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MALE BREAST DISEASES: ICONOGRAPHIC ESSAY

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Abstract: Male breast diseases are a group of rare conditions, around 100 times less common than female breast diseases, and there have been few studies. Therefore, the scarcity of studies on male breast diseases justifies the need to explore and document these conditions in order to improve the understanding and clinical management of these rare pathologies. This is an observational and descriptive study of male breast diseases, including five patients from an imaging clinic in Manaus. The study identified breast conditions in men, including gynecomastia, epidermal inclusion cyst, non-Hodgkin's lymphoma, invasive ductal carcinoma and breast metastasis secondary to sarcoma. Gynecomastia is the most common benign condition among male breast pathologies, manifesting as a soft and mobile subareolar mass, which can be unilateral or bilateral, and is often diagnosed by mammography. Epidermal inclusion cysts are palpable nodules, usually asymptomatic, which can cause diagnostic confusion. On ultrasound, they appear as hypoechoic lesions with an "onion skin" appearance, with no Doppler flow, located in the subepidermal region. Non-Hodgkin's lymphoma in the male breast is rare and is identified by clinical features and ultrasound, such as the presence of solid masses and associated lymphadenopathy. Invasive ductal carcinoma is an aggressive neoplasm, often identified by a palpable nodule in the retroareolar region and Doppler ultrasound. Breast metastasis secondary to sarcoma, on the other hand, is a rare finding, in which these metastases present as firm, painless nodules that can be mistaken for primary breast neoplasms. Therefore, this study contributes to expanding knowledge about these conditions, identifying their clinical manifestations and imaging findings. Correct identification is essential for the precise indication of biopsy and for the early start of treatment, highlighting the importance of further studies to improve understanding of male breast diseases.

Keywords: male breast neoplasms, ductal breast carcinoma, non-Hodgkin's lymphoma, metastasis, epidermal cyst.

INTRODUCTION

Male breast diseases are a group of very uncommon diseases in our country, most of which have had few studies on their etiologies, but it is known that hormonal, environmental and genetic factors are related to their development (Appelbaum *et. al.*, 1999). The breasts are the same at birth in boys and girls, consisting of breast lobules that drain through lactiferous ducts to the nipple (Vendramini; Scarelli; Costenaro, 2017*).* Because they are rare and there is little literature on them, the diagnosis and treatment of male breast diseases is based on the protocols in force for female breast diseases.

However, it is worth noting that the male breast is subject to the same conditions as the female breast, but with a delay in diagnosis because its causes are still poorly understood, but risk factors include endocrine aspects, family history, age and occupational exposure (Rodrigues et al., 2021). According to Duarte, Duarte and Nicolaides (2019), among male breast diseases, the most common are benign alterations, such as gynecomastia, pseudogynecomastia, dermal inclusion cysts, lipomas and others. Malignant forms include invasive ductal carcinoma, papillary carcinoma, metastases and lymphoma.

In the prepubertal period, breast differentiation occurs. In boys, testosterone peaks, leading to involution and atrophy of the breast ducts. In girls, oestrogen secreted by the ovaries stimulates ductal proliferation and branching, and progesterone stimulates the development of terminal ductolobular units. The transient increase in serum estradiol at

the onset of puberty can cause proliferation of subareolar ducts and stroma in males. This condition is usually self-limiting due to the neutralizing effect of testosterone on estradiol as boys move from puberty to adulthood (Appelbaum *et. al.*, 1999).

In Brazil, especially in the Amazonas region, there are few studies on breast pathologies in men. The National Cancer Institute (INCA) provides limited data, focusing mainly on deaths from male breast cancer. This gap makes it essential to describe and correlate epidemiological aspects, pathological and family histories, as well as the signs and symptoms present at the time of diagnosis.

