



DBT Guided Biopsy

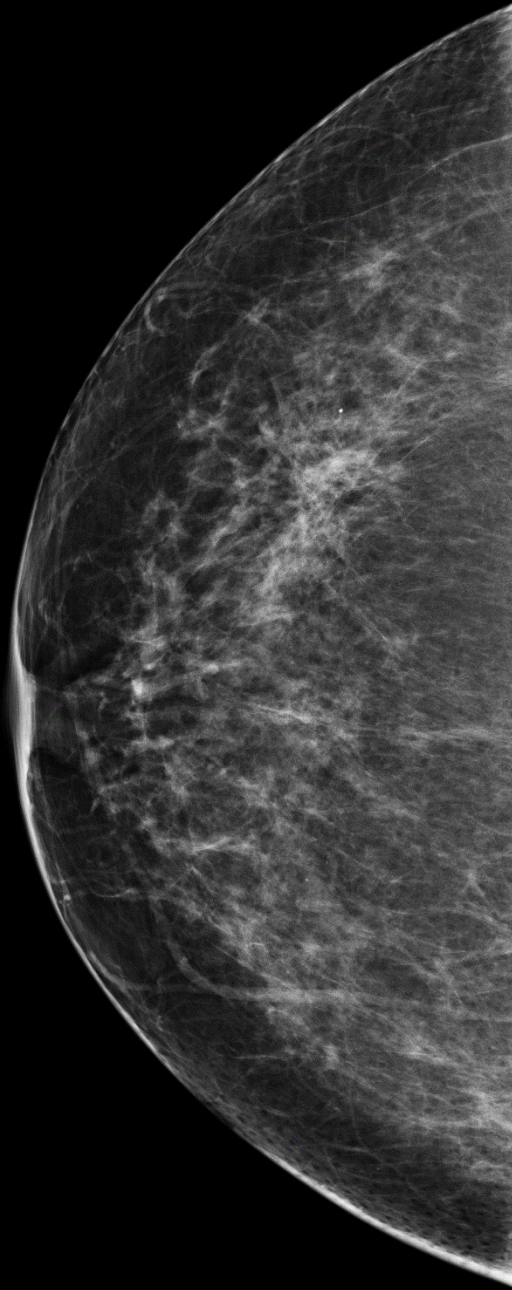
Sarah M. Friedewald, MD, FSBI, FACR
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Division Chief of Breast and Women's Imaging
Northwestern University, Feinberg School of Medicine
Chicago, Illinois





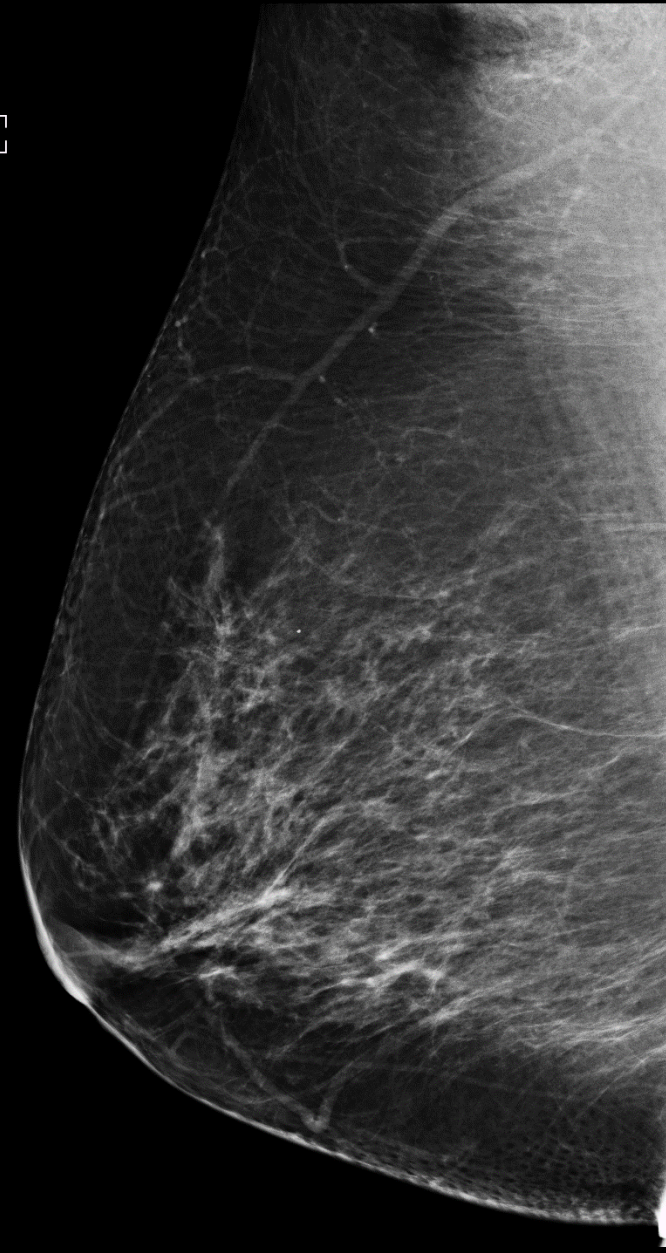
TE
M
LD

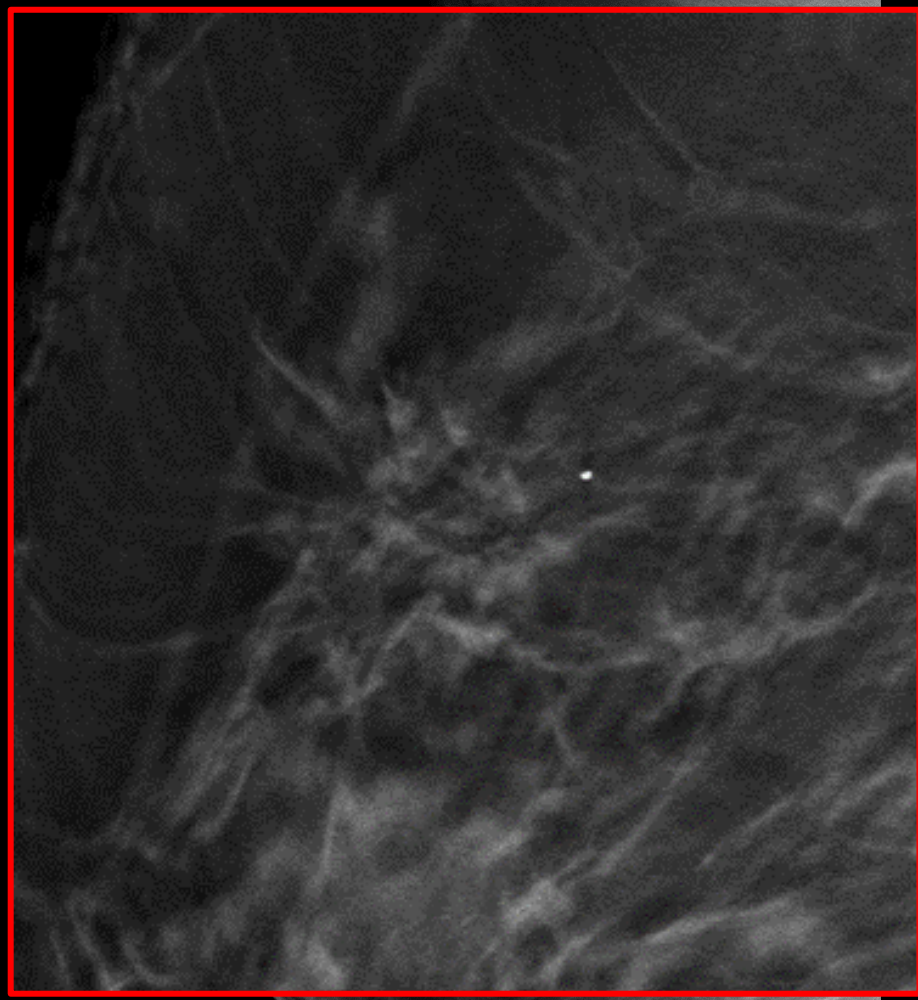
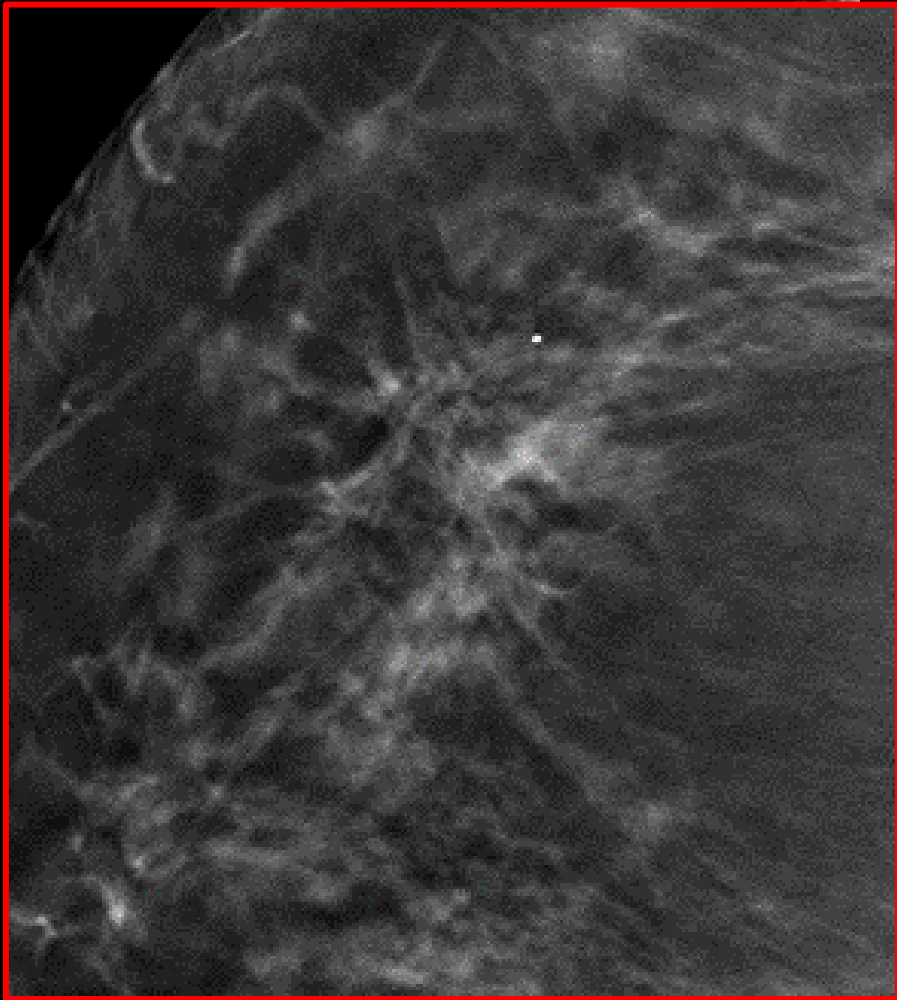
RCC



TE
M
LD

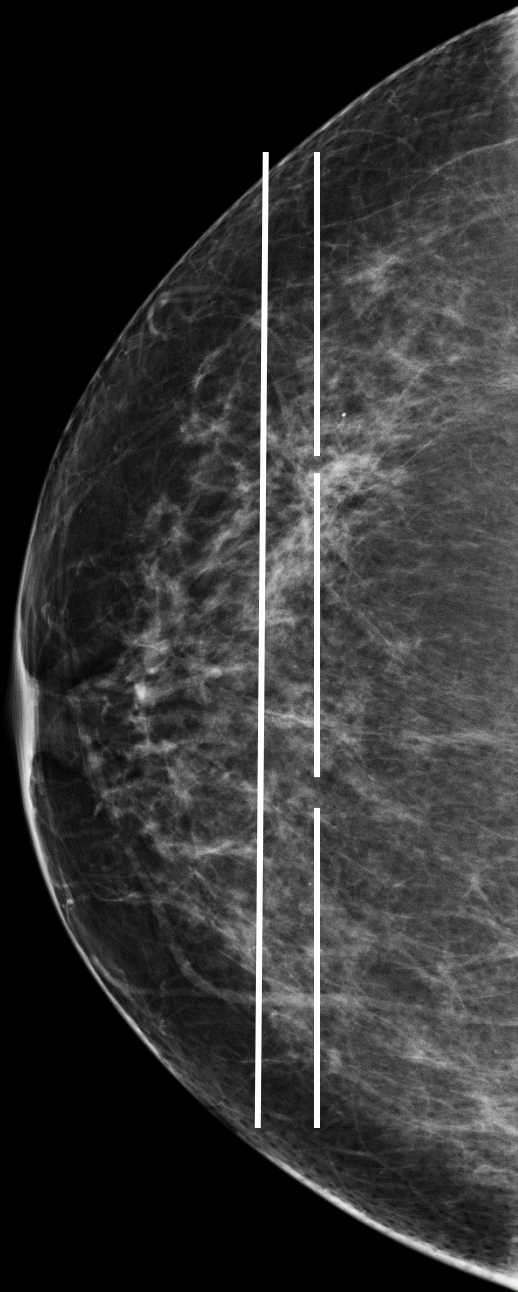
RMLO







TE
M
LD
RCC



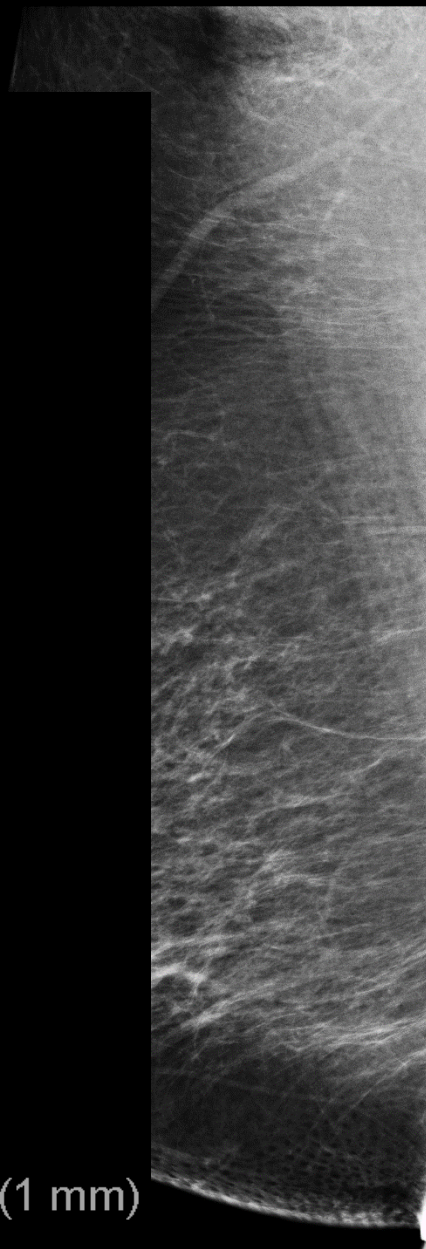
M



L

Paddle: 24X29

Slice: 29/89 Slab: 1 (1 mm)



Why DBT Guided Biopsy?

- Are DBT detected abnormalities (architectural distortion) with no sonographic correlate responsible for increase in false positive biopsies or are we detecting more cancer?

Preoperative Tomosynthesis-guided Needle Localization of Mammographically and Sonographically Occult Breast Lesions¹

Phoebe E. Freer, MD
Bethany Niell, MD, PhD
Elizabeth A. Rafferty, MD

Purpose:

To assess the feasibility and accuracy of digital breast tomosynthesis (DBT)-guided needle localization for DBT-detected suspicious abnormalities not visualized with other modalities and to analyze the imaging and pathologic characteristics of abnormalities detected only with DBT to determine the positive predictive value for malignancy.

Materials and Methods:

This HIPAA-compliant study was approved by the institutional review board, and the requirement to obtain informed consent was waived. A retrospective query of the imaging database identified 34 consecutive women (aver-

DBT Guided Localization

- Implemented pre-operative DBT-guided needle localization
 - Used in DM occult, US occult AD
- April 2011 to January 2013
 - 36 needle localizations
 - All US negative
 - 10 patients (11 lesions) underwent breast MR (neg/not visible at time of biopsy)
 - 25 lesions didn't have MR prior to localization

Results

- 34/36 lesions (94%) concordant
- 2 pts required short term follow up
 - Discordant- had second DBT localization 6 weeks later with path demonstrating IDC
 - Questionable concordance with a very small radial scar present at pathology- no malignancy at serial follow up

Results

Pathologic Findings of DBT-guided Needle Localization

Pathologic Finding	No. of Lesions
Malignant lesion	17 (47)
Invasive	13 (36)
Invasive ductal carcinoma	8 (22)
Invasive lobular carcinoma	4 (11)
Invasive adenosquamous carcinoma	1 (3)
Ductal carcinoma in situ	4 (11)
High-risk lesion*	5 (14)
Benign, no high-risk lesion	14 (39)
Radial scar	10 (28)
Sclerosing adenosis	3 (8)
Prior percutaneous biopsy site	1 (3)

Note.—Numbers in parentheses are percentages.

*High-risk lesions include atypical ductal hyperplasia, atypical lobular hyperplasia, and lobular carcinoma in situ. All high-risk lesions were associated with radial scars.

