

# UNILATERAL BREAST EDEMA DUE TO SUBCLAVIAN VEIN COMPRESSION

## Edema mamário unilateral resultante de compressão da veia subclávia

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### ABSTRACT

Unilateral breast edema may have different causes that vary from malignant to benign diseases. The knowledge of the main etiologies, associated to a detailed clinical examination and to radiological findings, is important in order to establish the correct diagnosis and determine the appropriate management of the patient. This article will report the case of a patient with lung cancer who developed unilateral breast edema; the main differential diagnoses will also be discussed.

**KEYWORDS:** Lung neoplasms; subclavian vein; ultrasonography, mammary; mammography; inflammatory breast neoplasms.

### RESUMO

O edema mamário unilateral pode ter diferentes causas, que variam desde doenças malignas até benignas. O conhecimento das principais etiologias, associado ao exame clínico detalhado e aos achados radiológicos, é importante para que se estabeleça o diagnóstico correto, e para que se determine o manejo adequado do paciente. Neste artigo, será relatado o caso de uma paciente com câncer de pulmão que desenvolveu edema mamário unilateral; também serão discutidos os principais diagnósticos diferenciais.

**PALAVRAS-CHAVE:** Neoplasias pulmonares; veia subclávia; ultrassonografia mamária; mamografia; neoplasias da mama.

### INTRODUCTION

Unilateral breast edema may occur due to different etiologies ranging from malignant — such as inflammatory breast carcinoma and metastasis — to benign conditions — such as mastitis, alteration after surgeries or radiotherapy procedures and lymphatic or central venous obstruction<sup>1</sup>. The knowledge of these etiologies, in association with a detailed clinical examination and radiological findings, is important in order to establish the correct diagnosis, and to determine the appropriate management of the patient.

Thus, this study aimed to report a not-so-frequent cause for unilateral breast edema — determined by pulmonary lesion causing the obstruction of the subclavian vein and subsequent damage to the lymphatic drainage of the breast —, as well as to discuss the main differential diagnoses of the case.

### CASE REPORT

Female patient, 48 years of age, with a 10 pack-year smoking history, having quit ten years ago. At the end of 2013, she had a typical clinical case of cholelithiasis, confirmed by an ultrasound study. During preoperative evaluation, a simple chest X-ray identified an ill-defined right paramediastinal opacity. Complementary investigation, with computed tomography (CT) scan of the thorax, detected a right peri-hilar mass, with infiltrative aspect and subcarinal lymph node enlargement. A CT guided biopsy was carried out, with anatomopathological results of an invasive muco-secretory adenocarcinoma of primary acinar pattern of the lung. Imaging tests for staging — magnetic resonance of the skull, abdomen and pelvis CT and bone scintigraphy — showed no metastases; however, the mediastinoscopy revealed the involvement of the upper mediastinal lymph

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nodes, reaching stage III A. The treatment with carboplatin and paclitaxel chemotherapy, and radiotherapy with irradiation field, started for the right peri-hilar mass and mediastinal lymph nodes, with chemoradiotherapy ending in July 2014. In July 2015, during follow-up, the disease progressed into pleura, and a pleurodesis was performed; there was also involvement of high mediastinal and supraclavicular lymph nodes, forming conglomerated, and metastases in the central nervous system. New chemotherapy cycles were performed, this time with docetaxel, and radiotherapy with irradiation of the mediastinum and right bronchus and radiosurgery of the lesion in the brain and cerebellum.