Mammography is considered the method of choice for the initial assessment of any changes in the male breast, with ultrasound being used as an important complement for assessing the axilla. Treatment follows the protocols established for female breast cancer. The analysis of mammographic, ultrasound, histopathological and immunohistochemical findings is crucial for a complete understanding of these conditions.

Familiarity with these diseases is important for the accurate interpretation of imaging tests, which facilitates early diagnosis and appropriate treatment, as well as helping to avoid overdiagnosis and overtreatment. This paper addresses pathologies such as gynecomastia, male breast cancer, male lymphoma and some benign breast neoplasms, highlighting the importance of a comprehensive approach to the management of these conditions in men.

In this context, this study aims to analyze the pathologies associated with the clinical and imaging findings of gynecomastia in patients at the Sensumed Medicina Diagnóstica Integrada clinic in Manaus. The specific objectives include identifying and categorizing the most common types of pathologies associated with imaging findings.

METHODOLOGY

This is an observational and descriptive study, focusing on male breast diseases, which are relatively rare in the scientific field. The study included five patients seen at the Sensumed Medicina Diagnóstica Integrada clinic, located in Manaus.

The cases were selected from the laboratory's database using specific inclusion criteria: male patients with confirmed diagnoses of breast abnormalities. Exclusion criteria included patients with a history of previous treatment for breast conditions or those whose records were incomplete.

Data was collected retrospectively from patients' medical records and imaging reports. Demographic information (such as age), relevant medical history, clinical symptoms and the results of imaging tests (ultrasound, mammography, etc.) were extracted.

The pathologies observed in the five cases included gynecomastia, epidermal inclusion cyst, non-Hodgkin's lymphoma, invasive ductal carcinoma and breast metastasis secondary to sarcoma. Each case was analyzed in terms of clinical presentation, imaging findings and differential diagnoses.

Data analysis was conducted in a qualitative manner, focusing on describing the patterns found in the clinical and imaging findings. The correlation between clinical characteristics and imaging results was assessed for each pathology identified. However, it is worth noting that the study was conducted in accordance with the ethical guidelines for medical research, guaranteeing the confidentiality and anonymity of the patients involved.

RESULTS

Normal adult male breasts are composed of skin, subcutaneous fat, stromal elements, a small areolopapillary complex and a poorly developed ductal system that ends in a blind bottom (Duarte; Duarte; Nicolaides, 2019). However, the normal male breast is predominantly composed of skin and fat, with Cooper's ligaments and Duret's ridges absent.

Lobular breast development is rare in men because it is not stimulated by estrogen and progesterone. Therefore, breast pathologies related to lobular proliferation, such as *phyllodes* tumor, fibroadenoma, invasive lobular carcinoma and lobular carcinoma in situ, are extremely rare in men. Pathologies related to ductal and stromal proliferation, such as gynecomastia, invasive ductal carcinoma, ductal carcinoma in situ and papillary neoplasia, may occur more commonly in men (Nguyen *et. al.,* 2013).

In this context, the results of this study were based on an analysis of the pathologies observed in five cases. The conditions included gynecomastia, epidermal inclusion cyst, non-Hodgkin's lymphoma, invasive ductal carcinoma and breast metastasis secondary to sarcoma. Each case was examined for its clinical presentation, imaging findings and differential diagnoses.

Gynecomastia, being the most common condition, was characterized by a benign increase in breast tissue, often associated with hormonal imbalances and characterized on mammography. Epidermal inclusion cysts, although rare, presented as asymptomatic palpable nodules and could cause diagnostic confusion. Non-Hodgkin's lymphoma, although uncommon in the male breast, was identified through clinical and ultrasound characteristics, presenting as solid masses associated with lymphadenopathy.

Invasive ductal carcinoma stood out for its aggressiveness and was identified as a nodule in the retroareolar region on ultrasound, highlighting the importance of early diagnosis. Finally, breast metastasis secondary to sarcoma was a rare finding, underlining the diagnostic complexity of ultrasound.