- 17/36 lesions (47%) were malignant
 - 13/17 (76%) lesions were invasive
 - Either Gr1 or Gr2 invasive cancers
- 19/36 lesions (53%) were benign
 - 15/19 were radial scars
 - 5/15 benign radial scars had high risk lesions associated (ADH, LCIS, ALH)
- 19/36 lesions (53%) were in fatty breasts or scattered breasts (BIRADS A or B)

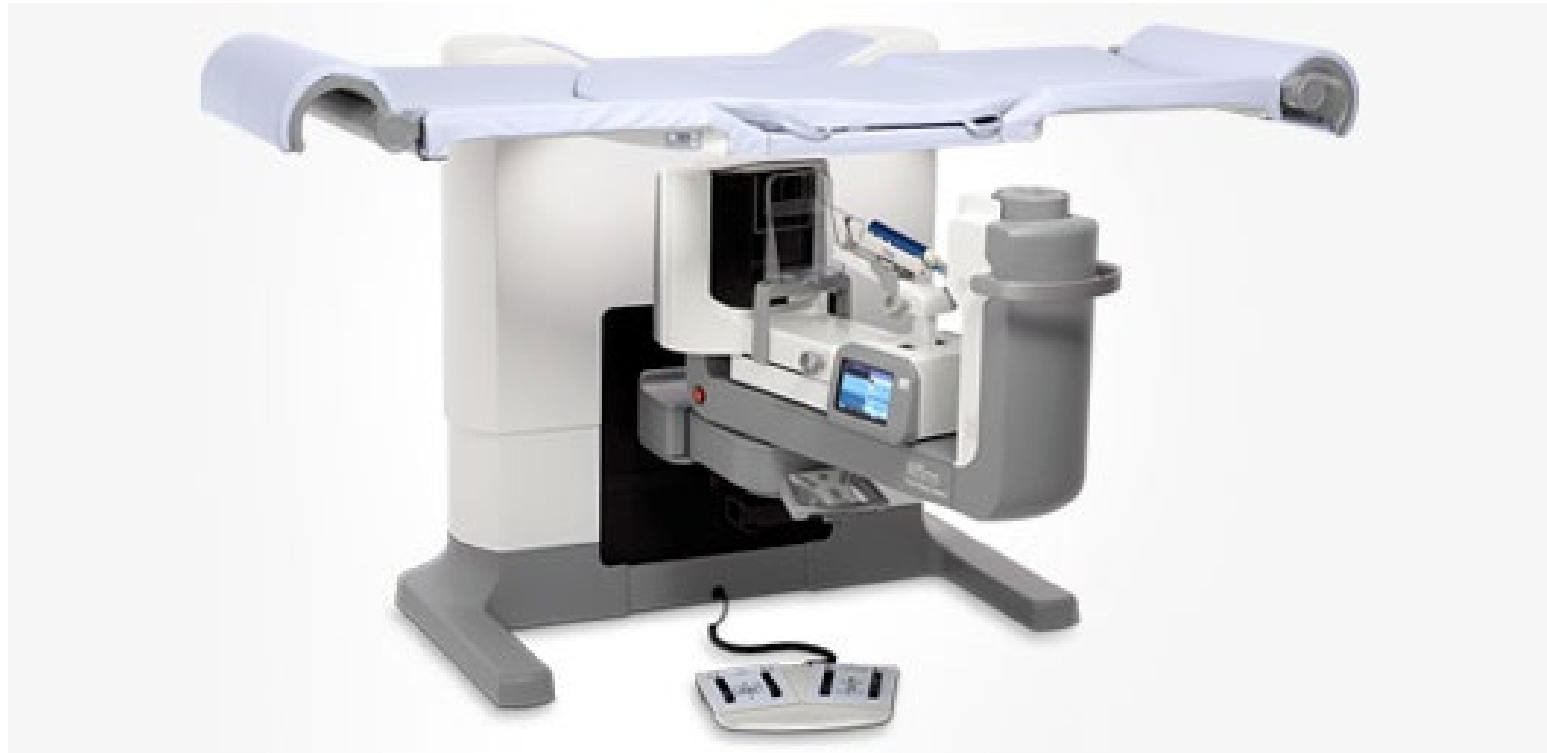
FDA Approval

Affirm upright biopsy
system
(attaches to Dimensions
unit)
7/15/2013



FDA Approval

Affirm prone biopsy system 4/21/2016



FDA Approval

Siemens Mammomat Revelation
3/27/2018



Upright versus Prone Biopsy

Upright advantages

- Add on to machine
- Utilize machine when not doing biopsies
- Helps with space
- Faster than prone
- No weight limit
- Pts who can't maintain prone position
- Wheelchair bound patients

Prone advantages

- No set up
- Patients not susceptible to vaso-vagal reactions
- Patient is not watching procedure
- No decubitus position if there is a lateral/medial or inferior approach

Upright DBT Biopsy

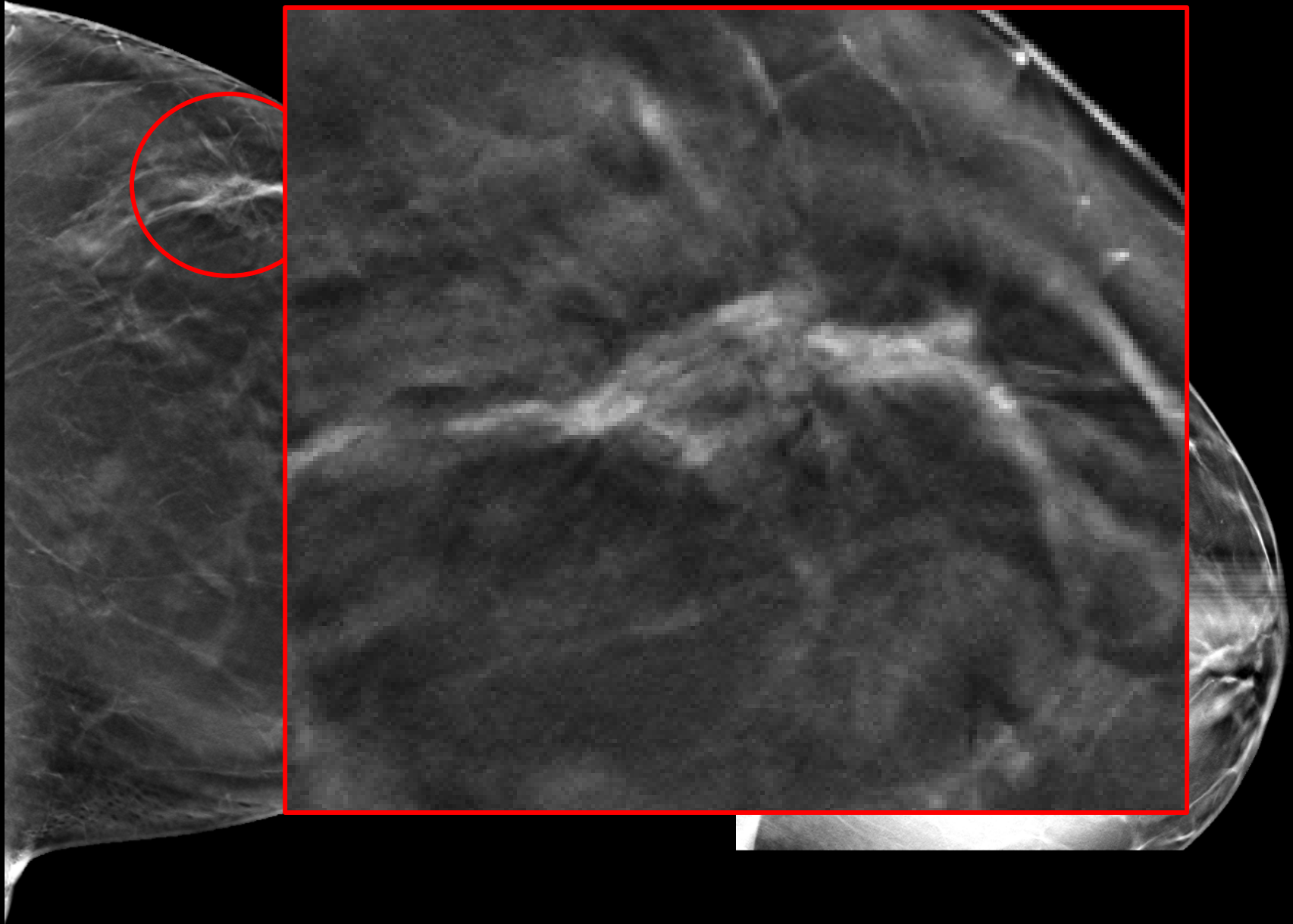


Upright DBT Biopsy



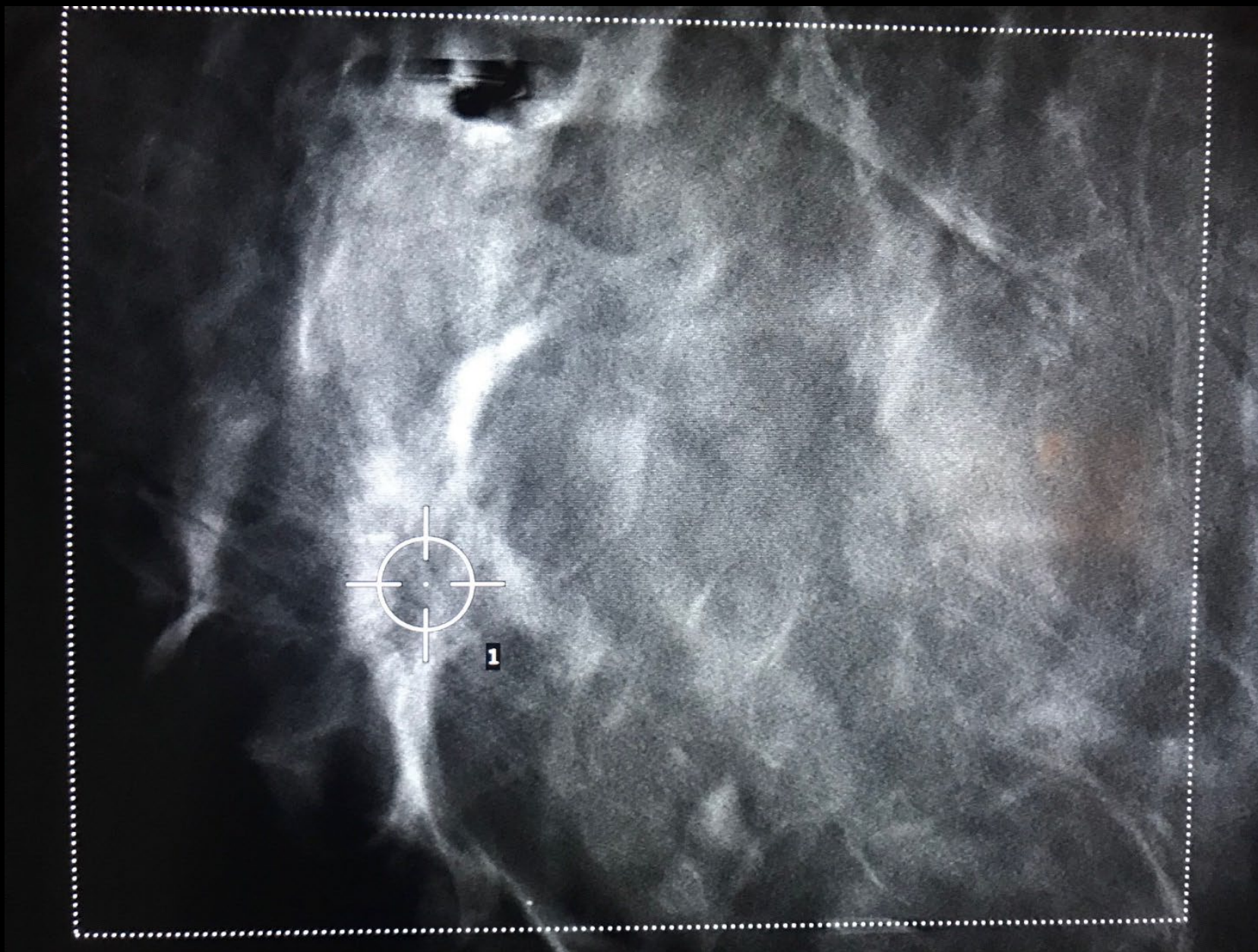
Prone DBT Biopsy





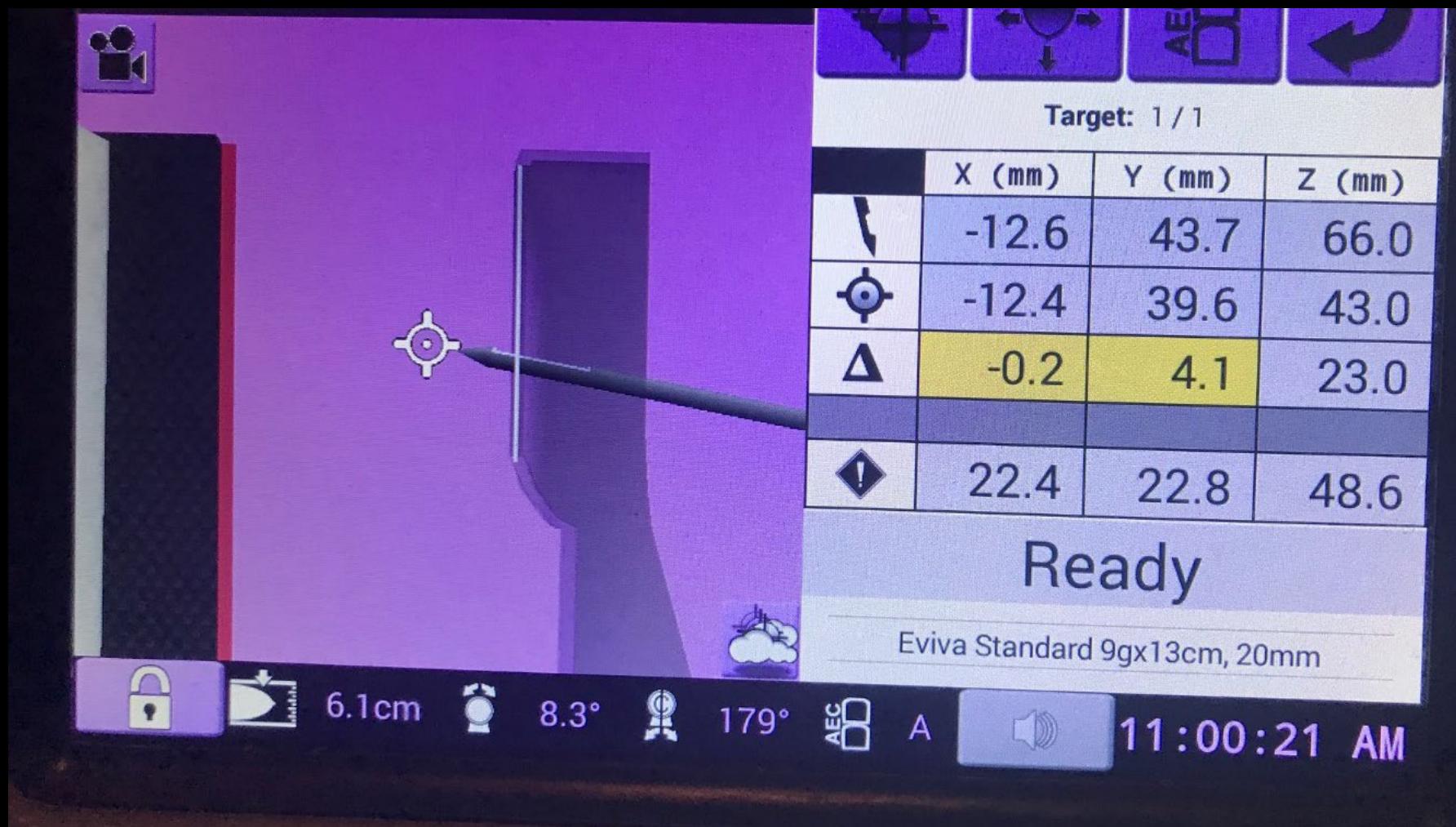
Process- Distortion/Asymmetry

- Position patient as normally would for stereotactic biopsy
- Take DBT sweep



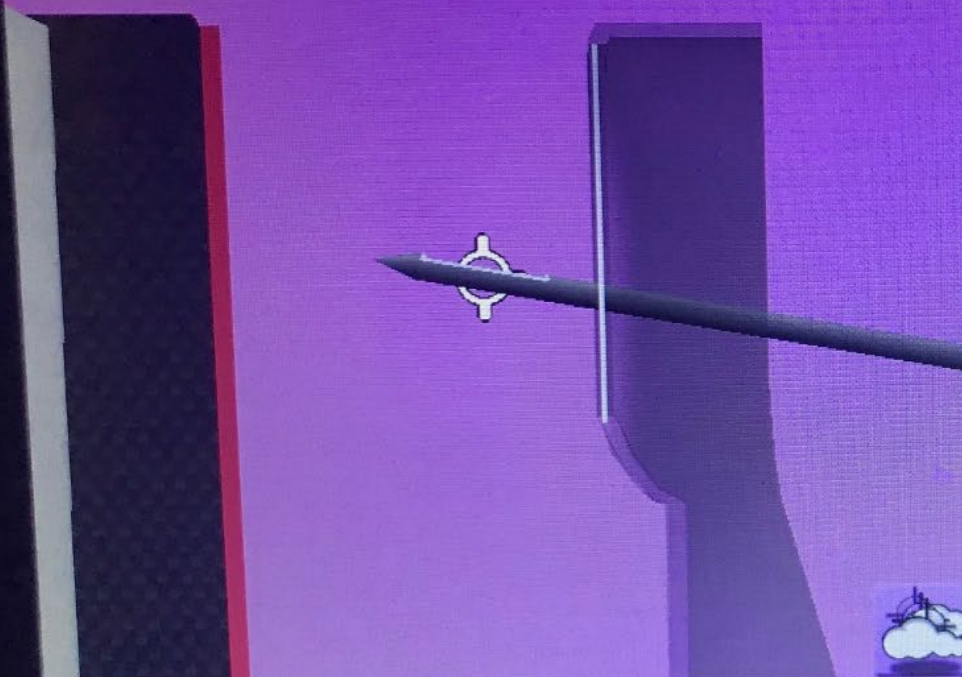
Process- Distortion/Asymmetry

- Position patient as normally would for stereotactic biopsy
- Take DBT sweep
- Confirm location with table



