



Senology Part I: Mammography

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Mammography

Mammography: ACR and BIRADS

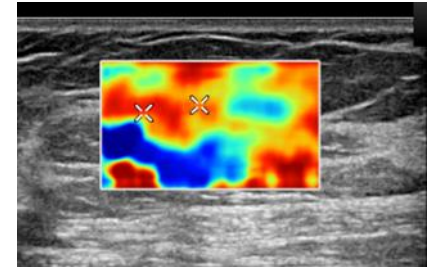
Malignancy in Mammography

Examples

New tools: Tomosynthesis, CESM

Diagnostic Tools in Senology:

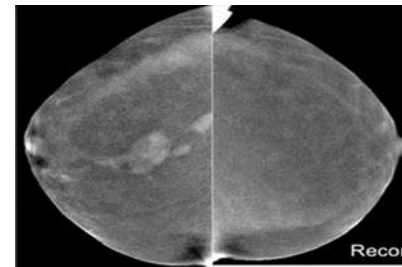
-Ultrasound, sens. in cases of malignancy 96%



-Mammography (sens. 55-98%, 90% overall)



-Tomosynthesis (sens. 92-100%)



-MR Mammography (sens. 75-95%)

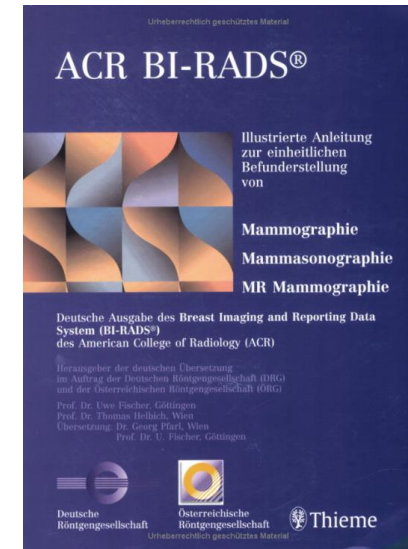
-CESM contrast enhanced subtracted mammography (sens. 100%)

-Hybridtools (PET MRT, PET CT)

ACR und BI-RADS®

ACR (*American College of Radiology*)

- ACR:
- since 1923
 - professionell
 - 34 members: Radiologists, Radiooncologists, Nuclear medicine...
 - aim: improvements in imaging
(Patient care, science, teaching)



ACR and BI-RADS®

BI-RADS®

(=Breast Imaging Reporting and Data System)
(<http://www.acr.org/>)

Existing for Mammography, Sonography and MRI

aim: - standardised reporting system



ACR/Breast density

ACR 1/A – 0 - 25% of the breast volume is filled with parenchyma

ACR 2/B – 25 - 50% of the breast volume is filled with parenchyma

ACR 3/C – 50 - 75% of the breast volume is filled with parenchyma

ACR 4/D -- 75 - 100% of the breast volume is filled with parenchyma



Problem:

Sensitivity in the detection of breast cancer depends on ACR, age, constitution...

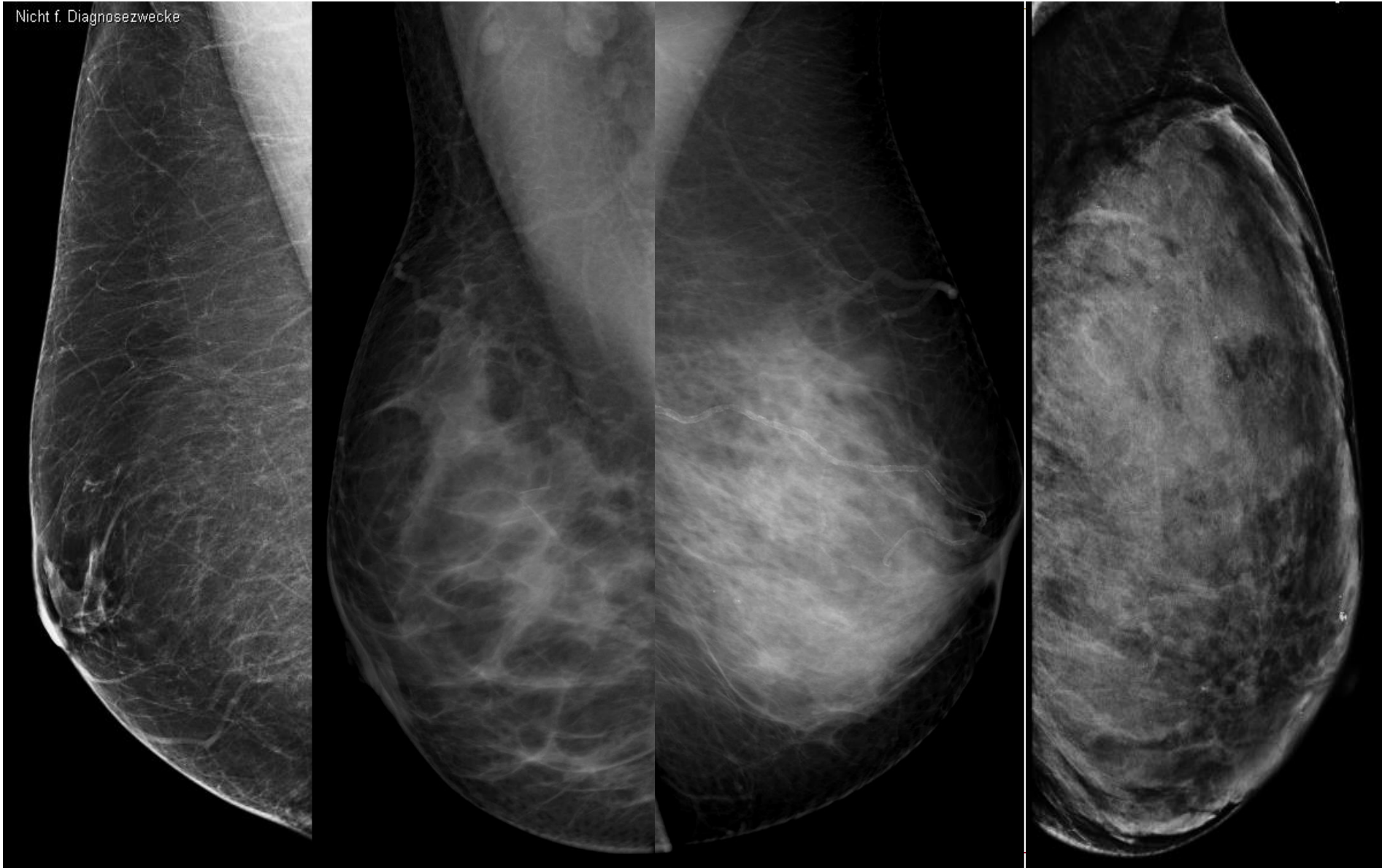
Low breast density	MG	92.9%	52.1%	76.3%	47.9%	7.1%	73.9%	83.3%
	US	98.6%	62.5%	83.9%	37.5%	1.4%	79.3%	96.8%
High breast density	MG	63.2%	82.7%	71.7%	17.3%	36.8%	82.7%	63.2%
	US	92.3%	69.7%	79.7%	30.3%	7.7%	70.6%	92.0%

Limitations of mammography in the diagnosis of **breast** diseases compared with ultrasonography: a single-center retrospective analysis of 274 cases.

Zhao H, Zou L, Geng X, Zheng S.

Eur J Med Res. 2015 Apr 21;20:49.

Nicht f. Diagnosezwecke





BI-RADS® classification

- A. masses
- B. calcifications
- C. Architectural distortion
- D. Special cases
- E. Associated findings
- F. Localisation



A. „masses“

Definition: a (3D) visible lesion, a 2 D visible lesion (1 plane) is a densification

- Descriptors:
 - shape (round, lobulated, irregular)
 - margins (sharp, microlobulated, not sharp, spiculated)
 - density (high, isoequivalent, low, fatty..)



B. Calcifications

Macrocalcifications: benign

Microcalcifications (single < 2mm): benign or malignant

Criteria for Malignancy:

- grouped
- Polymorphic
- Segmental formation

Intraductal malignant cells

BI-RADS® C. – F.

