Image characteristics of male breast disorders.

Santana-Vela IA¹, Córdova-Chávez NA¹, Putz-Botello MD¹, Onofre-Castillo JJ², Cuevas-Betancourt RE¹, Arreozola-Mayoral MA²

Abstract

OBJECTIVE: review the image characteristics of different disorders in differential diagnosis of benign and malignant processes of the male breast. Discuss the most common diseases seen at Hospital Christus Muguerza Alta Especialidad.

MATERIAL AND METHODS: we studied 40 patients in the period from January 2011 through December 2015. We searched the database of Hospital Christus Muguerza Alta Especialidad to identify patients who underwent studies of mammography, ultrasound, and subsequent biopsy of mammary lesions.

RESULTS: the disorder most commonly observed is of the benign variety; gynecomastia was the most common diagnosis (60.9%). We detected 4.3% of patients with malignant conditions; usually palpable tumors reported as invasive ductal adenocarcinomas.

DISCUSSION: in our population we found a majority of benign conditions, with gynecomastia the most common diagnosis. The malignancy reported most commonly was invasive ductal adenocarcinoma, a finding concurring with the specialized literature. We should take into account the BI-RADS reporting system, which does not make the distinction between female or male gender.

CONCLUSIONS: benign mammary disorders are the most common in male patients, and gynecomastia is the disorder of greatest incidence. Although malignant pathology of the male breast is uncommon, it is important to take into account the various clinical and image manifestations which suggest this diagnosis, to provide comprehensive and opportune treatments.

KEYWORDS: male breast; mammography; ultrasound

¹Médico radiólogo del Hospital Christus Muguerza Alta Especialidad con calificación agregada en imagen de mama.
²Médico radiólogo del Hospital Christus Muguerza Alta Especialidad. Jefe Departamento de Imagenología del Hospital Christus Muguerza. Hospital Christus Muguerza Alta Especialidad. Hidalgo Pte. # 2525 Col. Obispado, 64060, Monterrey, N. L.

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Correspondence
Ingrid Anel Santana Vela
ingridansantana@hotmail.com

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INTRODUCTION

Before puberty, the development of the breast is similar in males and females. During puberty, the male breast develops ductal structures but, without estrogen stimulation, the lobular structures do not grow. Thus, most of the male breast diseases involve ductal structures, but if there is long term estrogen stimulation, a disease associated to lobular structures may occur.

The normal male breast in the adult is made of skin, subcutaneous fat, atrophic ducts and stromal elements with no Cooper ligaments. The lobular development of the male breast takes place during stimulation processes with estrogen and progesterone and it is an uncommon condition. Therefore, conditions associated with lobular proliferation such as fibroadenomas, phylloides tumors, invasive or in situ lobular carcinoma are extremely rare in males, while conditions associated with ductal and stromal proliferation such as gynecomastia, invasive ductal carcinoma and papillary tumors may occur in males.

Clinical framework and epidemiology

In the last two decades the rate of males with breast disorders has increased from 0.8 to 2.4%, currently accounting for around 1% of all breast cancers. However, most of the men that have breast symptoms have benign disease, often gynecomastia or skin lesions. The symptoms referred by men in clinical examination are palpable areas, volume increase and breast pain. Most of the lesions are benign, but caution should be used in the evaluation since breast cancer incidence in males has increased as much as 26% in the last decades.

Lesions of the male breast

Most of the men that come for breast imaging studies refer palpable tumors, breast enlargement or sensitivity. It is crucial to establish the difference between benign and malignant tumors, to
decrease the patient’s anxiety and avoid unnecessary procedures. Most of the lesions found in the male breast are benign, with gynecomastia as the most common while malignant lesions account for less than 1% of the total lesions in males. Other conditions may arise from the skin, subcutaneous fat, blood vessels, lymphatics and nerves. Diseases such as lobular carcinoma, fibrocystic changes and adenosis are uncommon in males. Among the most common conditions we can find bilateral gynecomastia (56%), unilateral gynecomastia (25%), pseudogynecomastia (8), lipomas (4%) or normal studies (3%).

**Gynecomastia**

Excessive growth of breast tissue in males. It may be physiological or pathological. Physiological gynecomastia is found in three age groups: newborns, adolescents and older adults. Hypertrophy of the neonatal breast is a transient condition and common in up to 90% of all newborns (females and males). It is caused by elevation of estrogens that cross the placenta. Gynecomastia of puberty can be found in 3.9-64.6% of children between the ages of 10 to 13 years, with a typical onset 6 months after secondary sexual characteristics appear. A specific cause is unknown.