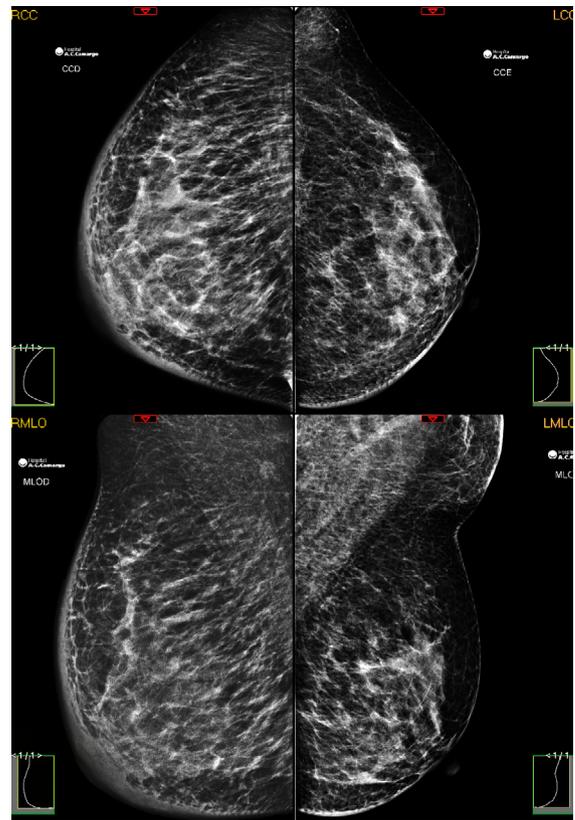
In April 2016, the patient was hospitalized with worsening respiratory complaints and enlargement of the right breast, a few days before.

At physical examination, the patient was afebrile, with edema in the lateral quadrants of the right breast and minimal erythema, without local temperature increase. Also, there was hardened and palpable lymphadenopathy in the right supraclavicular chain, and the right axilla was free. Laboratory exams did not evidence infectious conditions, with C-reactive protein (CRP) ranging from 2 to 10 mg/L and leukocytes from 6,000 to 8,000/mm<sup>3</sup>. The main diagnosis hypothesis were mastitis, metastasis and new breast cancer. New imaging exams were requested for further investigation, the mammography (Figure 1) and ultrasonography (Figure 2) demonstrated non-specific signs of edema, with no solid lesions, malignant microcalcifications and collections. Given the situation, empirical antibiotic therapy was started, with no improvement. An x-ray of the chest, requested in order to evaluate respiratory complaints, detected a veiling opacity of the right hemithorax. In the sequence, a chest angiogram was performed (Figures 3 and 4), which showed an extensive solid mass in the apical segment of the right superior lobe extending to the right hilum, infiltrating the mediastinum and invading the right pulmonary artery and segmental bronchi causing partial pulmonary collapse, in addition to a significant caliber reduction of the right subclavian vein at the outlet to the superior vena cava.

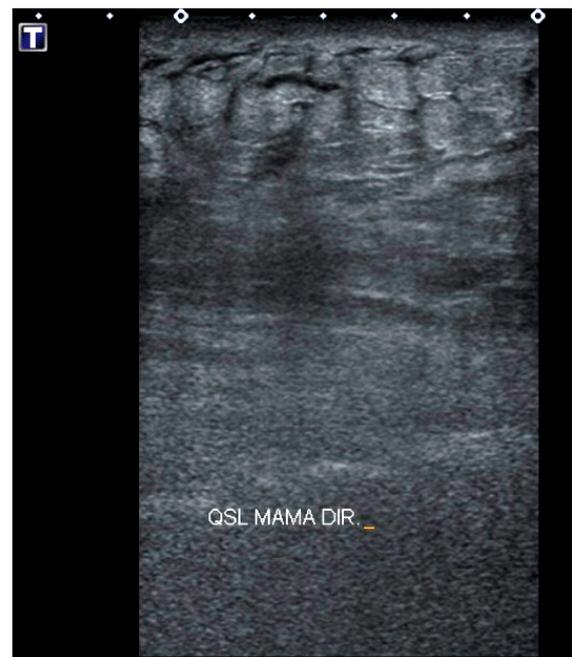
Subsequently, a vascular endoprosthesis was placed in the right subclavian vein, resulting in improvement in venous circulation and breast edema. The patient had no recurrence of symptoms of breast congestion within the following months, and carried on with her cancer treatment, using a new chemotherapy regimen with nevelbine. After four months, due to the lack of response to the new treatment and considering the requests of family members, only palliative measures were continued and, in December 2016, the patient passed away.

