Metaplastic Breast Carcinoma in a Male Patient: A Rare Case Report

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Radiology Case. 2024 Mar; 18(3):22-32 :: DOI: 10.3941/jrcr.v18i3.5235

ABSTRACT

Metaplastic breast carcinoma is known to be a rare entity among female breast cancers. It is even rarer for a male patient to be diagnosed with this variant of breast carcinoma, with fewer than ten reported cases in the literature.

We report an extremely rare case of metaplastic breast carcinoma in a male patient, with distant metastases, without axillary nodal disease. He presented with a left breast lump rapidly increasing in size over three weeks. Mammogram and ultrasound revealed a round heterogeneous complex mass with internal cystic components. The mass had posterior acoustic enhancement. Biopsy confirmed metaplastic breast carcinoma of the spindle cell subtype. The immunohistochemistry showed that it was triple negative for estrogen receptor (ER), progesterone receptor (PR), Human epidermal growth factor receptor-2 (HER2) receptor status. Staging CT showed pulmonary metastases and chest wall disease. In view of the patient's poor pre-morbid functional status, the decision was made for best supportive care and the patient eventually succumbed to the disease shortly after two months.

Metaplastic breast carcinoma is an aggressive breast carcinoma with poor prognosis. Despite rapid increase in size clinically, it can demonstrate non-aggressive radiological features. Complex echogenicity with solid-cystic components may be demonstrated on ultrasound, likely due to haemorrhage or cystic necrosis. Although there may be distant metastases, axillary nodal disease is not frequent. Radiologists should be aware of this disease entity, its imaging findings, and clinical features despite its rare occurrence.

CASE REPORT

INTRODUCTION

A 77-year-old male presented on 24 June 2022 with a left breast lump, rapidly increasing in size over three weeks. He also complained of pain at the left lower costochondral junction for one week duration. There was no recent trauma. His past medical history included diabetes mellites, hypertension, hyperlipidaemia and a smoking history of 60 pack years.

On examination, there was visible swelling and a hard mass at the left breast lower outer quadrant, approximately 3 x 3 cm in size. The mass was fixed to the skin with no overlying skin erythema or nipple retraction. There was no palpable supraclavicular, infraclavicular or axillary lymph node.

IMAGING AND HISTOLOGY FINDINGS

Bilateral mammogram and breast ultrasound were subsequently performed on the same day he presented. Left mammogram revealed a high-density oval mass with circumscribed margins partially visualized in the left breast lower outer quadrant (Figure 1). There was no calcification or architectural distortion. It corresponded to the palpable lump.

Ultrasound of the left breast demonstrated an oval complex solid-cystic mass with heterogeneous echogenicity. It had partially circumscribed and partially indistinct margins. Linear internal cystic spaces were present. The mass demonstrated posterior acoustic enhancement (A and B), increased stiffness on elastography (C) and mild internal vascularity on colour doppler (D). It measured 3.2 x 2.6 x 3.0 cm. There was no enlarged axillary lymph node.

Ultrasound guided core biopsy was performed for the left breast mass on 27 June 2022. Histology confirmed the presence of metaplastic breast carcinoma (MBC) with dominant spindle cell carcinoma (nearly 90%) (Figure 3A) and a smaller component of poorly differentiated adenocarcinoma. The immunohistochemistry was estrogen receptor (ER),

progesterone receptor (PR), Human epidermal growth factor receptor-2 (HER2), GATA 3, P63 and CD31 negative, Vimentin and cytokeratin AE1-E3 (Figure 3B,3C), CAM5.2 positive. Ki67 and desmin markers were not performed. Additional immunohistochemistry staining showed the absence of thyroid transcription factor-1 (TTF-1) marker which excluded the possibility of breast metastasis from a primary lung malignancy. Findings were therefore consistent with the spindle cell subtype of MBC.

A staging computed tomography (CT) thorax, abdomen and pelvis was performed on 5 July 2022. It revealed bilateral pulmonary nodules with a dominant mass in the right upper lobe (Figure 4A,4B). The dominant pulmonary mass was centred along the right upper lobe bronchus. Given its peri-bronchial distribution and the patient's significant smoking history, the decision was made to proceed with a lung biopsy to exclude a synchronous primary lung malignancy. CT guided lung biopsy was performed on 18 July 2022. Histology showed spindle cell carcinoma (Figure 5) with negative staining for the TTF-1 marker. This confirmed the diagnosis of primary MBC with pulmonary metastasis.

On CT, there was a soft tissue nodule at the left lower anterior chest wall subcutaneous layer (Figure 6A and 6B). On ultrasound, a heterogeneous solid mass with cystic components and posterior acoustic enhancement was noted. It had lobulated margins. It measured 3.2 x 2.3 x 1.0 cm. It was overall similar in morphology to that of the primary left breast tumour (Figure 7). This was suspicious for chest wall metastasis.

