

# Correlation between histopathological results and BI-RADS classification in breast masses

Nizamettin Kutluer<sup>1</sup>, Ali Aksu<sup>1</sup>, Mehmet Bugra Bozan<sup>2</sup>, Burhan Hakan Kanat<sup>1</sup>, Hulagu Kargici<sup>3</sup>, Ferhat Cay<sup>4</sup>, Ayse Azak Bozan<sup>1</sup>

<sup>1</sup>Elazig Fethi Sekin City Hospital, Clinic of General Surgery, Elazig, Turkey

<sup>2</sup>Kahramanmaraş Sutcu Imam University, Faculty of Medicine, Department of General Surgery, Kahramanmaraş, Turkey

<sup>3</sup>Ankara Dışkapı Yıldırım Beyazıt Training and Research Hospital, Clinic of General Surgery, Ankara, Turkey

<sup>4</sup>Balıkesir University, Faculty of Medicine, Department of General Surgery, Balıkesir, Turkey

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## Abstract

**Aim:** The aim of this study was to determine the reliability of BI-RADS Classification by evaluating the correlation between BI-RADS Classification System and pathology results of patients admitted to the general surgery outpatient clinic of our hospital with the complaints of breast lump, breast pain and nipple discharge.

**Material and Methods:** This retrospective study was conducted between 2009 and 2011. The study included a total of 150 female patients, who applied to the Research and Training Hospital General Surgery Polyclinics with the complaints of breast lump, pain and discharge which were classified as BIRADS-3, BIRADS-4 (4a, 4b, 4c) subcategories and BIRADS-5 category, and were evaluated using the epicrisis forms, test results (radiological imaging and tumor markers) and pathology reports.

**Results:** The study included a total of 150 patients; 21 of which were classified as BI-RADS 3, 44 as BI-RADS 4a, 35 as BI-RADS 4b, 22 as BI-RADS 4c and 28 as BI-RADS 5. Of the masses determined to be benign, 21 cases (100%) were classified as BI-RADS 3, 43 cases (97.72%) as BI-RADS 4a, 34 cases (97.14%) as BI-RADS 4b, 8 cases (36.36%) as BI-RADS 4 and 1 case as BI-RADS 5 (3.57%). Of the malignant masses, 1 case (2.28%) was classified as BI-RADS 4a, 1 (2.86%) as BI-RADS 4b, 14 cases (63.64%) as BI-RADS 4c and 27 cases (96.43%) as BI-RADS 5.

**Conclusion:** In the light of these data, we believe that the division of BI-RADS category 4 into sub-categories play an important role in management of breast masses.

**Keywords:** Breast cancer; BI-RADS classification; breast masses.

## INTRODUCTION

Breast cancer is the most common cancer and the second leading cause of cancer death among women. It is one of the few malignancies which allow screening and subclinical diagnosis. Studies reveal that one in ten women will develop breast cancer over the course of a lifetime; perhaps even higher, according to the recent assessments. It is highly important that mammography screening can reduce breast cancer mortality by around %30. As in many cancer types, it is essential to establish a multidisciplinary approach including various branches regarding the diagnosis and treatment in breast cancer (1-4).

BI-RADS classification has been used for interdisciplinary

standardization in the interpretation of radiological methods for approximately 20 years. In 1997, the system was established for the first time in an attempt to standardize mammography findings by the American College of Radiology (ACR) and the American Cancer Society (ACS). BI-RADS (Breast Imaging Reporting and Data System) is a numerical scale in which the scores range between the codes of 0-6. The aim of the system was to establish a common image interpretation by clinicians in order to facilitate follow up of suspicious cases (2,3) (Table 1). Thus, it was aimed to evaluate the changes in breast in respect to the probability of malignancy and to decide on follow-up or further treatment options.

The objective of this retrospective study was to evaluate the histopathological correlation of mammary lesions

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**Corresponding Author:** Mehmet Bugra Bozan, Kahramanmaraş Sutcu Imam University, Faculty of Medicine, Department of General Surgery, Kahramanmaraş, Turkey **E-mail:** bbozan@yahoo.com

detected by mammography and ultrasonography with BI-RADS classification in order to determine the reliability of BI-RADS classification.

