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CORRELATION OF MAMMOGRAPHIC AND HISTOPATHOLOGICAL FINDINGS IN PATIENTS SUBMITTED TO MAMMOTOMY

Correlação de achados mamográficos e histopatológicos de pacientes submetidas a mamotomia

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ABSTRACT

Objective: To correlate patients with BI-RADS 4 or 5 mammographic results submitted to mammotomy and compare these findings to histopathological ones. **Method:** We selected 111 patients with non-palpable breast lesions detected on mammography and who underwent mammotomy at Clínica de Oncologia e Mastologia de Natal. The samples were sent to the laboratory Dr. Getulio Sales, after x-ray of the pieces, and all patients had to use a titanium clip. **Results:** The prevalent age group was 41-50 years (40.5%); approximately 30.6% had a family history of breast cancer; among the patients selected, 97.3% had a BI-RADS 4 classification and 2.7%, a BI-RADS 5; with microcalcifications being the main reason for mammotomy indication in both cases. The distribution of benign and malignant lesions was 70 and 30%, respectively. The prevalent malignant lesion was ductal carcinoma *in situ* (58%). Clinical suspicion of malignancy according to BI-RADS 4 and 5 was statistically significant, p=0.018 [95%CI 0.28 (0.209–0.383)]. The degree of association verified through odds ratio showed that the BI-RADS 5 group had 72% less chance of having a benign lesion when compared to the BI-RADS 4 group. There were no reports of complications in patients submitted to mammotomy in the present study. **Conclusion:** Mammotomy proved to be a safe method to diagnose suspicious lesions (BI-RADS 4 and 5), and its results fit what is observed in the literature.

KEYWORDS: Breast cancer; early diagnosis; mammography.

RESUMO

Objetivo: Correlacionar as pacientes com resultado mamográfico BI-RADS 4 ou 5 submetidas a mamotomia e comparar os achados com os encontrados na histopatologia. **Método:** Foram selecionadas 111 pacientes as quais apresentavam lesões mamárias não palpáveis detectadas na mamografia e que realizaram mamotomia na Clínica de Oncologia e Mastologia de Natal. As amostras foram enviadas para o laboratório Dr. Getulio Sales, após radiografia das peças, e todas as pacientes tiveram de colocar clipe de titânio. **Resultados:** A faixa etária predominante foi de 41–50 anos (40,5%); cerca de 30,6% possuía histórico familiar de câncer de mama; entre as selecionadas, 97,3% possuíam classificação 4 do BI-RADS e 2,7% tinham classificação 5, predominando, em ambos os casos, as microcalcificações como indicação de mamotomia. A distribuição entre lesões benignas e malignas foi de 70 e 30%, respectivamente. A prevalência de lesões malignas foi de carcinoma ductal in situ (58%). Houve significância estatística com relação à suspeição de malignidade de acordo com o BI-RADS 4 e 5, p=0,018 [IC95%0,28 (0,209–0,383)]. O grau de associação verificado por meio da odds ratio mostra que o grupo BI-RADS 5 tinha 72% menos chance de ser benigno quando comparado ao grupo BI-RADS 4. Não houve relato de complicações nas pacientes submetidas a mamotomia no presente estudo. **Conclusão:** A mamotomia mostrou-se um método seguro no diagnóstico de lesões suspeitas (BI-RADS 4 e 5), estando dentro do observado na literatura.

PALAVRAS-CHAVE: Câncer de mama; diagnóstico precoce; mamografia.

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INTRODUCTION

Breast cancer is one of the main public health issues worldwide, and its incidence significantly increased in recent decades. According to a World Health Organization publication[1], breast cancer is the second most common type of malignant neoplasm among women in the world.

Mammography is an excellent early screening method for breast cancer, and, according to several studies, it results in a decrease in mortality, with a gain in overall survival[2].

