Utility of Diagnostic Mammography as the Primary Imaging Modality for Palpable Lumps in Women With Almost Entirely Fatty Breasts

Olivia E. Linden1 Jessica H. Hayward2 Elissa R. Price2 Tatiana Kelil2
Bonnie N. Joe2 Amie Y. Lee2

AJR 2020; 214:938–944

報告者:曾淑如
日期:2025/07/03

Background

- Breast cancer is the most common and second deadliest cancer in women.
- Most common symptom: palpable lump.
- ACR recommends mammography + ultrasound for women 30+.
- Is mammography alone enough in entirely fatty breasts?

Objective

- To assess performance of diagnostic mammography alone for palpable lumps in women with almost entirely fatty breasts.

Methods

- Retrospective study (2009–2017), UCSF, 323 cases.
- Imaging: 2D mammography, optional targeted ultrasound.
- Analysis: sensitivity, specificity, NPV, PPV.

- Exclusion criteria included palpable symptoms in areas other than the breast (e.g., axilla), mastectomy bed symptoms, presence of breast implants,diagnostic imaging performed for a screening recall,imaging follow-up of a known or suspected abscess, biopsy of a palpable symptom before diagnostic imaging, and insufficient follow-up to confirm benignity.

- Images were interpreted in real time and prospectively reported by one of 14 attending academic radiologists who subspecialized in breast imaging (1 to > 30 years' experience).
- DBT was not used in any case.
- Whole breast ultrasound is not performed at our institution.

- Each case was assigned a single BI-RADS final assessment category, determined by the most concerning feature on either mammography or ultrasound.
- For purposes of analysis for this study,cases assigned as BI-RADS 1 or 2 were considered negative and cases assigned as BI-RADS 4 or 5 were considered positive.
- There were no BI-RADS 0, 3, or 6 assignments in this cohort.
- Malignant outcomes were determined by pathologic findings from percutaneous biopsy or any subsequent surgical excision.

Results

- 323 cases(271 women; range, 27–95 years):
  - 74%（240/323 cases） no finding on mammography
  - 12%（38/323 cases） benign
  - 14%（45/323 cases） suspicious

=>278

- All cases underwent diagnostic mammography.
- The majority of cases (294/323;91%) also underwent targeted breast ultrasound at the time of diagnostic mammography.

TABLE 1: Mammograms With Negative or Benign Findings

Mammographic Finding	No. of Mammograms
No correlate[a]	237
Benign correlate	
Fat necrosis	12
Dermal lesion	6
Dystrophic calcification	6
Lymph node	5
Circumscribed mass with long-term stability	3
Fat-containing mass (lipoma vs hamartoma)	3
Calcified fibroadenoma	3
Total	275

38

[a]Excluding three positive mammograms with incidental suspicious findings but no correlate to the palpable site.

TABLE 2: Mammograms With Positive Findings

Mammographic Finding	No. of Mammograms
Suspicious correlate to lump	
Mass	25
Mass with calcifications	9
Developing asymmetry	7
Focal asymmetry	4
Incidental suspicious finding in symptomatic breast	
Mass	2
Calcifications	1
Total	48

- Of the total 275 negative mammograms,only one cancer was detected at adjunct ultrasound,yielding an NPV of 99.6% for diagnostic mammography alone.
- A total of 42 of the 48 positive mammography cases underwent percutaneous sampling, and 26 were malignant.
- Total malignancy: 8% （ 27/323 cases ）

Mammography Performance

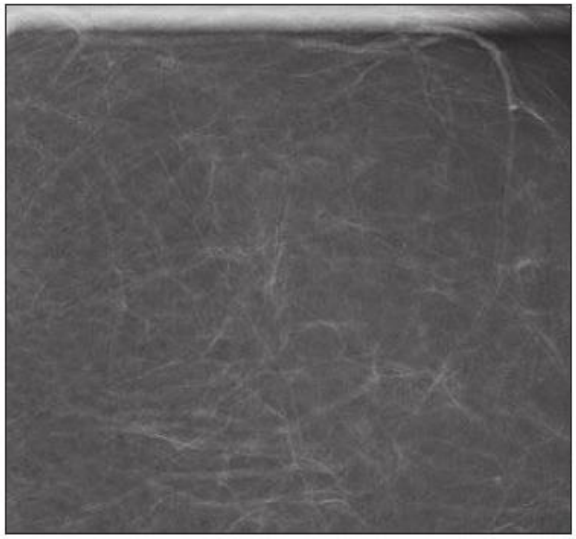
- False negative: 1 case (density misassigned)
- Sensitivity: 96%
- Specificity: 93%
- NPV: 99.6%

Ultrasound Added Value

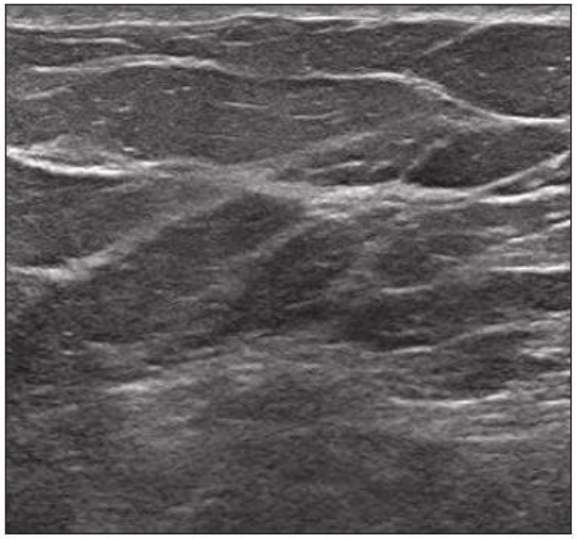
- Ultrasound found 1 extra cancer (density misread)
- Also identified 8 benign causes of lumps
- Downside: 11 false positives

Negative Mammograms

A



B



C

Fig. 1—50-year-old woman with palpable lump in lower outer left breast.
A and **B**, Left craniocaudal full-field mammogram with metallic ball bearing marking site of lump (**A**) and spot compression magnification mammogram (**B**) show no correlate to palpable lump. Breast tissue composition is almost entirely fatty and unlikely to obscure malignancy; however, subsequent ultrasound was performed.
C, Targeted ultrasound shows no sonographic correlate to palpable lump. Absence of malignancy was confirmed with long-term follow-up.

