
ORIGINAL ARTICLE

An Institutional Audit and Pictorial Review of Common Male Breast Diseases

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ABSTRACT

Objective: To review the mammographic and sonographic features of common benign and malignant lesions of the male breast.

Methods: This was a retrospective institutional review. A total of 72 consecutive male patients having breast imaging performed between 1 July 1999 and 30 June 2010 were included. The clinical data and electronic radiological images were retrieved from the electronic patient record, radiology information system, and Advantage Workstation (GE Healthcare).

Results: The mean age of the patients was 57 (range, 12-86) years. Indications for breast imaging included: breast mass (83%), breast tenderness (10%), nipple discharge (5%), and inverted nipple (3%). Mammographic examination was performed in 49 patients, and sonographic examination in 71. Biopsies were obtained from 19 patients. In 18 patients, no abnormality was found. The imaging / pathological diagnoses in the remainder were categorised as benign or malignant. Benign lesions included: gynaecomastia (n = 42), lipoma (n = 2), fibrocystic change (n = 2), and epidermal inclusion cyst (n = 1). Malignant lesions included: carcinoma (n = 6) and Paget's disease (n = 1). The clinical presentations and salient imaging features of these patients are discussed.

Conclusion: Based on knowledge of mammographic and sonographic features of the common benign and malignant lesions of the male breast, accurate radiological diagnoses can be achieved and unnecessary biopsy procedures can be avoided.

Key Words: Breast diseases; Breast neoplasms, male; Gynecomastia; Mammography; Ultrasonography, mammary

中文摘要

根據一所機構的資料對男性乳腺常見病變進行審核及影像回顧

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目的：回顧男性乳腺常見的良性及惡性病變的X線及超聲的特徵。

方法：本回顧研究對象為1999年7月1日至2010年6月30日期間，在一所機構內所有進行乳腺成像的男性。從電子病歷、放射科信息管理系統、及Advantage Workstation (GE Healthcare) 搜集共72位病人的臨床資料及電子放射影像。

結果：病人平均年齡57歲（介乎12至86歲）。進行乳腺成像的原因包括：乳腺腫塊（83%）、乳房脹痛（10%）、乳頭溢液（5%）、乳頭內陷（3%）。病人接受不同形式的檢查，分別有乳房X線49人，超聲檢查71人。19人進行了活檢。18位病人的檢測結果正常。其餘病人則按影像或病理結果被診斷為良性或惡性病變。良性病變包括：男子女性型乳房（42位）、脂肪瘤（2位）、乳房纖維性囊腫（2位）、表皮包涵囊腫（1位）。惡性病變包括癌症（6位）和柏哲德氏症（Paget's disease）

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(1位)。本文討論有關這些病人的臨床資料及特有的影像學特徵。

結論：根據對男性乳腺良性和惡性病變的X線及超聲特徵的認識，可以為病情作出準確的診斷，避免不必要的活檢。

INTRODUCTION

Male breast imaging accounts for less than 1% of examinations in breast imaging centre.¹ Knowledge on breast imaging is much less in men compared with women. In this article, we review the mammographic and sonographic features of common male breast diseases.

METHODS

This was a retrospective institutional review. A total of 72 consecutive male patients having breast imaging performed between 1 July 1999 and 30 June 2010 were included. The clinical data and electronic radiological images were retrieved from the electronic patient record, radiology information system and advantage workstation (ADW; GE Healthcare, US).

RESULTS

The mean age of the patients was 57 (range, 12-86) years. Indications for breast imaging included a breast mass (83%), breast tenderness (10%), nipple discharge (5%), and inverted nipple (3%). Mammographic examination was performed in 49 patients. Sonographic examination was performed in 71 patients. Biopsy was taken in 19 patients. No abnormality was found in 18 patients. In the remainder, the imaging / pathological diagnoses were categorised as benign and malignant. The benign lesions included: gynaecomastia (n = 42), lipoma (n = 2), fibrocystic change (n = 2), and epidermal inclusion cyst (n = 1). The malignant lesions included: carcinoma (n = 6) and Paget's disease (n = 1). Their clinical presentations and salient imaging features are discussed below.

DISCUSSION

Normal Male Breast

When we read mammographic images, we presume the patient is a female, but this may not be true. We should therefore look at all the information provided (patient's name, age, gender, and date of examination). Mammographic features also help us to determinate whether the image is from a male, including: predominantly fatty tissue rather than glandular tissue, prominent pectoral muscles, and a small nipple (Figure 1).² Normal male breast tissue contains major subareolar

ducts with little secondary branching. Lobular units are rare (noted in 1 in 1000 men), therefore, lobular lesions such as fibroadenoma, sclerosing adenosis are uncommon.²

Benign Male Breast Lesions

Gynaecomastia

Gynaecomastia is the commonest benign condition affecting male breasts.³ Our results were concordant with this observation, the condition being present in 42/72 (58%) of the patients in our series. Characteristically, there is hyperplasia of ductal and stromal elements of the male breasts. It can be unilateral, or bilateral (symmetrical or asymmetrical), and its aetiology can be physiological (neonatal, at puberty, or in the elderly), or secondary to an underlying cause (drug, systemic disease, or tumour).⁴

