Mammographic features of screening detected pT1 (a–b) invasive breast cancer using BI-RADS lexicon

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ARTICLE INFO

ABSTRACT

Aim: To describe mammographic features in screening detected invasive breast cancer less than or equal to 10 mm using Breast Imaging Reporting and Data System lexicon in full-field digital mammography.

Patients and methods: A retrospective analysis of 123 pT1 (a–b) invasive breast cancers in women aged 50–69 years from our screening program. Radiologic patterns were: masses, calcifications, distortions, asymmetries and mixed. Masses: shape, margins and density, and calcifications: morphology, number of flecks and size of the cluster were taken into account, following Breast Imaging Reporting and Data System terminology.

Results: We found 61 masses (49.6%), 8 masses with calcifications (6.5%), 30 groups of calcifications (24.4%), 19 architectural distortions (15.4%), 1 architectural distortion with calcifications (0.8%), 4 asymmetries (3.2%). Sixty out of 69 masses were irregular in shape, 6 lobular, 2 ovals and 1 round. Thirty-four showed ill-defined margins, 29 spiculated and 6 microlobulated. Most of them showed a density similar to surrounding fibroglandular tissue.

Calcifications were pleomorphic or fine linear in 24 of 30 (80%). Most of cases showed more than 10 flecks and a size greater than 1 cm.

Conclusion: The predominant radiologic finding is an irregular, isodense mass those margins tend to share different descriptors, being ill-defined margins the most constant finding. Calcifications representing invasive cancer are predominantly pleomorphic with more than 10 flecks per cm. Architectural distortion and invasive tubular carcinoma are more common than reported in general series.

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1. Introduction

Invasive tumour size is one of the most important factors to determine prognosis, therefore, it is expected that a screening program can detect as many small invasive tumours as possible. According to European guidelines for breast cancer screening [1] the proportion of invasive screening detected cancer measuring less than or equal to 10 mm should be more than 25% in first screening examination and more than 30% in subsequent-regular screening examinations.

Some work has been done describing the mammographic features of early breast cancer. Ciatto et al. analysed the mammographic characteristics of 548 nonpalpable breast malignant lesions. They found that stellate opacities were the most common pattern [2]. Burrell et al. on 225 breast cancers found that spiculated masses had the higher positive predictive value for malignancy [3]. These studies focussed on non-palpable breast cancer, without specifying the actual size of the lesions and using a noncurrent terminology. Moreover, the palpability of the tumours depends not only on the size but also on the characteristics of the tumours, the size of the breast, the experience of the examiner, etc. Others have investigated the radiological findings of breast cancer in a screening setting. Azavedo and Svane found that 77% of screening detected cancers showed rather typical findings, such as spiculated densities with and without calcifications [4]. Evans et al., in women 40–48 years, found that calcification is the sign most frequently associated with invasive cancers <10 mm in size [5]. These studies are using a noncurrent or standard terminology and the last is addressed to younger women.

To overcome these limitations, we have focussed our study on invasive tumours less than or equal to 1 cm, which means pT1a and pT1b tumours according to TNM staging system, which is used and supported by the International Federation of Gynecology and Obstetrics (FIGO) and we have used Bi-RADs lexicon to describe mammographic findings.

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Since the very aim of the screening is to detect as many cancers as possible and at their earliest possible stage, we think it is important to focus on radiologic signs of early breast cancer. The aim of this study was to assess the mammographic characteristics of pT1a–b screening detected invasive breast cancer using BI-RADS lexicon.

2. Patients and methods

2.1. Design and patients

Ethics committee approval was obtained. A retrospective review was performed on 123 women diagnosed with pT1a and pT1b invasive breast cancer. The results of 80,257 screening mammograms of asymptomatic women who had participated in our population-based mammographic screening program from May 2002 to June 2010 were collected and a total of 461 cancers were diagnosed. Our screening program involves the areas of Sants-Montjouit, Les Corts and Eixample esquerre in the city of Barcelona and started in May 2002. In June 2010 we completed our fourth round of screening. The target population included women between 50 and 69 years-old who were invited to participate every 2 years. The program adhered to the European guidelines [1]. The performance of the screening unit during the study period was characterized by a global cancer detection rate of 5.74 per thousand and a recall rate of 6.7%. The proportion of invasive screening detected cancer measuring less than or equal to 10 mm was 36.28%.

Our study group consisted of 123 women diagnosed with pT1a and pT1b invasive breast cancer. The mammograms were retrospectively reviewed recording the radiologic characteristics of the tumours by using the BI-RADS lexicon, which was created by the ACR (American College of Radiology) in an attempt to standardize the mammographic report.