## DISCUSSION

The clinical manifestation of breast edema, translated by cutaneous thickening and volumetric tissue enlargement, is



**Figure 1.** Mammography of craniocaudal (CC) and mediolateral oblique (MLO) incidences – dense breasts, with cutaneous thickening and slight increased trabeculation of the right breast, suggesting edema.

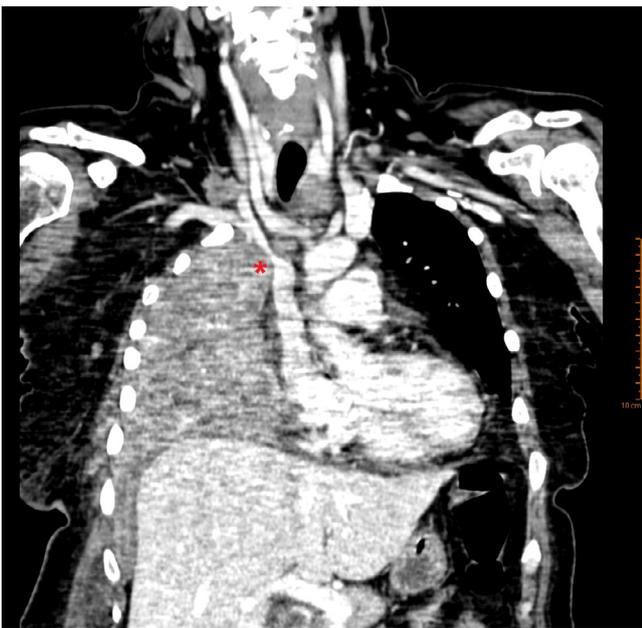


**Figure 2.** Ultrasonography – cutaneous thickening and hyperechogenicity of the subcutaneous cellular tissue, with anechoic serpiginous images of permeation (edema).

nonspecific. However, there are imaging characteristics which may be present and useful in etiological differentiation. In the mammography, breast edema is characterized by cutaneous thickening, increased parenchyma density and prominence of the interstitium, characterized by trabecular thickening<sup>1,2</sup>. The identification of nodules and/or microcalcifications may be of help in diagnosing malignancy<sup>2</sup>. Ultrasonography shows cutaneous thickening associated with hyperechogenicity of the subcutaneous tissue and the mammary parenchyma, with lymphatic engorgement. Ultrasonography may assist the detection and characterization of nodules and collections, as well as guide biopsies<sup>3</sup>. In magnetic resonance, breast



**Figure 3.** Chest CT – extensive involvement of the right pulmonary parenchyma and homolateral breast edema.



**Figure 4.** Chest CT scan (coronal reconstruction) – mass in the right pulmonary Apex, which caused compression and important reduction of caliber of the right subclavian vein at the opening to the superior vena cava (asterisk).

edema is manifested by cutaneous and interstitial thickening, which come along with hypersignaling of T2 images, and if breast edema is the only finding, there is no post-contrast enhancement.

Breast inflammatory carcinoma — a relatively uncommon form of breast cancer of rapid progression, which affects women between their fourth and fifth decade of life — in general is locally advanced when diagnosed, and is manifested with edema and erythema, which may be associated with sensation of warmth in the affected breast, in addition to orange-peel-like skin. There may or may not be a palpable nodule and, usually, the patient has no fever<sup>1,3-5</sup>. Histologically, there is an invasion and obstruction of the lymphatics of the dermis and capillaries and of subepidermal venules, resulting in mammographic findings of edema and cutaneous retraction. Malignant nodule and calcifications may be present; axillary lymph node disease is a common occurrence<sup>1,3-5</sup>. Ultrasonography may evidence an irregular hypoechoic nodule with speculated or indistinct margins and posterior acoustic shadow; the nodule may be obscured in the mammography due to the increased breast density, in addition to the possibility of showing an invasion of pectoral muscles and lymph node involvement<sup>3</sup>.