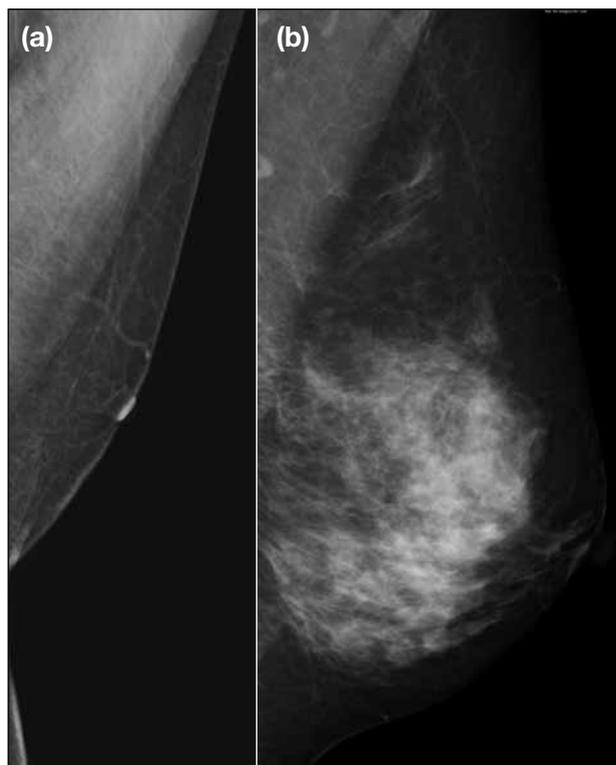


Figure 1. Which of these breasts is from a male and which from a female? (a) Mediolateral oblique mammogram of normal male breast with predominantly fatty tissue, prominent pectoral muscles and a small nipple. (b) Mediolateral oblique mammogram of a normal female breast.

The imaging hallmark of gynaecomastia is its retroareolar location and concentric distribution. Three mammographic patterns have been described and represent different stages of ductal and stromal proliferation.⁵ These patterns are termed: early nodular (florid phase), chronic dendritic (fibrous / quiescent phase), and diffuse glandular. The early nodular pattern (florid phase) is noted in patients with gynaecomastia for less than a year. Mammography shows a nodular retroareolar density (Figure 2a). Ultrasound shows a retroareolar fan-shaped hypoechoic nodule surrounded by normal fatty tissue (Figure 2b). Chronic dendritic

pattern (fibrous / quiescent phase) is noted in patients with gynaecomastia of longer duration. Fibrosis becomes a predominant process and is irreversible. Mammography shows a dendritic retroareolar density with posterior linear projections radiating into the surrounding tissue, which is unlike the appearance in malignancy in which there is associated nipple retraction

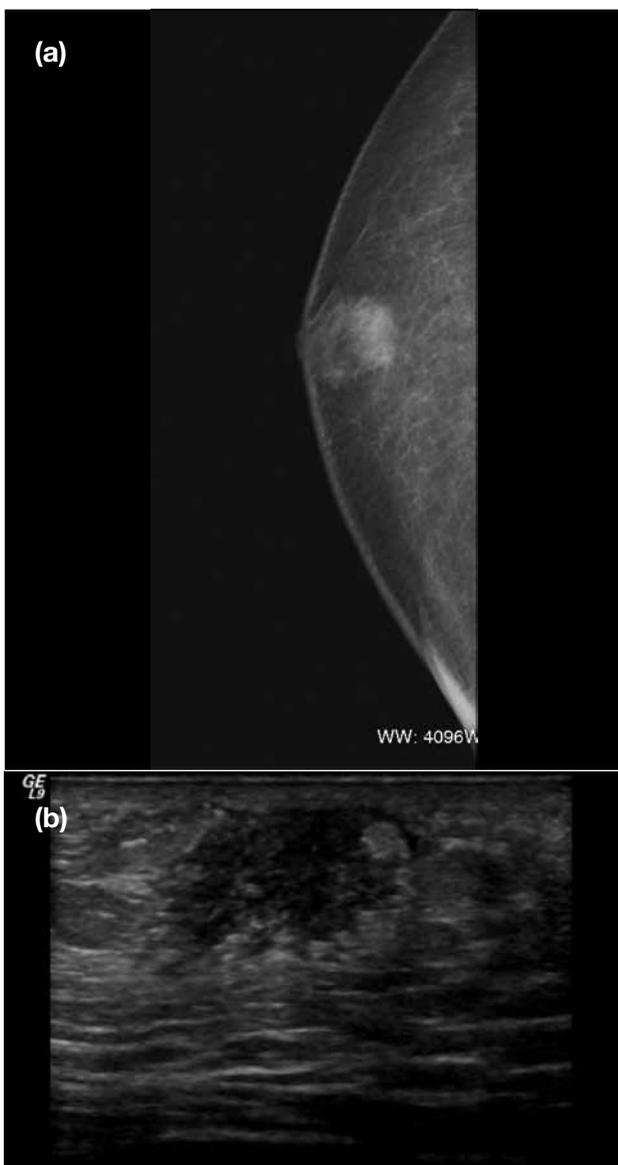


Figure 2. Early nodular gynaecomastia: (a) Craniocaudal mammogram reveals a nodular retroareolar density. (b) Supplementary ultrasound shows a retroareolar fan-shaped hypoechoic nodule surrounded by normal fatty tissue.



