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Original Article

Concordance Rate of Radiological Stage With Post-Operative Pathological Stage In Breast Cancer

Tooba Ather, Ghulam Haider, Mahnoor Ahsan, Batool Memon, Sana Sehar, Berkha Rani

Department of Medical Oncology, Jinnah Postgraduate Medical Centre, Karachi Pakistan.

ABSTRACT

Objective: To assess the concordance between the radiological and post-operative pathological stages in invasive breast carcinoma.

Study Design: Cross-validation study

Place and Duration of Study: Department of Medical Oncology, Jinnah Postgraduate Medical Centre, Karachi Pakistan, from Jan to Jul 2020.

Methodology: A total of 160 females aged 20-80 years with confirmed diagnosis of breast cancer underwent upfront modified radical mastectomy along with axillary node dissection were included in the study. Demographic and clinic pathological findings of all the patients were reported in pre-designed proforma. Stage concordance was labelled as a patient assigned to the same stage radiologically and pathologically.

Results: The mean age of the 160 patients was 47.22±10.51 years. The relationship between radiological and pathological staging was weak (r=0.383) but statistically significant (p=0.001). The tumor stage on radiological and pathological assessment was similar in 60 cases (37.3%). Radiologic assessment overestimated the stage in 75 cases (46.6%) and underestimated it in 26 cases (16.1%). The overall concordance between radiological and pathological staging was 18.8% (p=0.001).

Conclusion: Among patients with breast cancer, a high rate of discordance was observed between the radiological and pathological stages. The high odds of discordance are therefore important to plan treatment.

Keywords: Concordance, Breast neoplasms, Neoplasm staging, Neoplasm grading, Diagnostic imaging.

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INTRODUCTION

Globally, breast cancer (BC) is the most prevalent disease among women, affecting 2.1 million females per year and also contributing to the highest number of deaths for females due to cancer. In 2018, it was estimated that 627,000 people died from breast cancer, which is about 15% of all female cancer deaths worldwide. While Breast cancer rates are higher among women in more developed countries, rates are rising globally in almost every region.[1,2] The 5-year survival of stage IV Breast cancer is estimated as 10%, but if it is diagnosed early and treated, then the survival probability is up to 85%.[3, 4]

Breast imaging plays a vital role in deciding the treatment plan, especially in identifying which patient is qualifying for breast-conserving therapy (BCT). Ultrasound and mammography are less accurate than magnetic resonance imaging (MRI)/Computerized tomography(CT) in assessing the local extent, tumour size, and additional foci of BC.[5-7] While Magnetic resonance imaging provides the benefit of high sensitivity, the drawbacks include poor specificity, which can lead to more invasive procedures like biopsies and mastectomies.[8] Literature showed that pre-operative Magnetic resonance imaging altered the treatment plan in 18% of breast cancer patients. Additionally, 20% converted to mastectomy in the Magnetic resonance imaging group as compared to the control group, and the rate of reoperations was lesser in the Magnetic resonance imaging group than in the control group (5% versus 15%).[9]

Discordance between the pre-operative radiological stage and the post-operative pathological stage can lead to under or over-treatment of the patient. A high agreement between radiological and pathological assessment is thus advantageous since it infers accurate treatment plans for the patients.[10] Previous studies have focused mainly on concordance for phenotype/nature of the diagnosis, i.e. malignant versus benign. In contrast, very few studies are present on radiologic-pathologic agreement on breast cancer staging. Hence, in the current study, we have evaluated the concordance between the radiological stage and the post-operative pathological stage in invasive Breast cancer in order to check the accuracy and validity of the radiological stage.

Correspondence: Dr Tooba Ather, Department of Medical Oncology, Jinnah Postgraduate Medical Centre, Karachi Pakistan.

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METHODOLOGY

The cross-validation study was conducted at the Department of Medical Oncology, Jinnah Postgraduate Medical Center, Karachi, Pakistan, from January to July 2020, after approval from the Ethical Review Committee (No.F.21-81/2020-genl/48134/JPMC). The sample size was estimated using an Open Epi sample size calculator by taking statistics of agreement between Computerized tomography (with contrast)/ ultrasound assessment and pathological assessment as 38%.[11]

Inclusion Criteria: All females aged 18-60 years with upfront modified radical mastectomy and axillary node clearance having a diagnosis of invasive ductal carcinoma (IDC) ,invasive lobular carcinoma (ILC), mucinous, inflammatory, papillary and metaplastic carcinoma were included.

Exclusion Criteria: Patients who had upfront lumpectomies having a diagnosis of phyllodes tumour, Paget's disease, sarcomas, lymphomas, and patients who received neoadjuvant chemotherapy were excluded.

The consecutive sampling technique was applied for the selection of the sample. The informed consent was obtained from all the eligible patients. Demographic and clinicopathological findings of all the patients were reported in pre-designed proforma. Computerized tomography-scan chest with contrast was used for radiological staging of the tumour. The stage was labelled according to 'TNM' staging, and 'M' was omitted. A post-surgery histopathological assessment was performed in order to evaluate the pathological stage. Stage concordance was labelled as a patient assigned to the same stage radiologically and pathologically.