C. Architectural distortions

D. Special cases

(tubular structures, dilated milk ducts, intramammary lymph nodes, asymmetry, focal asymmetry)

E. Associated findings

(cutis retraction, mamillar retraction, cutis thickening, reticular dense structure, cutis lesion, axillary LN, architectural distortion, calcification inside a lesion)

F. Localisation (Side, Quadrant, time, distance to mamilla)

BI-RADS® („Reporting“)

1. Breast density ACR

(reflecting the probability of evtl. missed cancers)

1. <25 % Parenchyma
2. 25-50% Parenchyma
3. 51-75% Parenchyma
4. >75% Parenchyma

2. Findings

a. clear description of relevant findings

(s. Lexikon A. bis E.)

b. general BIRADS classification of lesions with standardized recommendation

BI-RADS® („Reporting“)

BIRADS 0 – unclear finding, additional imaging necessary

unclear

BIRADS 1 – normal female breast

0% malignancy

BIRADS 2 – benign lesion

0% malignancy

BIRADS 3 – Asymmetry, sharp margined opacity,
granular MK Group

<3% malignancy

BI-RADS® („Reporting“)

BIRADS 4 – lesion which should be biopsied (polymorph. Microcalcification, segmental MC, opacity with unsharp margins)

3-95% malignancy

BIRADS 5 – typically malignant finding (segmental and polym. Mc, spiculated opacity)

>95% malignancy

BIRADS 6 – known malignancy

100% maligne



Typical breast tumors (and preinvasive forms DCIS, LCIS..)

-NST (non specific type) Tumors 70-80%

Untypical breast carcinomas 20-30%

-Lobular carcinoma 5-15%

-Papillar carcinoma

-Tubular carcinoma

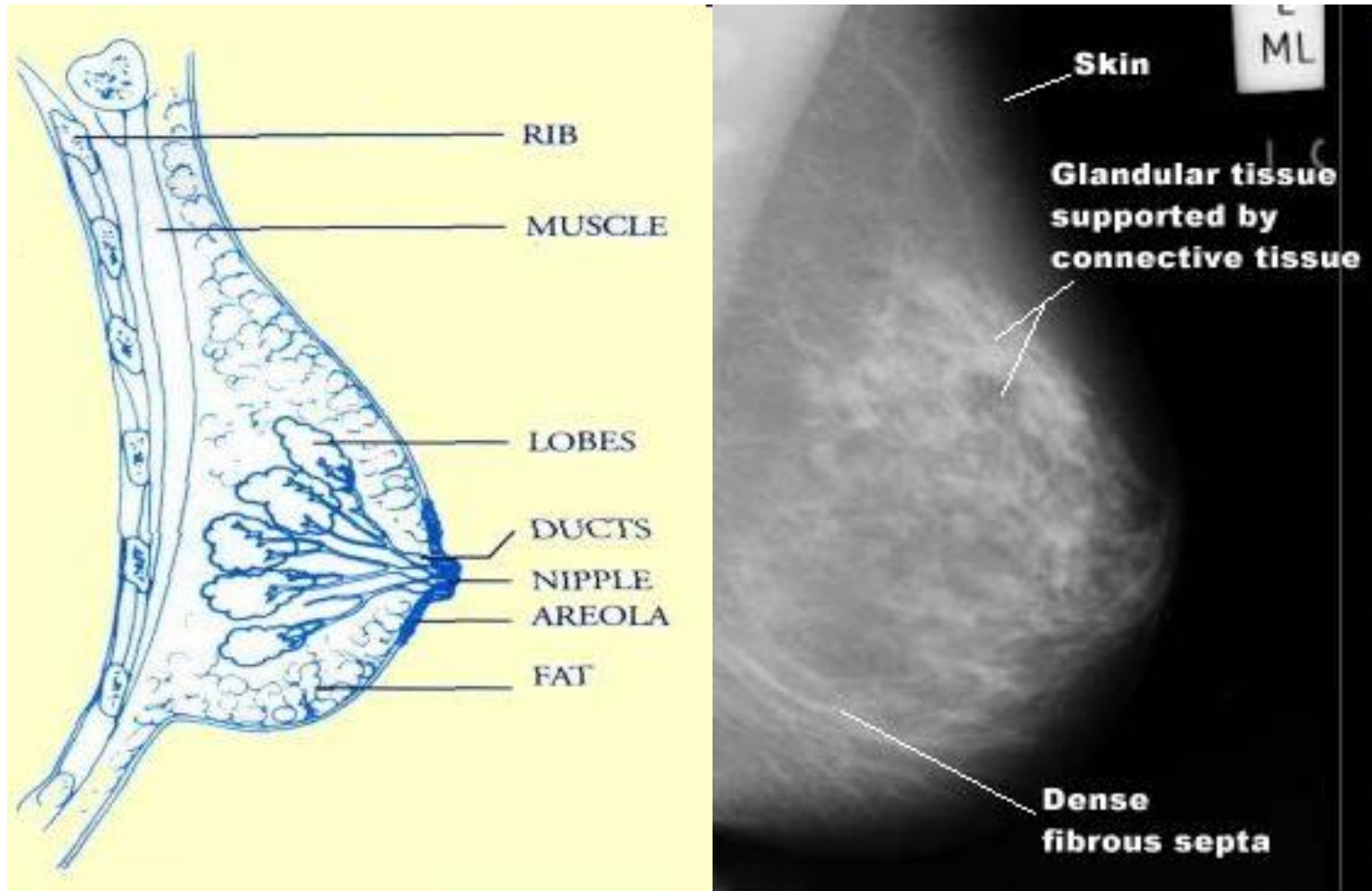
rare metaplastic CA, adenoidcystic CA, Paget CA

Metastasis of other tumors (Lymphoma, Melanoma)



Morphologic stigmata of solid tumors in mammography:

- Spiculated opacity
- Opacity with unsharp margins
- Asymmetry
- High density lesions
- Visibility in 1 or 2 planes (MLO vs CC)
- (MC Association)
- Secondary findings: Oedema, Cutis thickening, LN Axilla