Patients with BI-RADS 4 and 5 mammographic abnormalities receive an indication to incisional biopsy. These lesions have a higher suspicion of malignancy but do not always need a surgical procedure. However, diagnostic investigation through an invasive procedure with tissue removal and histopathological study is mandatory[3].

According to Hall, non-palpable lesions subjected to surgical biopsy have a malignancy rate of 15–30%, and mammographic screening has contributed to increasing the number of unnecessary procedures[4]. In this scenario, we can conclude that most surgeries could be avoided with regular patient follow-up.

Thus, percutaneous biopsy emerged as an alternative to surgical biopsy for diagnostic clarification of categories 4 and 5, providing a better cost-benefit ratio, shorter procedure time, greater comfort to the patient, and lower risk of complications, in addition to a smaller scar in the radiological follow-up examinations[5].

Vacuum-assisted percutaneous biopsy, also known as mammotomy, is a technique that can remove the entire lesion seen on mammography or ultrasound with a single needle insertion into the breast, extracting a larger volume of breast tissue and surpassing the core biopsy and Fine-Needle Aspiration. Stereotactic mammotomy has greater benefits, mainly in microcalcification removal[6].

According to Crippa, in a study performed with patients undergoing both ultrasound-guided and mammography-guided mammotomy, it was possible to demonstrate that the method was effective for histopathological study and precise in obtaining the necessary material[7]. A study with 397 patients submitted to ultrasound-guided mammotomy proved that the method was safe and had good accuracy, with a sensitivity of 97.4% and specificity of 100%[8].

Considering the need for a histological study with a group of patients with suspicious lesions (BI-RADS 4 and 5), our goal was to correlate the mammography radiological findings and compare them to histopathological results after removing these lesions with mammotomy.

METHOD

This is a cross-sectional, retrospective study based on the findings of histopathological results of women who underwent mammotomy at Clínica de Oncologia e Mastologia de Natal, the only institution that performed this procedure during the study period — from January 2010 to June 2015. We analyzed the following data: age, BI-RADS, distribution and morphology of mammographic findings, presence of benign or malignant lesions in the histopathological study and their distribution, family history of breast cancer, age at first pregnancy and menarche.

The sample consisted of patients with suspicious mammographic findings (BI-RADS 4 and 5) who underwent mammotomy in the location of the study. The exclusion criteria were lack of knowledge of referral to the procedure and lack of histopathological report.

Data were collected directly from the patients' medical records and pathology report, through a form elaborated by the researchers involved in the study, from January 2010 to June 2015. The collection occurred in the Medical Archive of Clínica de Oncologia e Mastologia de Natal, during the hours of operation.

The collected data were recorded in an encoded Microsoft Excel table, accessible with a password known only by the researchers. Subsequently, we analyzed the results using the software Statistical Package for Social Sciences (SPSS version 14.0). The variables were subjected to the χ^2 test. We considered significant all tests with $p<0.05$. Patients were identified by numbers on the data collection form to ensure that only the researchers involved had knowledge of and access to the information.

RESULTS

Clinical-epidemiological profile of the sample

Initially, we assessed 196 patients submitted to a diagnostic procedure, dismissing 85 for not having mammographic information and/or pathology report in their medical record. The remaining 111 patients underwent statistical analysis.

The prevalent age group was 40–50 years, which was expected due to the high demand for screening among these patients, resulting in a higher number of suspicious findings and diagnostic procedures (Graphic 1). Sixty-four percent of the patients breastfed their children for any period (Graphic 2). Less than half (30.6%) had a history of some relative with breast cancer (Graphic 3).

A large portion of patients with non-palpable lesions belonged to the age group 41–60 years, with a slight prevalence of the range 41–50 years. This result suggests the importance of screening the target population starting at 40 years of age to detect suspicious lesions early and, consequently, cancer cases still in their initial stages.

The findings of non-palpable lesions occurred predominantly in the UOQ of the left breast, followed by the UOQ of the right breast, and together they reached 63% of the cases (Table 1).