Management

The final clinical tumour, nodal, metastasis (cTNM) staging was cT4bN0M1. The patient was discussed at a multi-disciplinary tumour board on 9 July 2022. Management options included palliative chemotherapy versus best supportive care. Given the reported poor response rate of palliative chemotherapy in the literature and considering the patient's poor pre-morbid performance status (Eastern Cooperative Oncology Group, ECOG 3), decision was made for best supportive care.

Follow up

Due to the aggressive nature of the disease, there was rapid progression and the patient passed away shortly, two months after initial diagnosis, on 14 August 2022.

DISCUSSION

Aetiology and demographics

MBC is a rare disease entity. Lee et al. noted the prevalence of MBC to be 0.8%, with a median age of diagnosis to be 50 years old [1]. There are currently only five reported cases of male patients with MBC. The ages of the male patients range from 47 to 78 years old at the time of diagnosis, with three of the five patients aged 70 years and above [2-6]. Our patient was 77 years old at the time of diagnosis. Of the male patients with MBCs, three were Asian, one Middle Eastern and two Caucasians [2-6]

Clinical Findings

Initial clinical presentation of MBC is commonly a large rapidly growing mass. The median tumour size in a previous study for MBC was 5.0 cm, larger than the size of triple negative invasive ductal carcinoma (IDC) (median 2.1 cm) [1]. The male patients with MBC had masses larger than 2.0 cm, with the largest being 5.0 cm. Our patient similarly presented with a large mass measuring up to 3.2 cm. MBC also commonly presents with distant metastases without axillary nodal involvement [1,7]. Of the reported cases of male patients with MBCs, four of five had distant metastases at the time of diagnosis Three out of five patients showed involvement of the axillary lymph nodes [2-6]. Our patient had distant metastases with no nodal involvement at the time of diagnosis. There are no known risk factors associated with this disease entity [1].

Radiological findings

Mammographic appearances of MBC have been described as high-density masses with either circumscribed, obscured, irregular and/or spiculated margins [8-11]. A few studies reported a more benign appearance on mammography including a round or oval shape and circumscribed margins [9,11]. Partially circumscribed margins are frequently encountered and possible distinctive imaging feature, reflecting the presence of both the metaplastic and invasive carcinoma components [7]. Calcifications are not commonly present in metaplastic breast carcinoma and are described in up to 25% of cases [7, 8].

The sonographic appearance of metaplastic breast carcinoma has been described as having a complex structure of heterogeneous echogenicity with cystic areas, although they can also be seen as a heterogeneous or hypoechoic solid mass or a mixed solid-cystic mass [9]. The cystic components are likely due to necrosis, haemorrhage or cystic degeneration, which may result in the posterior acoustic enhancement seen in MBC. This is in contrast to the posterior acoustic shadowing commonly seen in IDC [12]. These appearances again emphasize that male patients with metaplastic breast cancers can show some conventionally "benign" features such as posterior acoustic enhancement and a round shape (in contrast to a spiculated shape seen in IDC).

On magnetic resonance imaging (MRI) T1-weighted sequence, the mass is generally isointense or hypointense when compared with the normal fibro-glandular tissue. On T2-weighted sequence, heterogeneous high signal intensity of the mass is a pertinent MRI feature [7, 8, 11, 13]. This is likely because of tumour necrosis. The most common pattern of enhancement is ring-like enhancement with central non-enhancing area, again due to central necrosis [7, 8, 11, 13].

Histological and immunohistochemistry

The World Health Organization (WHO) Classification of Breast Tumours classifies MBC into six categories: mixed metaplastic carcinoma, low-grade adeno-squamous carcinoma, fibromatosis-like, squamous cell carcinoma, spindle cell carcinoma, and metaplastic carcinoma with mesenchymal differentiation [14]. The histology of MBC commonly contains poorly differentiated cells, as is the case for our patient. Squamous cell carcinoma is the most common subtype among patients with metaplastic breast carcinoma [2, 7]. However, in the five cases of male patients, the most common subtypes were that of metaplastic carcinoma with mesenchymal differentiation and adeno-squamous carcinoma, each consisting two patients [2-6]. The spindle cell subtype will now have two recorded cases after including our patient.

The immunohistochemistry profile of MBC is frequently triple negative for ER, PR and Her2 receptors [7, 15]. Approximately three quarters of all MBC stain positively for cytokeratin biomarkers (example AE1-E3 and CK5-6) [15]. GATA3, a common diagnostic marker used to identify tumours of breast origin, is expressed by only 21% of MBC [15]. Gerhard et al. showed that MBC also stains positively for vimentin [16]. Among the reported male patients with MBC, four out of five reported triple negative status. Our patient also showed a similar triple negative status, positive for vimentin, some cytokeratin biomarkers such as AE1/3 and CK5-6 and negative for GATA3. This immunohistochemistry profile falls in line with that in the reported literature.