Process- Distortion/Asymmetry

- Position patient as normally would for stereotactic biopsy
- Take DBT sweep
- Confirm location with table
- Local anesthesia (1% lido skin, 1% lido with epi deep)
- Advance needle until table reads 0/green on x, y, z axis



Target: 1 / 1

	X (mm)	Y (mm)	Z (mm)
	-12.4	39.6	43.0
	-12.4	39.6	43.0
	0.0	0.0	0.0
	22.5	22.8	25.6

Ready

Eviva Standard 9gx13cm, 20mm

6.1cm

8.3°

179°

AEC

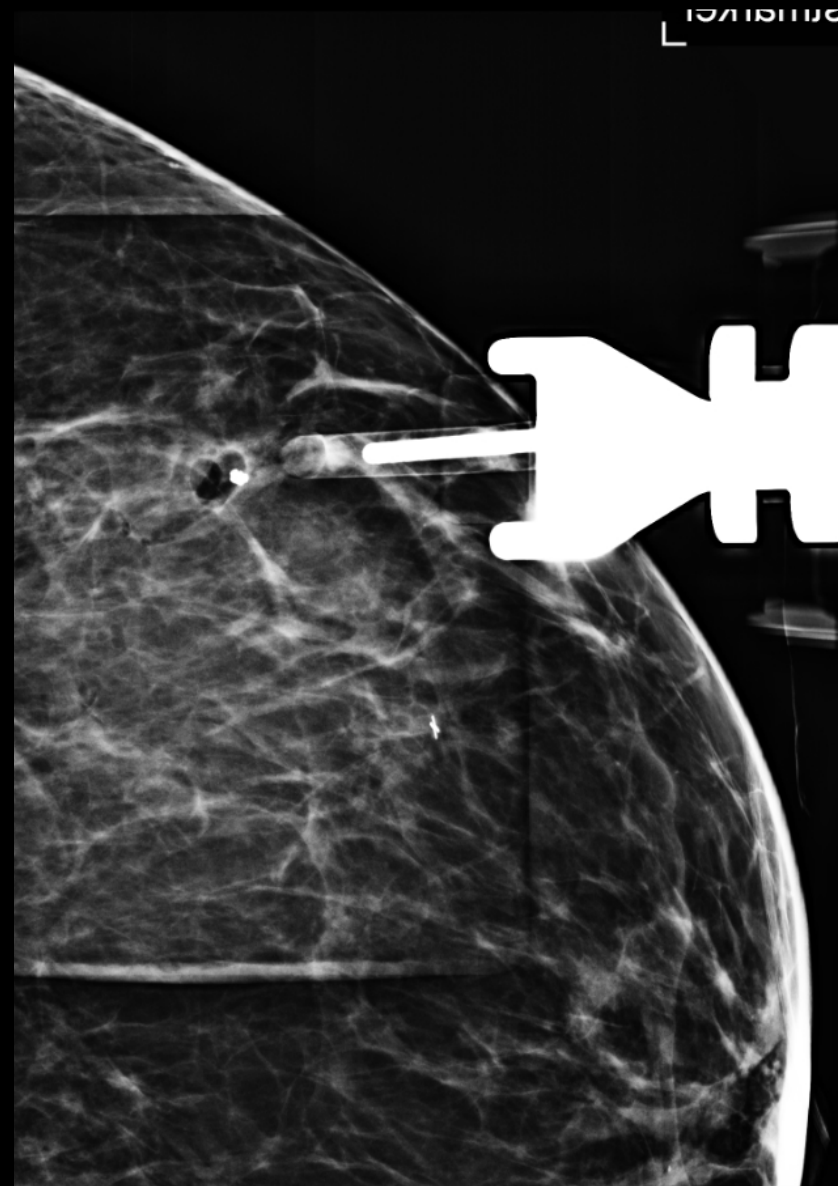
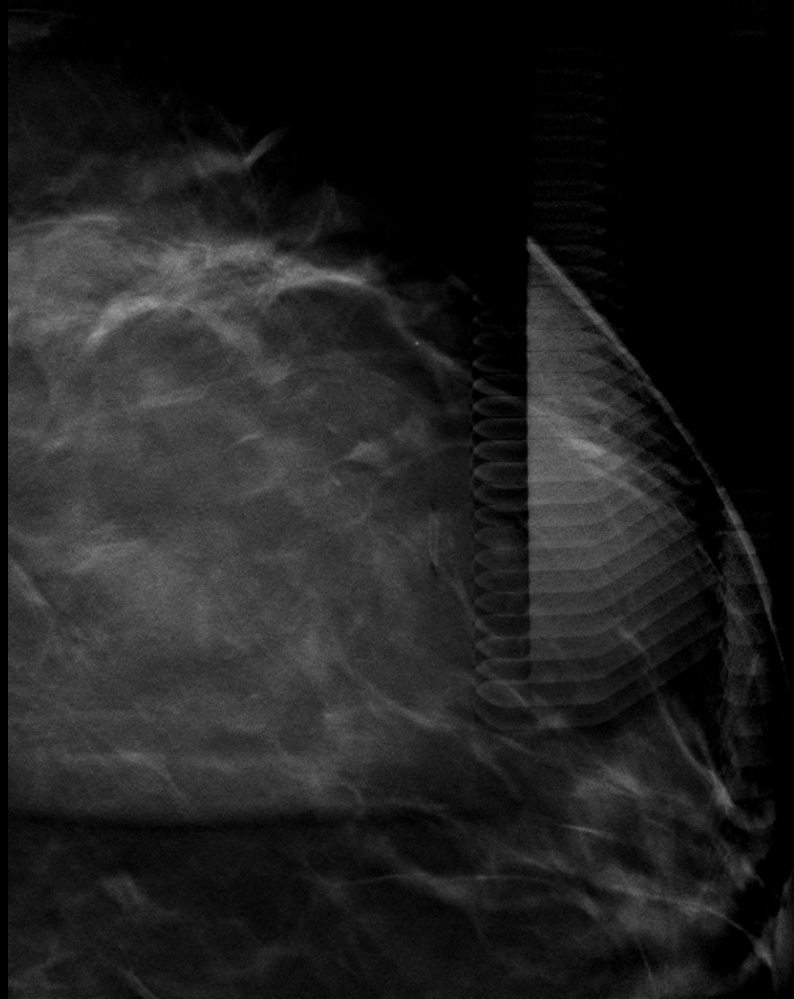
A

11:01:10 AM



Process- Distortion/Asymmetry

- Position patient as normally would for stereotactic biopsy
- Take DBT sweep
- Confirm location with table
- Local anesthesia (1% lido skin, 1% lido with epi deep)
- Advance needle until table reads 0/green on x, y, z axis
- Take DBT sweep (optional)
- Deploy needle (fire)
- Retract/remove needle
- Place clip
- Take single DM image or DBT sweep



Process- Distortion/Asymmetry

- Position patient as normally would for stereotactic biopsy
- Take DBT sweep
- Confirm location with table
- Local anesthesia (1% lido skin, 1% lido with epi deep)
- Advance needle until table reads 0/green on x, y, z axis
- Take DBT sweep (optional)
- Deploy needle (fire)
- Retract/remove needle
- Place clip
- Take single DM image or DBT sweep
- Post biopsy images with DBT

C. Left breast, architectural distortion, outer central, stereotactic core needle biopsy (BI-RADS 4B):

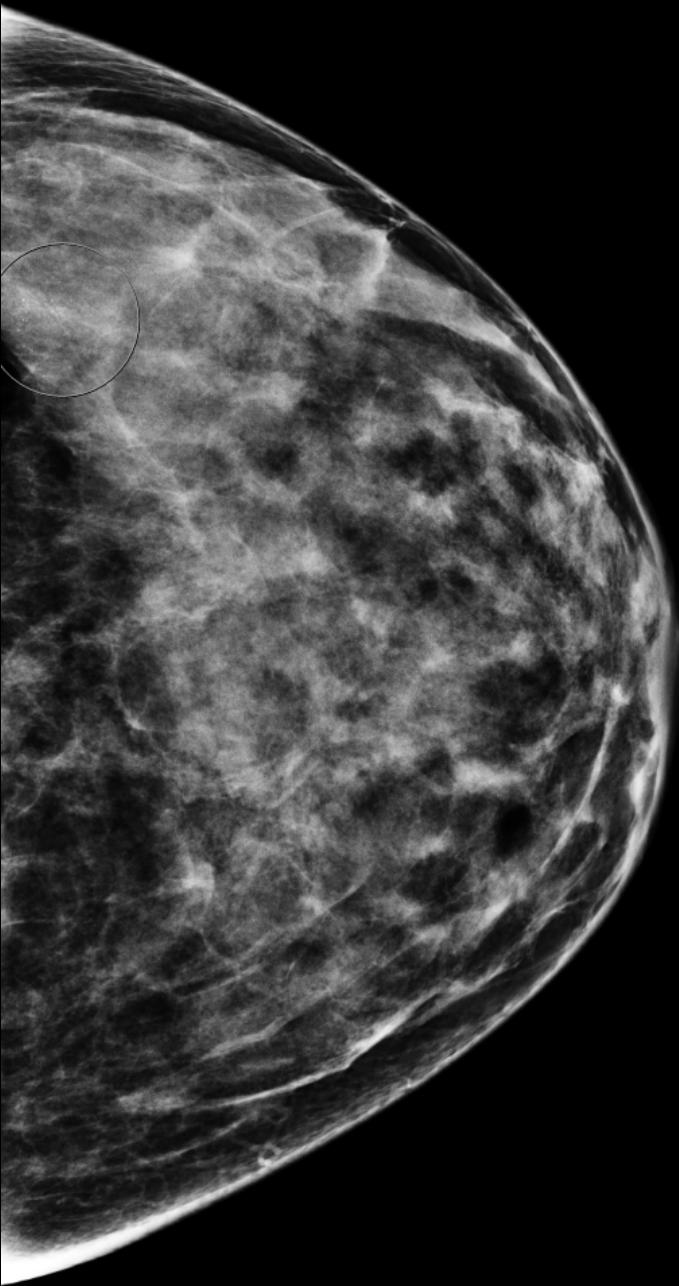
- Invasive ductal carcinoma, grade 1 (1+1+1), see note.
- Atypical ductal hyperplasia (ADH).
- Largest tumor fragment measures 0.5 cm in greatest dimension.
- Microcalcifications are associated with invasive carcinoma.



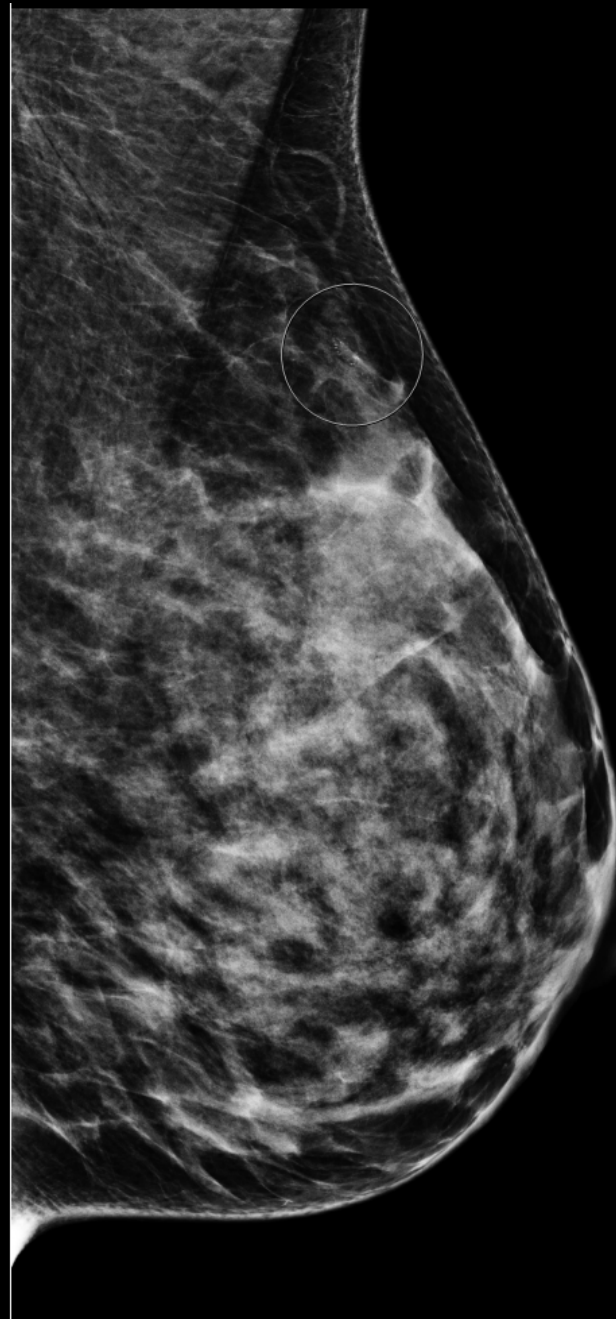
DBT Biopsy of Calcifications

Process- Calcifications

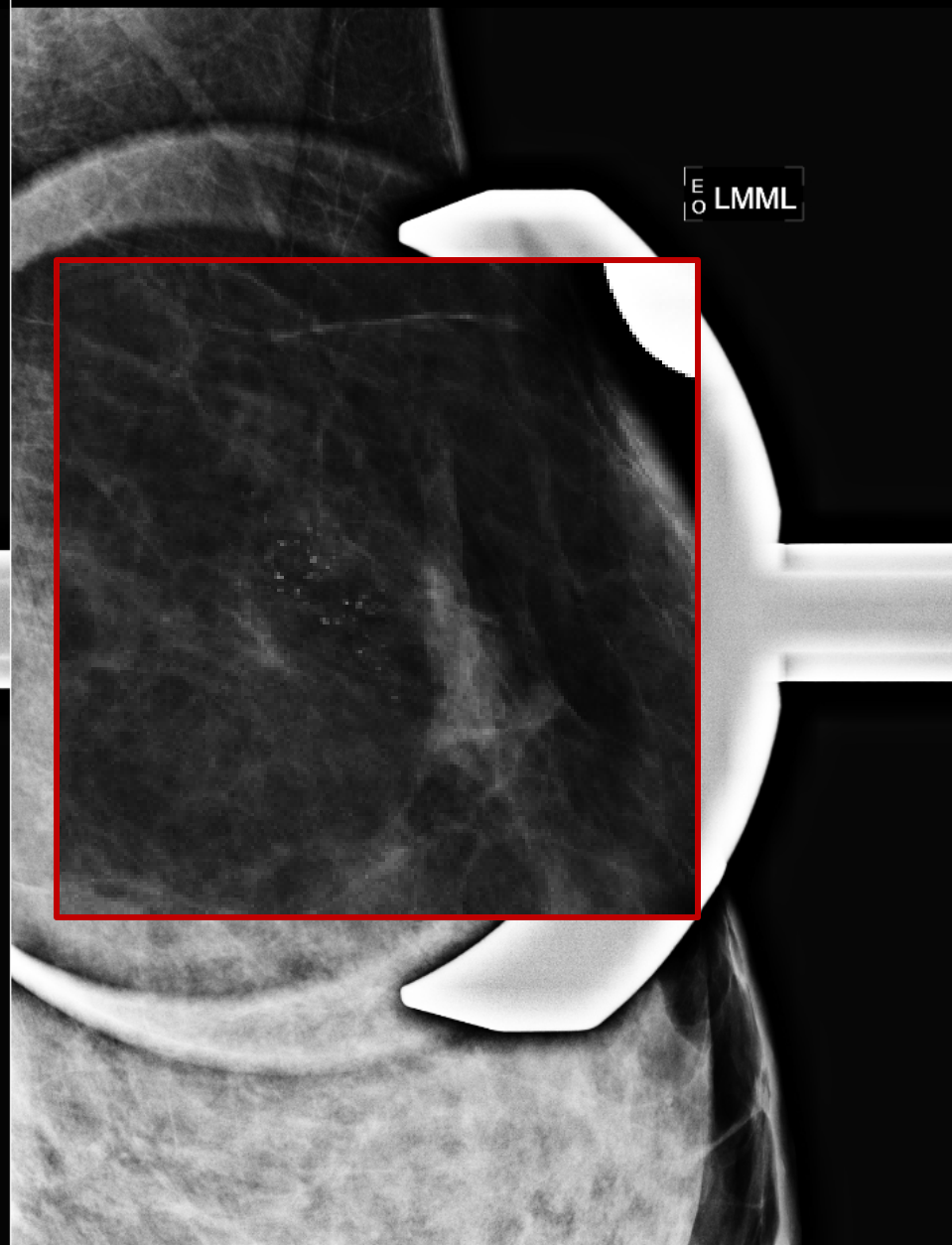
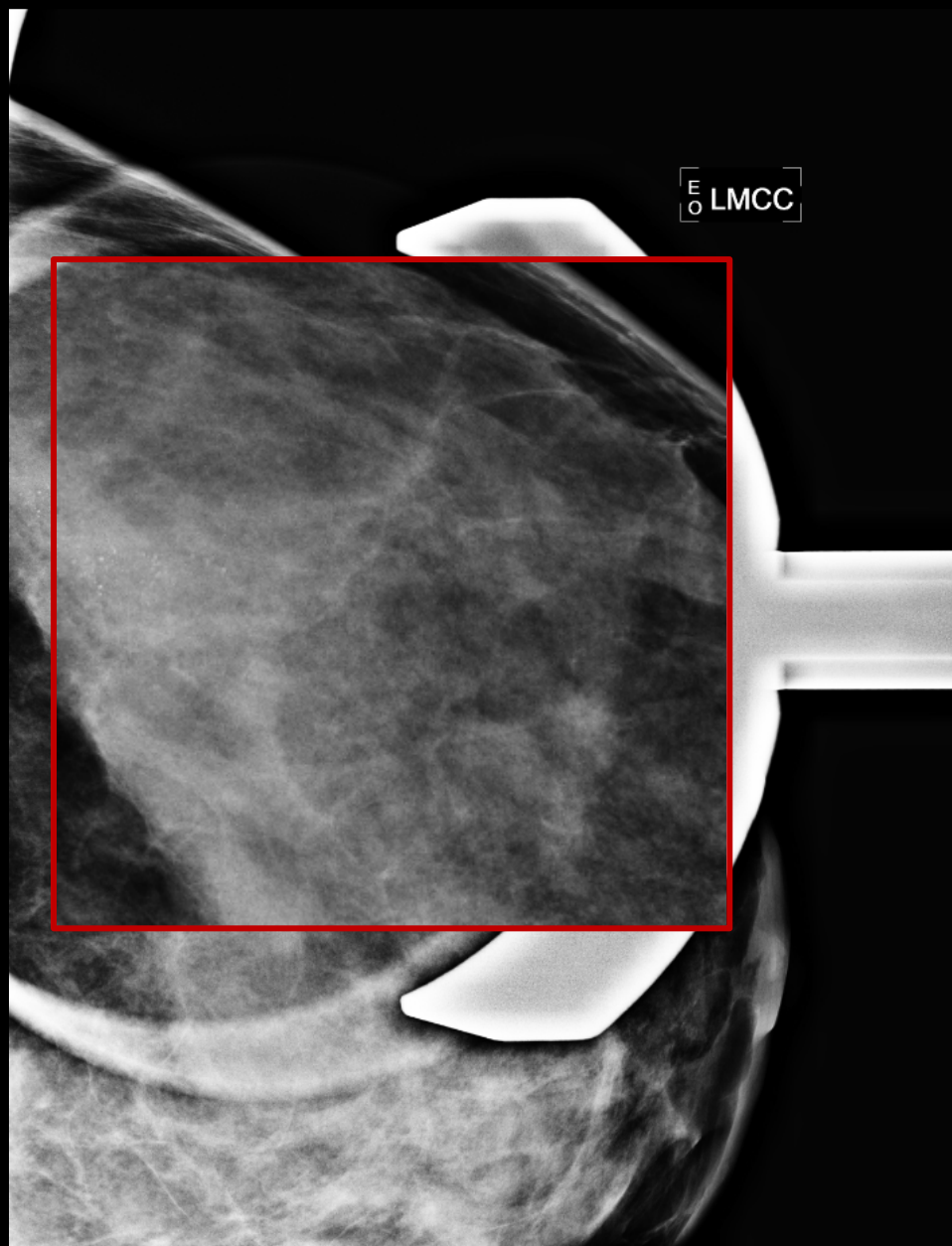
- Position patient as normally would for stereotactic biopsy
- Take DBT sweep
- Confirm location with table
- Local anesthesia (1% lido skin, 1% lido with epi deep)
- **Take DBT sweep post lidocaine**
- Advance needle until table reads 0/green on x, y, z axis
- **Take DBT sweep (optional)**
- Deploy needle (fire)
- **If you want to verify location take stereo pair**
- Retract/remove needle
- Place clip
- Take DBT sweep or one single post
- Post biopsy images