Figure 3. Chronic dendritic gynaecomastia: (a) Mediolateral oblique mammogram showing a dendritic retroareolar density with posterior linear projections radiating into the surrounding tissue, unlike malignancy, there is no associated nipple retraction or skin thickening. (b) Supplementary ultrasound shows a retroareolar hypoechoic lesion with an anechoic star-shaped posterior border or finger-like projections insinuating into the surrounding echogenic fibrous breast tissue.

or skin thickening (Figure 3a). Ultrasonography shows a retroareolar hypoechoic lesion with an anechoic star-shaped posterior border or finger-like projections insinuating into the surrounding echogenic fibrous breast tissue (Figure 3b). A diffuse glandular pattern is commonly seen in patients receiving exogenous oestrogens. Mammography and ultrasonography show both dendritic and nodular features (Figure 4).⁶ The former has been shown to be an accurate method for diagnosing benign gynaecomastia.⁷ Ultrasonography is resorted to when the mammography finding is suspicious or atypical.

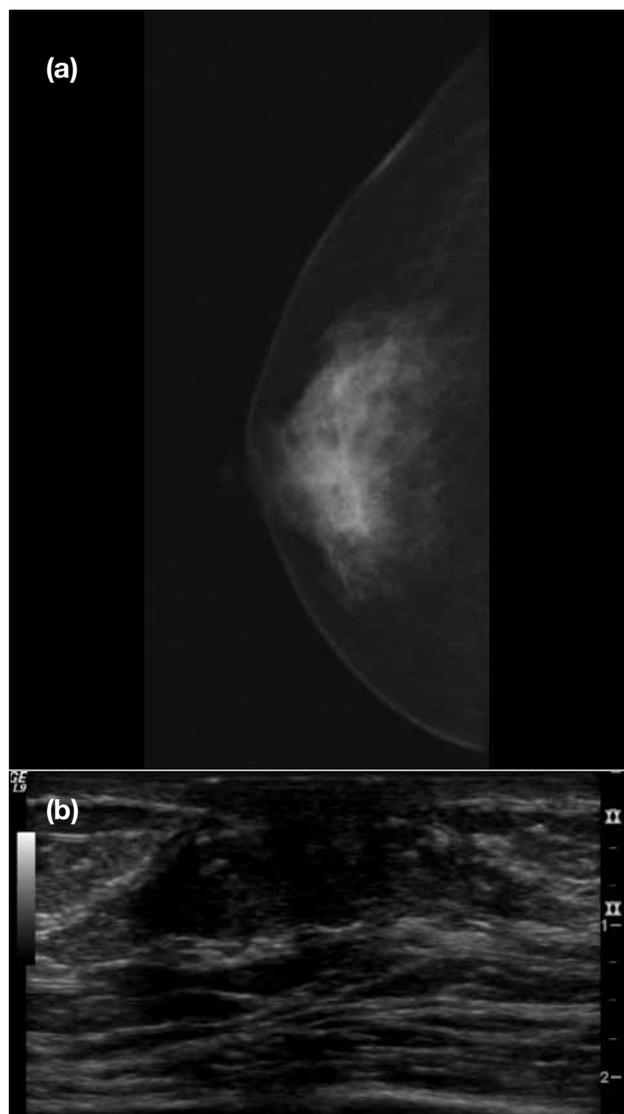


Figure 4. Diffuse glandular gynaecomastia: (a) Craniocaudal mammogram showing a diffuse density with both dendritic and nodular features. (b) Supplementary ultrasound reveals a heterogeneous breast with both dendritic and nodular features.

Lipoma

Lipoma is the second most common benign condition of the male breast,⁸ and our findings were concordant in that there were 2/72 (3%) of such cases in our series. Lipomas consist of mature adipocytes with uniform nuclei that are identical to those in normal adult white fat. Additional mesenchymal elements may sometimes be present, and are most commonly noted as fibrous connective tissue predominately in septa, and occasionally other mesenchymal elements (such as bone and cartilage) may also be seen.⁹ Mammography may reveal an encapsulated radiolucent mass in the palpable area (Figure 5), but sometimes it may not be discerned by this means owing to its surrounding fatty