**Table 1. BI-RADS classification**

Classification	Description
BI-RADS 0	Additional imaging methods required
BI-RADS 1	Unremarkable mammogram
BI-RADS 2	Benign findings
BI-RADS 3	Probably benign
BI-RADS	
4a	Low suspicion
4b	Moderate suspicion
4c	High suspicion
BI-RADS 5	Highly suggestive of malignancy
BI-RADS 6	Known malignancy (verified by biopsy but not yet treated)

## MATERIAL and METHODS

This study was conducted between 2009 and 2011. We retrospectively analyzed a total of 150 cases who applied to the General Surgery Outpatient Clinics of Training and Research Hospital, presenting with the complaints of breast lump, pain and discharge which were classified as BIRADS-3, BIRADS-4a, BIRADS-4b, BIRADS-4c and BIRADS-5. In this study, we examined the epicrisis forms and medical records of 150 female patients who underwent biopsy for breast masses. Age, menopause, symptoms, mammography, ultrasonography and pathology results were evaluated.

### Statistical analysis

The data analysis was performed using SPSS (Statistical package for social sciences) Windows 11.5 package program. The quantitative data were compared using descriptive statistics (mean, standard deviation, median) in addition to the Kruskal-Wallis H and Mann-Whitney U tests. The values between  $p < 0.01$  and  $p < 0.05$  in 95% and 99% confidence intervals were considered statistically significant between the groups.

## RESULTS

The mean age was 47.5 (18-77) years. The most common complaint among the patients was breast lump. Other symptoms included breast pain and nipple discharge. There were also patients who presented for routine mammography screening.

Out of a total 150 patients, 21 were classified as BIRADS-3, 44 as BIRADS-4a, 35 as BIRADS-4b, 22 as BIRADS-4c and 28 as BIRADS-5, according to the radiological examinations. The masses were determined to be benign in a total of 21 patients (100%) classified as BIRADS-3 category, 43 patients (97.72%) as BIRADS-4a, 34 patients (97.14%) as BIRADS-4b, 8 patients (36.36%) as BIRADS-

4c and 1 patient as BIRADS-5 (3.57%). The masses were determined to be benign in 1 patient classified as BIRADS-4a (2.28%), 1 patient classified as BIRADS-4b (2.86%), 14 patients classified as BIRADS-4c (63.64%) and 27 patients (96.43) classified as BIRADS-5 (Table 2).

**Table 2. Histopathological examination results of patients classified according to BIRADS classification**

	Benign	Malign	Total
BIRADS-3	21	-	21
BIRADS			
4a	43	1	44
4b	34	1	35
4c	8	14	22
BIRADS-5	1	27	28

**Table 3. Benign pathologies revealed by histopathological examination**

	BI-RADS 3	BI-RADS 4a	BI-RADS 4b	BI-RADS 4c	BI-RADS 5
Fibroadenoma	11	6	2	1	--
Fibrocystic changes	3	9	6	--	--
Atypical columnar h. hyperplasia	3	1	3	--	--
Granulomatous mastitis	2	--	--	--	--
Fat necrosis	1	--	--	--	1
Intraductal papilloma	1	6	4	1	--
Ductal epithelial hyperplasia	--	6	6	4	--
Sclerosing adenosis	--	1	5	--	--
Tubular adenoma	--	--	--	2	--
Sclerosing Papilloma	--	1	2	--	--
Atypical Ductal Epithelial Hyperplasia	--	1	1	--	--
FibroadiPOSE Tissue	--	--	1	--	--
Spindle Cell Tumor	--	--	1	--	--
Epidermal Type Keratinous Cyst	--	--	1	--	--
Moderate Epithelial Hyperplasia	--	3	2	--	--
Duct ectasia	--	2	--	--	--
Complex Apocrine Metaplasia	--	2	--	--	--
Granulomatous inflammation	--	1	--	--	--
Non-Caseified Granulomatous Inflammation	--	1	--	--	--
Atypical epithelial hyperplasia	--	1	--	--	--
Borderline Filloides Tm	--	1	--	--	--
Mild Epithelial Hyperplasia	--	1	--	--	--
Total	21	43	34	8	1

The evaluation of benign lesions showed that 19.62% of the cases were classified as BIRADS-3, 40.19% classified as BIRADS-4a, 31.77% classified as BIRADS-4b, 7.47% classified as BIRADS-4c, and 0.95% were classified as BIRADS-5. The evaluation of malignant lesions by Kruskal Wallis Test showed that 2.32% of the cases were classified

as BIRADS-4a, 2.32% classified as BIRADS-4b, 32.55% classified as BIRADS-4c and 62.81% were classified as BIRADS-5.

