

# COMPARISON OF MAMMOGRAPHY AND ULTRASOUND IN PREOPERATIVE ASSESSMENT OF SUSPECTED BREAST LESION

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**Submitted:** September 14.2025

**Accepted:** October 13.2025

**DOI:** <https://doi.org/10.48026/issn.26373297.2025.1.16.2>

## SUMMARY

**Aim of the study:** The aim of this study is to present the role of mammography in assessing the size of malignant breast lesions, to present the role of ultrasound in the evaluation of malignant breast lesions, and to demonstrate mammography as the gold standard in the assessment of breast cancer. A retrospective-prospective study was conducted at the Radiology Clinic of the Clinical Center of the University of Sarajevo. The study included 50 female patients with a mean age of  $52.94 \pm 11.46$  years, the youngest patient was 32 and the oldest was 77 years.

**Results:** Analysis of the reasons for visiting a doctor showed that 21 patients (42%) had no prior diagnosis, while 24 patients (48%) came for follow-up examinations. All patients underwent mammography imaging, breast ultrasound examination, and histopathological (HP) analysis. The analysis revealed that, out of 40 evaluated mammographic images of the right breast, a suspicious lesion was identified in 27.5% of the images. Analysis of the distribution of patients according to the BI-RADS score showed that BI-RADS categories 1 and 2 were observed in 48.89% of cases on ultrasound and

in 55.32% of cases on mammography. BI-RADS categories 5 or 6 were observed in 6.66% of patients on ultrasound and in 8.59% of patients on mammography. There was no significant difference in the distribution of patients ( $\chi^2=3.214$ ,  $p=0.782$ ). Based on the available data on the size of histopathological samples, it was determined that 40.91% were smaller than 15 mm, as well as within the range of 15 to 30 mm. Histopathological samples larger than 30 mm accounted for 18.18% of the cases. The analysis showed that, out of 50 histopathologically examined samples, 35 (70%) had a benign diagnosis, 6 (12%) patients had a suspicious lesion, and 9 (18%) patients were diagnosed with carcinoma. The analysis also revealed that the sensitivity of ultrasound was 44.44%, with a confidence interval of 13.70 to 78.8%, while the sensitivity of mammography was 55.56% (21.20–86.30%). The specificity of ultrasound was 97.14%, with a confidence interval of 85.08–99.93%. Specificity of mammography was 97.37% (86.19–99.93%). The positive predictive value was 80% for ultrasound and 83.33% for mammography.

**Keywords:** mammography, ultrasound, histopathology, breast cancer, tumor size





## 1. INTRODUCTION

Malignant diseases are among the major health problems in Bosnia and Herzegovina and in developed countries worldwide. Despite tremendous advances in diagnosis and treatment methods, breast cancer remains the number one cancer among women. Over the past three decades, it has become possible to reduce mortality and morbidity from breast cancer thanks to the detection of smaller non-palpable lesions, which in the past were diagnosed only when they became symptomatic or palpable. (1) The biggest risk factor for breast cancer is older age. The incidence of breast cancer begins to rise between the ages of 35 and 45. As the incidence of breast cancer increases, women's awareness of self-examination is also rising, and the country has launched various early detection programs for breast cancer. (2) Mammography is the method of choice for women over the age of 40 or those who have symptoms. It depends on the woman's reproductive age and hormone levels, as fibroglandular parenchyma is more likely to be present in women of reproductive age compared to those with reduced parenchyma and an increased proportion of fatty tissue.

### 1.1. Imaging methods

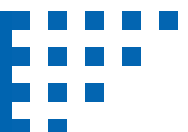
If breast cancer is detected at an early stage, before metastasis occurs, a better treatment outcome can be expected. Radiological diagnostics is considered crucial in the detection of early breast cancer, in differentiating benign from malignant lesions, as well as in the treatment process and follow-up of patients who have undergone surgery. (42)

The imaging methods used in radiological diagnostics for the detection of breast cancer are mammography, ultrasound, and magnetic resonance imaging (MRI). As technology