Normal Anatomy

Example 1

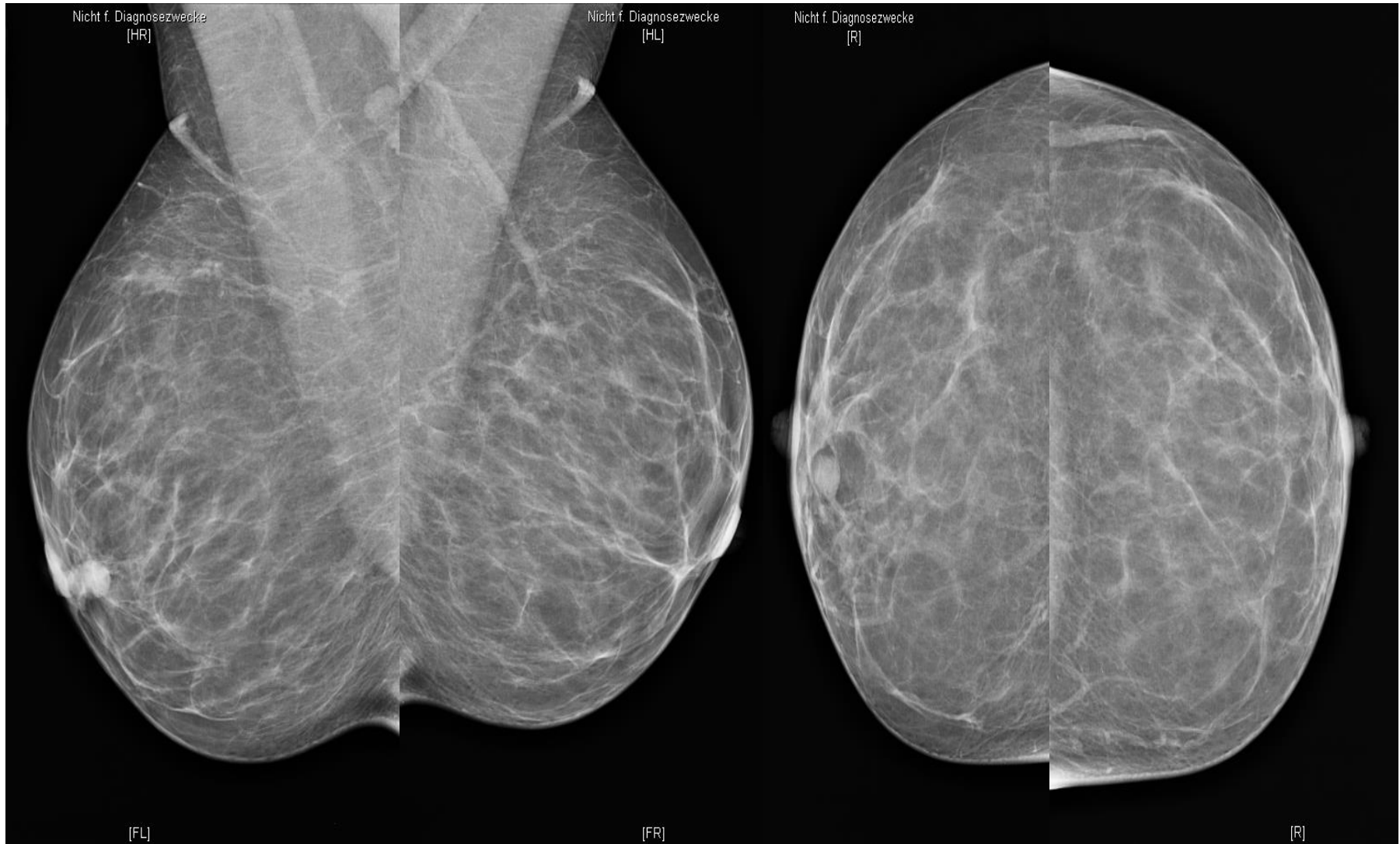




Biopsy specimen right side 4 clock: Infiltration of
Mammacarcinoma NST G3
Receptor analysis negativ, Her2-Neu-neg.

B-Klassifikation: B5b.

Patient B.B. 36 y.o., new nodule







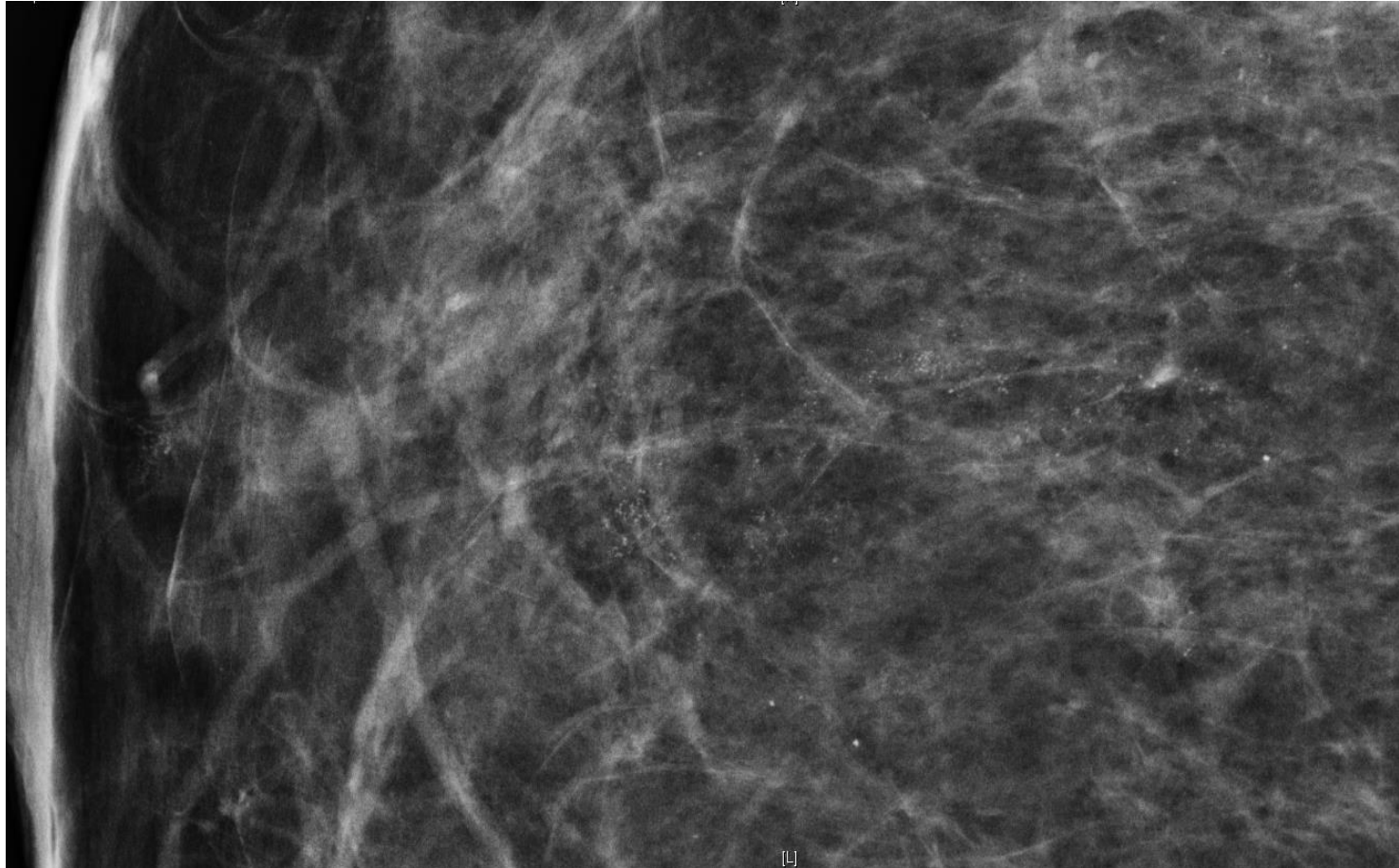
Histology: Papilloma, B3

DD: mucinous NPL, adenoidcyst. CA,
papillary CA, G3 CA!



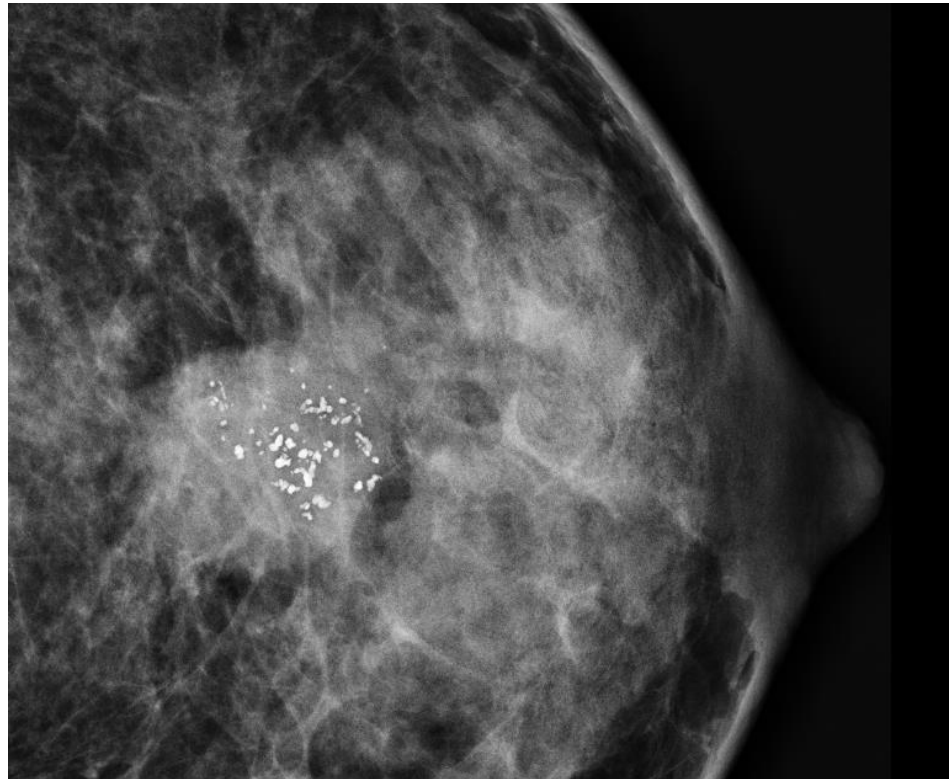
Screening mammography, 63 y.o. patient

Example 3



Typical malignant microcalcification and an opacity

NST + DCIS





Tomosynthesis „3D“-Mammography



Problem: tissue overlapping:

- ▶ asymmetric parenchyma, overlapping parynchema

Results:

False positive / negative findings

- ▶ Additional images: magnification views, MRT, US
- ▶ Biopsies
- ▶ Recall of the patient

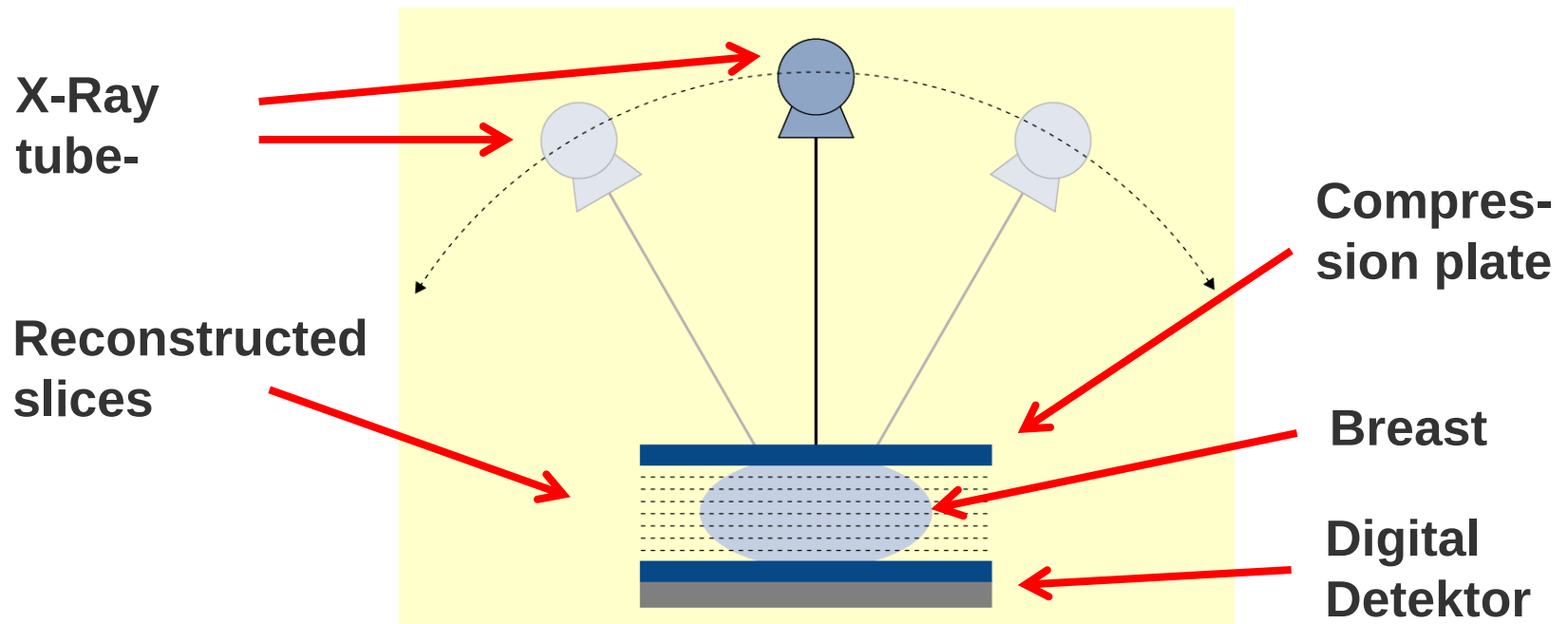


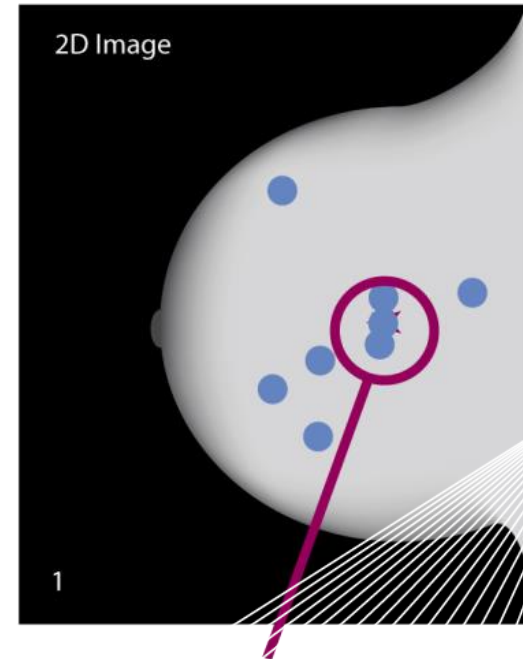
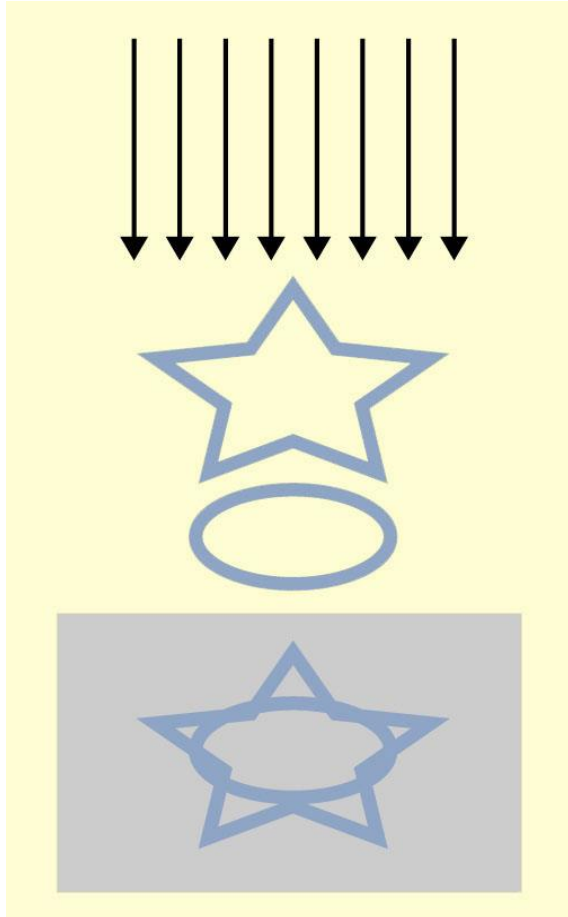
- 3-D Technology
- 1 mm thin slices of the breast



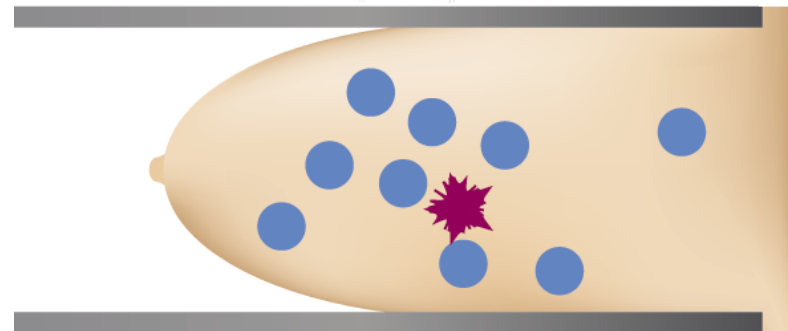
- Elimination of overlapping projections
 - Increase of sensitivity and specificity
 - Increase of the cancer detection rate
 - better diagnosis of benign lesions
 - Reduction of negative biopsies
 - Less unclear findings
 - Recall-Reduction
-

