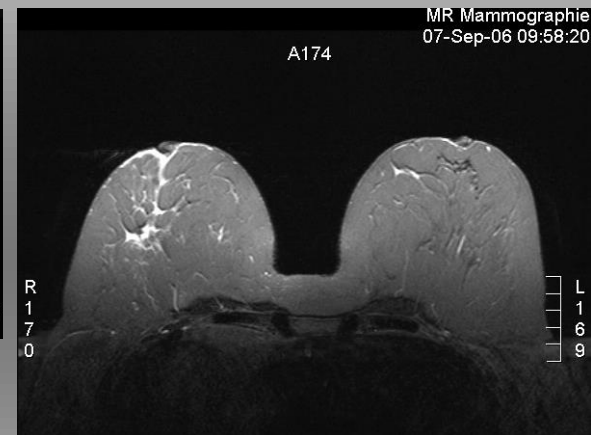
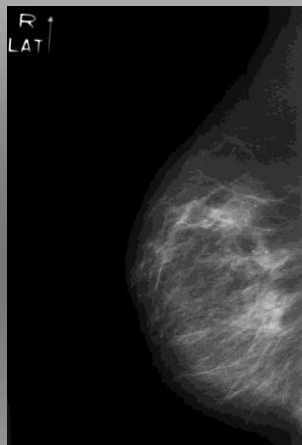


Spezielle Radiologische Diagnostik der Mamma



Prof. Dr. L. Heuser

E-mail: Lothar.Heuser@rub.de

www.lheuser.de

Spezielle Radiologische Diagnostik der Mamma

- Röntgen-Mammographie
 - Analoge Technik (Film-Folien-System)
 - Digitale Technik (Speicherfolie u. Flächendetektor)
- Mamma-Sonographie
 - B-Bild 7,5 – 15 MHz handgeführt
 - Automatische Verfahren
- MR-Mammographie



Spezielle Radiologische Diagnostik der Mamma

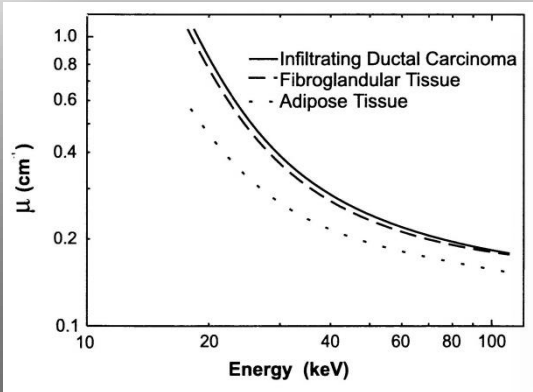
- Röntgen-Mammographie -

- Röntgentechnik
 - Röhre mit Molybdän-Anode
 - 25 – 32 KV Röhrenspannung
 - Nutzung des Heel-Effektes
- Bildempfängersystem
 - Spezielle Film-Folien-Kombination
 - Digitale Speicherfolie
 - Flächendetektor

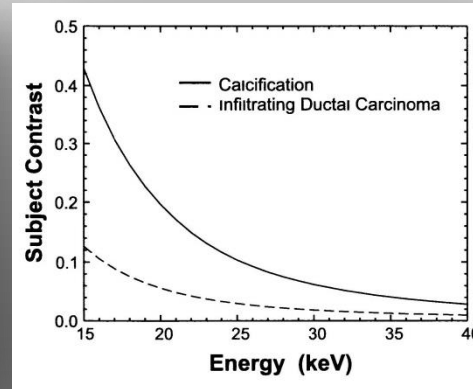


Röntgen-Mammographie

- Strahlenqualität -

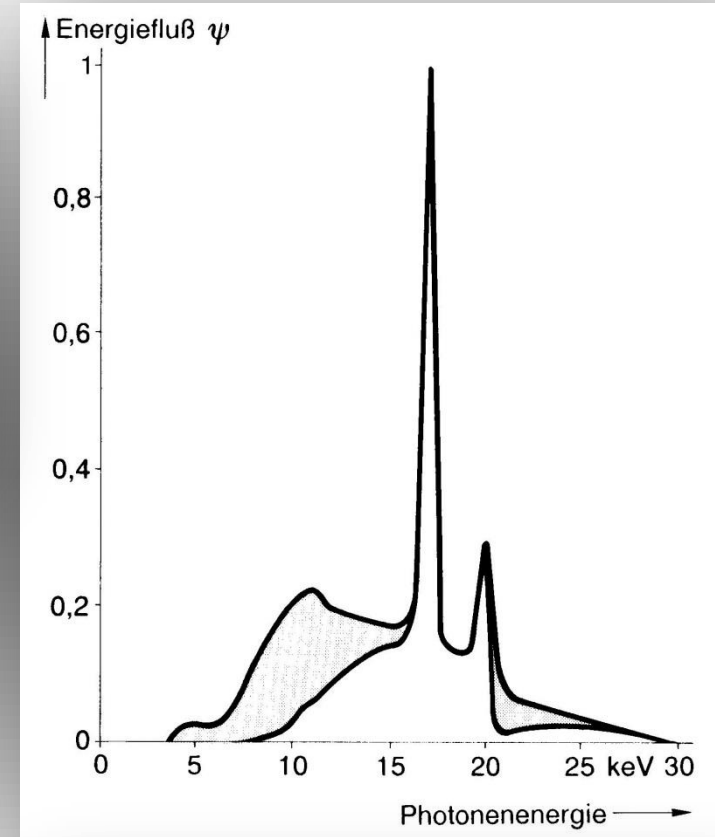


a



b

Schwächung der Strahlung (a) und Kontrast (b) der Mamma-Strukturen in Abhängigkeit von der Energie der Strahlung

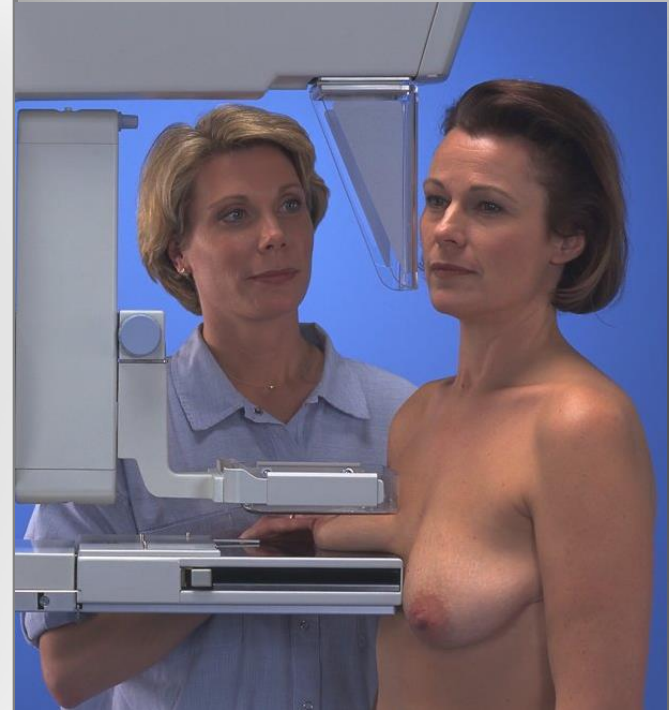


Spektrum der Mo-Anode mit und ohne Mo-Kantenfilter

Röntgen-Mammographie

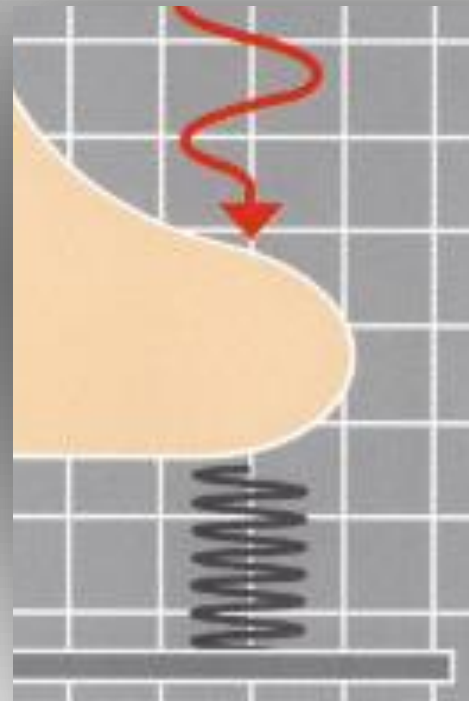
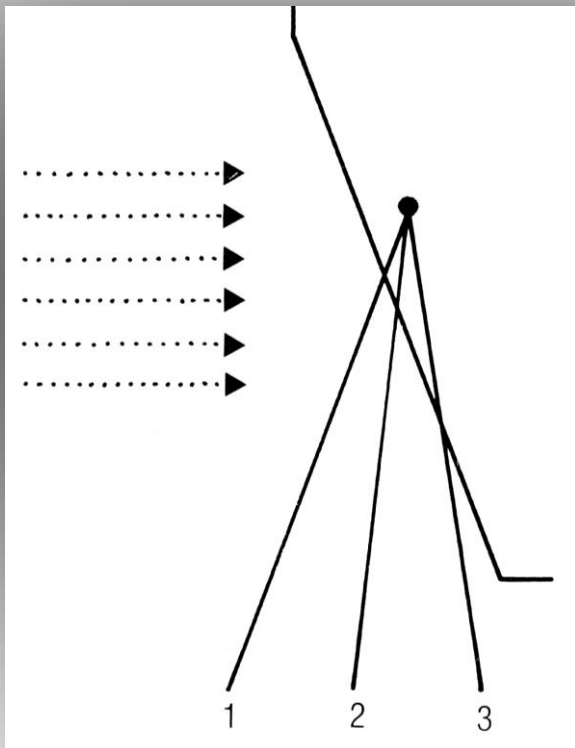
- Kompression -

- Verbesserte Auflösung
- Dosisreduktion
- Kontrastverbesserung
- Verringerung der Streustrahlung.
- Separation überlagernder Strukturen
- Verhinderung der Bewegungsunschärfe

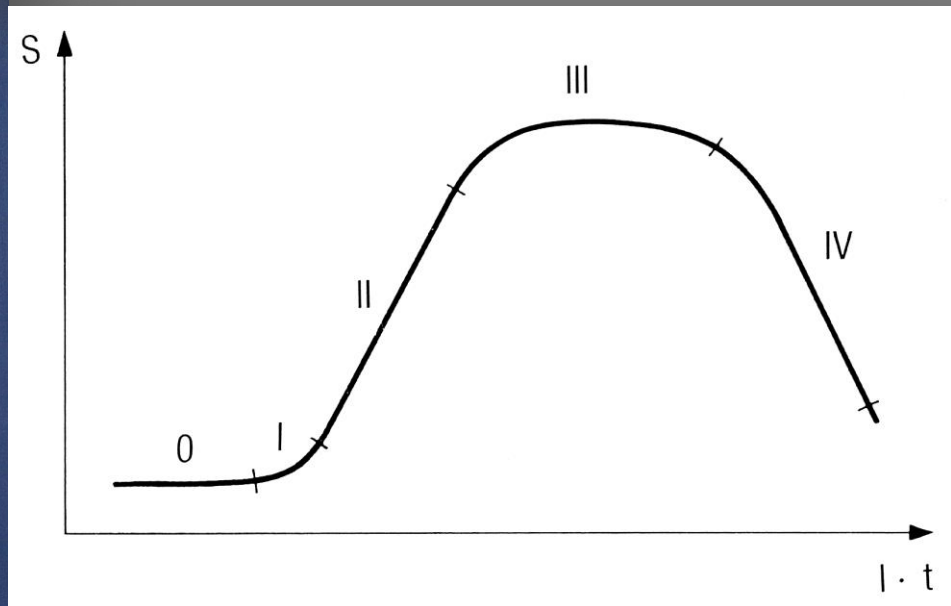
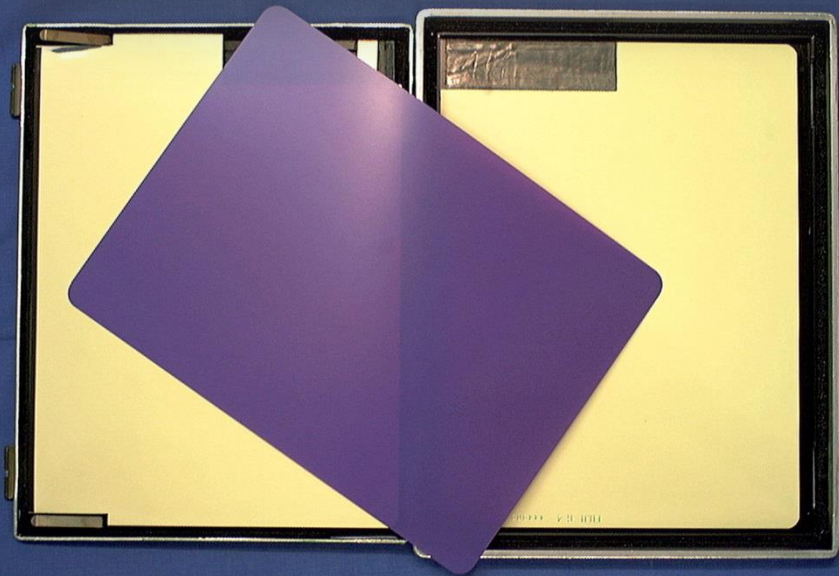
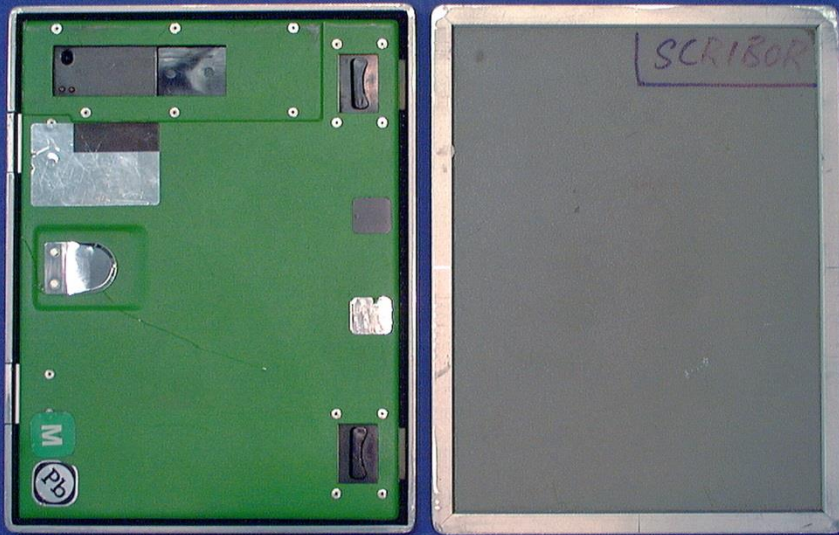


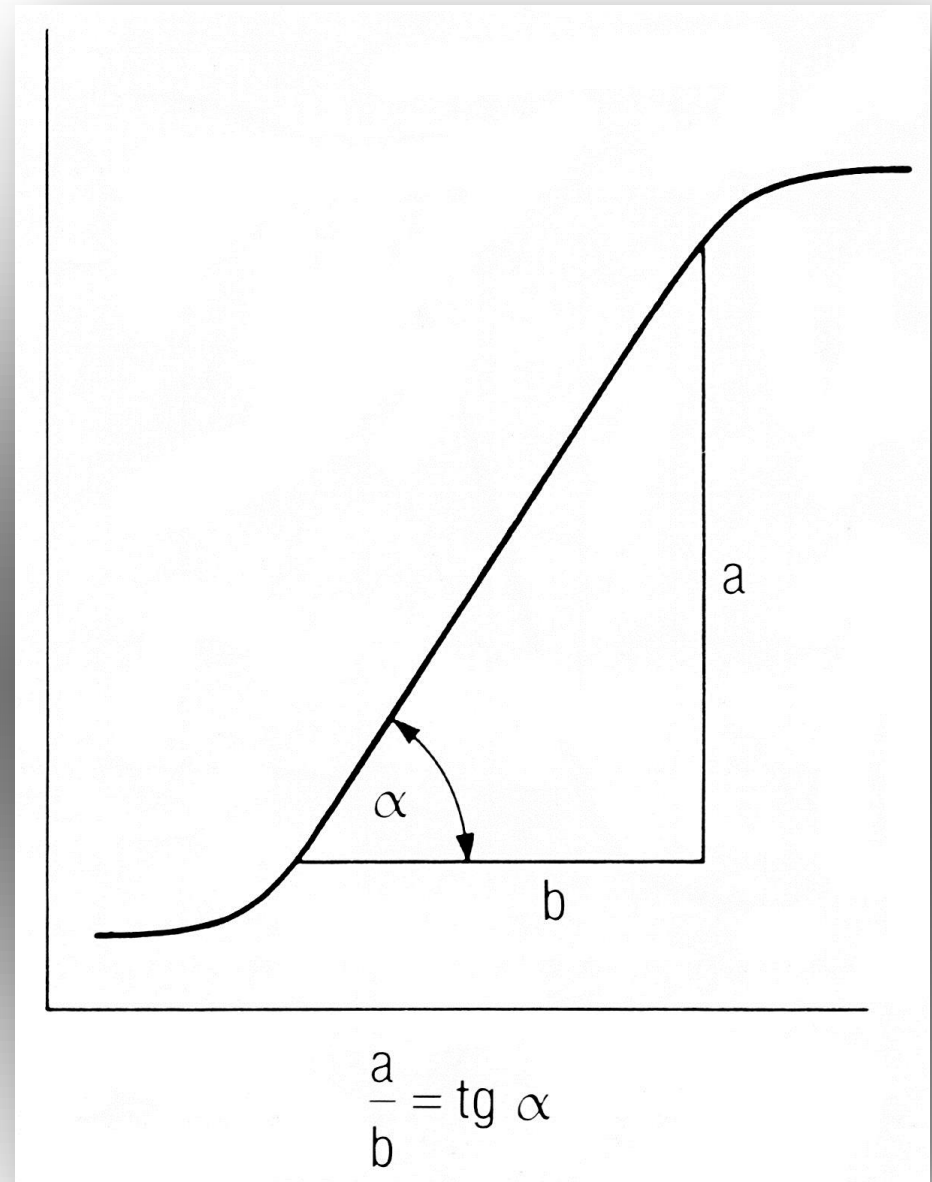
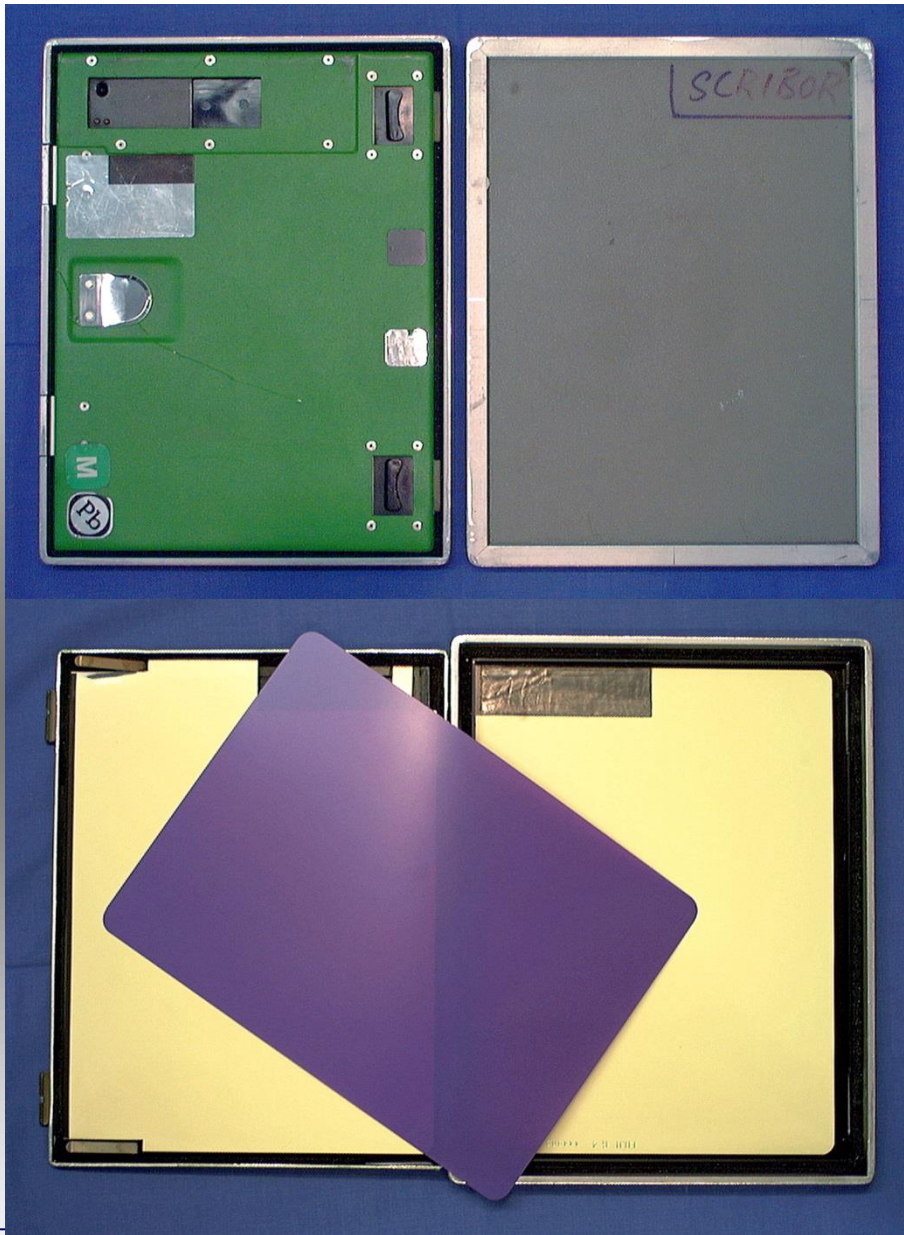
Der „Heel-Effekt“

