Approach to Nonmass Lesions on Breast Ultrasound

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Abstract

Nonmass lesions in breast ultrasound (US) are areas of altered echogenicity without definite margins or mass effect. However, these lesions may show calcifications, associated architectural distortion, or shadowing just like masses. They vary in their echogenicity, distribution, ductal or nonductal appearance and the associated features that can be seen in variety of benign and malignant pathologies. With no uniform definition or classification system, there is no standardized approach in further risk categorization and management strategies of these lesions. Malignant nonmass lesions are not uncommon and few sonographic features can help in differentiating benign and malignant pathologies. US-guided tissue sampling or lesion localization can be preferred in the nonmass lesions identified on second look US after magnetic resonance imaging or mammography. This article aims to describe various imaging patterns and attempts to provide an algorithmic approach to nonmass findings on breast US.

Keywords
- nonmass lesions
- BIRADS
- architectural distortion
- breast ultrasound

Introduction

The ACR-BIRADS ultrasound (US) lexicon includes mass, calcifications, and associated features where the mass is defined as a three-dimensional space occupying lesion that can be seen on two different projections which can be distinguished from normal anatomical structures.[1] However, certain lesions encountered on breast US do not typically fit into the description of mass. They have been described as nonmass lesions (NMLs), nonmass image forming lesions, nonmass findings, vague area of altered echotexture, etc. with no uniform terminology or definition for the same.[2] Such NMLs have an incidence varying between 1 and 10%.[3–5] Different authors have described different classifications for NMLs depending on their echogenicity, internal ductal pattern or architecture, associated calcifications, architectural distortion, and posterior shadowing. Although a majority of nonmass findings are benign, they may be malignant in 6.3 to 54% cases.[6]

They may correspond to architectural distortion or asymmetry on mammography (MG) and nonmass enhancement on breast magnetic resonance imaging (MRI). Many entities can present with nonmass features including inflammatory, proliferative lesions, posttreatment changes, residual lesion post-chemotherapy, ductal carcinoma in situ (DCIS), and sometimes, invasive breast carcinoma. Many times, these go missed on initial US due to subtle image findings. Once an abnormality is confirmed on MG or MRI, a relook US is done to establish US correlate and plan for guided biopsy. Knowledge of the patterns and subtle appearances of nonmass findings can help in identification of correlates on US, increasing its diagnostic accuracy. It can also aid in further management of such NMLs through the convenient and cost-effective US-guided biopsy instead of difficult and more invasive techniques.

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Definition and Ultrasound Characterization

Different definitions and descriptors have been used for nonmass findings on breast US by various authors. They may refer to areas of altered echogenicity seen on two orthogonal planes, with absence of convex or conspicuous margins; hence, they do not show mass effect and do not confirm to the definition of a mass.[2] They can also include areas of calcifications not associated with a mass, duct like parallel structures, or architectural distortion that are visible by US.[2] They are, however, not included as a separate entity under the current ACR-BIRADS US lexicon.[1]

The first description of nonmass findings was given by the Japanese Association of Breast and Thyroid Sonology in 2004.[7] This initial classification included four different US appearances—ductal dilatation, multivesicular cystic areas, low echogenicity areas that could be mottled, geographic, or indistinct in appearance, and architectural distortion.[7] Almost a decade later, multiple classifications were being proposed by different authors. Uematsu classified them into ductal and nonductal lesions and the latter could be focal or segmental in distribution. Calcifications and architectural distortion were associated features that could be identified on US.[8] Kim et al included only nonductal lesions and suggested a focal or regional distribution pattern.[3] Ko et al divided the lesions into four categories: ductal, nonductal (both of which may or may not show associated calcifications), architectural distortion, and indistinct with posterior acoustic shadowing.[9] Wang et al divided them into hypoechoic lesions, hypoechoic lesions with microcalcifications, architectural distortion, and solid echogenicity within a duct.[10]

Park et al focused on the distribution pattern of the lesions, which were divided into focal, linear—segmental or regional, while ductal changes were included under associated findings.[11] Presence of an echogenic halo, posterior shadowing, or ductal or tubular architecture was also included under associated findings by Giess et al.[12] Choe et al divided them based on their echogenicity, distribution, and associated features.[2] More recently, the Japan Society of Ultrasonics in Medicine (JSUM) guidelines have divided them into hypoechoic area, duct abnormalities, architectural distortion, multiple small cysts, and echogenic foci without a hypoechoic area. The lesions are to be labeled as unilateral or bilateral followed by distribution as focal, segmental, or diffuse.[13] Although there is varying terminology in the classification of nonmass abnormalities, in general the classification systems focus on the echogenicity, distribution, ductal or nonductal architecture, and associated features.

Echogenicity: NMLs can be hypoechoic, mixed hyper and hypoechoic or hyperechoic (►**Fig. 1**).

a) **Hypoechoic—**This is the most common echogenicity pattern. The JSUM guidelines term NMLs as hypoechoic when they show an echogenicity less than the surrounding glandular parenchyma.[13] This is different from the ACR-BIRADS definition of echogenicity patterns of mass lesions, where subcutaneous fat is taken as the reference for echogenicity. These hypoechoic NMLs can be further subdivided into mottled or patchy (multiple discrete small hypoechoic areas in a single lesion), geographic (has an appearance as though the patchy or mottled areas are fused together), or indistinct (has ill-defined borders and does not fit into patchy or geographic).[13]
b) **Mixed echogenicity—**It has mixed hyper and hypoechoic areas.[2]
c) **Hyperechoic—**No standard definitions are available in literature for hyperechoic or mixed echogenicity NMLs. Choe et al described predominantly hyperechoic lesions having over 50% hyperechoic areas within them.[2] Hyperechoic breast lesions are rare, amounting to only 1 to 6% of breast masses, out of which a majority are benign.[14]

Distribution: Similar to the distribution pattern defined in ACR-BIRADS for nonmass enhancement on breast MRI, NMLs on US have also been categorized by various authors into focal, linear/segmental, regional, or diffuse.

a) **Focal**—It includes NMLs that are limited to a small confined area, occupying less than one breast

