ORIGINAL ARTICLE

1. Hospital Unidad Médica de Alta Especialidad 4 "Luis Castelazo Ayala", Instituto Mexicano del Seguro Social, Estado de México, México
2. Hospital Angeles Lomas, Huixquilucan, México
3. Universidad Panamericana, Huixquilucan, México
4. Hospital Infantil del Estado de Sonora, Sonora, México
5. Centro Médico ABC, Ciudad de Médico, México
6. Hospital Angeles Villahermosa, Villahermosa, México

a. Gynecologic Oncologist ORCID 0000-0002-6287-5932
b. Radiologist and specialist in breast intervention ORCID 0000-0003-1090-2027
c. Master in Public Health ORCID 0000-0001-7907-5870
d. Obstetrician and Gynecologist ORCID 0009-0005-5250-6067
e. General Practitioner ORCID 0009-0005-3265-4791
f. Obstetrician and Gynecologist ORCID 0000-0002-6428-4001
g. Obstetrician and Gynecologist ORCID 0009-0009-9212-5559.

Authorship contributions: LSS, JGA and LCSV contributed to the design of the study protocol. LSS and JGA contributed to the input of patients. LSS, JGA, BSA, LCSA collected and obtained the data. BSA and DCE contributed to the statistical analysis of the data. LSS, ARB and MMF contributed to the research and writing of the manuscript. All authors critically reviewed the manuscript, validated it, and gave their approval of its final version for publication.

Confidentiality of data: The handling of information during the research was carried out under strict rules of confidentiality, solely for research purposes.

Right to privacy and informed consent: The privacy of the participants' clinical records was respected at all times. Informed consent was not required as this was a retrospective study.

Funding: The authors declared that they had no funding from any entity.

Conflict of interest: The authors declared no conflict of interest.

Data availability: Data supporting the conclusions of this study are available from the corresponding author upon reasonable request.

Acknowledgement of authorship: All authors have accepted responsibility for the entire contents of this manuscript and approved its publication.

Ethics committee approval: The research with human subjects complied with all relevant national regulations, institutional policies and conforms to the principles of the Declaration of Helsinki and has been approved by the authors. Approval Folio HAL-23-017

Use of artificial intelligence: Artificial intelligence was not used for any part of the manuscript.

Original contribution and importance: Quality indicators for clinical, imaging and histopathologic correlation were identified to improve standards in our mastology clinics.

Received: 30 September 2024

Accepted: 11 December 2024

Online publication: 12 March 2025

Corresponding author:
Leopoldo Santiago Sanabria
✉ leopoldosantiagosanabria@gmail.com

Cite as: Santiago Sanabria L, Garza Arrieta J, Contreras Estrada D, Rochin Benoit A, Sánchez Alquicira B, Malfavón Farias M, Sanabria Villegas LC. Clinical, radiological and histopathological correlation in breast lesions: 10 years of experience. Rev peru ginecol obstet. 2025;71(1). Doi: https://doi.org/10.31403/rpgo.v71i2729

Clinical, radiological and histopathological correlation in breast lesions: 10 years of experience

Correlación clínica, radiológica e histopatológica en lesiones de mama: experiencia a 10 años

Leopoldo Santiago Sanabria[1,a], Julieta Garza Arrieta[2,b], Daniela Contreras Estrada[3,c], Adalberto Rochin Benoit[4,d], Bernardo Sánchez Alquicira[3,e], Montserrat Malfavón Farias[5,f], Luz del Carmen Sanabria Villegas[6,g]

DOI: https://doi.org/10.31403/rpgo.v71i2729

ABSTRACT

Introduction: Breast cancer remains a global public health problem. It is estimated that its incidence will increase in the coming years. It is important to evaluate screening studies in breast clinics through indicators in order to obtain an adequate clinical, imaging and histopathological correlation. Objectives: To evaluate the correlation between clinical, radiological and histopathological studies in women who underwent breast cancer screening tests over a 10-year period. Methods: A cross-sectional, descriptive, retrospective cohort study was conducted using the records of a referral center from June 2013 to June 2023, of women who underwent breast cancer screening. In those who underwent biopsy, the samples were analyzed at our institution. Results: The records of 6 754 women who met the inclusion criteria were analyzed, where the average age of the study population was 50.7 years. It was recorded that 73.2% of the studies were categorized BI-RADS 2 and the majority of the participants were asymptomatic. Of those 551 women who received a BI-RADS >4 mammogram, 226 (41%) had a malignant result. Conclusions: Mammography has been shown to be the only imaging tool that has managed to have an impact on mortality. There are modalities, such as tomosynthesis, that have increased the performance of this test. It is valid to use new technologies to maintain quality standards in the studies.