und seine Nutzung in der Mammographie

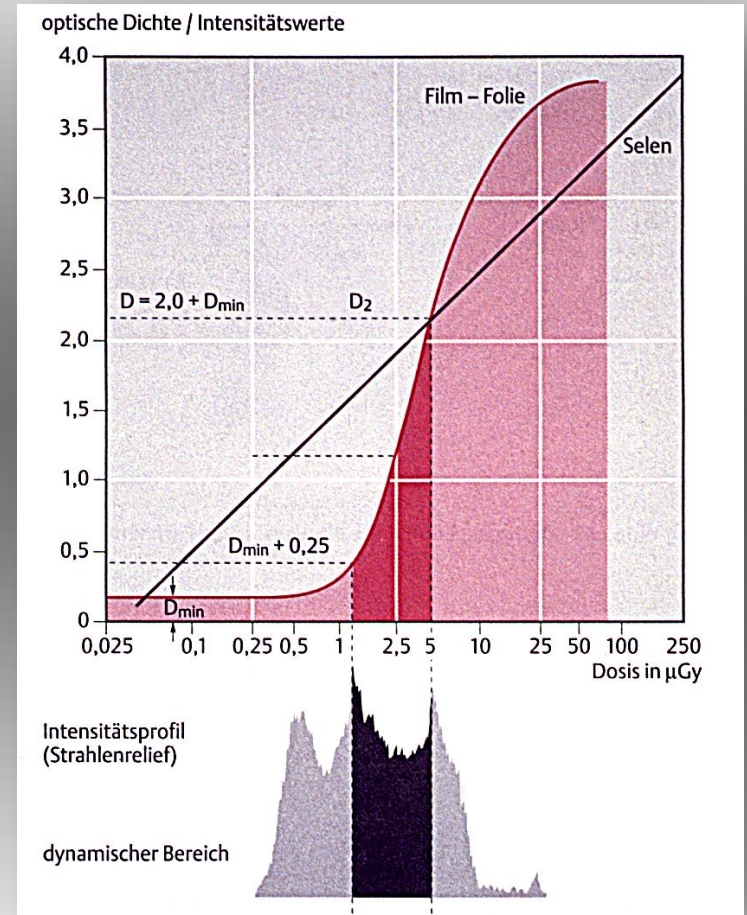
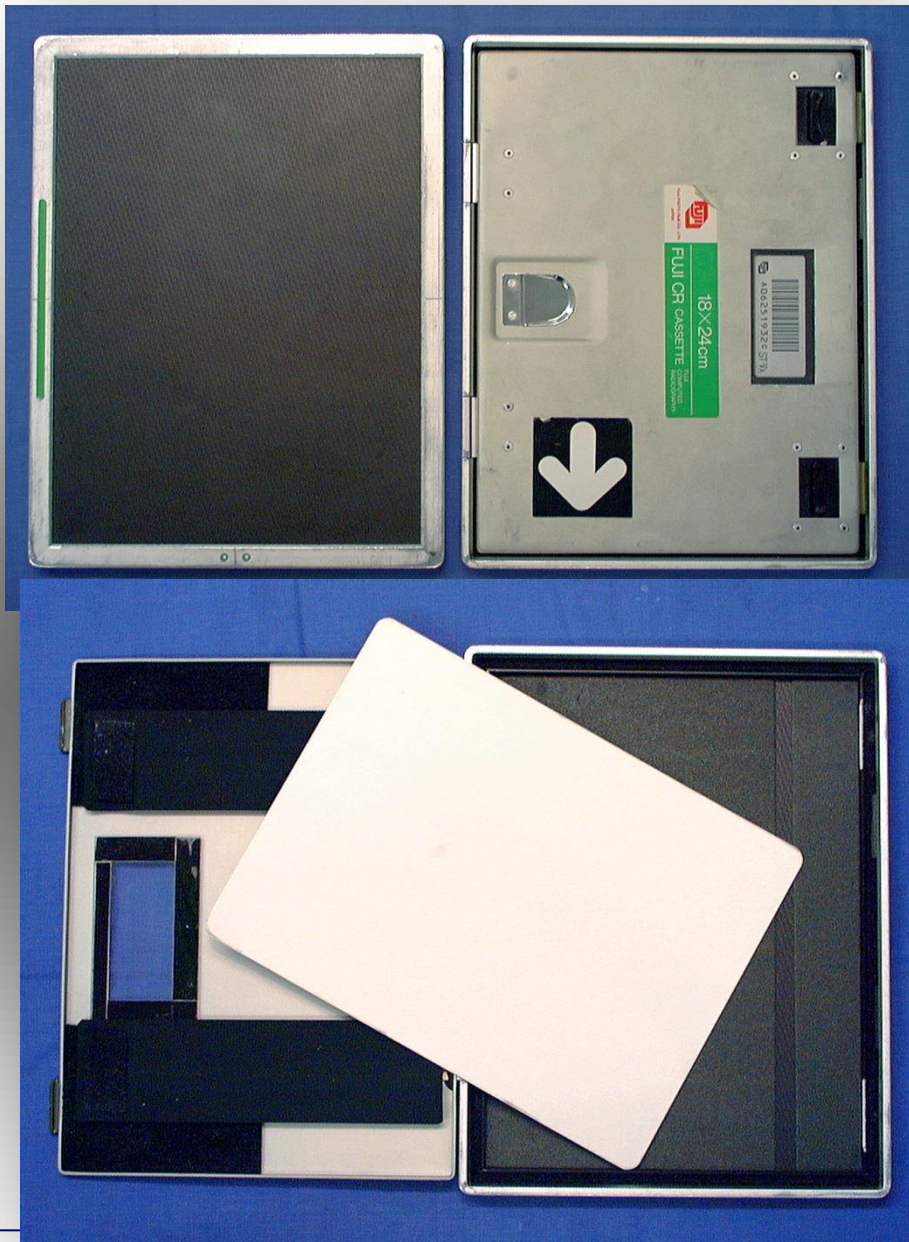


Analoge Mammographie mit Film-Folien-Technik





Digitale Mammographie mit Speicherfolientechnik



Röntgen-Mammographie

Speicherfoliensysteme

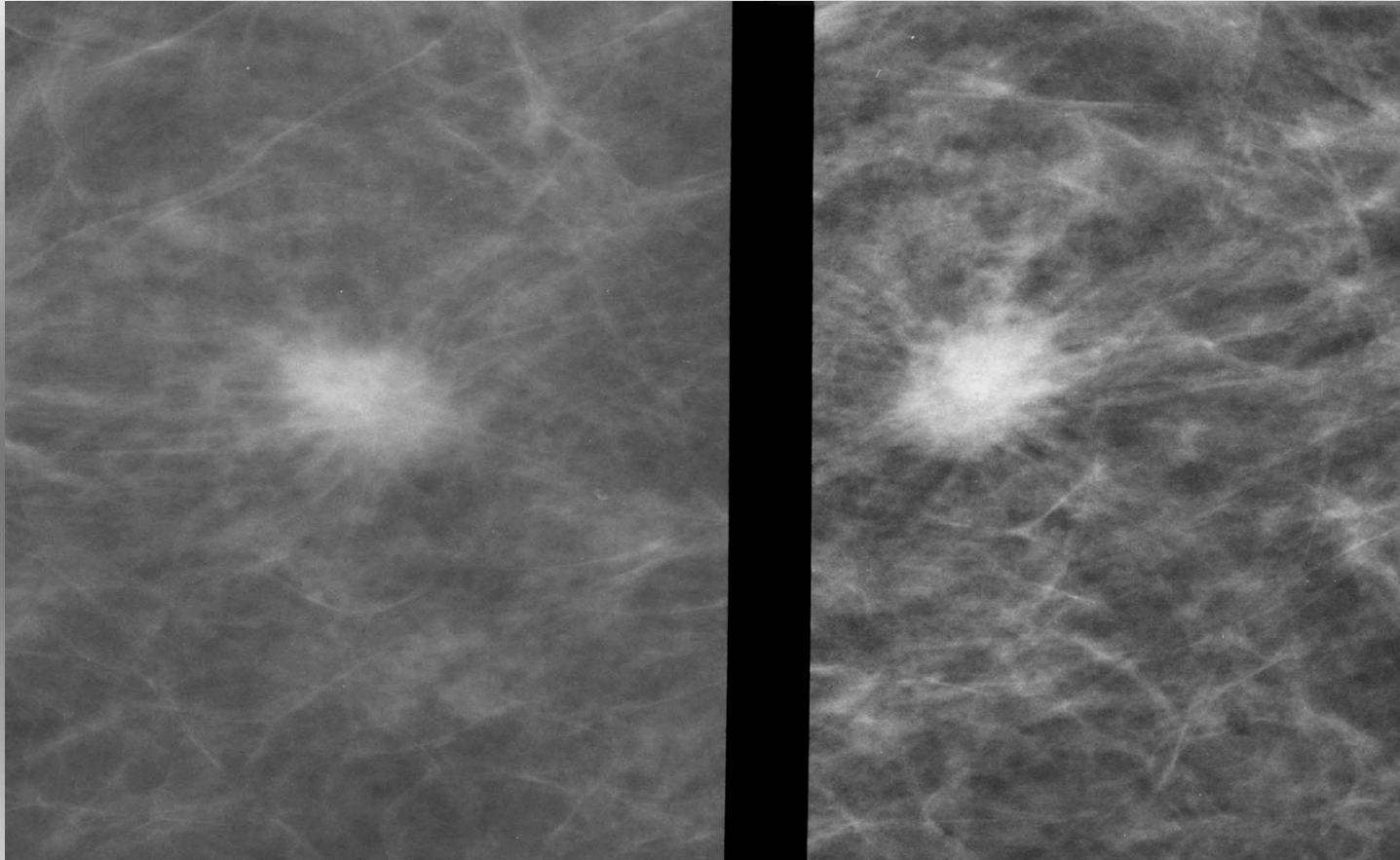
Eigenschaften des Lesegerätes

- Bildqualität
 - 50 µm Pixel-Teilung
 - 10 bit Kontrastauflösung
- Zwei Formate
 - 18 x 24 cm und 24 x 30 cm
- Unkomplizierte Adaption an bestehende Mammographiegeräte
- Hohe Verfügbarkeit
- Gutes Preis-Leistungsverhältnis



Röntgen-Mammographie

Vergleich Film/Folie - digitale Aufnahme

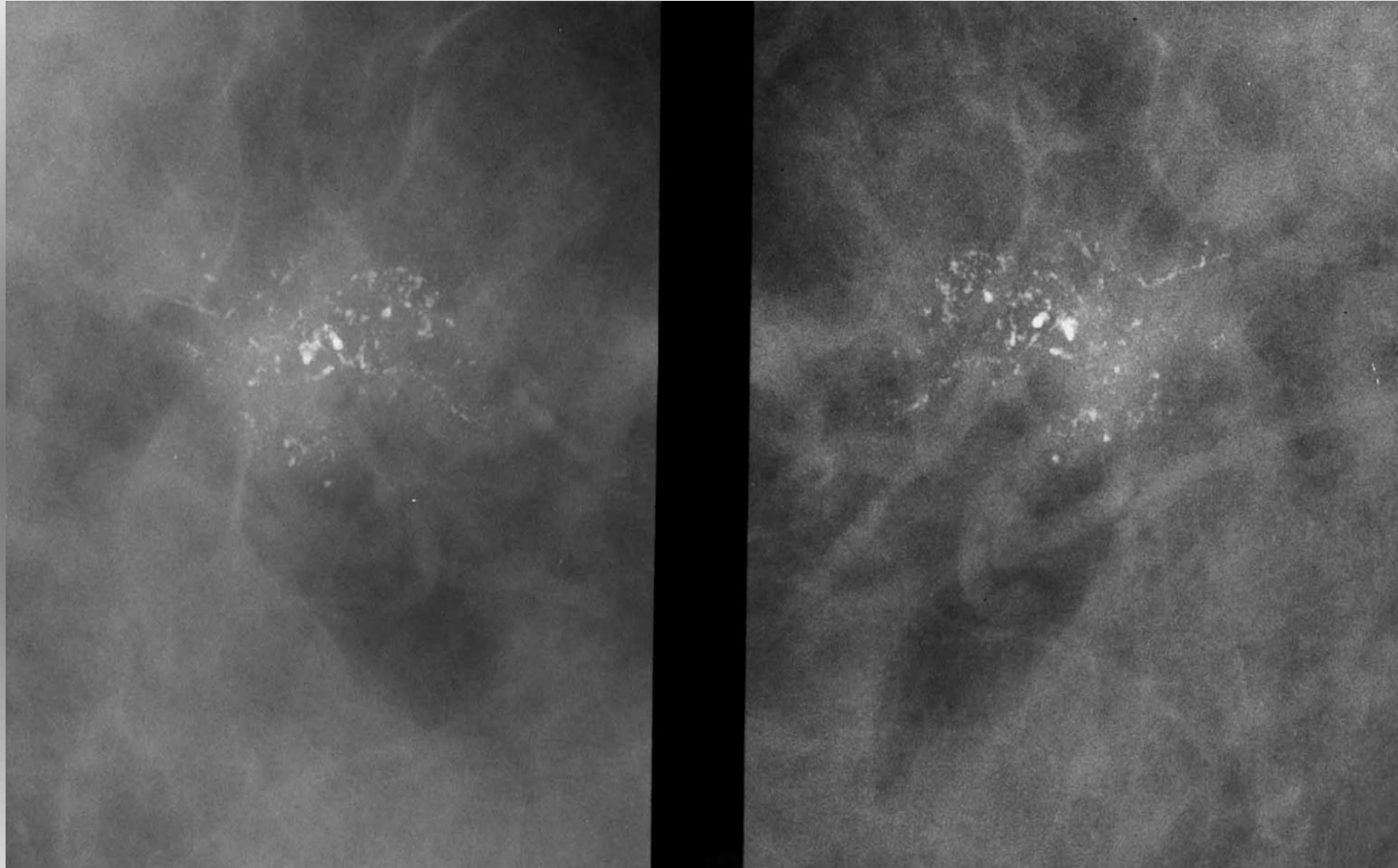


Film/ Folie

digital

Röntgen-Mammographie

Vergleich Film/Folie - digitale Aufnahme



Film/ Folie

Selenium

Röntgen-Mammographie

Abbildungsqualität – die wichtigsten Kenngrößen

Hohe Ortsauflösung

geringe Pixelgröße



Kontrastauflösung

Effektive Quantenausnutzung
(DQE)

Konventionelles
Film-Folien-System

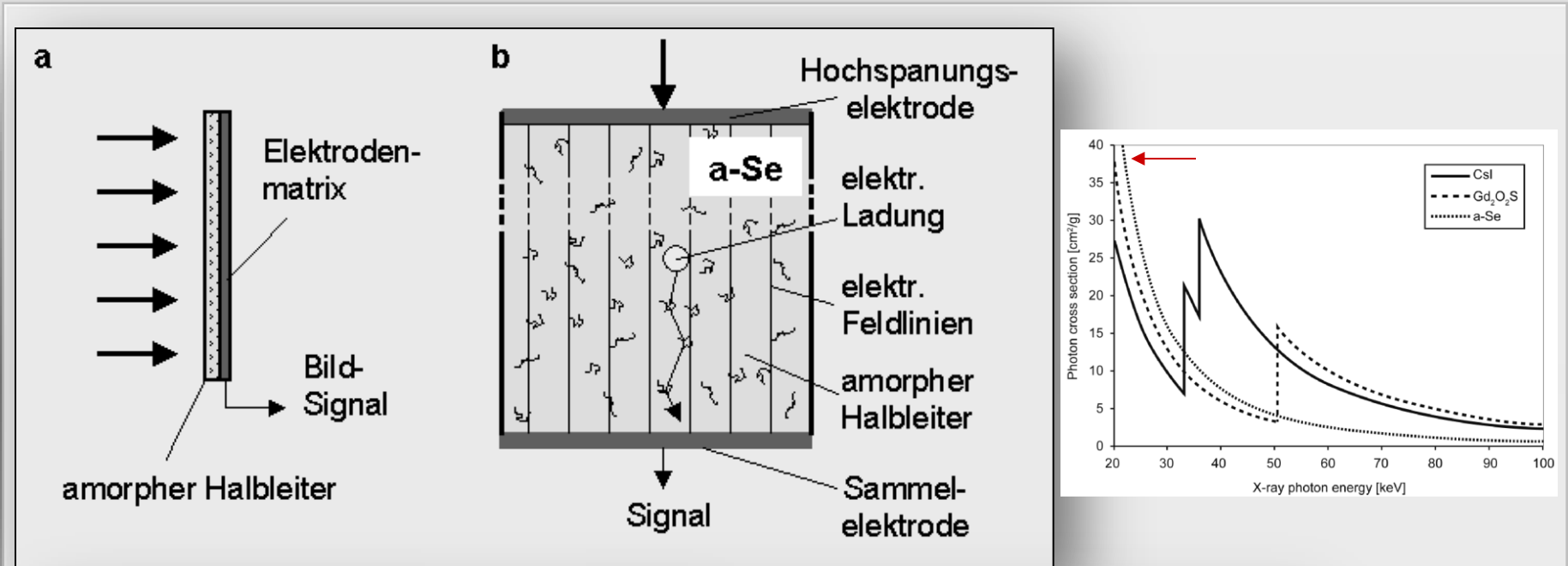
Speicherfolien-
system CR

Digitales Detektorsystem



FD mit direkter Konversion

Prinzip der Bildentstehung



- ❑ Hohe Ortsauflösungen möglich
- ❑ Gute Dosisausbeute (DQE) bei niedrigen Energien (kV)
- ❑ Geringere Dosisausbeute (DQE) bei Energien (kV) im Bereich der Skelettradiographie

Röntgen-Mammographie

- Befunde -

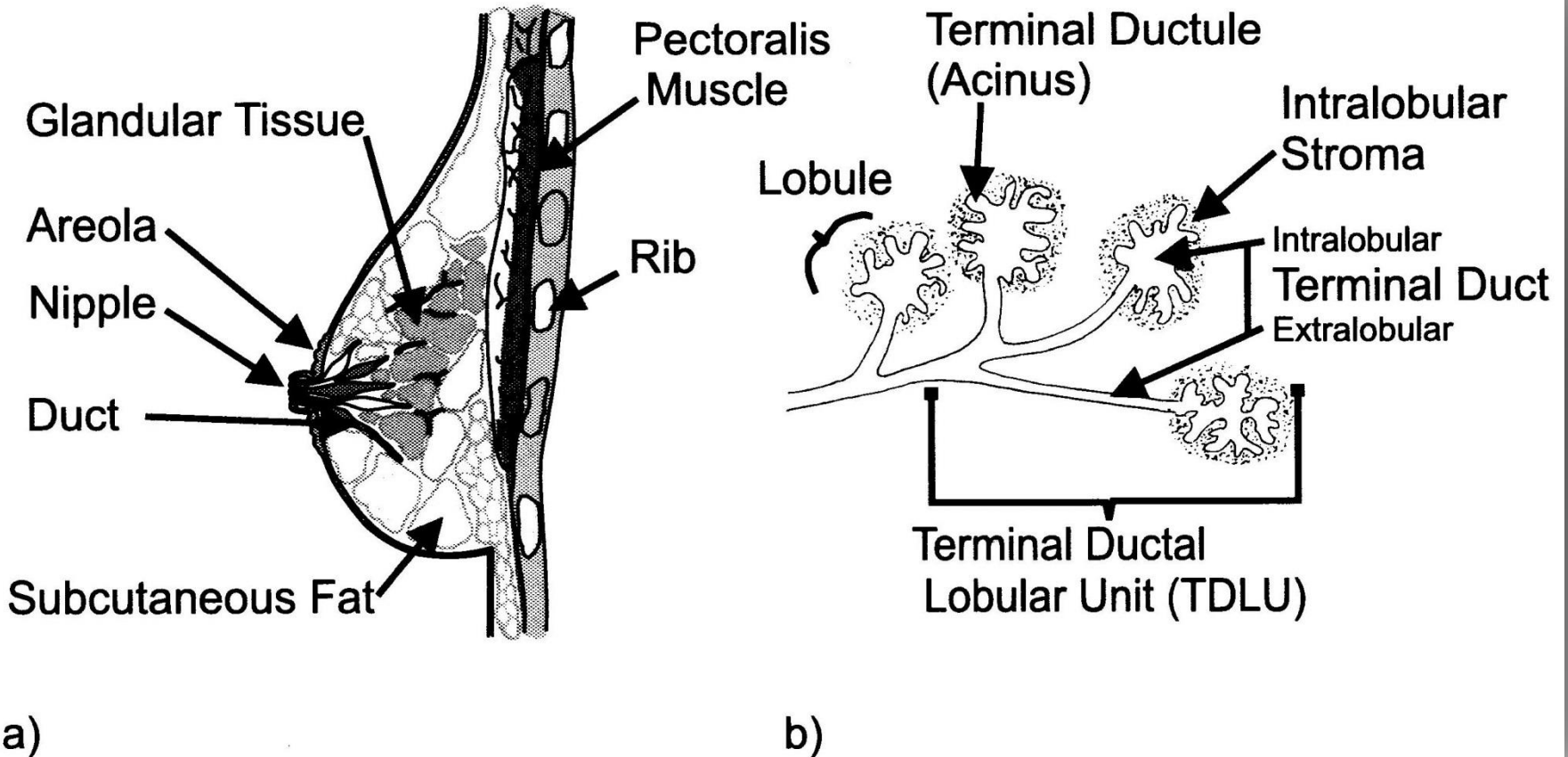
- **Normalbefund**

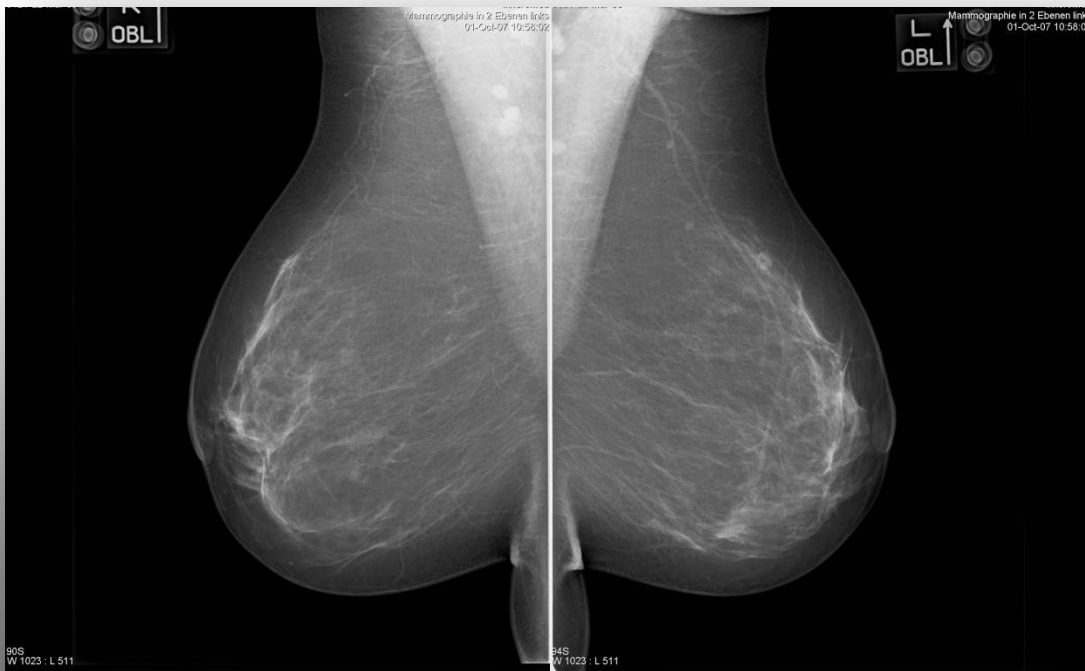
- Drüsengewebe
- Fettgewebe
- Cooper-Ligamente
- Gefäße
- Lymphknoten

