Case Report

Image Guided Core Needle Biopsy (CNB) of the Breast—Part 1: Ductal Carcinoma In Situ (DCIS) and Invasive Ductal Carcinoma (IDC)

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Abstract

There are varied mammographic and ultrasonographic manifestations of breast carcinomas that begin in the milk ducts and are confined to the ducts and lobules or penetrated through the duct wall into the stroma. The mammographic findings include focal masses with or without spiculated hyperdense lesion, oval or lobulated shape, various patterns of microcalcifications, asymmetric density, architectural distortion, and associated features such as skin thickening and retraction, nipple retraction, and axillary lymphadenopathy. The ultrasonographic abnormalities include masses (solid or cystic) and their shapes, margins, echo patterns, posterior acoustic features, calcifications, vascularity determined by color Doppler imaging, and effects on surrounding tissue. Radiologists play no role in giving direct pathological reports. Our role is to describe the findings and give an impression of what they look like in terms of Breast Imaging Report and Data System (BIRADS). For any suspected lesion with a chance of malignancy of 2% and above (BIRADS 4 and 5), a pathological study is recommended. For any lesions seen by ultrasonography (US), a US-guided core needle biopsy (CNB) is recommended. For lesions seen only by mammography, stereotactic guidance is appropriate. The image-guided intervention provides the pathological result that is essential for the clinician to plan treatment with the patient.

Part 1 of this case report includes DCIS and IDC. The interesting cases are the varieties of presentation, different patterns of imaging findings, CNB results, and finally the surgical pathological results.

Keywords: image-Guided CNB, malignancy of the breast, ductal carcinoma, image-guided CNB result, US-guided CNB result, surgical pathology result.

Abbreviations

ABVS	=	Automated Breast Volume Sonography
BIRADS	=	Breast Imaging Report and Data System
CBS	=	Conservative breast surgery
CC	=	Craniocaudal
CESM	=	Contrast enhanced spectral mammography
CE-MRI	=	Contrast enhanced magnetic resonance imaging
CNB	=	Core Needle Biopsy
DCIS	=	Ductal Carcinoma In Situ
FNA	=	Fine needle aspiration
HER2	=	Human epidermal growth factor receptor 2
HH-US	=	Handhelds Ultrasound
IDC	=	Invasive Ductal Carcinoma
LC	=	Lobular carcinoma
LCIS	=	Lobular carcinoma in situ
LIQ	=	Lower inner quadrant
MC	=	Mucinous carcinoma
MCB	=	Mucinous carcinoma of the breast
MLO	=	Mediolateral oblique
MRI	=	Magnetic resonance imaging
MRM	=	Modified Radical Mastectomy
SSCM	=	Spot Cone Compression with Magnification
UOQ	=	Upper outer quadrant
US	=	Ultrasound

Breast cancer is classified into different types based on how the cells look under a microscope. Most breast cancers are adenocarcinomas, a type of cancer that begins in the linings of most organs.

DCIS is the most common type of noninvasive breast cancer, characterized by cancerous cells that are confined to the lining of the milk ducts and have not spread through the duct walls into surrounding breast tissue. If DCIS is left untreated, over time cancer cells may break through the duct and spread to nearby tissue, becoming an invasive breast cancer. It has a higher risk for becoming recurrent after treatment, mostly within 5 to 10 years after the initial diagnosis, may be invasive or noninvasive, as well as the risk of developing new breast cancer in the other breast.[1]

There are varied mammographic manifestations of DCIS, with casting-type calcifications being the most common (present in 50-75% of cases).[2] Other manifestations include a soft-tissue opacity either with or without associated calcifications. Linear calcifications are more likely to be associated with comedo-type DCIS, while granular calcifications are more often correlated with non-comedo DCIS. Occasionally DCIS appears as a simple mass or asymmetry without calcification (~8% of cases).[3]

One of the benefits of identifying a corresponding ultrasound (US) abnormality in women with mammographically detected DCIS is to use ultrasound to guide interventional (e.g. biopsy/hook wire) procedures.[4] A microlobulated mild hypoechoic mass with ductal extension and normal acoustic transmission is considered the most common feature in the US detected DCIS and US-guided biopsy of DCIS is now an everyday procedure.[5]

IDC accounts for 80% of invasive breast cancer.[6] IDC begins inside the milk ducts and spreads to their surrounding fatty tissue. In addition to the detection of breast cancer, its extent and other relevant abnormal findings, especially axillary nodes, should carefully be identified.[7] The ultimate goal of treatment is curative by removing cancer from the breast. This can be done by either lumpectomy or mastectomy.