The more glandular tissue there is, the less visible microscopic calcifications become. (3) Mammography is the main method (gold standard) for early detection of breast cancer. Mammographic findings are summarized into several categories, from 0 to 6, using the BI-RADS classification system, which standardizes the description of lesions and the need for further action. (4,5) A common indication for ultrasound is to complement mammographic findings by differentiating solid from cystic, palpable, or mammographically (in)visible lesions. In addition, it is a better method than mammography for visualizing and detecting axillary lymph nodes, which are an integral part of every ultrasound examination. A preoperative analysis is also performed, and its results are important for potential surgery, radiation, or systemic therapy. Ultrasound results depend on the operator's description of the lesion and its classification according to the BI-RADS system. On ultrasound, malignant lesions appear as hypoechoic masses with internal calcifications, shadowing, spiculated structures, and irregular margins. (6).

continues to advance, newer methods are being introduced, such as contrast-enhanced mammography, automated breast ultrasound, sonoelastography, and digital tomosynthesis.

To standardize findings in ultrasound, mammography, and MRI, the ACR-BI-RADS classification (American College of Radiology – Breast Imaging Reporting and Data System) is used. By using this classification, breast lesions are categorized into one of seven existing categories, which allows for follow-up of findings, diagnostic evaluation, and quality



control. It allows us to determine the further diagnostic procedure.

- BI-RADS 0 – finding is not completely clear, requires additional tests
- BI-RADS 1 – finding without noticeable changes
- BI-RADS 2 – finding of definitely benign changes, usually representing a cyst
- BI-RADS 3 – a probably benign finding; the patient should be referred for additional ultrasound or mammography and a follow-up examination within 3 to 6 months
- BI-RADS 4 – suspicious abnormality; histopathological analysis is required to confirm or rule out malignancy, and surgical intervention is indicated if breast cancer is confirmed
- BI-RADS 5 – suspected malignant change, finding that indicates breast cancer, biopsy and removal of the breast is performed
- BI-RADS 6 – breast cancer diagnosed, treatment plan implemented

## 2. RESEARCH MATERIALS AND METHODS

### 2.1. Patients

The study was conducted at the Clinical Center of the University of Sarajevo, at the Clinic of Radiology. Data were collected in the BIS system. Medical documentation was used: patient referrals and ultrasound, mammography, and histopathology reports. The study included

50 female patients of different age groups who underwent examinations using both diagnostic modalities and had histopathological analysis performed.

### 2.2 Criteria for inclusion in the study

The study included the following patients:

- Female patients,
- Female patients over 18 years of age,
- Female patients who have been diagnosed with a suspected breast lesion by mammography and ultrasound
- Female patients who underwent histopathological analysis

### 2.3 Criterion for exclusion from the study

The study does not include:

- Male patients,
- Female patients under the age of 18,
- Female patients who have not been diagnosed with a suspected breast lesion by mammography and ultrasound
- Female patients who did not undergo histopathological analysis



## 2.4 Type of study

The study was conducted as a retrospective-prospective study at the University Clinical

Center in Sarajevo, from March 2022 to March 2023.

## 2.5 Research method

The study was conducted as a retrospective-prospective study. The study included 50 female patients of different age groups in whom ultrasound and mammography revealed a suspicious breast lesion, as well as patients who underwent surgical treatment. Ultrasound and mammography findings were compared with histopathological findings. Data were processed using standard statistical methods and presented in graphical and tabular form. All patients who met the inclusion criteria were included in the study. The general part of the study was based on the patients' age and their referral

diagnoses. After that, definitive mammography and ultrasound diagnoses were performed for the breasts in which a suspicious lesion was detected. Mammography findings were classified according to the BI-RADS system. After mammography, definitive ultrasound diagnoses were presented, which were also classified according to the BI-RADS system. The sizes of the suspicious lesions were classified on both diagnostic modalities. After that, based on histopathological findings, the locations of breast lesions, their sizes, and the outcomes of the histopathological results were determined.