- **Pathologische Befunde**

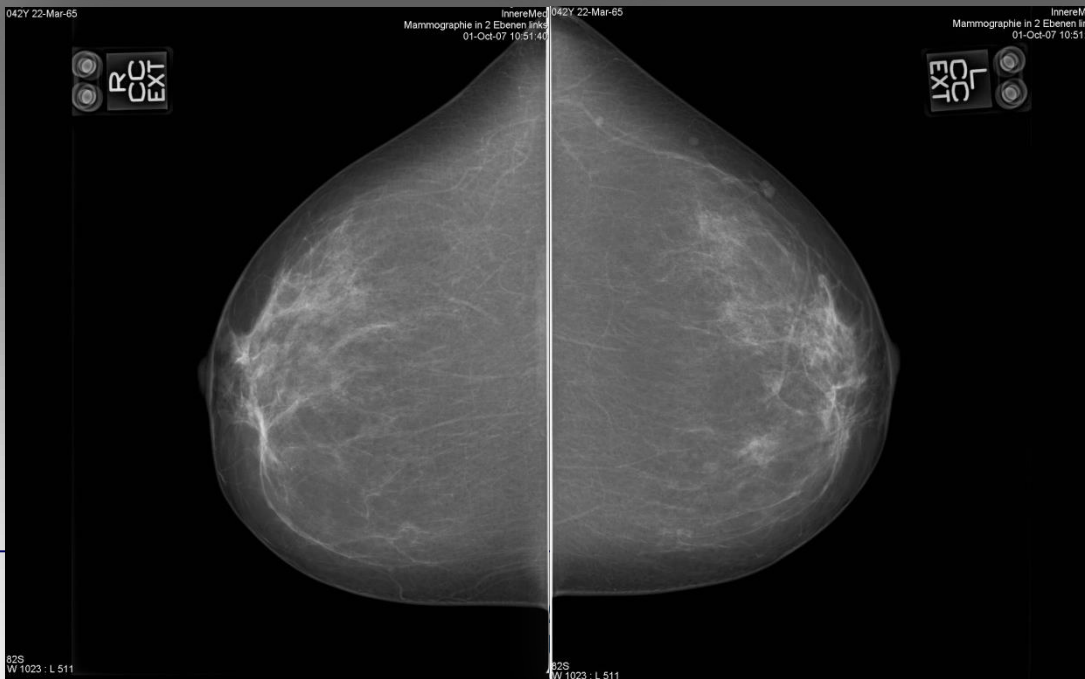
- Herdbefunde
- Verkalkungen
- Architekturstörung
- Fremdkörper

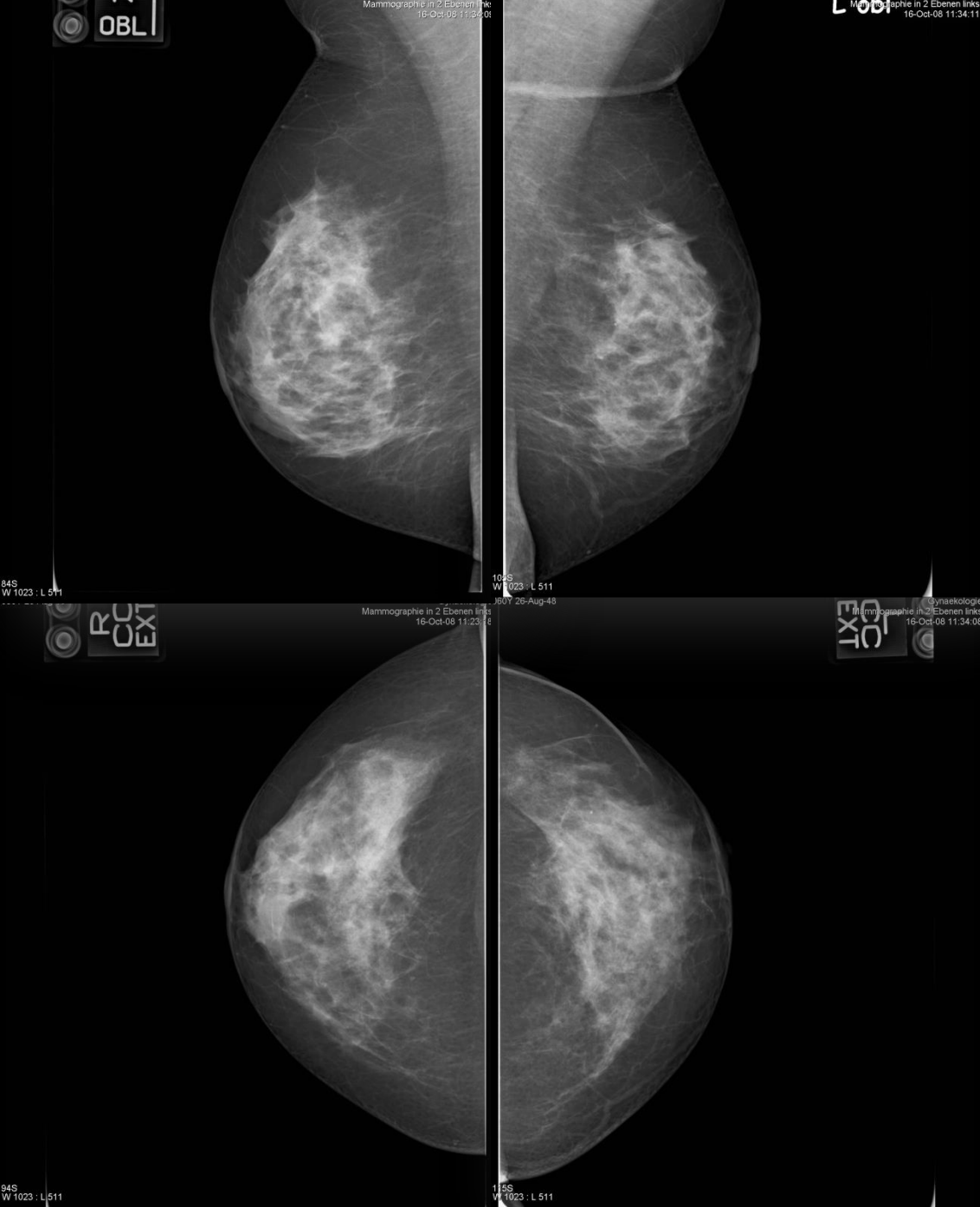
Darzustellende Mamma-Strukturen



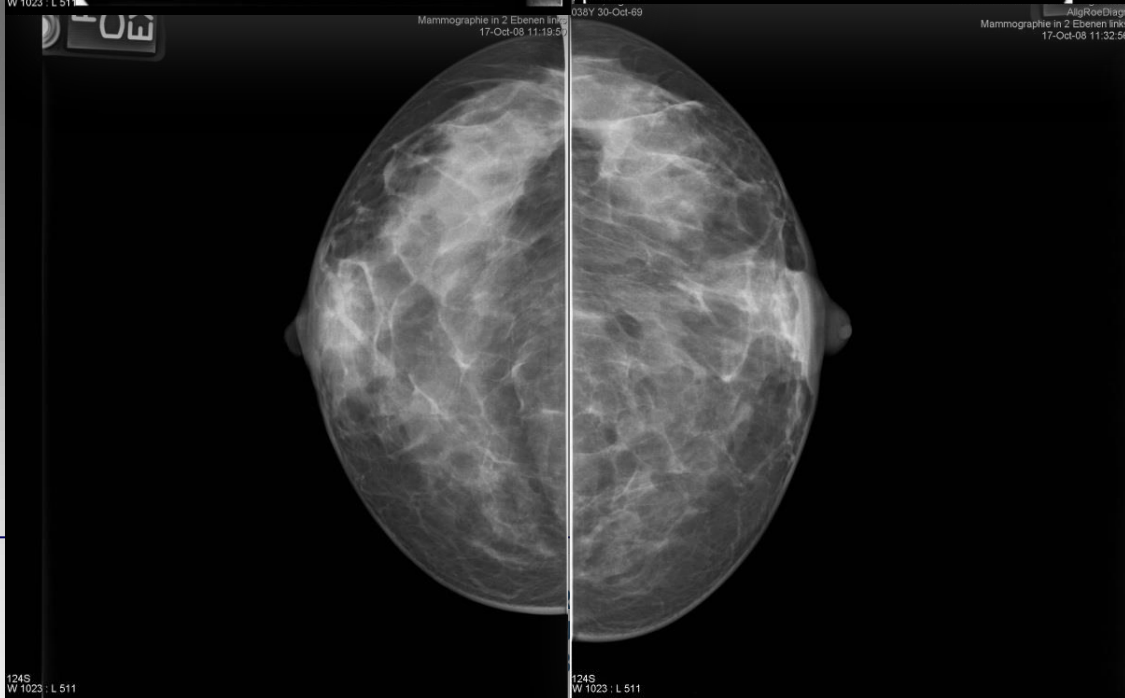
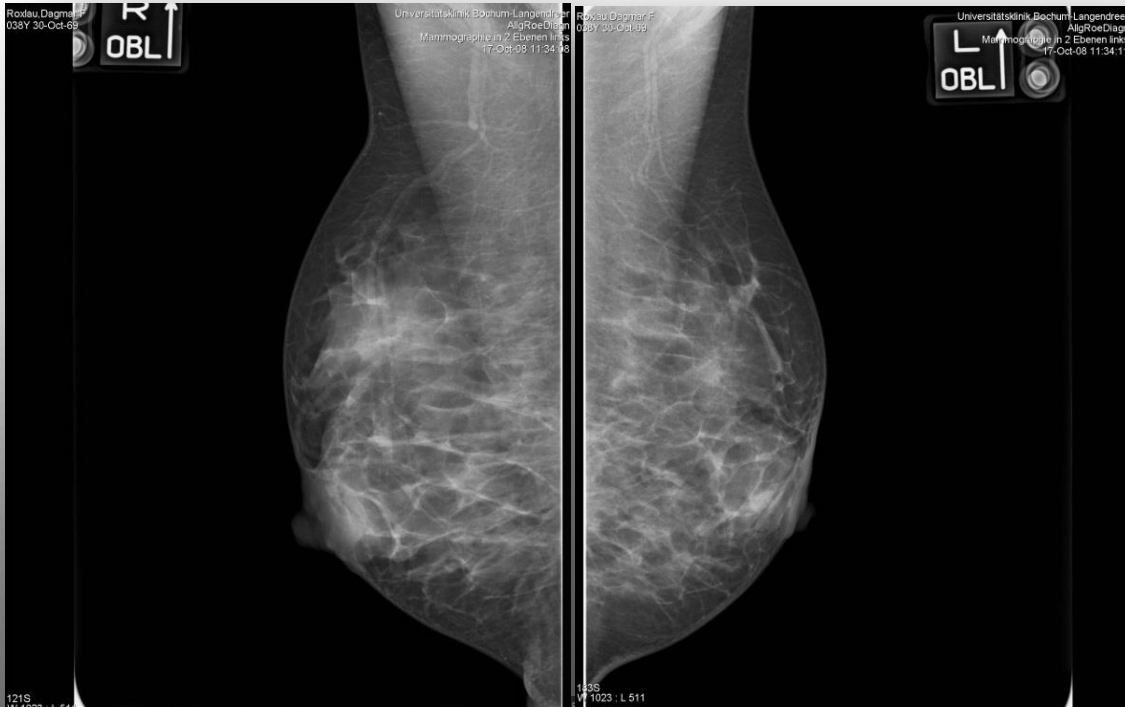


Normal Befund:
Ältere Patientin (70 J.)
ACR I





Normal Befund:
Mittelalte Patientin (50 J.)
ACR II



Normal Befund:
Junge Patientin (30 J.)
ACR III

Benign Breast Lesions



Frequency

- **Cyst**
- **Fibroadenoma**
- **Papilloma**
 - Noncalcified
 - Associated with coarse calcifications
 - Associated with irregular microcalcifications
- **Breast abscess**
- **Cystosarcoma phyllodes**
 - Benign
 - High grade
- **Juvenile papillomatosis**
- **Intramammary lymph node:** may be metastatic or “reactive” in eczema, RA, sarcoidosis
- **Sebaceous cyst**

most frequent

least frequent

Figure 61. Benign breast lesions listed by frequency of occurrence. *RA* = rheumatoid arthritis.

Malignant Breast Lesions

Frequency

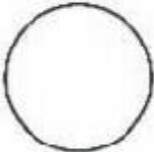
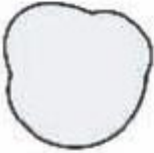

- **Invasive ductal carcinoma, NOS**
- **Invasive breast cancers with special features**
 - Mucinous carcinoma
 - Medullary carcinoma
 - Papillary carcinoma
- **DCIS – intracystic carcinoma**
- **Recurrence on the mastectomy side**
- **Pathologic intramammary lymph node**
 - Breast cancer
 - Lymphoma
- **Metastases to the breast**
 - Malignant melanoma
 - Lung cancer
 - Kidney cancer
 - Lymphoma

most frequent

least frequent

Figure 60. Malignant breast lesions listed by frequency of occurrence. *NOS* = not otherwise specified.

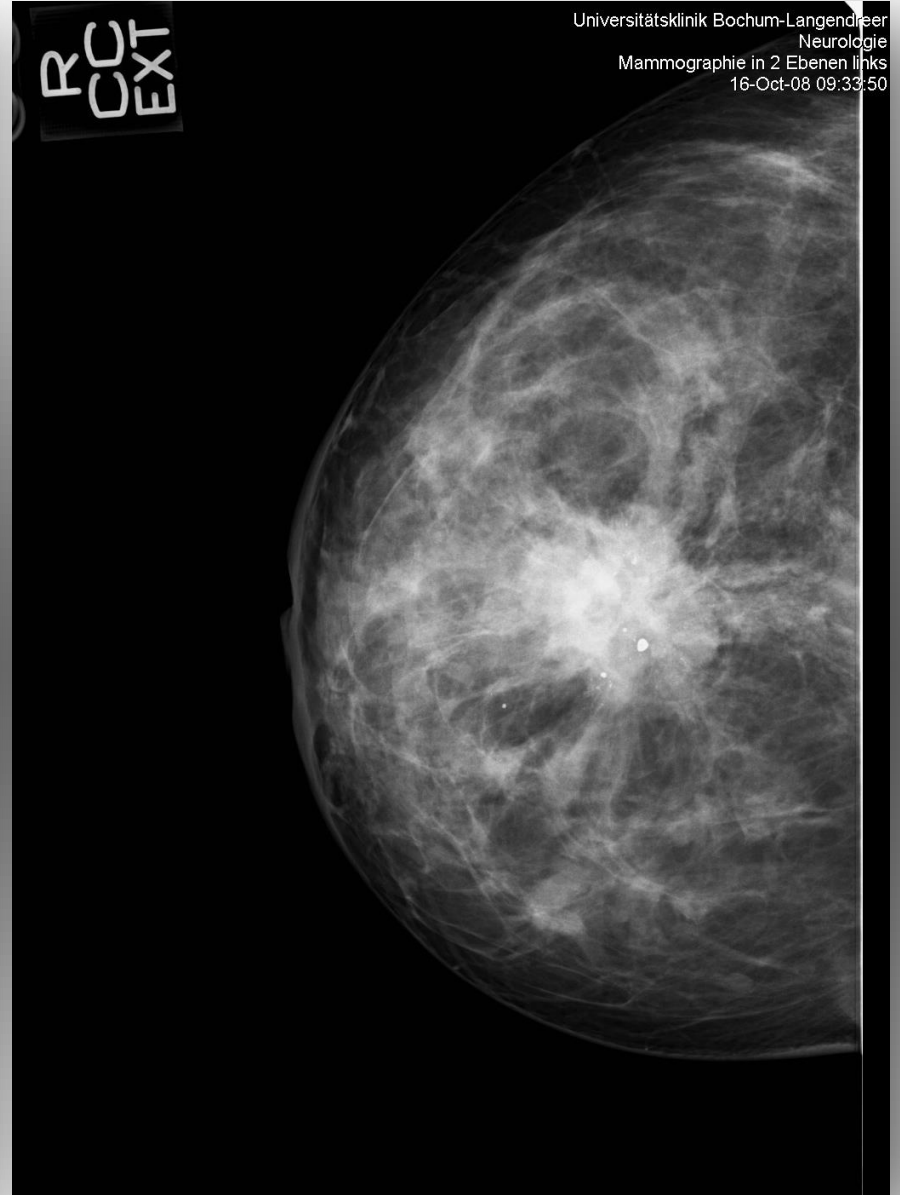
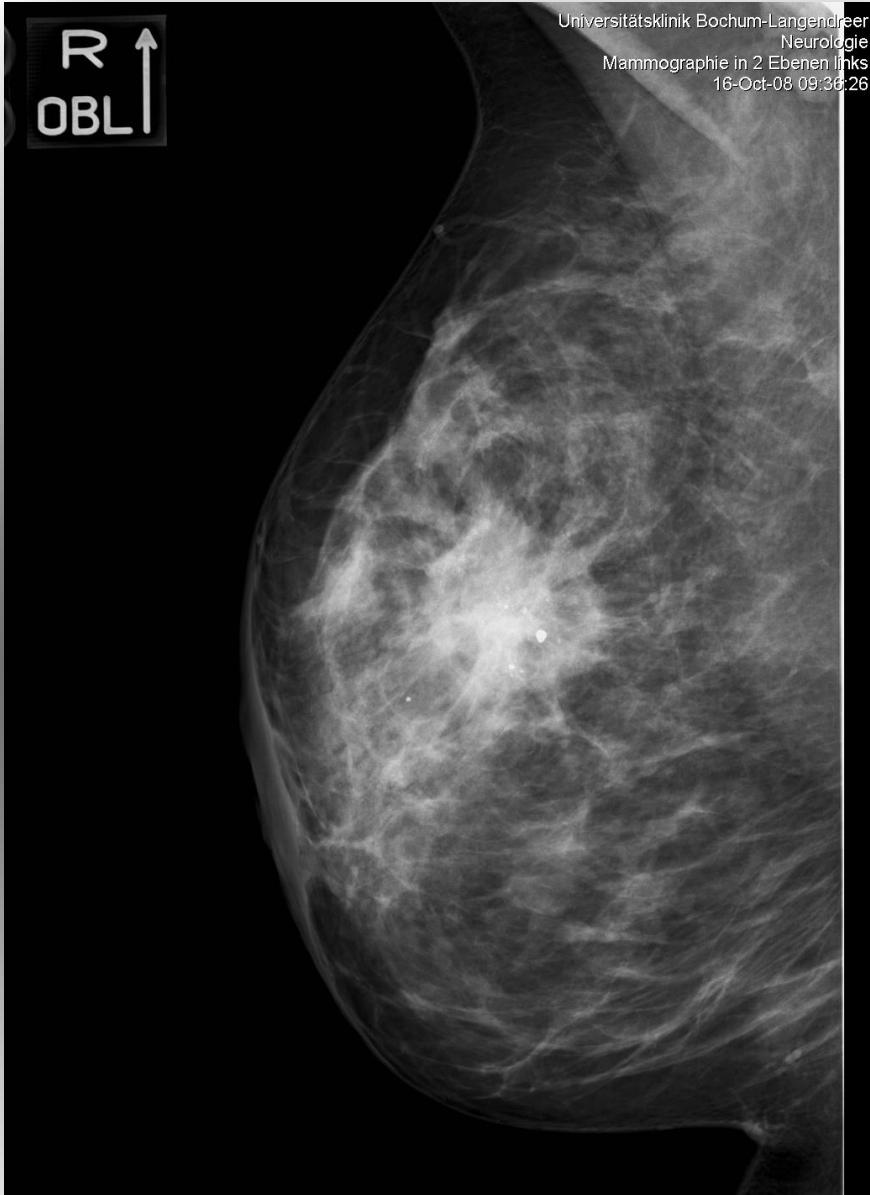
Morphologie und Konsequenzen der Herdbefunde

Circular/oval shaped mass	Mammo work-up suggests	Ultrasound	Intervention		
			Fine needle aspiration	Core biopsy	Surgical biopsy
	Benign	+ (cyst)	+ (after consultation with patient)	-	-
	Benign	+ (solid)	-	+	After consultation with patient
	Malignant	+	+	+	+

b.
B = fine-needle aspiration biopsy. (b) Selection of diagnostic tools for

Konsequenzen:

- 1 Jeder Herdbefund sollte sonographisch kontrolliert werden.
- 2 Jede nicht zystische Läsion sollte bioptisch abgeklärt werden (bei mammo-graphisch benignen Läsionen Verlaufskontrollen möglich).