Key words: Mammography, Early detection of cancer, Breast cancer, Breast density, Diagnostic imaging, Ultrasonography, mammary

RESUMEN

Introducción. El cáncer de mama continúa siendo un problema de salud pública a nivel global. Se estima que su incidencia incrementará en los próximos años. Es importante evaluar a través de indicadores los estudios de escrutinio de las clínicas de mastología con el fin de obtener una adecuada correlación clínica, imagenológica e histopatológica. Objetivos. Evaluar la correlación que existe entre la clínica, los estudios radiológicos e histopatológicos en mujeres que acudieron a exámenes de escrutinio para cáncer de mama en un periodo de 10 años. Métodos. Se realizó un estudio transversal, descriptivo de cohorte retrospectiva efectuado de los registros de un centro de referencia en el periodo de junio del 2013 a junio 2023, de mujeres quienes acudieron a tamizaje para cáncer de mama. En aquellas que se les realizó toma de biopsia, las muestras fueron analizadas en nuestra institución. Resultados. Se analizaron los registros de 6 754 mujeres que cumplieron los criterios de inclusión, en donde la edad promedio de la población de estudio fue de 50,7 años. Se registró que 73,2% de los estudios se categorizaron BI-RADS 2 y la mayoría de las participantes cursaba asintomática. De aquellas 551 mujeres que recibieron una mamografía BI-RADS >4, 226 (41%) obtuvieron un resultado de malignidad. Conclusiones. La mamografía ha demostrado ser la única herramienta de imagen que logrado tener un impacto sobre la mortalidad. Existen modalidades, como la tomosíntesis, que han incrementado el rendimiento de esta prueba. Es válido auxiliarse de nuevas tecnologías para mantener estándares de calidad en los estudios.

Palabras clave. Mamografía, Detección temprana de cáncer, Cáncer de mama, Densidad mamaria, Diagnóstico por imagen, Ultrasonografía mamaria

Introduction

Breast cancer represents a global public health problem[1]. At the beginning of the last decade, this entity was responsible for 16% of cancer deaths in women. It is estimated that the overall 5-year survival rate in developed countries is 90%, in contrast to 66% in developing countries, which represents an area of opportunity to improve breast cancer screening indicators in our Latin American countries[2,3].

In the latest report by the Global Cancer Observatory (GLOBOCAN), it was documented that breast cancer is the cancer with the highest incidence and mortality in Mexico. Annually, 31 043 new cases are reported, which corresponds to 15-20% of all malignant neoplasms in the country[4,5].

Early detection through screening has made it possible to diagnose a greater number of cases in the early stages, which allows us to offer curative and less invasive treatments. The American College of Radiology (ACR) recommends starting screening at 40 years of age and annual follow-up to maximize the benefits of screening[6]. Mammography, considered the gold standard as a screening method, has been shown to reduce mortality by 26-41% in the average risk population[7].

Tomosynthesis mammography is a useful resource, with limited availability, which has shown greater sensitivity for the detection of lesions, asymmetries and distortions in the architecture compared to digital mammography, with a difference that ranges between 5 and 7%[8]. However, this modality is not exempt from false positive results, which can lead to overdiagnosis and increase the rate of second calls[9,10]. This means that some lesions that do not pose a risk to the patient's life or that will not progress to a malignant process have a potential for overtreatment through repeat biopsies, surgery, radiotherapy or other adjuvant therapies[11,12]. International standards dictate that the false positive rate should not exceed 10% of all screening mammograms in order to reduce the rate of second callbacks[13].

Breast cancer is an entity with a widely heterogeneous clinical picture, which can present with or without specific symptoms[14]. Nowadays, the focus is on precision medicine, where it is imperative to establish an adequate radiological-pathological correlation in order to obtain biological information on tumors through biopsies and provide targeted therapy[15].

There are infrequent findings in screening mammograms such as focal, global and developing asymmetries, which do not exceed 5%[16]. Other findings, such as inflammatory processes, which represent a challenge for the clinician, make it necessary to rule out a malignant process. Typically, these findings will be related to benign processes. However, it is valid to request complementary studies, such as ultrasound, in order to obtain greater accuracy in the radiological-pathological correlation and avoid invasive procedures[17,18].

Recently, the introduction of artificial intelligence in mastology has proved to be a promising auxiliary tool. This will allow suspicious images to be identified through programmed algorithms in order to improve said correlation and perform selective biopsies in those findings highly suggestive of malignancy[19].

The objective of the present study was to evaluate the correlation between clinical, radiological and histopathological studies in women who attended screening examinations for breast cancer over a 10-year period.

Methods

A cross-sectional, descriptive, retrospective cohort study was conducted at Hospital Angeles Lomas, in Huixquilucan, Mexico in the period between June 2013 and June 2023. The clinical, imaging and histopathological records of women who attended screening studies for breast cancer were analyzed. All women underwent tomosynthesis mammography and in selected cases the study was complemented with breast ultrasound.

The inclusion criteria for the study were women who underwent screening mammography by tomosynthesis, age over 40 years, histopathological study analyzed in the pathological anatomy service of our institution in those women who underwent cutting needle biopsy.

