Multimodality Imaging Review of Papillary Lesions in the Breast

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Introduction and Objective:

Papillary breast lesions encompass a broad spectrum of entities, ranging from benign to malignant. Their heterogeneity and similar imaging features between benign and malignant types pose diagnostic and management challenges. This poster aims to review the imaging characteristics of various papillary breast lesions and highlight features that may help predict malignancy.

Material and Method:

A retrospective review was conducted on female patients with pathological proven papillary breast lesions between 2008 and 2025 in our institutions. Radiological features were analysed across multiple imaging modalities, including full-field diagnostic mammography (FFDM), digital breast tomosynthesis (DBT), ultrasound (USG), and magnetic resonance imaging (MRI).

Results:

Benign	Malignant
Central intraductal papilloma (IDP)	IDP associated with ductal carcinoma in-situ (DCIS) or invasive carcinoma
Peripheral IDP	Encapsulated papillary carcinoma
	Solid papillary carcinoma
Juvenile papillomatosis	Papillary DCIS
	Micropapillary DCIS
IDP associated with atypia or high risk lesions	Invasive papillary carcinoma
	Invasive micropapillary carcinoma

Benign Papillary Lesions

IDP

- Most common papillary breast lesion

Divided into:

- **Central** type (usually centrally located within subareolar ducts)
- **Peripheral** type (often arise from distal and smaller ducts, more likely multiple)

- **MMG:** round or oval circumscribed mass, a single dilated duct at the retroareolar region (Fig 1a), and/or grouped microcalcifications
- **USG:** a dilated duct with an intraductal mass, mixed cystic and solid mass (Fig 1b), or a solid circumscribed mass. A vascular pedicle or stalk on colour Doppler
- **MRI:** enhancing mass +/- intraductal component. Type 2 or 3 enhancement curve
- IDP associated with atypia exhibit similar imaging characteristics to those of benign papillomas across all modalities (Fig 2)

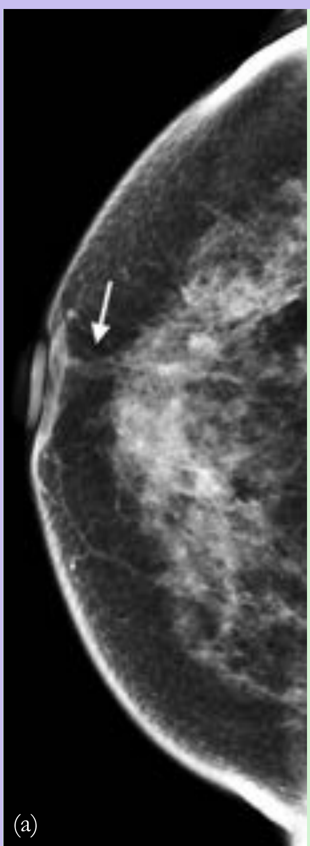


Fig 1. Central IDP
Mammogram (MMG) of the right breast in CC view showed a dilated duct (arrows) at retroareolar region (a). On supplementary ultrasound (USG)of the right breast, a corresponding mixed cystic and solid mass at periareolar region was seen (b).