Pathologic gynecomastia may be caused by an increase in estrogens, decreased testosterone, medications, drug abuse or it could be idiopathic. The increase in estrogen concentrations may be due to testicular tumors (Leydig tumors) or to adrenocortical tumors. The increased aromatization of estrogen precursors may result in increased estrogens and be associated to gynecomastia from Sertoli cell tumors, tumors of the testicular sexual cord, germinal cell tumors, liver disease, hyperthyroidism or Klinefelter syndrome. Disorders with reduced testosterone are those such as aplasia or congenital testicular hypoplasia, trauma, testicular torsion or viral orchitis. Medications such as spironolactone and ketoconazole may displace sexual estrogen from the hormone binding globulin resulting in elevation of free estrogen concentrations. It is the most common cause of breast disease in males; clinical manifestations include palpable abnormalities, focal pain, burning sensation. It can be unilateral or bilateral and clinical location is subareolar.

On mammography three patterns are found: nodular, dendritic and diffuse. The early florid changes have nodular appearance in mammograms and represent hyperplasia of the intraductal epithelium with stromal edema. In this phase, the symptoms last less than a year. On ultrasound, a subareolar nodule with low level echoes with a disc or fan shape is found and may be hypervascular from stromal proliferation. If the symptoms persist more than a year, the quiescent phase may be seen, associated with the dendritic growth pattern found in mammography and ultrasound, where finger-like projections are seen, either radial or in the shape of flames, extending to the retroareolar tissue. The late histopathologic stage is characterized by hyalinized stroma, consistent with fibrous gynecomastia. The third pattern is diffuse gynecomastia that is associated with exposure to exogenous estrogens.

**Pseudogynecomastia**

The male breast grows as a result of excessive accumulation of fatty tissue with no glandular tissue. It is more common in older adults.

**Lipoma**

It is the second most common benign lesion of the male breast. These lesions are fat containing and well defined. They present as palpable tumors but, in general, they are asymptomatic. On ultrasound they are well circumscribed masses, uniform, isoechoic, hypoechoic or hyperechoic, with a thin echogenic capsule. On mammography they have a fine capsule that allows visualization of the radiolucent lesion.
**Epidermal inclusion cyst**

It is common in males, accounting for the third most common benign lesion of the male breast. It is the result of the obstruction of a hair follicle or can be post-traumatic, after an insect bite or surgery. Physical examination shows typically palpable lesions, and the glandular orifice can be seen as a black dot on the tumor. On ultrasound they appear as an ovoid tumor, circumscribed, and hypoechoic. On mammography it is an ovoid tumor, circumscribed, with high density and adjacent to the skin.¹²

**Mastitis**

It is the infection of breast tissue that can lead to an abscess and areas of duct ectasia. On mammography it is found as a unilateral growth of the breast, with trabecular and skin thickening. An abscess may be found as an irregular tumor, with or without calcifications, so it is difficult to differentiate from a malignancy. It is important to establish a correct correlation of the clinical findings with the patient’s history, in order to give an accurate diagnosis.¹³

**Intramammary lymph node**

It is a well-defined nodule in the upper outer quadrant of the breast, with a radiolucent center. It is considered pathognomonic of an intramammary lymph node.¹⁴ On ultrasound reniform tumors are described with fatty hilum, a hypoechoic cortex and echogenic hilum. They may be found anywhere in the breast, but they are more common in the upper outer quadrant, especially towards the axillary extension; they range from 0.3 to 1 cm in size.¹⁵

**Duct ectasia**

It predominantly involves the retroareolar ducts and is defined as a non-specific dilatation of one or more ducts. It may be a palpable finding or there may be nipple discharge. Mammograms show dense tubular structures converging in the areola-nipple complex; they may have calcifications. On ultrasound they are tubular branched structures, anechoic, full of discharge and that may contain cell debris; they may be central or peripherally located, the latter favoring a malignancy.¹⁶

**Hamartoma**

They are benign, mixed, circumscribed lesions that contain glandular elements, fibrous and fatty tissue. It is uncommon, with a 0.1-0.7% reported incidence. There may be invasive ductal carcinoma or in situ ductal carcinoma in remote cases. On mammography lesions are ovoid, well circumscribed with lucencies, dense elements that represent glandular and fibrous tissue. On ultrasound the echotexture may be hyperechoic, isoechoic or heterogenous.¹⁷

**Costochondritis**

It is a self-limited condition defined as an inflammation of the costochondral or costosternal junction, usually in multiple levels with no inflammation or induration. Pain is elicited with intentional palpation of the affected cartilage and may irradiate to the chest wall.¹⁸