Treatment and prognosis

There is currently no consensus on the management of MBC. Due to the advanced stage of disease at diagnosis, patients commonly undergo systemic chemotherapy [17, 18]. Neoadjuvant chemotherapy and radiotherapy followed by surgical resection are also possible treatment options [1, 19]. However, the treatment of MBC remains a conundrum due to the poor efficacy of conventional chemotherapy in decreasing overall tumour burden [20]. Hennessy et al. and Haque et al. reported a pathologic response rate of 10.0% [21] and 9.8% [19] following conventional chemotherapy respectively. Despite the reported chemoresistance, patients are still being managed according to the strategies for triple negative invasive ductal carcinoma.

For our patient, decision was made for best supportive care instead of palliative chemotherapy due to his poor pre-morbid functional status. Prognosis of male patients with MBC is poor, with only one patient (out of five) showing good response to treatment who remains alive two years after diagnosis [3]. The rest of the male patients with MBC passed away less than 6 months after diagnosis, including our patient[2-6]. This poor prognosis is likely a result of both advanced stage of the disease, the aggressive nature of MBC and the patient age; four of those who passed away are older than 70 years of age [2, 4-6].

DIFFERENTIAL DIAGNOSIS

Breast sarcoma

Breast sarcoma is a rare entity which accounts for less than 1% of all diagnosed breast cancers. It is an aggressive disease and specific types include angiosarcoma, liposarcoma, fibrosarcoma, leiomyosarcoma, sarcomas with bone and cartilage, and malignant fibrous histiocytoma [22]. The imaging findings are largely similar to that of MBC.

Majority of the patients demonstrate a high-density oval mass with indistinct margins on mammography. Calcification is uncommon, with only 21% of the cases showing it [22]. Of note, it is rare for breast sarcoma to involve the axillary lymph nodes, with one study showing none of the patient's demonstrating axillary lymphadenopathy. Sonographic findings of breast sarcoma include oval hypoechoic masses with indistinct margins and internal vascularity. About half of the cases show posterior acoustic enhancement, similar to MBC [22, 23]. On MRI, the mass demonstrated irregular margins, T1-weighted hypointensity or mixed signal and T2-weighted hyperintensity [22, 23]. The larger masses demonstrate peripheral enhancement with central areas of non-enhancement, similar to MBC. This is because of central necrosis [22, 23]. Due similar imaging appearance, primary breast sarcoma and MBC imaging differentials and diagnosis is usually made on histology.

Treatment of breast sarcomas involve a multidisciplinary approach to therapy including surgery, radiation, and chemotherapy. Axillary nodal dissection is not routinely performed due to the uncommon involvement of the axillary lymph nodes [22, 23].

Invasive ductal carcinoma

IDC is the most common form of breast cancer, accounting for 60-70% of all breast cancers[1]. It is an infiltrating and malignant proliferation of neoplastic cells in the breast tissues. Some imaging features of IDC are different from MBC.

Mammographic appearance is usually that of a high-density mass with spiculated or irregular margins. The mass may be associated with microcalcifications, in a linear or segmental distribution pattern, amorphous or pleomorphic in morphology. Calcifications occur more commonly in IDC than MBC [13]. Sonographically, it presents as an irregular or spiculated hypoechoic breast mass, with posterior acoustic shadowing [1, 13, 24]. The mass shows T1-weighted signal isointense to the breast parenchyma; and isointense to hypointense T2-weighted signal on MRI. They are irregular or spiculated with early contrast enhancement and washout. As opposed to MBC, masses of IDC show fewer “benign” characteristics [13]. There is commonly axillary lymphadenopathy in advanced stages of disease.

Treatment of IDC is dependent on the staging of the disease and the hormonal profile of the tumour. Overall prognosis is better than that of MBC [1, 24].

Breast Metastasis

Metastasis to the breast is a rare occurrence. The most common primary malignancies that metastasize to the breast are melanoma and haematological malignancies [25, 26]. Mammographic findings are usually that of a high density, round to oval mass with poorly defined or obscured margins. On ultrasound, it is seen as a poorly defined, irregular hypoechoic mass, predominantly distributed superficially [25]. However, the imaging findings of metastatic masses to the breast are often variable, depending on the primary origin of the malignancy [25-27]. As such, definite diagnosis of metastasis to the breast is usually made on histology, when immunohistochemistry markers specific to various primary malignancies are tested. For example, a primary lung malignancy with metastasis to the breast will show positive staining for TTF-1[27].

AUTHORS' CONTRIBUTIONS

1) **Tan Hong Yu – Data collection, manuscript preparation, literature analysis**
2) **Cheryl Lim Hui Shan – Data collection**
3) **Margaret Lee Yee Wah – Data collection**
4) **Issam Al Jajeh – Data collection**
5) **Tarun M Mirpuri - Study plan, Data collection/ entry, manuscript preparation**

TEACHING POINT

Metaplastic breast carcinoma is a rare aggressive breast carcinoma with a poor prognosis. Despite rapidly increasing in size clinically, it can demonstrate non-aggressive radiological appearances. Masses with complex echogenicity and solid-cystic components may be demonstrated on ultrasound, likely due to internal haemorrhage or cystic necrosis. Axillary nodes are not frequently involved. Radiologists should be aware of this disease entity, its imaging findings, and clinical features despite its rare occurrence.