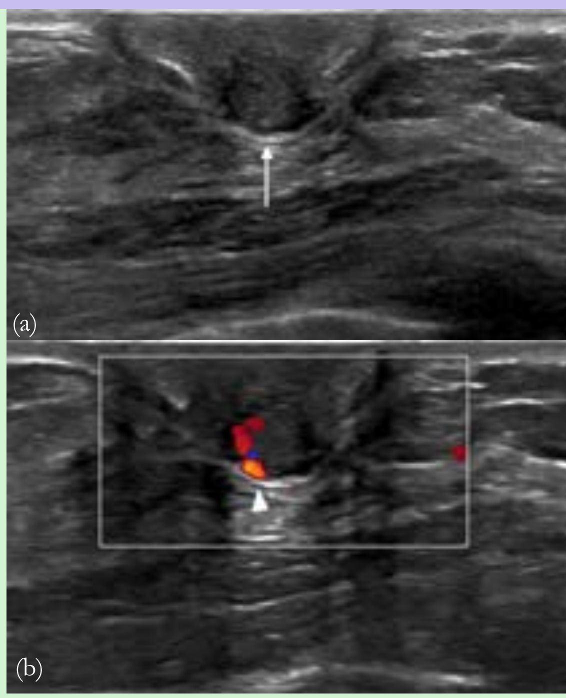


Fig 2. IDP with superimposed atypical ductal hyperplasia (ADH)
USG showed a retroareolar hypoechoic solid lesion with indistinct margin (arrow)(a). An associated vascular pedicle is demonstrated on color Doppler (arrowhead)(b).

Papillomatosis

- Defined as the presence of **5 or more** papillomas
- Higher **association with atypia, high risk lesions or malignancy** (Fig 3)
- Juvenile papillomatosis primarily affects women under 30 and is linked to an increased risk of breast cancer

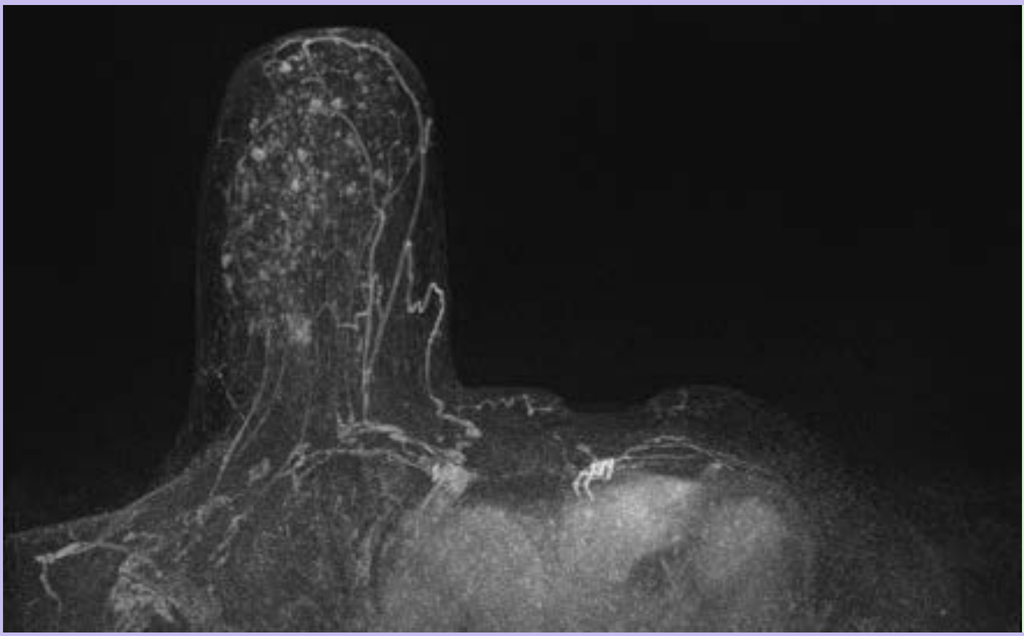


Fig 3. Papillomatosis
A patient with prior left mastectomy for invasive ductal carcinoma. T1-weighted post-gadolinium enhanced maximum intensity projection (MIP) MR image illustrated multiple enhancing lesions in the right breast. Biopsy of some of these lesions confirmed IDP.

Mimickers of Benign Papillary Lesions

Multiple **benign** and **malignant** (Fig 4) pathologic entities can manifest as complex cystic breast lesions:

- **Fibrocystic disease, fibroadenoma, ADH, DCIS, infiltrating ductal and lobular carcinoma with central necrosis**
  → Tissue sampling is required to confirm the diagnosis.
- **Hematoma, oil cyst, fat necrosis** (Fig 5) **and galactocele**
  → Relevant history or fat density on MMG may help distinguish them from papillary lesions.
- **Inspissated content** within a dilated duct should exhibit no vascularity on ultrasound. Whereas a papillary lesion may demonstrate Doppler signal.