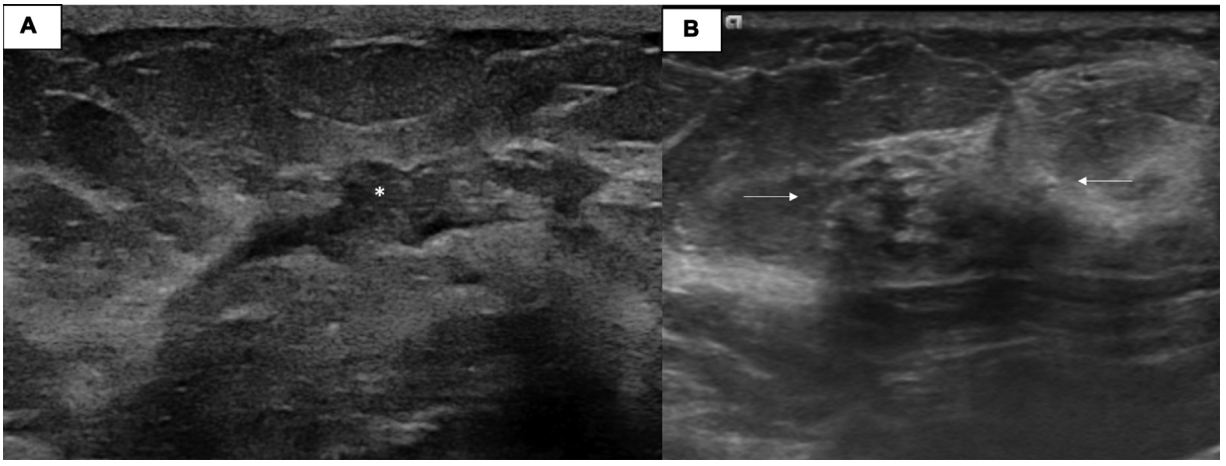

Fig. 1 Nonmass lesions according to echogenicity on ultrasound. (**A**) Hypoechoic pattern—Ill-defined nonmass lesion (asterisk) is seen that is hypoechoic as compared to surrounding parenchyma seen in a female postchemotherapy; (**B**) Mixed echogenicity nonmass finding (arrows) seen in patient with architectural distortion on surveillance mammogram.

quadrant.[2,3,8,11] Focal has also been defined as a clustered appearance with possible malignant potential.[13]

b) **Linear or segmental**—The term is used for NMLs with longitudinal, triangular, or radial distribution along the course of a duct.[2,8,11] This is associated with a risk of malignancy, particularly DCIS.[13]

c) **Regional**—It is defined as a large geographic area not confirming to a ductal distribution.[11]

d) **Diffuse**—They refer to NML diffusely scattered in the breast. Regional and diffuse distributions are usually associated with benignity.[13] However, multiple bilateral diffuse hypoechoic areas may also be normal variations due to hormonal changes.[8]

Ductal abnormalities: Duct-like architecture refers to single or multiple tubular hypoechoic areas with parallel orientation.[8] They may or may not be associated with echogenic foci which represent calcifications. Ductal abnormalities can be related to the caliber, wall irregularities, or presence of internal echoes within them. Ductal architecture may also be seen associated with hypoechoic nonductal lesions (►**Fig. 2A**).

a) **Duct dilatation**—Duct ectasia is defined as the caliber of ducts over 2 mm or ampullary portion more than 3 mm.[15] Visibly dilated ducts within the areola alone can be present in normal breasts, particularly in old age, late gestation, or during lactation. Dilatation of ducts beyond the extent of areola can be concerning.[13]

b) **Irregular caliber of ducts**—Irregular caliber or focal thickening of duct walls raise the suspicion of malignancy, especially in peripherally dilated ducts or those with associated mass.[15]

c) **Duct with internal echoes**—Dilated ducts can be filled with solid internal echoes that may show internal vascularity representing intraductal masses like papilloma or DCIS. An acute angle of margin with the duct can be seen with benign papillomas, while malignant lesions like DCIS show gradual change in caliber or obtuse margins.[13] Hyperechoic foci within ducts represent calcifications, while floating internal echoes can be seen with breast milk, pus, or blood within the duct.[13]

Associated Features

a) **Calcifications or echogenic foci**—Echogenic foci representing calcifications are less commonly visualized on US compared to MG, but when seen on US, they are associated with more than three times risk of malignancy.[2] Calcifications associated with malignancy are better seen on US