QUESTION AND ANSWER

Question 1

What is the prevalence of metaplastic breast carcinoma and how many reported male metaplastic breast carcinoma cases are there?

1. less than 1% prevalence; fewer than 10 reported male metaplastic breast carcinoma. (applies)

2. less than 5% prevalence; fewer than 10 reported male metaplastic breast carcinoma.

3. less than 25% prevalence; fewer than 100 reported male metaplastic breast carcinomas.

4. less than 25% prevalence; fewer than 10 reported male metaplastic breast carcinoma.

5. less than 1% prevalence; fewer than 100 reported male metaplastic breast carcinomas.

Explanation:

1. less than 1% prevalence; fewer than 10 reported male metaplastic breast carcinoma. [Prevalence of metaplastic breast carcinoma is 0.8%; There are currently only five reported male cases of metaplastic breast carcinoma.]

2. less than 5% prevalence; fewer than 10 reported male metaplastic breast carcinoma. [Prevalence of metaplastic breast carcinoma is 0.8%; There are currently only five reported male cases of metaplastic breast carcinoma.]

3. less than 25% prevalence; fewer than 100 reported male metaplastic breast carcinomas. [Prevalence of metaplastic breast carcinoma is 0.8%; There are currently only five reported male cases of metaplastic breast carcinoma.]

4. less than 25% prevalence; fewer than 10 reported male metaplastic breast carcinoma. [Prevalence of metaplastic breast carcinoma is 0.8%; There are currently only five reported male cases of metaplastic breast carcinoma.]

5. less than 1% prevalence; fewer than 100 reported male metaplastic breast carcinomas. [Prevalence of metaplastic breast carcinoma is 0.8%; There are currently only five reported male cases of metaplastic breast carcinoma.]

Question 2

Which of the following statement about the clinical features of metaplastic breast carcinoma is true?

1) The breast mass is typically smaller than that of invasive ductal carcinoma.

2) It more commonly demonstrates distant metastases on diagnosis rather than nodal metastases. (applies)

3) The overall prognosis of metaplastic breast carcinoma is better than that of invasive ductal carcinoma.

4) The patient usually presents with a gradually enlarging breast mass.

5) It more commonly demonstrates nodal metastases than distant metastases.

Explanation:

1) The breast mass is typically smaller than that of invasive ductal carcinoma. [The median tumour size in a previous study for metaplastic breast carcinoma was 5.0 cm, larger than the size of triple negative invasive ductal carcinoma (median 2.1 cm).]

2) It more commonly demonstrates distant metastases on diagnosis rather than nodal metastases. [Metaplastic breast carcinoma also commonly presents with distant metastases and less frequently with axillary nodal involvement.]

3) The overall prognosis of male metaplastic breast carcinoma is better than that of invasive ductal carcinoma. [Prognosis of male metaplastic breast cancers appear poor, with only one patient with response to the treatment with survival of 2 years at the time of reporting.]

4) The patient usually presents with a gradually enlarging breast mass. [Initial clinical presentation of metaplastic breast carcinoma commonly involves a rapidly growing large mass.]

5) It more commonly demonstrates nodal metastases than distant metastases. [Metaplastic breast carcinoma also commonly presents with distant metastases and less frequently with axillary nodal involvement.]

Question 3

Which of the following statement is true about mammographic findings for metaplastic breast carcinoma?

1. Calcifications are common in metaplastic breast carcinoma.
2. Enlarged axillary lymph nodes are commonly seen on mammogram.
3. The margins of metaplastic breast carcinoma masses are usually spiculated.
4. The margins of metaplastic breast carcinoma masses are most commonly partially circumscribed. (applies)
5. Masses of metaplastic breast carcinomas always show features highly suggestive of malignancy.

Explanation:

1. Calcifications are common in metaplastic breast carcinoma. [Calcifications are not commonly present in metaplastic breast carcinoma and are described in up to 25% of cases.]
2. Enlarged axillary lymph nodes are commonly seen on mammogram. [Many do not show enlarged axillary lymph nodes.]
3. The margins of metaplastic breast carcinoma masses are usually spiculated. [A few studies also reported a more benign appearance on mammography including a round or oval shape and circumscribed margins.]
4. The margins of metaplastic breast carcinoma masses are most commonly partially circumscribed. [A few studies also reported a more benign appearance on mammography including a round or oval shape and circumscribed margins.]
5. Masses of metaplastic breast carcinomas always show features highly suggestive of malignancy. [A few studies also reported a more benign appearance on mammography including a round or oval shape and circumscribed margins.]

Question 4

Which of the following statement is true about sonographic findings for metaplastic breast carcinoma?

