Mastectomy (MRM) specimens and Microscopic examination of stained tissue sections obtained by various steps of histological laboratory techniques including fixation, dissection, tissue processing, paraffin embedding, microtomy, slide preparation and routine H-E staining. On basis of both gross & microscopic findings, final diagnosis is given including grading & staging of tumor.

During examination of Cytological (FNA) smears, scoring of grade is done by using Robinson's Grading System that includes six different criteria namely Cell Dissociation, Size of the Nucleus, Uniformity of Cells in size and shape, Nucleoli, Nuclear Margin & Pattern of Nuclear Chromatin. Score 1, 2 or 3 is given separately for each criterion and ultimately Total score is calculated. Details are given below in Table 1.

Table 1: Robinson's Cytological Grading System

Criterion	Score 1	Score 2	Score 3
Cell Dissociation	Mostly Clusters	Clusters & Single cells	Mostly Single Cells
Nuclear Size	1-2 times size of erythrocyte	3-4 times size of erythrocyte	5 or more times size of erythrocyte

Cell Uniformity	Monomorphic	Mildly Pleomorphic	Pleomorphic
Nucleoli	Indistinct/ Small	Noticeable	Abnormal/Distinct
Nuclear Margin	Smooth	Slightly Irregular/Folds and Grooves	Buds and Clefts
Chromatin Pattern	Vesicular	Granular	Clumped & Cleaved

Total Score b/w 6 to 11:- Grade I, Total Score b/w 12 to 14:- Grade II & Total Score b/w 15 to 18:- Grade III. During examination of Stained tissue sections, scoring of grade is done by using Elston & Ellis modification of Bloom-Richardson Histological Grading System that includes three different criteria namely Formation of Tubules, Pleomorphism of Nuclei and Number of Mitosis per Ten High Power Fields. Score 1, 2 or 3 is given separately for each criterion and ultimately Total score is calculated. Details are given below in Table 2.

Table 2: Elston and Ellis modified Bloom-Richardson Grading System

Criterion	Score 1	Score 2	Score 3
Tubule formation	>75%	10-75%	<10%
Nuclear Pleomorphism	Small, regular & uniform cells	Moderate variation in size/shape	Marked nuclear Pleomorphism
Mitosis per 10 h.p.f in 44mm field diameter	0-5	6-10	11 or more

Grade I – score 3-5 well differentiated;
Grade II- score 6-7 moderately differentiated;
Grade III – score 8-9 poorly differentiated.

Comparative evaluation is done between both systems and Concordance rates (both grade-wise and Absolute) are then calculated followed by calculation of Kappa (κ) coefficient for each grade separately to compare the strength of agreement (statistical analysis).

Results

Total 50 diagnosed cases of Infiltrating Ductal Carcinoma have been included in this present study & all of them are females. Out of them, 22 cases belong to age group of 41-50 years. Youngest patient is 32 years old while eldest one is 85 years old. Distribution of cases according to their grading & Comparison b/w two grading systems with Concordance Rate for each corresponding grade are mentioned below in Table 3.

Table 3: Distribution, Comparison & Concordance Rates

Robinson's Grading	No. of cases in Robinson's grading	No. of Cases in Modified Bloom-Richardson's Grading			Rate of Concordance in %
		Grade I	Grade II	Grade III	
I	08	04	04	----	50.00
II	24	02	20	02	83.33
III	18	----	01	17	94.44
Total	50	06	25	19	

Overall or Absolute Concordance Rate of our present study is 82.00% (41 out of 50 cases).

Agreement between Robinson's and Modified Bloom-Richardson's Grading Systems using Kappa Statistics is mentioned below in Table 4.

Table 4: Standard Error & Strength of Agreement

Grade	Kappa Value for Concordance	95% Confidence Interval	Standard Error	Strength of Agreement
I	0.504	0.132-0.876	0.190	Moderate
II	0.640	0.426-0.854	0.109	Substantial
III	s.871	0.730-1.012	0.072	Almost Perfect

Results or Observations mentioned above in both Table 3 & 4 indicate almost perfect agreement between these two grading systems for Grade III Carcinoma or Poorly Differentiated Carcinoma followed by substantial agreement for Grade II Carcinoma or Moderately Differentiated Carcinoma. Moderate agreement is found for Grade I

Carcinoma or Well Differentiated Carcinoma. So finally, we can say that in cases of poorly differentiated carcinoma (Grade III), various cytological and histological grading systems yield almost similar results. It is easy to diagnose poorly differentiated carcinoma on both cytological & histological basis.