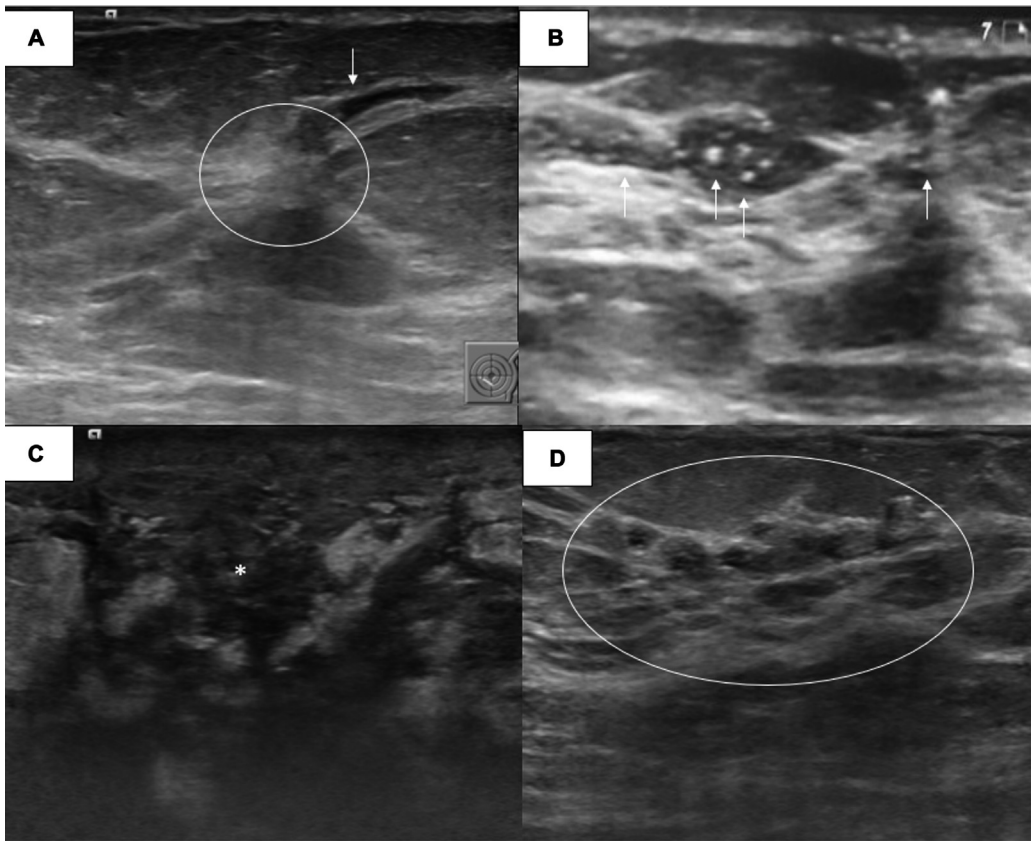

Fig. 2 Nonmass lesions on ultrasound (US). (**A**) Mixed echogenicity lesion (circled area) with posterior shadowing and focally single dilated duct (arrow)—US-guided biopsy confirmed ductal carcinoma in situ (DCIS). (**B**) US shows segmental distribution of echogenic foci representing microcalcification in ductal pattern (arrows)-proven DCIS. (**C**) Mixed echogenicity nonmass finding (asterisk) in regional distribution with posterior shadowing and associated features of skin and subcutaneous thickening in a patient with postradiation mastitis. (**D**) Focal nonmass lesion with mixed echogenicity and internal cystic changes (circled area) corroborating with architectural distortion on mammogram—US-guided biopsy revealed areas of benign ducts with fibrosis and adenosis changes and no evidence of malignancy.

as they are within hypoechoic masses or NMLs as compared to benign calcifications that occur within the normal echogenic parenchyma. These echogenic foci may or may not show posterior shadowing, can be present within or near or outside the NMLs, within or around dilated ducts (►**Fig. 2B**).[11]

b) **Architectural distortion**—This has been described as tissue compression around the NMLs or convergent changes in the breast tissue, creating thin lines, radiating spicules or focal retractions from the abnormal tissue.[11,13,16] It can be seen associated with NML or in isolation. It can correspond to both benign and malignant histological correlates such as biopsy scar, fibrosis post neoadjuvant chemotherapy, or radiotherapy (►**Fig. 2C**), sclerosing adenosis, DCIS, and invasive ductal carcinoma (IDC).[8]

c) **Posterior acoustic shadowing (►Fig. 2C)**—It is caused by attenuation of sound waves in areas of desmoplastic reaction, either due to fibrosis, scarring, or malignancy.[9]

d) **Multiple small cysts**—This has been described for clustered microcysts or multiple small cysts that are not completely anechoic (►**Fig. 2D**). They are mostly benign, but can rarely represent DCIS.[13]

Role of Elastography and Contrast-Enhanced Ultrasound in Nonmass Breast Lesions

Many benign as well as malignant entities can present as NMLs. Due to overlapping features between them, conventional US may not accurately differentiate the entities. Shear wave elastography (SWE) and contrast-enhanced ultrasound (CEUS) are advanced US techniques that can help to increase the specificity of US in detection of malignancy. Benign NML shows a complete dark blue color, while malignant lesions show a stiff rim of orange to red color by qualitative SWE indicating the lower and higher stiffness of the tissue, respectively. The average mean elasticity values are significantly higher in malignant NMLs; however, this may not always be the case.[17] On CEUS, malignant NML shows early wash in time, hyperenhancement, larger enhancement areas compared with grayscale and early wash out time.[18] In a study by Zhang et al, the specificity of US increased from 29 to 77.4% on addition of Doppler, strain elastography, and CEUS for detection of malignant NML.[19] ►**Table 1** describes the US features that can help to differentiate between benign and malignant NMLs.

Radio Pathological Correlation of Nonmass US Findings

Benign Pathologies

a) **Inflammatory** (►**Figs. 3** and **4**)—Inflammatory pathologies such as suppurative or granulomatous mastitis, abscess, and diabetic mastopathy can present as NMLs. Puerperal mastitis is seen in lactating women, most commonly due to staphylococcus aureus infection. While mastitis is seen as subcutaneous edema, hyperechogenicity, and increased vascularity of the breast parenchyma, associated abscesses can be seen as fluid collections with internal moving echoes.[20] Nonpuerperal subareolar mastitis occurs in middle aged or elderly women, is associated with smoking, and caused by squamous metaplasia and inflammation along lactiferous ducts, with subsequent formation of fistulas and recurrent abscesses.[20] In a study by Tan et al, about 27 % nonpuerperal mastitis presented as NMLs on US.[21] Granulomatous mastitis can be seen as NMLs in upto 20% cases with tubular extensions, may have associated collections with intercommunicating tracts or duct ectasia with internal echoes.[22] Diabetic mastopathy occurs due to lymphocytic infiltration and fibrosis of the breast in patients with long-standing type I diabetes mellitus. Besides presenting as irregular hypoechoic masses, they can also be seen as heteroechoic NMLs with posterior acoustic shadowing.[23]

Table 1 Ultrasound features of benign and malignant NML[2,11,16–19]

Ultrasound features	Benign NML	Malignant NML
Echogenicity	Variable, hyperechoic lesions are mostly benign	Hypoechoic/variable
Distribution	Diffuse, regional, focal	Linear/segmental
Vascularity	Less or no vascularity, except inflammatory pathologies	Higher vascularity
Associated calcifications	Less common	More common
Architectural distortion	Less common	More common
Elastography	Uniformly blue on qualitative SWE, greater than half of the lesion area green on strain elastography Lower elasticity scores (E_{mean} and E_{max})	Rim of red/orange on qualitative SWE, entirely or almost entirely blue on strain elastography Higher elasticity scores (E_{mean} and E_{max})
Contrast enhanced ultrasound	Synchronous wash in/washout time, iso/hypo enhancement, heterogeneous enhancement, similar enhancement area	Early wash in/wash out time, hyperenhancement, larger enhancement areas compared with grayscale and radial or penetrating vessels

Abbreviations: NML, nonmass lesion; SWE, shear wave elastography.