1. Posterior acoustic enhancement is a distinct feature and is likely a reflection of a benign process in metaplastic breast carcinoma.
2. Posterior acoustic enhancement is a distinct feature and is likely a reflection of a malignancy related process in metaplastic breast carcinoma. (applies)
3. Complex heterogeneous echogenicity with cystic space are not features of metaplastic breast carcinoma.
4. Areas of necrosis is not a common feature of metaplastic breast carcinoma.
5. Calcifications are common findings on ultrasound.

Explanation:

1. Posterior acoustic enhancement is a distinct feature and is likely a reflection of a benign process in metaplastic breast carcinoma. [The cystic components likely correspond to necrosis, haemorrhage or cystic degeneration and therefore often show posterior acoustic enhancement,]
2. Posterior acoustic enhancement is a distinct feature and is likely a reflection of a malignancy related process in metaplastic breast carcinoma. [The cystic components likely correspond to necrosis, haemorrhage or cystic degeneration and therefore often show posterior acoustic enhancement,]
3. Complex heterogeneous echogenicity with cystic space are not features of metaplastic breast carcinoma. [The sonographic appearance of metaplastic breast carcinoma has been described as having a complex structure of heterogeneous echogenicity with cystic areas, although they can also be seen as a solid mass, heterogeneous or hypoechoic solid mass or a mixed cystic and solid mass.]
4. Areas of necrosis is not a common feature of metaplastic breast carcinoma. [The cystic components likely correspond to necrosis, haemorrhage or cystic degeneration and therefore often show posterior acoustic enhancement,]
5. Calcifications are common findings on ultrasound. [Calcifications are uncommon findings on ultrasound.]

Question 5

Which of the following regarding the differential diagnoses is true?

1. Breast sarcoma can show very similar imaging features to metaplastic breast carcinoma. It usually is diagnosed on histology. (applies)
2. Invasive ductal carcinoma of the breast less commonly shows calcifications than metaplastic breast carcinoma.
3. Metastases to the breast show consistent and distinct imaging features.
4. Metaplastic breast carcinoma do not show benign features on ultrasound.
5. Breast sarcoma happens more frequently than metaplastic breast carcinoma.

Explanation:

1. Breast sarcoma can show very similar imaging features to metaplastic breast carcinoma. It usually is diagnosed on histology. [The imaging findings can be similar to that of metaplastic breast carcinoma. A diagnosis of primary breast sarcoma should be made only after metaplastic carcinoma has been excluded.]
2. Invasive ductal carcinoma of the breast less commonly shows calcifications than metaplastic breast carcinoma. [Calcifications occur more commonly in invasive ductal carcinoma than metaplastic breast carcinoma.]
3. Metastases to the breast show consistent and distinct imaging features. [The imaging findings of metastatic lesions to the breast are often variable, depending on the primary origin of the malignancy.]
4. Metaplastic breast carcinoma do not show benign features on ultrasound. [The cystic areas are likely as a result of necrosis and therefore produce posterior acoustic enhancement which is a feature of 'benignity' on ultrasound.]
5. Breast sarcoma happens more frequently than metaplastic breast carcinoma. [Breast sarcoma is a rare entity which accounts for less than 1% of all diagnosed breast cancers.]

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FIGURES

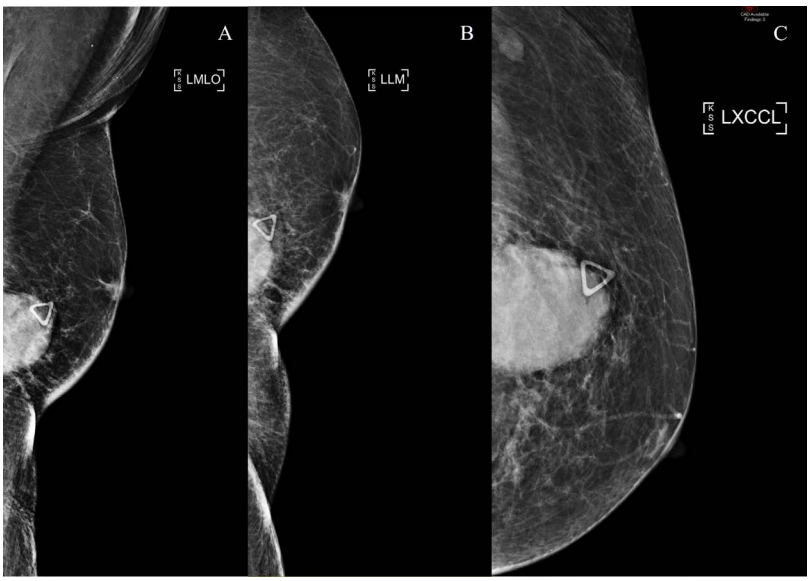

Figure 1: A 77-year-old male with primary metaplastic breast carcinoma with metastases to the lungs and chest wall.
Findings: Left digital mammography in the mediolateral oblique (MLO) view (A), lateromedial (LM) view (B) and extended craniocaudal (XCCL) view (C) show a partially visualized mass in the lower outer quadrant (palpable, as annotated by the Beekley marker). The mass was oval of high density with circumscribed margins. There was no calcification or architectural distortion.
Technique: Left digital mammography in mediolateral oblique (MLO) view, lateromedial (LM) view and extended craniocaudal (XCCL) view.