Positive Mammograms

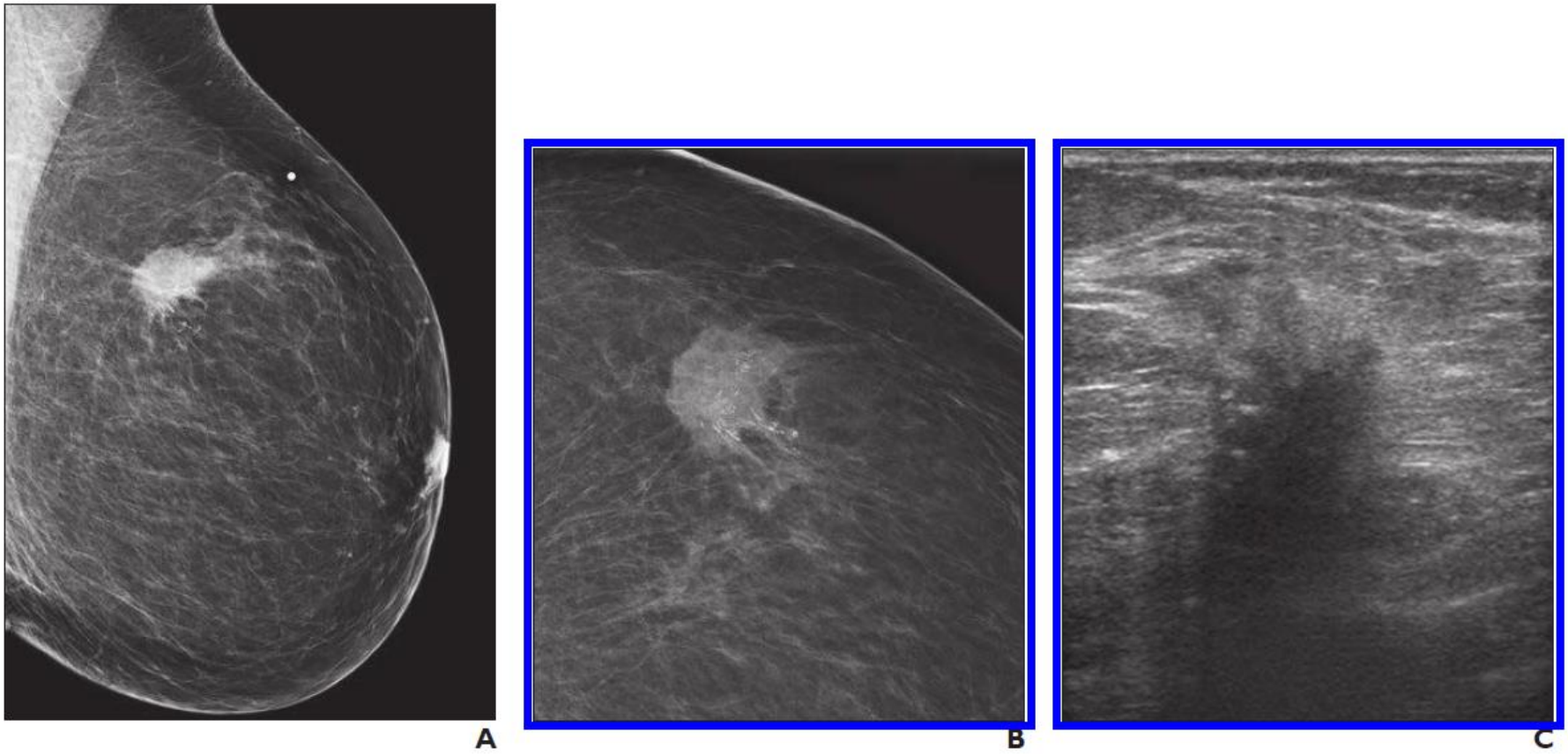
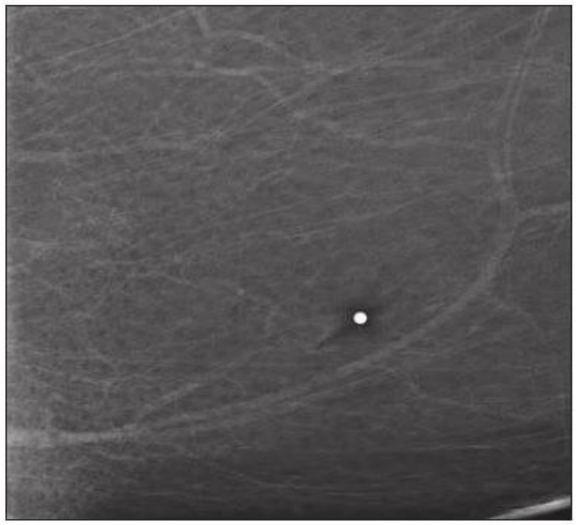
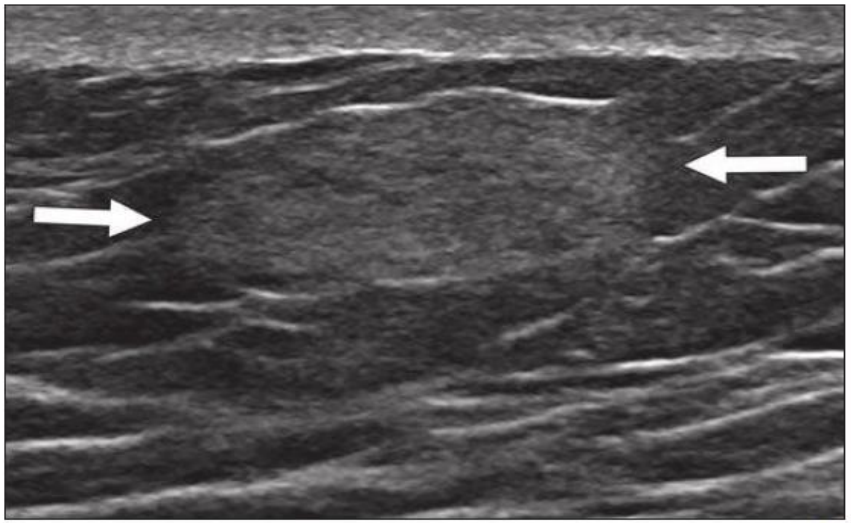


Fig. 2—63-year-old woman with palpable lump in upper outer left breast.
A and **B**, Left mediolateral full-field mammogram with metallic ball bearing marking site of lump (**A**) and craniocaudal spot compression magnification mammogram (**B**) show irregular mass with spiculated margins and associated fine pleomorphic calcifications corresponding to palpable lump. This is clearly visible and unobscured in setting of entirely fatty breast tissue.
C, Targeted ultrasound confirms hypoechoic irregular mass with spiculated margins corresponding to mammographic mass.