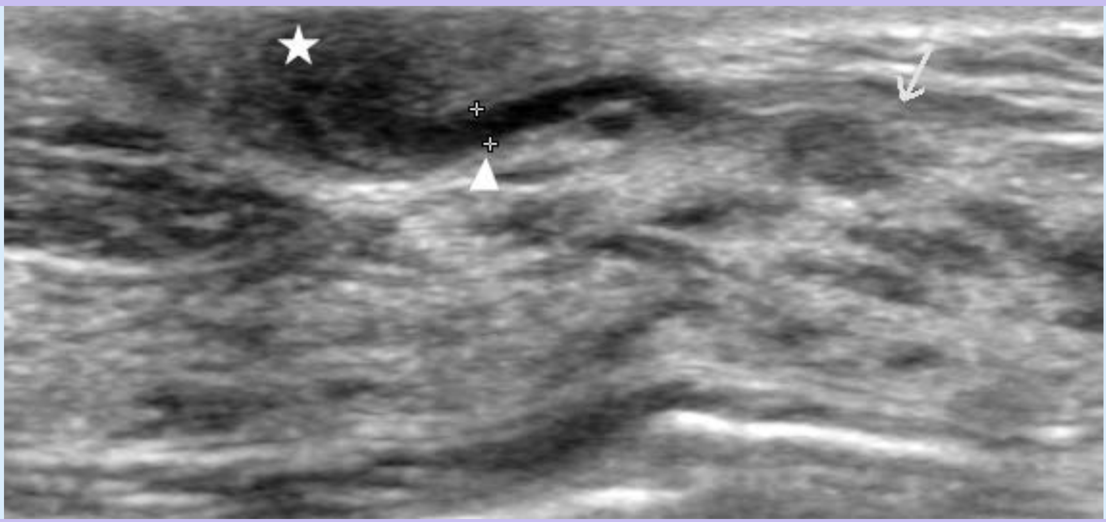


Fig 4. Solid papillary carcinoma
USG image showed a prominent duct (arrowhead) extending from nipple (asterisk), associated with a hypoechoic oval lesion with partially indistinct margin (arrow). This demonstrates malignant lesions can have overlapping features with benign lesions.