Figure 2: A 77-year-old male with primary metaplastic breast carcinoma with metastases to the lungs and chest wall.
Findings: Left breast ultrasound showed an oval solid-cystic mass with heterogeneous echogenicity. It had partially circumscribed and partially indistinct margins. Linear internal cystic spaces were present. The mass demonstrated posterior acoustic enhancement (A and B), increased stiffness on elastography (C) and mild internal vascularity on colour doppler (D). It measured 3.2 x 2.6 x 3.0 cm.
Technique: Gray-scale ultrasound imaging of left lower outer breast mass using Siemens 18L6 HD linear array transducer at 7-10MHz frequency. A) Transverse view, B) longitudinal view, C) Elastography, D) Colour Doppler.

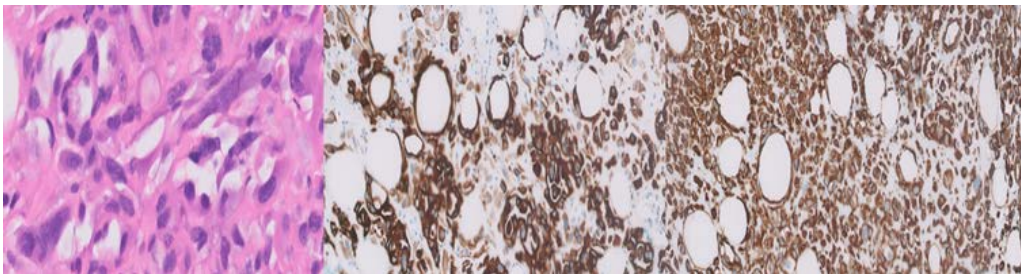

Figure 3: A 77-year-old male with primary metaplastic breast carcinoma with metastases to the lungs and chest wall.
Findings: Histology of the left breast mass showed pleomorphic cells with mostly large high grade plump spindles (A). The histology specimen stained positive for the cytokeratin marker AE1/3 (B) and vimentin (C). Both markers are known to be found in metaplastic breast carcinoma.
Technique: A) Haematoxylin and eosin staining of the left breast mass, seen under 40X microscopic magnification. B) Immunohistochemistry staining with the cytokeratin marker AE1/3 seen under 40x microscopic magnification. C) Immunohistochemistry staining with vimentin seen under 40x microscopic magnification.

Figure 4: A 77-year-old male with primary metaplastic breast carcinoma with metastases to the lungs and chest wall.
Findings: Non-contrast CT chest, abdomen and pelvis of the patient was performed for staging. It showed a dominant irregular mass in the right upper lobe, peri-bronchial in location, measuring 5.9 x 3.7 x 6.6 cm. A subsequent CT guided core biopsy of this mass confirmed pulmonary metastases from the metaplastic breast cancer.
Technique: Non-contrast enhanced CT of the thorax, abdomen and pelvis, Siemens Somatom Force CT scanner, 100kV 82 mAs, 3mm slices. Axial (A) and coronal (B) views.