Benign Mammograms

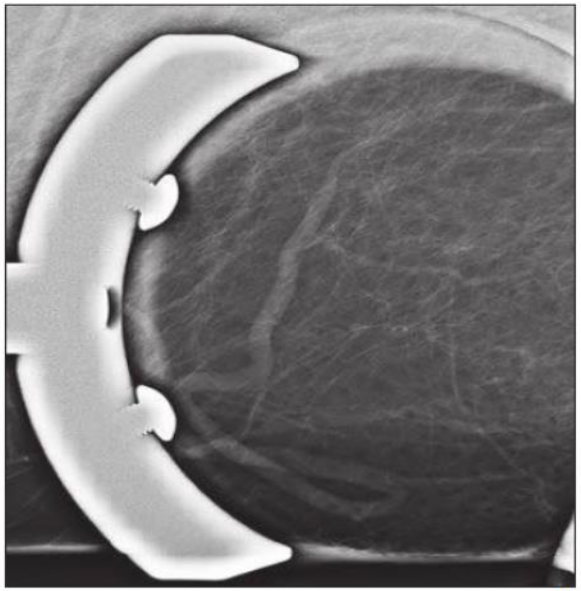


A

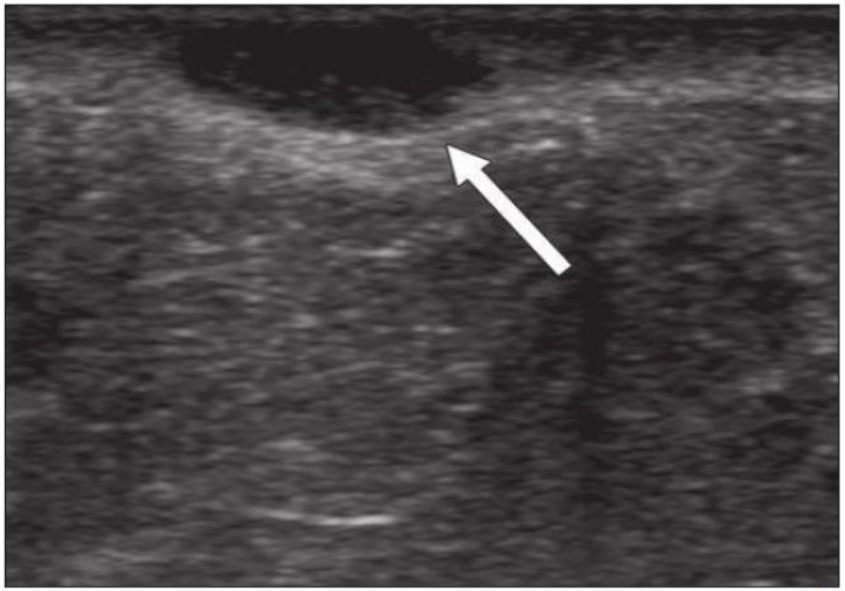


B

Fig. 3—68-year-old woman with palpable lump in upper inner left breast.
A, Left craniocaudal spot compression magnification mammogram shows almost entirely fatty breast tissue with no correlate to palpable lump at site of metallic ball bearing.
B, Targeted ultrasound shows oval hyperechoic mass (*arrows*), compatible with benign fat-containing lesion such as lipoma or fat necrosis.



A



B

Fig. 4—35-year-old woman with superficial palpable lump in lower outer right breast.
A, Right lateral spot compression magnification mammogram shows almost entirely fatty breast tissue with no correlate to palpable lump.
B, Targeted ultrasound shows superficial benign intradermal lesion (*arrow*) corresponding to palpable lump.

False-Negative Diagnostic Mammogram

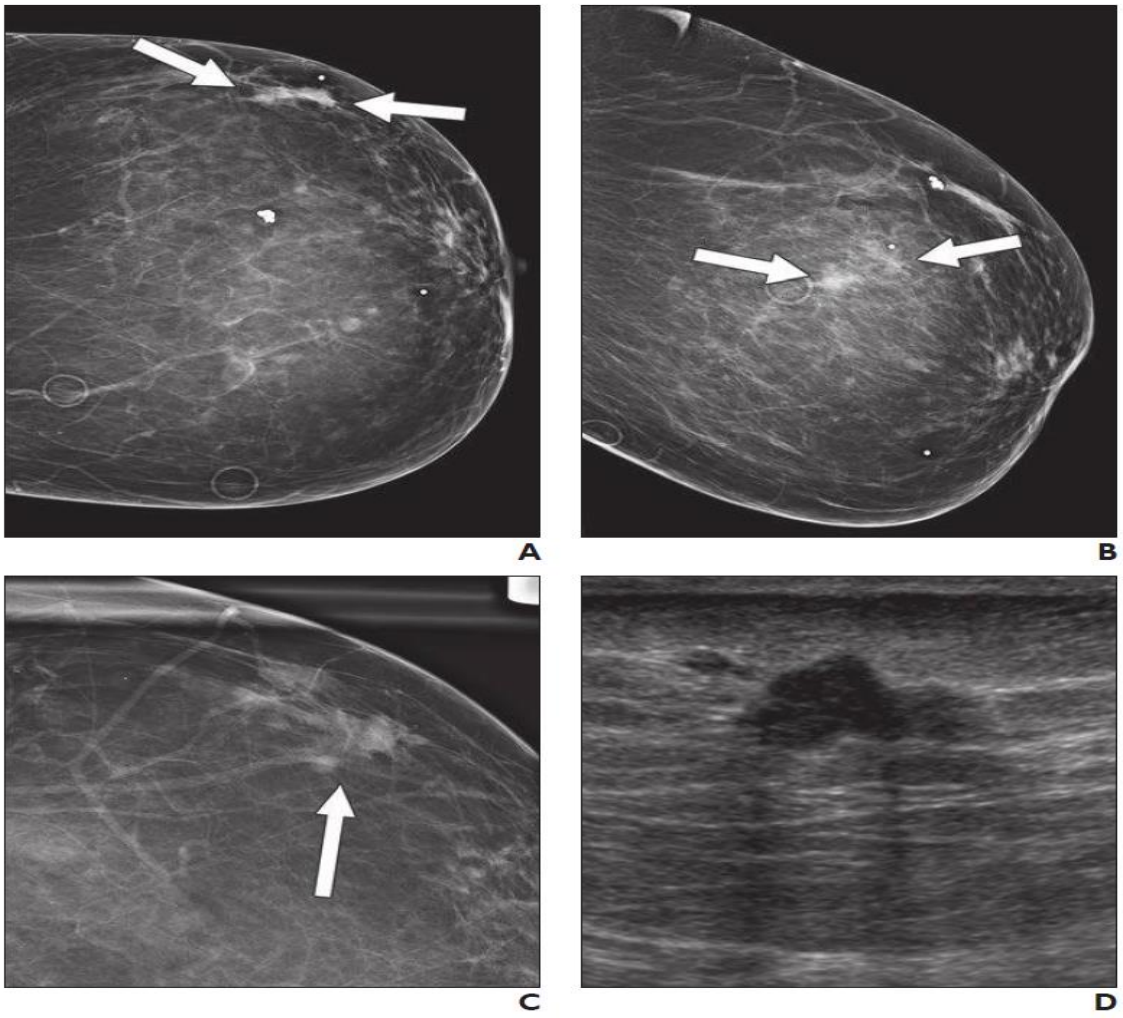


Fig. 5—76-year-old woman with palpable lump in upper outer left breast.
A–C, Radiology report noted almost entire fatty breast tissue with no mammographic correlate to palpable lump. However, in retrospect, left craniocaudal (**A**), mediolateral oblique (**B**), and craniocaudal spot magnification (**C**) mammograms show that tissue is not almost entirely fatty, and focal asymmetry (*arrows*) corresponds to site of palpable lump. Circles in **A** and **B** denote patient's moles.
D, Targeted ultrasound shows corresponding hypoechoic irregular mass with angular margins. Ultrasound-guided core biopsy found invasive ductal carcinoma.

Discussion

- Ultrasound helps find benign causes.
- If density is correctly assessed, mammography may be sufficient.
- Avoid unnecessary procedures.

Recommendations

- Recommend mammography alone if no suspicious findings and fatty composition.
- Limitations: retrospective, subjective density.

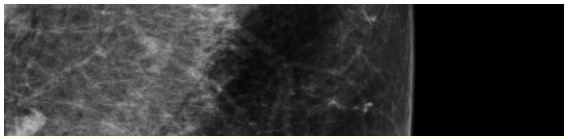
Conclusion

- Diagnostic mammography is highly effective in fatty breasts.
- The added value of ultrasound in the setting of a negative mammogram was greatest in detecting benign causes of lumps not visible on mammography with the downside of generating false-positives.
- Ultrasound adds little value unless density is misread.