Tomosynthesis-Procedure

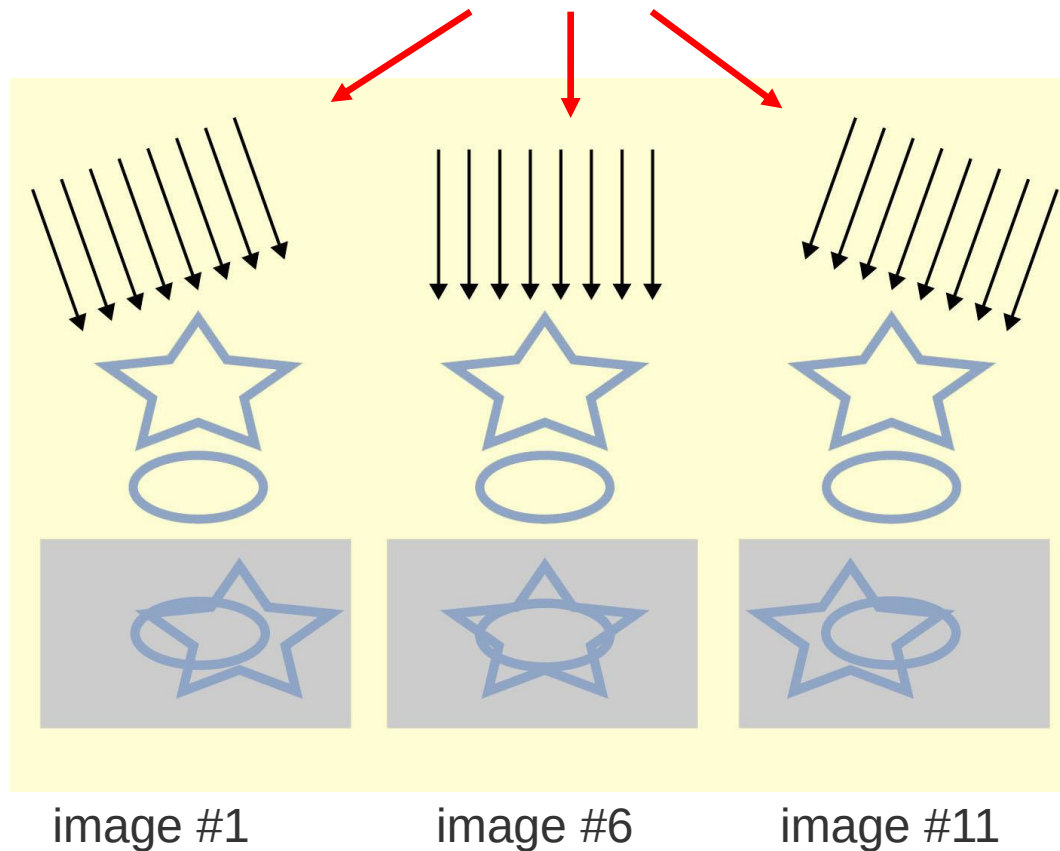




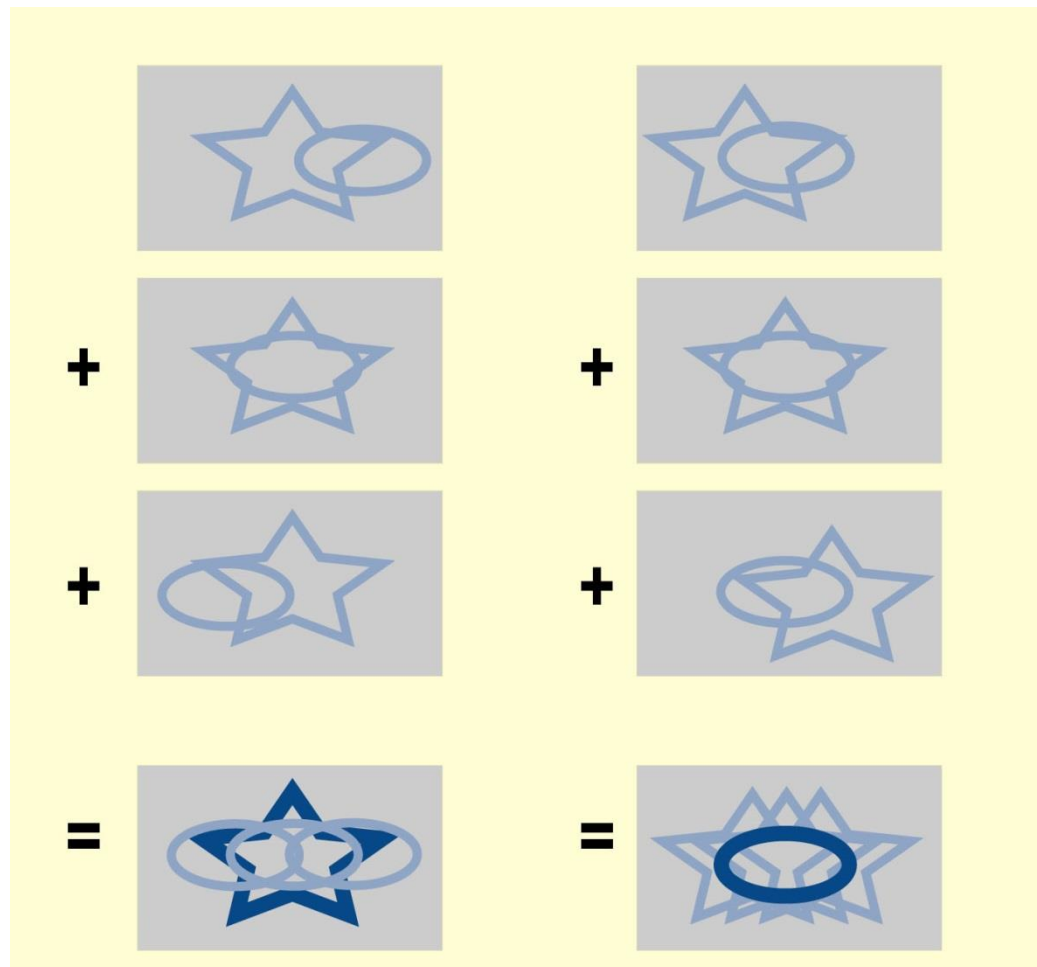
Lesion Superimposed in 2D



Projections from different angles

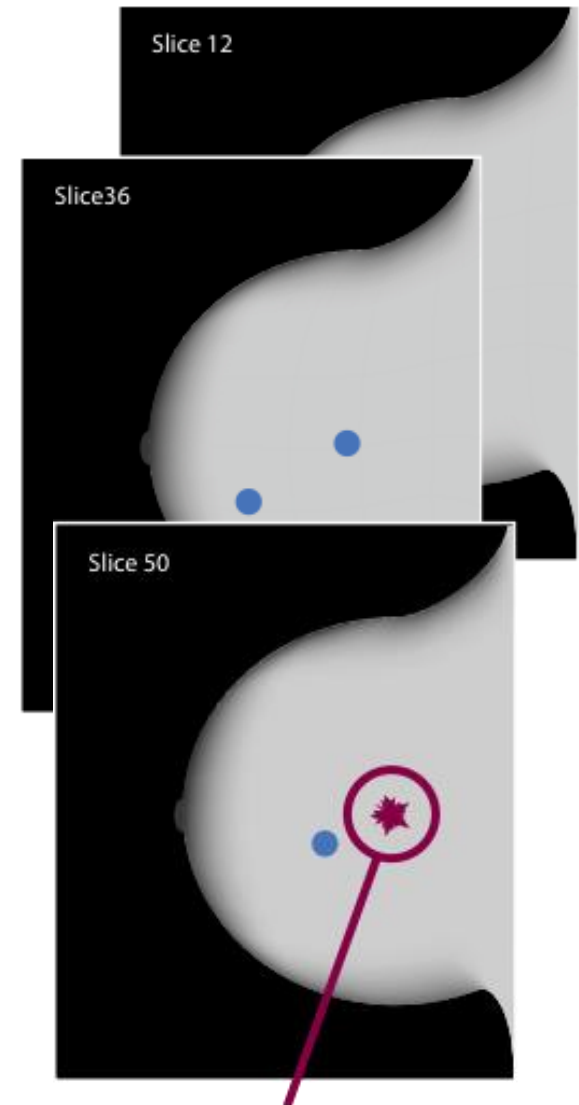


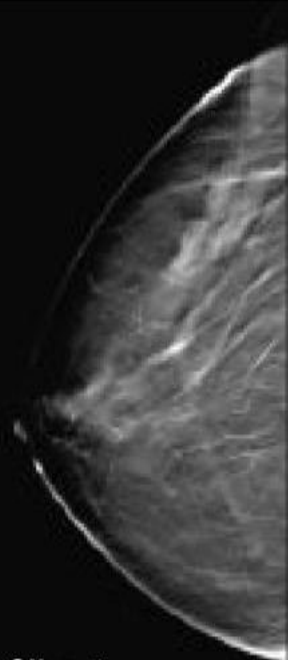
2-D row data



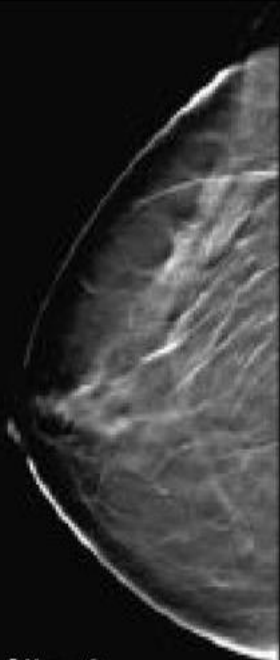
Slice 1

Slice 2