However, there might be interference in after-treatment appearance with both types of surgery. Local recurrence and distant disease are significant findings to be searched for in the follow-up study.

Mammography reported breast parenchymal density or fibroglandular breast tissue is classified according to the American College of Radiology BIRADS classifications, which affects the detectability of breast lesion. Mammograms were reviewed for focal masses with or without spiculated hyperdense lesion, oval or lobulated shape, various patterns of microcalcifications, asymmetric density, architectural distortion, and associated features such as skin thickening and retraction, nipple retraction, and axillary lymphadenopathy.[8]

Real-time gray-scale US, color Doppler US or Automated Breast Volume Sonography (ABVS) were performed and assessed for masses (solid or cystic). Their shapes, margins, echo patterns, posterior acoustic features, calcifications, vascularity was determined by color Doppler imaging, and effects on surrounding tissue was determined according to the BIRADS sonography lexicon. The disease was also assessed as unifocal, multifocal, or multicentric in all patients as well as the assessment of the regional lymph node basins, including the axillary, infraclavicular, internal mammary, and supraclavicular regions.[9]

Radiologists play no role in giving direct pathological reports. Our role is to describe the findings and give an impression of what they look like in terms of the BIRADS. The pathological study is recommended when there is any suspected lesion with the chance of malignancy from 2% and above (BIRADS 4 and 5). Any lesions seen by the US-guided core needle biopsy (CNB) is recommended.[10] The lesions are seen only by mammography. where stereotactic guidance is appropriate. Image-guided intervention provides the pathological result that is essential for the clinician to plan treatment with the patient.

The interesting cases are shown with breast imaging, CNB, and surgical pathology of the different presentation and imaging patterns, as follows:

1. Screening for breast cancer, CNB specimen reveals DCIS.
2. Palpable abnormality in right breast, CNB specimen reveals DCIS.
3. Mass felt in right breast, CNB shows mucocele-like lesion, Surgical excision reveals DCIS.
4. Nipple discharged, CNB reveals intraductal papilloma with florid hyperplasia, excision of the mass reveals DCIS.
5. Palpable breast mass, CNB specimen reveals IDC with ductal involvement.
6. Questionable palpation in the breast. CNB reveals IDC, grade I-II. Surgical pathology reveals IDC, grade I.
7. Questionable palpation in axilla. CNB reveals IDC with axillary node metastasis.
8. Status postoperative: left conservative breast surgery (CBS), CBS, come with a palpable abnormality on the chest wall, CNB reveals recurrent IDC with axillary lymph nodes metastasis.
9. Screening for breast cancer, CNB reveals DCIS, Surgical pathology reveals IDC grade II with multifoci of DCIS and nodal metastasis.

Case Report # 1

A 57-year-old woman came for breast cancer screening with no presenting symptoms. Mammography was performed, showing dense fibroglandular breast tissue. Subtle microcalcifications are noted in the left inner area, confirmed by Spot cone compression with magnification (SCCM). The study reveals a tiny cluster of punctate microcalcifications, some of which are in linear arrangement. The US was subtle.

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Impression by breast imaging was done through BIRADS 4C, which suggests stereotactic-guided CNB. Specimen radiograph of stereotactic-guided CNB shows microcalcifications in all 5 specimens. The specimens were preserved in 10% formalin and were sent to the Department of Pathology. The CNB specimen reveals DCIS, and was confirmed by surgery (Figure 1).