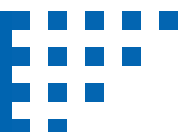
## 2.6 Database and further processing

### Statistical processing

The collected data were stored in an electronic database created using Microsoft Office 2019, in the Excel spreadsheet program. For statistical data analysis, the SPSS v27.1.0 software by IBM was used. Categorical variables were presented as frequencies, expressed either as absolute numbers or percentages. The results of the descriptive statistical analysis of risk were presented using the following parameters: mean value and standard deviation. The chi-square test ( $\chi^2$ ) was used to examine the existence of differences between expected and observed values in one or more categories in contingency tables. In cases where more than 20% of the expected cell values were less than 5, Fisher's exact test was applied.

The potential use of ultrasound and mammography in detecting breast lesions was tested using the ROC (Receiver Operating Characteristic) curve. Area under the curve (AUC) values of  $p > 0.5$  indicate the test's applicability, while values above 0.6 suggest a moderate test strength in detecting two outcomes. The analysis also included sensitivity, specificity, positive predictive value, and negative predictive value.

The research results were presented in textual, tabular, and graphical form. Statistical significance was set at a probability level of  $p < 0.05$



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### 3. RESULTS

The study analyzed radiological findings of 50 female patients, with a mean age of  $52.94 \pm 11.46$  years and a median age of 51.50 years. The youngest patient was 32 years old and the oldest was 77 years old.

Analysis of the reasons for visiting a doctor showed that 21 patients (42%) had no prior diagnosis, while 24 patients (48%) came for

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follow-up examinations. Mastitis was found in 2 patients (4%), as well as FNAC in observation. Cysts were the reason for consultation in 1 patient (2.0%).

All patients underwent mammography imaging, breast ultrasound examination, and histopathological (HP) analysis.

#### Analysis of mammography examination

The analysis revealed that, out of 40 evaluated mammographic images of the right breast, a suspicious lesion was identified in 27.5% of the images. Undifferentiated shading was observed in 17.5% of the images, and no suspicious lesions were observed in 55%.

Out of 50 participants, 36 had complete data, and it was determined that a suspicious lesion was identified in 27.78% of those images, while an undefined shading was observed in 11.11% of the images. No suspicious lesions were observed at 61.11%.

A BI-RADS value of "1," representing a negative finding, was observed in 2 patients (4.26%), while a value of "2," indicating a benign finding, was observed in 24 patients (51.06%). A BI-RADS value of "3," representing a probably benign finding, was observed in 9 patients (19.15%) on the right breast. A BI-RADS value of "4," representing a suspicious finding, was observed in 8 patients (17.02%). A highly suggestive malignant finding, corresponding to a BI-RADS value of "5," was observed in 3 patients (6.38%). A BI-RADS value of "6," indicating malignancy, was observed in 1 patient (2.21%).

A BI-RADS value of “1,” representing a negative finding, was observed in 3 patients (7.14%), while a value of “2,” indicating a benign finding, was observed in 21 patients (47.72%). A BI-RADS value of “3,” representing a probably benign finding, was observed in 11 patients

(25,0%) on the right breast. A BI-RADS value of “4,” representing a suspicious finding, was observed in 8 patients (18,18%). A highly suggestive malignant finding, corresponding to a BI-RADS value of “5,” was observed in 1 patient (2.27%).