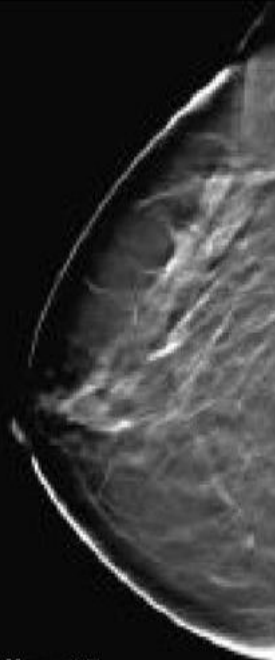




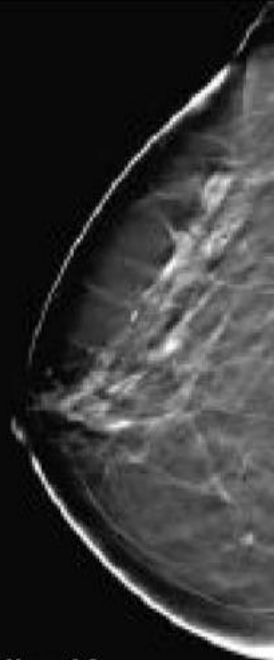
Slice 1



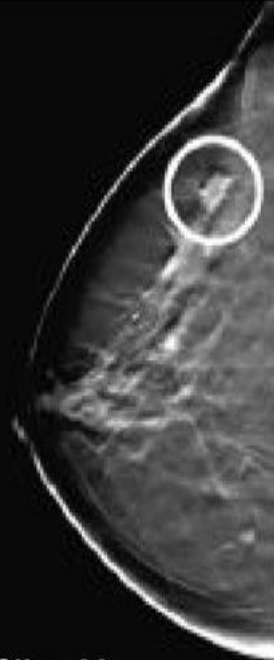
Slice 8



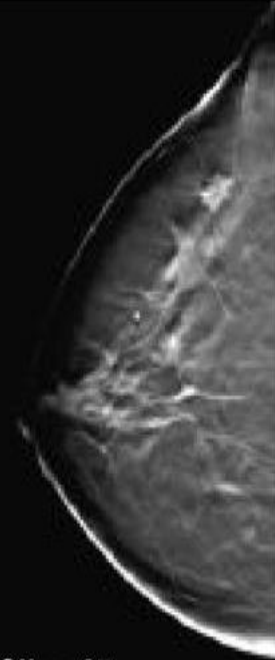
Slice 15



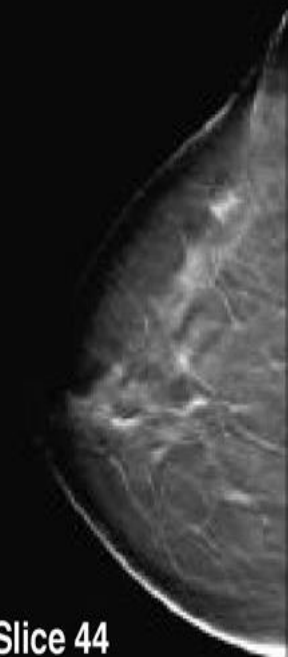
Slice 23



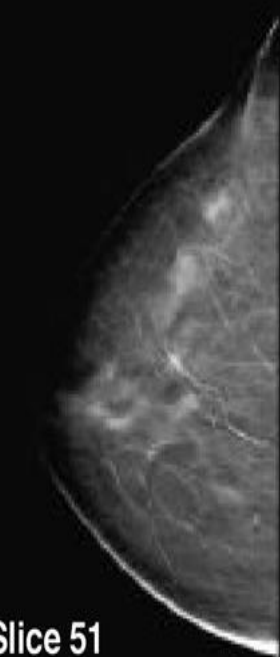
Slice 30



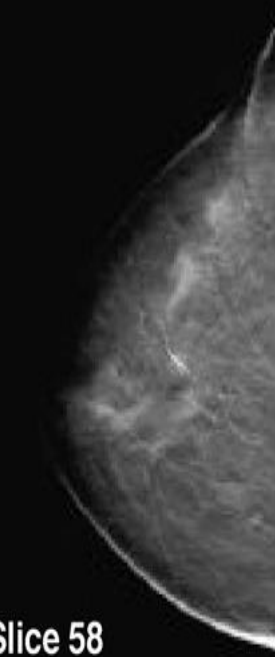