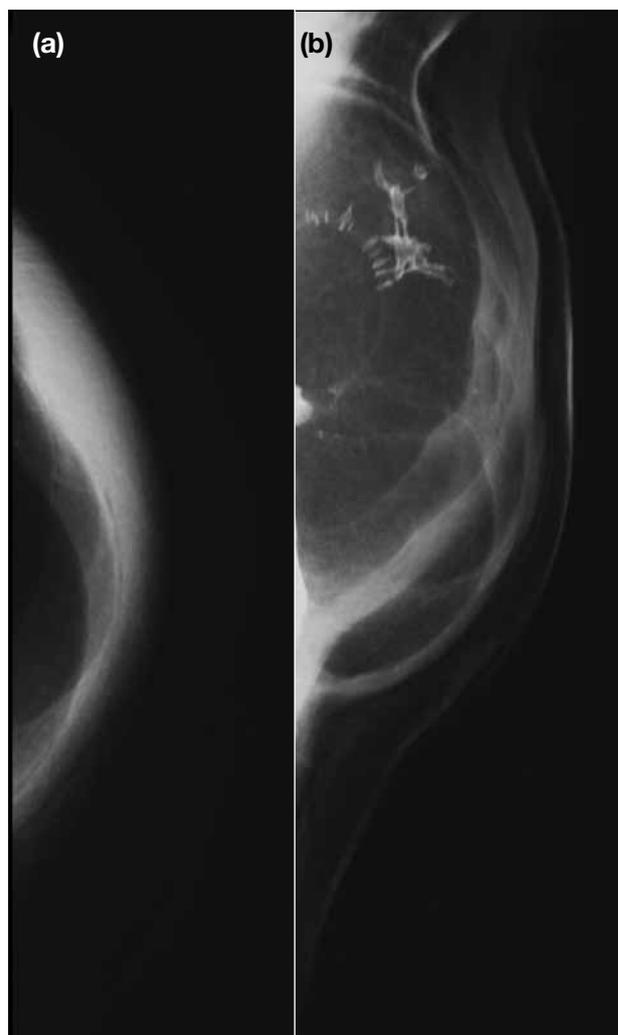


Figure 5. Lipoma: this patient had a history of chest wall mass for 20 years. Fine-needle aspiration of this mass revealed lipoma. (a) Craniocaudal and (b) mediolateral oblique mammograms show an encapsulated radiolucent mass. There are flecks of coarse calcifications seen in the mediolateral oblique view and represents mineralisation within the lipoma.

background (Figure 6a). Mineralisation (both chondroid and osteoid) in soft tissue lipomas is uncommon, but reported to ensue in up to 11% cases, especially when long standing (Figure 5b).^{10,11} Ultrasonography of the palpable abnormality usually shows a parallel, encapsulated, homogeneous and mildly hyperechoic mass (Figure 6b).⁶

Epidermal Inclusion Cyst

Epidermal inclusion cysts are the third most common benign lesions affecting male breasts.⁶ In our series there was one case (1%). The term ‘cyst’ is a misnomer as the lesion is composed of laminated keratin surrounded by stratified squamous epithelium. It arises

from an obstructed hair follicle or at sites of previous skin trauma.¹² Mammography demonstrates a well-defined dense oval mass, continuous with the skin in the area where it can be palpated. Ultrasonography reveals a hypoechoic lesion with posterior enhancement, which is continuous with the epidermis, and gives rise to the claw sign (Figure 7). The latter sign is useful for differentiating this benign lesion from cystic malignancy of the male breast.⁶

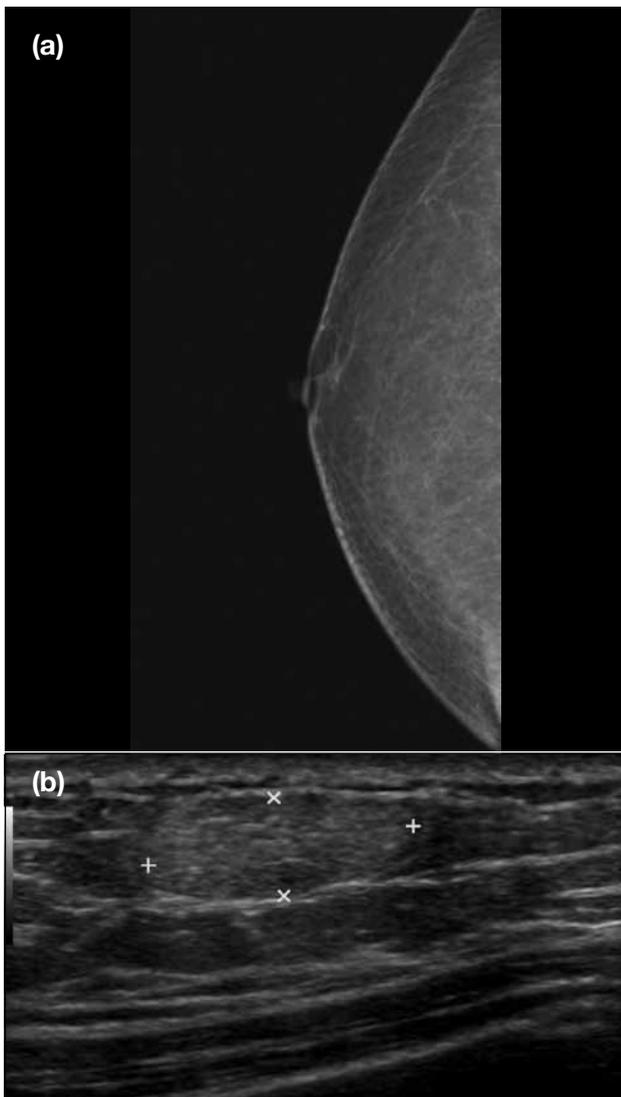


Figure 6. Another patient with a lipoma: (a) Craniocaudal mammogram reveals no definite mass. (b) Supplementary ultrasound of the palpable area reveals a parallel, homogeneous, mildly hyperechoic encapsulated mass, suggesting lipoma.