GYNECOMASTIA

In the five cases studied, gynecomastia was identified as the benign pathology among the patients. The condition is characterized by benign proliferation of breast tissue resulting from a hormonal imbalance between estrogen and androgens. It was observed that gynecomastia occurs predominantly in newborns, peri-pubertal boys and men over the age of 50, corroborating the study by Nguyen et al. (2013). The causes identified included endocrine disorders, systemic diseases, the use of certain medications and, in some cases, neoplasms.

Clinically, gynecomastia manifests as a soft and mobile subareolar mass, which can be unilateral or bilateral, symmetrical or asymmetrical, painful or painless (Matos; Souza, 2021). In the patient studied, the condition was unilateral and asymptomatic.

Mammography is the test of choice for assessing gynecomastia. Mammographic patterns include:

a) Nodular: identified in the initial phase of the condition, lasting less than a year. It is characterized by a nodule or fan-shaped density radiating from the nipple, and is a reversible phase;

b) Dendritic: represents a later and irreversible phase, with subareolar density that extends into the deep fatty tissue, indicating an irreversible fibrotic phase;

c) Diffuse: resembles the female breast exposed to high levels of oestrogen, presenting as heterogeneous and dense.

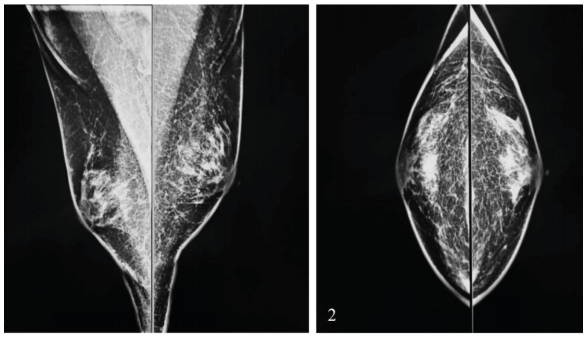
To this end, ultrasound, which complements the diagnostic assessment, shows the following patterns:

a) Nodular: subareolar area in the shape of a fan or disk, with indistinct boundaries, hypoechoic and captured by Doppler;

b) Dendritic: hypoechoic nodule with spicules or digitiform projections (stromal fibrosis), with no Doppler flow;

c) Diffuse: hypercohesive pattern of breast tissue.

Figures 1 and 2 show a high-resolution mammogram of a male patient, in craniocaudal and mediolateral oblique views. The images reveal the presence of symmetrical fibroglandular tissue in the breasts, a characteristic finding of gynecomastia. The symmetry observed in the tissue suggests benign proliferation typical of this condition. Detailed mammography allows the internal structures to be characterized, helping to differentiate gynecomastia from other breast pathologies by showing the absence of suspicious lesions or significant asymmetry.



Figures 1 and 2: Craniocaudal and mediolateral-oblique high-resolution mammograms of a male patient showing symmetrical fibroglandular tissue bilaterally.

DERMAL INCLUSION CYSTS

Dermal inclusion cysts represent the third most common benign condition among male breast anomalies. These cysts originate from an obstructed hair follicle located between the dermis and the subcutaneous tissue. They are characterized by rounded, circumscribed formations measuring between 1.0 and 5.0 cm. On mammography, these lesions appear as hyperdense areas, and on ultrasound, they are anechoic or hypoechoic, often displaying an "onion skin" appearance due to the presence of laminated keratin in the cyst wall (Vendramini; Scarelli; Costenaro, 2017*)*.

Figure 3 shows an ultrasound of the male breast which shows a hypoechoic, circumscribed nodule with an "onion skin" appearance, subepidermal in location, with no Doppler flow, corroborating the diagnosis of a dermal inclusion cyst. These imaging findings are essential for distinguishing cysts from other breast lesions and guiding appropriate clinical management.