**Cancer**

Breast cancer in males accounts for approximately 1% of all breast cancers and around 0.17% of all cancers in males. The average age of presentation is 59 years.³ It presents as an irregular tumor, subareolar, with retraction of the nipple and skin, ulceration and thickening. Thelorrhagia is reported up to 25%.³

Risk factors to develop male breast cancer include advanced age, chronic exposure to
estrogens, BRCA2 genetic predisposition, cryptorchidism, testicular lesions, liver dysfunction and Klinefelter syndrome. In 85% of cases it has been shown to be an invasive ductal adenocarcinoma, with carcinoma *in situ* in half the cases. Most of the patients present with a palpable tumor and it may be associated with gynecomastia; however, gynecomastia is not recognized as a risk factor for the development of carcinoma.

On mammography tumors appear with high density, they are irregular, spiculated and with lobulated margins. A remarkable feature in male breast cancer is that microcalcifications are not documented in most of the cases, for they are only found in 13 to 30% of cases and they are not as thick and are less linear than those seen in female cancers. On ultrasound, a solid, hypoechoic tumor is found, irregularly shaped, spiculated or with lobulated margins.

*Treatment of male breast cancer*

Surgical treatment includes simple or modified mastectomy with axillary assessment and sentinel node or biopsy.

**OBJECTIVE**

Imaging studies of the male breast are used for the evaluation of clinical anomalies such as breast growth, palpable tumors, pain, nipple discharge or skin lesions. Since this is a disease that is becoming more common, it is important to know the differences between benign and malignant findings. Imaging and pathological characteristics were reviewed in the differential diagnosis of benign and malignant tumors in the male breast. The most common conditions will be discussed as well as the different reasons to perform breast imaging studies in the male population seen at the Hospital Christus Muguerza Alta Especialidad.

**DESIGN**

Descriptive, observational, cross-sectional, retrospective study.

**Inclusion criteria**

All male patients who had mammography or ultrasound and interventional procedures from January, 2011 to December, 2015 were included in the study, regardless of age.

**MATERIAL AND METHODS**

Mammograms were performed with Hologic Selenia® y Hologic Selenia Dimensions® equipment in mid lateral oblique (MLO) view and additional views according to the case. For complementation, Phillips iU22® and Phillips Epic 5® ultrasound equipment was used with a lineal transducer of 12 and 18 MHz, using color Doppler and qualitative elastography.

**Protocol for interventional procedures in male breasts at the Hospital Christus Muguerza Alta Especialidad**

In some patients a percutaneous biopsy is performed in real time using a BARD gun, with a 14 gauge needle. Approximately 6 fragments are obtained from the lesions, which are all placed in jars to be sent to the Pathology department for definitive study.

Each study was examined by three radiologist certified on breast imaging of our institution. They evaluated the findings documented on mammography and ultrasound. In cases where an interventional procedure was performed, the imaging and histopathology findings were assessed.
Analysis

Statistical analysis: The statistical programs from Microsoft Office Excel® 2010 were used to analyze the results.

Ethics

Patients who underwent interventional procedures were requested to sign an informed consent form in which the physician or technologist explained the risks and care after the procedure. A report was made in cases where a complication was documented and follow-up was based on the severity of symptoms.

RESULTS

Forty male patients who came to our breast diagnosis center to have an imaging study were found, accounting for 0.21% of the total number of breast studies performed in our hospital. Out of 15,218 mammograms, 26 were performed in males (0.17%) and of a total of 17,915 breast ultrasound studies, 45 were in the male population (0.25%) in the study period.

When imaging studies were performed in our diagnostic center, ages ranged between 10 (in the youngest patient) and 92 years, with a mean of 42 years of age (Table 1). The reasons for having the study were documented for each patient and the most common were palpable areas, pain, breast tissue growth, palpable tumors and nipple discharge.

The diagnoses reported in order of frequency were: gynecomastia (60.9%, n=28), palpable nodes with focal or diffuse cortical thickening (10.9%, n=5) and other miscellaneous disturbances (6.5%, n=3) such as hamartoma (n=1), deep giant lipoma with pectoral muscle involvement (n=1) and prominent and palpable fatty lobule (n=1). Concerning frequency, the inflammatory process of the breast was found in 4.3% (n=2), as in patients with costochondritis. Some patients presented because of mammary gland growth and were diagnosed as having pseudogynecomastia (4.3%, n=2). Another patient 4.3% (n=2) had palpable tumors and nipple retraction with a diagnosis of invasive ductal adenocarcinoma. In ductal disease we saw a patient with ectasia of retroalveolar predominance (2.2%) and among skin and adnexal diseases one patient was documented (2.2%) with a diagnosis of epidermal inclusion cyst (Table 1, Figures 1-6). Considering the frequency documented in our study, gynecomastia was found to be the most common diagnosis in our population: 20 patients had unilateral disease (71.5%) while only 8 patients had bilateral disease (28.6%).