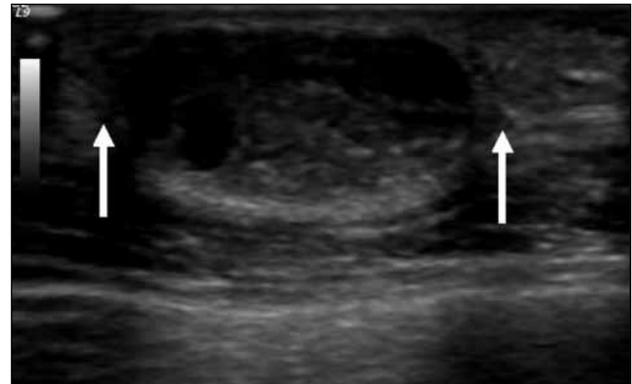


Figure 7. Epidermal inclusion cyst: ultrasound shows a hypoechoic lesion with posterior enhancement and contiguity with the epidermis (arrows), and the claw sign.



Figure 8. A patient with gynaecomastia and fibrocystic change: (a) Craniocaudal and (b) mediolateral oblique mammograms showing features of nodular gynaecomastia with solitary benign calcification (arrows). Biopsy results revealed gynaecomastia with non-proliferative fibrocystic change.

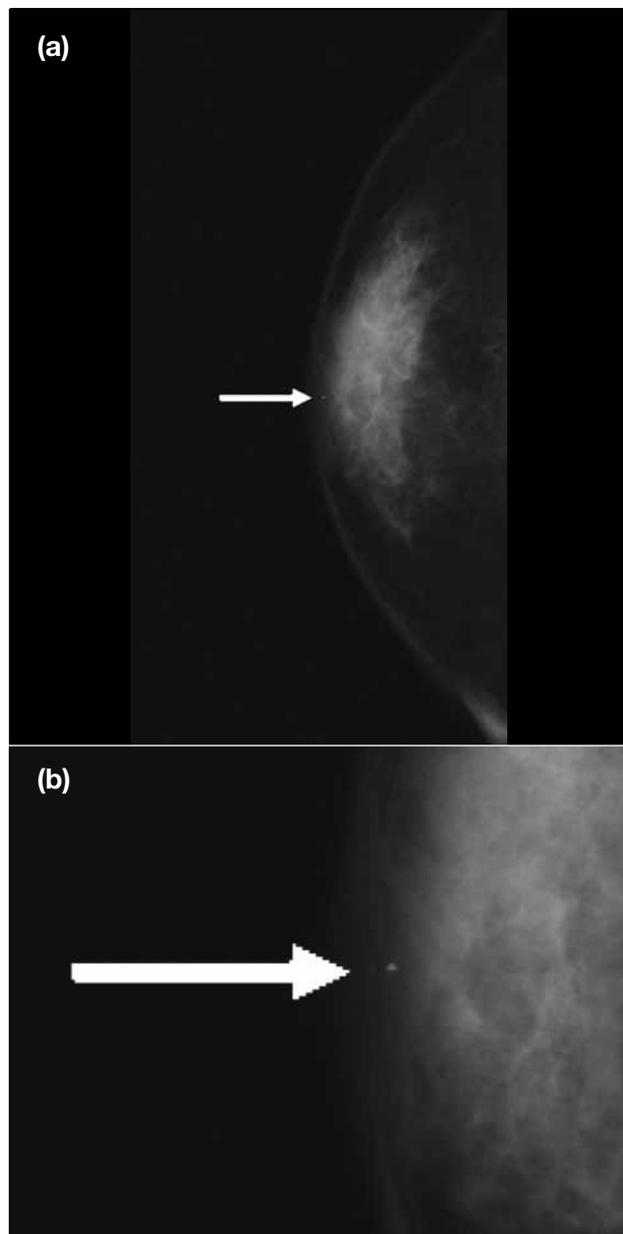


Figure 9. A patient with gynecomastia and fibrocystic change: (a) Craniocaudal mammogram and (b) its magnified image showing gynecomastia with solitary benign calcification (arrows). Biopsy revealed gynecomastia with fibrocystic change.

Table 1. Mean age, presenting symptoms, secondary signs, and risk factors in our patients with proven malignancy (n = 6).