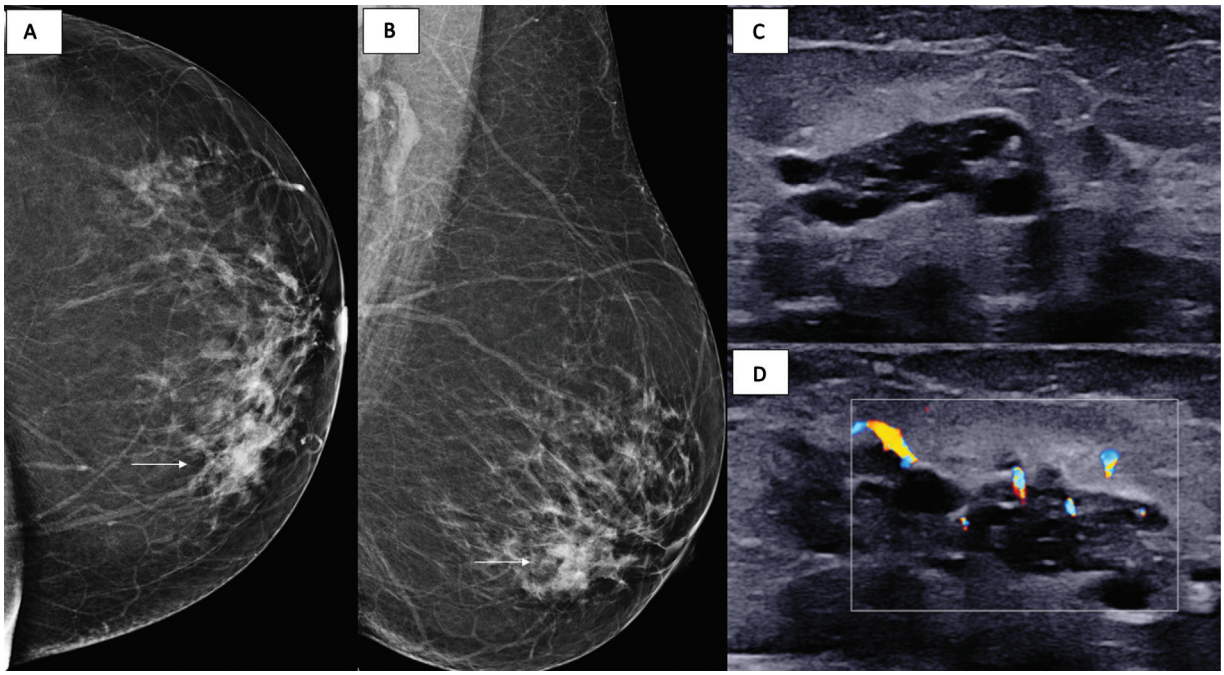

Fig. 3 Residual breast abscess sequelae as nonmass finding. Mediolateral oblique and craniocaudal mammographic views show an equal density mass with indistinct margins in the lower inner quadrant (arrows in **A** & **B**). Correlative ultrasound shows a hypoechoic nonmass lesion with peripheral vascularity and internal cystic areas and septations (**C** & **D**). The patient had a history of abscess with aspiration of pus from the same site few months back.

b) Proliferative—Nonmass proliferative conditions include fibrocystic change, sclerosing adenosis, radial scar, apocrine metaplasia, and atypical ductal or lobular hyperplasia. Fibrocystic change is the most common benign breast pathology, with varying areas of stromal fibrosis, adenosis, cysts, metaplasia, and hyperplasia of epithelium (►**Fig. 5**). They can present as simple, complicated, or clustered cysts, complex solid cystic lesions, solid masses or NMLs.[24] Apocrine metaplasia refers to epithelial changes within the lobular part of the terminal ductal lobular unit. They can be visualized as lobulated masses or NMLs with clustered cysts.[24] Premalignant lesions like atypical ductal or lobular hyperplasia can sometimes be seen as areas of architectural distortion and may show calcifications or ductal architecture within nonmass findings.[2,25] Sclerosing adenosis involves proliferation of the lobular epithelium with desmoplasia that is seen as irregular hypoechoic masses with ill-defined margins and posterior shadowing, with or without calcifications. It can also show

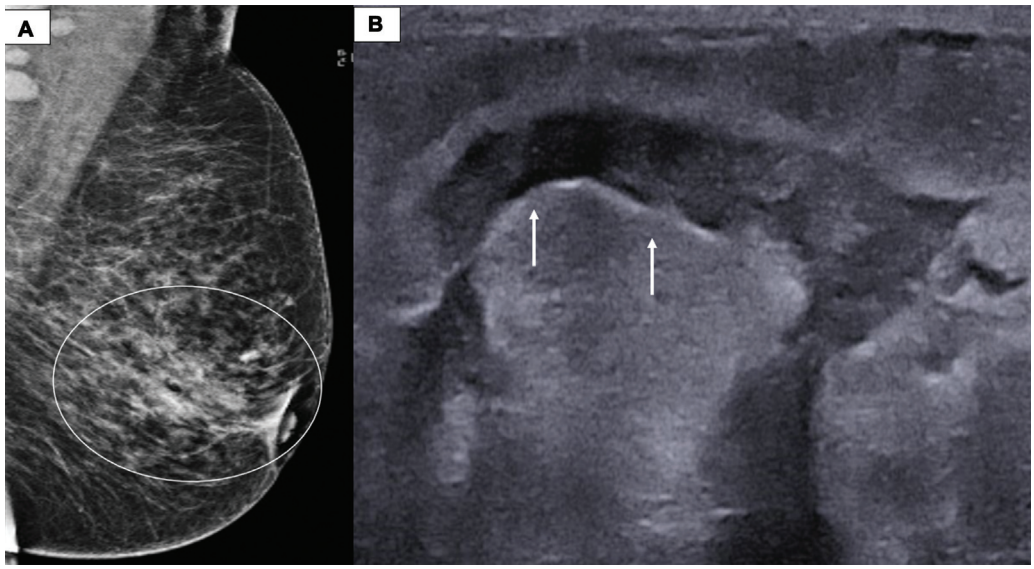

Fig. 4 Granulomatous mastitis with nonmass imaging features. (**A**) Single mediolateral oblique mammogram of left breast shows architectural distortion extending to retroareolar location with nipple retraction (encircled). (**B**) corroborative ultrasound (US) revealed fluid tracking channels with internal echoes (arrows). No definite mass noted. US-guided biopsy diagnosed it as granulomatous mastitis.