CLINICAL CASE

Case 1

70Y



(2023/12/27) Mammography Right+Left

Imaging findings :

Screening mammogram of Bilateral breasts, included CC-view and MLO views:

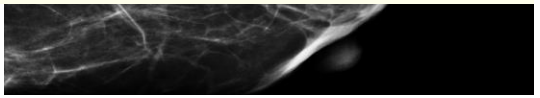
Findings:

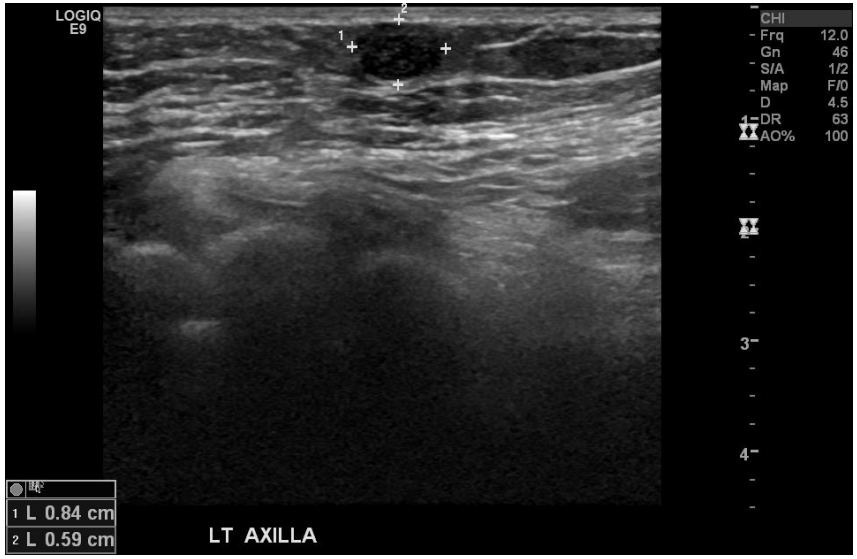
- The breasts are almost entirely fatty.
- There is no evidence of suspicious mass or pleomorphic calcifications.
- Increase soft tissue shadow at the left axillary tail. S/P triangular skin marker retention in placement.
- There is no evidence of focal asymmetry or architectural distortion.

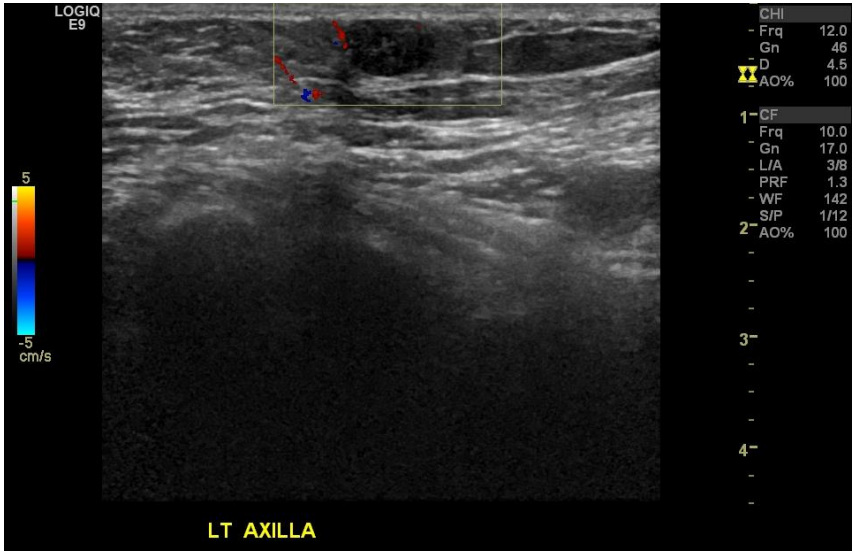
Impression:

1. Category 0 (according to ACR BI-RADS categories for mammographic lesions): need additional imaging evaluation.
2. No significant interval change as compared to previous mammograms. (2020/05-2023-12)
3. Advise breast sonography for further evaluation.
4. CAD (computer-assisted detection): Negative

報告登打： 周紹賓醫師 (放診專醫字第000525號 員編 111240) 2023/12/29 08:44







開啟影像

(2024/01/05) 超音波Breast 雙側

Screeing US of bilateral breast shows:

- Homogenous fatty echogenicity
- There are two hypoechoic subcutaneous nodular lesion at right breast, the largest around 1.42cm at right axilla r/o subceous cyst or epidermoid cyst.
- There are a few hypoechoic nodular lesion at left axilla subctuanoue region the largest around 0.84cm at left axilla, in favor subceous cyst.

CONCLUSION:

BIRADS 2, benign findings.

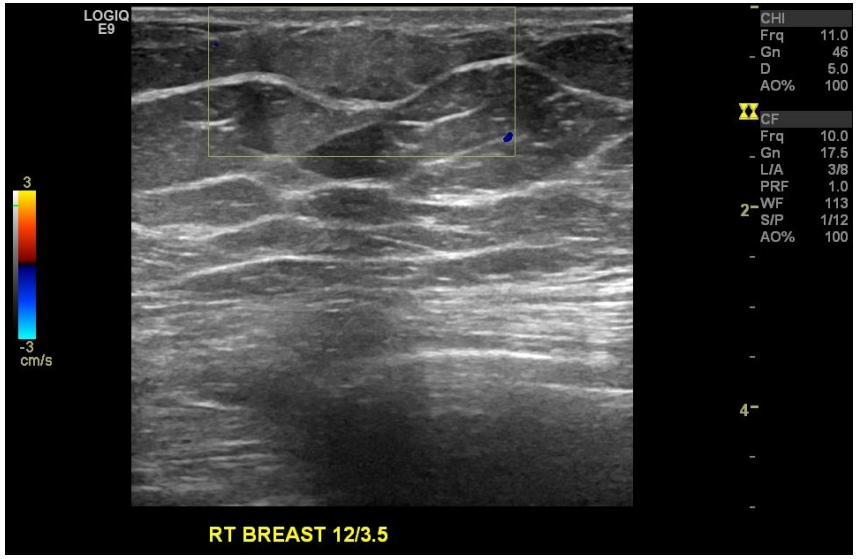
報告登打： 謝宜兼醫師 (放診專醫字第00920號 員編 97293) 2024/01/05 10:32

Case 2

55Y

(2022/06/23) 婦女乳房檢查服務, 45歲以上至未滿70歲之婦女

開啟影像



(2022/06/24) 超音波Breast 雙側

Dignosis sonogram shows:

- homogenous fatty echogenicity
- Evidence of isoechoic fatty nodule at right 12/3.5.
- No space occupyinglesions at left breast.
- No enlarged bilateral axillary lymph nodes.

CONCLUSION:

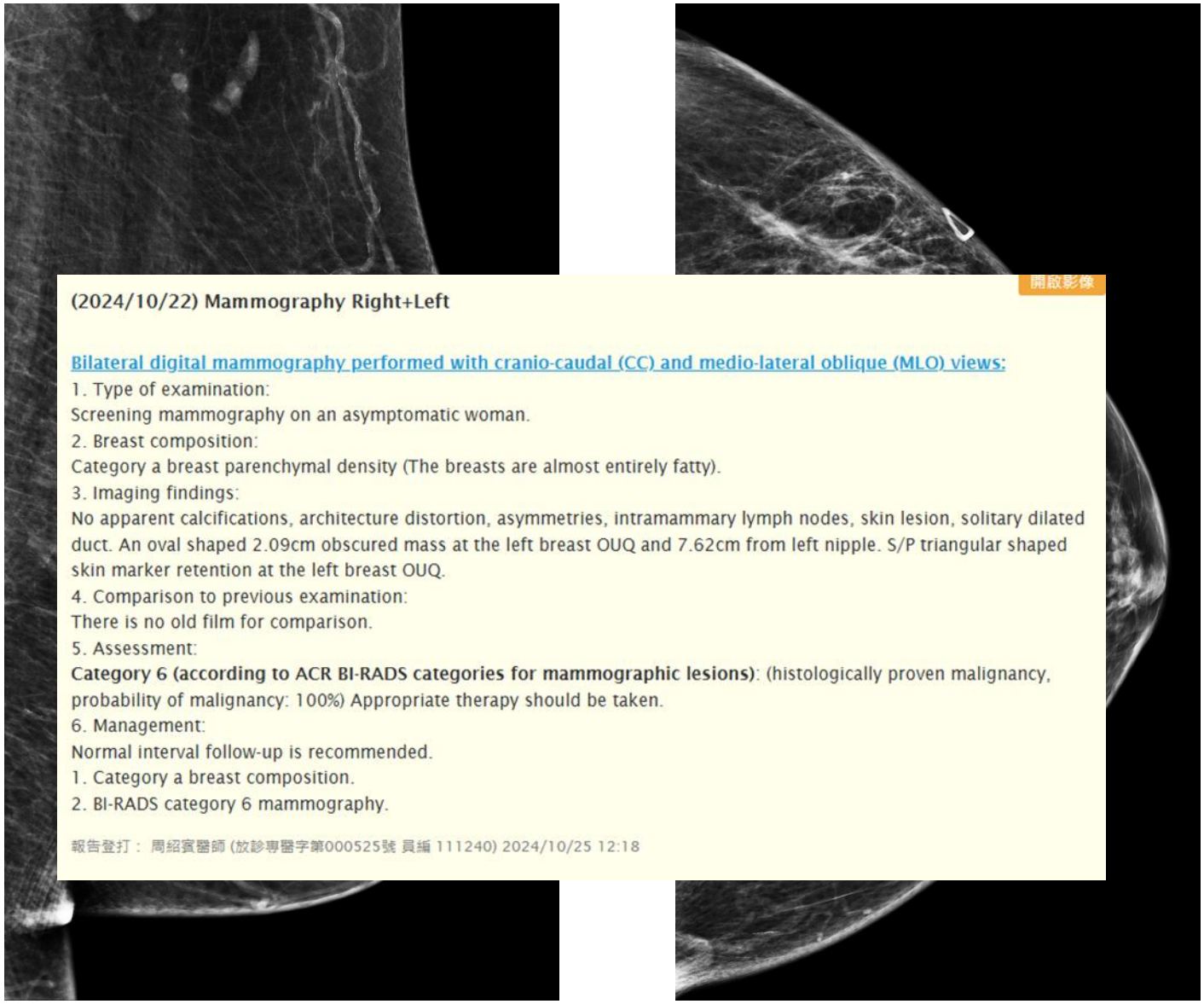
BIRADS 2, benign findings.

- the asymmetry mentioned on mammogram is demonstrated as a lipoma
- Suggested follow up in 12month interval

報告登打： 謝宜兼醫師 (放診專醫字第00920號 員編 97293) 2022/06/24 11:33

Case 3

81Y



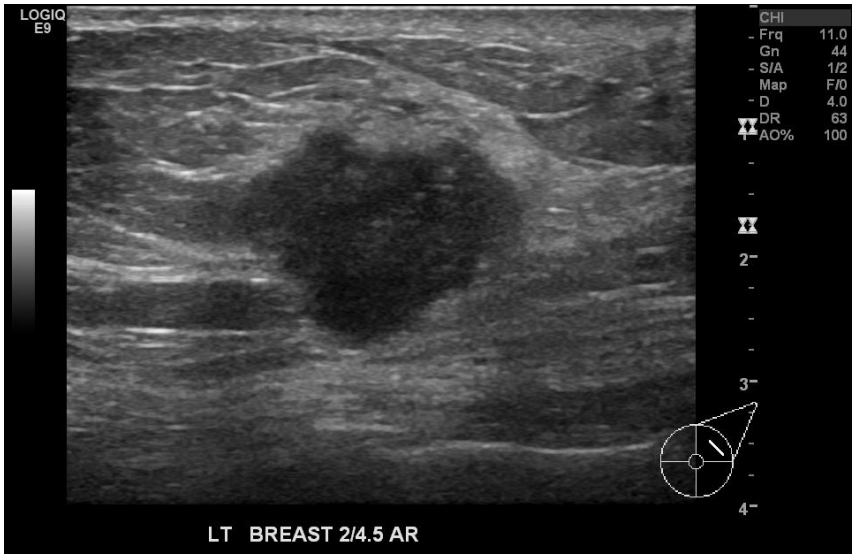
開啟影像

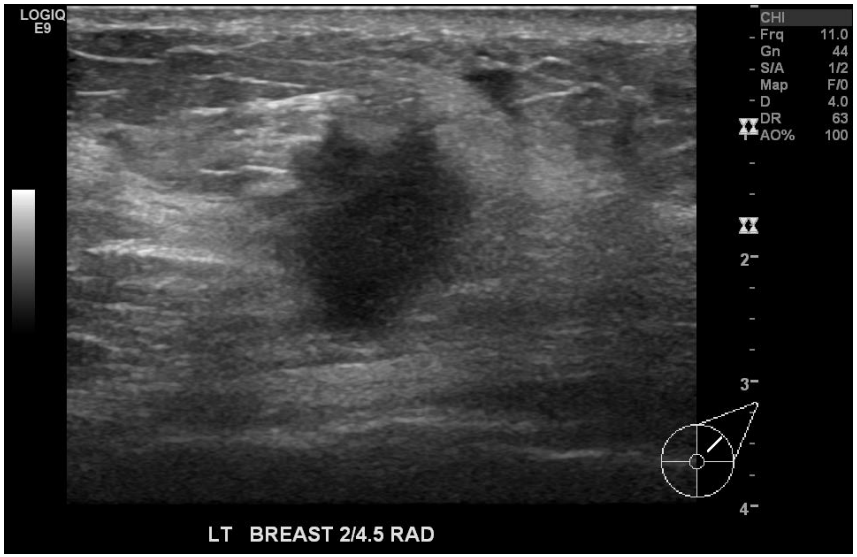
(2024/10/22) Mammography Right+Left

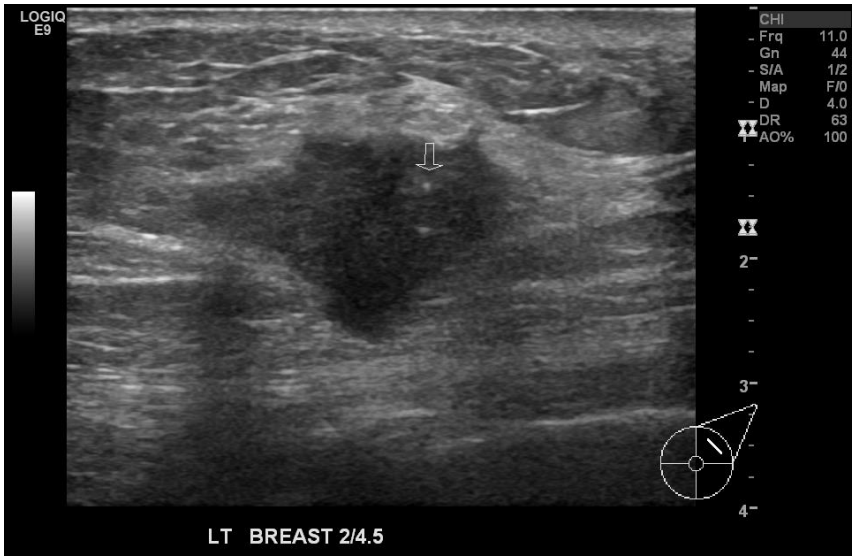
Bilateral digital mammography performed with cranio-caudal (CC) and medio-lateral oblique (MLO) views:

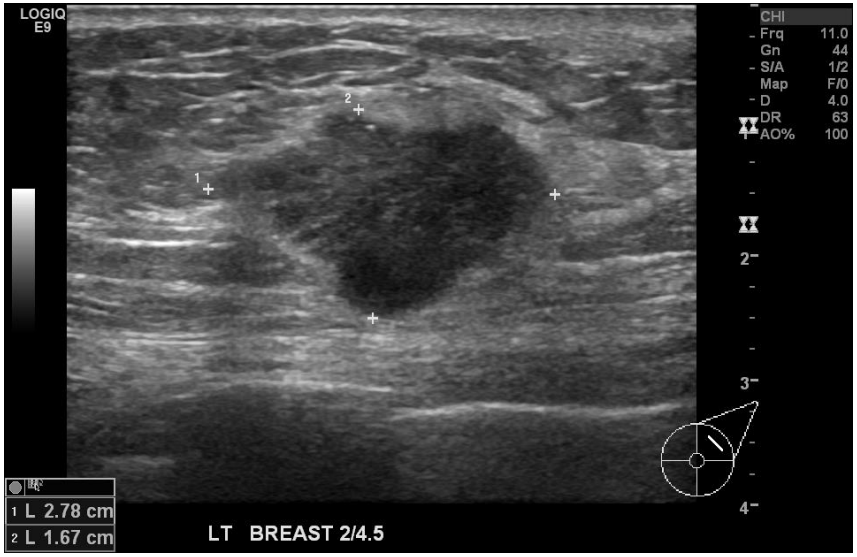
1. Type of examination:
Screening mammography on an asymptomatic woman.
2. Breast composition:
Category a breast parenchymal density (The breasts are almost entirely fatty).
3. Imaging findings:
No apparent calcifications, architecture distortion, asymmetries, intramammary lymph nodes, skin lesion, solitary dilated duct. An oval shaped 2.09cm obscured mass at the left breast OUQ and 7.62cm from left nipple. S/P triangular shaped skin marker retention at the left breast OUQ.
4. Comparison to previous examination:
There is no old film for comparison.
5. Assessment:
Category 6 (according to ACR BI-RADS categories for mammographic lesions): (histologically proven malignancy, probability of malignancy: 100%) Appropriate therapy should be taken.
6. Management:
Normal interval follow-up is recommended.
1. Category a breast composition.
2. BI-RADS category 6 mammography.

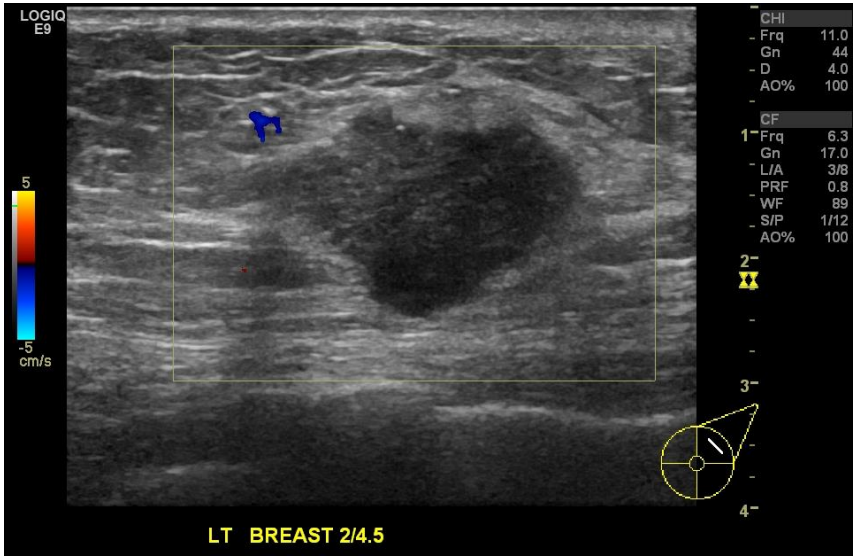
報告登打： 周紹賓醫師 (放診專醫字第000525號 員編 111240) 2024/10/25 12:18

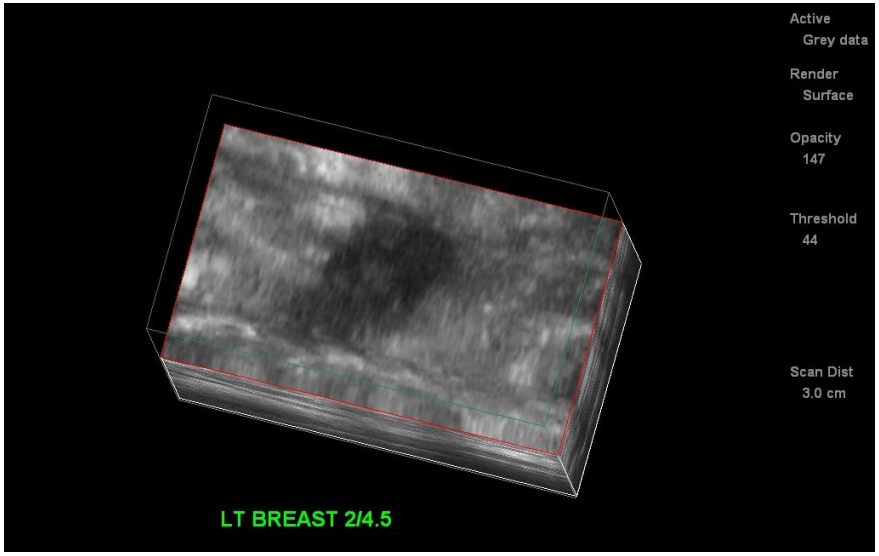

LOGIQ
E9
CHi
Frq 11.0
Gn 44
S/A 1/2
Map F/0
D 4.0
DR 63
AO% 100
LT BREAST 2/4.5 AR


LOGIQ
E9
CHi
Frq 11.0
Gn 44
S/A 1/2
Map F/0
D 4.0
DR 63
AO% 100
LT BREAST 2/4.5 RAD


LOGIQ
E9
CHi
Frq 11.0
Gn 44
S/A 1/2
Map F/0
D 4.0
DR 63
AO% 100
LT BREAST 2/4.5


LOGIQ
E9
CHi
Frq 11.0
Gn 44
S/A 1/2
Map F/0
D 4.0
DR 63
AO% 100
1 L 2.78 cm
2 L 1.67 cm
LT BREAST 2/4.5





(2024/10/22) 超音波Breast 雙側

Diagnostic Sonography of both breasts:

Findings:

Breast composition: Heterogeneous background echotexture.
Highly probability suspicious mass: Size & location: 2.78 cm x 1.67 cm at left 2/4.5. Orientation: not parallel.
Margin: irregular.
Echogenicity: hypoechoic.
Posterior feature: none.
Calcifications: present.
Associated features: none.
Vascularity: internal.
Elastography: hard.
Benign or probably masses: nil.