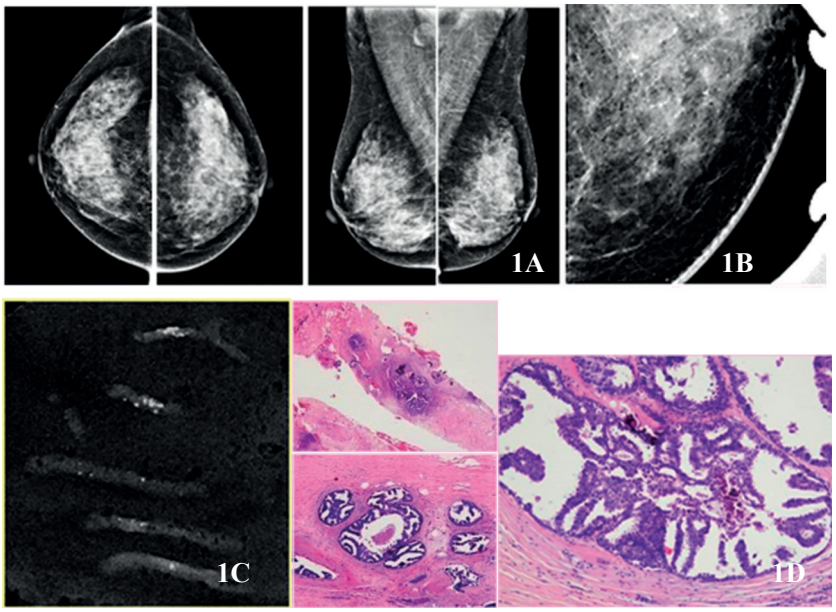

Figure 1: A 57-year-old woman with screening for breast cancer.
1A: Mammography shows subtle microcalcifications in left inner area. **1B:** SCCM (Spot cone compression with magnification) confirms a tiny cluster of punctate microcalcifications, some are in linear arrangement. **1C:** Specimen radiograph of stereotactic-guided CNB shows microcalcifications in all 5 specimens. **1D:** CNB reveals DCIS.

Case Report # 2

A 75-year-old woman presented with a palpable abnormality in her right breast. Mammography was performed, showing almost entirely fatty fibroglandular breast tissue. Focal asymmetry and a mass are noted in the right subareolar area. Compared with the previous study, the progression of microcalcifications are noticed. An irregular shaped hypoechoic mass containing brighter spots of microcalcifications was seen. Impression by breast imaging was done through the BIRADS 5, which requires CNB. Since the lesion is clearly shown in the US, US-guided CNB was performed with particular aiming at the microcalcification spots. Specimen radiograph of US-guided CNB shows a few soft microcalcifications in all 4 specimens. The routine specimen handling was performed by preservation in 10% formalin and was sent to the Department of Pathology. The CNB specimen revealed DCIS, and was confirmed by surgery. (Figure 2)

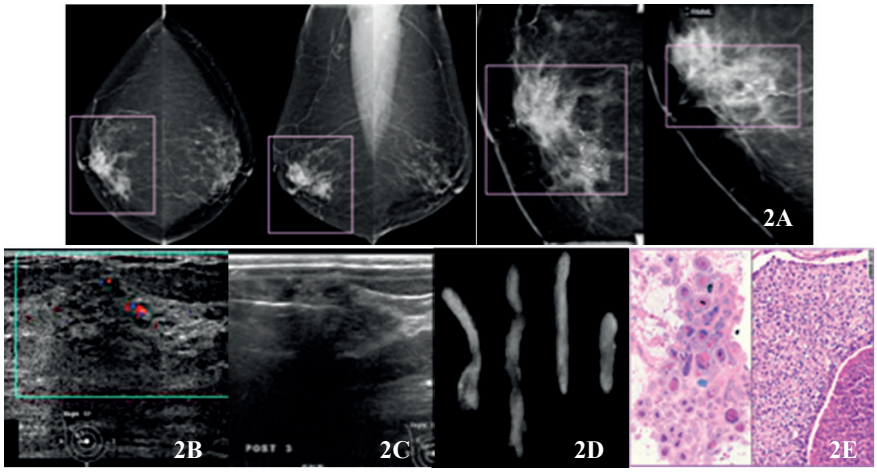

Figure 2: A 75-year-old woman with a palpable abnormality in her right breast.
2A: Mammography shows progression of breast microcalcifications. **2B:** US (with Mammography mapping) shows area of microcalcifications. **2C:** US-guided CNB was performed. **2D:** Specimen radiograph shows microcalcifications in the core specimen. **2E:** CNB reveals DCIS.

Case Report # 3

A 43-year-old woman presented with a mass felt in her right breast. The US shows a cluster of microcysts, possibly with a tiny solid component at the palpable abnormality, measures 9.6x 25.5mm. Impression by breast imaging was done through the BIRADS 4b, which requires CNB. Since the lesion is clearly shown in the US, US-guided CNB was performed with particular aiming at the suspected solid component in the microcysts cluster. Specimen of US-guided CNB shows mucocele-like lesion. Surgical excision of the lesion reveals DICS (Figure 3).