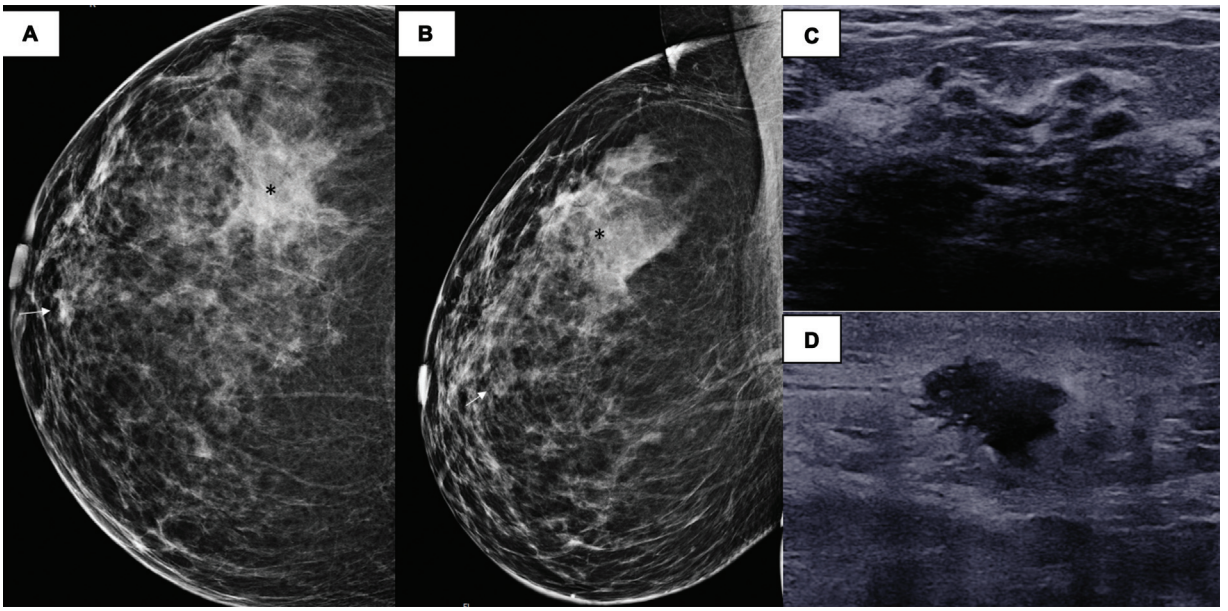

Fig. 5 Fibrocystic change as nonmass finding. Mediolateral oblique and craniocaudal mammographic views showing area of focal asymmetry in the upper outer quadrant (asterisks in **A** & **B**). A small equal density mass with microlobulated margins is also seen in the retroareolar region, which corresponded to the site of lump complained by the patient (arrow in **A** & **B**). Ultrasound of the focal asymmetry revealed a nonmass lesion with multiple cystic areas (**C**) within that corresponded to fibrocystic changes on biopsy. A smaller nonparallel hypoechoic spiculated mass (**D**) was seen corresponding to the retro areolar mass, which was proven to be invasive ductal carcinoma on biopsy.

heterogeneously echogenic NMLs or architectural distortions on US.[26] Radial scars (< 1 cm) or complex sclerosing lesions (> 1 cm) occur due to epithelial proliferation with a central fibroelastic zone and surrounding tubular extensions, giving rise to a stellate or spiculated appearance. They can present as irregular, round, or oval hypoechoic masses or areas of parenchymal distortion, or posterior shadowing.[27]

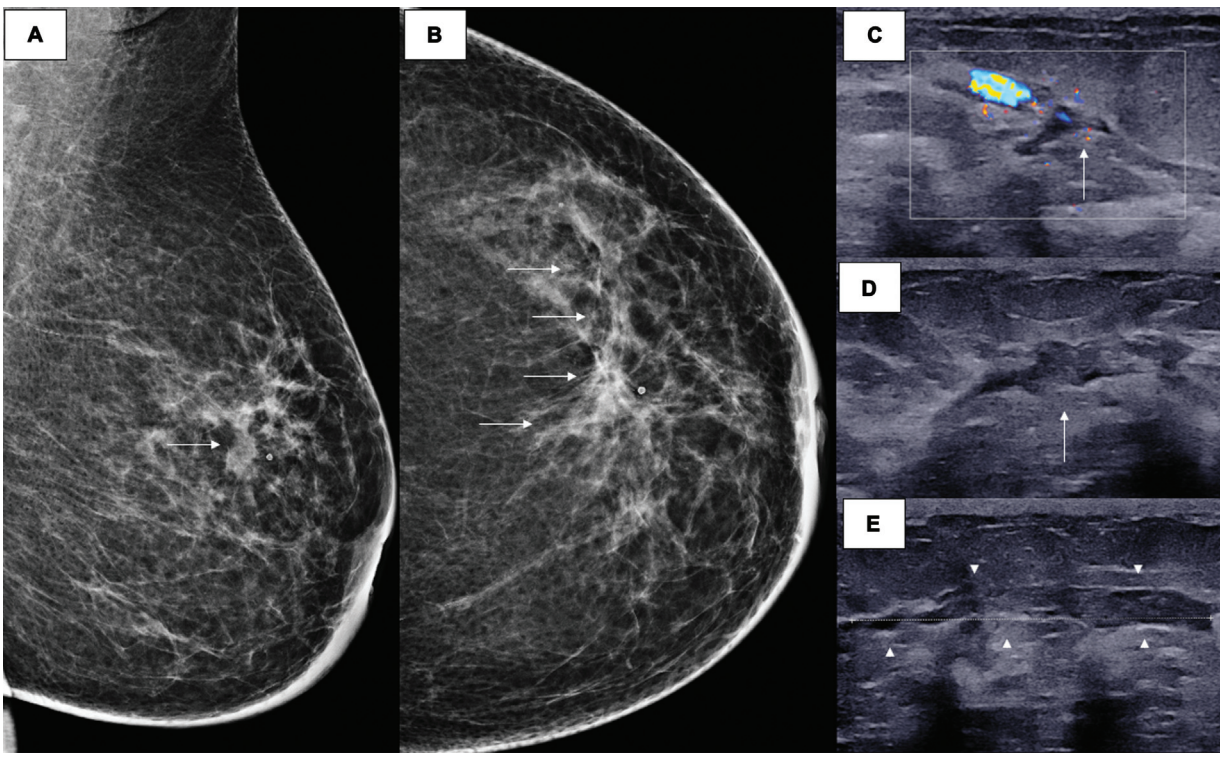

Fig. 6 Residual lesion postchemotherapy. Mediolateral oblique and craniocaudal views showing a focal asymmetry with architectural distortion, seen extending along the upper outer quadrant (white arrows in **A** & **B**) corresponding to the previous site of the mass. A careful second look ultrasound revealed a nonmass hypoechoic lesion with surrounding architectural distortion and internal vascularity (white arrows in **C** & **D**, arrowheads in **E**).