Statistical Package for Social Sciences (SPSS) version 21.0 was used for the data analysis. Quantitative variables were expressed as Mean±SD and qualitative variables were expressed as frequency and percentages. Kappa statistics measured the agreement between the radiological stage and pathological stage of the tumour. Spearmen correlation was applied to assess the strength of the association between the radiological stage and the pathological stage of the tumour. Uni-variate logistic regression was applied to assess the significant predictors of concordance. Predictors significant at 25% were moved into the multivariate logistic regression model. The *p*-value of ≤0.05 was taken as statistically significant.

RESULTS

Of 161 patients, the mean age was 47.22±10.51 years (range: 22-72 years). Most of the patients were urban area residents 157(97.5%), unemployed 158 (98.1%), Urdu speaking 149(92.5%) and had a negative family history of breast cancer 156(96.9%). About 103(64%) of the patients had tumours on the left side . In 78(48.4%) cases, the tumour was located in the upper outer quadrant, followed by the central quadrant 59(36.6%). Invasive ductal carcinoma was the frequent histology, accounting for 154 cases (95.7%). Of 161 patients, 149(92.5%) had negative margins of ductal carcinoma, 134(16.8%) had perineural invasion, 45(28%) had lymphovascular invasion, and 107(66.5%) had lymph node involvement (Table-I).

Table-I: Baseline Characteristics (n=161)

Variables	Mean±SD/ n (%)
Age (years)	47.2±10.5
Residence	
Urban	157(97.5)
Rural	4(2.5)
Employment status	
Unemployed	158(98.1)
Employed	3(1.9)
Ethnicity	
Sindhi	3(1.9)
Urdu	149(92.5)
Punjabi	2(1.2)
Pashtoo	4(2.5)
Baloch	3(1.9)
Family history of breast cancer	
Yes	5(3.1)
No	156(96.9)
Side	
Right	58(36)
Left	103(64)
Quadrant	
Central	59(36.6)
Upper outer	78(48.4)
Upper inner	13(8.1)
Lower outer	3(1.9)
Lower inner	8(5)
Histological type	
Invasive ductal carcinoma (IDC)	154(95.7)
Mucinous	2(1.2)
Papillary	1(0.6)
Others	4(2.5)
Margins	
Positive	12(7.5)
Negative	149(92.5)
Perineural invasion	
Present	27(16.8)
Absent	134(83.2)
Lymphovascular invasion	
Present	45(28)
Absent	116(72)
Lymph node involvement	
No	54(33.5)
Yes	107(66.5)

Initial trust biopsy results showed the majority of the patients had grade III tumours 81(50.3%). On radiological assessment, 71(44.1%) of the patients had stage IIB of tumor. Pathologically, most patients had grade III tumours 115(71.4%) and stage IIIA tumours 43(26.7%) (Table-II).

Table-II: Radiological and Pathological Assessment (n=161)

	Biopsy Assessment	Pathological Assessment
Grade	**n (%)**	**n (%)**
I	22 (13.7)	7 (4.3)
II	58 (36)	39 (24.2)
III	81 (50.3)	115 (71.4)
Stage	**n (%)**	**n (%)**
IA	5 (3.1)	5 (3.1)
IB	7 (4.3)	3 (1.9)
IIA	53 (32.9)	42 (26.1)
IIB	71 (44.1)	42 (26.1)
IIIA	12 (7.5)	43 (26.7)
IIIB	12 (7.5)	9 (5.6)
IIIC	1 (0.6)	17 (10.6)

The low value of R2 0.134 showed high variability in data. However, the relationship between the radiological and pathological stages was weak (r=0.383) and statistically significant (p=0.001) (Figure-1).

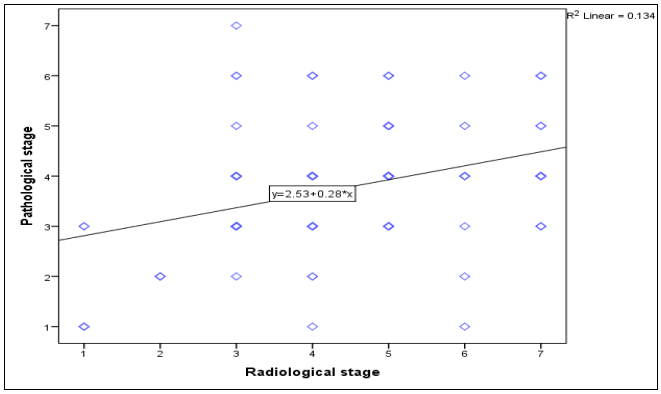

Figure-1: Correlation between Radiological and Pathological Stage of Tumor (n=161)

The tumour stage on radiological and pathological assessment was similar in 60 cases (37.3%). Radiologic assessment overestimated the stage in 75 cases (46.6%) and underestimated it in 26 cases (16.1%). The overall agreement between radiological and pathological staging was 18.8% (p=0.001) (Table-III).

Uni-variate analysis showed a significant association between concordance and age, sidedness, margins, perineural invasion and lymph node involvement. In multivariate analysis, age and sidedness were significantly associated with concordance (p<0.05) (Table-IV).