Slice 37



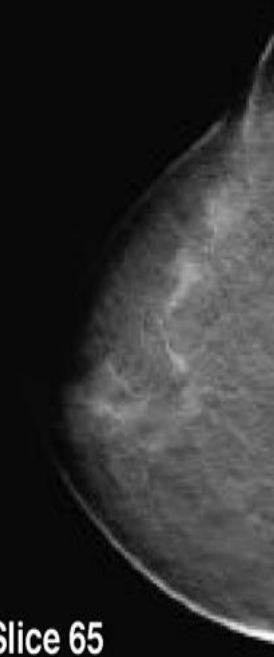
Slice 44



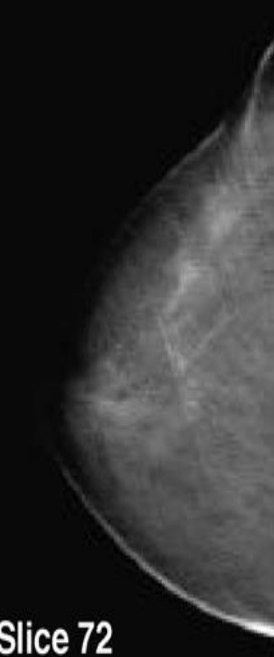
Slice 51



Slice 58



Slice 65



Slice 72

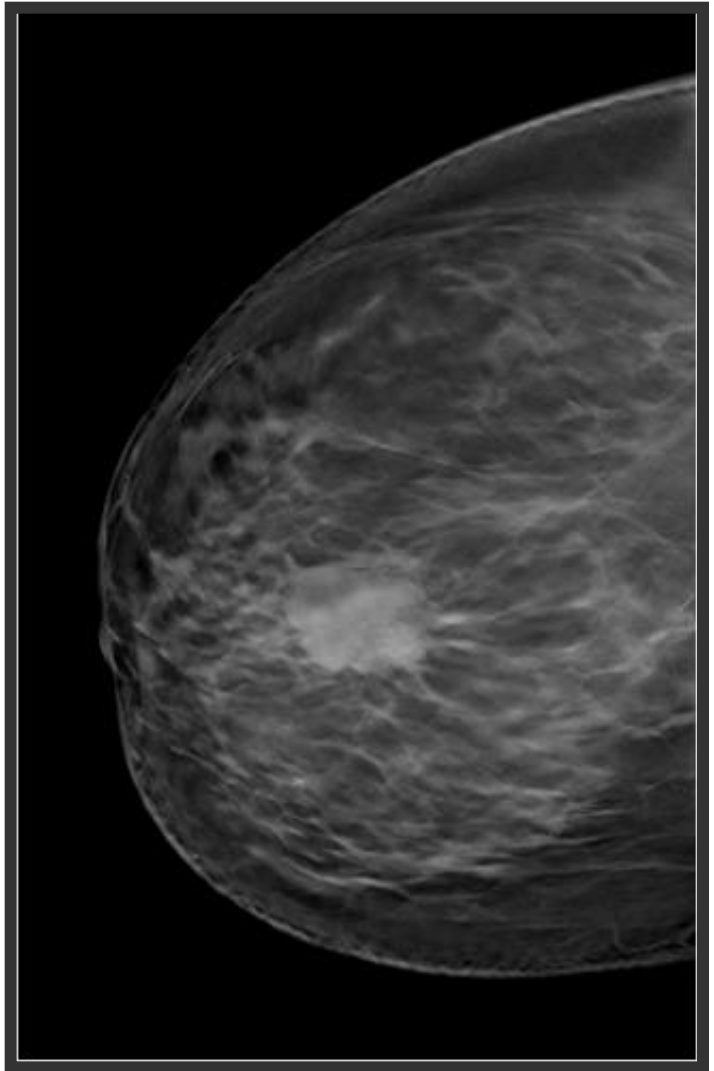
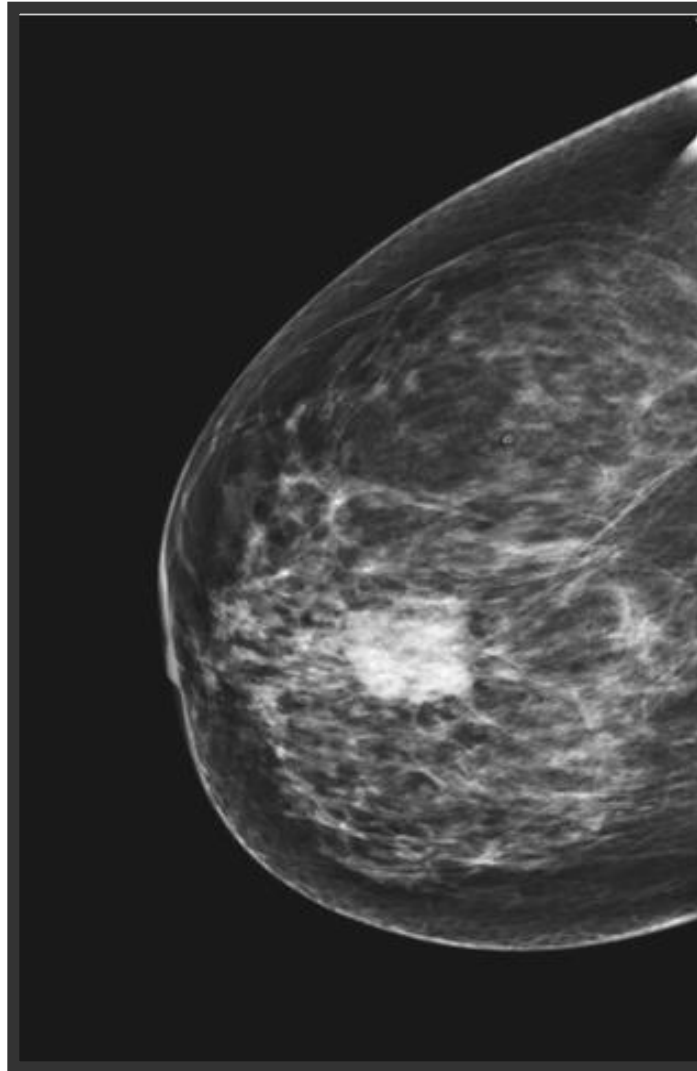


Slice 79

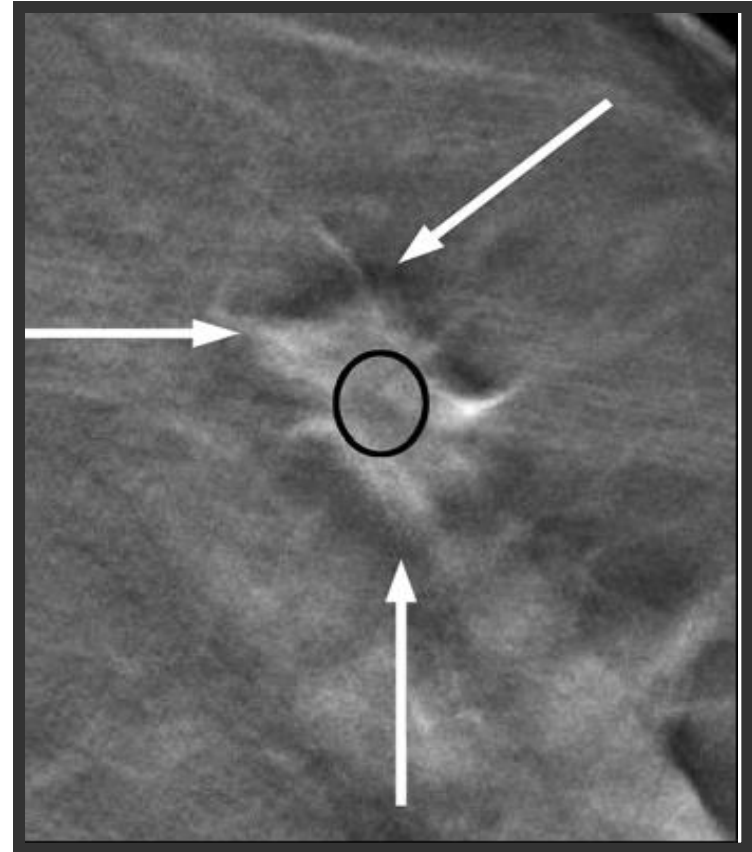
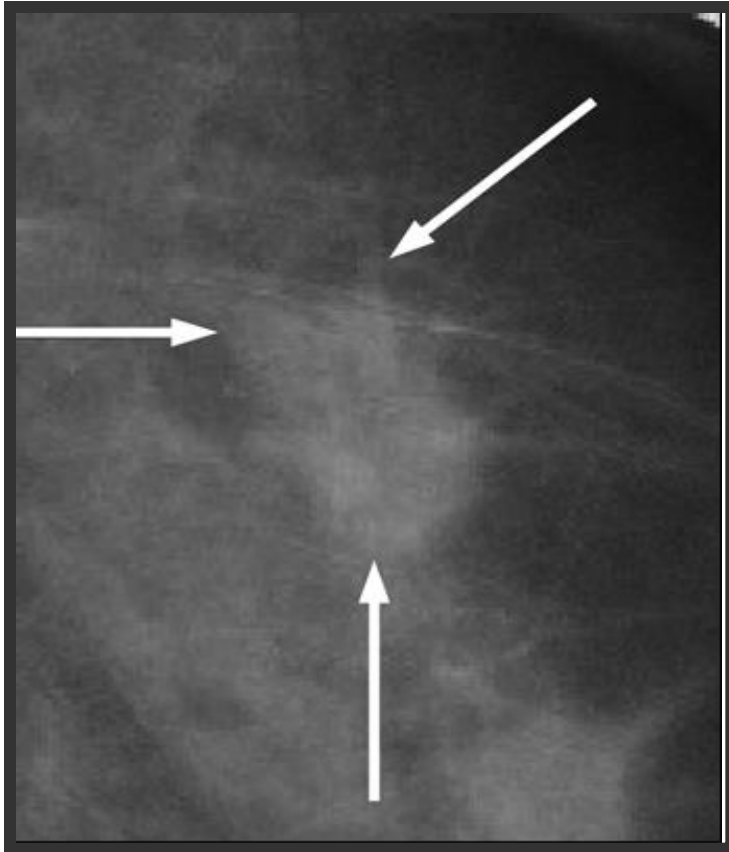
71 old P.