Case Report # 4

A 49-year-old woman presented with nipple discharge from her right breast. Mammography was performed, showing dense fibroglandular breast tissue. No focal asymmetry, mass or microcalcification is noted in her right breast. An irregular shaped homogenous hypoechoic mass with a questionable amount of tiny fluid in the deep part of the lesion. Impression by breast imaging was done by the BIRADS 4C, which requires CNB. Since the lesion is clearly shown in the US, US-guided CNB was performed with routine specimen handling. The CNB specimen reveals intraductal papilloma with florid hyperplasia. The excision of the mass reveals DCIS (Figure 4).

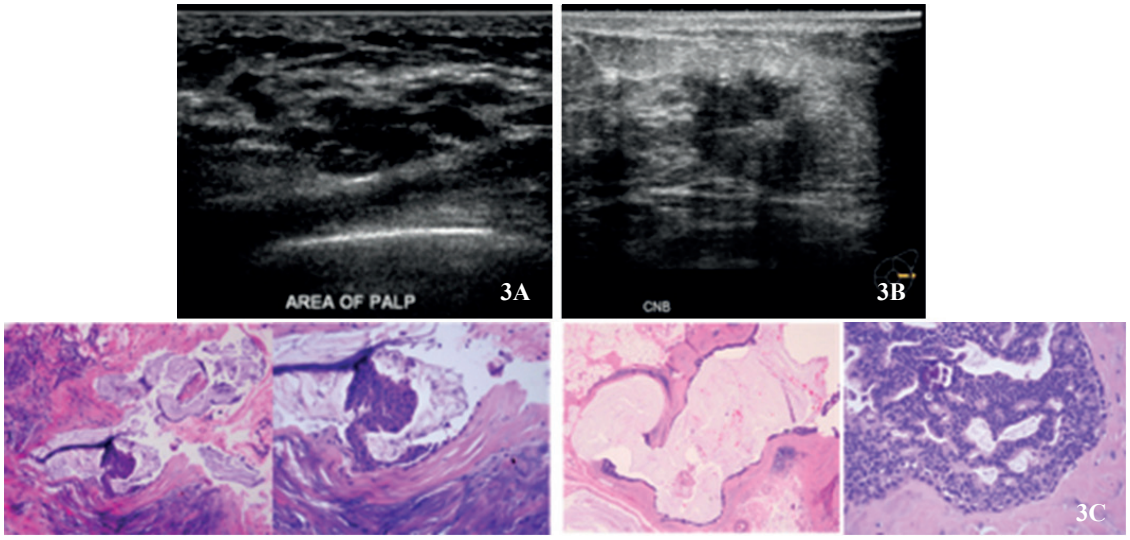

Figure 3: A 43-year-old woman with mass felt in the right breast, mammography was negative.
3A: US shows a cluster of microcysts possibly with tiny solid component at the palpable abnormality, 9.6x 25.5mm.
3B: CNB reveals mucocele-like lesion. 3C: Excision of the mass reveals DICS.

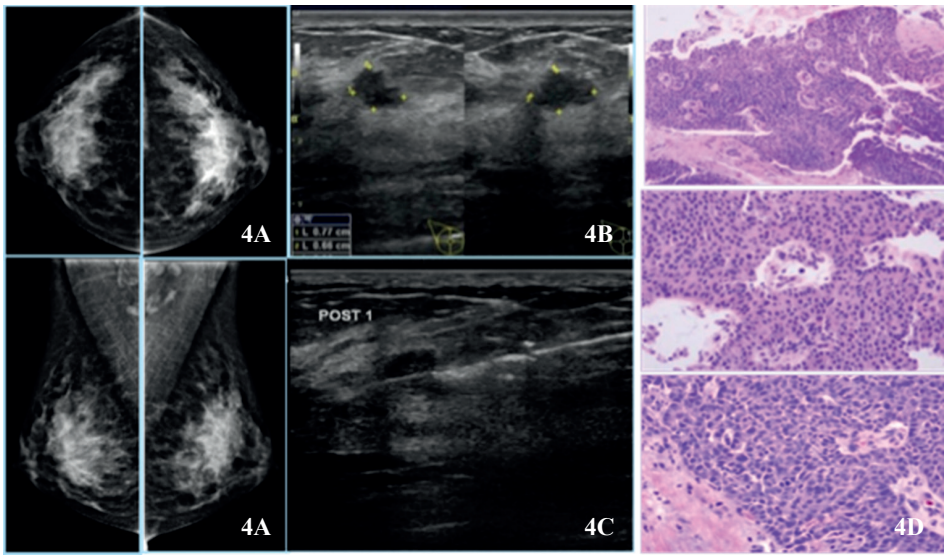

Figure 4: A 49-year-old woman with right nipple discharge.
4A: Mammography is negative. **4B:** US shows an irregular shaped homogenous hypoechoic mass with questionable amount of tiny fluid in deep part of the lesion. **4C:** CNB reveals intraductal papilloma with florid hyperplasia.
4D: Excision of the mass reveals DCIS.