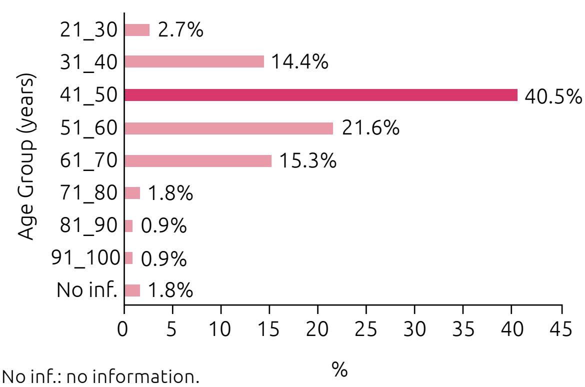
Almost all patients were in category 4 of BI-RADS, with only a few in category 5. Three patients were in category 0 for having dense breasts. However, it was possible to outline the lesions seen in mammography, and after reassessing the images, they were considered BI-RADS 4 (Graphic 4 and Table 2).

Microcalcifications were the main cause of mammotomy indications, followed by architectural distortions (Table 3).

Architectural distortions associated with microcalcifications classified as BI-RADS 5 had linear microcalcifications, following a ductal path (Table 4).

All BI-RADS 5 patients had a histopathological diagnosis of category 4 carcinoma; only 28.3% of them were cancer (Tables 5 and 6 and Graphic 5).

There were 33 cases (29.7%) of malignant lesions, with a prevalence of carcinoma *in situ*, corroborating that the mammographic findings contributed to the early detection of breast cancer (Table 7 and Graphic 6).



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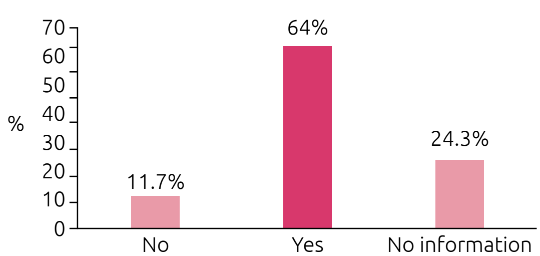
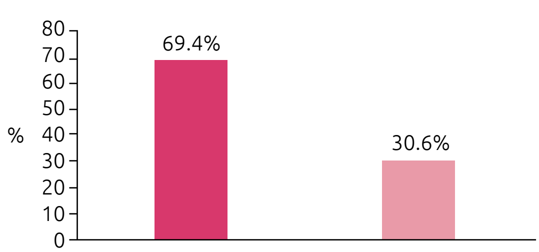
Graphic 1. Patient characteristics.



s: age group (years).

Graphic 2. Patient characteristics: breastfed.



Graphic 3. Patient characteristics: cancer history.

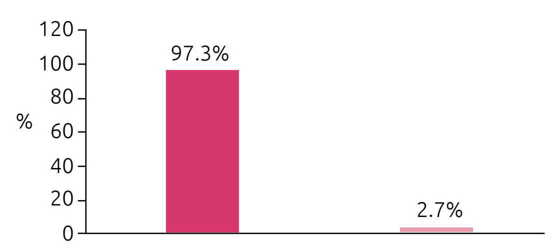
DESCRIPTION OF THE STATISTICAL ANALYSIS

The tabulation and exploratory data analysis were conducted based on descriptive statistics, using tables and measures to summarize the data for a better interpretation and

Table 1. Lesion distribution according to location.

