RADIOLOGICAL CASE

CLINICS IN DIAGNOSTIC IMAGING (11)

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CASE REPORT

A 39-year-old premenopausal Chinese woman, status para 3, presented with a palpable left breast lump. Although the mass had been noticed for three months, it had been increasing in size only over the past one month. She had no family history of breast cancer and had never been on oral contraceptives.

On clinical examination, a small (approximately 2 cm diameter) hard but mobile mass was palpable in the upper outer quadrant of the left breast. No overlying skin change or nipple retraction was noted. There were no palpable axillary lymph nodes.

Bilateral mammograms and breast ultrasound were performed. What do the localised view of the left craniocaudad mammogram (Fig 1) and transverse ultrasound scan of the left breast (Fig 2) show? What is the diagnosis?

Fig 1 – Cranio-caudad coned view mammogram of the left breast.

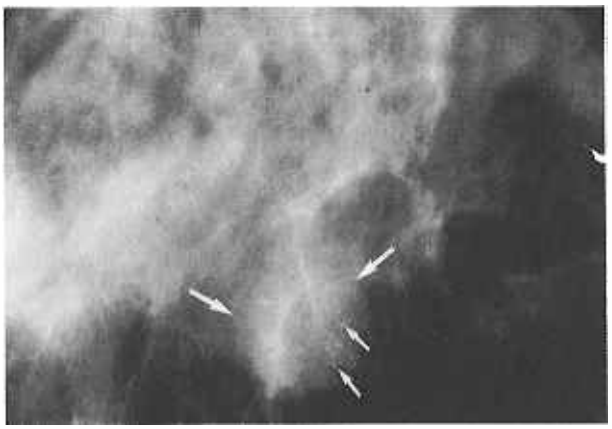

Fig 2 – Transverse ultrasound of the left breast mass.

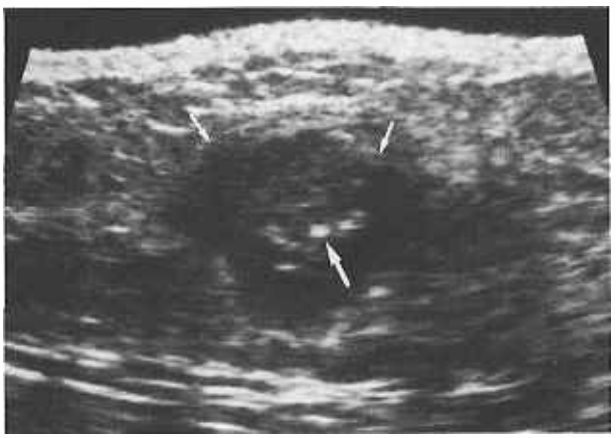

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IMAGE INTERPRETATION

The mammogram (Fig 1) shows an opacity measuring 2 x 2 cm, with irregular, poorly defined margins (white arrows). No definite spiculation or architectural distortion is seen. Associated clusters of variable/pleomorphic microcalcifications (short white arrows) are present within the mass. Ultrasound (Fig 2) demonstrates an hypoechoic 1.5 x 1.5 cm mass with irregular margins (short white arrows), but without distal shadowing. The hyperechoic foci within (white arrow) the mass do not however cast acoustic shadows. These represent microcalcifications which are demonstrable on ultrasound, when within an hypoechoic tumour mass. The depth/width (anteroposterior/transverse diameter) ratio of the mass approaches one. The right breast had a normal appearance on mammography and ultrasound.

DIAGNOSIS

Ductal carcinoma of the breast.

CLINICAL COURSE

The patient underwent excision biopsy of the left breast lump which confirmed the presence of infiltrative ductal carcinoma. She subsequently had a left modified radical mastectomy. The resected specimen revealed residual tumour (infiltrative ductal carcinoma - Grade III Bloom and Richardson) (Fig 3) with a few adjacent foci of ductal carcinoma-in-situ, comedo type (Fig 4). Oestrogen receptor status was negative. Eight lymph nodes that were sampled were all negative for metastases. The patient is currently receiving chemotherapy and was well at last oncological follow-up.