2.2. Imaging

The mammograms were performed using a full-field digital mammography system (Senographe 2000D FFDM, GE Healthcare, Milwaukee, WI, USA). All patients underwent a bilateral craniocaudal and mediolateral oblique views. Spot-compression and true lateral images were obtained on subsequent call-back exam when necessary. However, since the purpose of this study is to determine the appearance of small breast cancer as they appeared in routine examinations, we have only used standard craniocaudal and mediolateral oblique views to evaluate mammographic characteristics.

2.3. Mammographic findings

The following variables were collected: age, breast density pattern according to ACR classification: type 1: predominantly fatty breast (<25% of dense tissue); type 2: scattered fibroglandular densities (25–50% of dense tissue); type 3: heterogeneously dense breast (50–75% of dense tissue) and type 4: extremely dense breast (>75% of dense tissue), and radiologic pattern of neoplasm: mass, calcification, architectural distortion, asymmetry or mixed.

A mass was defined as a lesion with, at least, partially visualized borders, usually seen in two different projections. The mass shape was described as round, oval, lobular or irregular. The mass borders were described as circumscribed, microlobulated, ill-defined and spiculated. Well defined contours whenever more than 75% of the circumference of the mass was seen and borders were well delimited. Microlobulated when at least one third of the contour showed microlobulations. If the rest of contour showed poorly defined borders, the mass was considered ill defined. Ill-defined borders when at least one third of the contour showed indistinct margins. Finally,

to distinguish between spiculated and ill-defined margins, we considered spiculated in the case that one or more long, or several short spicules were seen.

The contour of masses commonly showed several of these patterns. Therefore, we have chosen the worrisome characteristic affecting at least one third of the contour.

The mass density was described as low density compared to normal fibroglandular tissue, density similar to that of normal fibroglandular tissue, high density respect to normal fibroglandular tissue, and fat containing when a clear hipodense area is seen inside the mass in both projections.

Classification of microcalcifications was performed according to their morphology, the number of flecks per cluster and the size of the cluster. Regarding to the morphology, we adhered to the BI-RADS lexicon and definition: punctate, amorphous, pleomorphic, linear, branching or casting. When at least one fine linear or branching microcalcification was clearly present, the cluster was classified in the last subgroup. Regarding to the number of flecks per cluster: less than 10, 10–30, more than 30. Regarding to the size of the cluster: less than 10 mm, 10–30 mm, more than 30 mm.

An architectural distortion was defined as the presence of distortion without an associated mass. The lesion appearance may vary depending on the situation. Whenever the lesion is centrally located (surrounded by fibroglandular parenchyma), it may adopt a typical appearance of radiating spiculation from a central point (stellate lesion). In the case the lesion is close to the anterior or retromammary fat, it may manifest as a retraction in the interfaces between fat and parenchyma (also known as edge sign).

A focal asymmetry was considered when an asymmetry could not be accurately identified as a true mass (lack of any border).

We also collected the histologic type of the neoplasm. The invasive cancers were histopathologically categorized as follows: invasive ductal carcinoma, lobular carcinoma and a miscellaneous group including colloid, medullary and tubular types.

2.4. Statistical analysis

To evaluate screening detected cancers, characteristic variables including age, breast composition, mammographic findings and histopathologic features (tumour type and size) were compared. To study association between categorical variables: radiologic pattern with breast density, tumour size and histological type on one side and shape and margins of the masses with shape on the other, the chi-square test was performed. A P value of <0.05 was considered statistically significant. Statistical analysis was performed using the Statistical Package for the Social Sciences (SPSS version 15.0 for Windows, Chicago, IL, USA).

3. Results

One hundred and twenty three cancers were detected in women between 50 and 69 years old with a median age of 61. Thirty four out of 123 were pT1a with an average size of 3.45 mm and 89 out of 123 were pT1b with an average size of 7.83 mm. Patients in pT1a group had a median age of 59. Patients in pT1b group had a median age of 62.

We found 61 masses (49.6%), 8 masses with calcifications (6.5%), 30 groups of calcifications (24.4%), 19 architectural distortions (15.4%), 1 architectural distortion with calcifications (0.8%), 4 asymmetries (3.2%). The average tumour diameter of invasive cancers detected on the basis of masses was 7.2 mm, calcifications alone 5 mm, architectural distortions 6.5 mm and asymmetries 7.8 mm.

Masses were the predominant radiologic pattern observed in 61 out of 123 cases (49.6% or 56.1% if we consider masses with