DISCUSSION

The cancer screening system aims to give prognostic estimates and guide clinicians in developing an individual patient's plan of treatment plan. East Cancer patients are assigned a clinical stage at the time of diagnosis. Then, in the post-survey, the pathological stage is evaluated by assessing lymph nodes and resecting the resected tumour.[12,13] In the present study, we evaluated the difference between radiological and pathological stages in invasive breast cancer patients.

In our study, the radiological stage and pathological stage discordance rate was 62.7% (16.1% downstage and 46.6% upstage) for invasive I-III stage Breast Cancer patients who underwent surgery prior to systemic therapy. In a study, Plichta *et al*. found the disagreement rate for the clinical and pathological stage as 31.8% (i.e. 8.7% upstaged and 23.1% downstaged) in invasive Breast Cancer cases.[10] Keune *etal*. observed that mammography and ultrasound combine gave high accuracy for the prediction of pathological response and moderate agreement in the prediction of pathological residual tumour size post neoadjuvant chemotherapy.[14] In a study by Lai *et al*. found that ultrasound had greater concordance than Magnetic resonance imaging (54% versus 44%). They observed that Magnetic resonance imaging frequently overestimates the tumour size. At the same time, ultrasound tends to underestimate it, and combined magnetic resonance imaging and ultrasound increase the accuracy for the prediction of tumour size.[15]

Hamza *et al*. found mean radiological and pathological tumour sizes statistically different, with overall concordance in 40% of the cases. Therefore, the decision regarding lumpectomy versus mastectomy surgery, which was based on radiological assessment, was not always accurate.[8] Establishing treatment strategy on radiological tumour size and, therefore, clinical stage in these cases may result either in a method that would otherwise not be appropriate or, on the other hand, conservative and therefore ineffective.[16, 17]

In the present study, we found a moderate correlation between the radiological stage and pathological stage of Breast Cancer cases. Ehsan *et al*. studied the association between breast carcinoma's biological and pathological sizes and found a moderate

Table-III: Agreement between Radiological Assessment and Pathological Assessment of Tumor Stage (n=161)

Radiological stage	Pathological stage							Kappa	*p*-value
	IA	IB	IIA	IIB	IIIA	IIIB	IIIC		
IA	3(60%)	-	2(40%)	-	-	-	-	0.188	0.001
IB	-	3(100%)	-	-	-	-	-		
IIA	-	1(2.4%)	24 (57.1%)	13(31%)	1(2.4%)	2(4.8%)	1(2.4%)		
IIB	1(2.4%)	2(4.8%)	13 (31%)	22(52.4%)	1(2.4%)	3(7.1%)	-		
IIIA	-	-	10 (23.3%)	23(53.5%)	7(16.3%)	3(7%)	-		
IIIB	1(11.1%)	1(11.1%)	1 (11.1%)	4(44.4%)	1(11.1%)	1(11.1%)	-		
IIIC	-	-	3 (17.6%)	9(52.9%)	2(11.8%)	3(17.6%)	-		

Table-IV: Uni-variate and Multivariate Logistic Regression For Concordance (n=161)

	p-value	OR	95% CI for OR	*p*-value	AOR	95% CI for AOR
Age (years)	0.016	1.040	1.01-1.07	0.010	1.046	1.01-1.08
Sideness						
Right	1					
Left	0.07	1.85	0.954-3.58	0.038	2.135	1.04-4.36
Quadrant						
Central	1					
Upper outer	0.45	0.76	0.37-1.54			
Upper inner	0.67	0.76	0.22-2.63			
Lower outer	0.97	0.95	0.08-11.13			
Lower inner	0.11	0.29	0.06-1.31			
Margins						
Positive	1					
Negative	0.14	0.31	0.06-1.48	0.129	3.701	0.68-20.04
Lymphovascular						
Absent	1					
Present	0.78	1.11	0.54-2.26			
Perineural invasion						
Absent	1					
Present	0.20	.58	0.25-1.34	0.179	0.533	0.21-1.33
Lymphnode involvement						
No	1					
Yes	0.09	1.77	0.91-3.46	0.080	1.881	0.93-3.82

correlation between radiological and pathological assessment of tumour tumours (r=0.394).[11] Ramirez *et al*. compared ultrasound and Magnetic Resonance Imaging and found a strong correlation (r=0.75).[18] While Hamza *et al*. found a correlation between the radiological and pathological size of the tumour as 0.61 (*p*=0.001).[8]

CONCLUSION

There was a high degree of discordance between the radiological and pathological stages of women with Breast Cancer. Our findings underscore the importance of correct staging obtained by surgery since this information is typically used to convey prognostic facts to clinicians and patients and can influence subsequent management recommendations. Hence, the high odds of discordance are therefore important to consider for the treatment plan and overall outcome of the disease.

Conflict of Interest: None.

Authors Contribution:

Following authors have made substantial contributions to the manuscript as under:

TA & GH: Data acquisition, data analysis, drafting the manuscript, critical review, approval of the final version to be published.

MA & BM: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

SS & BR: Conception, data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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