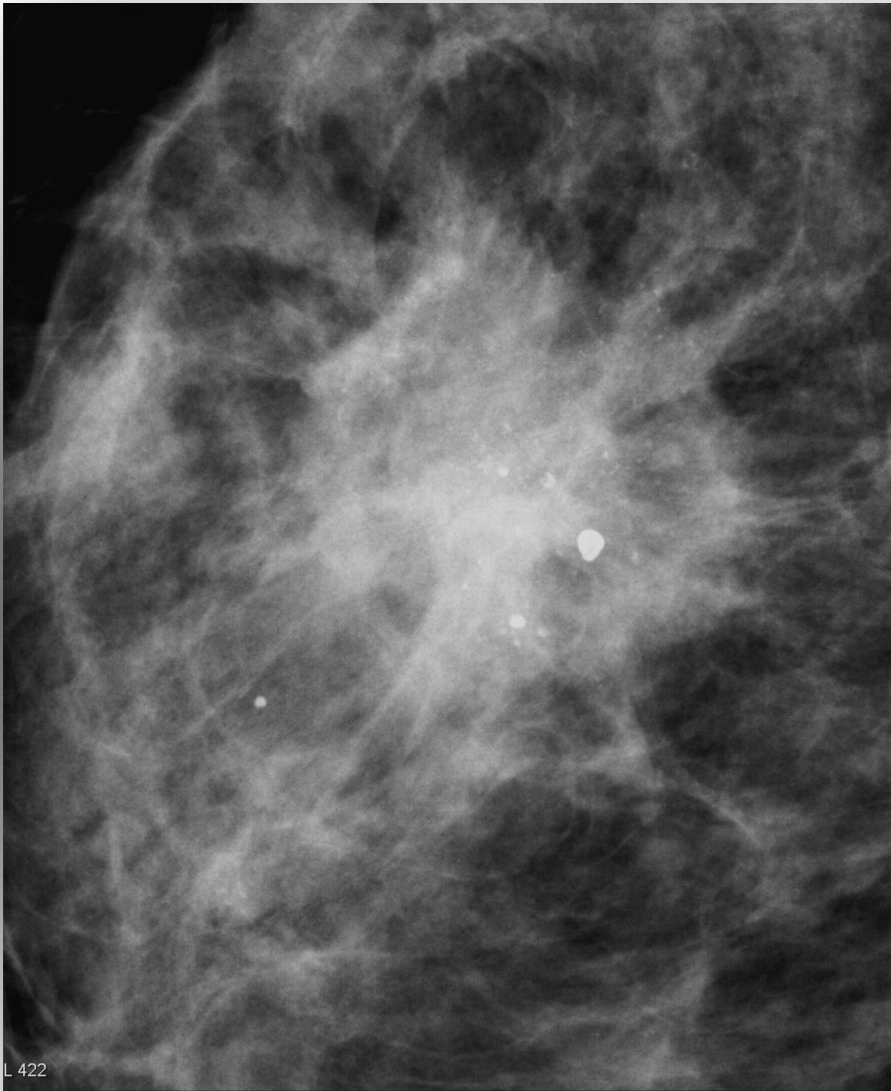


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Herdbefund mit

- Vermehrter Dichte
- Unregelmäßigem Rand
- Spikulae
- Polymorphen Verkalkungen

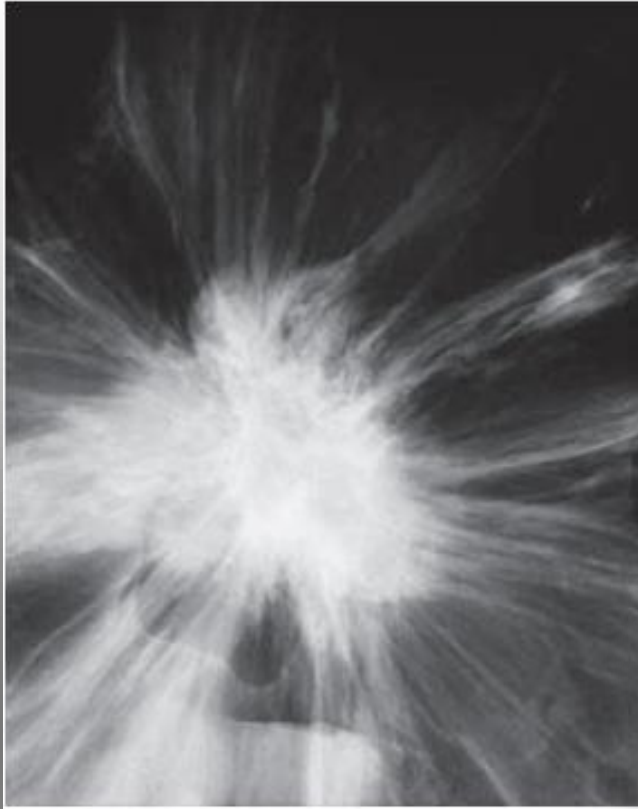


Figure 7. Mammographic image of an invasive ductal carcinoma, showing the central tumor mass with surrounding spiculations.

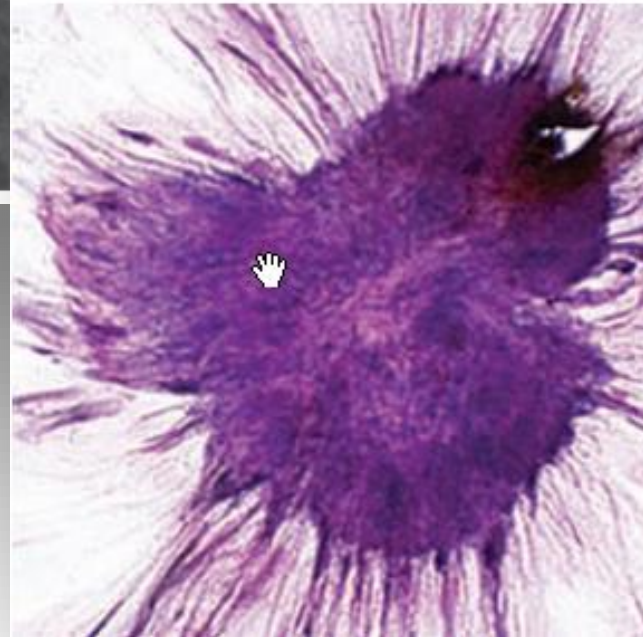
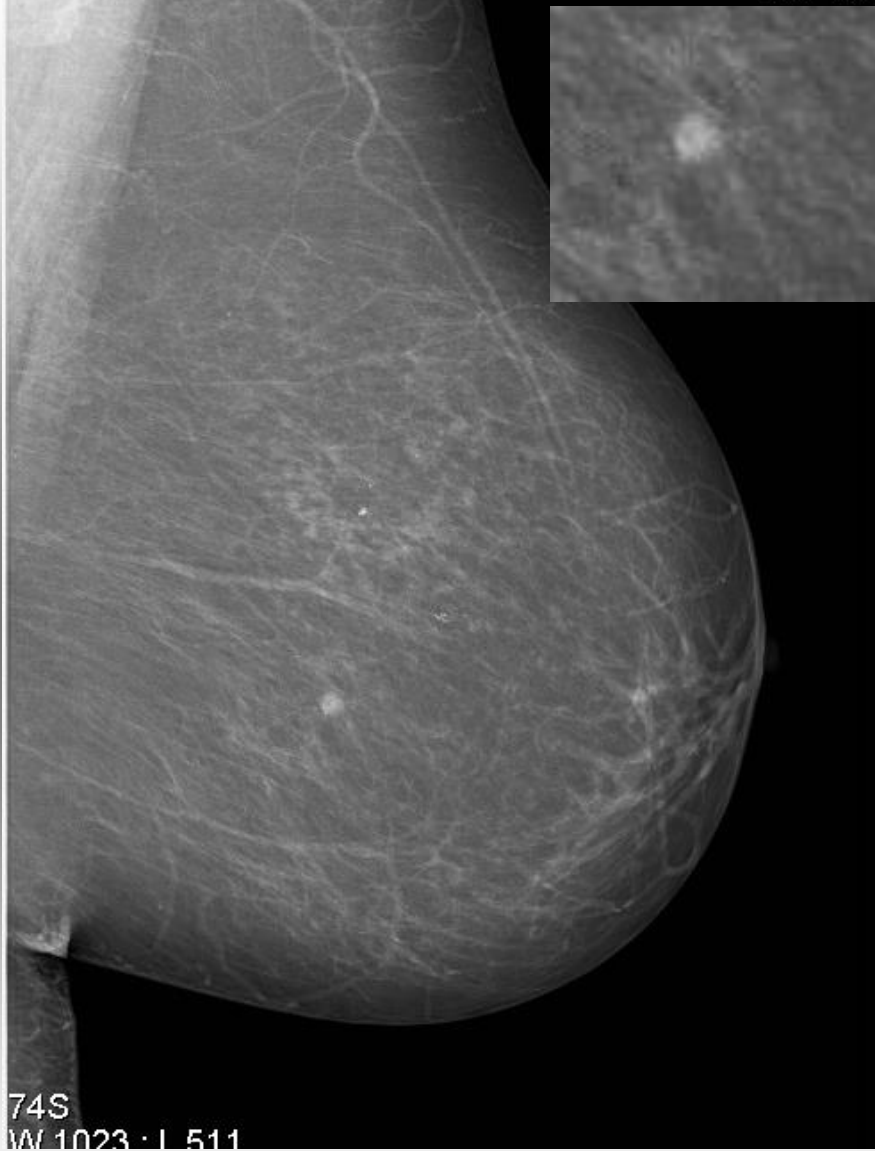


Figure 8. Subgross histologic image of invasive ductal carcinoma. Note the defect from core biopsy. (Hematoxylin-eosin [H-E] stain; original magnification, $\times 5$.) (Reprinted, with permission, from reference 1.