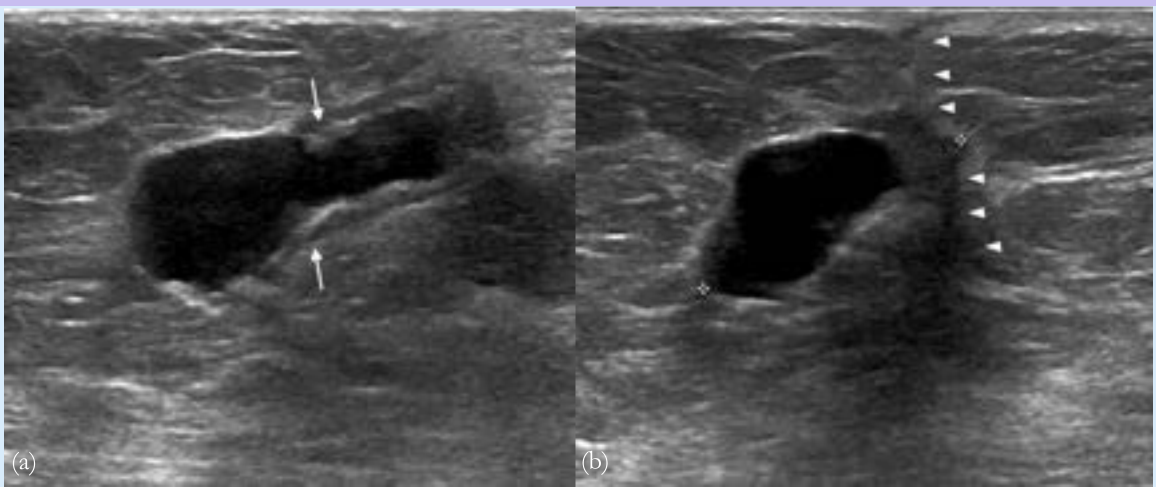


Fig 5. Fat necrosis
This patient had history of lumpectomy for CA breast. USG showed a circumscribed cystic lesion with thickened wall and subtle wall nodularity (arrows)(a) adjacent to the surgical scar (arrowheads)(b).

Features to Predict Malignant Papillary Lesions:

MMG

Larger in size and more readily detected by MMG as mass or asymmetry (Fig 6a)

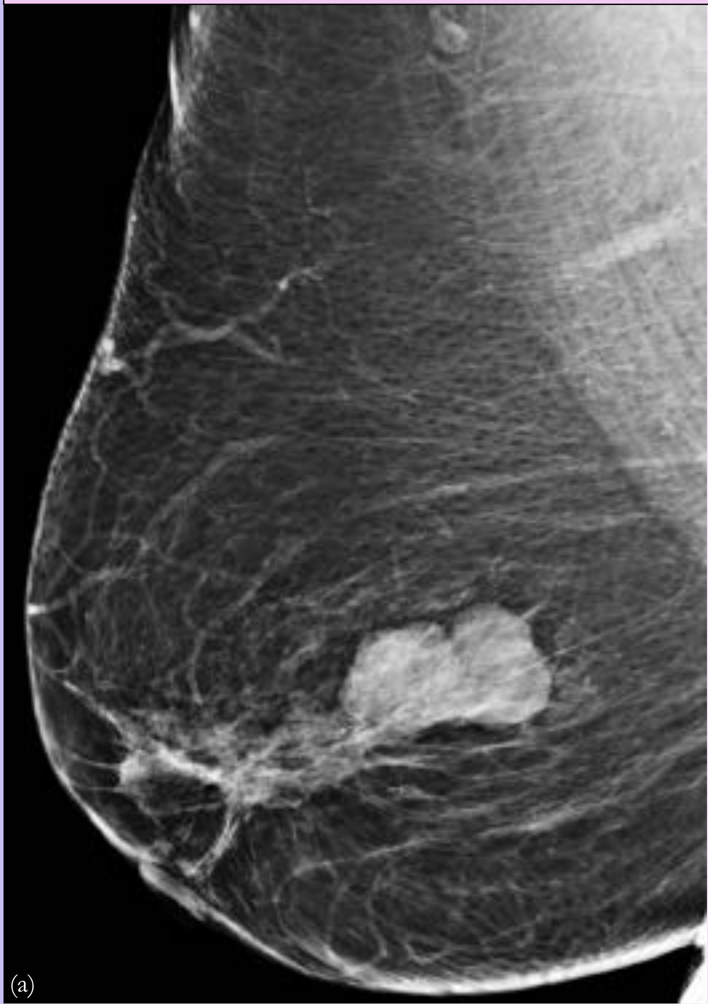
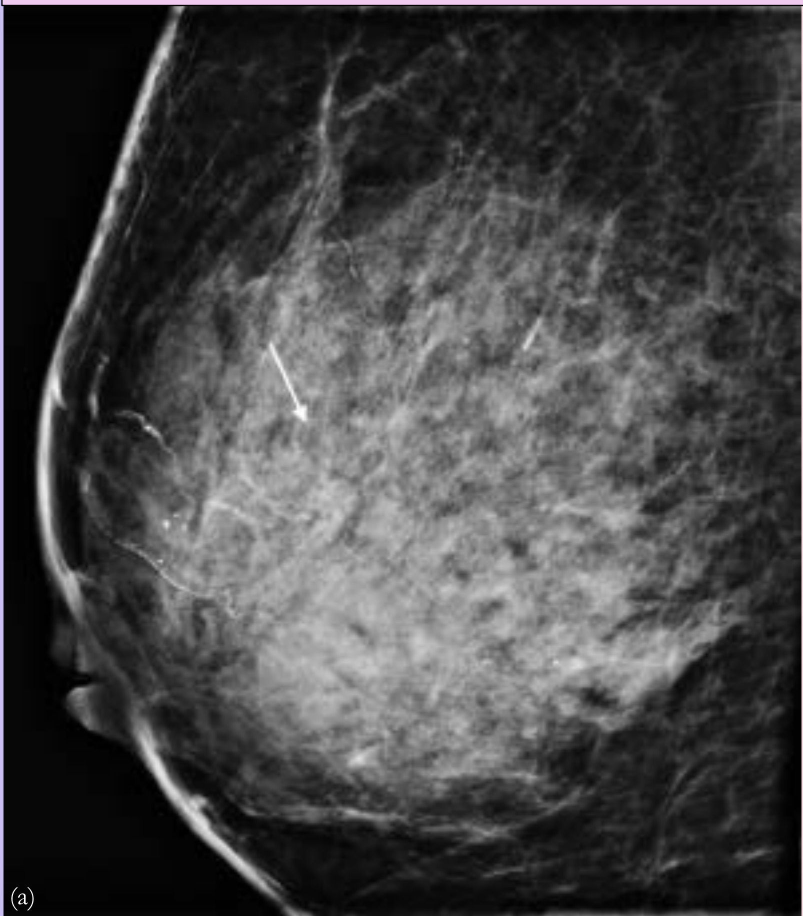