Impression:

1. ACR-BIRADS Category 5: tumor at left 2/4.5. Suggest tissue proof.

報告登打： 林暐棠醫師 (放診專醫字第001437號 員編 108182) 2024/10/27 09:49

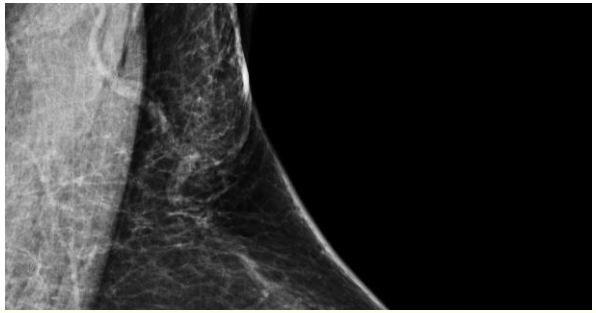
Patho

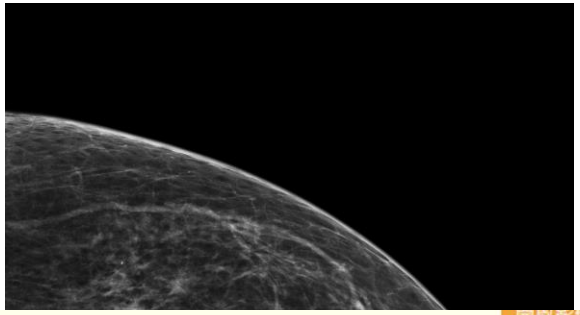
(2024/10/21) Breast, left, 2/8, core biopsy, invasive ductal carcinoma

The specimen submitted consists of four tissue fragments, measuring up to 2 x 0.1 x 0.1 cm in size, fixed in formalin.
Grossly, they are white to yellow and soft.
All for section.
Microscopically, it shows a picture of invasive ductal carcinoma arranged in solid nests and cell cords and rarely in tubules. The tumor cells reveal moderate nuclear atypia. They are positive for E-cadherin immunostain.
Histologic Grade (Nottingham Histologic Score)
(1) Glandular (Acinar)/Tubular Differentiation: Score 3: <10% of tumor area forming glandular/tubular structures
(2) Nuclear Pleomorphism: Score 2: Cells larger than normal with open vesicular nuclei, visible nucleoli, and moderate variability in both size and shape
(3) Mitotic Rate: Score 2 (4-7 mitoses per mm2)
(4) Overall Grade: Grade 2: scores of 6 or 7

Case 4

60Y





(2025/05/23) 婦女乳房檢查服務，40歲以上至74歲之婦女，每二年一次

Screening mammogram of bilateral breasts, included craniocaudal (CC) and mediolateral oblique (MLO) views shows:

Findings:

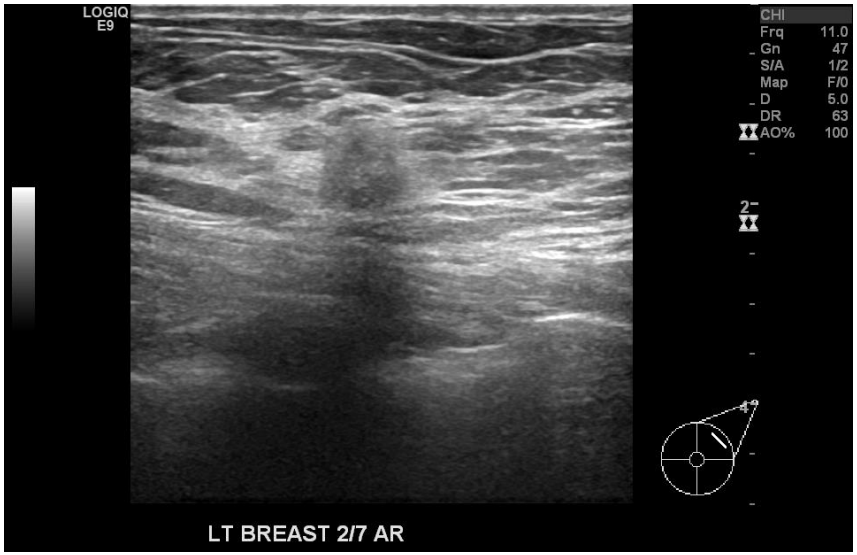
- The breasts are almost entirely fatty.
- There are a few typically benign round and punctate calcifications in bilateral breasts.
- There is a nodule 1.26cm ill defined hyperdense at left upper outer away from nipple 11.22cm

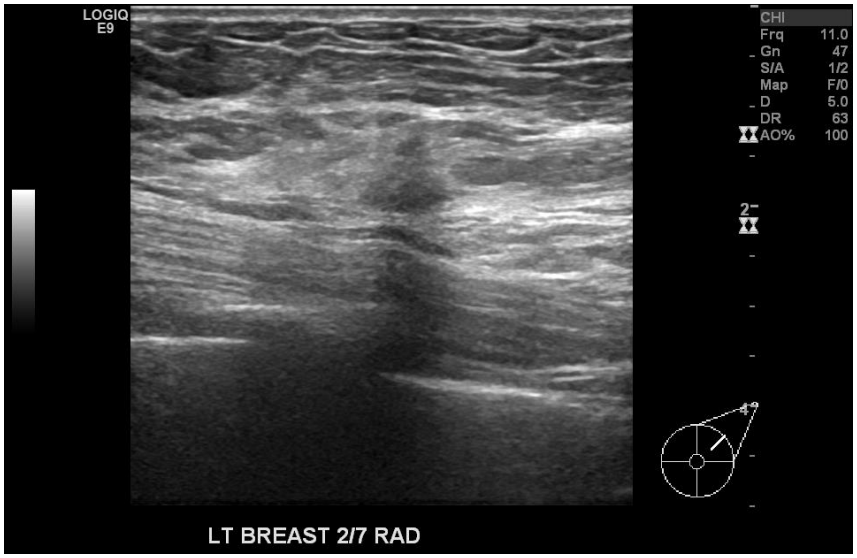
Impression:

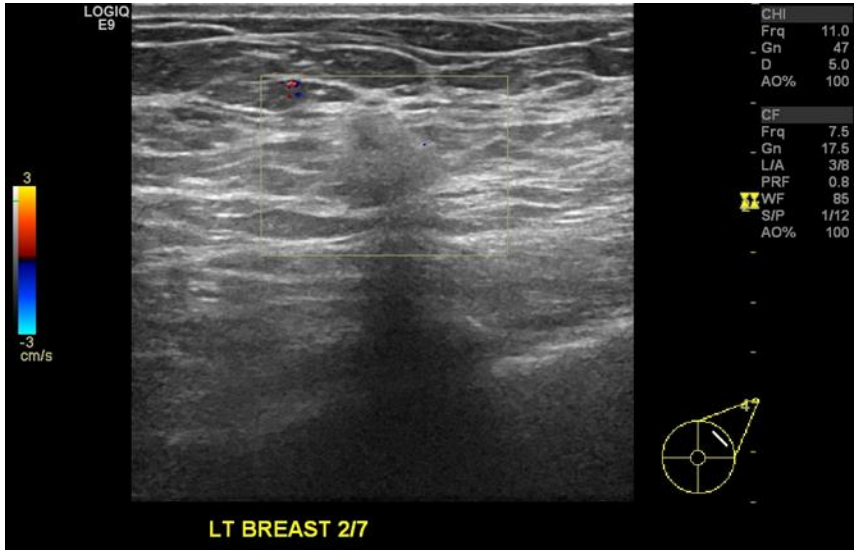
1. ACR BI-RADS Need additional imaging evaluation. (Category 0) 需附加其他影像檢查再評估。
2. Interval change and newly developed nodule lesion at left breast as compared to previous mammograms. (2021/04-2025/05)
3. Advise sonogram correlation for the newly developed nodule at left breast .
4. CAD (computer-assisted detection): not available.