The exclusion criteria were male patients, diagnostic and follow-up mammograms, confirmed diagnosis of breast cancer, history of any type of oncologic process and its treatment in the last 10 years, and follow-up in another institution.

Women whose records were incomplete or duplicated and those who did not authorize the use of personal data were eliminated.

The present study obtained the approval of the Ethics and Research Committee of the same institution with folio HAL-23-017. All participants gave authorization for the use of their personal data for research purposes, safeguarding the privacy of their identity.

The following variables were collected: 1) clinical variables: age, thyroid alterations, history of hormone therapy, family history of breast cancer, BRCA1 and 2 gene mutation, symptomatology at the time of the study; 2) imaging characteristics: all mammograms were categorized according to the Breast Imaging Reporting and Data System (BI-RADS) 5th edition, breast density, distortion of the architecture, presence of calcifications and nodes, associated benign lesions; 3) histopathological findings: histological lineage of breast cancer.

For statistical analysis, a 95% confidence interval was established, with statistical significance a value <0.05. The statistical software used was JASP version 0.18. All categorical variables are expressed in frequency and percentages and the chi-square test was used as a statistical test for proportional differences between groups.

Results

From June 2013 to June 2023, 6 754 women attended the mastology clinic, of which 259 studies were excluded because they did not meet the inclusion criteria of the protocol: 7 male patients, 112 women under 39 years of age, 89 records were incomplete, 4 women only attended for surgical marking, 11 women were in follow-up and 36 women had a pending or inconclusive histopathological result.

The 6 495 women who met all the inclusion criteria were evaluated and grouped into three age groups: 1) 40-49 years, 2) 50-69 years and 3) older than 70 years, in order to obtain a better analysis in accordance with the recommendations of the different international societies in breast cancer screening (Table 1).

The average age of the study population was 50.7 years, with an age range between 40 and 91 years. The age group with the largest volume of women was 40-49 years (55.8%), while the group of women over 70 years of age only represented 5.9%. The most prevalent thyroid disorder in the population was hypothyroidism (6.7%), 12.3% of women reported hormonal use, the majority of participants, 5 148 (79.2%) had no family history of breast cancer, known mutations in the BRCA1 and 2 genes, as documented by 6 416 (98.7%) women. The majority of participants, 5,296 (81.5%) reported being asymptomatic at the time of screening. Most of the screening studies were categorized within the BI-RADS 2 category. The most predominant density was type B density, i.e. those mammary glands with dispersed fibroglandular tissue. Among the mammographic findings, the most common were suspicious amorphous calcifications, which were found in 4.2% of the mammograms. Lymph nodes were less frequent findings, being more common those intramammary compared to axillary nodes. A benign condition was found in 55.8% of the mammograms, the most frequent being fibrocystic mastopathy (43.8%) followed by fibroadenomas (19.8%), especially in the 40-49 age group (Table 1).

On the other hand, there were 226 women who were diagnosed with malignancy, whose average age was 56.5 years. Most of them had no hereditary family history of breast cancer, that is, their presentation was de novo (81.4%). A genetic study was obtained from all women with malignant pathology, where 15.5% presented mutation in the BRCA1 or BRCA2 genes. The majority of women, 115 (50.8%) reported being asymptomatic at the time of the study. The BI-RADS category most associated with breast cancer was BI-RADS 5, occurring in 31% (Figure 1). The most prevalent histological strain was invasive ductal carcinoma (59.6%), followed by ductal carcinoma in situ (25.3%). Likewise, less prevalent strains were documented in the literature, such as Paget's disease and non-Hodgkin's lymphoma (Table 2). Type B breast density was the most reported in women with a confirmed diagnosis of malignancy (Figure 2).

In the present study, screening mammography using tomosynthesis, in those women with studies categorized within BI-RADS 4 and 5, obtained a sensitivity of 90.9%, a specificity of 41%, a positive predictive value of 96.4% and a negative predictive value of 90%, figures that may vary depending on the age group, secondary to breast density (Table 3).

Discussion

Breast cancer in Mexico has shown an increase in incidence over the decades, similar to what has been reported internationally. This may be due to various circumstances such as population aging, higher life expectancy, lifestyle and the great-

Table 1. Demographic characteristics, mammographic and histologic findings by age group. All results are reported in frequencies (percentages).