Fig 6. Encapsulated papillary carcinoma
MMG of right breast in MLO view showed a high density circumscribed mass with slightly microlobulated margin at upper right breast posterior depth (a). A corresponding irregular mass with cystic component (arrow) is noted on ultrasound (b).

Associate with calcifications (Fig 7a) **and more readily detected by MMG**



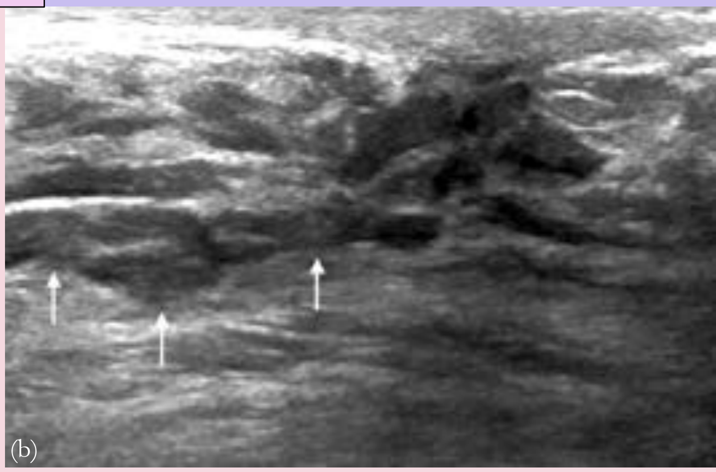


Fig 7. IDP associated with DCIS
MMG of the right breast in magnified mediolateral (ML) view. There was focal asymmetry at retroareolar region of right breast with regional microcalcifications (arrows)(a). USG showed corresponding dilated duct with intraductal filling defects (arrows)(b).