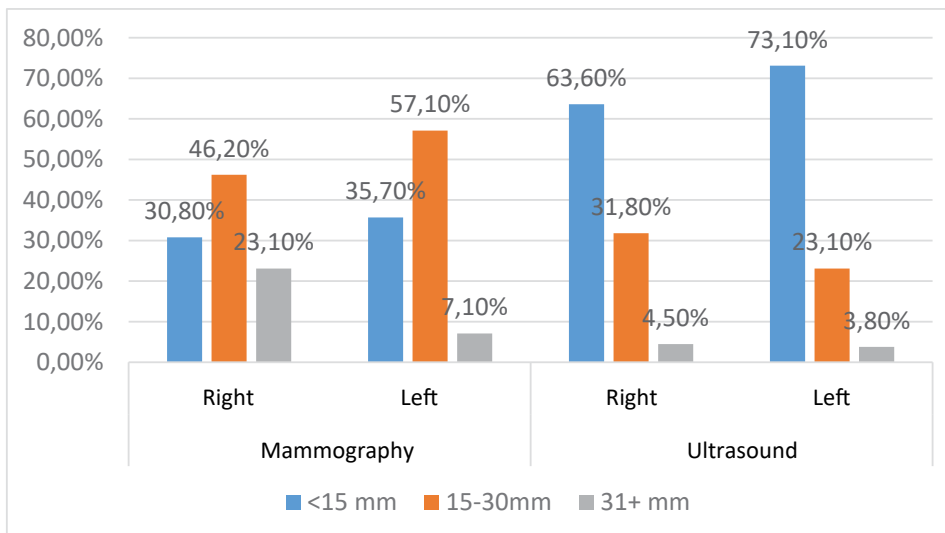
### Ultrasound examination analysis

A total of 45 patients had data on the value of ultrasonic BI-RADS. It was determined that 1 patient (2.22%) had a BI-RADS value of “0,” indicating the necessity of using additional radiological techniques. A BI-RADS score of “1” was observed in 4 patients (8.89%), while a score of “2,” indicating a benign lesion, was found in 18 patients (40%). A BI-RADS value of “3,” representing a probably benign lesion, was observed in 8 patients (17.78%). A BI-RADS score of “4,” indicating a suspicious lesion, was observed in 11 patients (24.44%). BI-RADS values of “5,” indicating highly suspicious lesions, were observed in 2 patients (4.44%). A BI-RADS value of “6,” indicating a known breast malignancy, was observed in 1 patient (2.22%).

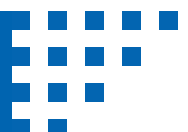
was determined that 2 patients (5.63%) had a BI-RADS value of “1,” indicating normal breast structure. A BI-RADS value of “2,” representing a benign lesion, was observed in 19 patients (50%). A BI-RADS value of “3,” indicating a probably benign lesion, was observed in 10 patients (26.32%). A BI-RADS score of “4,” representing a suspicious lesion, was observed in 6 patients (15.79%). A BI-RADS value of “5,” indicating a highly suspicious lesion, was observed in 1 patient (2.63%). A BI-RADS value of “6,” representing a known breast malignancy, was not observed in any patient.

A total of 38 patients had data on the value of the ultrasound BI-RADS for the left breast. It

The relationship between BI-RADS values of the right breast obtained by mammography and by ultrasound diagnostics is presented in Graph 8.



**Graph 1.** Lesion sizes on mammography and ultrasound of the right and left breast



On mammography, 30.8% of lesions measured less than 15 mm, 46.2% measured between 15 and 30 mm, and 23.10% measured more than 30 mm. For comparison, on ultrasound, lesion size was reported as less than 15 mm in 63.6% of cases, between 15 and 30 mm in 31.8% of cases, and 31 mm or larger in 4.5% of cases. Nevertheless, due to the smaller number of samples with available data, no significant difference was found (Fisher's exact test = 0.09).

On mammography of the left breast, the lesion was found to be smaller than 15 mm in 35.7% of cases, between 15 and 30 mm in 57.1% of cases, and larger than 30 mm in 7.1% of cases. On ultrasound, 73.1% of lesions were described as measuring less than 15 mm, 23.10% as 15–30 mm, and 3.8% as larger than 30 mm. Nevertheless, due to the smaller number of samples with available data, no significant difference was found (Fisher's exact test = 0.051).

## Analysis of mammography and ultrasound in detection of breast lesions

The use of mammography and ultrasound in the detection of lesions relative to the findings was

tested using ROC analysis.

**Table 1.** ROC analysis mammography use

	%	CI%
<b>Sensitivity</b>	76.92%	41.19%-94.96%
<b>Specificity</b>	65.35%	44.33%-82.79%
<b>PPV</b>	52.63%	28.86%-75.55%
<b>NPV</b>	85%	62.11%-96.79%
	Area value	CI
<b>AUC</b>	0.71	0.54-0.84

Based on the appearance of mammography findings, the sensitivity of mammography was determined to be 76.92%, with a confidence interval of 41.19–94.96%. Specificity was 65.335%, with a confidence interval ranging from 44.33% to 82.79%. The positive predictive

value of mammography in detecting malignant lesions was 52.63%, while the negative predictive value was 85%.