Location	No. of patients	%
LUOQ	42	37.8
RUOQ	28	25.2
JRUQ	10	9.0
RRAR	6	5.4
JROQ	5	4.5
JRUQ+LUQ	4	3.6
RUOIQ	4	3.6
JRIQ	3	2.7
JLUQ	3	2.7
JLLQ	2	1.8
RLOQ	1	0.9
LLOQ	1	0.9
LLIQ	1	0.9
RUIQ	1	0.9
Total	111	100.0

LUOQ: left upper outer quadrant; RUOQ: right upper outer quadrant; JRUQ: junction of the right upper quadrants; RRAR: right retroareolar region; JROQ: junction of the right outer quadrants; JRUQ+LUQ: junction of the right upper quadrant and left upper quadrant; RUOIQ: right upper outer-inner quadrant; JRIQ: junction of the right inner quadrants; JLUQ: junction of the left upper quadrants; JLLQ: junction of the left lower quadrants; RLOQ: right lower outer quadrant; LLOQ: left lower outer quadrant; LLIQ: left lower inner quadrant; RUIQ: right upper inner quadrant.



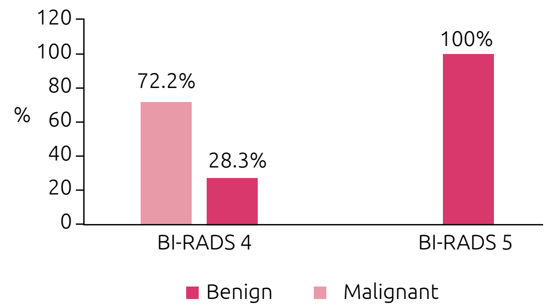
Graphic 4. Distribution according to the Breast Imaging-Reporting and Data System (BI-RADS).

Table 2. Distribution according to the Breast Imaging-Reporting and Data System (BI-RADS).

BI-RADS	Amount	%
4	108	97.3
5	3	2.7
Total	111	100.0

Table 3. Distribution according to mammotomy (MMT) indication.

MMT Indication	Amount	%
Microcalcifications	91	82
Architectural distortion	1	0.9
Focal asymmetry with microcalcifications	5	4.5
Calcifications	4	3.6
Focal asymmetry	1	0.9
Focal asymmetry with isolated calcification	1	0.9
Nodule with microcalcifications	1	0.9
Architectural distortion with microcalcifications	7	6.3
Irregular nodule	1	0.9
Total	111	100.0



Graphic 5. Distribution of Breast Imaging-Reporting and Data System (BI-RADS) according to benign and malignant diseases.

Table 4. Distribution according to Mammotomy (MMT) indication and Breast Imaging-Reporting and Data System (BI-RADS).

MMT Indication	BI-RADS		Gran
	4	5	Total
Microcalcifications	91	-	91
Architectural distortion associated with microcalcifications	4	3	7
Focal asymmetry with microcalcifications	5	-	5
Calcifications	4	-	4
Focal asymmetry	1	-	1
Focal asymmetry with isolated calcification	1	-	1
Nodule with microcalcifications	1	-	1
Architectural distortion	1	-	1
Total	106	3	111

Table 5. Comparison between mammography findings and histopathological classification.

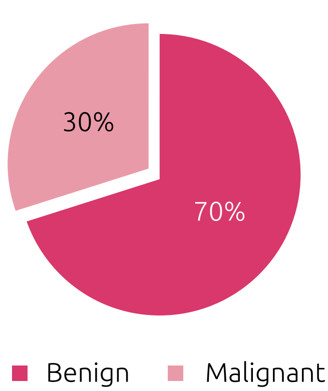
MMT Indication	Classification			
	Benign	(%)	Malignant	(%)
Focal asymmetry (N=1)	1	100.0	-	0.0
Focal asymmetry with isolated calcification (N=1)	1	100.0	-	0.0
Focal asymmetry with microcalcifications (N=6)	3	50.0	3	50.0
Nodule with microcalcifications (N=1)	1	100.0	-	0.0
Architectural distortion associated with microcalcifications (N=7)	1	14.3	6	85.7
Microcalcifications (N=91)	66	74.2	24	25.8
Architectural distortion (N=1)	1	100.0	-	0.0

Table 6. Distribution of Breast Imaging-Reporting and Data System (BI-RADS) according to benign and malignant diseases.