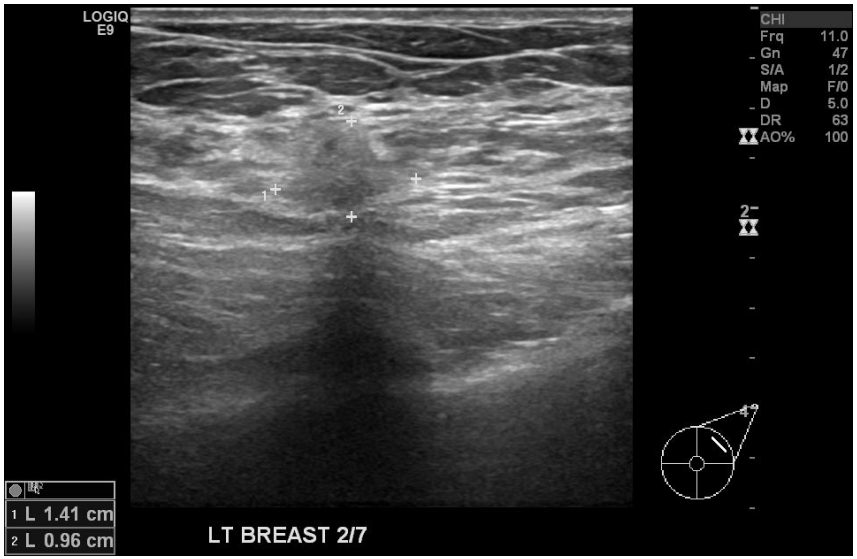
(Note: RUOQ/LUOQ represents right/left upper outer quadrant, RUIQ/LUIQ represents right/left upper inner quadrant, RLOQ/LLOQ represents right/left lower outer quadrants, RLIQ/LLIQ represents right/left lower inner quadrants.)
(Note: Rt represents right, Lt represents left and Bil represents bilateral, CC represents chief complaint, PE represents physical examination, US represents ultrasound, US-CNB represents ultrasound guided core needle biopsy.)

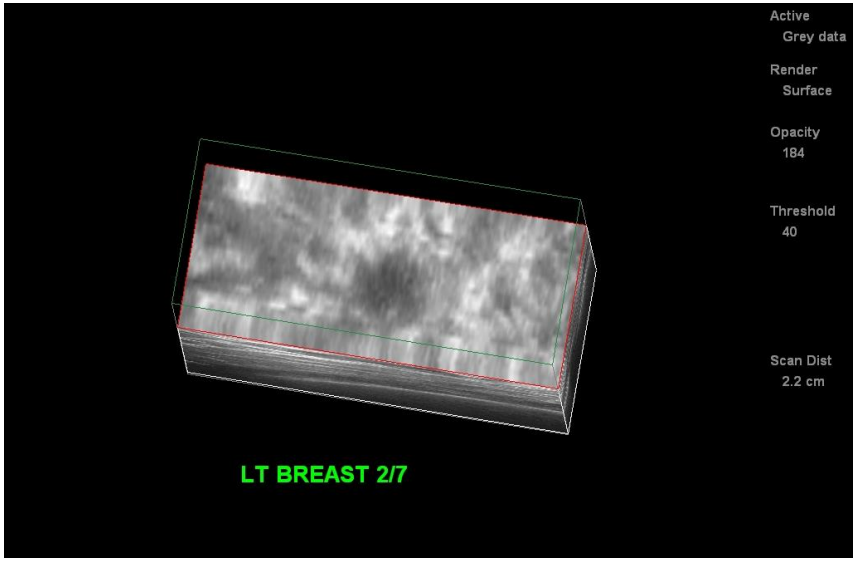
報告登打： 謝宜兼醫師 (員編 97293) 2025/05/23 11:41


LOGIQ
E9
CHI
Frq 11.0
Gn 47
S/A 1/2
Map F/0
D 5.0
DR 63
AO% 100
LT BREAST 2/7 AR


LOGIQ
E9
CHI
Frq 11.0
Gn 47
S/A 1/2
Map F/0
D 5.0
DR 63
AO% 100
LT BREAST 2/7 RAD


LOGIQ
E9
CHI
Frq 11.0
Gn 47
D 5.0
AO% 100
CF
Frq 7.5
Gn 17.5
L/A 3/8
PRF 0.8
WF 85
S/P 1/12
AO% 100
3
-3
cm/s
LT BREAST 2/7





(2025/06/13) 超音波Breast 雙側

Diagnostic Sonography of both breasts shows:
Clinical history

- CC: refer from abnormal MG, heterogeneous dense, a isodense nodule at Rt lower (Cat. 0)
- PE: no palpable lump

Findings:

- Breast composition: Homogeneous echotexture-fat
- Highly probability suspicious mass: Size & location: 1.41cmx0.96cm Shape: irregular Orientation: not parallel Margin: spiculated Echogenicity: hypoechoic Posterior feature: shadowing Calcifications: not present
- Associated features: architectural distortion, skin thickening, edema and nipple retraction.

- Vascularity: internal
- Elastography: hard
- Non-specific lymph nodes in bilateral axilla
- Benign or probably masses:

Impression:
1. ACR-BIRADS Category 4c: Highly Suggestive of
Malignancy
2. Breast cancer at left breast, advise US-CNB, surgical and clinical treament within one month.
3. Need to R/O left axillary lymphadenopathy
4. No previous sonograms available for comparison.

報告登打： 謝宜兼醫師 (員編 97293) 2025/06/13 10:04

Patho

(2025/06/16) Breast, left, 2/7, core needle biopsy, invasive carcinoma of no special type (ductal)

The specimen submitted consists of six tissue fragments, measuring up to 1.5 x 0.1 x 0.1 cm in size, fixed in formalin.
Grossly, they are gray to yellow, soft, and cord-like.
All for section.
Microscopically, it shows a picture of invasive ductal carcinoma with tumor cells arranged in solid nests, cords, and a few tubular structures infiltrating in desmoplastic stroma. The tumor cells show moderate to severe nuclear pleomorphism, hyperchromatic nuclei, and distinct nucleoli. Immunohistochemically, the tumor cells are positive for E-cadherin.
Histologic Grade (Nottingham Histologic Score)
(1) Glandular (Acinar)/Tubular Differentiation:
Score 3: <10% of tumor area forming glandular/tubular structures
(2) Nuclear Pleomorphism:
Score 3: Vesicular nuclei, often with prominent nucleoli, exhibiting marked variation in size and shape, occasionally with very large and bizarre forms
(3) Mitotic Rate:
Score 1 (<=3 mitoses per mm2)
(4) Overall Grade:
Grade 2: scores of 6 or 7

References

1. Siegel RL, Miller KD, Jemal A. Cancer statistics,2018. CA Cancer J Clin 2018; 68:7–30
2. Koo MM, von Wagner C, Abel GA, McPhail S,Rubin GP, Lyratzopoulos G. Typical and atypical presenting symptoms of breast cancer and their associations with diagnostic intervals: evidence from a national audit of cancer diagnosis. Cancer Epidemiol 2017; 48:140–146
3. Lehman CD, Lee AY, Lee CI. Imaging management of palpable breast abnormalities. AJR 2014;203:1142–1153
4. Moy L, Heller SL, Bailey L, et al.; Expert Panel on Breast Imaging. ACR appropriateness criteria palpable breast masses. J Am Coll Radiol 2017; 14(5 Suppl):S203–S224
5. Moy L, Slanetz PJ, Moore R, et al. Specificity of mammography and US in the evaluation of a palpable abnormality: retrospective review. Radiology 2002; 225:176–181
6. Dennis MA, Parker SH, Klaus AJ, Stavros AT,Kaske TI, Clark SB. Breast biopsy avoidance: the value of normal mammograms and normal sonograms in the setting of a palpable lump. Radiology 2001; 219:186–191