Characteristic	Data
Mean (range) age (years)	67 (56-74)
Presenting symptoms	
Mass	5
Nipple discharge (bloody or clear fluid)	3
Secondary signs	
Inverted nipple	1
Skin thickening	1
Axillary lymphadenopathy	0
Risk factors (positive family history in first-degree relative)	1

Fibrocystic Changes

Fibrocystic changes are non-proliferative and have three predominant morphological features: cyst formation, fibrosis, and adenosis. Being a lobular process, it is uncommon in males. It accounted for two (3%) of the cases in our series in which it was an incidental finding revealed in biopsy specimens obtained during the investigation of gynecomastia. To our knowledge, there is limited literature detailing imaging findings of fibrocystic changes in male patients. We retrospectively reviewed our two cases from this perspective. Notably, mammography revealed gynecomastia with solitary coarse punctate benign calcification (Figures 8, 9), whereas sonography yielded gynecomastia without any cyst being noted. We believe the mammographic findings of fibrocystic changes in men are similar to those in women with benign calcification, but further study is required to validate this assumption.

Malignant Male Breast Lesion

Male Breast Cancer

Males account for 0.7% of all breast cancers,¹³ and yet breast cancer is the most common malignant lesion

Table 2. Summary of imaging features in our patients with proven malignancy.

Imaging feature	No. of patients
Mammogram	4
Mass	4
Density	
High	3
Equal	1
Margin	
Spiculated / lobulated	3
Circumscribed	1
Location	
Retroareolar / eccentric to nipple	3
Lower outer quadrant	1
Microcalcifications	0
Secondary signs	
Nipple retraction and skin thickening	1
Axillary lymphadenopathy	0
Ultrasound	6
Mass	6
Echogenicity	
Hypoechoic / solid	6
Margin	
Irregular	5
Circumscribed	1
Location	
Retroareolar / eccentric to nipple	5
Lower outer quadrant	1
Posterior shadowing	1
Secondary signs	
Nipple retraction and skin thickening	1
Axillary lymphadenopathy	0

of the male breast.^{6,7,14} This diagnosis accounted for 6/72 (8%) of the cases in our series. The mean age, symptoms, secondary signs, risk factors, and imaging features of our patients are summarised in Tables 1 and 2. The most common complaint in male patients with breast cancer is a palpable mass.⁴ Risk factors include advanced age, prior chest irradiation, diseases associated with hyperestrogenism and androgen deficiency, genetic and chromosomal conditions such as BRCA2 mutation and Klinefelter syndrome, and a positive family history in a first-degree relative.^{15,16} The majority of such

primary breast tumours in males are invasive ductal carcinomas of the ‘not otherwise specified’ subtype.¹⁷

Mammographic findings include: a high-density mass with a spiculated, lobulated or microlobulated margin; a retroareolar location usually eccentric to the nipple, and secondary signs, such as nipple retraction, skin thickening, and axillary lymphadenopathy (Figure 10a, b). Secondary signs are helpful in differentiating carcinoma and gynaecomastia, as both can be retroareolar. Ultrasound findings are comparable and

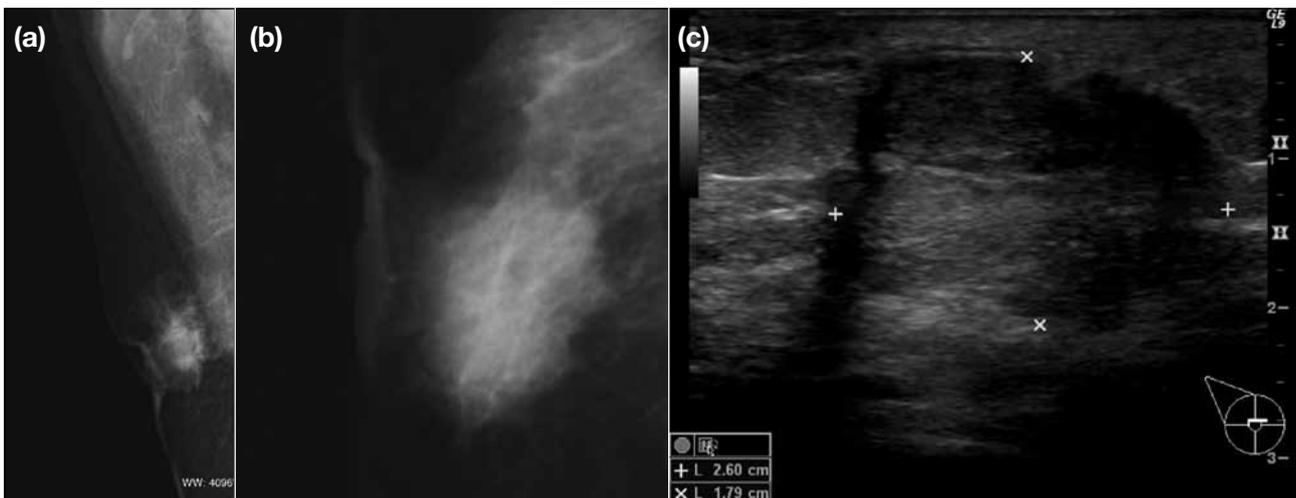


Figure 10. Invasive ductal carcinoma of male breast: (a) Mediolateral oblique mammogram and (b) magnified image showing a retroareolar high-density mass with a lobulated margin, no microcalcification is noted, secondary signs including nipple retraction and skin thickening are present. (c) Supplementary ultrasound reveals a hypoechoic mass with a lobulated margin, which is retroareolar and slightly eccentric to the nipple. Subsequent ultrasound-guided biopsy revealed invasive ductal carcinoma.