The value of the area under the curve on the ROC analysis was AUC=0.71, which indicates good test performance.

**Table 2.** ROC analysis of ultrasound use

	%	CI%
Sensitivity	72.73%	39.03-93.98
Specificity	52.86%	40.55-64.91
PPV	19.51%	8.82-34.87
NPV	93%	79.61-98.43
	Area value	CI
<b>AUC</b>	0.63	0.51-0.73



Based on the appearance of mammography findings, the sensitivity of ultrasound was determined to be 72.73%, with a confidence interval of 39.03–93.98%. Specificity was 52.86% with a confidence interval of 40.55% to 64.91%. The positive predictive value of mammography in detecting malignant lesions was 19.51%,

while the negative predictive value was 93%.

The value of the area under the curve on the ROC analysis was AUC=0.63, which indicates the possibility of use in detection, but it did not show the same value as mammography, i.e. the test is of a lower level.

**Table 3.** Detection analysis based on mammography and ultrasound

		Histopathological findings					
		Benign		Suspicious change		Cancer	
		N	R%	N	R%	N	R%
<b>Ultrasound</b>	By BI-RADS Benign	20	76.9%	3	11.5%	3	11.5%
	Suspicious change	9	69.2%	2	15.4%	2	15.4%
	Cancer	0	0.0%	1	20.0%	4	80.0%
<b>Mammography</b>	By BI-RADS Benign	21	84.0%	1	4.0%	3	12.0%
	Suspicious change	10	62.5%	5	31.3%	1	6.3%
	Cancer	0	6.0%	1	16.7%	5	83.3%

The analysis showed that, out of 26 ultrasound findings considered benign by the physician, 76.9% were confirmed as benign on histopathological examination, 11.5% were identified as suspicious changes, and 11.5% were confirmed as carcinoma. Of the 13 findings that were considered suspicious on ultrasound, 69.2% were benign, 15.4% were also classified as suspicious on histopathological examination, and 15.4% were confirmed as carcinoma. On ultrasound, 5 findings were classified with BI-RADS values of 5 or higher, of which 4 (80%) were confirmed as carcinoma on histopathological examination.

From a mammographic perspective, out of 25 findings classified as benign, 84% were also confirmed as benign on histopathological examination, while 4% were identified as suspicious changes. Of these findings, 12% were confirmed as carcinoma on histopathological examination. Among the findings that were presented and described as suspicious on mammography, 62.5% were benign, 31.3% were suspicious, and 6.3% were confirmed as carcinoma.



## ROC analysis based on BI-RADS values

	Ultrasound		Mammography	
	%	CI%	%	CI%
<b>Sensitivity</b>	44.44%	13.70-78.80%	55.56%	21.20-86.30%
<b>Specificity</b>	97.14%	85.08-99.93%	97.37%	86.19-99.93%
<b>PPV</b>	80.00%	28.36-99.49%	83.33%	35.88-99.58%
<b>NPV</b>	87%	72.57-95.70%	90.24%	76.87-97.28%
<b>AUC</b>	0.71	0.55-0.84	0.76	0.62-0.88

The analysis showed that the sensitivity of ultrasound was 44.44%, with a confidence interval of 13.70 to 78.8%, while the sensitivity of mammography was 55.56% (21.20-86.30%). The specificity of ultrasound was 97.14%, with a confidence interval of 85.08–99.93%. Specificity of mammography was 97.37% (86.19-99.93%).

The positive predictive value was 80% for ultrasound and 83.33% for mammography. The negative predictive value was 87% for ultrasound and 90.24% for mammography.

The area under the curve was 0.71 for ultrasound, and 0.76 for mammography.

## 4. DISCUSSION

The study was conducted as a retrospective-prospective study. The study included 50 female patients of different age groups in whom ultrasound and mammography revealed a suspicious breast lesion, as well as patients who underwent surgical treatment. Ultrasound and mammography findings were compared with histopathological findings. Data were processed using standard statistical methods and presented in graphical and tabular form. All patients who met the inclusion criteria were included in the study.