DISCUSSION

Breast cancer remains a leading cause of cancer and cancer death in women throughout the world. The incidence of breast cancer is increasing globally and remains a significant public health problem. There are two main categories of breast imaging and evaluation, namely: (a) screening for breast cancer, and (b) diagnosis and management of benign and malignant breast disease.

Screening aims at the identification and early detection of breast cancer such that a reduction in mortality from this disease is achieved. The rationale for screening rests in the observation that breast cancer prognosis depends on the stage of the disease at the time of treatment. High survival rates are associated with smaller lesions that have no axillary nodal involvement[1].

The effectiveness of a screening programme depends on the sensitivity and accuracy of the examination, which should ideally be widely available, affordable, and of documented high benefit and low risk. Screening mammography is currently the best modality for breast cancer screening. It is the periodic examination of asymptomatic women to detect breast cancer at an earlier stage than encountered in clinical practice. Standard views include 45 degree mediolateral oblique and craniocaudad views. It has a sensitivity of approximately 80% and specificity of approximately 95%[2-4]. Its main advantage is that it detects many non-infiltrating and small non-palpable tumours which tend to be axillary node negative[2,5]. Combined screening mammography and physical examination lead to a 20-30% reduction in mortality from breast cancer in women above 50 years of age[6,7]. However, poor quality mammography will not be effective in women of any age group[3,4], stressing the need for strict quality assurance programmes in any screening set up. Current guidelines by the American Cancer Society and the American College of Radiologists advise screening every one to two years in women between the ages of 40 to 49 years, and annual mammographic screening thereafter[8]. No screening is

Fig 3a - Photomicrograph of mastectomy specimen showing infiltrative ductal carcinoma (white arrows). (Haematoxylin and eosin stain, magnification x 200).

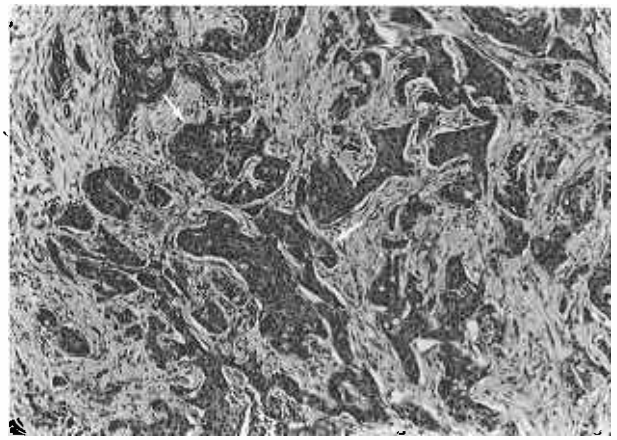


Fig 3b - Photomicrograph of biopsy specimen showing infiltrative ductal carcinoma and foci of microcalcifications (short black arrow). (Haematoxylin and eosin stain, magnification x 100).

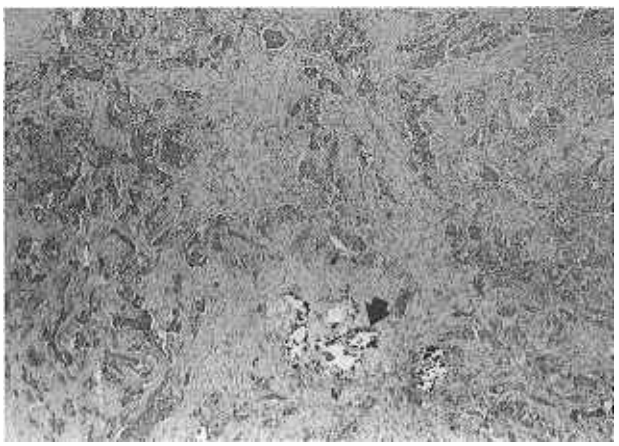


Fig 4 - Photomicrograph of mastectomy specimen showing ductal carcinoma-in-situ (arrow). (Haematoxylin and eosin stain, magnification x 400).