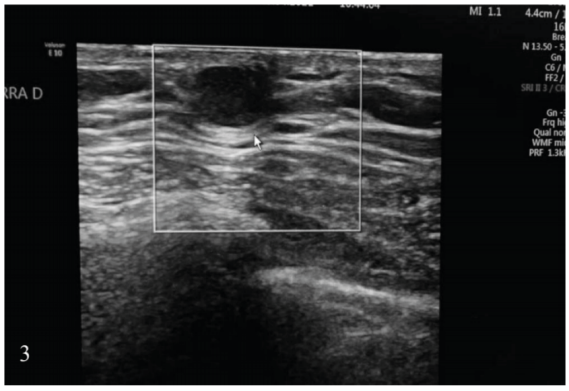
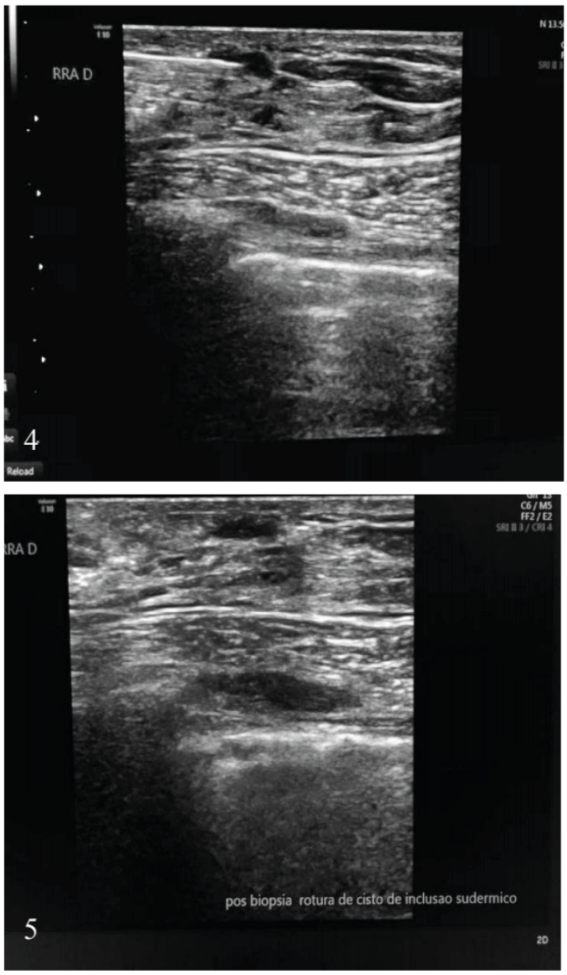


Figure 3: Ultrasound of the male breast showing a hypoechoic lesion with an "onion skin" appearance, without Doppler flow, located in the subepidermal region.

Figures 4 and 5 show sequential ultrasounds of the male breast. The first image shows a subdermal cyst in the retroareolar region of the right breast with a core biopsy needle inside. After the biopsy, the cyst shows a significant reduction in size, which confirms its cys-

tic nature. This post-biopsy change indicates that the contents of the lesion were partially drained or displaced during the procedure. The reduction in size of the lesion after biopsy not only reinforces its classification as cystic, but also provides valuable information for differential diagnosis, helping to exclude malignant possibilities and guiding appropriate treatment.



Figures 4 and 5: ultrasound of the male breast showing a subdermal cyst (4) with a core biopsy needle inside. After biopsy, the lesion has reduced in size, which confirms its cystic nature.

NON-HODGKIN'S LYMPHOMA

Breast lymphoma is a rare form of extranodal manifestation of non-Hodgkin's lymphoma (NHL) that tends to affect men in their mid-60s, with few cases yet described in the literature. NHL of the breast corresponds to around 0.04% to 0.5% of malignant lesions of the mammary gland (Vignot et. al., 2005).