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Case Report # 5

A 59-year-old woman presented with a palpable mass in her right breast. Mammography was performed, showing heterogeneous fibroglandular breast tissue. A well-defined lobulated mass with subtle spiculation was noted in her right upper outer quadrant (UOQ). No microcalcification is noted. Breast US revealed an irregular shaped homogenous hypoechoic mass with angulation, combined pattern of heterogeneous posterior enhancement, and acoustic shadowing at the medial aspect. Dilated pathological blood vessels accompanying a dilated duct to the lesion was seen with some marginal blood vessels.

Impression by breast imaging was done by the BIRADS 4C, which required CNB. Since the lesion was clearly shown in the US, US-guided CNB was performed with routine specimen handling. The CNB specimen revealed IDC with ductal involvement. (Figure 5)

Case Report # 6

A 42-year-old woman presented with questionable palpation in her left breast. Mammography was performed, showing homogenous fibroglandular breast tissue. Left breast asymmetry was detected with a partially obscured mass in the lower part of her left breast. No abnormal microcalcifications is note. The US over the palpable suspected area revealed an irregular shaped heterogeneous hypoechoic mass with extensive tissue reaction around the lesion in her left LIQ. Combined pattern of posterior enhancement and acoustic shadowing on the edge of the lesion was detected. Impression by breast imaging was done by the BIRADS 5, which requires CNB. Since the lesion was clearly shown in the US, US-guided CNB was performed with routine specimen handling. The CNB specimen reveals IDC grade I-II. The surgical pathology is IDC grade I (Figure 6).

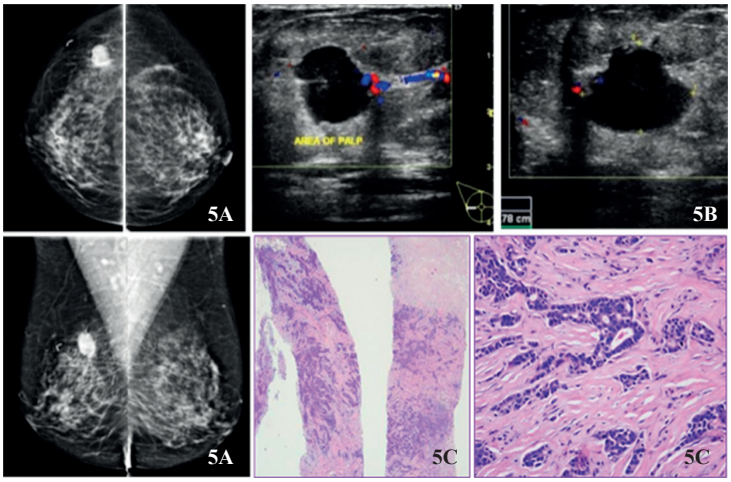

Figure 5: A 59-year-old woman with palpable mass in right breast.
5A: Mammography shows an irregular shaped hyperdensity mass with spiculation in right UOQ. **5B:**US shows an irregular shaped hypoechoic mass with angulation, spiculation, hypervascular and duct involvement. **5C:** CNB reveals IDC with ductal involvement.