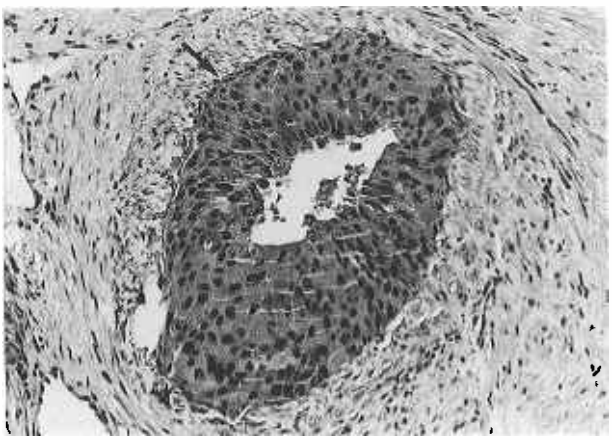
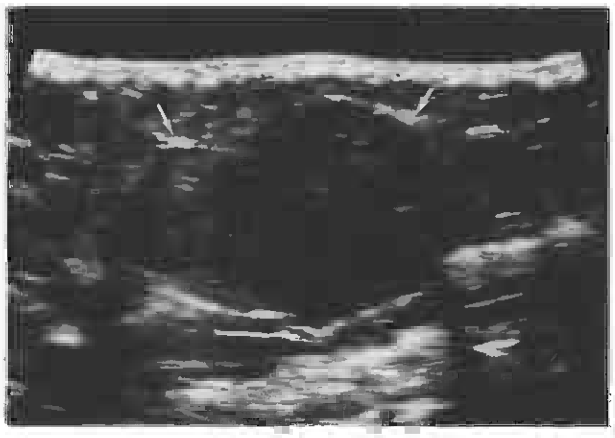


Fig 5a – Cranio-caudad mammogram in a 45-year-old woman shows an ovoid, slightly lobulated (arrow), well-circumscribed mass without associated microcalcifications. These features suggest a benign lesion.

Fig 5b – Ultrasound in the same patient shows a lobulated, ovoid, solid, hypoechoic nodule with well defined margins (white arrows). Note posterior acoustic enhancement. Features are in keeping with a fibroadenoma.



performed below 40 years of age as the expected yield is small due to the low breast cancer incidence in this age group. Women falling into high risk groups (particularly those having first degree relatives with breast cancer) are advised to consult their clinicians regarding the need for earlier screening.

Diagnostic mammography, in contrast, is performed in response to clinical signs and symptoms (for example, pain, nipple discharge or a palpable breast lump). It may also be used to evaluate an abnormality found on screening mammography.

An abnormality detected on mammography must be further characterised by detailed analysis of its radiological features. The shape, margin characteristics and density of a mass are important descriptive parameters. Benign masses tend to be round, well circumscribed and of low density (Fig 5a, 6a). Features that typify a malignant mass on mammography are high density, irregularity or spiculation, and indistinct margins[9] (Fig 1, 7a). Associated findings in conjunction with masses and/or calcifications which may indicate malignancy include skin and nipple retraction, and skin and/or trabecular thickening. Secondary signs of malignancy include asymmetric breast tissue and architectural distortion.

Macrocalcifications are benign calcifications which measure more than 0.5mm in diameter (Fig 8). Microcalcifications

Fig 6a – Cranio-oblique mammogram in a 39-year-old woman shows an ovoid, well-circumscribed opacity with smooth walls. Its appearances suggest a benign lesion but mammogram is not able to differentiate between a cyst and a solid mass.