BI-RADS	Benign	%	Malignant	%	Grand Total
4	78	71.7	30	28.3	108
5	0	0.0	3	100.0	3
Total	78	-	33	-	111

Table 7. Distribution of histopathological diagnosis.

Diagnosis	Lesions	%
Benign (N=78)		
Dystrophic calcification	64	82.1
Dystrophic microcalcifications	5	6.4
Fibroadenoma	2	2.6
Fibrosis	2	2.6
Sclerosing Adenosis	1	1.3
Microscopic cyst	1	1.3
Fibroadenoma with calcifications	1	1.3
Usual ductal hyperplasia (UDH)	1	1.3
Stromal microcalcifications	1	1.3
Malignant (N=33)		
High grade ductal carcinoma *in situ*	13	39.4
Invasive ductal carcinoma G3	5	15.2
Invasive ductal carcinoma G2	3	9.1
Intermediate grade ductal carcinoma *in situ*	4	12.1
Lobular carcinoma *in situ*	2	6.0
Invasive ductal carcinoma G1	2	6.0
Invasive ductal carcinoma G2 + High grade ductal carcinoma *in situ*	1	3.0
Invasive lobular carcinoma G2	1	3.0
Invasive ductal carcinoma G2 + Low grade ductal carcinoma *in situ*	1	3.0
Invasive ductal carcinoma G2 + Intermediate grade ductal carcinoma *in situ*	1	3.0
Total	111	-



Graphic 6. Percentage of benign x malignant histopathological findings.

presentation of results. We used the software Microsoft Excel to analyze the data, and SPSS 20 for Windows (IBM, USA) to perform the χ^2 statistical test, at a significance level of 5%, in order to assess whether an association between the variables existed. The degree of association was verified through odds ratio.

Test of association between variables

To evaluate if there was an association between the variables "BI-RADS" and "condition (benign or malignant)," we conducted the χ^2 statistical test, with a significance level of 5%. We can confirm that the association between BI-RADS and condition (benign or malignant) was significant, p=0.018. The degree of association verified through odds ratio showed that the BI-RADS 5 group had 72% less chance of having a benign lesion when compared to the BI-RADS 4 group (Table 8).

DISCUSSION

The early diagnosis of breast cancer has been one of the greatest allies in its treatment. Periodic mammography with screening indication for women aged 40 years and older has become the main form of detection of suspicious lesions in the early stages of cancer, especially suspicious microcalcifications. However, this method fails to diagnose approximately 10–30% of cancer cases. The age group of patients was wide, ranging from 21 to 90 years.

The patients submitted to this procedure were mostly 40- to 50-year-olds, indicating that finding non-palpable lesions at this age can aid in the early diagnosis of breast neoplasms. All patients underwent stereotactic mammotomy. Less than half of the patients (30.6%) had a family history of breast cancer, confirming that the study included a heterogeneous sample, consistent with what we usually see in a screening population. Over half of the lesions were in the upper quadrants (63%), which can be justified by the greater volume of breast tissue in this location.

According to mammographic findings, the vast majority of patients belonged to the group of category 4 lesions (97.3%), with microcalcifications as one of the main causes of indication. At first, some tests classified as category 3 and 0 received a mammotomy indication, with a reassessment of the lesions and reclassification as category 4.

Table 8. Association between variables.

BI-RADS	Benign (%)	Malignant (%)	OR (95%CI)	P
4	71.7 (76)	28.3 (30)	0.28 (0.209–0.383)	0.018
5	0 (0)	100 (3)		

BI-RADS: Breast Imaging-Reporting and Data System; OR: odds ratio; 95%CI: confidence interval of 95%.

Our study identified that microcalcifications had the higher number of mammotomy indications (80.2%). In a study conducted by Tonegutti et al.[9], microcalcifications represented 77.5% of indications for patients who underwent mammotomy. According to Chagas et al.[10], suspicious microcalcifications are associated with 20–30% of cases of carcinoma in general, both *in situ* and invasive. Chala and Shimizu[2] consider microcalcifications one of the most important signs of non-palpable breast cancer, detected almost exclusively by mammography, with a high probability of ductal carcinoma *in situ*. In the present study, we found a value of 28%, which is in agreement with the literature.