	Total (n=6 495)	40-49 years n=3 627 (55.8%)	50-69 years n=2 480 (38.1%)	≥70 years n=388 (5.9%)	p value
Clinical history					
Average age (Range)	50.7 (40 -91)	43.5 (40-49)	57.6 (50-69)	74.6 (70-91)	<0.05
Thyroid disorder					
Hypothyroidism	435 (6.7)	259 (7.1)	147 (5.9)	29 (7.5)	0.01
Thyroid cancer	2 (0.03)	1 (0.02)	1 (0.4)	--	
Hormone use	796 (12.3)	471 (12.9)	279 (11)	46 (12)	
Family history of breast cancer					
Yes	1347 (20.7)	781 (21.5)	441 (17.7)	125 (32.2)	0.07
No	5148 (79.2)	2846 (78.4)	2039 (82.2)	263 (67.7)	
Mutation in BRCA1 y 2					
Yes	79 (1.2)	52 (1.4)	23 (0.9)	4 (1)	0.001
No	6416 (98.7)	3575 (98.5)	2457 (99)	384 (98.9)	
Symptoms referred to screening					
Palpable nodule	993 (15.2)	646 (17.8)	283 (11.4)	64 (16.4)	0.006
Changes in color	57 (0.8)	14 (0.3)	36 (1.4)	7 (1.8)	
Mastalgia	125 (1.9)	49 (1.3)	43 (1.7)	33 (8.5)	
Telorrhea	24 (0.3)	14 (0.3)	8 (0.3)	2 (0.5)	
Asymptomatic	5296 (81.5)	2904 (80)	2110 (85)	282 (72.6)	
Imaging studies Mammographic findings					
BI-RADS category					
BI-RADS 0	370 (5.6)	254 (7)	100 (4)	16 (4.1)	0.02
BI-RADS 1	264 (4)	222 (6.1)	40 (1.6)	2 (0.5)	
BI-RADS 2	4, 752 (73.1)	2538 (69.9)	1916 (77.2)	298 (76.8)	
BI-RADS 3	538 (8.2)	353 (9.7)	170 (6.8)	15 (3.8)	
BI-RADS 4A	147 (2.2)	86 (2.3)	55 (2.2)	6 (1.5)	
BI-RADS 4B	277 (4.2)	126 (3.4)	125 (5)	26 (6.7)	
BI-RADS 4C	55 (0.8)	21 (0.5)	27 (1)	7 (1.8)	
BI-RADS 5	92 (1.4)	17 (0.4)	39 (1.5)	16 (4.1)	
Breast density					
A	783 (12)	243 (6.6)	443 (17.8)	97 (25)	0.05
B	3021 (46.5)	1637 (45.1)	1198 (48.3)	186 (47.9)	
C	2645 (40.7)	1714 (47.2)	826 (33.3)	105 (27)	
D	46 (0.7)	33 (0.9)	13 (0.5)	--	
Distortion of architecture	475 (7)	210 (5.8)	229 (9)	36 (9.3)	
Calcifications					
Amorphous	270 (4.2)	101 (2.8)	152 (6)	17 (4.4)	0.049
Thin, linear and branched	7 (0.1)	5 (0.1)	--	2 (0.5)	
Lymph nodes					
Axillary	263 (4)	138 (3.8)	116 (5)	9 (2.3)	0.01
Intramammary	867 (13.3)	397 (10.9)	390 (16)	80 (20.6)	
Pathological findings: Benign lesions					
Benign pathology	3,264 (55.8)	2,065 (56.9)	1,364 (55)	195 (50.3)	0.04
Type of breast lesion					
Fibrocystic mastopathy	1.586 (43.8)	1.012 (49.1)	518 (38.1)	56 (28.7)	
Fibroadenoma	715 (19.8)	420 (20.4)	261 (19.2)	34 (17.4)	
Calcifications	329 (9.1)	148 (7.2)	155 (11.4)	26 (13.3)	
Lymph nodes	230 (6.4)	118 (5.7)	96 (7.1)	16 (8.2)	
Asymmetries	353 (9.8)	185 (9)	141 (10.4)	27 (13.8)	
Other	404 (11.1)	179 (8.6)	189 (13.8)	36 (18.6)	

TABLE 2. CLINICAL CHARACTERISTICS, RADIOLOGICAL AND HISTOPATHOLOGICAL FINDINGS IN WOMEN WITH A DIAGNOSIS OF MALIGNANCY. ALL RESULTS ARE REPORTED IN FREQUENCIES (PERCENTAGES).