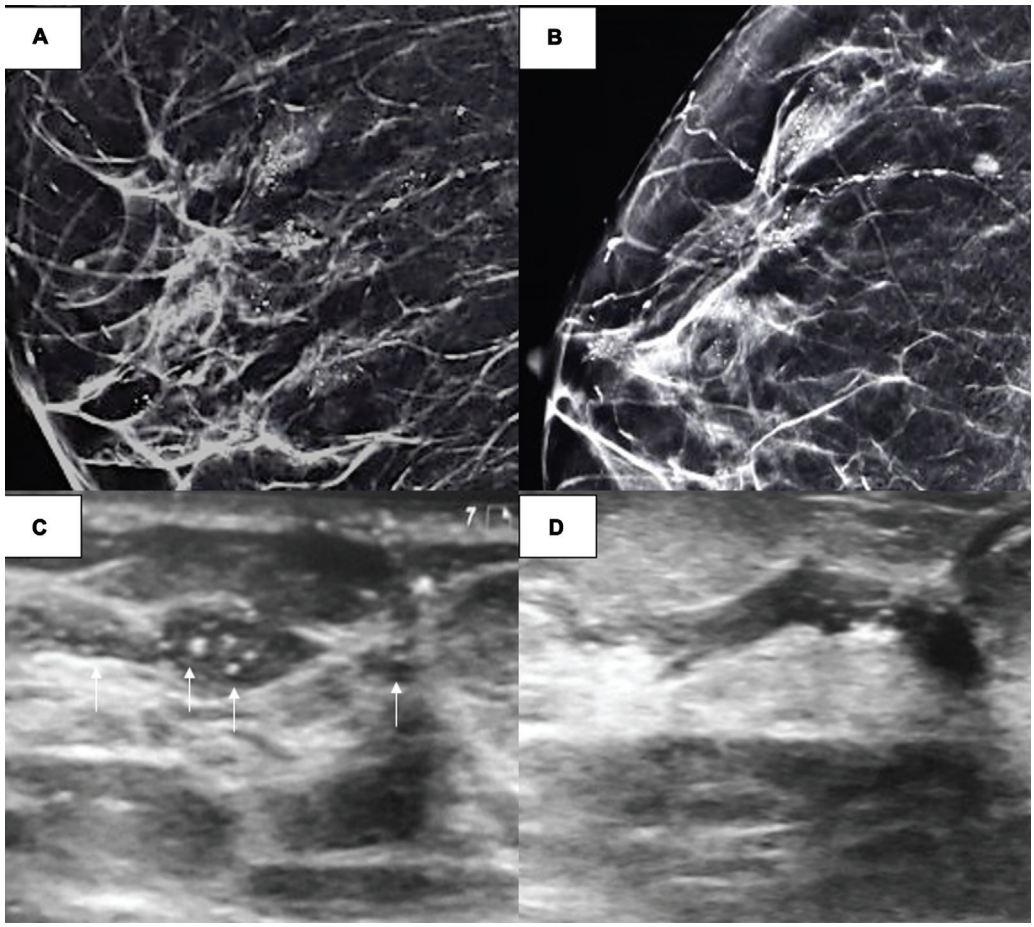

Fig. 7 High-grade ductal carcinoma in situ (DCIS) as nonmass finding. Screening mammogram of BRCA 1 positive female with history of ovarian cancer in 2019 (**A** & **B**) revealed coarse heterogenous calcifications in upper outer and central quadrants. Corroborative ultrasound (**C** & **D**) showed linear/tubular hypoechoic structures representing dilated ducts in the corresponding region with hyperechoic specks of calcification within (arrows in C). Stereotactic biopsy diagnosed it as high-grade DCIS.

c) **Posttreatment changes** (►**Fig. 6**)—Fibrosis can occur in postbiopsy or postoperative scars, or can be associated with tumor shrinkage after neoadjuvant chemotherapy. These can be seen as areas of architectural distortion in association with nonmass findings on US.[28] Postoperative or posttraumatic fat necrosis can be seen on US as echogenic solid masses to complex solid cystic lesions or cysts with posterior acoustic enhancement or shadowing. Bilgen et al reported isolated increased echogenicity of subcutaneous tissue in 27% cases with fat necrosis.[29] Rarely, they can be seen as architectural distortions on US.[28]

Malignant Pathologies

The most common malignancies presenting as nonmass findings are DCIS and invasive lobular cancer (ILC). Approximately 25 to 61 % DCIS present as NML on US.[30–32] They can be seen as hypoechoic mass or NMLs, calcifications alone, architectural distortion, or ductal change (►**Figs. 7** and **8**). Mass lesions are seen when DCIS involves the peripheral ducts or lobules, while NMLs or ductal architecture are seen when DCIS spreads along the central or peripheral ducts.[31] Nonmass appearance is more often associated with high-risk DCIS as compared to mass lesions. Posterior shadowing due to clumped microcalcifications may represent high-grade comedo type DCIS.[32] Pure lobular carcinoma in situ is rare and can be seen as irregular ill-defined hypoechoic masses with occasional calcifications.[33] IDC usually present as irregular hypoechoic masses with posterior shadowing or enhancement, while foci of IDC may be seen along with DCIS presenting as NMLs.[2,34] ILC, on the other hand, may show nonmass findings like posterior shadowing only or hypoechoic inhomogeneous areas due to their noncohesive and infiltrative growth.[2,35] Other malignancies like metastasis, metaplastic carcinoma, inflammatory carcinoma, mucinous carcinoma, and leukemia have also been described with nonmass appearance on US.[2] The imaging findings in few common nonmass pathologies on US have been summarized in ►**Table 2**.[2,20–32,34,35]

Role and Correlation with Other Imaging Modalities and Management Approach

Calcifications, focal or developing asymmetry or architectural distortion on MG are the most common imaging features that present as nonmass findings on US.[2,12,36] In a study by Giess et al, over half of developing asymmetries on MG corresponded to NMLs on US. Malignant NMLs are more likely to be associated with a MG correlate in the form of