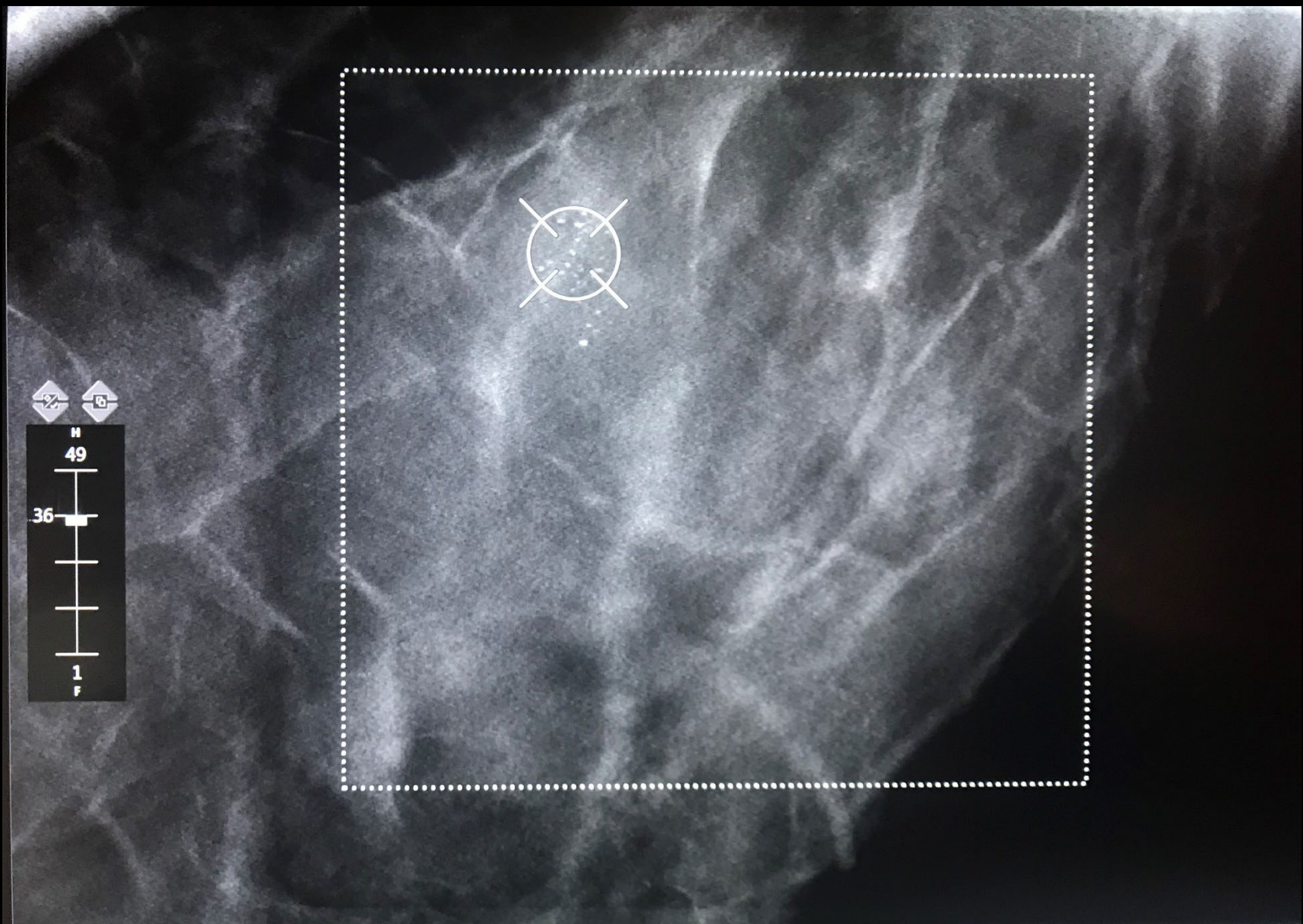


┌_C
└_A LCC┐



┌_C
└_A LMLO┐





Device

Eviva Standard 9gx13cm, 20mm

1

X: -8.1
Y: 19.1
Z: 32.0

-

X: -8.5
Y: 19.2
Z: 35.0

3.0mm

14.6mm

0mm

1.2mm

28.4mm

Multi-Pass

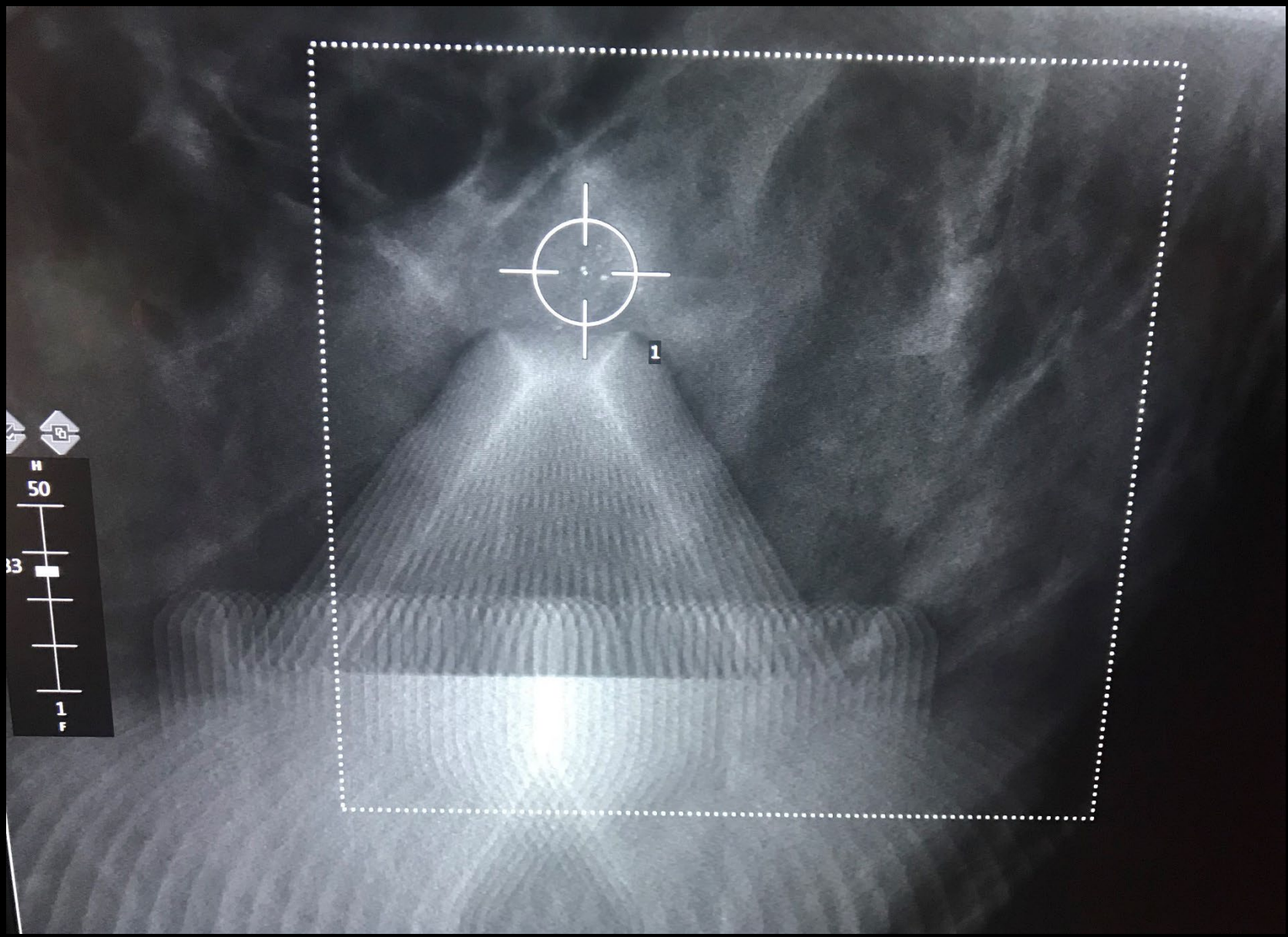
2mm

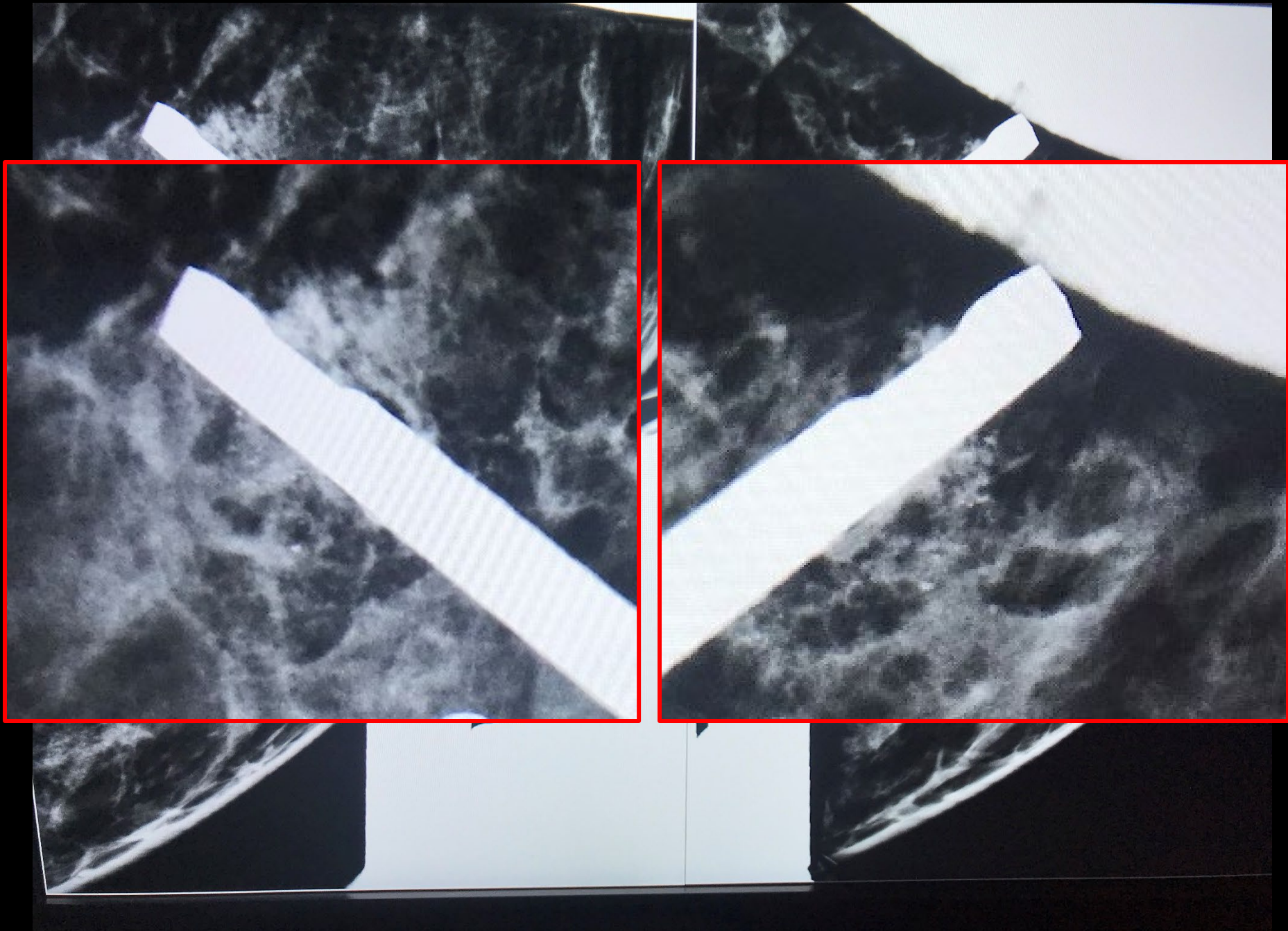
3mm

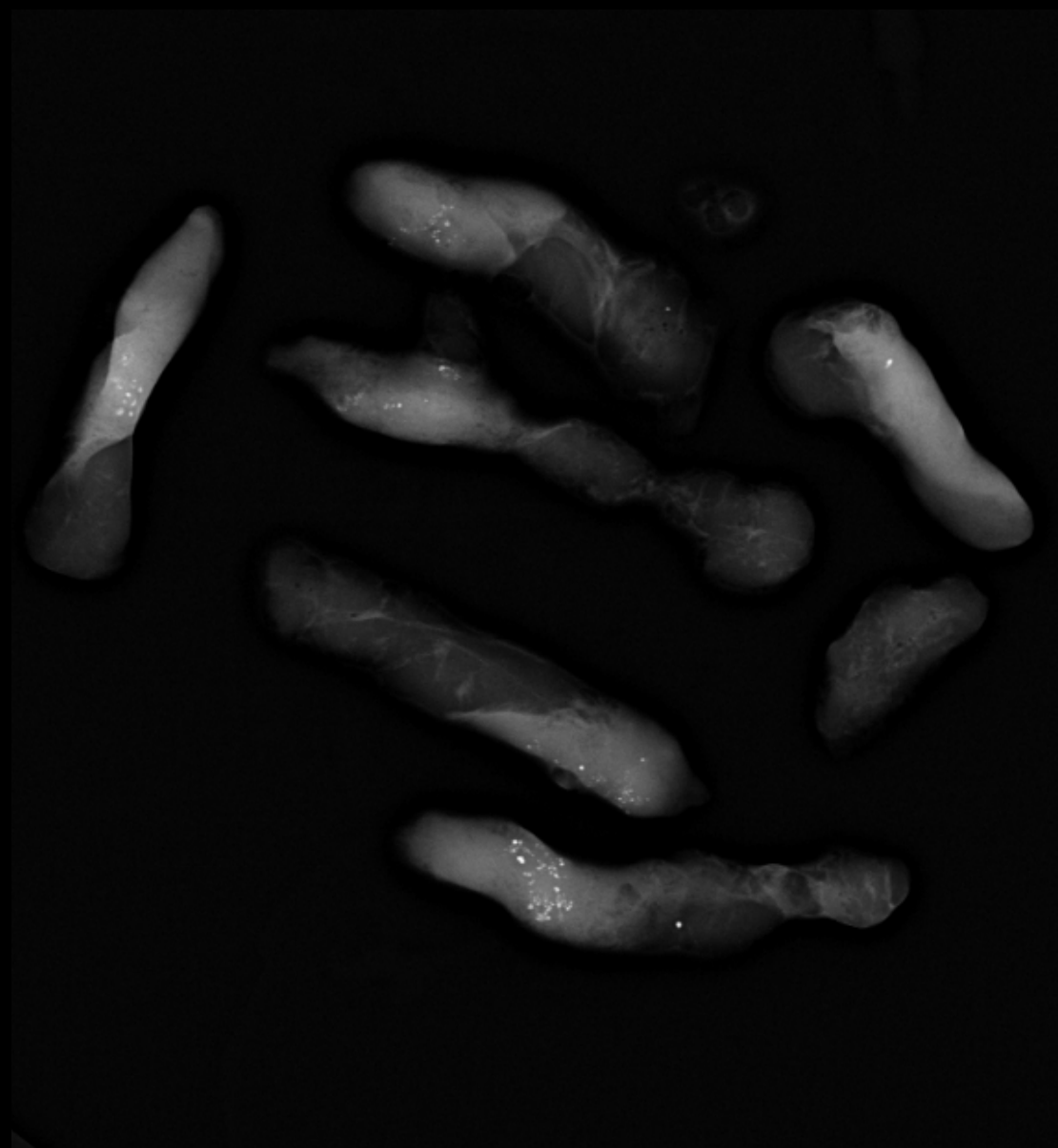
4mm

5mm

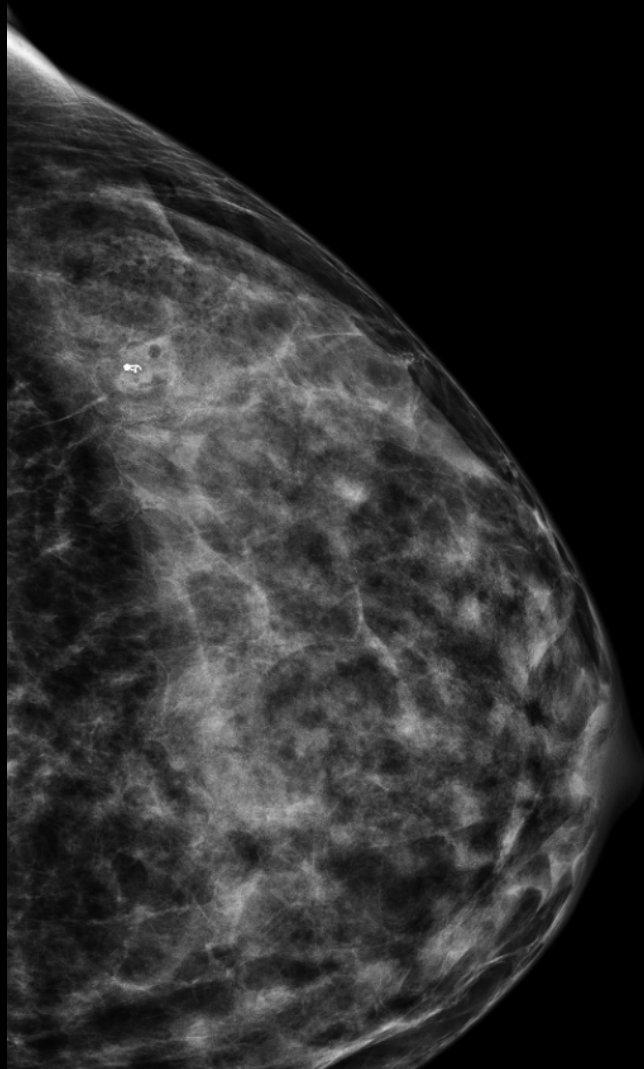
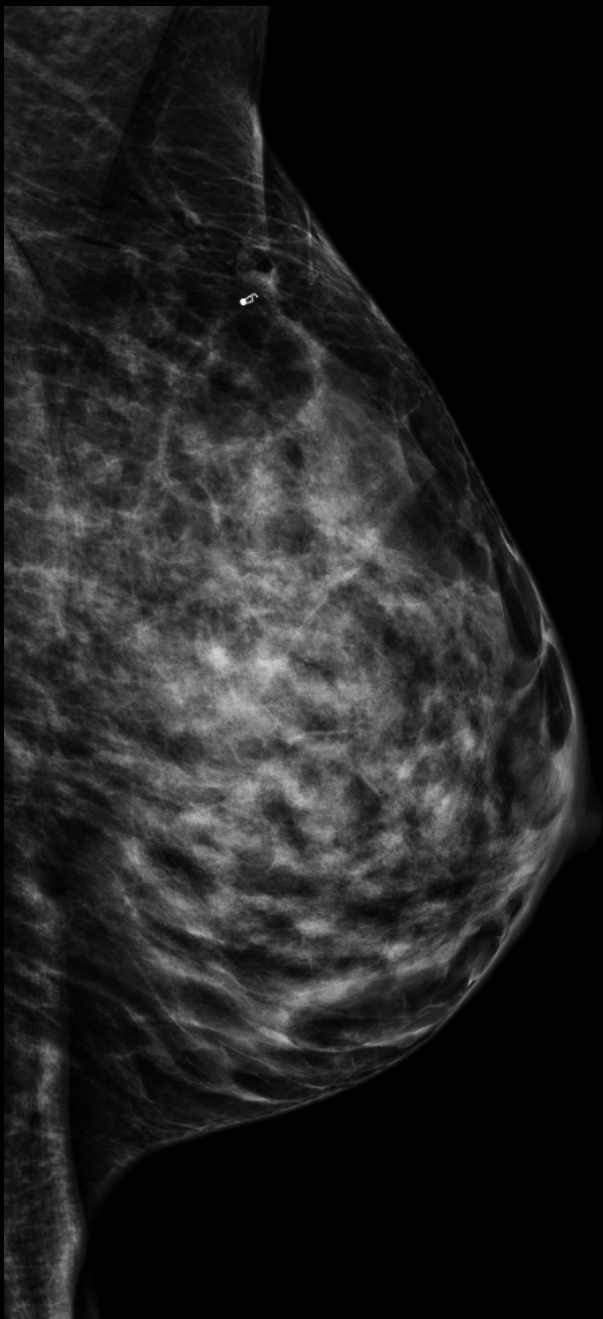
C - N18MG3127857











Final Diagnosis

A. Left breast, upper outer quadrant and posterior, with calcifications, stereotactic core needle biopsy (BI-RADS 4B):

- Breast tissue with pseudoangiomatous stromal hyperplasia (PASH), columnar cell change, microcysts, and numerous microcalcifications.

B. Left breast, upper outer quadrant and posterior, without calcifications, stereotactic core needle biopsy (BI-RADS 4B):

- Benign fibroadipose tissue.



Literature



Initial Experience of Tomosynthesis-Guided Vacuum-Assisted Biopsies of Tomosynthesis-Detected (2D Mammography and Ultrasound Occult) Architectural Distortions

Bhavika K. Patel¹
Matthew Covington¹
Victor J. Pizzitola¹
Roxanne Lorans¹
Marina Giurescu¹
William Eversman¹
John Lewin²

OBJECTIVE. As experience and aptitude in digital breast tomosynthesis (DBT) have increased, radiologists are seeing more areas of architectural distortion (AD) on DBT images compared with standard 2D mammograms. The purpose of this study is to report our experience using tomosynthesis-guided vacuum-assisted biopsies (VABs) for ADs that were occult at 2D mammography and ultrasound and to analyze the positive predictive value for malignancy.

MATERIALS AND METHODS. We performed a retrospective review of 34 DBT-detected ADs that were occult at mammography and ultrasound.

RESULTS. We found a positive predictive value of 26% (nine malignancies in 34 lesions). Eight of the malignancies were invasive and one was ductal carcinoma in situ. The invasive cancers were grade 1 (4/8; 50%), grade 2 (2/8; 25%), or grade 3 (1/8; 13%); information about one invasive cancer was not available. The mean size of the invasive cancers at pathologic examination was 7.5 mm (range, 6–30 mm).

CONCLUSION. Tomosynthesis-guided VAB is a feasible method to sample ADs that are occult at 2D mammography and ultrasound. Tomosynthesis-guided VAB is a minimally invasive method that detected a significant number of carcinomas, most of which were grade 1 cancers. Further studies are needed.

- Retrospective review Sept 2014- May 2017
- All cases DBT bx that were DM and US occult
- 32/34 patients underwent DBT VAB
 - 2 were not visible at the time of bx
- Upright DBT

Initial Experience of Tomosynthesis-Guided Vacuum-Assisted Biopsies of Tomosynthesis-Detected (2D Mammography and Ultrasound Occult) Architectural Distortions

TABLE 1: Pathologic Findings of Tomosynthesis-Guided Vacuum-Assisted Biopsy

Pathologic Finding	No. (%) of Lesions (<i>n</i> = 34)
Malignant lesion	9 (27)