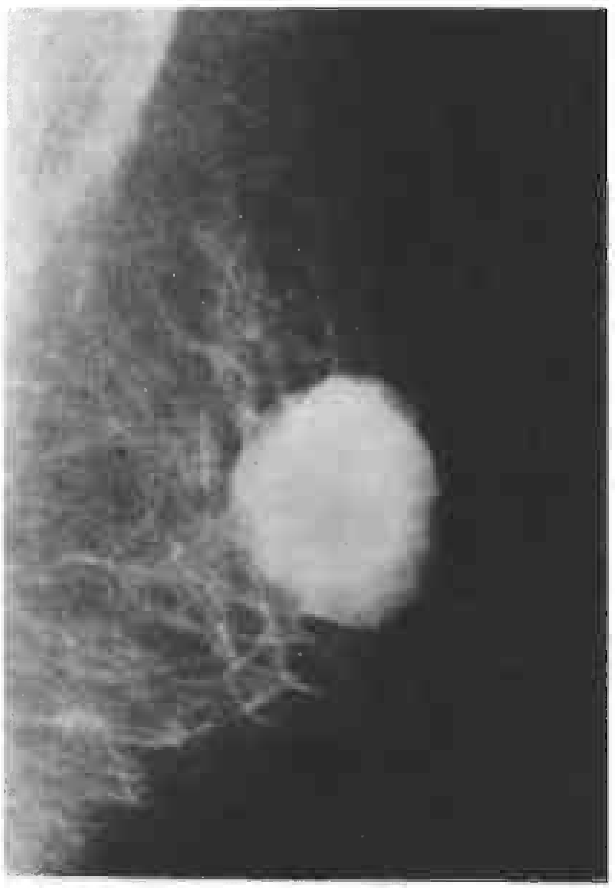
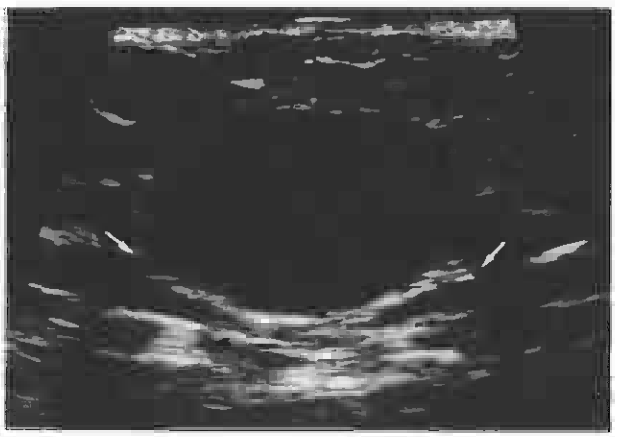


Fig 6b - Ultrasound in the same patient shows an ovoid, anechoic lesion with smooth walls and posterior acoustic enhancement (white arrows). These features are diagnostic of a simple cyst.



measure less than 0.5mm across, and have a higher association with malignancy. Twenty to thirty percent of all needle-localised mammographically-suspicious biopsy specimens prove to be cancer[10]. The size and morphology of each element of microcalcification, and its distribution within the breast are important features in predicting benignity or malignancy. Microcalcifications which appear punctuate, round, spherical or

lucent-centred and are scattered throughout the breast are infrequently associated with malignancy; whereas clustered, pleomorphic, dense, fine and branching linear calcifications giving a 'casting' pattern (Figs 1,9), have a high predictive value for malignancy[11]. These usually indicate the presence of ductal carcinoma-in-situ.

Although mammography is currently the most widely used and important breast imaging method, breast sonography has evolved tremendously over the past two decades to secure a definite role as a complementary diagnostic tool in the characterisation, diagnosis and management of breast abnormalities.

The indications for breast sonography are to:

1. Characterise mammographic or palpable masses as either cystic or solid.
2. Evaluate palpable masses in young (under age of 30 years), pregnant, and lactating patients.
3. Evaluate non-palpable abnormalities in which the mammographic diagnosis is uncertain.
4. Help exclude a mass in an area of asymmetric density on mammography.
5. Confirm or better visualise a lesion seen incompletely or on only one mammographic projection (eg near the chest wall).
6. Guide interventional procedures eg cyst aspirations, fine-needle aspiration cytology, and pre-surgical localisation.
7. Evaluate the post-surgical, post-augmentation of male breast.

The approach to evaluating a mass sonographically involves description of its location, number, appearance (margin, shape, size), internal contents (solid, cystic, mixed), echogeneity (homogeneous, heterogeneous), and posterior sound transmission.