Non-Hodgkin's lymphoma (NHL) is a type of cancer that affects lymphocytes, the essential cells of the lymphatic system. The main types of lymphocytes are B cells, T cells and natural killer cells. Lymphomas can be classified as primary or secondary, depending on their origin. B-cell lymphoma is the most common form of primary breast lymphoma, although it is still rare, and corresponds to around 0.04% to 0.5% of malignant lesions of the mammary gland (Aviv et al., 2013).

In primary lymphoma, the breast is the main or only site of the disease, while in secondary lymphoma, the breast is affected along with other sites (Aviv et al., 2013). Diffuse large B-cell lymphoma is the most common type of NHL and can occur at any age, but is more common in men.

Risk factors for NHL include a weakened immune system, autoimmune diseases, some infections, previous cancer treatments, exposure to the insecticide Lindane, a family history of NHL, and breast implants. NHL can present with indolent or aggressive growth, most commonly with the formation of a painless mass in the outer quadrants of the breast (Anne et al., 2011).

Associated symptoms can include fever, night sweats, unexplained weight loss, palpable and painless lymph nodes in the armpits, neck or groin, skin rashes, itching and unexplained fatigue. Although mammography and ultrasound do not offer distinct features to differentiate NHL from other types of breast cancer or benign nodules, CT scans are useful for staging and identifying involved lymph

nodes (Anne et al., 2011). The definitive diagnosis is made by excisional or core needle biopsy, with B-cell lymphoma being the most common histological type identified.

Figure 6 shows a palpable nodule in the transition between the superolateral quadrant of the right breast and the ipsilateral axillary extension. This area is frequently examined due to the presence of breast tissue that may be susceptible to alterations. The presence of a nodule in this region indicates the need for additional diagnostic evaluation, such as mammography and/or ultrasound, in order to determine its characteristics and guide appropriate treatment.

Figure 6: Palpable nodule in the transition between the upper lateral quadrant of the right breast and the ipisilateral axillary extension.

The same patient underwent ultrasound which showed an oval-shaped mass, parallel to the skin, heterogeneous, with a circumscribed margin and hypervascularized on the color Doppler study, measuring around 5.5 x 3.4 cm, as shown in figure 7. The hypervascularization observed suggests an increase in blood flow, which corresponds to tumoral or inflammatory activity. The size and characteristics of the mass on the image are important for differential diagnosis and can guide the need for biopsy or other diagnostic interventions.

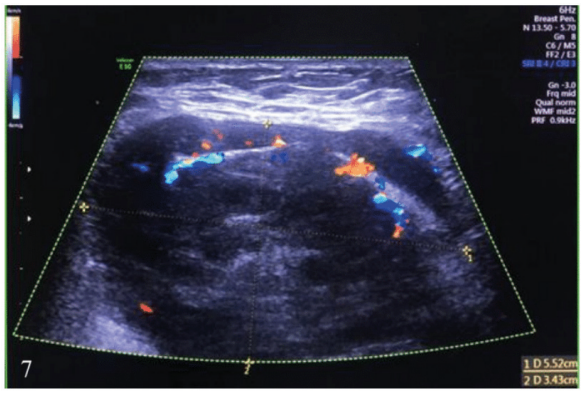


Figure 7: ultrasound of the right breast showing an oval-shaped mass, parallel to the skin, heterogeneous, with a circumscribed and hypervascularized margin, measuring approximately 5.5 x 3.4 cm.

An ultrasound of the right axillary region was then carried out, which showed lymphadenopathy at level 2, measuring 1.9 x 1.5 cm, as shown in figure 8. This change in size and echographic characteristics may indicate an inflammatory/infectious response or even suggest a malignant process. Detailed imaging helps to assess morphology and blood flow, which is important for differential diagnosis and to determine the need for additional procedures, such as biopsy.

Figure 8: ultrasound of the right axillary region showing lymphadenopathy at level 2, measuring approximately 1.9 x 1.5 cm.