Invasive	8 (24)
Invasive ductal carcinoma	5 (15)
Invasive lobular carcinoma	3 (9)
Ductal carcinoma in situ	1 (3)
High-risk lesion ^a	4 (12)
Benign, no high-risk lesion	21 (62)
Radial scar	16 (47)
Sclerosing adenosis	4 (12)
Prior surgical site	1 (3)

^aHigh-risk lesions include atypical lobular hyperplasia, flat epithelial atypia, and lobular carcinoma in situ.

- Malignancy in 26% 9/34 (8 invasive, 1 DCIS)
- Of the 8 invasive CA
- 4 were Gr 1
- 2 were Gr 2
- 1 was Gr 3
- 1 was unknown
- 7/8 had no lymph node involvement
- 1/8 (ILC) had isolated tumor cells

Initial Experience of Tomosynthesis-Guided Vacuum-Assisted Biopsies of Tomosynthesis-Detected (2D Mammography and Ultrasound Occult) Architectural Distortions

TABLE 1: Pathologic Findings of Tomosynthesis-Guided Vacuum-Assisted Biopsy

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Sclerosing adenosis	4 (12)
Prior surgical site	1 (3)

^aHigh-risk lesions include atypical lobular hyperplasia, flat epithelial atypia, and lobular carcinoma in situ.

- 25 benign lesions
- 16/25 (64%) radial scars
- 4/25 had associated high risk lesions
LCIS/FEA/ALH
- Thus 80% of benign lesions (20/25) went on to surgery

1/32 patients had a vasovagal reaction

DBT Guided Biopsies

Study	Date	# of Cases	Lesion type	PPV3
Viala	2013	118 lesions	All (some seen on DM)	42%
Waldherr	2016	13/24 lesions	AD only	54% invasive ca
Patel	2018	8/32 lesions	AD only	26%

Digital Mammography Stereotactic Biopsy Versus Digital Breast Tomosynthesis- guided Biopsy

- 1313 women (1405 biopsies)
- DM stereo 2013 to 2015 (643 DM)
- DBT bx 2015 to 2017 (762 DBT)
- Retrospective review
- Calcifications were most common target
 - 89.9% DM
 - 71.1% DBT
- Architectural distortion
 - 2.0% DM
 - 17.7% DBT

Digital Mammography Stereotactic Biopsy Versus Digital Breast Tomosynthesis- guided Biopsy

- DBT and DM stereo resulted in a similar rate of malignancy
 - 27.8% DM
 - 24.8% DBT
- DBT resulted in more biopsies for architectural distortion
- DBT bx resulted in more discordant path rates
 - 4.5% DM
 - 1.4% DBT
- Overall more radial-sclerosing lesions biopsied with DBT
- Upgrade rates for Radial Sclerosing Lesions:
 - Douglas-Jones et al -281 core biopsies= 3.9% (11/281) upgrade to malign
 - Chou et al -122 biopsies= 1.6% (2/122) upgrade to malign
 - Kalife et al- 100 biopsies= 0% (0/100)
 - Phantana-Angkool- 223 biopsies= 6% before and 3% after DBT

Considerations

- Angle of the needle

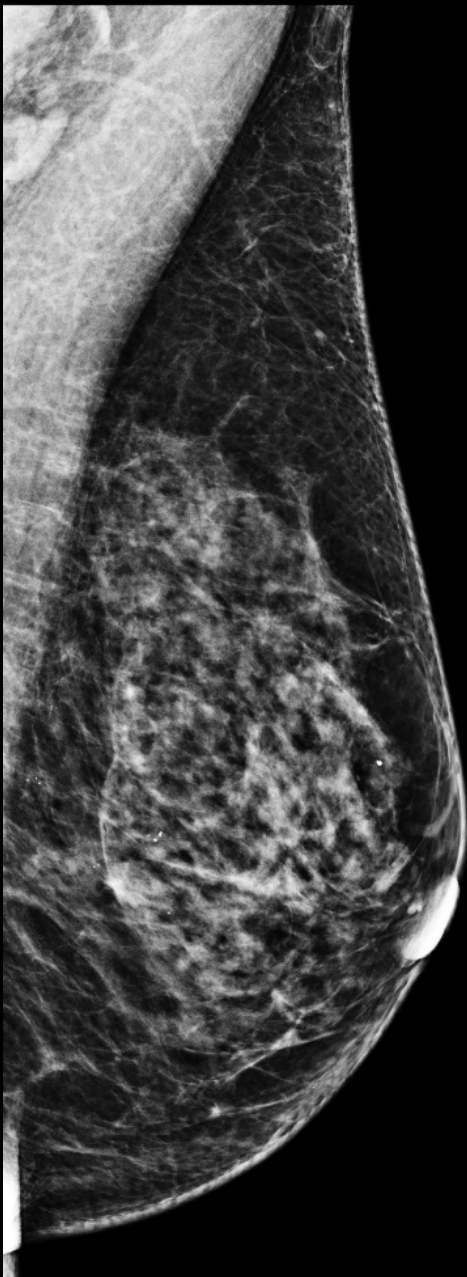


Considerations

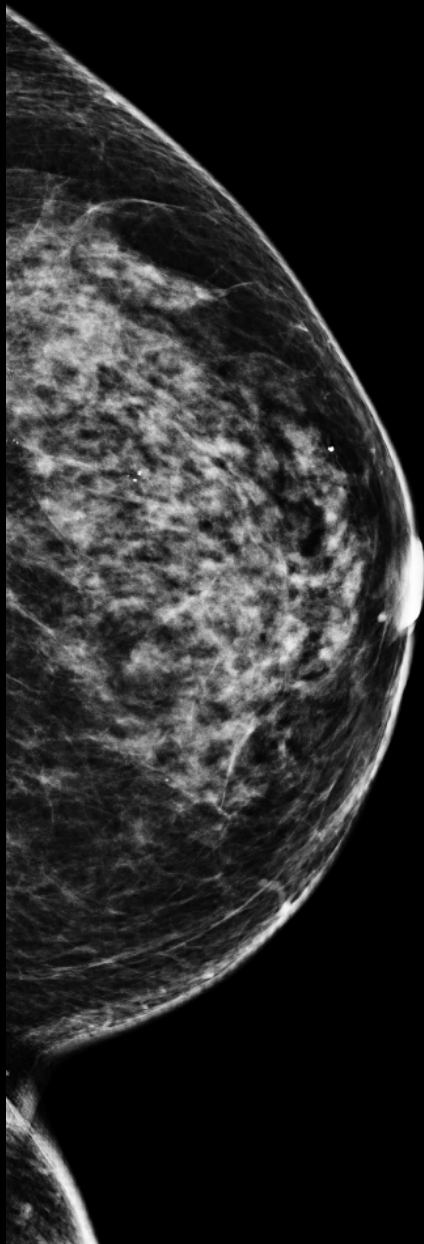
- Can be challenging to determine if you sampled properly
- Biopsy clip can be displaced in x, y and z axis
- Easier for calcifications, but challenging for distortion
- Post fire image should be a stereo pair
- Needle will obscure the images

Considerations

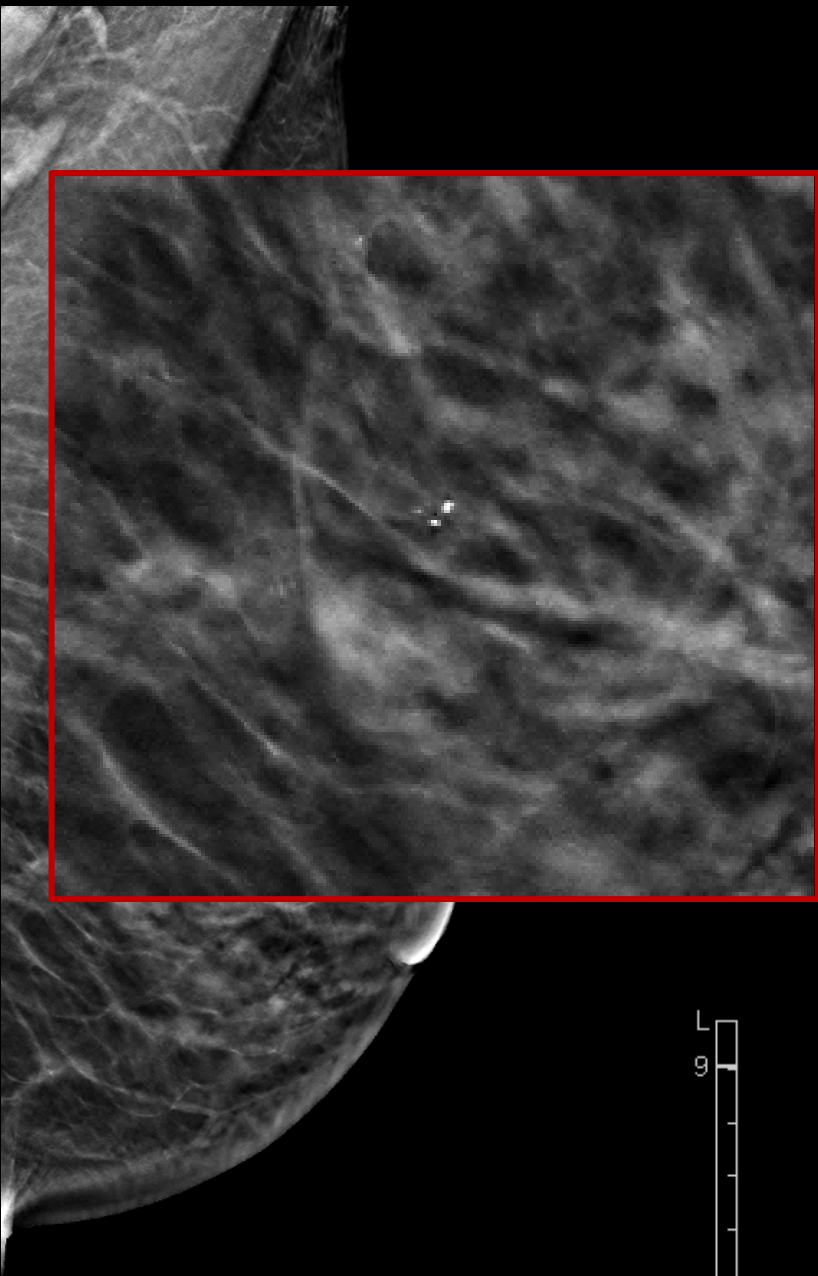
- Skin Calcifications
 - Should be detected at the time of the diagnostic examination
 - Can be verified at the time of the examination