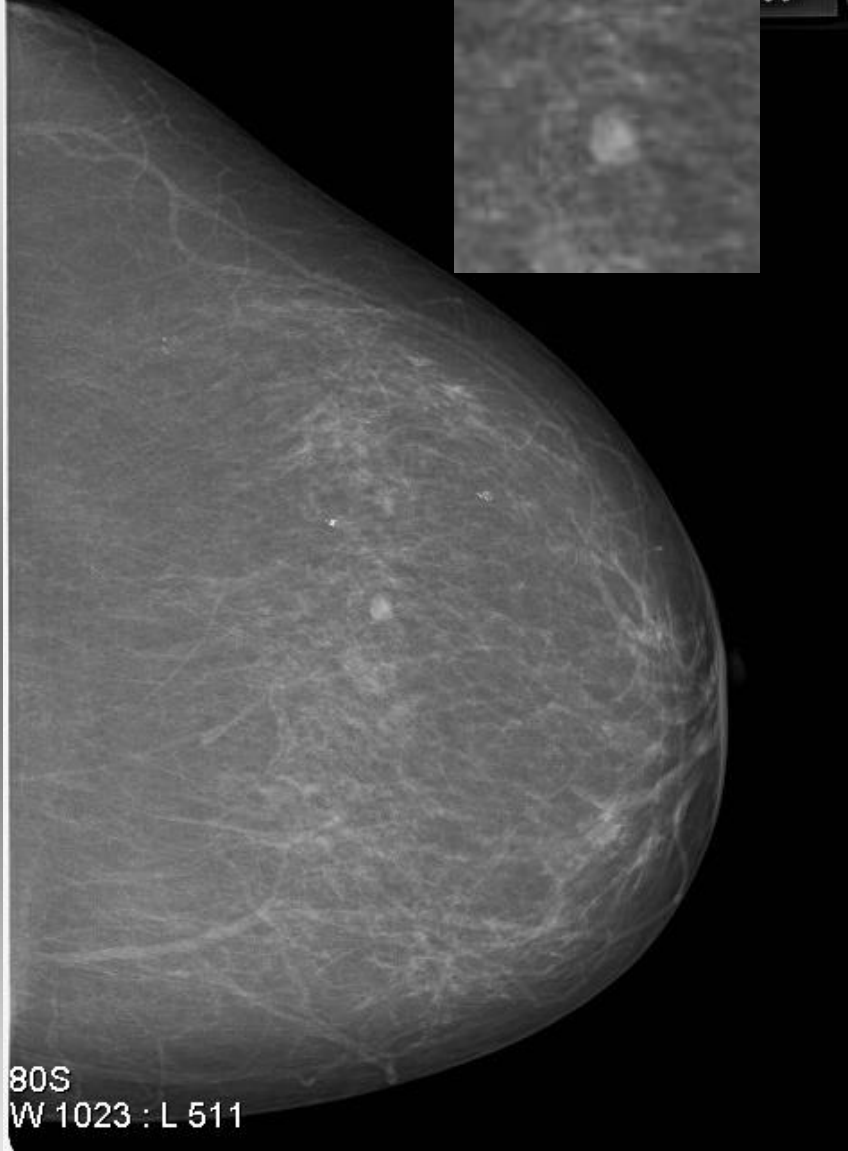
064 Y 10-Aug-42

Gyn
Mammographie in 2 Eb
15-Feb-07

Mammographie in 2
15-Feb-07



74S
W 1023 : L 511



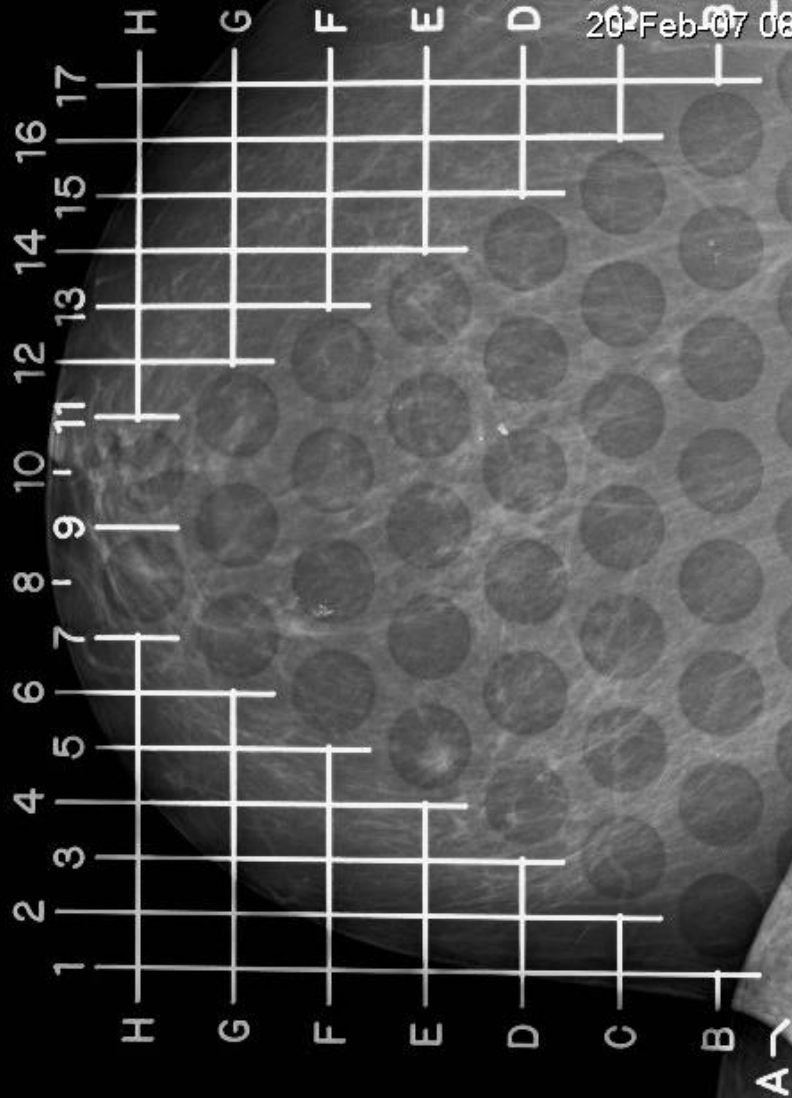
80S
W 1023 : L 511

0-Aug-12

Gynaekologie

Mammo Drahtmarkierung links

20-Feb-07 08:41:31



20-Feb-07



96S
W 1023 : L 511

BASAL

Präparater
20-Fe

MEDIAL

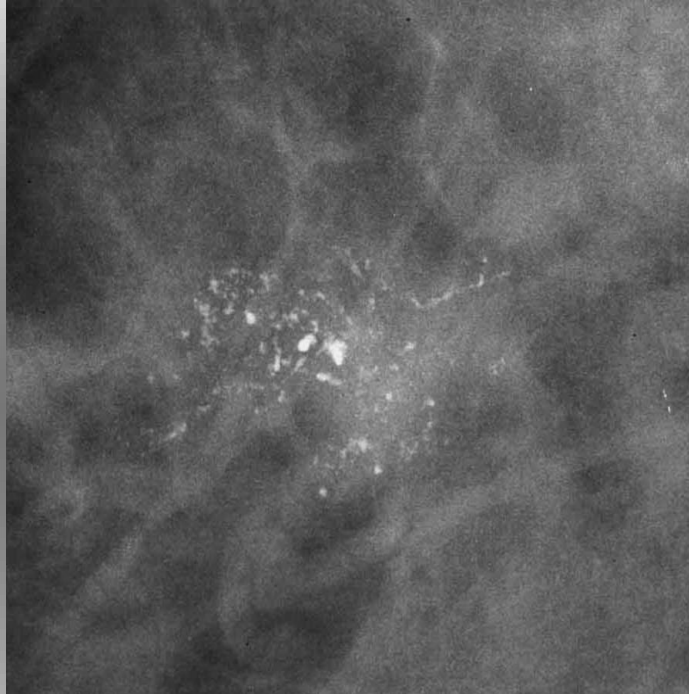
LATERAL



Präparatradiogramm

Mikrokalzifikationen

- Mamma-Ca -



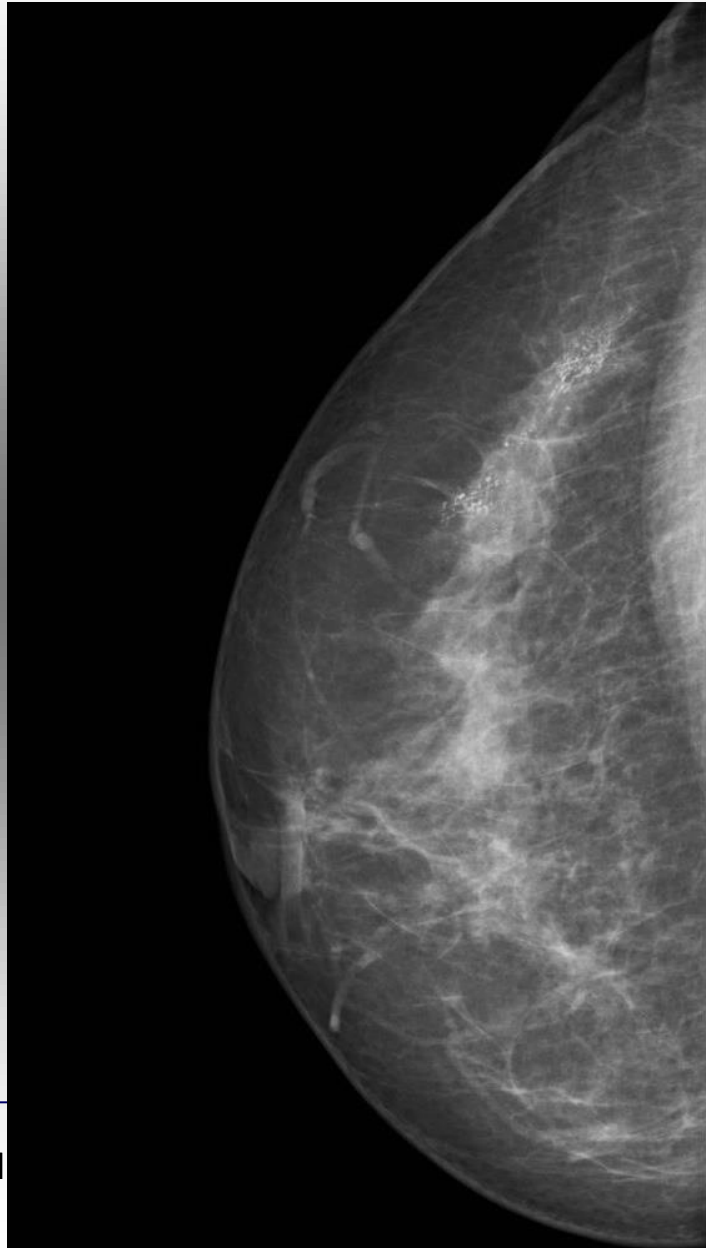
Polymorphe Verkalkungen =

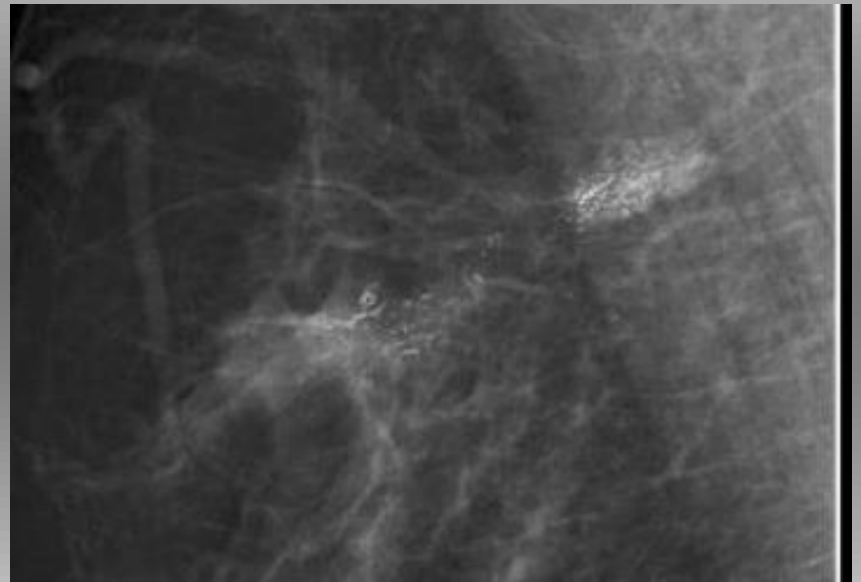
- Variable Geometrie +
- Variable Größe

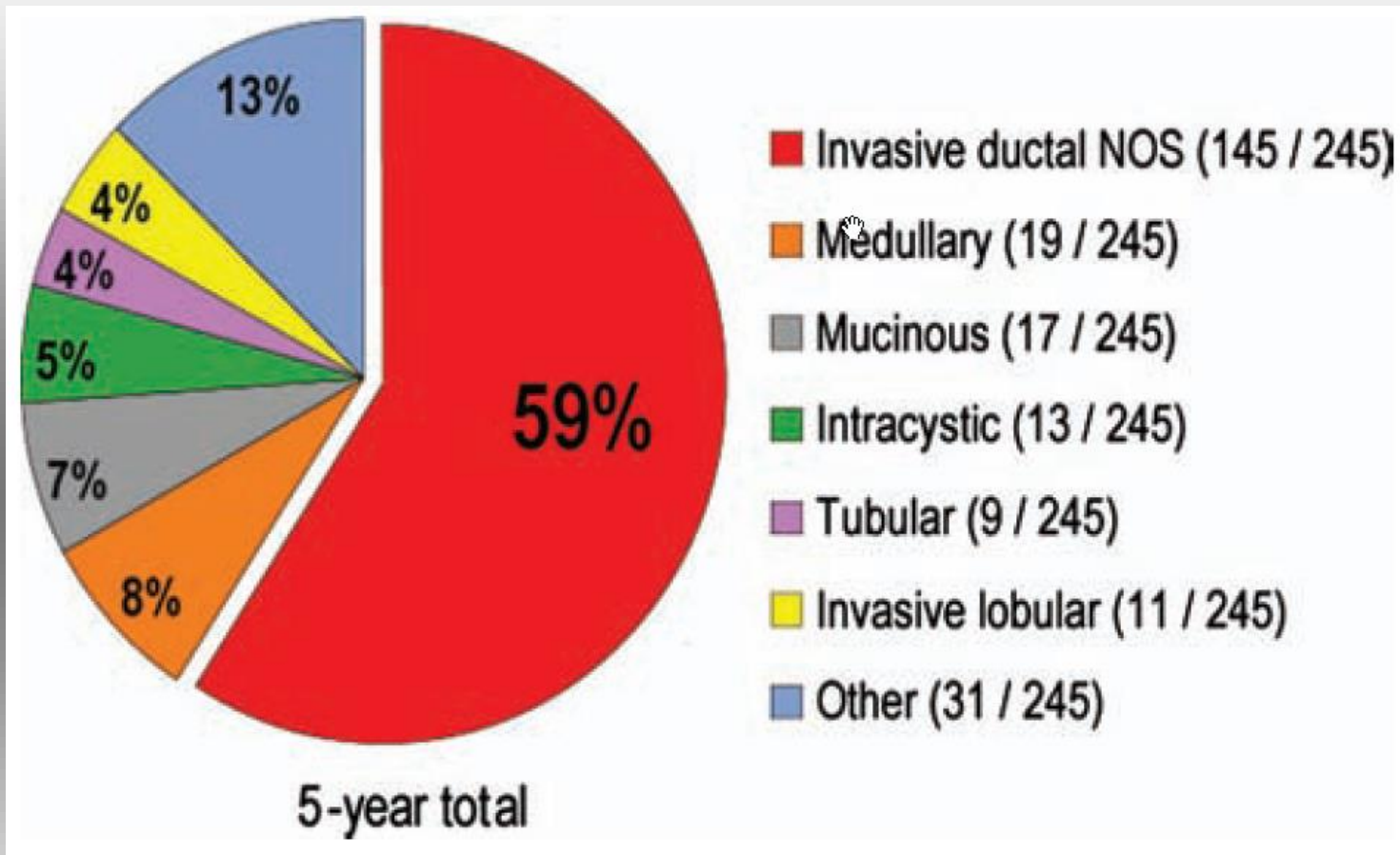
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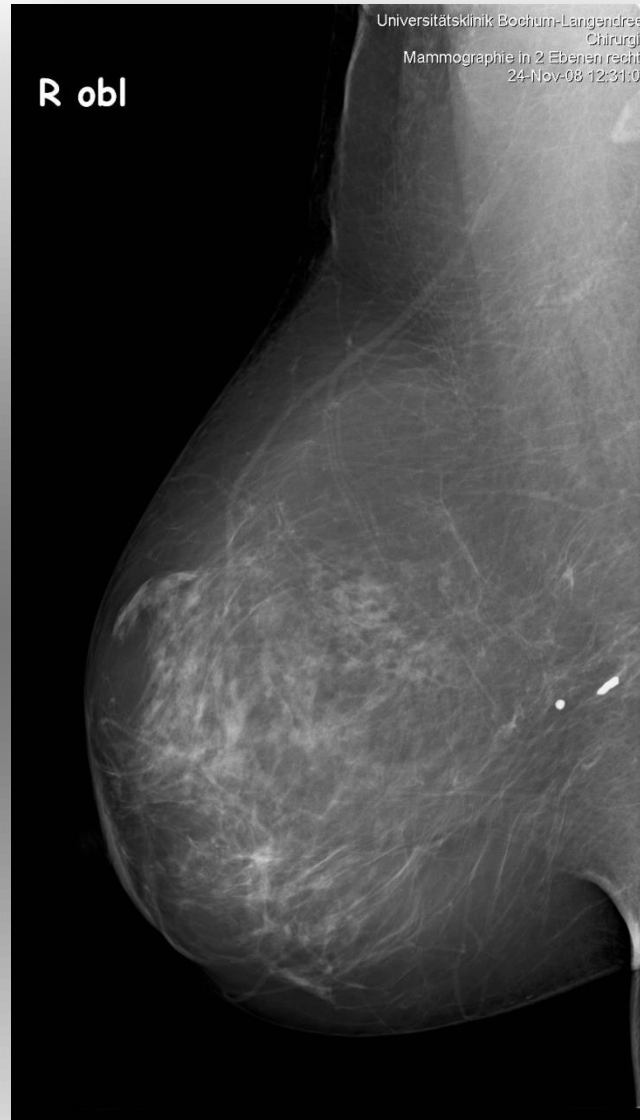
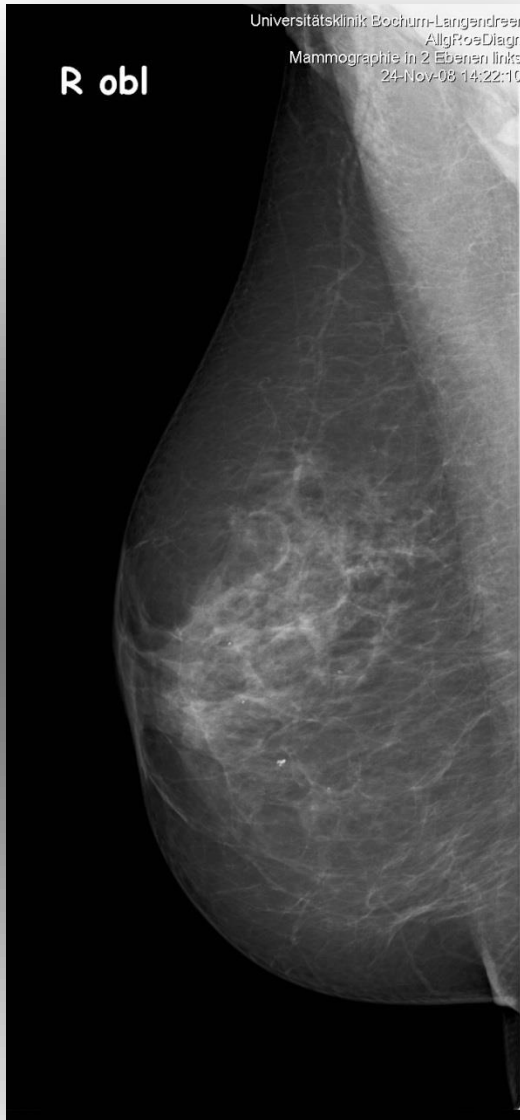
Ductal Invasives Karzinom

Duktales Carcinoma in situ (DCIS)



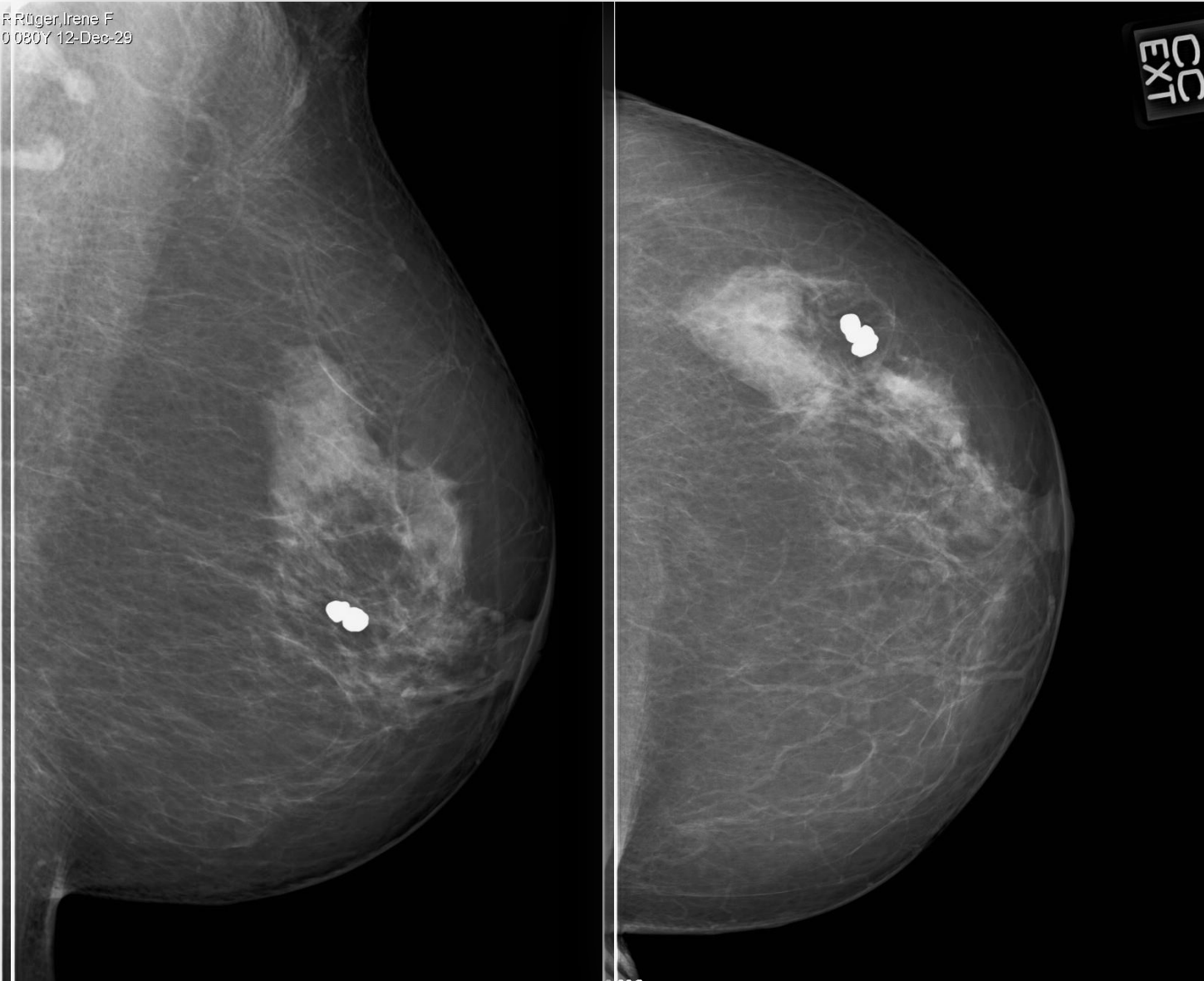






Benigne Verkalkungen

F Rüger Irene F
0 0807 12-Dec-29



**Verkalktes
Fibroadenom**

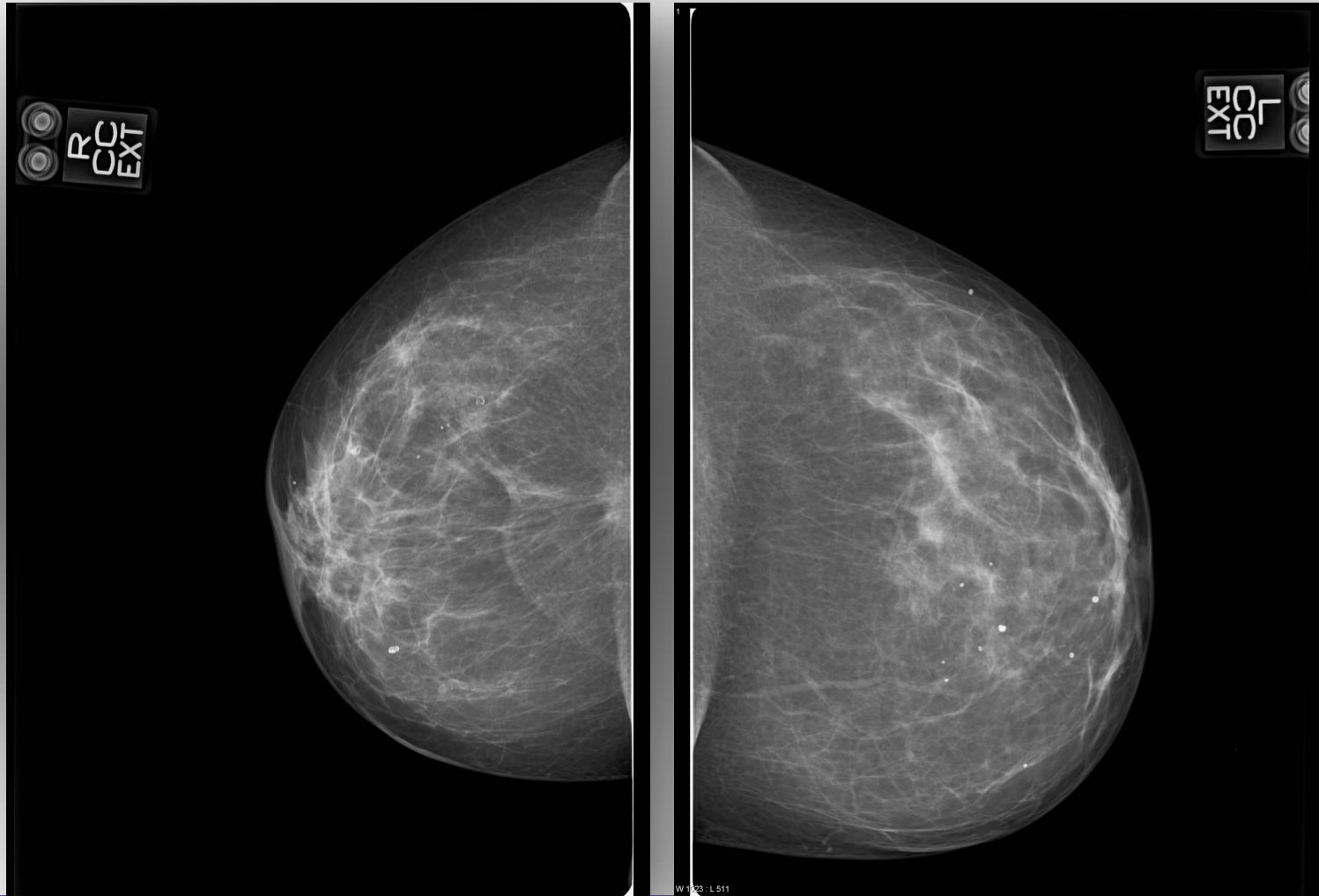
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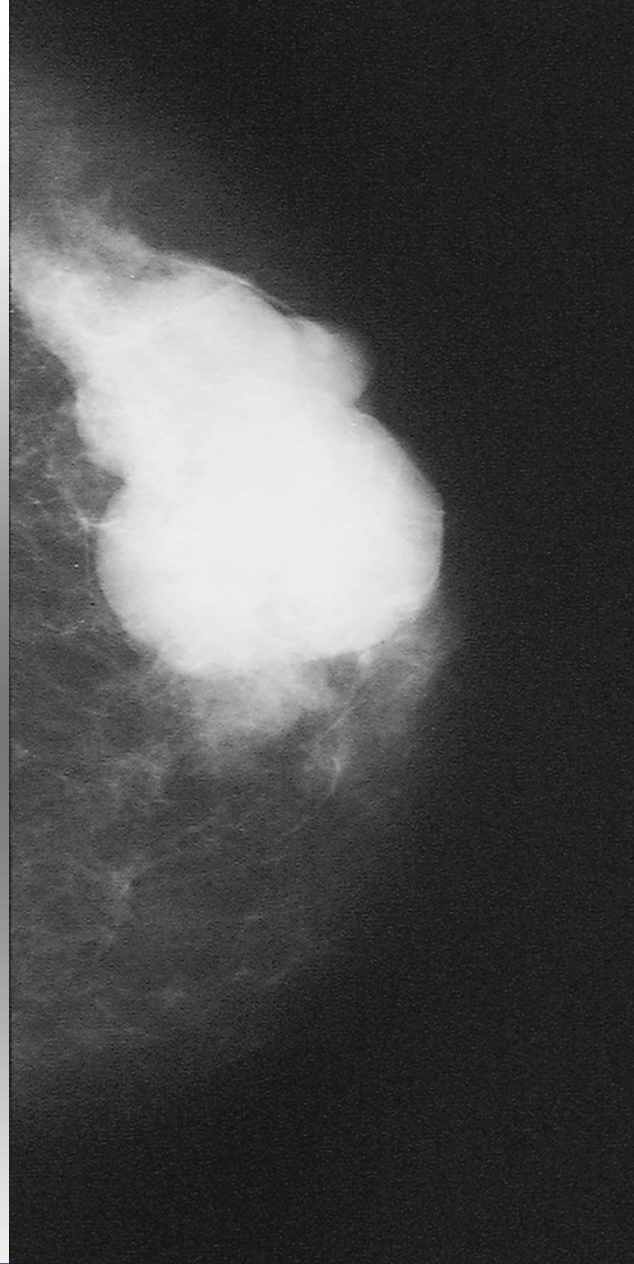
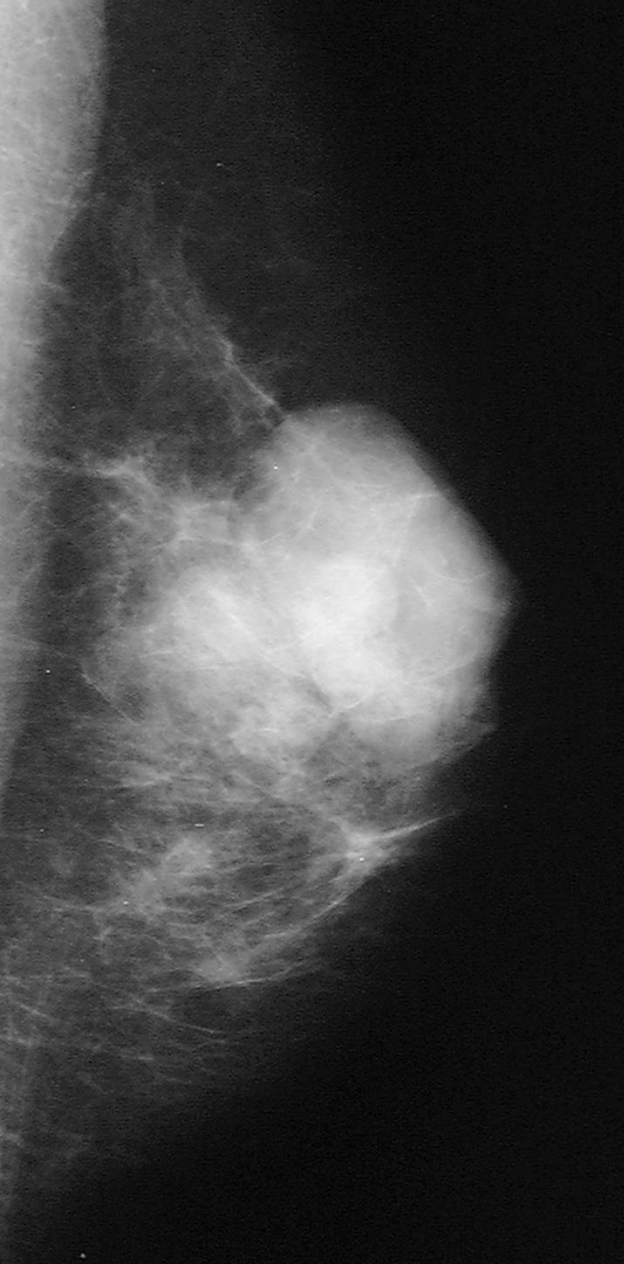
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Liponekrosen