The same patient underwent breast MRI which showed a hyperintense, heterogeneous mass in the superolateral quadrant of the right breast, as shown in figure 9. The high signal intensity of the mass indicates the presence of anomalous tissue or fluid, while the heterogeneity indicates variations in its composition, which may be relevant to the differential diagnosis between benign and malignant processes. Based on the images analyzed, a core needle biopsy was indicated. The histopathological study confirmed the diagnosis of NHL.

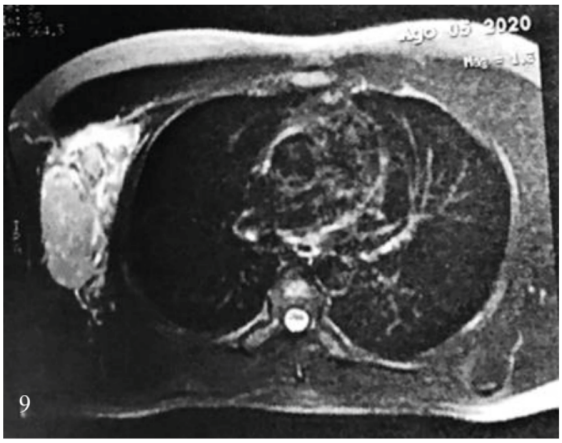


Figure 9: MRI scan showing a hyperintense, heterogeneous mass in the superolateral quadrant of the right breast.

MALE BREAST CANCER

Male breast cancer is a rare condition and represents only 0.5-1% of all cases of malignant neoplasms in men. This low incidence is due to the reduced amount of breast tissue and the differences in the hormonal environment in men. The highest incidence occurs between the ages of 52 and 71, with a peak at the age of 71 (Gómez-Raposo et al., 2010). In 1970 the rate was 1.1/100,000 inhabitants, in 2010 it was 1.44/100,000 inhabitants (Fentinan; Fourquet; Hortobagyi, 2006).

The causes of male breast cancer are still not fully understood. However, several risk factors have been identified, including endocrine factors, family history, Klinefelter's syndrome, gynecomastia, advanced age and certain occupational exposures. Most tumors are of the invasive ductal type (90%), while the lobular type is rare (1.5%) due to the absence of the ductolobular unit in men (Vendramini; Scarelli; Costenaro, 2017).

From an immunohistochemical point of view, most tumors are positive for estrogen receptors (80-90%), which favors the use of hormone therapy as treatment. Clinically, male breast cancer manifests as a palpable and painless mass, which may present with ulceration, skin retraction and nipple discharge. Around 75% of cases may present as a subareolar mass, with the left breast being more affected than the right. The average time between the onset of symptoms and diagnosis has fallen from 29 months to around 6 months in recent years (Gómez-Raposo et al., 2010; Duarte; Duarte; Nicolaides, 2019).

According to Nugyen et al. (2013), mammography is the test of choice for palpable lesions, which are usually visualized as a well--defined hyperdense mass, eccentric to the nipple, with a spiculated margin, or as an architectural distortion. On ultrasound, the lesions are solid in invasive cancer, often associated with skin thickening, papillary retraction and axillary lymphadenopathy.

Figure 10 shows a palpable nodule in the areolopapillary complex of the right breast in a man. This location is common for the development of breast alterations in men and can indicate benign conditions, such as gynecomastia, or malignant ones, such as male breast cancer. It is worth noting that the palpability of the nodule suggests that it is of sufficient size and consistency to be detected during physical examination, which motivates further diagnostic investigations, such as mammography or ultrasound, in order to determine its nature and guide appropriate clinical management.

Figure 10: palpable nodule in the areolopapillary complex of the right breast.

To this end, an ultrasound of the patient's right breast was carried out, which showed an irregularly shaped, heterogeneous nodule, not parallel to the skin, with a non-circumscribed and avascular margin, located in the retroareolar region. The imaging aspect is suspicious of malignancy.