LMLO



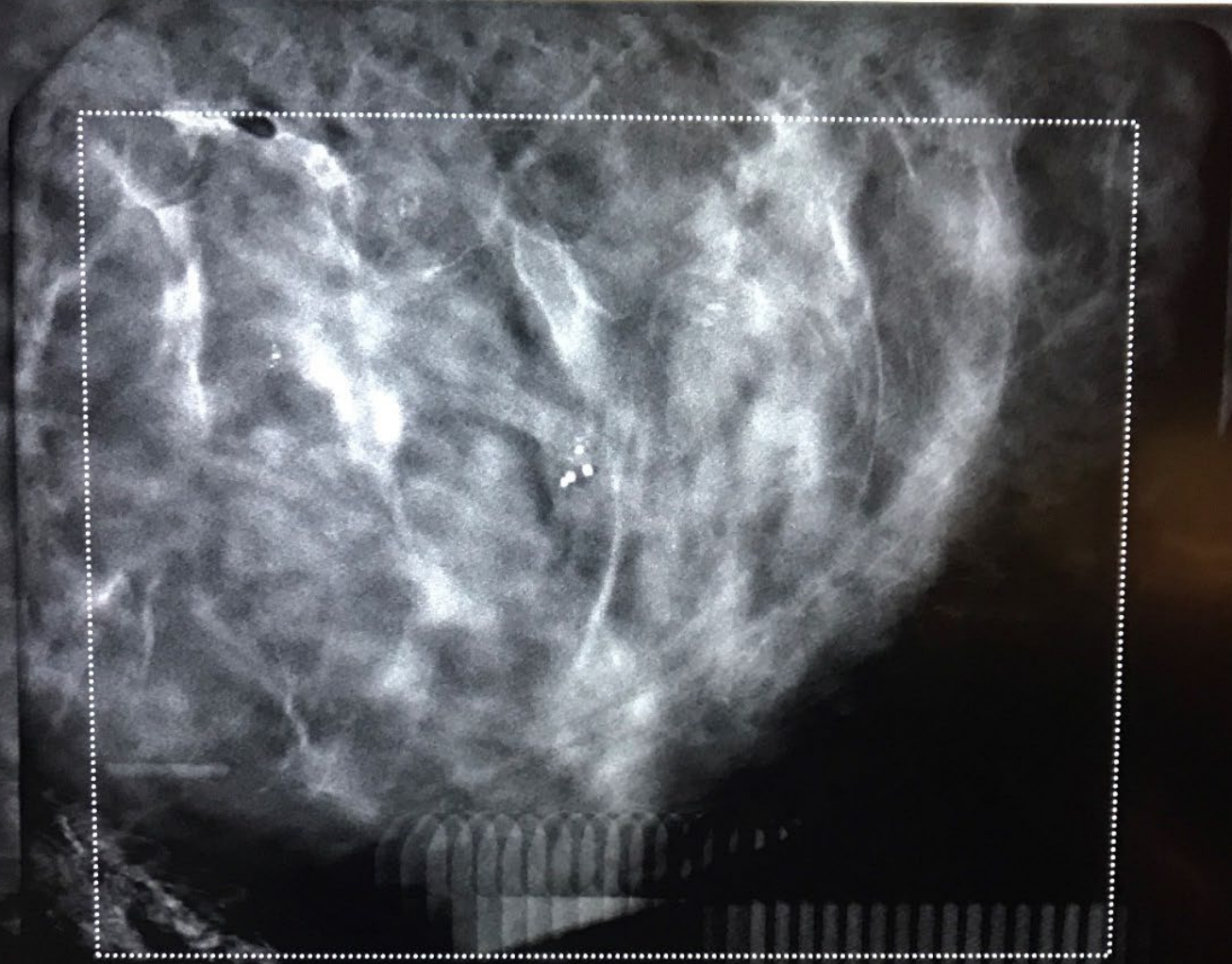
LCC

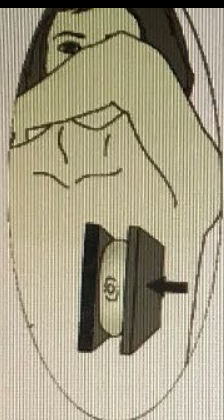


L
9
M



R
7
H





LLM Tomo Scout



Change Status

Accept

Reject

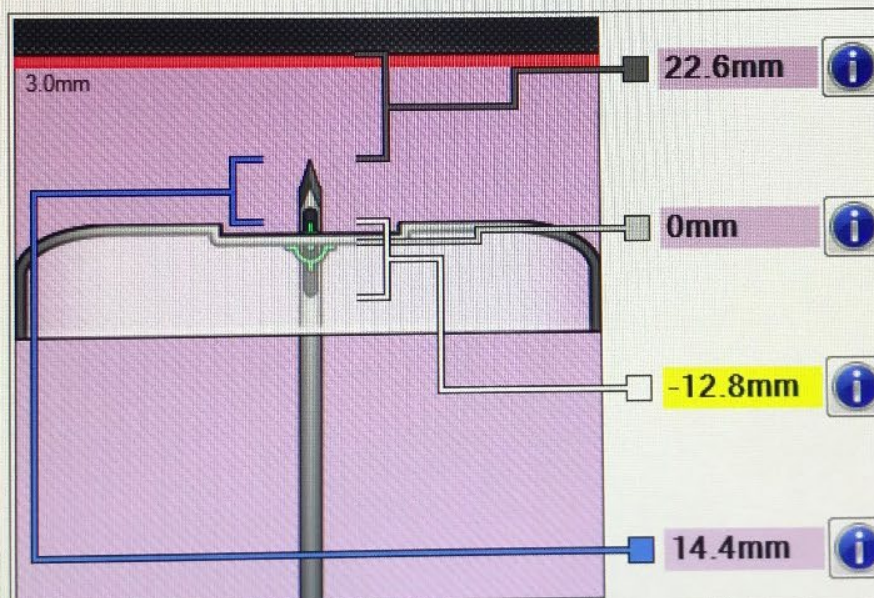
Standby

Paddle	6x7 STD
Thickness	3.7 cm
Biopsy Arm	0°
Stereo Mode	Auto

Device

Eviva Standard 9gx13cm, 20mm

1
X: -2.0
Y: 32.0
Z: 40.0



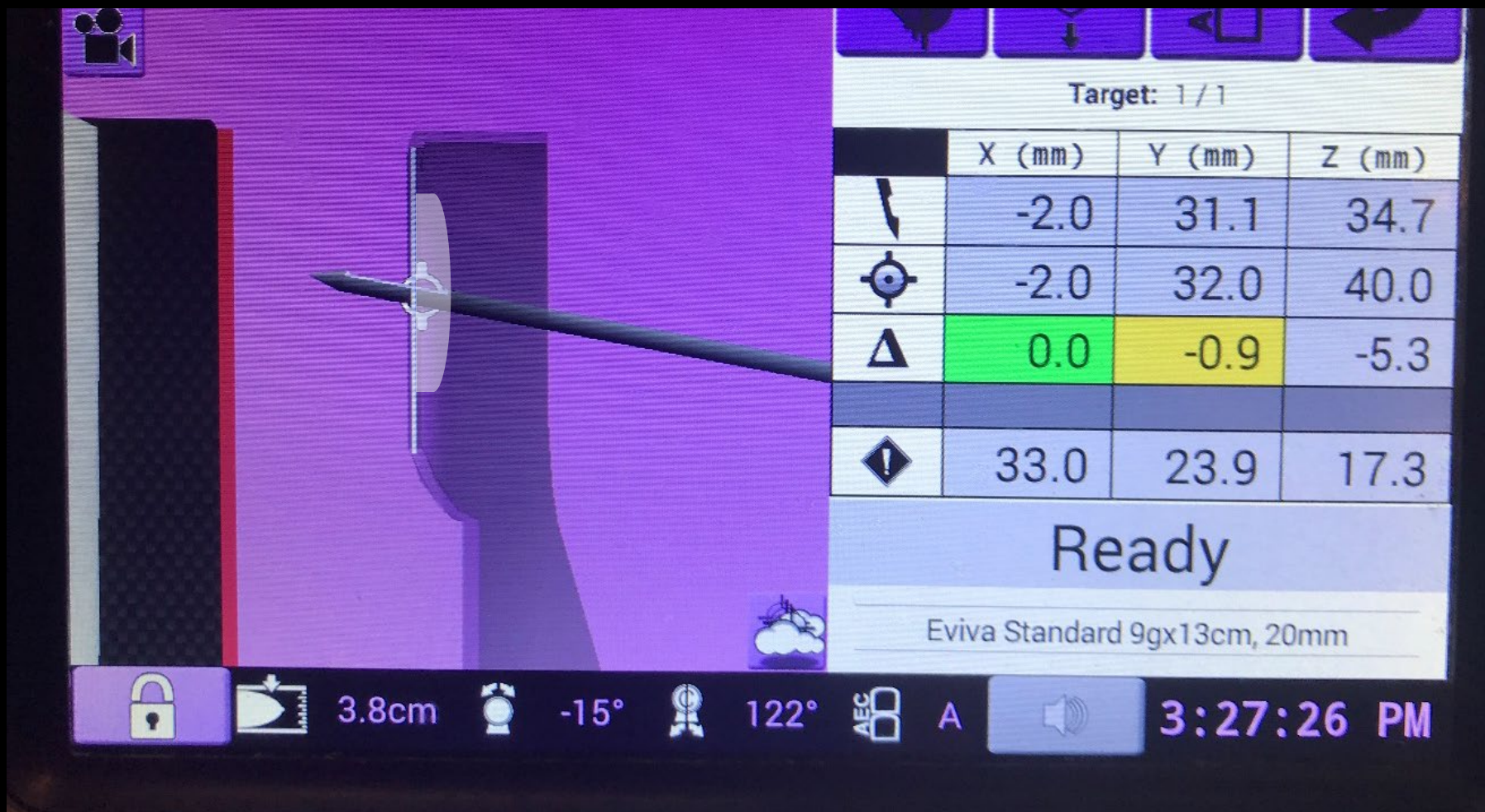
Multi-Pass

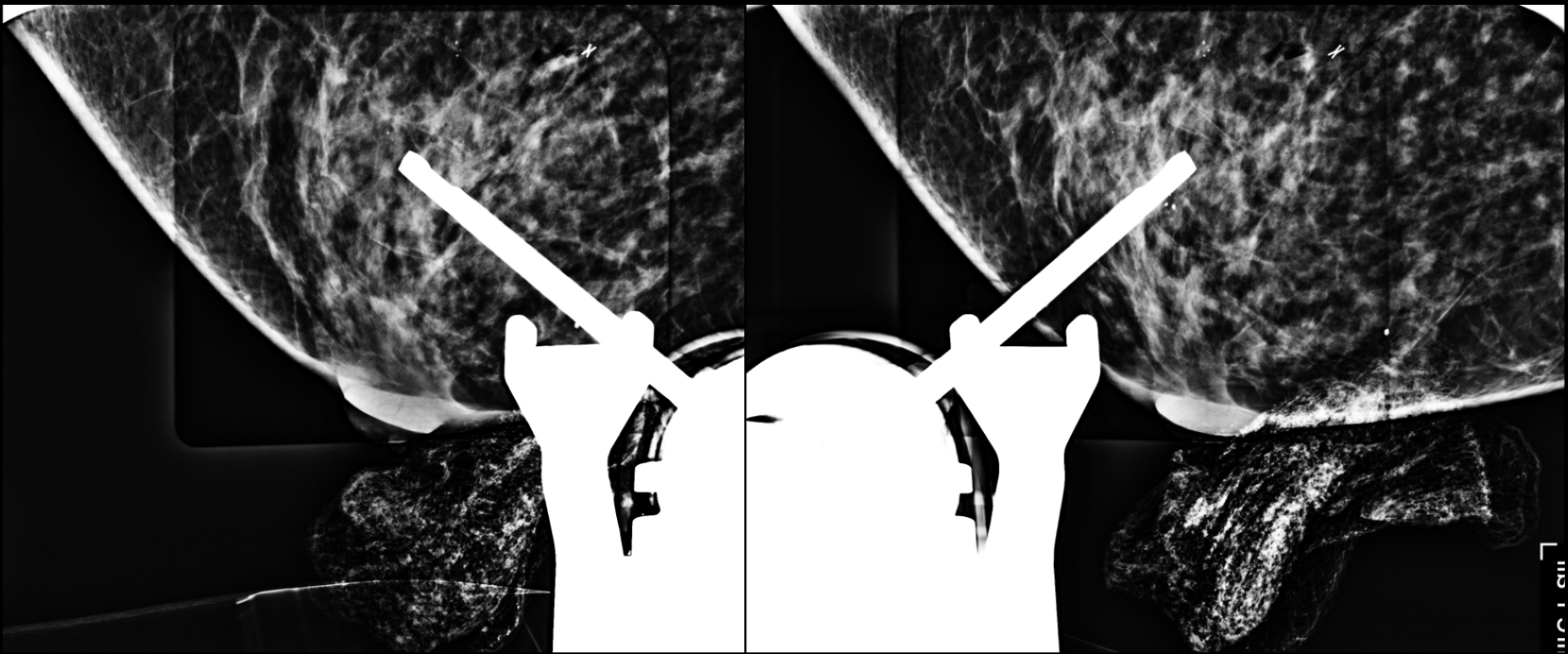


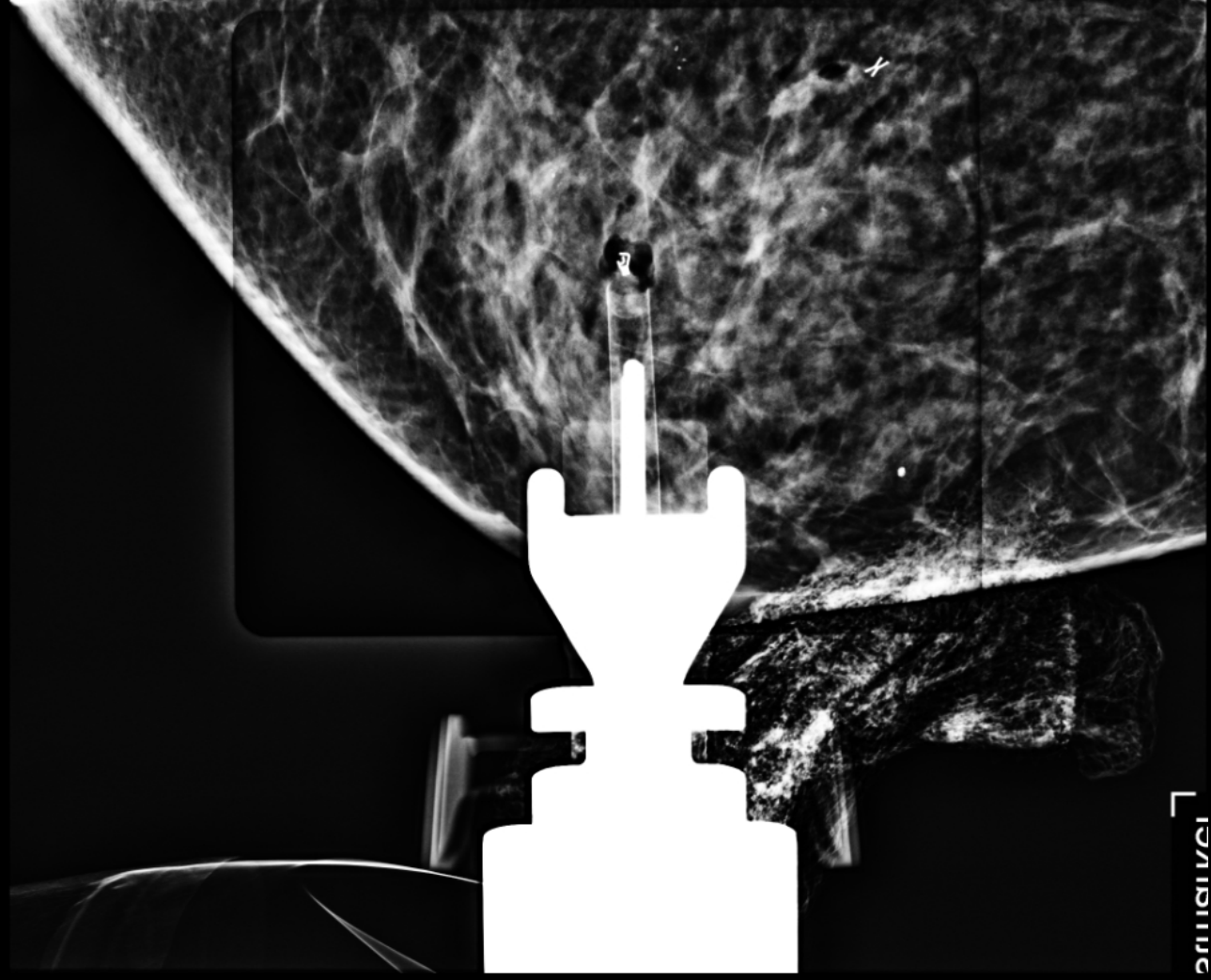
2mm	3mm
4mm	5mm



Skin Calcifications?