USG

Echogenic rind

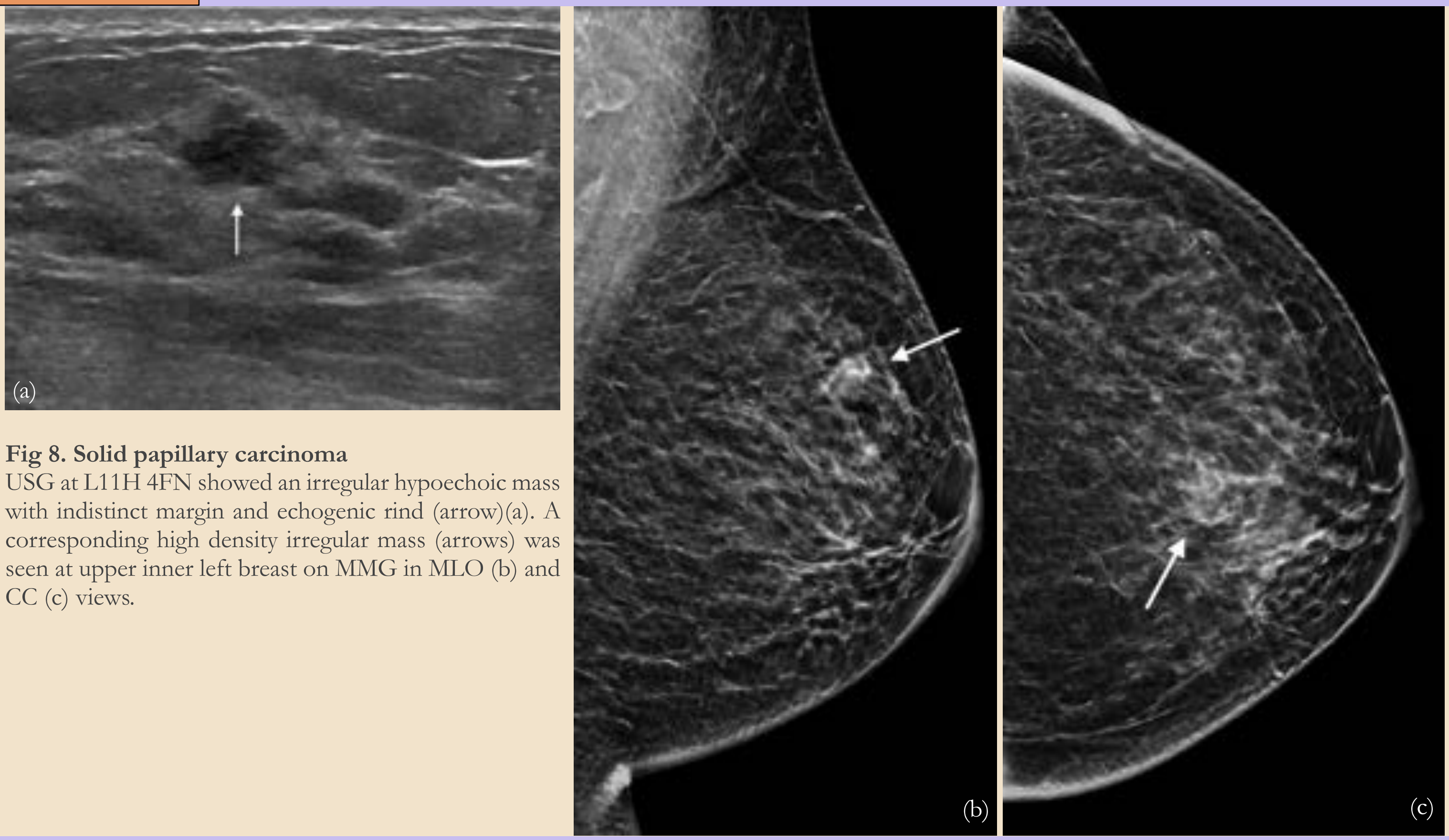


Fig 8. Solid papillary carcinoma
USG at L11H 4FN showed an irregular hypoechoic mass with indistinct margin and echogenic rind (arrow)(a). A corresponding high density irregular mass (arrows) was seen at upper inner left breast on MMG in MLO (b) and CC (c) views.