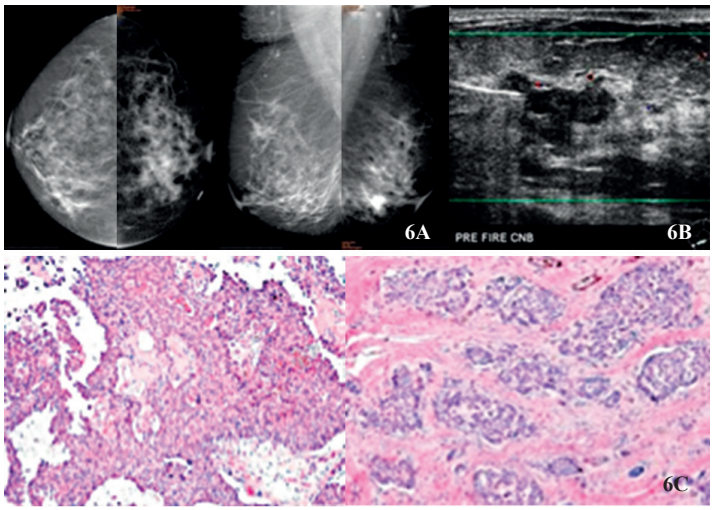

Figure 6: A 42-year-old woman with left IDC grade I
6A: Mammography revealed an irregular shaped mass in left LIQ. **6B:** US-guided CNB of a well-defined irregular shaped, homogenous hypoechoic mass in left LIQ was performed. 6C: CNB reveals IDC grade I-II. The surgical pathology is IDC grade I.

Case Report # 7

A 75-year-old woman presented with questionable palpation in her left axilla. Clinical breast examination revealed a palpable mass in the left axilla and a suspected large mass in the left UOQ. Mammography was performed, showing dense fibroglandular breast tissue. Left breast asymmetry was detected with a focal asymmetrical area in left UOQ. A hidden partially obscured mass is not ruled out. No abnormal microcalcification is noted. The US over the palpable suspected area revealed a large irregular shaped homogenous hypoechoic mass with moderate tissue reaction around the lesion in her left UOQ. Combined pattern of posterior enhancement and acoustic shadowing are detected. Two nearby oval shaped homogenous hypoechoic masses are noted in the palpable abnormality in left axilla, compatible with total nodal involvement. Impression by breast imaging was done by BIRADS 5 with axillary nodal metastasis, which requires CNB. Since the lesion is clearly shown in the US, US-guided CNB was performed on the mass with routine specimen handling. The CNB specimen revealed IDC grade II. US-guided fine needle aspiration (FNA) of the abnormal axillary lymph nodes was performed. The specimen was routinely smeared and fixed in 95 % alcohol and was sent for cytological study. IDC of the left breast with axillary node metastasis were confirmed in modified radical mastectomy (MRM) and axillary nodal clearance (Figure 7).