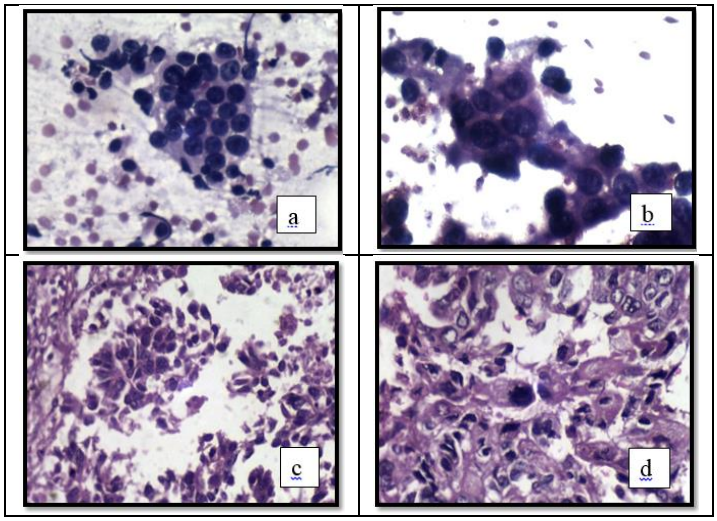

Fig. 1: Photomicrographs showing cytological and histological features of Breast Carcinoma (IDC): a) Breast Carcinoma with Moderate Differentiation and Cytological Grade II; b) Breast Carcinoma with Poor Differentiation and Cytological Grade III; c) Breast Carcinoma with Moderate Differentiation and Histological Grade II; d) Breast Carcinoma with Poor Differentiation and Histological Grade III

Discussion

Overall or Absolute Concordance Rate of our present study is **82.00% (41 out of 50 cases)**. Comparison of Concordance Rates of various studies (including present study) is mentioned below in Table 5.

Table 5: Comparison of concordance rates

Sr. No.	Name of the Study	Year	Concordance Rate (%)			
			Grade I	Grade II	Grade III	Absolute
1	Present Study	2018	50.00	83.33	94.44	82.00
2	Agarwal AA et al[8]	2016	100.00	85.71	100.00	93.33
3	Khan N et al[9]	2009	92.30	83.30	91.70	89.10
4	Patel J et al[10]	2017	54.54	91.30	92.85	85.48
5	Pradhan SP et al[11]	2017	84.61	79.16	87.50	83.60
6	Kanth K et al[12]	2016	66.00	85.00	100.00	83.60
7	Pandey P et al[13]	2014	85.74	84.21	75.00	83.33
8	Gore CR et al[14]	2013	100.00	81.81	75.00	82.76
9	Mustaphi RM et al[15]	2014	62.50	88.90	88.90	80.10
10	Chavda A et al[16]	2017	80.00	78.57	00.00	79.17
11	Pal S et al[17]	2016	78.57	79.31	71.42	78.00
12	Pandya AN et al[18]	2012	79.16	73.07	66.66	74.57
13	Phukan JP et al[19]	2015	50.00	83.30	83.30	72.20
14	Sood N et al[20]	2013	75.00	70.67	60.00	68.97
15	Chalise S et al[21]	2015	45.00	80.00	72.70	65.90

Comparative analysis of various similar studies mentioned above in Table 5 show significant similarity of Absolute Concordance Rates (%). Total 9 out of 14 studies show similar results. Grade wise concordance rates show different results that are quite comparable for Grade II carcinoma & for Grade III carcinoma up to some extent. For grade I carcinoma results are not comparable with that of our present study. So we can say that moderately differentiated carcinoma & poorly differentiated carcinoma show comparable results on both cytological & histological grading.

Kappa Values of our present study are 0.504, 0.640 and 0.871 for Grade I, II & III tumors respectively. Other similar studies like those done by Sinha SK et al,[22] Sood N et al,[20] Pandya AN et al[18] and Phukan JP et al[19] also include Kappa Statistical Analysis in order to

know about strength of agreement between corresponding grades. Out of them, Kappa Values of the study done by Sinha SK et al[22] are 0.630, 0.656 and 0.829 for Grade I, II & III tumors respectively and these values are comparable with the kappa values of our present study.

Our present study includes only one cytological grading system namely Robinson's system. There are many studies that include other cytological grading systems like those done by Arul P et al[23] & Einstien D et al.[24] Both include multiple cytological grading systems like Robinson, Mouriquand, Fisher, Taniguchi, Khan, Howell, Dabbs, etc. Among all these grading systems best results are obtained between Robinson's Cytological Grading system & Modified Bloom-Richardson's Histological Grading system in terms of Absolute Concordance Rates, Kappa Values & Strength of Agreement. Arul P et al[23] reported 88.30% Absolute Concordance rate & Substantial Agreement between these two popular grading systems with Kappa Value of 0.737. Einstien D et al[24] reported 77.70% Absolute Concordance rate & Substantial Agreement between these two popular grading systems with Kappa Value of 0.610. Thus, it is quite obvious that out of all cytological grading systems Robinson's system yields best result in terms of correlation & concordance. So it is applicable & should be incorporated in our routine reporting practice based upon FNA smears.

Conclusion

Microscopic Grading plays an essential role in both diagnosis & prognosis of Breast Carcinoma. It gives an idea about degree of differentiation & aggressiveness of tumor. For Grading, we should use Robinson's method in cytology & Modified Bloom-Richardson's method in histology because both are easy & quite comparable methods. Pre-operative assessment of breast carcinoma is based upon clinical, radiological & pathological (FNA) findings. Robinson's grading system is quite helpful in this assessment.

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