	Total (n=226)	Age groups n=226 (100)			*p* value
		40-49 years n=79	50-69 years n=118	>70 years n=29	
Clinical history					
Average age (Range)	56.5 (37-90)	44.6 (40-49)	58.8 (50-69)	77.5 (71-90)	0.005
Thyroid disorder					
Hypothyroidism	26 (11.5)	12 (15.1)	9 (7.6)	5 (17.2)	0.02
Thyroid cancer	1 (0.4)	--	1 (0.8)	--	
Hormonal use	91 (40.2)	51 (64.5)	28 (23.7)	12 (41.3)	
Family history of breast cancer					
Yes	42 (18.6)	14 (17.7)	18 (15.2)	10 (34.4)	0.01
No	184 (81.4)	65 (82.3)	100 (84.7)	19 (65.1)	
BRCA1/2 mutation					
Yes	35 (15.5)	13 (16.4)	18 (15.2)	4 (13.7)	0.13
No	191 (84.5)	66 (83.5)	100 (84.7)	25 (86.3)	
Symptoms					
Palpable nodule	41 (18.1)	12 (15.1)	24 (20.3)	5 (17.2)	0.45
Changes in color	29 (12.8)	6 (7.5)	20 (16.9)	3 (10.3)	
Mastalgia	31 (13.7)	11 (13.9)	17 (14.4)	3 (10.3)	
Telorrhea	10 (4.4)	3 (3.7)	5 (4.2)	2 (6.8)	
Asymptomatic	115 (50.8)	47 (59.4)	52 (44)	16 (55.1)	
Imaging studies Mammographic findings					
BI-RADS Category					
BI-RADS 0	3 (1.3)	1 (1.2)	2 (1.69)	--	0.001
BI-RADS 1	--	--	--	--	
BI-RADS 2	--	--	--	--	
BI-RADS 3	2 (0.9)	2 (2.5)	--	--	
BI-RADS 4A	21 (9.3)	8 (10.1)	12 (10.1)	1 (3.4)	
BI-RADS 4B	67 (29.6)	28 (35.4)	34 (28.8)	5 (17.2)	
BI-RADS 4C	43 (19)	14 (17.7)	24 (20.3)	5 (17.2)	
BI-RADS 5	90 (31)	26 (20.2)	46 (32.2)	18 (55.17)	
Breast density					
A	16 (7.0)	2 (2.5)	8 (6.7)	6 (20.6)	0.02
B	119 (52.6)	61 (26.9)	47 (39.8)	11 (37.9)	
C	90 (39.8)	15 (18.9)	63 (53.3)	12 (41.3)	
D	1 (0.4)	1 (1.2)	--	--	
Distortion of architecture	75 (33.1)	13 (16.4)	56 (47,4)	6 (20.6)	
Calcifications	**VV**				
Amorphous	35 (15.4)	8 (10.1)	23 (19.4)	4 (13.7)	0.10
Thin, linear and branched	--	--	--	--	
Lymph nodes					
Axillary	33 (14.6)	10 (12.6)	15 (12.7)	8 (27.5)	0.01
Intramammary	16 (7)	6 (7.5)	8 (6.7)	2 (6.8)	
Histopathological findings					
Invasive ductal carcinoma	134 (59.6)	47 (59.4)	69 (58.4)	18 (62)	<0.001
Ductal carcinoma in situ	57 (25.3)	23 (29.1)	28 (23.7)	6 (20.6)	
Invasive lobular carcinoma	9 (4)	1 (1.2)	7 (5.9)	1(3.4)	
Lobulillar carcinoma in situ	6 (2.7)	3 (3.7)	3 (2.5)	--	
Inflammatory carcinoma	5 (2.2)	1 (1.2)	4 (3.3)	--	
Malignant phyllodes tumor	5 (2.2)	3 (3.7)	--	2 (6.8)	
Mucinous carcinoma	3 (1.3)	--	2 (1.6)	1 (3.4)	
Non-Hodgkin lymphoma	3 (1.3)	--	2 (1.6)	1 (3.4)	
Others	3 (1.2)	--	3 (2.5)	--	

Figure 1. Heat graph: distribution of breast cancer according to BI-RADS categories.

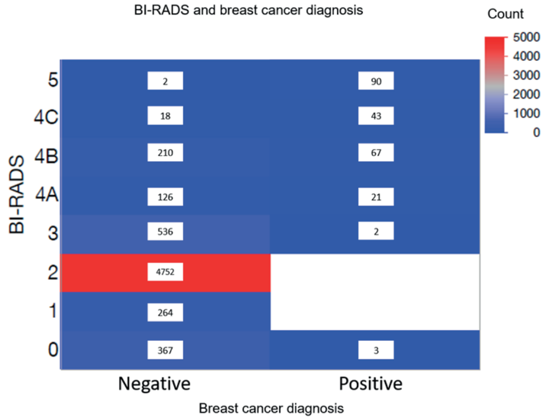

Figure 2. Heat plot: distribution of breast cancer according to breast density.

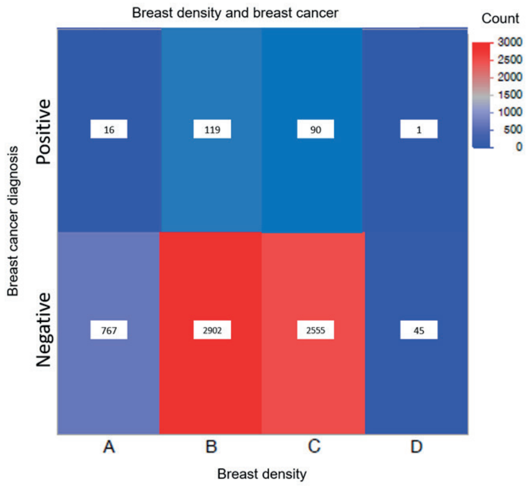

Table 3. Diagnostic test values of the women studied in BI-RADS 4 and 5.