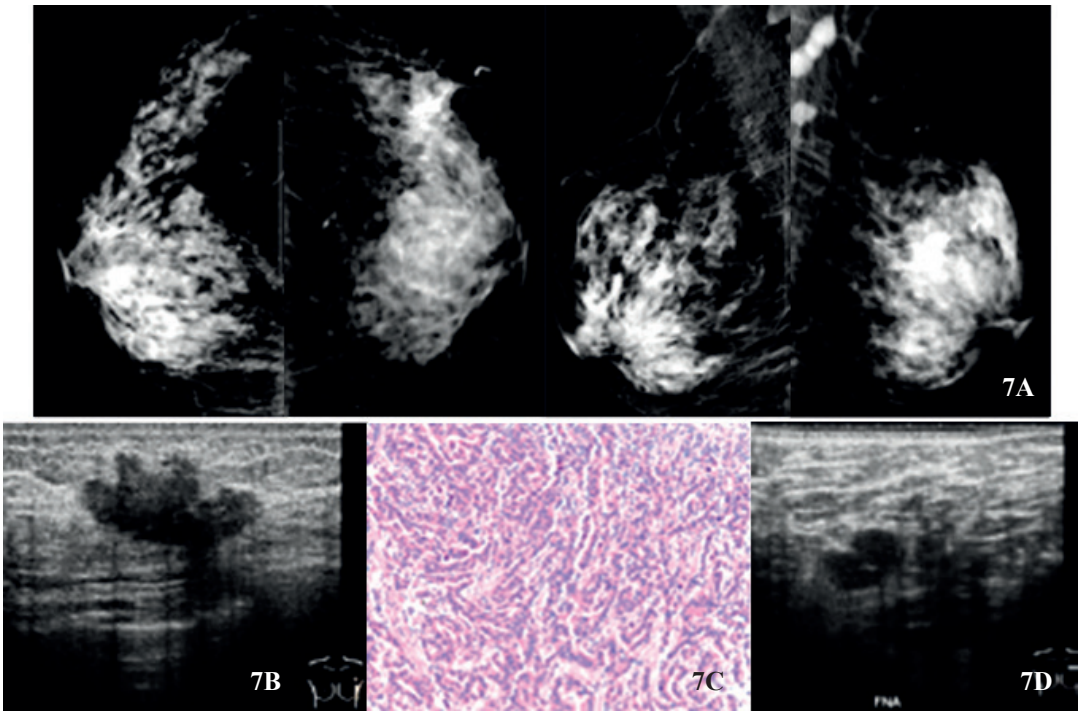

Figure 7: A 75-year-old woman with left IDC grade II with axillary node metastasis.
7A: Mammography shows a hyperdense lesion in left LOQ with axillary adenopathy. **7B:** US shows a small well-defined irregular shaped homogenous hypoechoic mass in left LIQ. US-guided CNB was performed. **7C:** CNB specimen reveals IDC grade II. **7D:** US-guided FNA left axillary lymph node shows nodal metastasis.

Case Report # 8

A 39-year-old woman, post left CBS, presented with palpable abnormality on the chest wall at the post-operation scar and in her left axilla. Clinical breast examination revealed a palpable mass in the left axilla and a mass in post-op area in left breast. Mammography was performed, showing extremely dense fibroglandular breast tissue, in which the lesions may be obscured. A partially obscured mass is noted in the far left LOQ / left axilla. No abnormal microcalcifications or other convincing abnormality is noted. The US over the palpable suspected area reveals a large hypoechoic mass with architectural disruption in her left UOQ. The depth to width ratio increases. Combined pattern of posterior enhancement is detected, compatible with local recurrence at PO area. A large smooth well-defined oval-shaped low-level homogenous hypoechoic mass is noted in the left axilla, compatible with nodal metastasis, total nodal involvement. Impression by breast imaging was BIRADS 5, local recurrent with axillary nodal metastasis, which requires US-guided tissue sampling with routine specimen handling. The CNB specimen revealed recurrent IDC. US-guided FNA of the abnormal axillary lymph nodes revealed axillary node metastasis confirmed in the MRM, and axillary nodal clearance (Figure 8).

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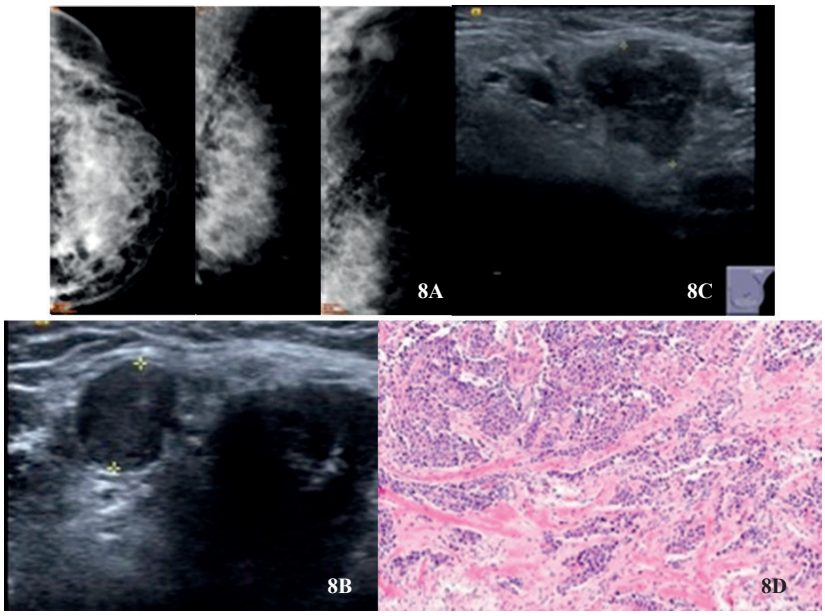

Figure 8: A 39-year-old woman with recurrent IDC at the skin on the chest wall with axillary nodal metastasis **8A:** Mammography reveals a partially obscured lesion in far left UOQ/axillary area. **8B:** US reveal a smooth well-defined oval-shaped low-level homogenous hypoechoic left axillary nodal metastasis. **8C:** US in far left UOQ/axillary area reveal a well-defined irregular-shaped, homogenous hypoechoic mass with increased vascularity. **8D:** US-guided CNB reveals recurrent IDC at the skin on the chest wall. US-guided CNB of a small well-defined oval-shaped, homogenous hypoechoic mass. FNA of a right axillary lymph node was done. CNB reveals IDC, FNA reveals nodal metastasis. The surgery confirms IDC grade II with multifoci of DCIS and nodal metastasis.