- Große Dichte
- Glatte Begrenzung
- Verdacht auf Cyste

**Weitere Abklärung
durch Sonographie**

Sonographie:

echoarm / echofrei

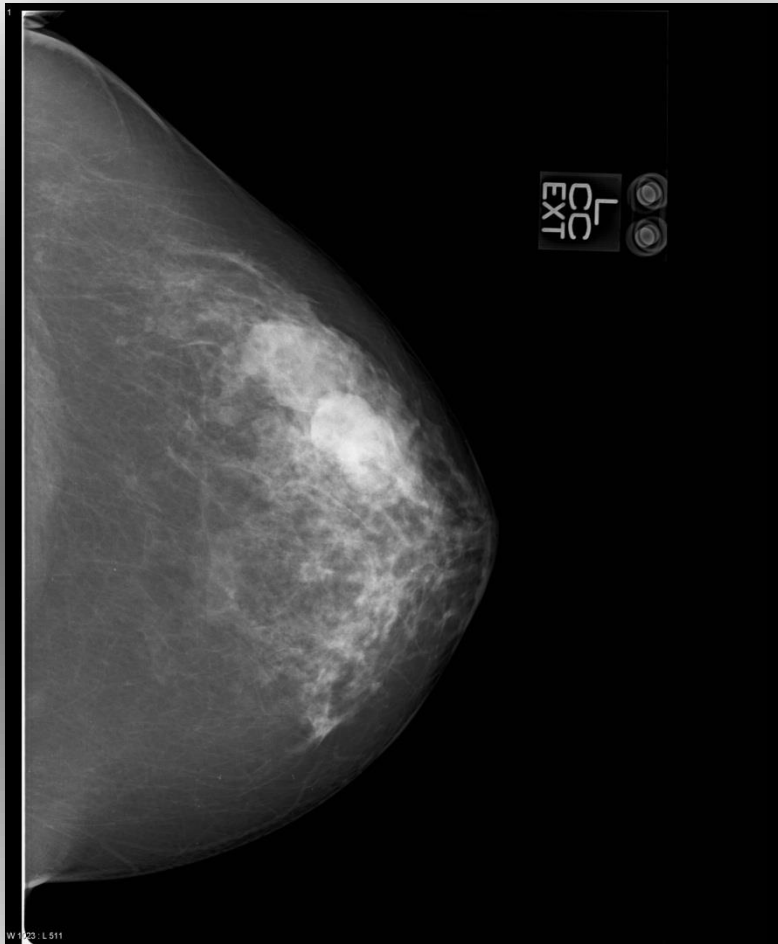
dorsale Schallverstärkung

laterale Randechos

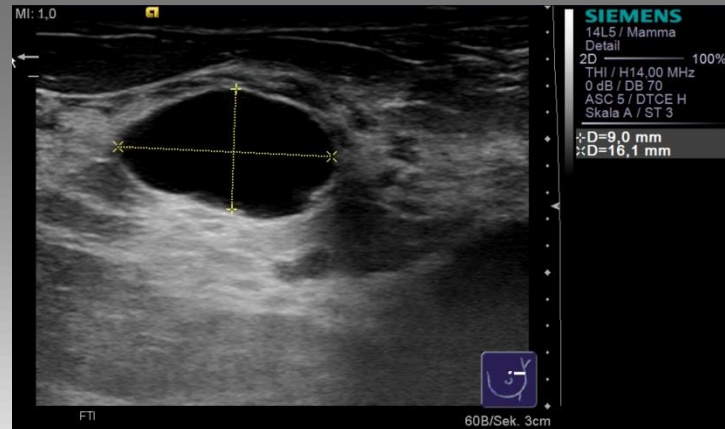
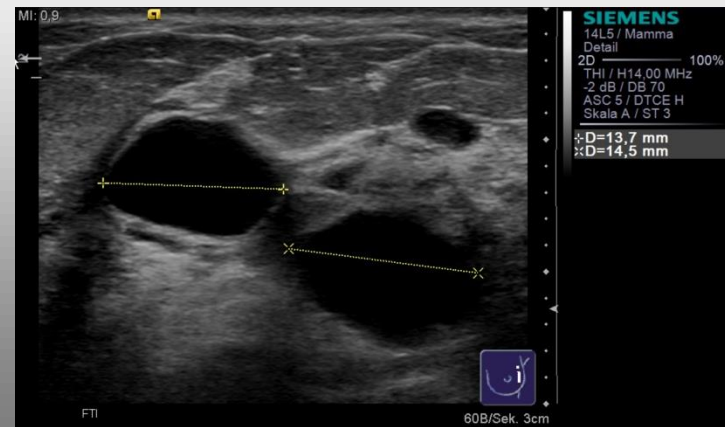
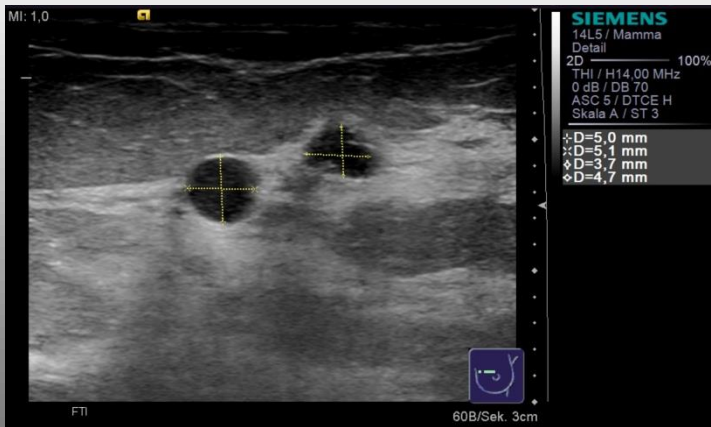
= Mammacyste

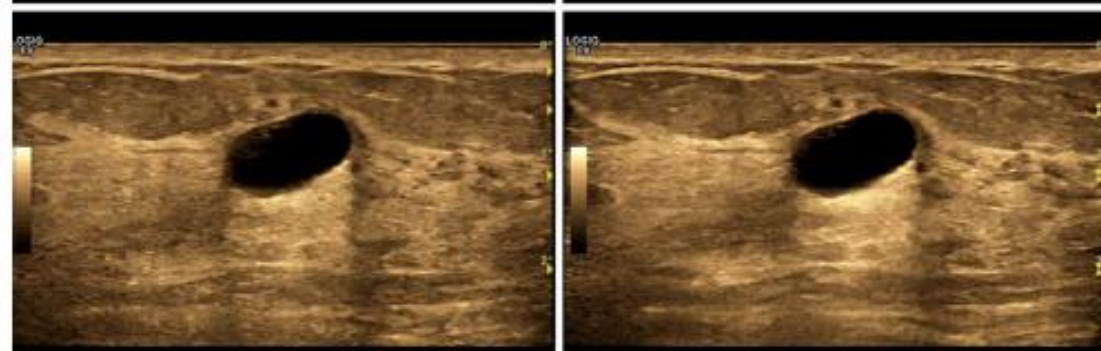
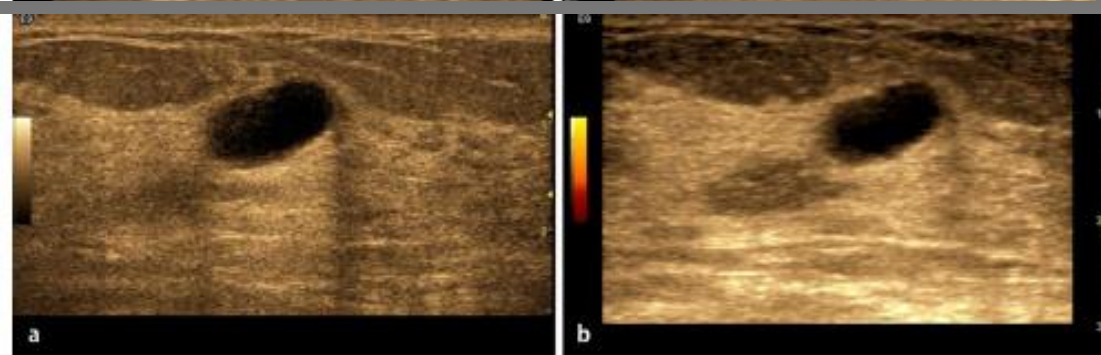
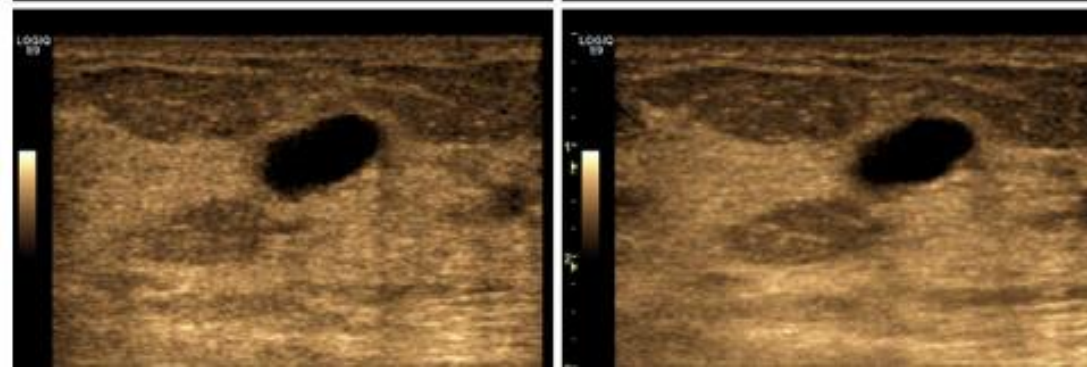
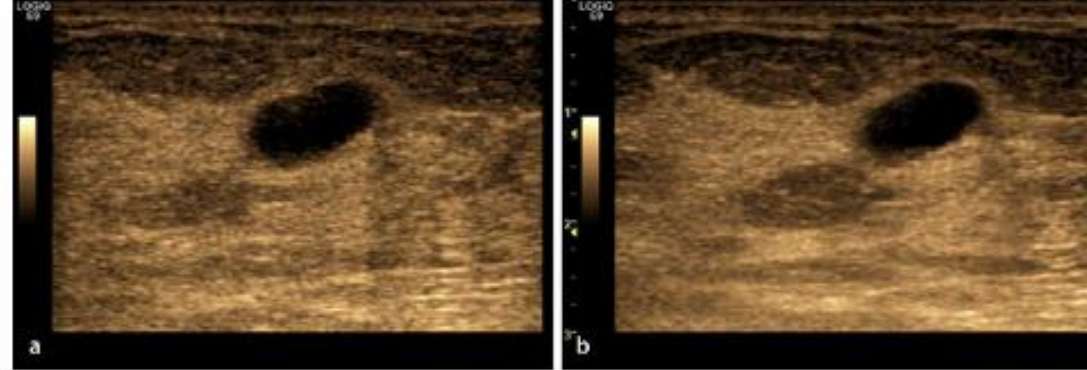


Mamma Zysten



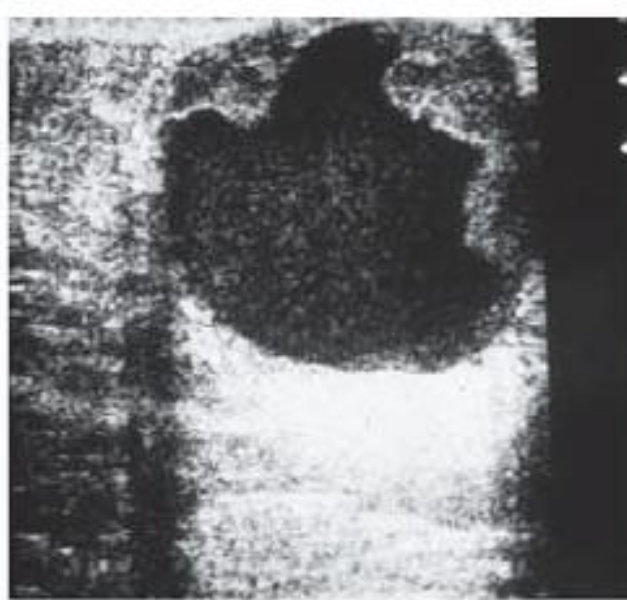
Mamma Zysten





9 MHz

15 MHz



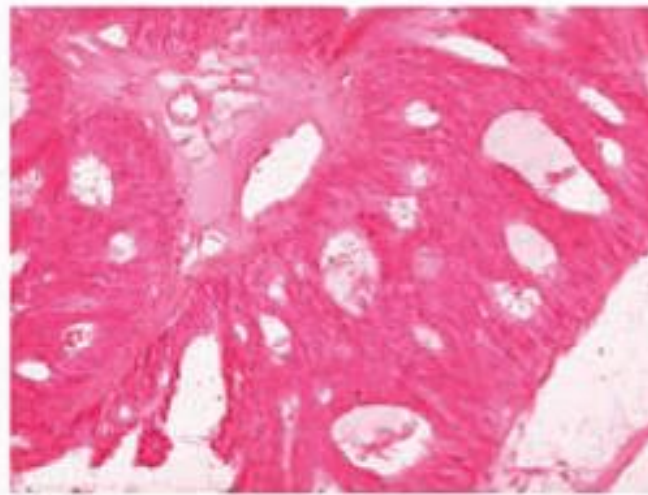
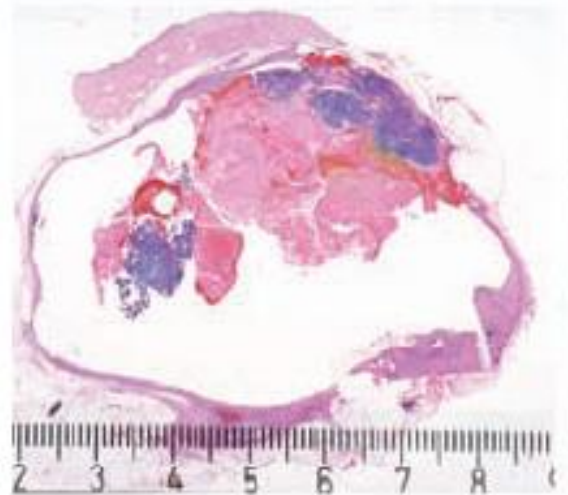
Histologie:

Intracystisches

Papilläres Carcinom

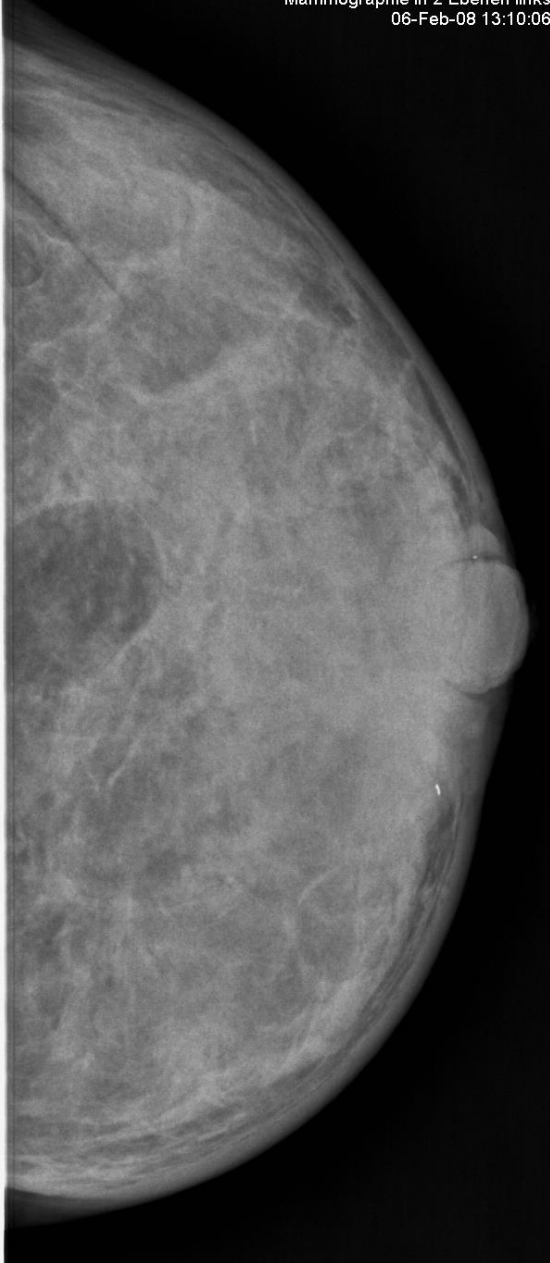
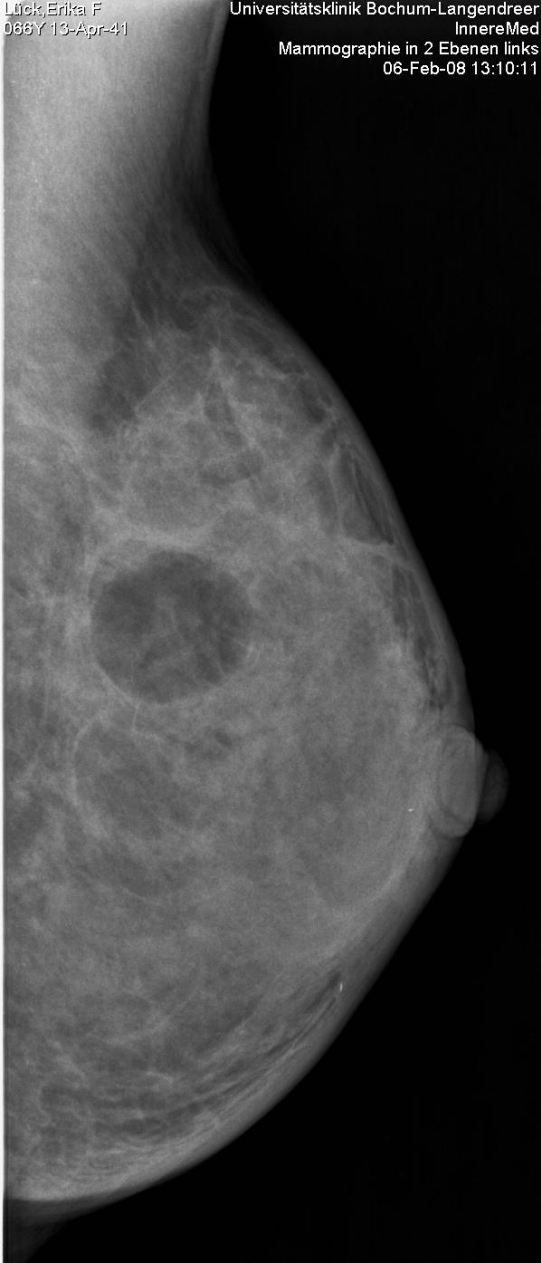
a.

b.



c.

d.