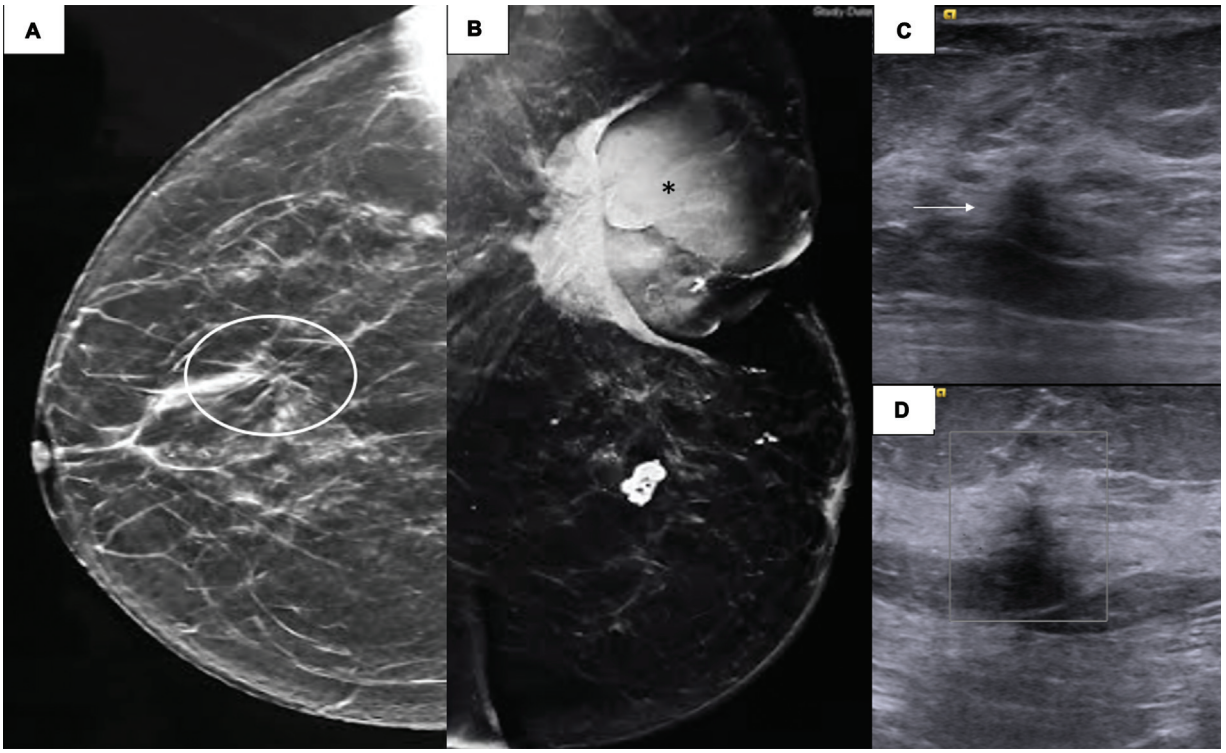

Fig. 8 Low-grade ductal carcinoma in situ (DCIS) as nonmass finding. Mammogram of a 56-year-old female with proven malignant mass in left breast (asterisk in **B**) incidentally revealed focal architectural distortion in central quadrant of right breast on craniocaudal view (circled in **A**). Subsequently performed ultrasound (US) showed a focal area of architectural distortion with posterior shadowing which was subjected to US-guided biopsy and proven to be low-grade DCIS.

asymmetry or calcifications than benign NML.[11] NMLs in the form of echogenic tissue have been described for focal asymmetries that corresponded to either stromal fibrosis or fibrocystic change.[36] In a study by Bahl et al, hypoechoic NML or posterior shadowing corroborated with architectural distortions on MG in 21.4%, which have a higher chance of being malignant as compared to those without any US correlate.[37]

Due to the subtle appearance of NMLs on US, second-look US after MRI can increase the detection rates of such lesions. This in turn can aid in subsequent US-guided biopsy instead of MRI-guided biopsy or surgery.[38] In the study by Coskun et al, MRI directed US could identify US correlates in up to one-third of nonmass enhancements. The detection rate was higher for malignant lesions, the most common being DCIS.[39] In another study by Sotome et al, NMLs on US correlated with nonmass enhancement on breast MRI in about 39 %, including 95% of proven malignancies that presented as NML on US.[40]

The current ACR-BIRADS for US includes descriptors for masses (shape, orientation, margins, echo pattern and posterior features), calcifications (either within or outside the mass or intraductal), and associated features (architectural distortion, duct changes, skin changes, edema, vascularity, and elasticity assessment). Special cases include cysts (simple cyst, clustered microcysts, complicated cyst), masses in or on the skin, foreign body or implants, lymph nodes, vascular anomalies, postsurgical fluid collection, and fat necrosis.[1] NMLs on US may fit into the description of calcifications, associated features, or special cases. Masses with indistinct margin may be interpreted as NMLs. Due to no clear terminology and multiple other classification systems, BIRADS assessment and further management for these NML are not standardized. In a study of 59 NML on US, Lin and Wu used one or more descriptors of malignancy for masses such as nonparallel orientation, spiculated or angular margins, microcalcification and posterior shadowing, in designation of a BIRADS category. This showed a sensitivity, specificity and positive and negative predictive value of 82.9, 41.7, 84.8, and 38.5%, respectively. The diagnostic accuracy was less than that for categorization of masses by ACR-BIRADS.[41] In another study by Wang et al for NMLs on US, using the previous BIRADS version, the sensitivity, specificity, positive, and negative predictive values were 95.4, 43.2, 66.1, and 88.9%, respectively.[10]

US-guided biopsy should be done if NMLs with suspicious features are detected on US. It is a cost-effective, efficient, and convenient method of sampling as compared with other imaging-guided procedures or surgical excision. US detection of NML can also be useful for US-guided wire localization prior to surgery. Ko et al classified nonductal hypoechoic areas without calcifications as BIRADS 4a; ductal hypoechoic area without calcification, vague altered echotexture with architectural distortion, or indistinct hypoechoic area with posterior shadowing into BIRADS 4b; and ductal or nonductal hypoechoic area with calcifications into BIRADS 4c. The positive predictive value for malignancy was highest for nonductal lesions with calcifications (79%) and lowest for vague altered echoes with architectural distortion (16%). Accordingly, biopsy or 6 months follow-up for BIRADS 4a and biopsy and follow-up (depending on radio pathological concordance for benign