The ultrasound features of a typical breast carcinoma are an hypoechoic tumour mass with irregular borders, inhomogeneous echo texture, posterior acoustic shadowing and an echogenic halo of variable thickness that possibly represents tumour extension or desmoplasia[12] (Fig 7b). Other features of malignancy include relative increase in echogenicity of overlying subcutaneous fat[12] and a depth/width ratio greater than 0.8[13]. The depth/width ratio is due to the tendency for malignant lesions to grow across tissue planes, which run horizontally, whilst benign lesions grow within them.

A benign lesion eg a fibroadenoma, is characteristically oval in shape, has smooth well-defined margins (Fig 5b) and is homogeneously echopoor. There is however an overlap between benign and malignant lesions, some cancers appearing homogeneous and well-defined, and some fibroadenomas being heterogeneous and ill-defined[14]. Ultrasound-guided fine needle aspiration cytology under direct vision in such situations is precise and can improve the specificity of cancer detection.

Breast cysts are common in pre-menopausal women in the 35-50 year age group and may persist in postmenopausal women on hormonal replacement therapy. Mammography cannot distinguish between cysts and solid masses, even for well circumscribed lesions, whilst ultrasound has 100% accuracy in the diagnosis of cysts if strict diagnostic criteria are adhered to[15]. These are demonstrated as anechoic, round or oval, sharply marginated lesions which demonstrate posterior acoustic enhancement (Fig 6b). The ultrasound diagnosis of a cyst can reduce the number of benign breast biopsies by up to 25%[15]. With high resolution technique, cysts as small as 2-3mm can be detected, whilst solid lesions in the range of 5mm are

Fig 7a - Cranio-caudad mammogram in a 64-year-old woman shows an irregular, spiculated, dense mass lesion with indistinct margins, but no associated microcalcifications, suggesting a malignant lesion.

Fig 7b - Corresponding ultrasound scan shows marked acoustic attenuation by an ill-defined mass lesion with an echogenic boundary halo (white arrows). Features are that of a malignant mass.

Fig 8 - Cranio-oblique mammogram in a 35-year-old woman shows coarse macrocalcifications (arrowheads) within a less distinct opacity (short arrows), representing the characteristic 'pop corn' calcifications seen in a hyalinised fibroadenoma.

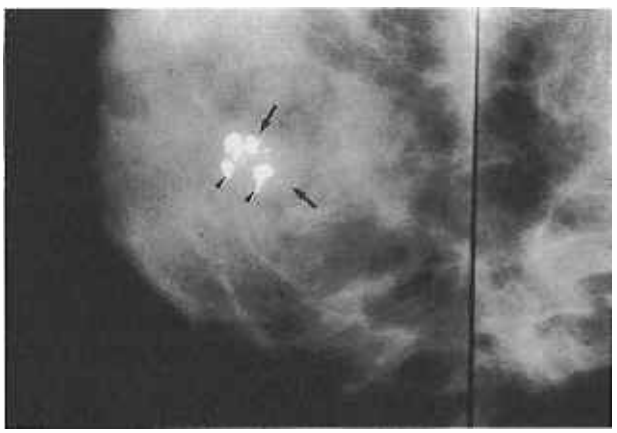


Fig 9 - Coned magnified cranio-caudad mammogram in a 43-year-old woman shows clustered, pleomorphic microcalcifications with a 'casting' pattern, highly suspicious of malignancy.

demonstrable.

In conclusion, mammography is currently the best method available for breast cancer screening. It also has a role in diagnostic work. Breast ultrasound, on the other hand, is purely a diagnostic tool. It improves the accuracy of clinical examination and mammography and is also excellent in guiding needle procedures.

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ABSTRACT

A 39-year-old Chinese woman presented with a palpable breast lump which was increasing in size. No overlying skin change or axillary lymph nodes were palpable. Mammograms and ultrasound showed a malignant left breast lesion, suspicious of ductal carcinoma. Following excision biopsy which confirmed infiltrative ductal carcinoma, a left modified radical mastectomy was performed. The role of mammographic screening is discussed. Diagnostic mammography in conjunction with ultrasound is emphasised.

Keywords: *breast cancer, screening, mammography, ultrasound*