ORIGINAL



C. Left breast, upper outer quadrant, anterior depth, with calcifications, stereotactic core needle biopsy (BI-RADS 4B):

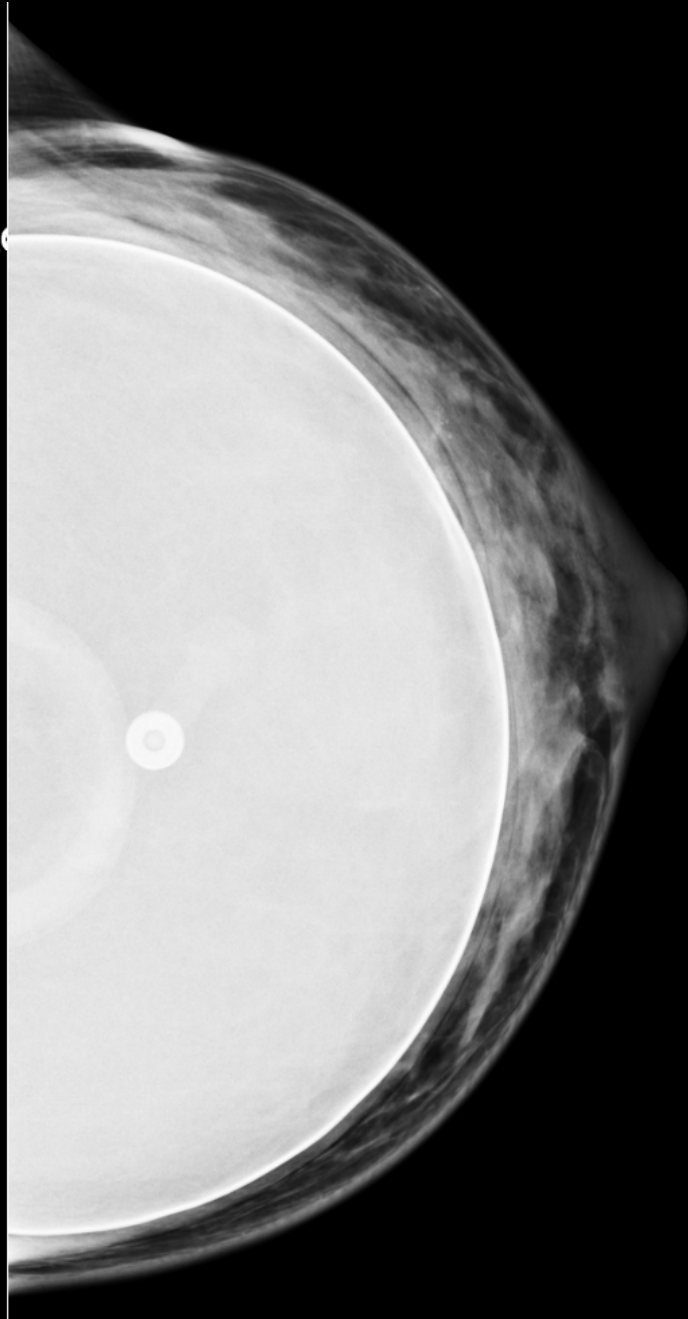
- Invasive lobular carcinoma, grade 2 (3+2+1), with histiocytoid and pleomorphic features, see note.
- Lobular carcinoma in situ (LCIS), pleomorphic and classic types, with necrosis, see note.
- Largest tumor fragment measures 0.5 cm in greatest dimension.
- Microcalcifications are associated with pleomorphic LCIS.

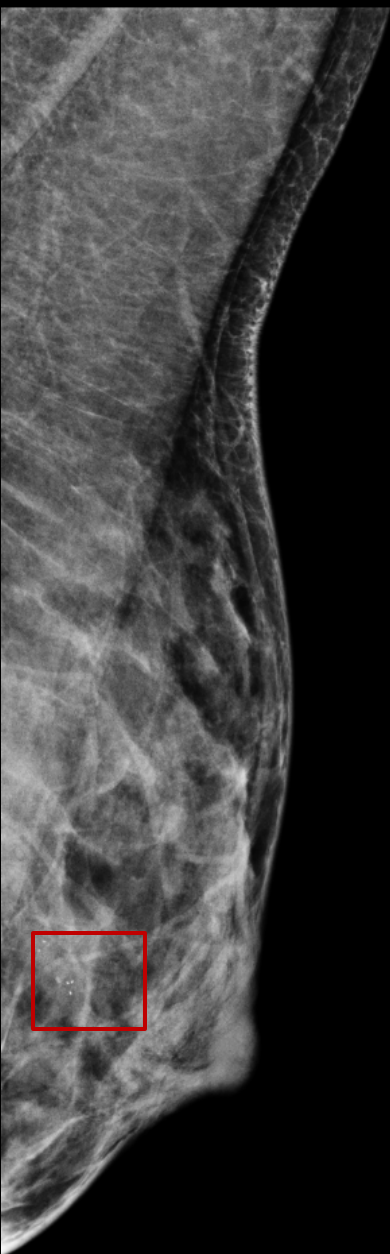
Lateral biopsy

- Used for patients when the compression thickness is less than 20mm
- Can easily change the approach without repositioning the patient
- Sometimes difficult to enter the skin so use a scalpel

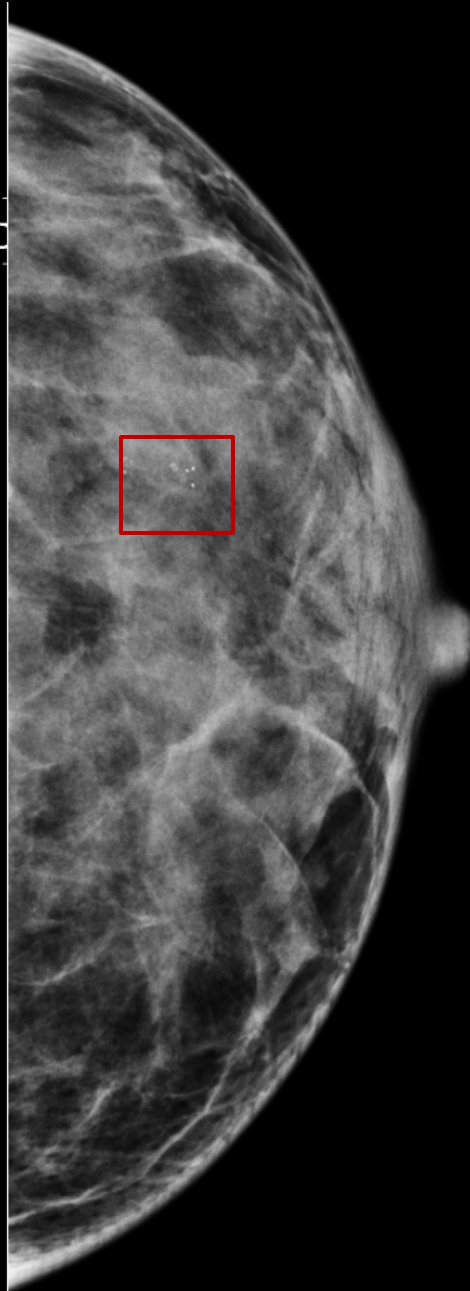


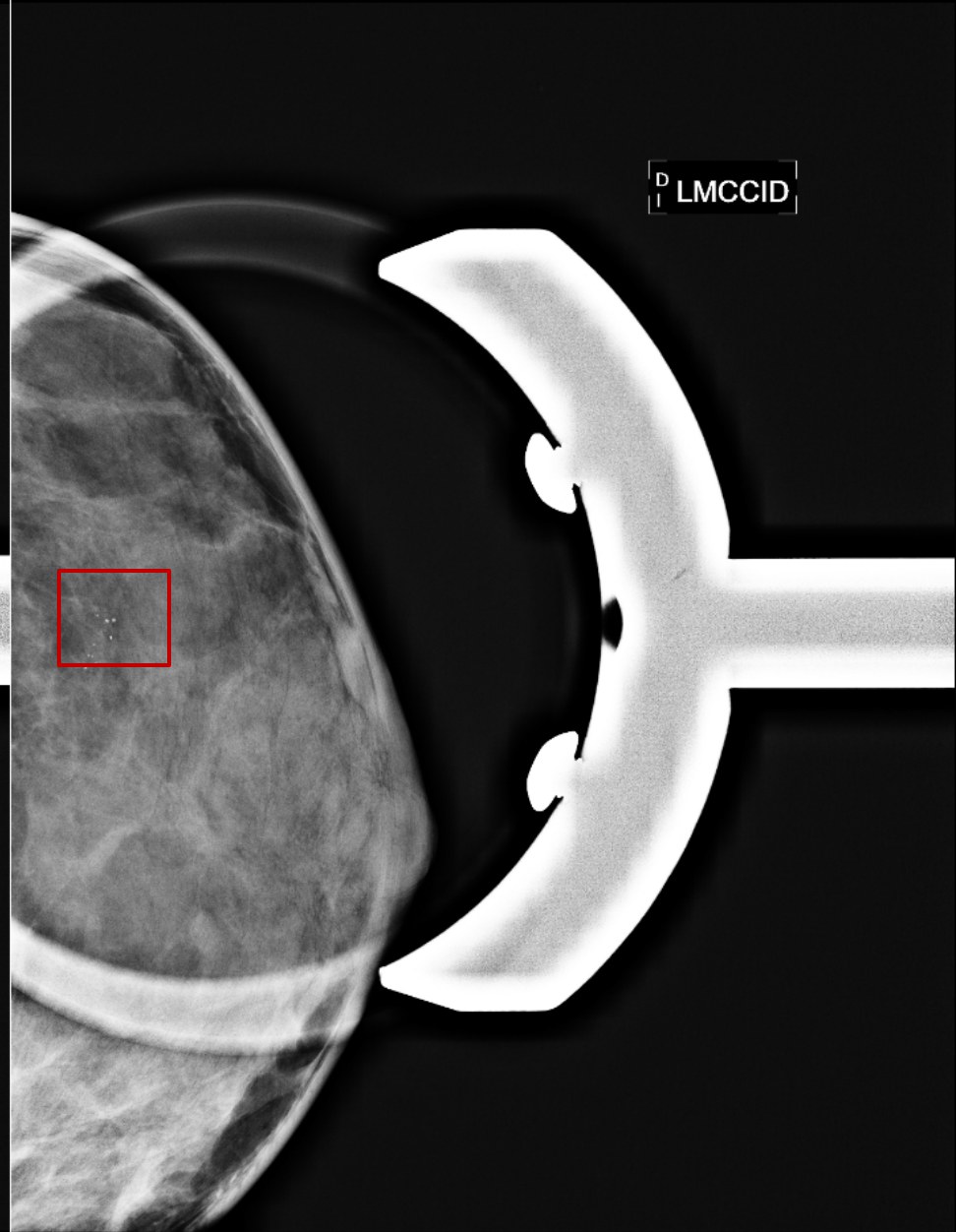
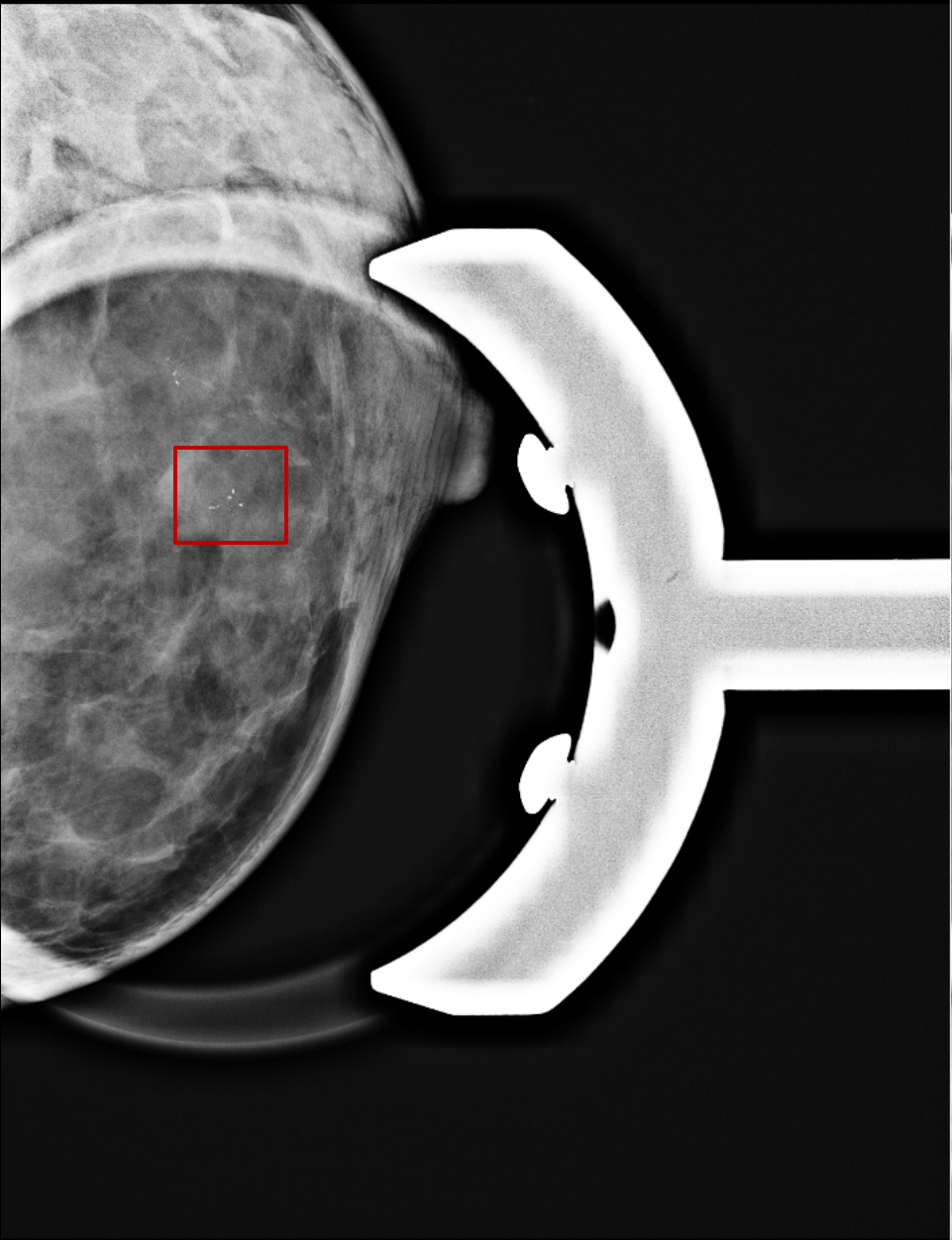
DL
LML