Increased vascularity

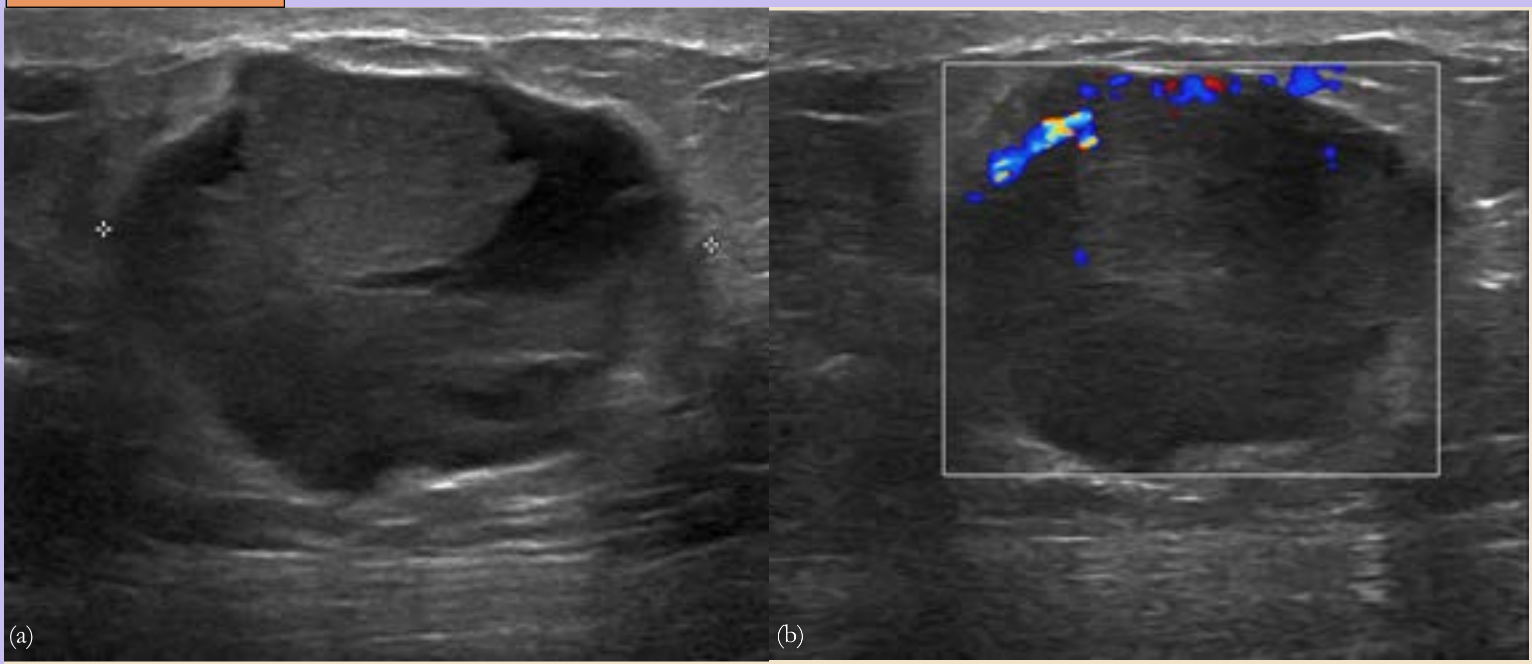


Fig 9. Papillary DCIS
USG of the right breast showed a mixed cystic solid hypoechoic mass (a) with increased vascularity noted on Doppler color image (b).

MRI

- Effectively detects papillary lesions, which typically appear as masses with **crescentic surrounding fluid** or as **intraductal filling defects**.
- **Non-fat-saturated T2 weighted sequence** is particularly useful to demonstrate the **dilated ducts** and the intraductal nature of the lesions.
- Malignant papillary lesions are more likely to show **heterogeneous** (Fig 10a)**, linear or segmental contrast enhancement** (Fig 10b) with **type III kinetic curve**.
- Valuable for assessing **ductal involvement and disease extent**, aiding surgical planning.