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diagnosis, while 24 patients (48%) came for follow-up examinations. Mastitis was found in 2 patients (4%), as well as FNAC in observation. Cysts were the reason for consultation in 1 patient (2.0%).

All patients underwent mammography imaging, breast ultrasound examination, and histopathological (HP) analysis. The analysis revealed that, out of 40 evaluated mammographic images of the right breast, a suspicious lesion was identified in 27.5% of the images. Undifferentiated shading was observed in 17.5% of the images, and no suspicious lesions were observed in 55%.

Out of 50 participants, 36 had complete data, and it was determined that a suspicious lesion was identified in 27.78% of those images, while an undefined shading was observed in 11.11% of



the images. No suspicious lesions were observed at 61.11%.

A BI-RADS value of “1,” representing a negative finding, was observed in 2 patients (4.26%), while a value of “2,” indicating a benign finding, was observed in 24 patients (51.06%).

A total of 45 patients had data on the value of ultrasonic BI-RADS. It was determined that 1 patient (2.22%) had a BI-RADS value of “0,” indicating the necessity of using additional radiological techniques. A BI-RADS score of “1” was observed in 4 patients (8.89%), while a score of “2,” indicating a benign lesion, was found in 18 patients (40%). A BI-RADS value of “3,” representing a probably benign lesion, was observed in 8 patients (17.78%). A BI-RADS score of “4,” indicating a suspicious lesion, was observed in 11 patients (24.44%). BI-RADS values of “5,” indicating highly suspicious lesions, were observed in 2 patients (4.44%). A BI-RADS value of “6,” indicating a known breast malignancy, was observed in 1 patient (2.22%).

The relationship between BI-RADS values of the right breast obtained through mammography and ultrasound diagnostics was previously presented graphically in the empirical part of the analysis. Analysis of the distribution of patients according to the BI-RADS score showed that BI-RADS categories 1 and 2 were observed in 48.89% of cases on ultrasound and in 55.32% of cases on mammography. BI-RADS categories 5 or 6 were observed in 6.66% of patients on ultrasound and in 8.59% of patients on mammography. There was no significant difference in the distribution of patients ( $\chi^2=3.214$ ,  $p=0.782$ ).

Analysis of the distribution of patients according to BI-RADS score values showed that BI-RADS categories 1 and 2 were observed in 55.14% of cases on ultrasound and in 52.63% of cases on mammography. BI-RADS values of “5” or “6” were observed in 2.27% of patients on ultrasound and in 2.63% of patients on mammography.

There is no significant difference in patient distribution ( $\chi^2=0.195$ ,  $p=0.995$ ).

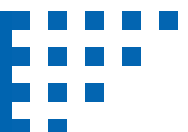
Based on the appearance of mammography findings, the sensitivity of mammography was determined to be 76.92%, with a confidence interval of 41.19–94.96%. Specificity was 65.335%, with a confidence interval ranging from 44.33% to 82.79%. The positive predictive value of mammography in detecting malignant lesions was 52.63%, while the negative predictive value was 85%.

The value of the area under the curve on the ROC analysis was  $AUC=0.71$ , which indicates good test performance.

Based on the appearance of mammography findings, the sensitivity of ultrasound was determined to be 72.73%, with a confidence interval of 39.03–93.98%. Specificity was 52.86% with a confidence interval of 40.55% to 64.91%. The positive predictive value of mammography in detecting malignant lesions was 19.51%, while the negative predictive value was 93%.

The value of the area under the curve on the ROC analysis was  $AUC=0.63$ , which indicates the possibility of use in detection, but it did not show the same value as mammography, i.e. the test is of a lower level.

The analysis showed that, out of 26 ultrasound findings considered benign by the physician, 76.9% were confirmed as benign on histopathological examination, 11.5% were identified as suspicious changes, and 11.5% were confirmed as carcinoma. Of the 13 findings that were considered suspicious on ultrasound, 69.2% were benign, 15.4% were also classified as suspicious on histopathological examination, and 15.4% were confirmed as carcinoma. On ultrasound, 5 findings were classified with BI-RADS values of 5 or higher, of which 4 (80%) were confirmed as carcinoma on histopathological examination.