The other malignant lesions were focal asymmetry associated with microcalcifications (50% were malignant) and architectural distortion associated with microcalcifications (85.7% were malignant). Thus, we can affirm that these findings had a higher degree of suspicion for histopathological diagnosis of malignancy.

Asymmetries can be the initial findings of a tumor before it progresses to a nodule. They represent an area of fibroglandular tissue, which is larger in one breast when compared to the contralateral one. Focal asymmetries are restricted to a small area of the breast, occupying less than one quadrant, and have a higher degree of suspicion of malignancy. When associated with another finding, such as microcalcifications, the final classification is the one of the more suspicious finding (BI-RADS 4)[3]. In our study, focal asymmetries associated with suspicious microcalcifications had a high rate of malignancy: three cases of carcinoma out of six.

Architectural distortions, when not associated with trauma, surgery history, or inflammatory process, are considered suspicious and require diagnostic investigation. They represent 5–10% of non-palpable carcinomas detected on mammography screening[10]. In the present study, this value was far from the aforementioned since only one patient had just architectural distortion, and the histopathological diagnosis was benign. However, when associated with microcalcifications, the incidence of malignancy was 85.5%. The cases of architectural distortion with linear microcalcifications were radiologically classified as BI-RADS 5.

The malignant findings in patients were distributed in the following manner: 78% had carcinoma *in situ*, and the others had invasive carcinoma, which suggests that a good screening method and precise diagnostic confirmation can early detect lesions still in their initial stage. According to the literature, mammotomy has good accuracy in diagnosing carcinoma *in situ*, with an underestimation of less than 10% for invasive carcinoma. As our work did not aim to calculate its accuracy, we did not compare mammotomy with other diagnostic methods.

The results of malignant findings in patients submitted to mammotomy according to the BI-RADS classification for suspicious lesions showed that among those in category 4, 30 out of 108 patients had cancer (28%), which is within the expected in the literature for a final cancer diagnosis (20–30%)[2]. In cases of benign diagnosis, patients can be safely monitored, decreasing costs, and avoiding the morbidity of surgery.

All three patients with lesions classified as highly suspicious (category 5) had a diagnosis of cancer, totaling 100%. Other authors have reported similar results, with the malignancy rate ranging from 85–100%[6,8]. In these cases, entirely removing the lesion from a radiological point of view does not mean entirely removing the neoplasm from the surgical specimen, and a complementary surgery is necessary according to pathological findings. Therefore, in this situation, other diagnostic methods with better cost-benefit ratio could be more indicated, such as the mammography-guided core biopsy.

Although there are complication reports in the literature, mainly related to bleedings and hematomas, with rates between 2 and 7%, this study had no such cases. The care methods taken were administering anesthesia with local vasoconstrictor effects, local compression, instructions for cryotherapy and use of a bra, and compression dressing for home, in addition to leaving the patient under observation for approximately one hour after the procedure.

Considering the concordance between our work and data from the literature, we can affirm that mammotomy is a suitable method to investigate suspicious lesions, especially those classified as BI-RADS 4, and is diagnostic and curative for benign lesions.

Subsequently, the study can be improved with the inclusion of histopathological findings in patients who underwent surgery to try to find whether the lesions were entirely removed, as well as the follow-up of the other patients.

CONCLUSIONS

Mammotomy proved to be a safe and efficient method to investigate suspicious non-palpable lesions, such as those found in mammographies, having a malignancy rate within the expected according to the literature. Benign cases could be regarded as treated.

Among the malignancy findings, the prevalence of lesions *in situ* favors the early diagnosis of breast cancer, allowing a higher chance of cure and reconstructive surgeries.

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