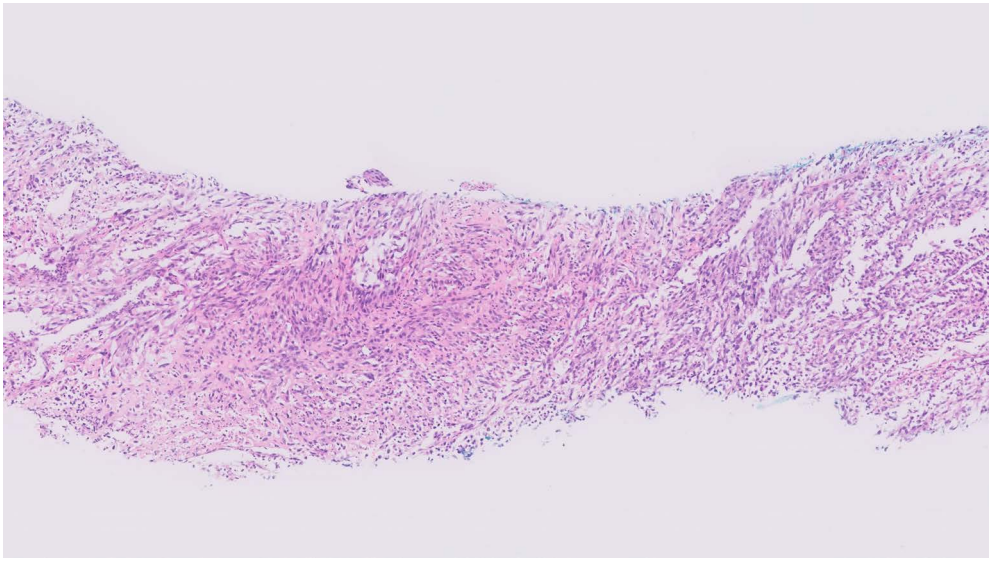

Figure 5: A 77-year-old male with primary metaplastic breast carcinoma with metastases to the lungs and chest wall.
Findings: Histology of the right upper lobe mass showed cellular lesional tissue composed of sheets of cells with ovoid to elongated nuclei. There is mild nuclear pleomorphism. Findings were consistent with spindle cell carcinoma, likely metastatic from the primary breast malignancy.
Technique: Haematoxylin and eosin staining of the right upper lobe mass under 10x microscopic magnification.

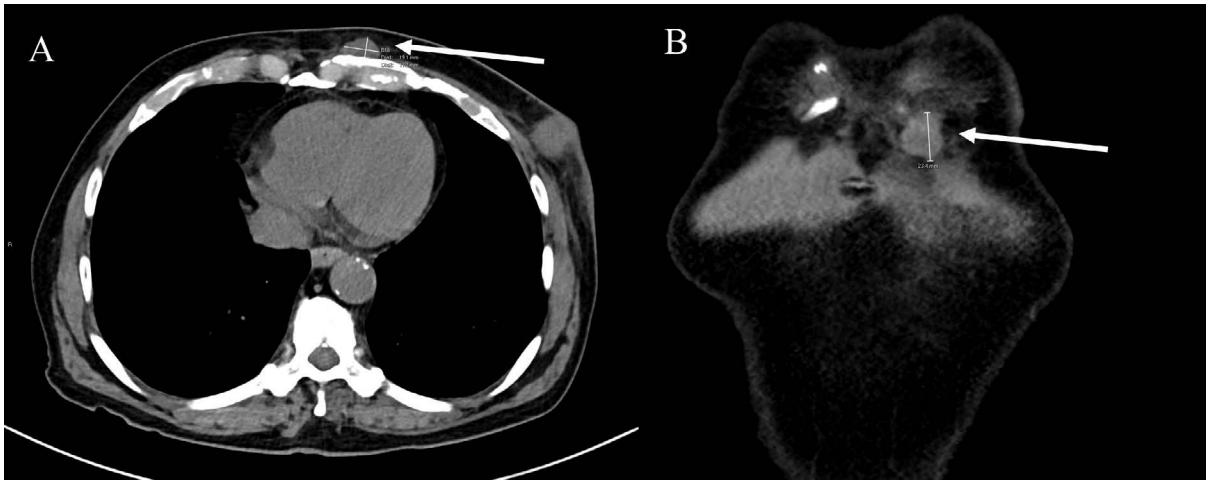

Figure 6: A 77-year-old male with primary metaplastic breast carcinoma with metastases to the lungs and chest wall.
Findings: Non-contrast CT chest, abdomen and pelvis showed a well-circumscribed soft tissue nodule in the subcutaneous tissues of the left anterior chest wall. It measured 1.9 x 1.1 x 2.3 cm.
Technique: Non-contrast enhanced CT of the thorax, abdomen and pelvis, Siemens Somatom Force CT scanner, 100kV 82 mAs, 3mm slices. Axial (A) and coronal (B) views.