Case Report # 9

A 32-year-old woman, came for routine screening. The clinical breast examination was negative. Mammography was performed, showing almost entirely fatty fibroglandular breast tissue. A smooth well-defined irregular-shaped hyperdensity mass with some extratumoral extension was detected in the right breast. No abnormal microcalcifications or posterior acoustic features are detectable. A few oval-shaped hyperdensity nodes with no detectable fatty hila were seen in contralateral left axilla with soft posterior enhancement. Impression by breast imaging was BIRADS 5 right breast mass with left axillary nodal metastasis, require tissue samplings. Since the lesion was clearly shown in the US, US-guided CNB and FNA were performed on both lesions with routine specimen handling. CNB reveals IDC, FNA revealed contralateral nodal metastasis. The surgery confirms IDC grade II with multifoci of DCIS and nodal metastasis (Figure 9).

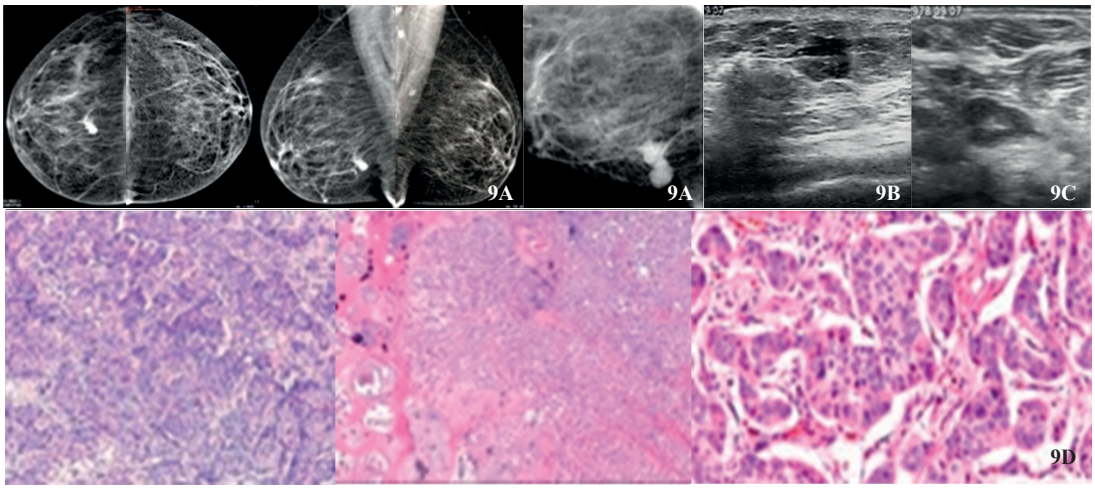

Figure 9: A 32-year-old woman with IDC grade II with multifoci of DCIS, axillary node metastasis. **9A:** Mammography revealed a smooth well-defined irregular shaped hyperdensity mass. **9B:** US-guided CNB of a small well-defined oval-shaped, homogenous hypoechoic mass. **9C:** FNA of a right axillary lymph node.**9D:** CNB revealed IDC, FNA reveals nodal metastasis. The surgery confirmed IDC grade II with multifoci of DCIS and nodal metastasis.

Discussion

Image-guided tissue sampling has reduced operation time and risks during the frozen section of the incisional biopsy of the breast lesion in the operating room.[11] The breast lesion and the axillary node histology and cytology are known before the operation, this allows the clinician to plan the management with the patient before the operation.[12] If the axillary lymph node is positive, axillary node dissection can be performed with no need for sentinel node study or frozen section. The procedure is very simple and easy, takes less time and the outcome is highly beneficial. If the malignancy is diagnosed, proper management is required. The pathologist should compare pathology with imaging; if they do not match with each other, discussion with the radiologist is advised. If the specimen contains only fatty tissue or normal fibroglandular tissue, no discrete mass, excisional biopsy is suggested or a repeat CNB, if the image fails to show the cutting chamber is inside the lesion. This part 1 includes DCIS and invasive ductal carcinoma. The interesting cases are the varieties of presentation, different patterns of imaging findings, CNB results and finally the surgical pathological results.

Conclusion

Mammographic and ultrasound manifestations of breast lesions are not specific for breast pathology. Radiologists can detect, define lesions and give impressions based on the American College of Radiology (ACR) BIRADS, and suggest the next step of management.[13] Image-guided tissue sampling is beneficial in identifying the pathology before planning for the proper management, and the clinical practice guideline to get a pathological diagnosis before the treatment.

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