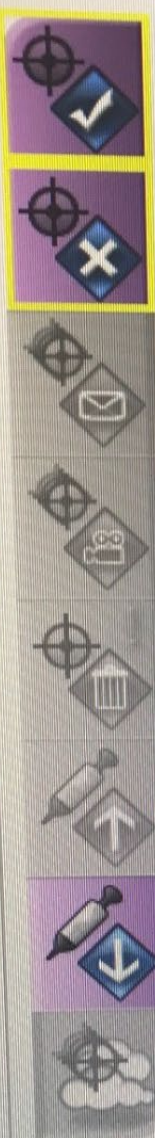




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] LMLOID







Device

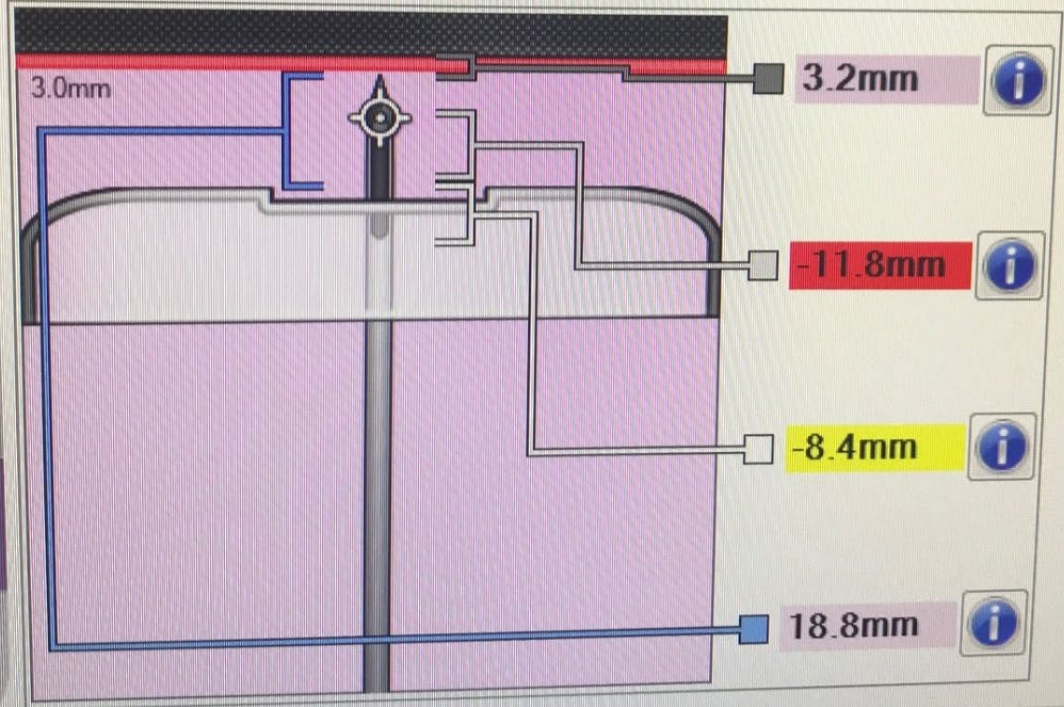
Eviva Standard 9gx13cm, 20mm

Pending

X:-12.2 Y:3

1

X: 2.1
Y: 23.4
Z: 20.5

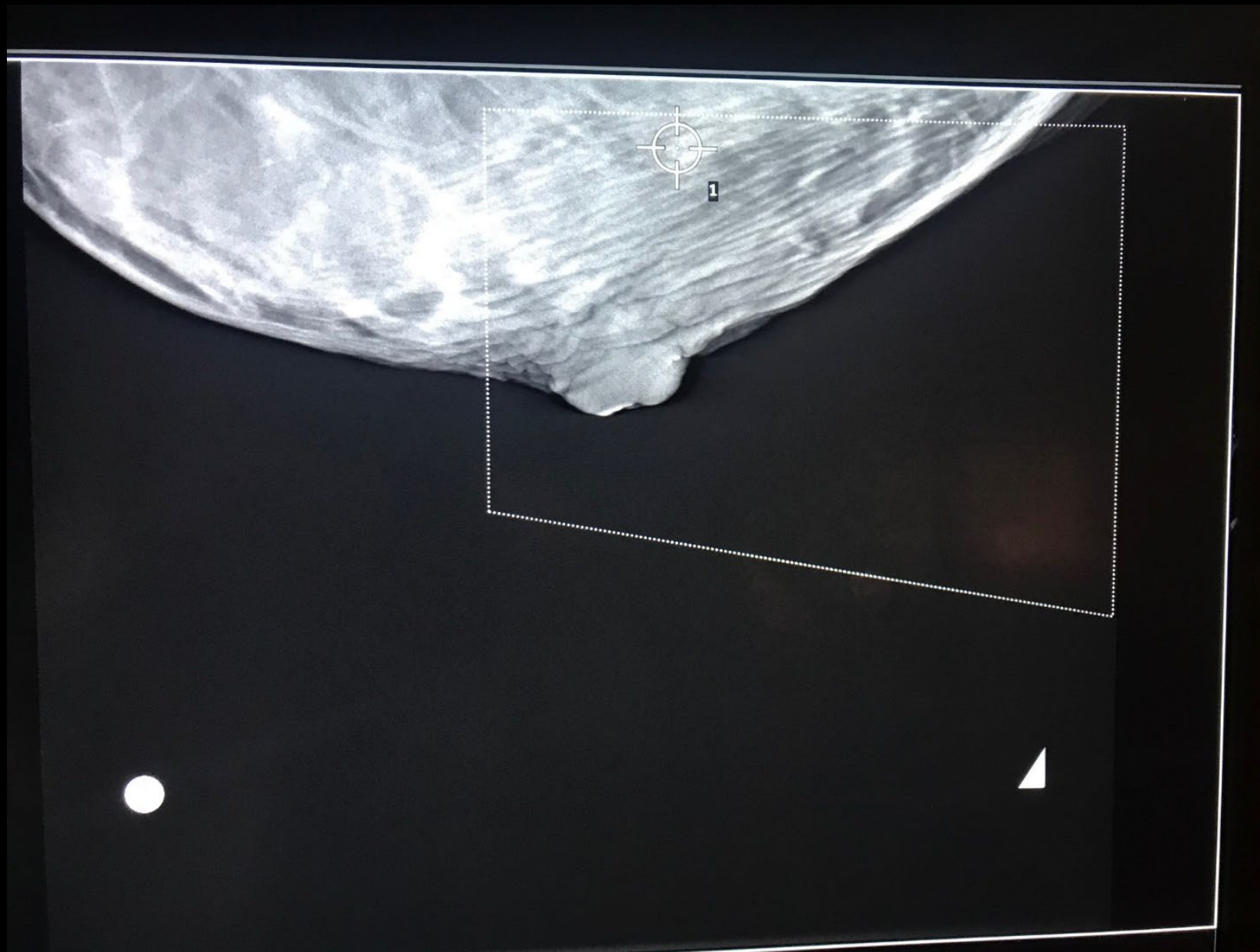


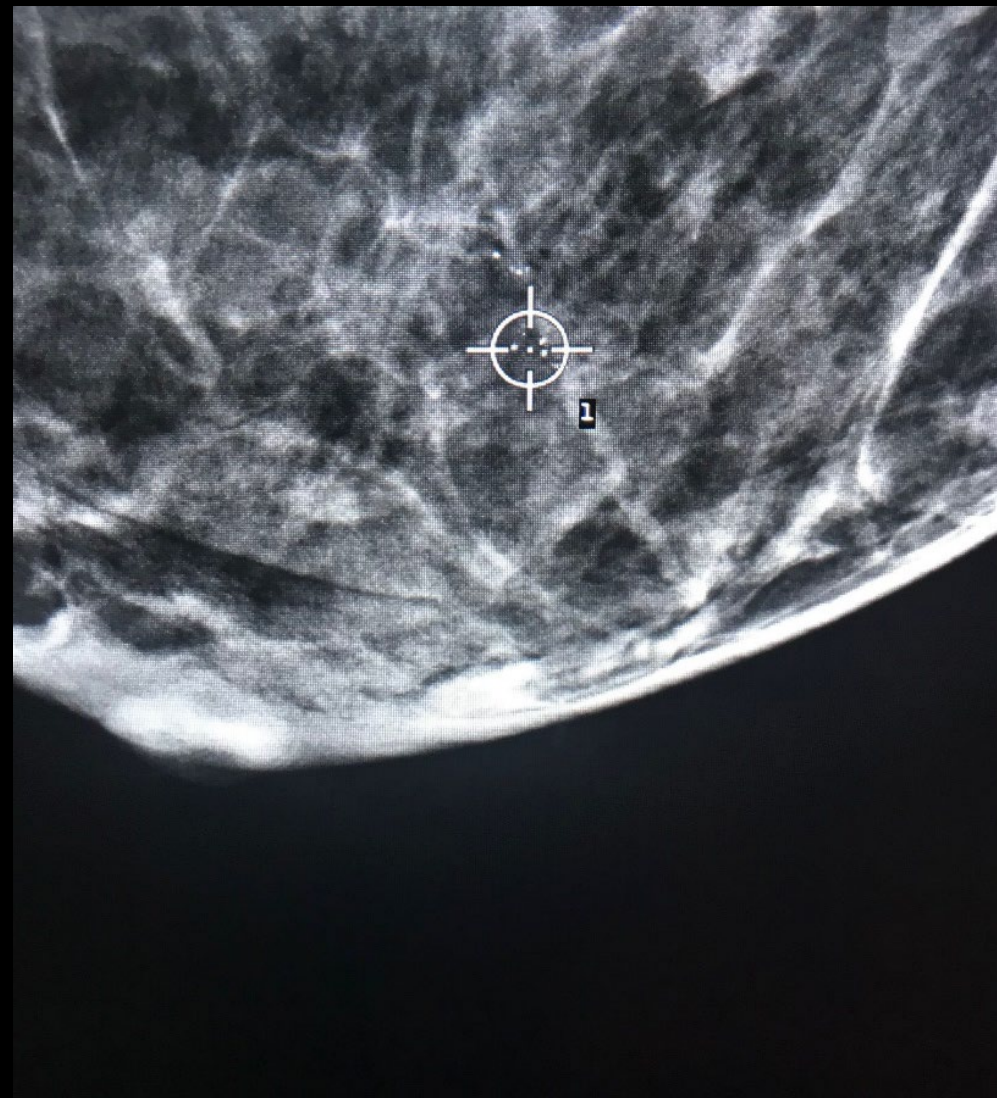
Mu



2mm

4mm





Standby

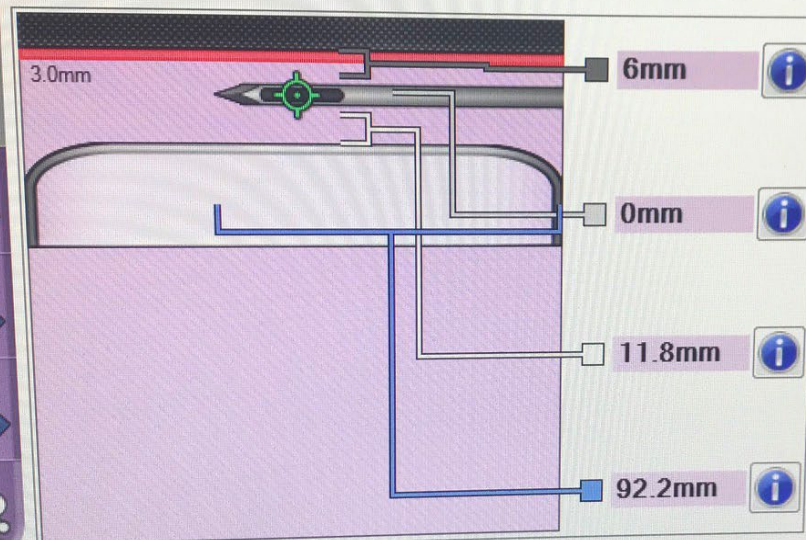
Paddle	15CM L
Thickness	2.2 cm
Biopsy Arm	90°
Stereo Mode	Auto

Device

Eviva Standard 9gx13cm, 20mm

1

X: 4.3
Y: 24.9
Z: 8.1



Multi-Pass

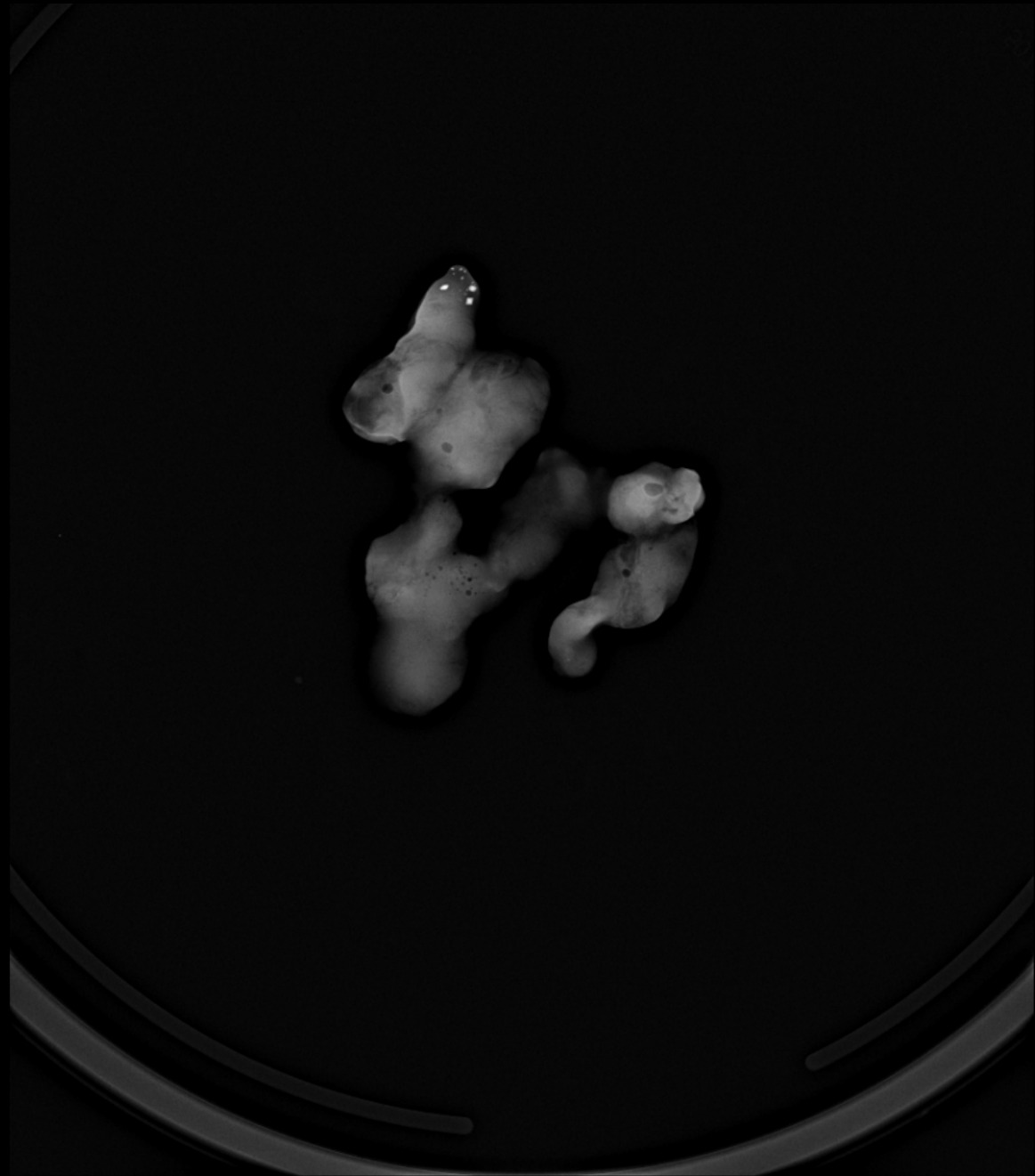


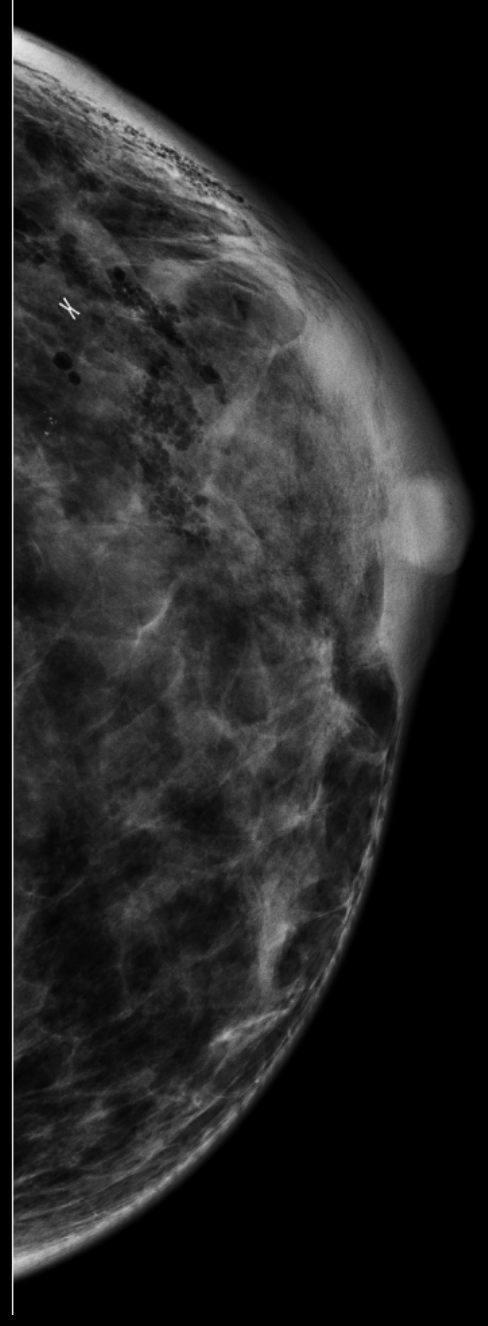
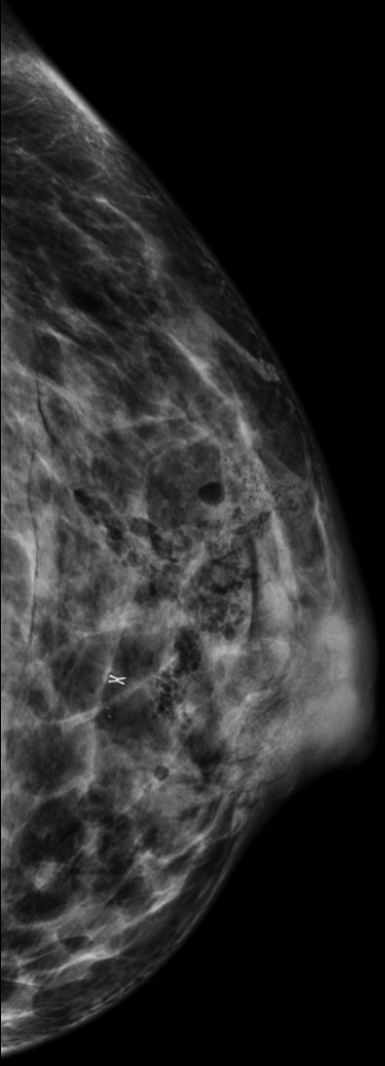
2mm

3mm

4mm

5mm





Summary

- Access to DBT guided biopsy is essential if using DBT in diagnostic setting
- Prone and upright techniques depending on practice setting
- Faster for patients despite initial concern about patient experience

Thank You

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