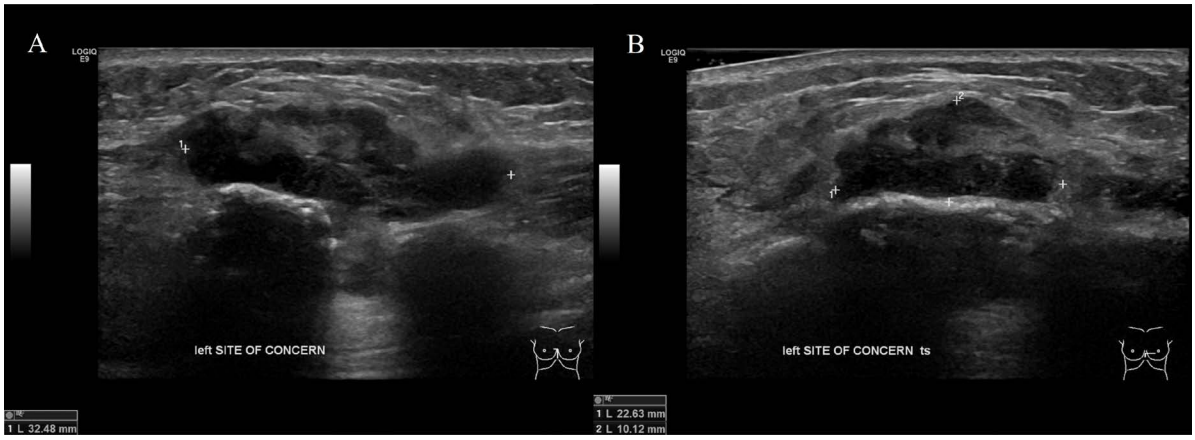

Figure 7: A 77-year-old male with primary metaplastic breast carcinoma with metastases to the lungs and chest wall.
Findings: Ultrasound of the left lower anterior chest wall nodule revealed a heterogeneous solid mass with cystic components and posterior acoustic enhancement. It had lobulated margins. The morphology of this nodule was similar to that of the primary breast mass, suspicious for a metastatic deposit. It measured 3.2 x 2.3 x 1.0 cm.
Technique: Gray-scale ultrasound imaging of left chest wall nodule using General Electric ML6-15-D linear array transducer at 15MHz frequency. A) Transverse view, B) longitudinal view.

TABLES

Table 1: Summary table of metaplastic breast carcinoma

Etiology	Metaplasia of the glandular and non-glandular cells of the breast, characterized by the presence of two or more malignant cell types, commonly a mixture of epithelial and mesenchymal components.
Incidence	Less than 1% of primary breast cancers
Gender ratio	>99% of cases are females; male cases are limited to fewer than ten reported in literature
Age predilection	50-60 years old
Risk factors	No known risk factors
Treatment	
Prognosis	Two-year and five-year overall survival rates in the entire cohort were 79% and 69%. Five-year progression free survival rates for stages I, II, and III were 68%, 72%, and 27%, respectively. Stage IV had worse survival with only a one-year progression free survival rate of 14%.
Findings on imaging	Mammographic findings: Commonly hyperdense lesions with round or oval shapes. The margins of these lesions may be circumscribed, obscured or indistinct. Partially circumscribed margins are frequently encountered and possible distinctive imaging feature, reflecting the presence of both the metaplastic and invasive carcinoma components. Calcification and enlarged axillary lymph nodes are uncommon features. Ultrasound findings: Frequently encountered as a mass with a complex echo structure containing a cystic component secondary to necrosis. Common to show posterior acoustic enhancement rather than shadowing. MRI findings: T1-weighted images are generally isointense or hypointense when compared with the normal fibro-glandular tissue. Heterogeneous high signal intensity on T2-weighted images is a significant MRI feature, as a result of the underlying necrosis. Most common pattern of enhancement is a ring-like enhancement.

Table 2: Differential diagnosis and their imaging features

Differential diagnosis	Mammographic finding	Ultrasound finding	MRI finding
Metaplastic breast carcinoma	- High-density oval/round mass with partially circumscribed margins. - Calcification is an uncommon finding - Uncommon to involve lymph nodes at the first instance	- partially circumscribed oval mass with a complex structure of heterogeneous echogenicity and cystic areas. - Posterior acoustic enhancement is a fairly common finding due to the underlying cystic areas due to necrosis.	- T1-weighted isointense or hypointense compared with normal fibro-glandular tissue. Heterogeneous T2-weighted high signal intensity is a key feature due to necrosis. - Pattern of enhancement is ring-like enhancement with central areas of non-enhancement
Breast sarcoma	- Oval masses with indistinct margin. - Most of the masses were high density. - Calcification is an uncommon finding, with only 21% of the cases showing it. - Rare to involve the axillary lymph nodes.	- Oval hypoechoic masses with indistinct margins. - Commonly show internal vascularity. - Half of the masses show posterior acoustic enhancement.	- Masses with irregular margins - T1-weighted hypointensity or mixed signal; T2-weighted hyperintensity compared with the fibro-glandular tissues. - Larger masses demonstrate peripheral enhancement with central areas of non-enhancement. These appearances are likely related to central necrosis.
Invasive ductal carcinoma	- High density mass with spiculated or irregular margins. - Can be associated with microcalcifications, in a linear or segmental distribution. They may appear amorphous or pleomorphic. - In more advanced stages of the disease, there is axillary lymphadenopathy.	- Irregular or spiculated hypoechoic breast mass. - Some may show posterior acoustic shadowing. - Associated microcalcifications can also be seen.	- Irregular or spiculated mass - T1W isointense signal and T2W isointense to hypointense signal. - early contrast enhancement with washout.
Metastasis to breast	Variable imaging findings depending on the primary malignancy. Definitive diagnosis of metastasis to the breast usually requires a histological confirmation with immunohistochemistry staining.		

KEYWORDS

• Male; metaplastic; breast cancer; mammography; ultrasound; magnetic resonance imaging; triple negative; spindle cell carcinoma

ABBREVIATIONS

MBC – Metaplastic breast carcinoma
IDC – Invasive ductal carcinoma
ER - Estrogen receptor
PR - Progesterone receptor
Her2 - Human epidermal growth factor receptor-2
TTF-1 - Thyroid transcription factor-1
CT - Computed tomography
cTNM - Clinical tumour, nodal, metastasis
ECOG - Eastern Cooperative Oncology Group
WHO - World Health Organization
MRI - Magnetic resonance imaging

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