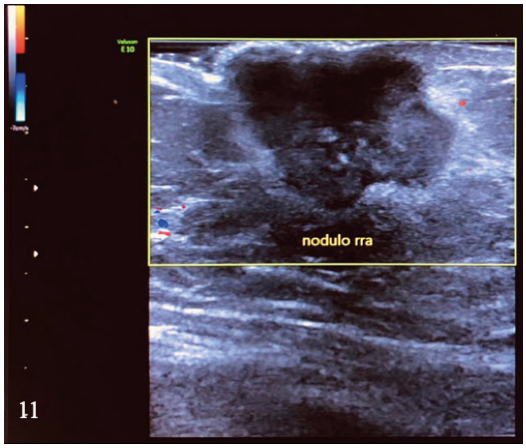


Figure 11: ultrasound showing an irregularly shaped, heterogeneous nodule, not parallel to the skin, with a non-circumscribed, avascular margin, located in the retroareolar region of the right breast.

The ultrasound scan was then extended to the patient's ipsilateral axillary region, as shown in figure 12, where lymph node disease was observed, characterized by a hypoechoic echotexture, cortical thickening, which indicates an anomalous or pathological response, suggestive of malignancy, and absence of the fatty hilum, which is normally visible in healthy lymph nodes. In addition, irregularity of the lymph node capsule was observed. The combination of these echographic features indicated the need for further investigation by biopsy, which resulted in invasive ductal carcinoma.

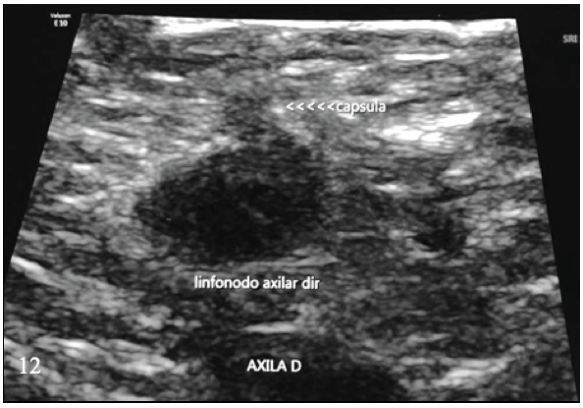


Figure 12: ultrasound of the right axillary region showing a hypoechoic atypical lymph node with a thickened cortex and no fatty hilum.

BREAST METASTASIS SECONDARY TO SARCOMA

Metastasis to the male breast mainly originates from prostate or lung neoplasms, and in some situations it is difficult to locate the primary site, as well as differentiate it from invasive ductal carcinoma (Duarte *et al.*, 2019).

According to Özsen et al. (2024), breast metastases secondary to sarcoma are rare events, but represent an important differential diagnosis in patients with a history of sarcoma, since it is a type of cancer that originates in connective tissues, including bones, muscles, cartilage and fat, and can generate metastases in various organs, including the breasts.

Metastases to the breast from non-breast tumors are uncommon, accounting for less than 2% of all malignant breast tumors. In the context of sarcomas, the incidence of breast metastasis is even lower. Women are more often affected than men, due to the greater

amount of breast tissue. The average age of patients with breast metastases from sarcomas varies, but often affects young or middle-aged adults (Upadhyay et al., 2020).

Clinically, breast metastases from sarcomas often present as firm, painless nodules that can be mistaken for primary breast neoplasms. Differentiation is crucial, as management and prognosis differ significantly between primary breast tumors and secondary metastases. Imaging features can help, but confirmation requires biopsy and histopathological analysis.

Figure 13 shows an ultrasound of the left forearm of a male patient, showing a solid nodule with characteristics suggestive of a primary neoplasm, possibly a soft tissue sarcoma. The nodule showed necrotic or cystic components, indicating areas of degeneration or internal liquefaction, which are often seen in aggressive neoplasms. The vascularization observed on Doppler study suggests an active blood supply, which is common in malignant tumours due to angiogenesis. These findings are compatible with a soft tissue sarcoma, a category of tumor that originates in connective tissues, such as muscles, tendons or fat, and which can present locally invasive behavior and potential for metastasis.