	Values	CI 95%
Sensitivity	90.9%	83.7-98.1%
Specificity	41.0%	29.8-52.2%
Positive predictive value	93.4%	86.2-94.1%
Negative predictive value	90.0%	85.6-94.4%

CI=confidence intervals

er number of cases diagnosed due to a greater number of screening studies. It has been estimated that by the year 2040, the number of new cases per year will be around 3 million and there will be approximately 1 million secondary deaths from this cause worldwide[20,21].

These data justify the need to make society aware of a culture of screening, with the aim of diagnosing diseases in early stages, always adhering to the recommendations issued by the American College of Radiology according to the BI-RADS system. This was designed so that the multidisciplinary teams use the same terminology, there is a systematization in the mammography report, the lesions are categorized according to the degree of suspicion, and recommendations are issued according to the category of the lesion, in order to obtain a quality control in the indicators of each mastology clinic. This system integrates other imaging tools such as ultrasound or nuclear magnetic resonance[22].

The clinic is important as a first approach, since most lesions, regardless of their benign or malignant nature, will manifest as a palpable nodule. Mastalgia is not related to malignant processes. Once the lesion has been identified, it is pertinent to request auxiliary imaging studies[23].

Mammography has been the only imaging tool that has had an impact on reducing mortality. Despite being the most important pillar of screening, it is not exempt from reporting false positives and negatives. It is therefore important to carry out quality control through indicators that evaluate the clinical, imaging and histopathological correlation[24].

There are intrinsic conditions of the mammary gland that reduce the sensitivity of this test, which can lead to both false-positive and false-negative results, which in turn lead to overtreatment or to overlooking lesions that merit protocolization (24). It has been reported that high breast density is closely related to reducing the sensitivity of this test, in addition to itself conferring an increased risk for breast cancer. Because of these two situations, in women with high breast density, complementary studies to mammography should be considered[25]. In the present study, women with breast cancer presented mainly B and C breast densities, which surely established an independent risk for their condition and made diagnosis difficult. Because of this, most of them were asked for additional studies in order to make a correct categorization.

In order to reduce the false positive rate, other mammographic methods have been validated, such as tomosynthesis, which was used in all the participants of the present study. The aim of the use of new technologies is the early detection of breast cancer in asymptomatic women. Thao-Ouyen and colleagues compared digital mammography with tomosynthesis, where the number of false positives was lower with the latter modality and, in turn, a higher detection rate was obtained. This is due to the reduction of the confounding effect of the superpositioning of breast tissue. Another advantage of using tomosynthesis mammography is the diagnostic accuracy of non-calcified lesions, since it reduces the need to obtain other projections due to the third dimension it uses[26]. The sensitivity obtained by tomosynthesis mammography in the present study was 90.9%, similar to what has been reported in the literature.

BI-RADS categories 3 and 4 have always been a dilemma in their categorization. In the study published by Offit and his group, where they compared digital mammography with tomosynthesis, a limit of 2% was set for the accepted malignancy rate, that is, the maximum percentage of studies reported as false negatives, where tomosynthesis showed a better performance, registering 1.8% compared to 5% with digital mammography. However, one of the disadvantages of tomosynthesis mammography has been the higher rate of false positives, especially in those lesions categorized as BI-RADS 4[27].

Once the anatomopathologic result was obtained, it was observed that the most frequent type of cancer recorded in the present study was invasive ductal carcinoma, similar to that published in the medical literature.

In this study a relationship was found between mammography and final histopathological results, where more positive results for malignancy were obtained according to a higher BI-RADS category, as shown in Figure 1. The positive predictive value obtained for these categories was 93.4%. However, it was not free of false positives.

It is important to mention that innovative tools such as artificial intelligence (AI) are currently available. This has turned out to be an ally for the interpretation of mammograms through deep learning algorithms. Its acceptance has made it possible to reduce the radiologist's tunnel vision, which causes him to overlook some suspicious images, by reducing the workload without affecting the sensitivity of the study. The support generated by these tools does not replace the work of the radiologist, who will always have the criterion to make a diagnosis[28]. Dembrower et al. compared the performance of radiologists against AI, concluding that their assessment is superior to AI. However, this tool has proven to be useful as a complement in practice[29].

It is essential to emphasize that clinical and imaging findings do not provide a definitive determination on their own, which is why it is imperative to obtain a histopathological result, which is known as triple test. Likewise, this must be performed in a context of discordance between the clinical and imaging findings. It has been shown that, if clinicians adhere to the practice of the triple test, the correlation between clinical, imaging and histopathology improves its performance, decreasing the rate of false positives and negatives[30].

The present study had some limitations. First, its retrospective design, since it was limited to clinical records and studies of past years, which could represent a bias. The main strength of the present study was the number of cases analyzed, which allows us to reflect on the quality indicators in our mastology clinic, in order to obtain better results that correlate clinical, imaging studies and histopathologic findings. We currently have new technologies such as AI, which in the future will allow us to further improve these quality standards.

In conclusion, mammography has been the only imaging tool that has had a positive impact on reducing breast cancer mortality. The tomosynthesis mammography modality has increased the yield of this test by detecting subclinical lesions. However, caution should be exercised in the categorization of BI-RADS 3 and 4 lesions, as they represent the highest number of false positives and negatives. With the advent of new technologies, a better correlation between clinical, imaging and histopathology is expected.