21 patients in BI-RADS 3 category had a negative family history, in which those over 45 were examined for tumor markers and tested negative. The other patients in BI-RADS 3 category were in the younger group and underwent surgical operations for breast masses sized 2 cm or more. Out of the 21 patients with malignancy revealed by pathology results, 11 had fibroadenoma (52.38%), 3 had fibrocystic changes (14.28%), 3 had atypical columnar cell hyperplasia (14.28%), 2 had granulomatous mastitis (9.5%), 1 had fat necrosis (4.78%) and 1 had intraductal papilloma (4.78%). Out of the 43 patients with benign lesions classified as BI-RADS 4a, the most common pathology was fibrocystic changes in 9 patients (20.9%), fibroadenoma in 6 patients (13.9%), intraductal papilloma in 6 patients (13.9%), ductal epithelial hyperplasia in 6 patients (13.9%) and moderate epithelial hyperplasia in 3 patients. Out of the 34 patients with benign lesions classified as BI-RADS 4a, the most common pathology was determined as fibrocystic changes in 6 patients (17.64%) and severe ductal epithelial hyperplasia in 6 patients (17.64%). 5 patients (14.70%) had sclerosing adenosis, 4 patients (11.76%) had intraductal papilloma and 3 patients (8.82%) had atypical columnar cell hyperplasia. Among the 8 cases in BI-RADS 4c category reported as benign, the most common lesion was severe ductal epithelial hyperplasia, which was present in 4 patients (50%). 2 patients (25%) had tubular adenoma, 1 patient (12.5%) had intraductal papilloma and 1 patient (12.5%) had fibroadenoma. Among the BI-RADS 5 cases, 1 (3.57%) was benign and histopathologically diagnosed as fat necrosis (Table 3).

**Table 4. Malignant pathologies revealed by histopathological examination**

	BI-RADS 4a	BI-RADS 4b	BI-RADS 4c	BI-RADS 5
Ductal carcinoma in situ	1		4	1
Mucous carcinoma		1		
Infiltrative ductal carcinoma			6	16
Invasive ductal carcinoma			1	7
Invasive lobular carcinoma			1	
Metastatic carcinoma			1	1
Ductal carcinoma in situ + lobular carcinoma			1	
Infiltrative ductal carcinoma + lobular carcinoma				2
Total	1	1	14	27

One patient with malignant lesions classified as BI-RADS 4a had ductal carcinoma in situ and 1 patient classified as BI-RADS 4b had mucous carcinoma. In BI-RADS 4c category, 14 patients had histopathologically malignant masses. 6 patients (35.71%) had infiltrating ductal carcinoma. It was determined that 4 patients (28.60%) had ductal carcinoma in situ, 1 patient (7.14%)

had invasive ductal carcinoma, 1 patient (7.14%) had invasive lobular carcinoma, 1 patient (7.14%) metastatic carcinoma and 1 patient (7.14%) had ductal carcinoma in situ + lobular carcinoma. 2 patients in BI-RADS 4c category had a positive family history. 3 patients had high concentrations of CA 15-3. In BI-RADS 5 category, 27 cases (96.43%) were malignant. 16 (57.14%) of them were infiltrating ductal carcinoma. 7 (25%) were invasive ductal carcinoma, 2 (7.15%) were infiltrative ductal carcinoma + lobular carcinoma, 1 (3.57%) was ductal carcinoma in situ and 1 (3.57%) was metastatic carcinoma (Table 4).

There was a statistically significant difference between BI-RADS scores and age. ( $p: 0.000 < 0.01$ ) The BI-RADS categories were higher in the groups with a higher mean age. Since there was a similar significant difference between the BI-RADS categories and pathology results, higher mean age lead to higher probability of malignancy in pathological cases.

There was a statistically significant difference between the values of premenopausal and postmenopausal periods according to the BI-RADS classification categories in malignant cases ( $p: 0.046 < 0.05$ ;  $\chi^2: 9.594$ ). 85.7% of the patients who were determined to have malignant masses, according to BI-RADS classification, were in postmenopausal period and 14.3% were in premenopausal period.

