ORIGINAL REPORT

Characterization of invisible breast cancers in digital mammography and tomosynthesis: Radio-pathological correlation☆

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Abstract
Objective: To review the radio-pathologic features of symptomatic breast cancers not detected at digital mammography (DM) and digital breast tomosynthesis (DBT).
Material and methods: Retrospective analysis of 169 lesions from symptomatic patients with breast cancer that were studied with DM, DBT, ultrasound (US) and magnetic resonance (MR). We identified occult lesions (true false negatives) in DM and DBT. Clinical data, density, US and MR findings were analyzed as well as histopathological results.
Results: We identified seven occult lesions in DM and DBT. 57 per cent (4/7) of the lesions were identified in high-density breasts (type c and d), and the rest of them in breasts of density type b. Six carcinomas were identified at US and MR (BI-RADS 4 masses); the remaining lesion was only identified at MR. The tumor size was larger than 3 cm at MRI in 57 per cent of the lesions. All tumors were ductal infiltrating carcinomas, six of them with high stromal proportion. According to molecular classification, we found only one triple-negative breast cancer, the other lesions were luminal-type. We analyzed the tumor margins of two resected carcinomas that were not treated with neoadjuvant chemotherapy, both lesions presented margins that displaced the adjacent parenchyma without infiltrating it.
Conclusion: Occult breast carcinomas in DM and DBT accounted for 4 per cent of lesions detected in patients with symptoms. They were mostly masses, all of them presented the diagnosis of infiltrating ductal carcinoma (with predominance of the luminal immunophenotype) and were detected in breasts of density type b, c and d.
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Caracterización de cánceres de mama sintomáticos invisibles en mamografía digital y tomosíntesis: correlación radiopatológica

Resumen

Objetivo: Revisar las características radiopatológicas de carcinomas mamarios sintomáticos ocultos en mamografía digital (MD) y tomosíntesis (TS).

Material y métodos: Análisis retrospectivo de 169 lesiones provenientes de pacientes sintomáticas con diagnóstico histológico de cáncer de mama y que fueron estudiadas con MD, TS, ecografía y resonancia magnética (RM). Se identificaron las lesiones ocultas (falsos negativos verdaderos) en MD y TS. Se analizaron datos clínicos, de densidad, los hallazgos con ecografía y RM, y la histopatología de las lesiones.

Resultados: Se detectaron siete lesiones neoplásicas ocultas en MD y TS. El 57% (4/7) se presentó en mamas densas (tipo c y d), y las restantes en mamas de densidad b. Se identificaron seis de los carcinomas por ecografía y RM (masas BI-RADS 4); la lesión restante solo se visualizó en RM. En el 57% de las neoplasias, el tamaño medido con RM fue mayor de 3 cm. Todas fueron carcinomas ductales infiltrantes, seis de ellos con alta proporción estromal. En cuanto a los subtipos moleculares, solo una fue triple negativo y las demás fueron de tipo luminal. Se analizaron los márgenes tumorales de dos carcinomas intervenidos sin quimioterapia previa, y ambos presentaban márgenes que desplazaban sin infiltrar el parénquima adyacente.

Conclusión: Los carcinomas ocultos en MD y TS representaron el 4% de las lesiones detectadas en pacientes sintomáticas, fueron mayoritariamente masas, todas tuvieron diagnóstico de carcinoma ductal infiltrante (con predominio del inmunofenotipo luminal) y se detectaron en mamas de densidad tipo b, c y d.

Introduction

Breast tomosynthesis (TS) is an important contributor in the diagnostic process of breast cancer. Various studies have confirmed the advantages of using it together with mammograms in programs of population screening (improving the detection of cancer with fewer recitations[1-4]), and in the pathological setting (improving the sensitivity, characterization, and categorization of the lesions,[5,6] with a lower percentage of findings classified BI-RADS 3,[7] among other).

However, it is not a perfect modality and although it allows us to assess areas where possible lesions may be misdiagnosed in the digital mammograms (DM), at times, breast cancer can remain invisible in the DM and the TS. Since it is more and more widely used, we need to know more about the advantages and limitations of TS (information on true false negatives in both modalities in medical literature is scarce).

The goal of this work was to analyze the radiopathological characteristics of lesions with histologic diagnosis of breast cancer (detected in patients with breast symptoms) hidden in the DM and the TS.

Material and methods

It is a retrospective study approved by our hospital ethics committee and focused on the descriptive analysis of hidden lesions in the DM and the TS with a histological diagnosis of breast cancer in patients with clinical suspicion. Out of the 387 female patients (both from the early detection program of our hospital and those with breast symptoms) with a diagnosis of breast cancer who were studied using DMs and TS as initial tests in the Breast Radiology Unit between Nov. 2011 and Dec. 2015, 160 patients with symptoms were selected (symptoms such as palpable nodules or indurations; changes in breast size or morphology; retraction or sinking of the nipple skin; nipple discharges, skin abnormalities; presence of axillary adenopathies; and even persistent mastodynia).

The patients were studied using the Selenia Dimensions system (Hologic, Bedford, MA, USA). The protocol used was the COMBO mode capable of acquiring 2D images and one tomosynthesis in one single compression; craniocaudal and mediolateral oblique projections were taken for every breast. As part of the diagnostic process, all cases underwent ultrasound scans with a 12 MHz linear probe (Aplio MX, Toshiba Medical Systems, Tokyo, Japan); MRIs (RM de 1.5 T Avanto, Siemens, Erlangen, Germany); the acquisition of images included T1 and T2-weighted enhanced sequences, and diffusion and dynamic studies after the administrations of gadolinium; and percutaneous biopsies (low ultrasonography with a 14 G tru-cut needle) as additional tests prior to surgical exeresis.

The images acquired and anonymized were part of a database that was reviewed by three (3) different radiologists with exclusive dedication (professional experience of 2–15 years) and a computed assisted detection system was used. Information such as age; clinical presentation; type of breast density; the BI-RADS category, and the number and type of lesions was gathered as well, and the lesions hidden in the DMs and TS were identified (true false negatives) having, as a reference point, the anatomopathological