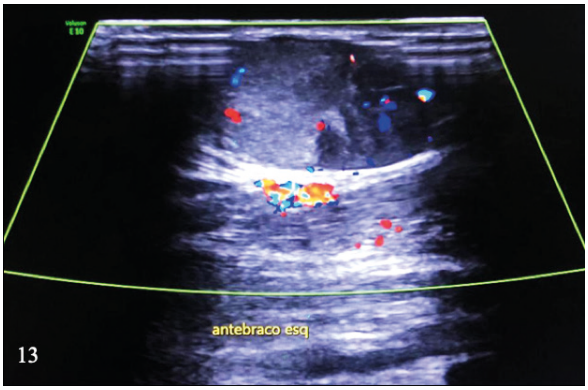
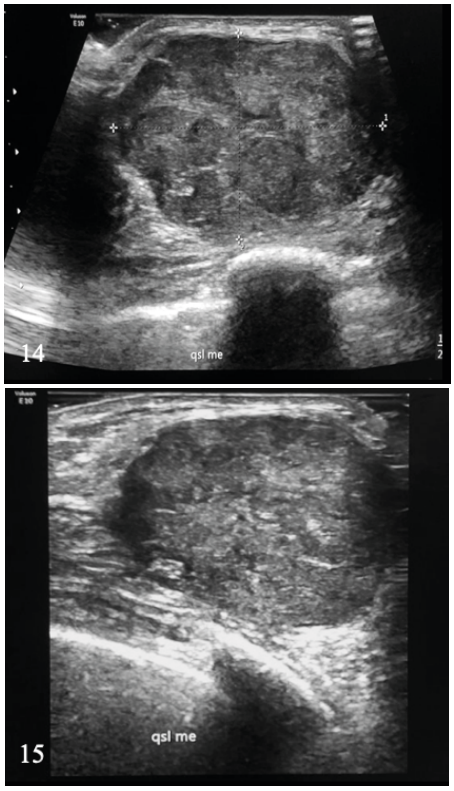


Figure 13: Ultrasound of the left forearm showing a solid nodule with a necrotic/cystic component, vascularized on Doppler, compatible with a primary neoplasm (soft tissue sarcoma).

Ultrasound of the left breast of the same patient showed an oval mass, parallel to the skin, with an uncircumscribed and heterogeneous margin, in the superolateral quadrant, compatible with metastatic neoplasia, the primary tumor being sarcoma. Figures 14 and 15 show the transverse and longitudinal sections of the mass, allowing a better assessment of its characteristics.



Figures 14 and 15: ultrasound of the left breast showing a mass in the superolateral quadrant of the left breast, in the transverse (figure 14) and longitudinal (figure 15) sections, compatible with metastatic disease.

CONCLUSION

The main objective of the study was to analyze the pathologies associated with the clinical and imaging findings of some breast diseases in male patients. The conditions observed included gynecomastia, epidermal inclusion cyst, non-Hodgkin's lymphoma, invasive ductal carcinoma and breast metastasis secondary to sarcoma.

The correlation between clinical and imaging findings was assessed for each pathology identified. Mammography was the test of choice for assessing gynecomastia, and can reveal patterns such as nodular, dendritic and diffuse. The symmetry observed in breast tissue suggests benign proliferation, typical of gynecomastia, and mammography allows gynecomastia to be differentiated from other breast pathologies, such as neoplasms.

Therefore, knowledge of the imaging pattern of the main breast lesions in male patients helps to differentiate between the various benign and malignant pathologies. Although these are relatively rare diseases, understanding the characteristics of these diseases in the various imaging methods, whether ultrasound, mammography or magnetic resonance imaging, is fundamental for the correct interpretation and indication of the histopathological study, thus reducing diagnosis time and starting treatment early.

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