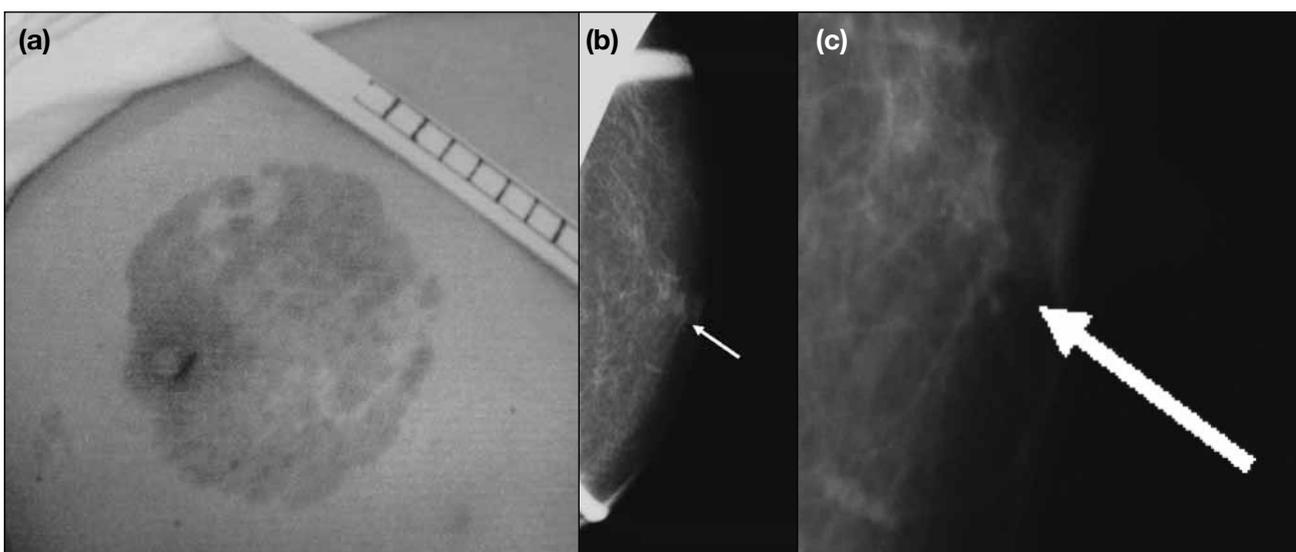


Figure 11. Paget's disease of male breast: (a) Clinical photo of a patient presenting with eczema at the areola and nipple of the right breast; skin biopsy confirmed it to be Paget's disease. (b) Cone magnification mammogram and (c) its close-up image revealing clustered pleomorphic calcifications (arrows) in retroareolar region. Ultrasound examination was unremarkable. Subsequent stereotactic-guided biopsy revealed atypical cells. The patient refused excision of the lesion and till now continues to receive conservative treatment.

Table 3. Characteristic imaging features of the three most common breast lesions in males.

	Mammogram	Ultrasound
Gynaecomastia	Retroareolar in location and concentric in distribution	-
Early nodular	Fan-shaped nodule	-
Chronic dendritic	Dendritic density with posterior linear projections	-
Diffuse glandular	Mixed pattern	-
Lipoma	Radiolucent encapsulated mass	Parallel, encapsulated, homogeneous and mildly hyperechoic mass
Epidermal inclusion cyst	-	Hypoechoic lesion with posterior enhancement and it is continuous with epidermis 'claw sign'