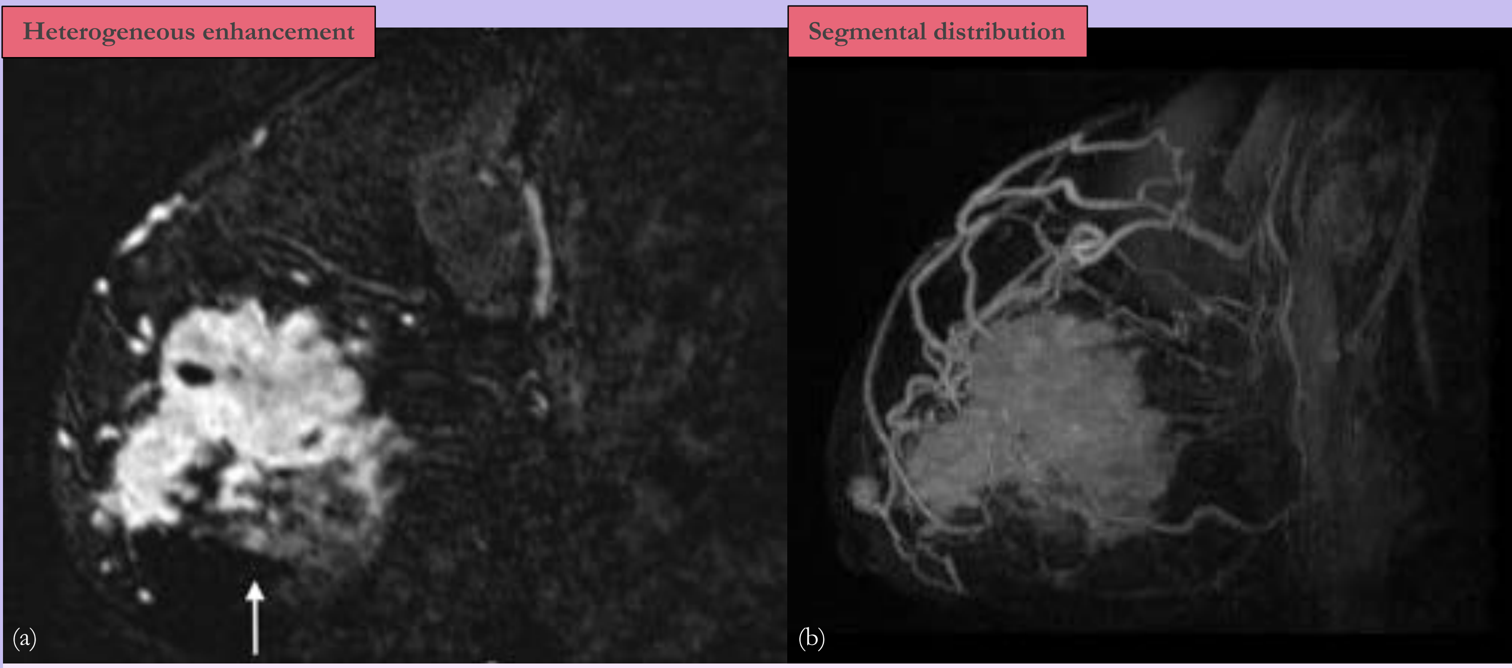


Fig 10. Invasive micropapillary carcinoma
Sagittal T1-weighted gadolinium-enhanced subtraction MR image of the left breast showed an irregular heterogeneously enhancing mass (a). T1-weighted gadolinium-enhanced subtraction MIP MR image demonstrated the enhancing lesion in segmental distribution (b).

Conclusion:

Papillary breast lesions exhibit a wide range of imaging appearances, contributing to diagnostic complexity. Tissue sampling and radiopathological correlation remain essential for accurate diagnosis and appropriate management.

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