Acknowledgements

We thank the anatomic pathology, interventional imaging and breast oncology departments of our institution for the great effort made daily to provide quality care to our women.

References

1. Maroun PS, Gomes R, da Silva A. Breast cancer cultural representations: a scoping review. Cien Saude Colet. 2024;29(6):e11002023. doi:10.1590/1413-81232024296.11002023

2. Benitez Fuentes JD, Morgan E, Luna Aguilar A, Mafra A, Giusti F, Vignat J. Global Stage Distribution of Breast Cancer at Diagnosis. JAMA Oncol. 2023;10(1):71–8. doi:10.1001/jamaoncol.2023.4837

3. Reyes A, Torregrosa L, Lozada Martínez ID, Cabrera Vargas LF, Nunez Ordonez N, Martínez Ibata TF. Breast cancer mortality research in Latin America: A gap needed to be filled. Am J Cardiol. 2023;225(5):937–8. doi:10.1016/j.amjsurg.2023.01.010

4. Ferlay J, Colombet M, Soerjomataram I, Parkin DM, Piñeros M, Znaor A, et al. Global Cancer Observatory: Cancer Today Mexico 2022. Glob Cancer Obs. 2024;1:1–2.

5. Arceo-Martínez MT, López-Meza JE, Ochoa-Zarzosa A, Palomera-Sanchez Z. Estado actual del cáncer de mama en México: principales tipos y factores de riesgo. Gac Mex Oncol. 2021;20(3):101–10. doi: 10.24875/j.gamo.21000134

6. Monticciolo DL, Malak SF, Friedewald SM, Eby PR, Newell MS, Moy L, et al. Breast Cancer Screening Recommendations Inclusive of All Women at Average Risk: Update from the ACR and Society of Breast Imaging. J Am Coll Radiol. 2021;18(9):1280–8. doi:10.1016/j.jacr.2021.04.021

7. Mao X, He W, Humphreys K, Eriksson M, Holowko N. Factors Associated With False-Positive Recalls in Mammography Screening. J Natl Compr Cancer Netw. 2023;21(2):1–15. doi:10.6004/jnccn.2022.7081

8. Onega T, Abraham L, Miglioretti DL, Lee CI, Henderson LM, Kerlikowske K, et al. Digital mammography and digital breast tomosynthesis for detecting invasive lobular and ductal carcinoma. Breast Cancer Res Treat. 2023;202(1):505–14. doi:10.1007/s10549-023-07051-6

9. Pace LE. False-Positive Results of Mammography Screening in the Era of Digital Breast Tomosynthesis. JAMA Netw Open. 2022;5(3):1–3. doi:10.1001/jamanetworkopen.2022.2445

10. 10. Johnson K, Olinder J, Rosso A, Andersson I, Lång K, Zackrisson S. False - positive recalls in the prospective Malmö Breast Tomosynthesis Screening Trial. Eur Radiol. 2023;33(11):8089–99. doi:10.1007/s00330-023-09705-x

11. Flemban AF. Overdiagnosis Due to Screening Mammography for Breast Cancer among Women Aged 40 Years and Over: A Systematic Review and Meta-Analysis. J Pers Med. 2023;13(3):1–16. doi:10.3390/jpm13030523

12. Suraya A, M MA, Rahayu R. Histopathological Correlation of Breast Carcinoma with Breast Imaging-Reporting and Data System. Malays J Med Sci. 2022;29(4):65–74. doi: 10.21315/mjms2022.29.4.7

13. Santiago Sanabria L, Gonzalez Sandoval DA, Meléndez Osuna A, Rendón Macias ME, Cisneros Vieyra AS. Hallazgos mastográficos benignos que simulan malignidad: un dilema diagnóstico. Ginecol Obs Mex. 2024;92(4):153–68. doi.org/10.24245/gom.v92i4.9218

14. Nguyen DL, Lotfalla M, Cimino-mathews MA, Habibi M. Radiologic-Pathologic Correlation of Nonmass Enhancement Contiguous with Malignant Index Breast Cancer Masses at Preoperative Breast MRI. Radiol Imaging Cancer. 2024;6(2):1–11. doi:10.1148/rycan.230060

15. Galati F, Rizzo V, Moffa G, Caramanico C, Kripa E, Cerbelli B, et al. Radiologic-pathologic correlation in breast cancer: do MRI biomarkers correlate with pathologic features and molecular subtypes? Eur Radiol Exp. 2022;7(6):1–13. doi: 10.1186/s41747-022-00289-7

16. Chesebro AL, Winkler NS, Birdwell RL, Gless CS. Developing Asymmetry at Mammography: Correlation with US and MR Imaging and Histopathologic Findings. Radiology. 2016;279(2):385–94. doi:10.1148/radiol.2015151131