Laterality of the lesions was evaluated in this work: 37% (n=17) were found in the left breast, 37% (n=17) in the right breast and 26% (n=12) presented lesions in both breasts (Table 2). Considering the characteristics and diagnosis of the lesions, a BI-RADS category was assigned. Most of the patients were BI-RADS-2, who were approximately 36 patients accounting for 90% of the population studied. In BI-RADS-4 category

<table>
<thead>
<tr>
<th>Disease</th>
<th>Number of cases</th>
<th>%</th>
<th>Mean age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gynecomastia</td>
<td>28</td>
<td>60.9</td>
<td>42</td>
</tr>
<tr>
<td>Lymph nodes</td>
<td>5</td>
<td>10.9</td>
<td>41</td>
</tr>
<tr>
<td>Others</td>
<td>3</td>
<td>6.5</td>
<td>50</td>
</tr>
<tr>
<td>Mastitis</td>
<td>2</td>
<td>4.3</td>
<td>40</td>
</tr>
<tr>
<td>Costochondritis</td>
<td>2</td>
<td>4.3</td>
<td>35</td>
</tr>
<tr>
<td>Pseudogynecomastia</td>
<td>2</td>
<td>4.3</td>
<td>56</td>
</tr>
<tr>
<td>Invasive ductal adenocarcinoma</td>
<td>2</td>
<td>4.3</td>
<td>73</td>
</tr>
<tr>
<td>Ductal ectasia</td>
<td>1</td>
<td>2.2</td>
<td>17</td>
</tr>
<tr>
<td>Inclusion cyst</td>
<td>1</td>
<td>2.2</td>
<td>29</td>
</tr>
</tbody>
</table>

Table 1. Imaging diagnostics
there were 2 patients (5%), one of them had cortical focal thickness and another one in category 4C had a spiculated tumor associated with calcifications and abnormal lymph nodes. For category BI-RADS-3 and 5 we found one patient in each (2.5%, respectively), and we found no cases in category BI-RADS-1 (Table 3).

**DISCUSSION**

Due to an increased incidence of male breast diseases in the last decades, including malig-
nent tumors, it is important that the radiologist should be familiar with the spectrum of diseases and imaging manifestations in order to establish timely diagnosis. During our study, we were able to see variable diseases of the male breast and their wide distribution in different age groups, knowing that the disease may be present from very early stages in life all the way to old age. Regarding reason for consultation we found agreement with the world literature. It is important to keep the clinical history of patients in mind with the goal of helping the radiologist to suspect a likely diagnosis.

In our study population we found mostly benign disease, where gynecomastia was the most common diagnosis. The most frequently reported malignancy was invasive ductal adenocarcinoma, consistent with literature reports and studies conducted in other hospitals.

In order to conduct and draw conclusions from a breast study, the BI-RADS report system must be considered, which makes no distinction between genders. When our patients were classified using this system, the most common category was BI-
RADS 2, with benign findings and no probability of a malignant lesion.

**CONCLUSION**

Benign breast disease is the most common one in patients of the male gender; gynecomastia accounts for the greatest incidence of cases. In spite that malignant disease of the male breast is not common, it is important to keep in mind the different clinical and imaging manifestations that may suggest this disease in order to provide patients with timely and integral treatment.

It is very important to know about the different radiological appearances of the different diseases that may involve the male breast, as well as to learn to use diagnostic tools properly. The initial study must be a mammography; however, ultrasound must be recognized as a powerful modality (together with mammography) to dif-

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**Table 2. Laterality of lesions**

<table>
<thead>
<tr>
<th>Laterality</th>
<th>Right</th>
<th>Left</th>
<th>Both</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lesions</td>
<td>37% (n=17)</td>
<td>37% (n=17)</td>
<td>26% (n=12)</td>
</tr>
</tbody>
</table>

**Table 3. BI-RADS category**

<table>
<thead>
<tr>
<th>BI-RADS category</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number of patients</td>
<td>0</td>
<td>36</td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>(90%)</td>
<td>(2.5%)</td>
<td>(5%)</td>
<td>(2.5%)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
fferentiate characteristics of benign and malignant breast lesions.

REFERENCES