Metastasis to the breast may be lymphatic or hematogenous. The former usually occurs transthoracically or by dissemination of the contralateral primary breast cancer. The latter, the hematogenous spread of extramammary cancer, is uncommon, and suggests advanced systemic disease. In these cases, both lymphoma and melanoma are the most common sources of metastases. In general, they do not cause cutaneous nor papillary retraction and tend to be more frequently multiple or bilateral in relation to primary breast neoplasms. The radiographic appearance is of one or more round and well-defined nodules, without microcalcifications in the subcutaneous tissue — except for rare exception, as in cases of ovarian cancer<sup>1,3,6,7</sup>.

Mastitis usually occurs among young women and breastfed infants, but may also affect immunosuppressed women. The most common agents are *Staphylococcus sp.* and *Streptococcus sp.* although *Mycobacterium tuberculosis* may also be found. In general, it presents erythema, pain, heat, fever, reactionary lymph node disease and leukocytosis, which respond to antibiotic therapy. If inflammatory symptoms are not improved with treatment, a biopsy may be required in order to rule out the possibility of inflammatory carcinoma. The most common mammographic aspect of mastitis is an ill-defined area, with increased density and cutaneous thickening, whereas the diffuse edema is seen only in a minority of cases. In the ultrasonography, there is an ill-defined area, with heterogeneous echotexture, presenting areas of hyperechogenicity, due to inflamed fat lobes,

and hypoechogenicity in glandular parenchyma, in addition to cutaneous thickening. Occasional abscesses may be identified. Mastitis may present a mammographic pattern similar to that of inflammatory carcinoma, though without malignant-like calcifications<sup>1-3,8</sup>.

Tissue response after partial mastectomy or radiotherapy, with cutaneous thickening and breast edema, is more pronounced 6 to 12 months after treatment, being gradually solved within 1 to 3 years. The clinical history is essential in order to differentiate this kind of edema and other causes. The changes after radiotherapy may be focal or diffuse, and with typical non-anatomic linear configuration borders<sup>1,9</sup>.

Less commonly, mechanical problems, such as vascular obstruction, may also be presented along with unilateral breast edema. Unilateral dilation of breast veins may be observed due to the obstruction of the axillary and subclavian veins. Superficial collateral veins may drain to the contralateral breast and even to the contralateral axillary or subclavian veins; however, they might not be seen if they form gradually<sup>1,10</sup>.

The understanding of breast venous drainage is important, once this may be a route of neoplastic dissemination, in addition to their intimate relation to lymphatic drainage. The main venous drainage routes are: internal mammary vein (inner thoracic), drained to the pulmonary capillary network; axillary vein; and intercostal veins. Lymphatic drainage is typically unidirectional, with approximately 75% of the lymphatic flow through the axillary lymph nodes; the rest flows

to internal mammary and parasternal chains, which may even present anastomosis with the contralateral network<sup>10</sup>.

In the case presented, an uncommon cause for unilateral breast edema was diagnosed, determined by a pulmonary lesion that damaged the vascular drainage. The patient was under treatment for pulmonary adenocarcinoma, which, despite therapy, evolved with a significant progression regarding its size, leading to the involvement of the right lymphatic duct and the right subclavian vein proximal to the inner mammary vein, determining increased venous and lymphatic pressure, with the leakage of fluid into the interstitial space, resulting in breast congestion.

The breast presented edema, of fast progression, in its lateral quadrants, a location outside the field of previous irradiations. However, there were no other signs to corroborate an infection. Nevertheless, the main diagnostic hypothesis, prior to the CT, was of acute mastitis, and a treatment with broad-spectrum antibiotics was initiated, with no clinical response.

## CONCLUSION

Unilateral breast edema is a condition with different etiologies, most often related to benign diseases such as infections. However, the attending physician should be aware of and analyze the range of available clinical and radiological information, which may suggest the hypothesis of potentially more severe conditions, such as malignant neoplasms, or rarer causes, such as vascular obstruction.

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