17. Guirguis MS, Adrada B, Santiago L, Candelaria R, Arribas E. Mimickers of breast malignancy: imaging findings, pathologic concordance and clinical management. Insights Imaging. 2021;12(1):1–20. doi:10.1186/s13244-021-00991-x

18. Tamaki K, Ishida T, Miyashita M, Amari M, Ohuchi N, Tamaki N. Correlation between mammographic findings and corresponding histopathology: Potential predictors for biological characteristics of breast diseases. Cancer Sci. 2011;102(12):2179–85. doi:10.1111/j.1349-7006.2011.02088.x

19. Sechopoulos I, Teuwen J, Mann R. Seminars in Cancer Biology Artificial intelligence for breast cancer detection in mammography and digital breast tomosynthesis: State of the art. Semin Cancer Biol. 2021;72(2021):214–25. doi:10.1016/j.semcancer.2020.06.002

20. Cárdenas-Sánchez J, Valle-Solís AA. Erazo, Arce-Salinas Claudia, Bargalló-Rocha JE, Bautista-Piña V, Cervantes-Sánchez G, et al. Consenso Mexicano sobre diagnóstico y tratamiento del cáncer mamario. Decima revisión. Colima 2023. Gaceta Mexicana de Oncología. doi:10.24875/j.gamo.M23000257

21. Arnold M, Morgan E, Rumgay H, Mafra A, Singh D, Laversanne M, Vignat J, Gralow JR, Cardoso F, Siesling S, Soerjomataram I. Current and future burden of breast cancer: Global statistics for 2020 and 2040. Breast. 2022 Dec;66:15-23. doi:10.1016/j.breast.2022.08.010

22. Spak DA, Plaxco JS, Santiago L, Dryden MJ, Dogan BE. BI-RADS fifth edition : A summary of changes. Diagn Interv Imaging. 2017;98(3):179–90. doi:10.1016/j.diii.2017.01.001

23. Sanabria-Villegas L, Santiago-Sanabria L, Villafán-Athie M, Van Tienhoven X, Rodríguez-Castro R, Puente-Gómez A. Abordaje diagnóstico y terapéutico de la mastalgia. Un reto en la consulta ginecológica. Rev Centroam Obstet y Ginecol. 2023;27(3):95–107. doi:10.37980/im.journal.revcog.20232257

24. Mao X, He W, Humphreys K, Eriksson M, Holowko N, Yang H, Tapia J, Hall P, Czene K. Breast Cancer Incidence After a False-Positive Mammography Result. JAMA Oncol. 2024 Jan 1;10(1):63-70. doi:10.1001/jamaoncol.2023.4519

25. Bodewes FTH, Asselt AA Van, Dorrius MD, Greuter MJW, Bock GH De. Mammographic breast density and the risk of breast cancer: A systematic review and meta-analysis. The Breast. 2022;66:62–8. doi:10.1016/j.breast.2022.09.007

26. Ho TH, Bissell MCS, Kerlikowske K, Hubbard RA, Sprague BL, Lee CI, Tice JA, Tosteson ANA, Miglioretti DL. Cumulative Probability of False-Positive Results After 10 Years of Screening With Digital Breast Tomosynthesis vs Digital Mammography. JAMA Netw Open. 2022 Mar 1;5(3):e222440. doi:10.1001/jamanetworkopen.2022.2440

27. Offit LR, Chikarmane SA, Lacson RC, Giess CS. Frequency and Outcomes of BI-RADS Category 3 Assessments in Patients With a Personal History of Breast Cancer: Full-Field Digital Mammography Versus Digital Breast Tomosynthesis. AJR Am J Reontgenology. 2023;221(3):313–23. doi:10.2214/AJR.23.29067

28. McKinney SM, Sieniek M, Godbole V, Godwin J, Antropova N, Ashrafian H, Back T, Chesus M, Corrado GS, Darzi A, Etemadi M, Garcia-Vicente F, Gilbert FJ, Halling-Brown M, Hassabis D, Jansen S, Karthikesalingam A, Kelly CJ, King D, Ledsam JR, Melnick D, Mostofi H, Peng L, Reicher JJ, Romera-Paredes B, Sidebottom R, Suleyman M, Tse D, Young KC, De Fauw J, Shetty S. International evaluation of an AI system for breast cancer screening. Nature. 2020 Jan;577(7788):89-94. doi:10.1038/s41586-019-1799-6

29. Dembrower K, Crippa A, Colón E, Eklund M, Strand F, and the ScreenTrustCAD Trial Consortium. Artificial intelligence for breast cancer detection in screening mammography in Sweden: a prospective, population-based, paired-reader, non-inferiority study. The Lancet Digital Health. 2023 Oct 5;(10):e703 - e711. doi:10.1016/S2589-7500(23)00153-X

30. Maha R, Alison J, Michael S, Manvydas V. Triple assessment breast clinics: The value of clinical core biopsies. Irish J Med Sci (1971 -). 2024;193:565–70. doi:10.1007/s11845-023-03445-z