Table 2 US features of few common nonmass breast pathologies[2,20–32,34,35]

Pathological diagnosis	Nonmass lesion characteristics on US					
	Echogenicity	Distribution	Calcifications on US	Ductal architecture	Architectural distortion	Posterior shadowing
Benign—inflammatory						
Abscess/mastitis	Echogenic fat, edema in mastitis, hypo to anechoic fluid collections in abscess	Focal/diffuse	–	Duct ectasia in periductal or nonpuerperal mastitis	-	-
Granulomatous mastitis	Echogenic fat, edema in mastitis, hypo to anechoic fluid collections in abscess	Focal/diffuse, with intercommunicating tracts and fistulae	–	Duct ectasia may be present	-	-
Diabetic mastopathy	Heteroechoic or hypoechoic	Focal	–	–	-	Can be present
Benign—proliferative						
Fibrocystic change	Heteroechoic, hypoechoic or anechoic (multiple cysts/clustered microcysts)	Focal, regional or diffuse	–	–	-	-
Atypical ductal/lobular hyperplasia	Hypoechoic or heteroechoic	Focal or segmental	Can be present	Can be present	Can be present	-
Radial scar/Complex sclerosing lesion	Hypoechoic or heteroechoic	Focal	Can be present	–	Can be present	Can be present
Sclerosing adenosis	Hypoechoic or heteroechoic	Focal	Can be present	–	Can be present	Can be present
Benign—posttreatment						
Fibrosis/scar (postsurgical, postchemotherapy)	Hypoechoic or heteroechoic	Focal	–	–	Can be present	Can be present
Fat necrosis	Echogenic or heteroechoic or anechoic (cystic), echogenic fluid level can be seen	Focal	Can be present	–	Can be present	Can be present
Malignant						
Ductal carcinoma in situ	Hypoechoic or heteroechoic	Linear/segmental	Can be present	Can be present	Can be present	-
Invasive carcinoma	Hypoechoic or heteroechoic	Focal or segmental (in small foci along with DCIS)	Can be present	Can be present	Can be present	Can be present

Abbreviations: DCIS, ductal carcinoma in situ; US, ultrasound.

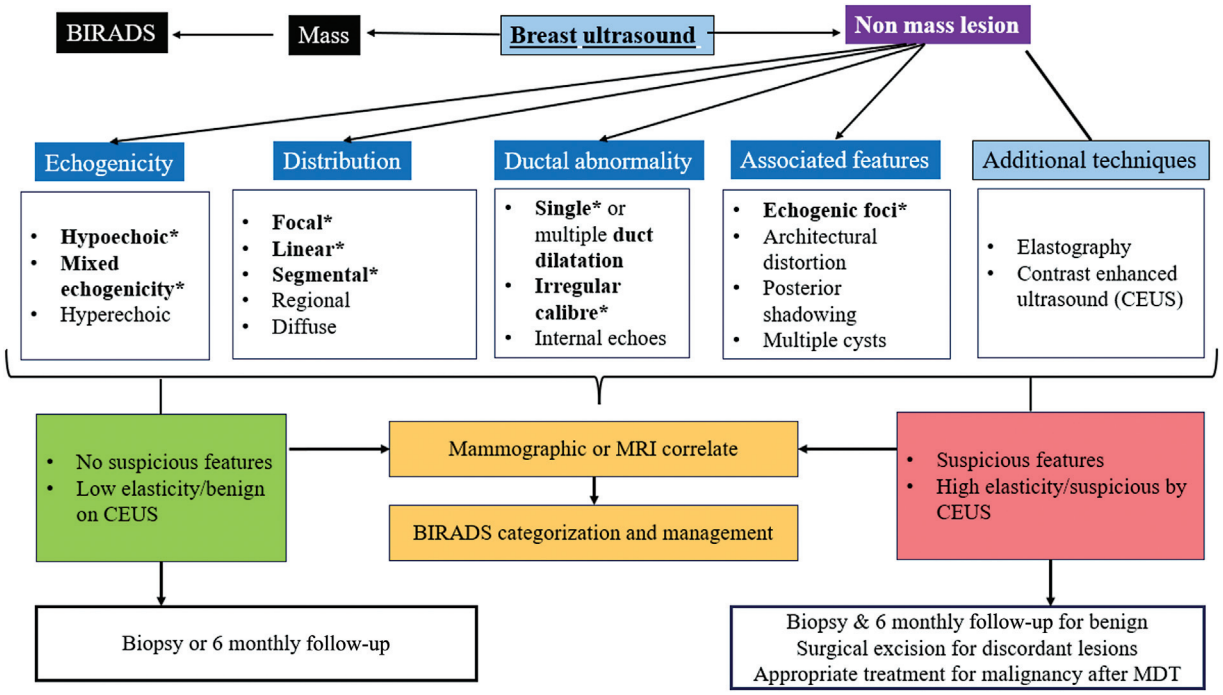

Fig. 9 Flowchart for approach to nonmass lesions on breast ultrasound (*features commonly associated with malignancy). MDT, multidisciplinary team meeting; MRI, magnetic resonance imaging.

lesions)/surgical excision for discordance were done for NML classified into BIRADS 4b and 4c lesions[9] (►**Fig. 9**).

However, due to lack of standardized terminology or classification system, there is no uniform approach in categorization of NML and further management. Inclusion of NMLs as a separate descriptor under ACR-BIRADS may prove to be useful in appropriate management of such lesions.

Conclusion

NMLs on US are subtle yet significant findings that can be picked up on screening, diagnostic, or relook US after MG or MRI. They can be risk stratified for malignancy based on their distribution, associated calcifications, architectural distortion, elasticity patterns, and CEUS features. US-guided biopsy or wire localization can be performed when US correlates are detected for these lesions. A uniform definition and classification of such lesions under ACR-BIRADS combined with active search for these subtle lesions may increase the sensitivity of US in detection of NML and help to standardize further management.

Authors' Contributions
S.L.M. contributed to resources and writing—original draft. E.D. helped in conceptualization, resources, writing—review and editing, and supervision. R.G. was involved in writing—review and editing.

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Conflict of Interest
None declared.

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