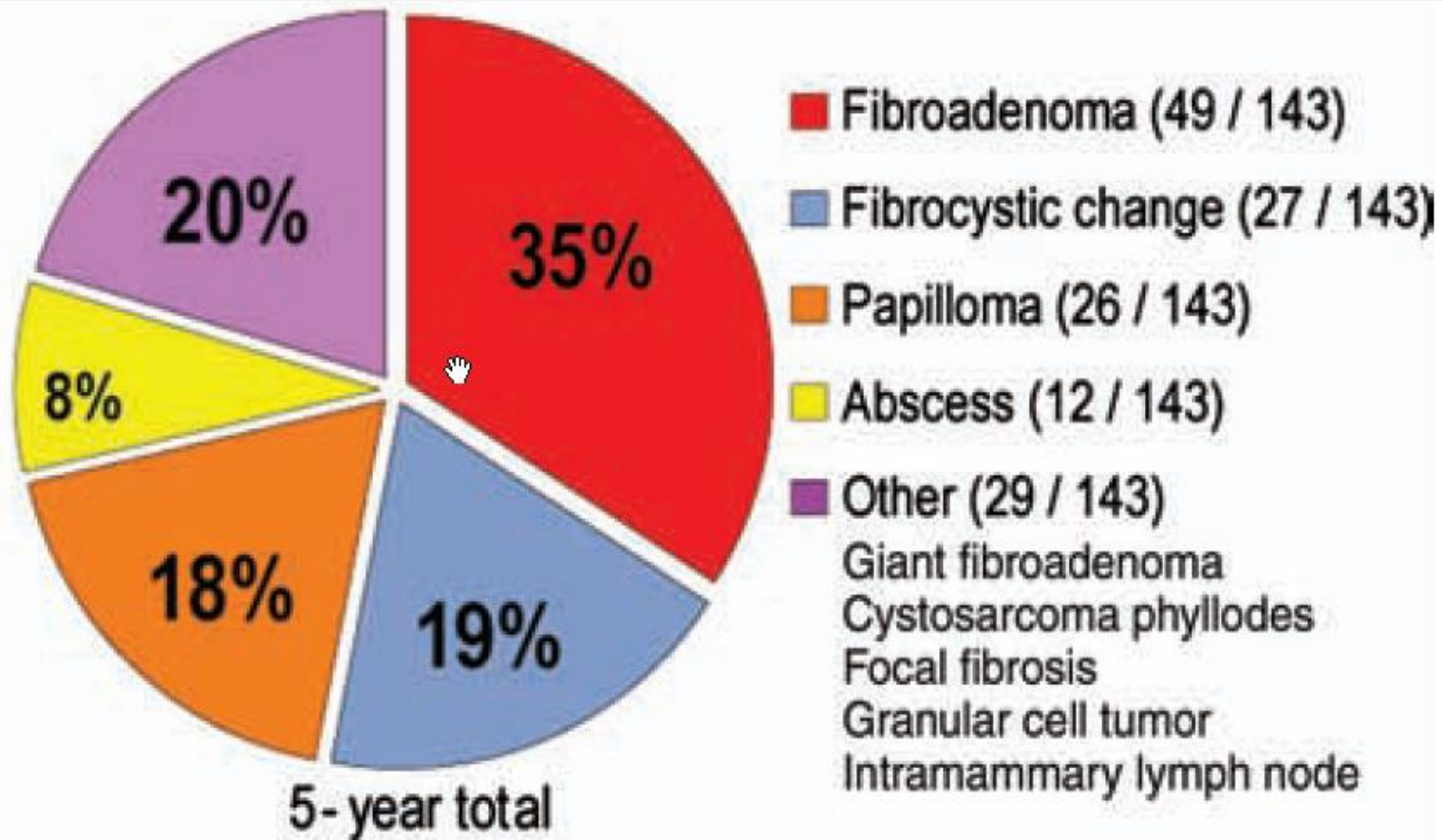


Diagnose:

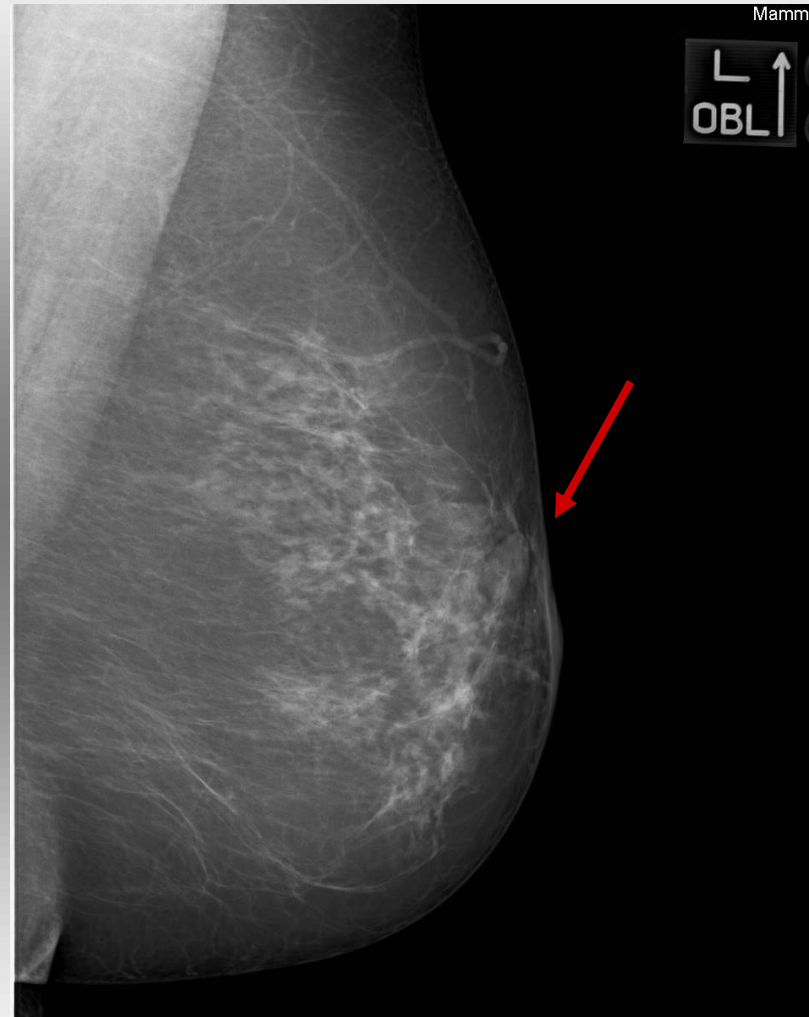
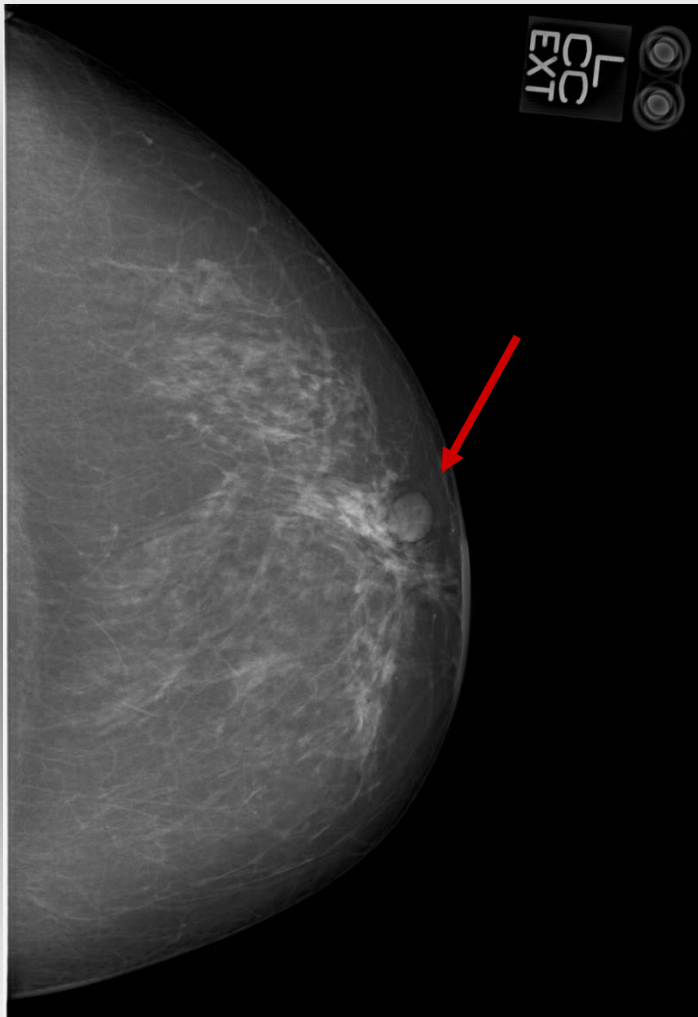
Ölcyste

Ölzyste

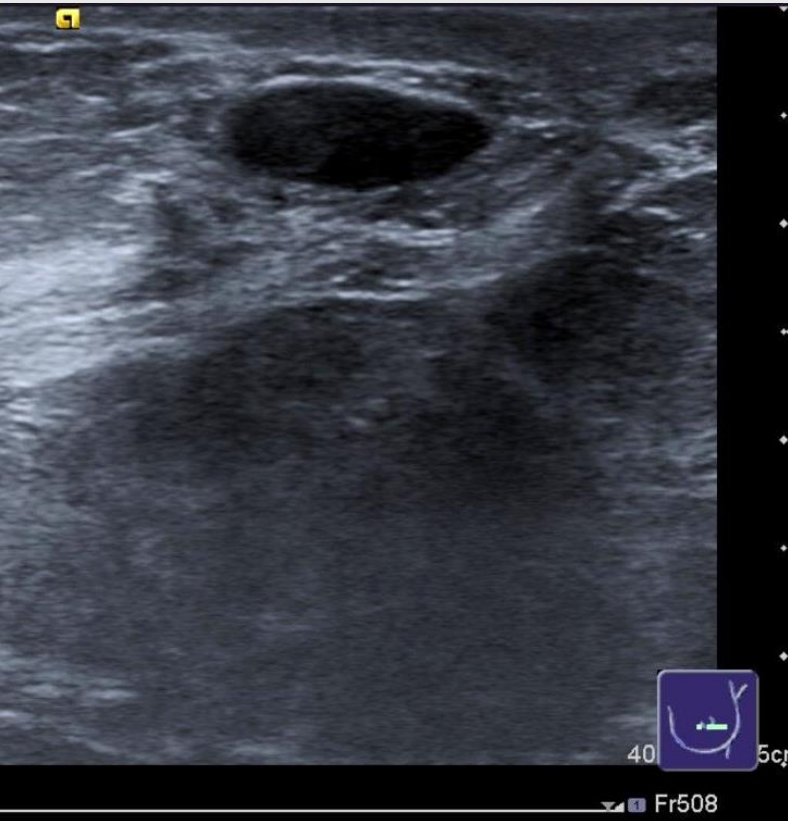




Fibroadenom

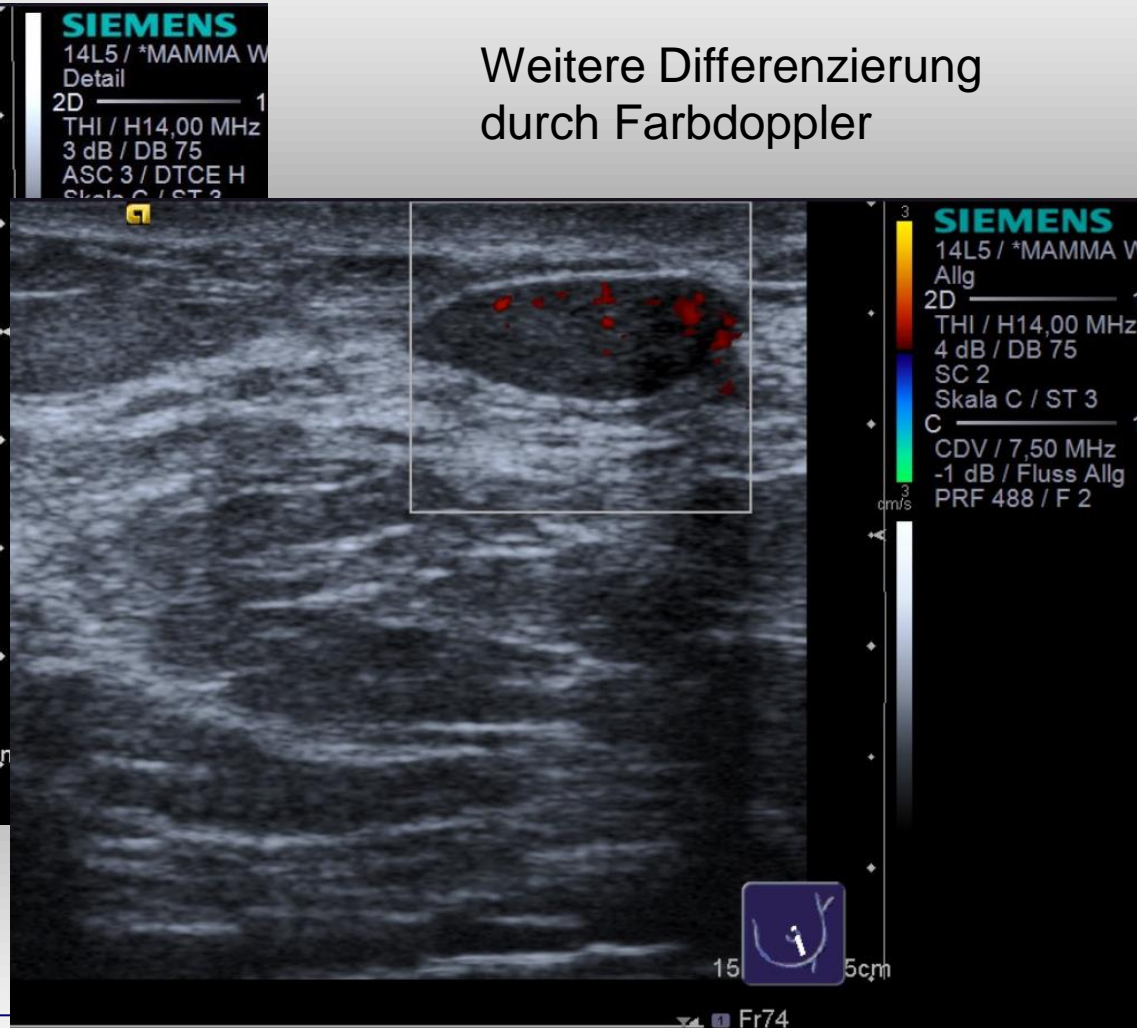


Fibroadenom



Reines B-Bild

Weitere Differenzierung durch Farbdoppler



sula F
t-49

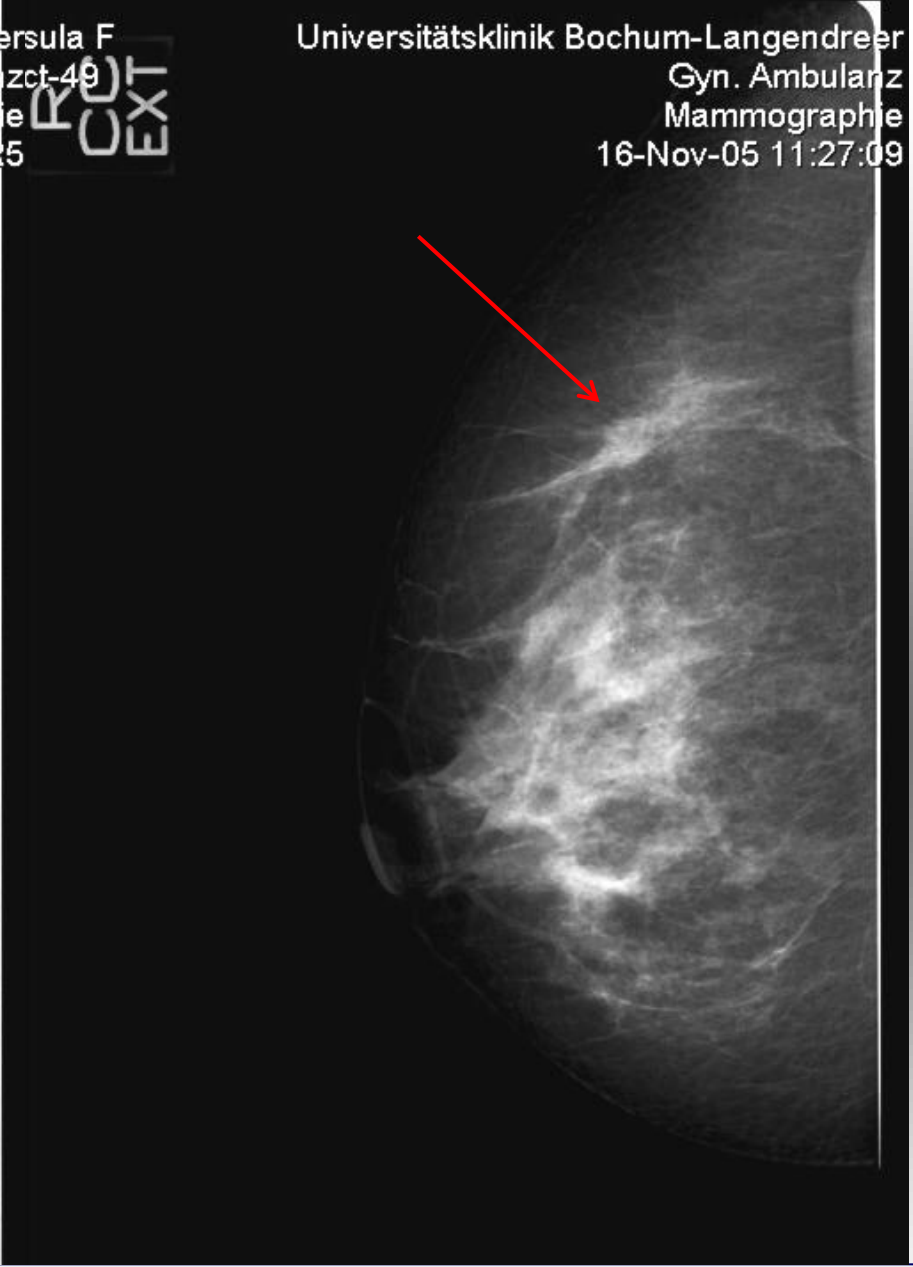
R
OBL ↑

Universitätsklinik Bochum-Langendreersula F
Gyn. Ambulanzct-49
Mammographie
16-Nov-05 11:27:25

EXT



Universitätsklinik Bochum-Langendreer
Gyn. Ambulanz
Mammographie
16-Nov-05 11:27:09