From a mammographic perspective, out of 25 findings classified as benign, 84% were also confirmed as benign on histopathological examination, while 4% were identified as suspicious changes. Of these findings, 12% were confirmed as carcinoma on histopathological examination. Among the findings that were presented and described as suspicious on mammography, 62.5% were benign, 31.3% were suspicious, and 6.3% were confirmed as carcinoma. Of the 6 findings classified as carcinoma on mammography, 16.7% were identified as suspicious changes on histopathology, while 83.3% were confirmed as carcinoma.

ROC value analysis based on BIRAD values is also significant. Specifically, the analysis showed that the sensitivity of ultrasound was 44.44%, with a confidence interval of 13.70 to 78.8%, while the sensitivity of mammography was 55.56% (21.20-86.30%). The specificity of ultrasound was 97.14%, with a confidence interval of 85.08-99.93%. Specificity of mammography was 97.37% (86.19-99.93%). The positive predictive value was 80% for ultrasound and 83.33% for mammography. The negative predictive value was 87% for ultrasound and 90.24% for mammography. The area under the curve was 0.71 for ultrasound, and 0.76 for mammography.

## 6. CONCLUSIONS

1. The sizes of suspicious lesions determined by mammography in this study largely corresponded to the sizes of suspicious lesions identified through histopathological analysis of the samples. Of the known data on histopathological sample sizes, 40.91% were smaller than 15 mm, while mammography determined lesion sizes smaller than 15 mm in 30.8% of cases in the right breast and 35.7% in the left breast. Sizes from 15 to 30

In the study titled “Comparison of mammography and ultrasonography findings with pathology results in patients with breast cancer in Birjand, Iran,” conducted by Haghigi F., Ghodratollah N., Mahyar M., and Naeeme A., which aimed to identify the preferred diagnostic modality for screening patients with breast cancer, 79 female patients referred to Imam Reza Hospital participated. Patient data were recorded using a checklist that included name, identification code, age, ultrasound and mammography results, as well as pathological reports. The ultrasound and mammography results were compared with the pathological findings.

The mean age of the patients was  $46.94 \pm 11.76$  years. The results showed that 7.6% of patients had ductal carcinoma. Approximately 72.5%, 2.9%, and 24.6% of patients had stage 2, stage 3, and breast carcinoma, respectively. In addition, both breasts were affected in 1.3% of patients. Ultrasound findings were positive and false negative in 97.5% and 2.5% of cases, respectively. Moreover, mammography and ultrasound results were positive and false-negative in 98.7% and 1.3% of patients, respectively.

This study demonstrated that mammography is the preferred modality for screening patients with breast cancer, while the use of ultrasound is recommended, particularly for women at higher risk. (61)

mm determined by mammography on the left breast were 35.7%, which is approximately the percentage of detected sizes through histopathological analysis. Mammographic assessment of the size of a suspicious breast lesion is an important predictor in evaluating its etiology and determining its dimensions, which is of great significance when selecting the appropriate treatment strategy.



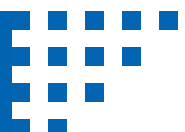
2. Ultrasound diagnostics play a major role in the detection of breast cancer and in determining lesion size. Ultrasound has particular potential to improve early detection rates in areas without access to mammography. Analysis of ultrasound in cancer detection, confirmed by histopathology, verified the presence of carcinoma; however, based on specificity and sensitivity testing in this study, lower percentages were recorded compared to the other diagnostic method.

3. In this study, mammography proved to be a method of choice where mammography

sensitivity of 76.92% was determined with a confidence interval of 41.19-94.96%. Specificity was 65.335%, with a confidence interval ranging from 44.33% to 82.79%. The value of the area under the curve on the ROC analysis was  $AUC=0.71$ , indicating that mammography is the primary method of choice for detecting carcinoma and suspicious changes, and therefore a superior method compared to ultrasound diagnostics

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