## DISCUSSION

Various studies have been conducted regarding the management of suspicious breast lesions. In 1997, ACS (American Cancer of Society) and ACR (American Committee of Radiology) introduced a standard system for mammography reports with the aim to facilitate the evaluation of breast masses. BI-RADS classification aims to establish a common interpretation and reach a consensus regarding the follow-up of suspicious cases. It has become widespread all over the world and become a surgical guide in many health centers since the beginning of the 2000s. Recently, it has also been adapted to ultrasonography in order to increase the reliability of examination due to the low specificity of conventional mammography (5). In our study, mammography results were supported by ultrasonography. Recent studies have reported that the BI-RADS classification, which is adapted to ultrasonography, provides high consensus among radiologists and gives hope for the future (6,7). The sensitivity, specificity, positive and negative predictive values of BI-RADS categorization were reported as 95.7%, 21.2%, 37.8% and 94.3%, respectively (8).

Barrenger et al. evaluated BI-RADS classification as a significant guide in the study, in which they investigated the surgical approaches for microcalcifications. They reported that wire localization was effective in non-palpable solid masses and microcalcifications revealing correlation between radiological and histological findings and stated that the method should be more widely used (8,10,11).

BI-RADS-3 and BI-RADS-4 are the most controversial

categories of the system. A review reported that patients classified as BIRADS-3 have low risk for cancer and 6-month mammography follow-up is appropriate (8). The authors stated that BIRADS-3 lesions are to be followed every 3-6 months, but biopsy may be performed according to the patient's preference and concern about cancer.

Mentes et al. determined the probability of malignancy in BI-RADS 3 as 1.5% and as 32.6% in BI-RADS 4. Positive predictive values were reported as 15.4% in BI-RADS 3 and 32.6% in BI-RADS 4. The authors noted that it is appropriate to follow up BI-RADS 3 lesions every 3-6 months, but biopsy may be recommended depending on the patient's preference and concern about cancer. The study, which found 3-fold increased probability of cancer in BI-RADS 4 lesions, reported that biopsy must be performed for patients in this category (12). In our study, the malignancy rate was 0% in BIRADS-3, 2.28% in BIRADS-4a, 2.86% in BIRADS-4b, 63.64% in BIRADS-4c and 96.43% in BIRADS-5. 21 patients classified as BIRADS-3 underwent biopsy and recommended follow-up after the lesions were determined to be benign. The lesions were found to be histologically benign. The negative predictive value of category 3 was determined as 100% in our study, in which the correlation between radiological and histological results was consistent with the literature. It indicates that the reliability of the BI-RADS Classification will increase when performed by experienced radiologists. These findings demonstrate that it is appropriate to follow up BIRADS-3 lesions at 6-month intervals.

Age is also an important factor in management of breast lesions. It should be kept in mind that the risk of breast cancer increases with age. In the literature, it has been emphasized that BIRADS-4 and 5 nonpalpable lesions in patients above 50 years of age should necessarily be biopsied using wire localization (8,13).

In our study, 85.7% of malignant cases were in postmenopausal period, whereas 14.3% of them were in premenopausal period. Malignancy rate generally increased in patients over the age of 47 years. The evaluation of BIRADS-4 sub-categories according to the mean age was as follows; 4a <4b <4c. These findings indicate that age may be useful for the BI-RADS classification. The removal of non-palpable lesions using a wire marker seems to be an effective method for early diagnosis in many malignant cases.

## CONCLUSION

In the light of these data, we believe that the sub-categories of BIRADS-4 category play an important role in management of breast masses. In addition, BI-RADS classification is a highly reliable classification method in experienced hands. However, a greater number of patients and multicenter studies are needed to obtain more accurate results.

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*Nizamettin Kutluer ORCID: 0000-0002-1092-2979*

*Ali Aksu ORCID: 0000-0002-9226-1720*

*Mehmet Bugra Bozan ORCID: 0000-0001-5573-2645*

*Burhan Hakan Kanat ORCID: 0000-0003-1168-0833*

*Hulagu Kargici ORCID: 0000-0001-8191-571X*

*Ferhat Cay ORCID: 0000-0001-5323-1599*

*Ayşe Azak Bozan ORCID: 0000-0001-8737-4408*

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