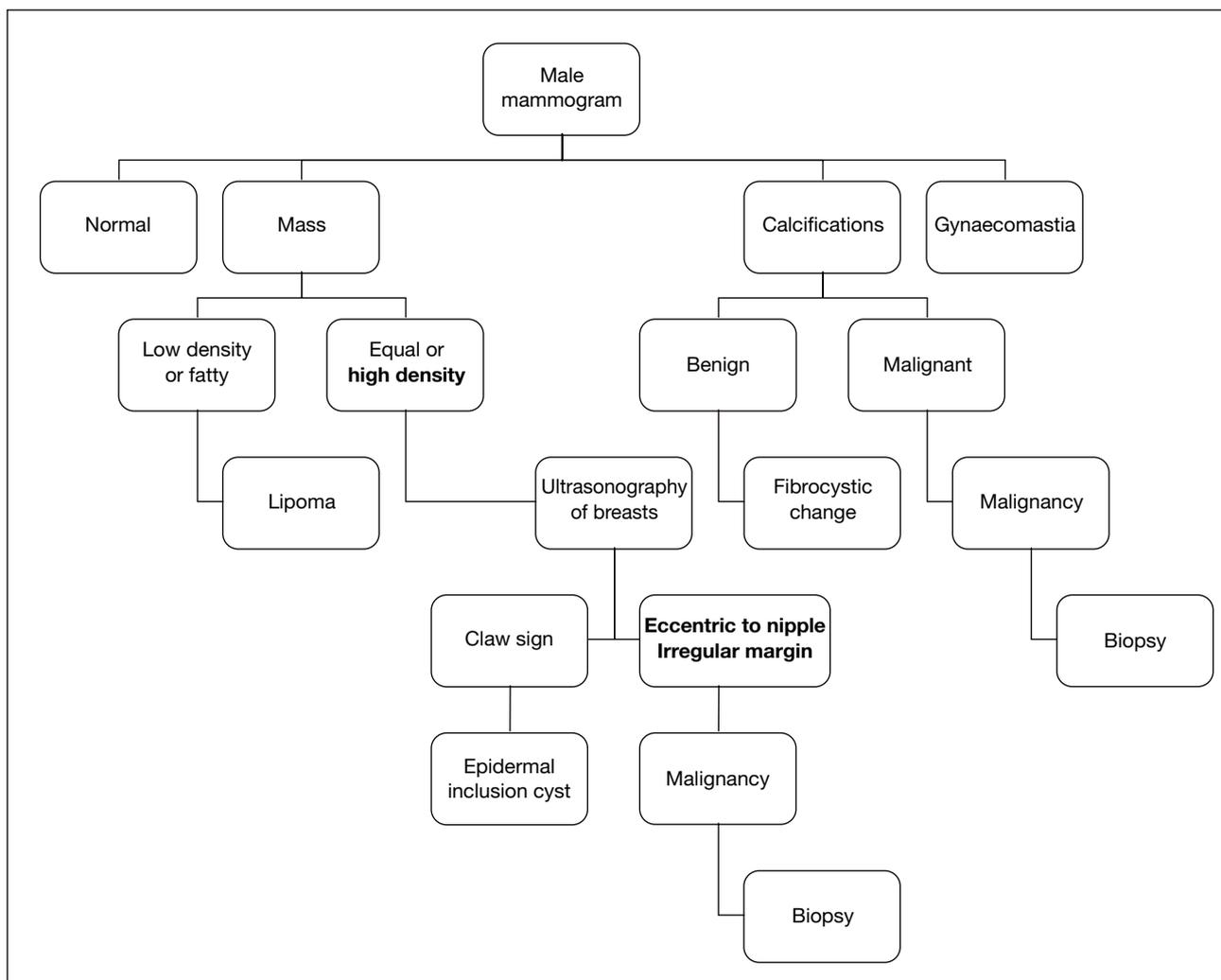


Figure 12. Summary of recommended workflow of male breast imaging. Words appearing in **bold** are the three most common imaging features of malignancy, for which biopsy is suggested.

include a hypoechoic mass with spiculated, lobulated or a microlobulated margin, a retroareolar location usually eccentric to nipple (Figure 10c). Ultrasonography is helpful in assessing the relation of the mass to the nipple,⁶ and secondary signs may also be noted. Imaging findings of male and female breast cancers

are similar, except in five aspects. First, in males the cancer is usually retroareolar or eccentric to the nipple. Second, calcifications are fewer, coarser and less frequently linear than those in female breast cancers. Third, secondary signs including nipple retraction and skin thickening are more apparent in men due to male

breasts being smaller and the lesions being retroareolar. Fourth, posterior acoustic features are not helpful for differentiating benign and malignant lesions in the male breast. Lastly, any complex cystic mass noted on sonography is very suggestive of malignancy.^{6,14,18}

Paget's Disease

Paget's disease is characterised by eczematous skin change of the nipple and is usually associated with an underlying breast malignancy. It was first described in 1874 by the surgeon, Sir James Paget, who found that this chronic eczematous rash of the nipple preceded presentation with an underlying intraductal carcinoma.¹⁹ It is extremely rare in male breasts; less than 50 such patients having been described in the literature.²⁰ From our series, one (1%) of the patients had Paget's disease.

Paget's disease may present with erythema (Figure 11a), ulceration, bleeding, scaling or a painful nipple. Clinical examination of the breast needs to be followed by imaging (mammography, ultrasound, or both), since it is associated with concomitant invasive ductal carcinoma. Imaging may reveal retroareolar microcalcifications (Figure 11b, c), architectural distortion, or nipple changes such as thickening.²¹

CONCLUSION

The majority of male breast lesions are benign, some of which show characteristic imaging features (Table 3). Male breast cancer also shows specific features distinct from its female counterpart. Our recommended workflow for breast imaging in males is summarised in Figure 12. Biopsy is suggested whenever there are suspicious radiological features of malignancy. With knowledge about the mammographic and sonographic features of the common benign and malignant lesions encountered in the male breast, an accurate radiological diagnosis can be achieved and unnecessary biopsy procedure can be avoided.

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