Palpable
finding right

Histology:
NST G2



84 old P., Palpable finding right



Histology: ILC

Aim: to get **metabolic** (tumour perfusion) **and** morphological information for

- higher sensitivity in CA detection especially in case of high density
- Elimination/diagnostic of multifocal/multicentric cancer

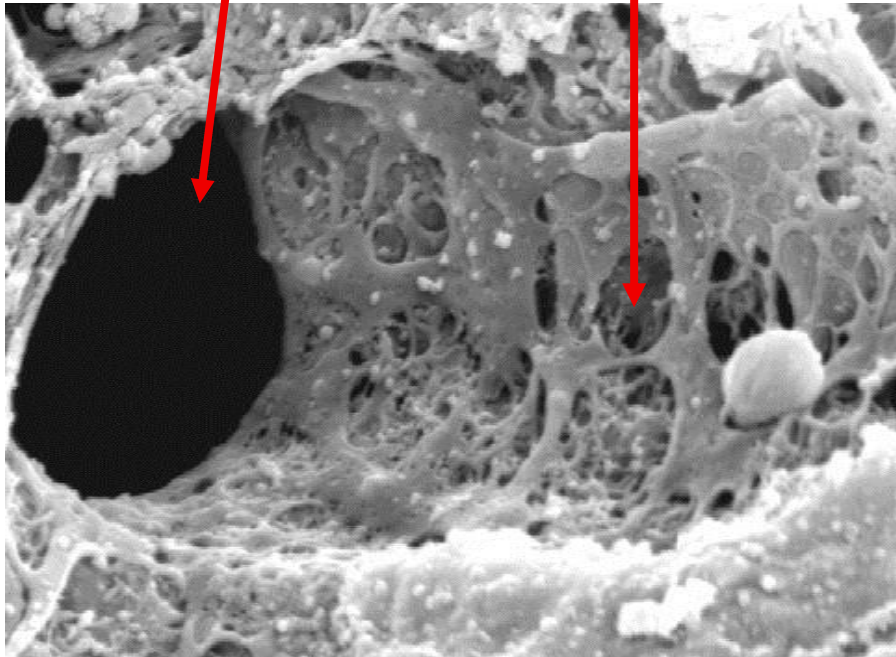
DCE-MRI: Morphology of tumor vessels

Vessel Lumen

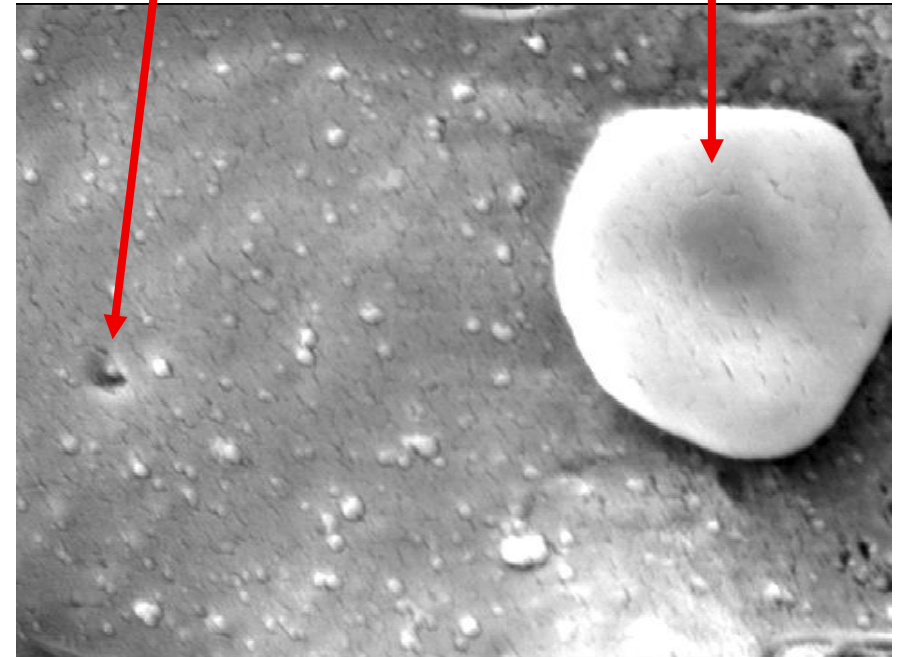
Open Pores

Closed Pores

Erythrocyte

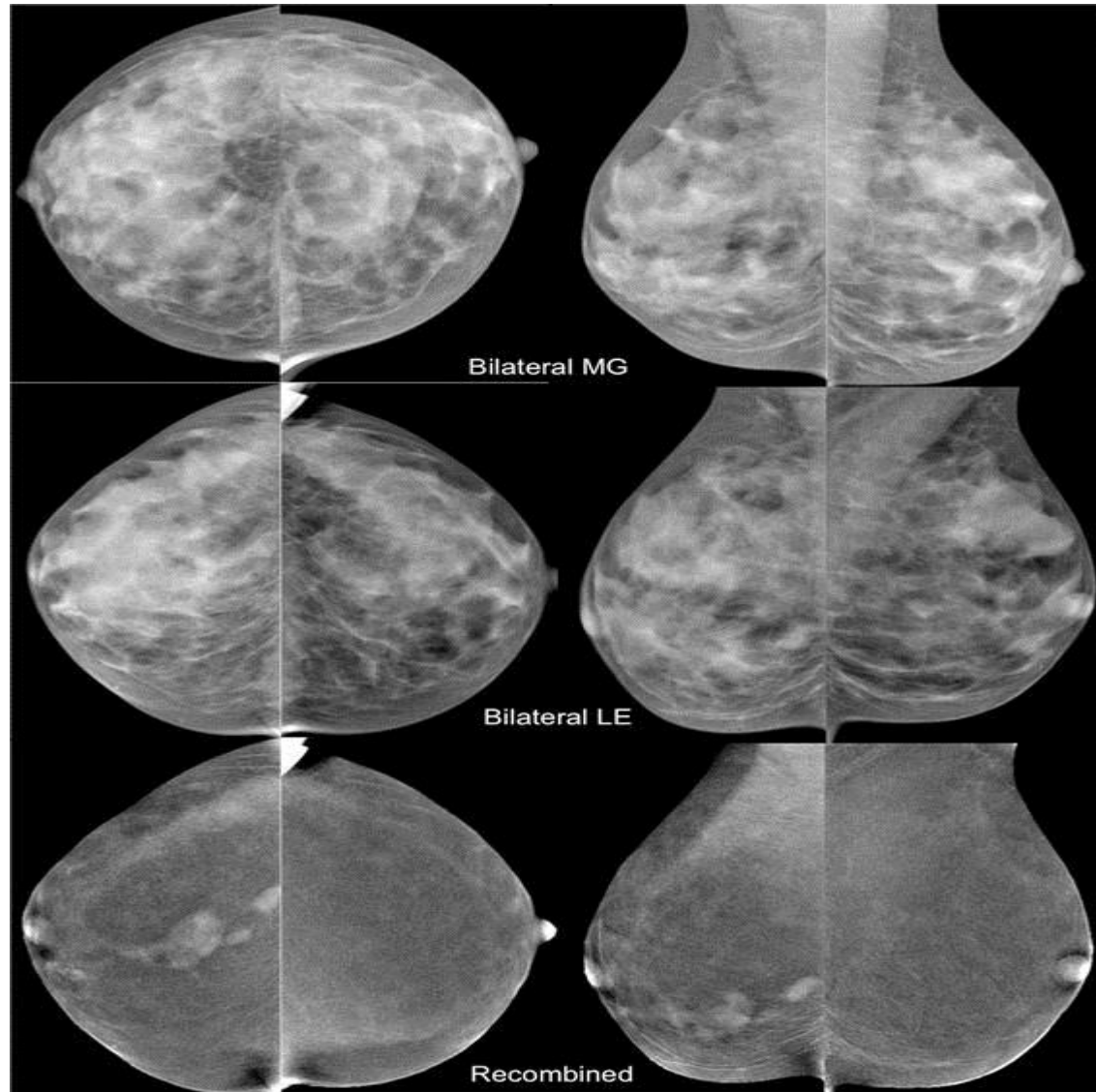


VEGF Stimulation



No VEGF Stimulation

Angiogenesis and Extravasation of contrast-medium (permeability)





- MG is the only statistically proven method for the screening of breast carcinoma (positive benefit/risk ratio)
- Tomosynthesis has the potential for better visualization of overlapped lesions and for the reduction of false positive lesions
- CESM can help in differentiating malignant from benign lesion
- CESM is helpful in cases of difficult mammograms (density) and if the patient has contraindications for MRM (pacemaker, claustrophobia..)



Thank you for your attention....

....Part 2 is coming