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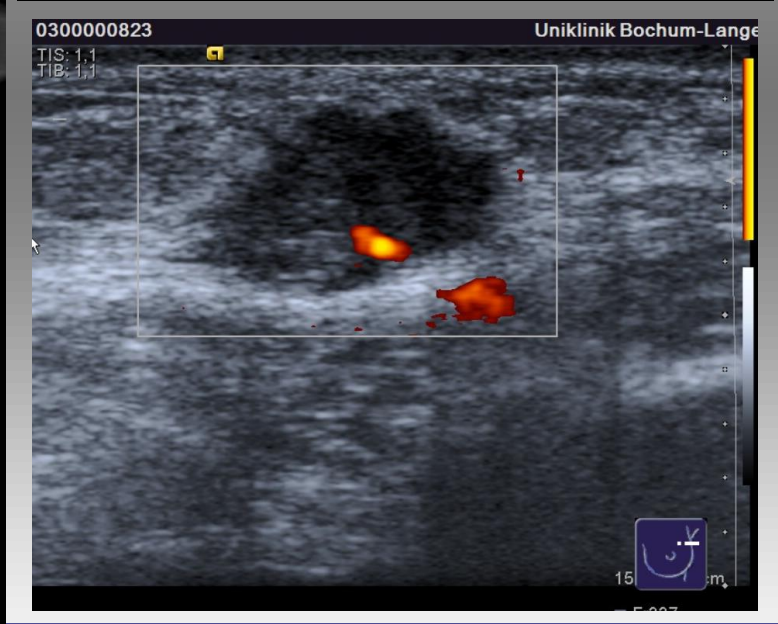
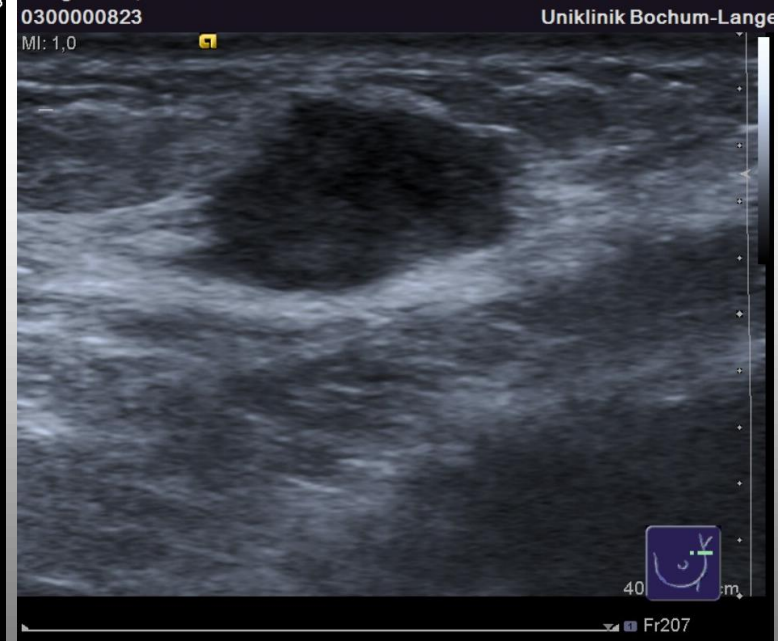
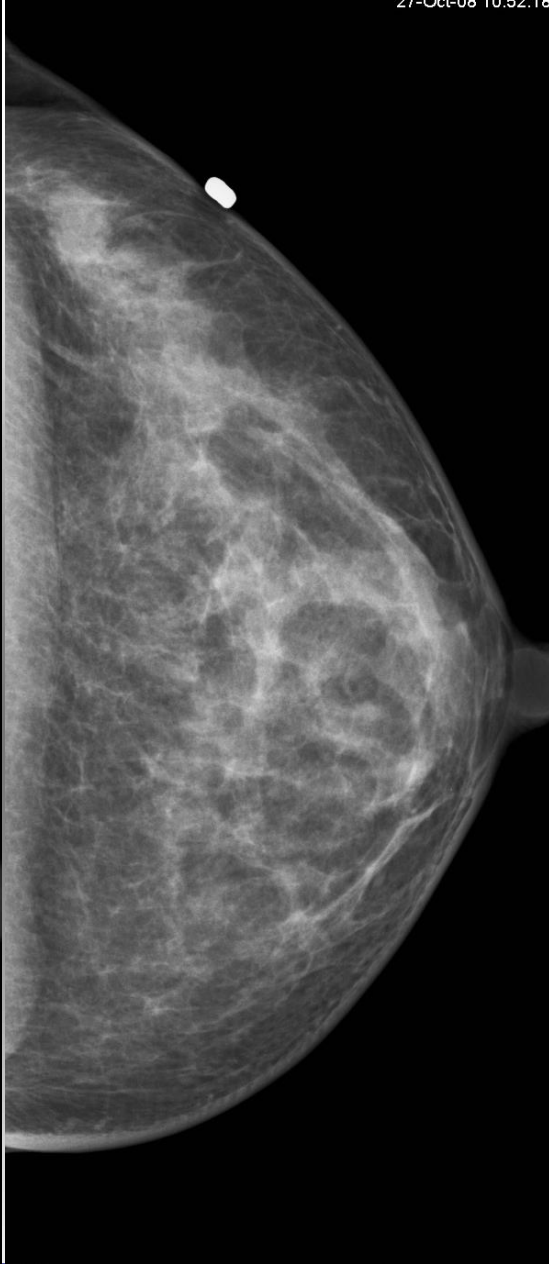
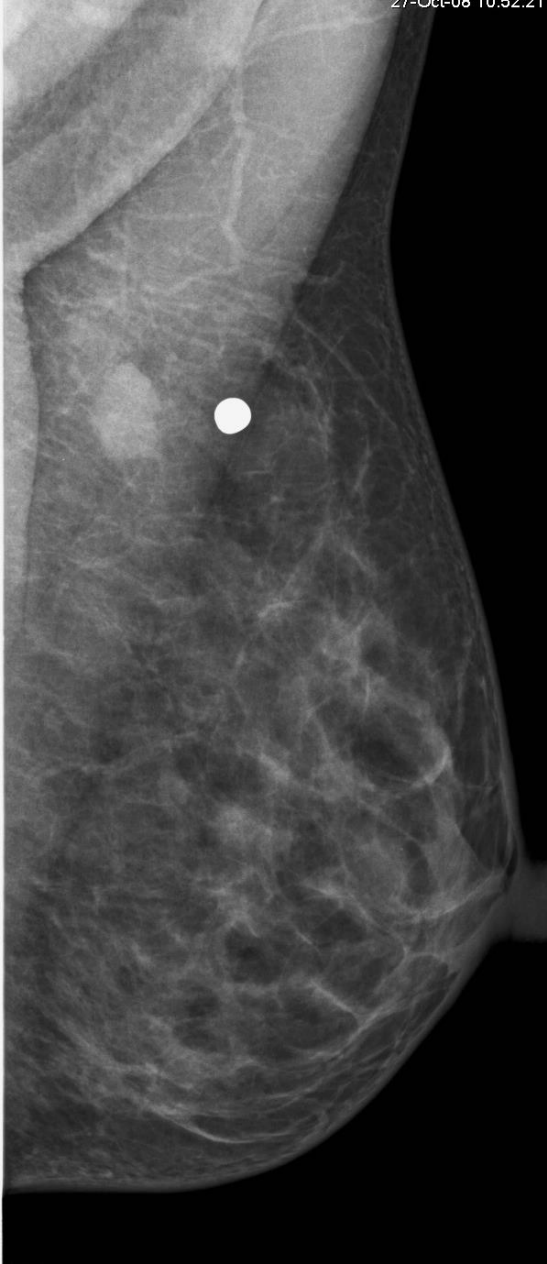
0.20 cm

0.32 cm

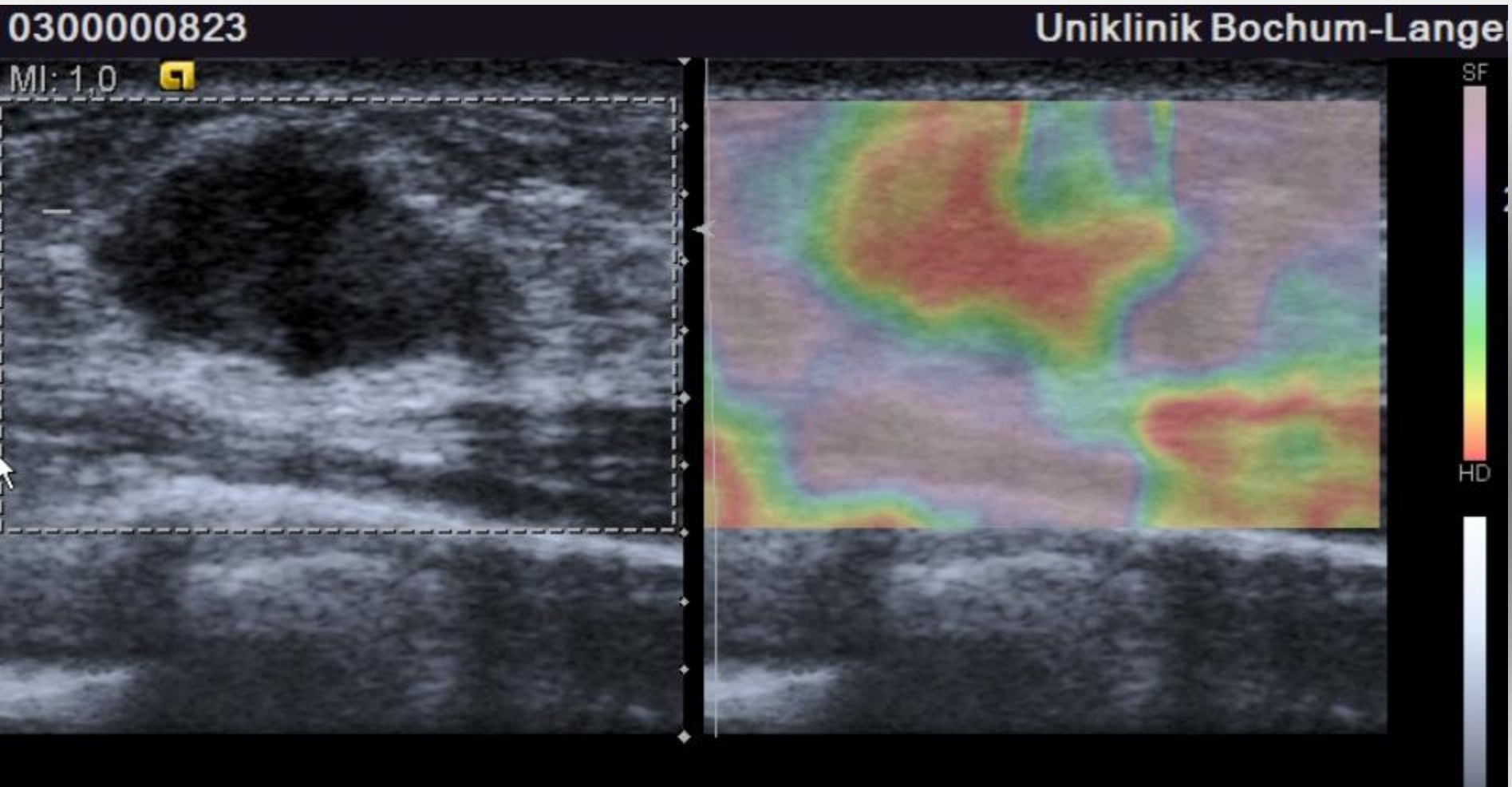


Histologie:

Sklerosierende Adenose



Duktales Karzinom



B-Bild

Elastogramm

Sonographische Kriterien

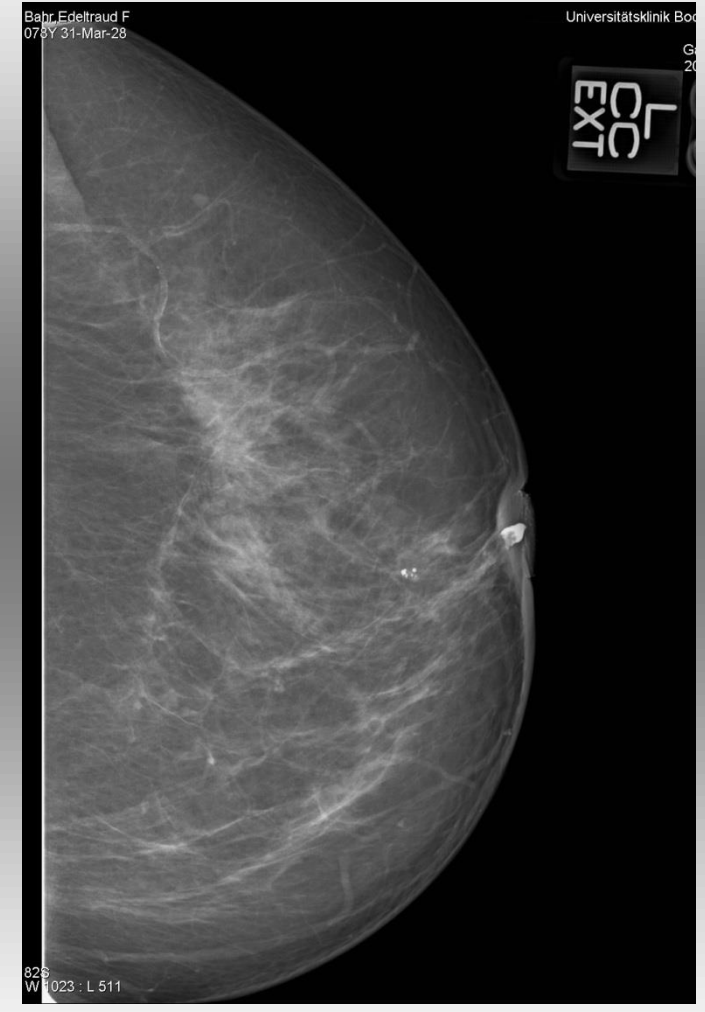
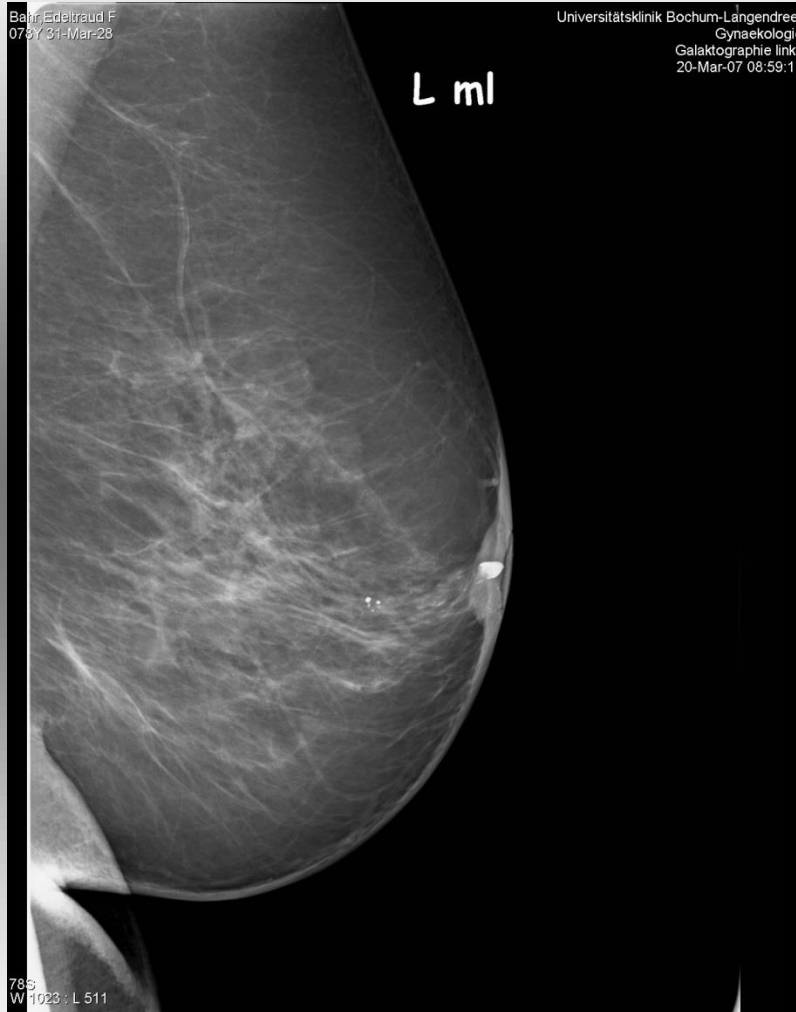
- **Benigne Läsion**

- Glatter Rand
- Echotextur homogen
- Dorsale Schallverstärkung
- Komprimierbar
- Powerdoppler: Keine Vaskularisation

- **Maligne Läsion**

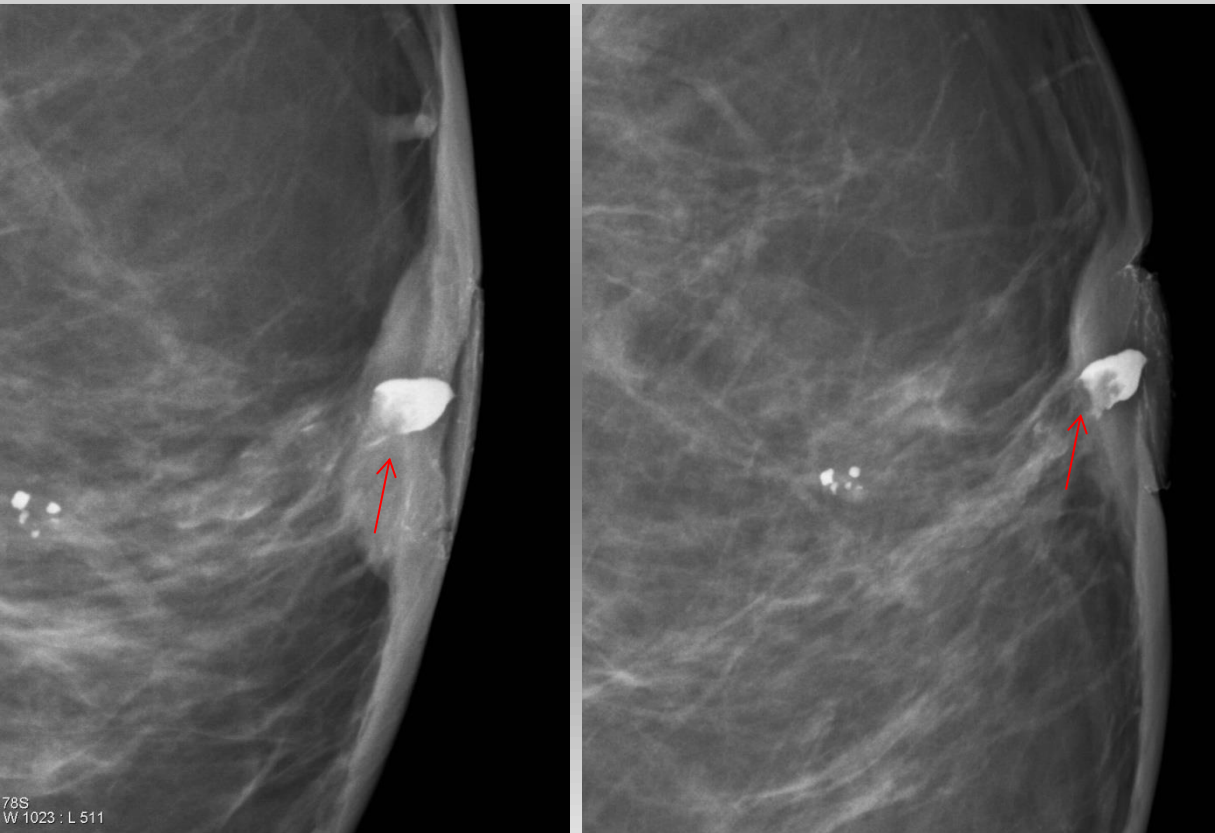
- Unscharfer Rand
- Echotextur inhomogen
- Dorsale Schallauslöschung
- Nicht komprimierbar
- Powerdoppler: Vaskularisation

Abklärung Blutiges Mammillensekret Galaktographie



Abklärung Blutiges Mammillensekret

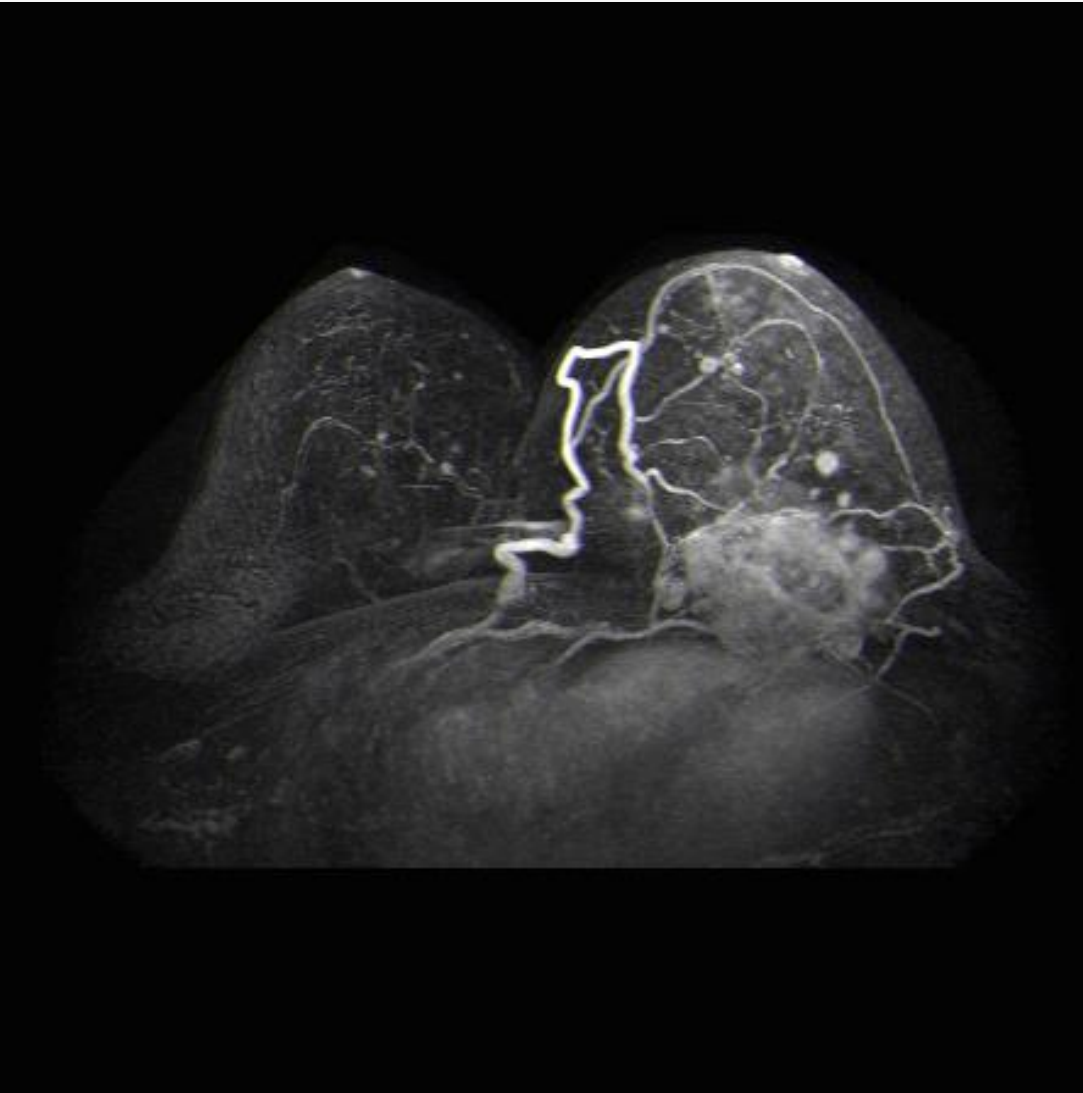
Galaktographie



Diagnose:

Milchgangspapillom

MR- Mammographie

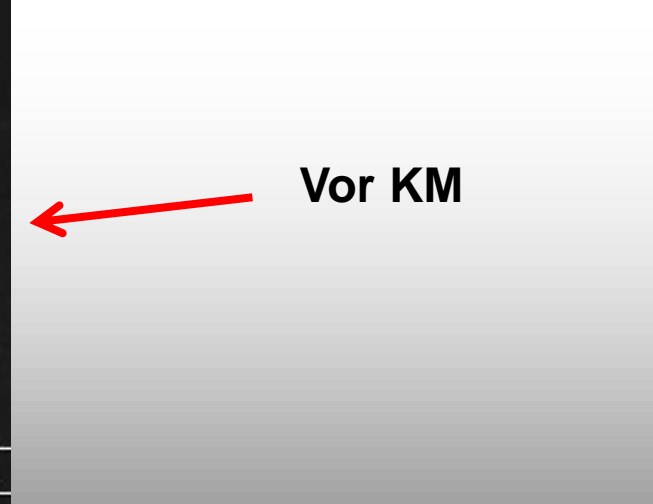
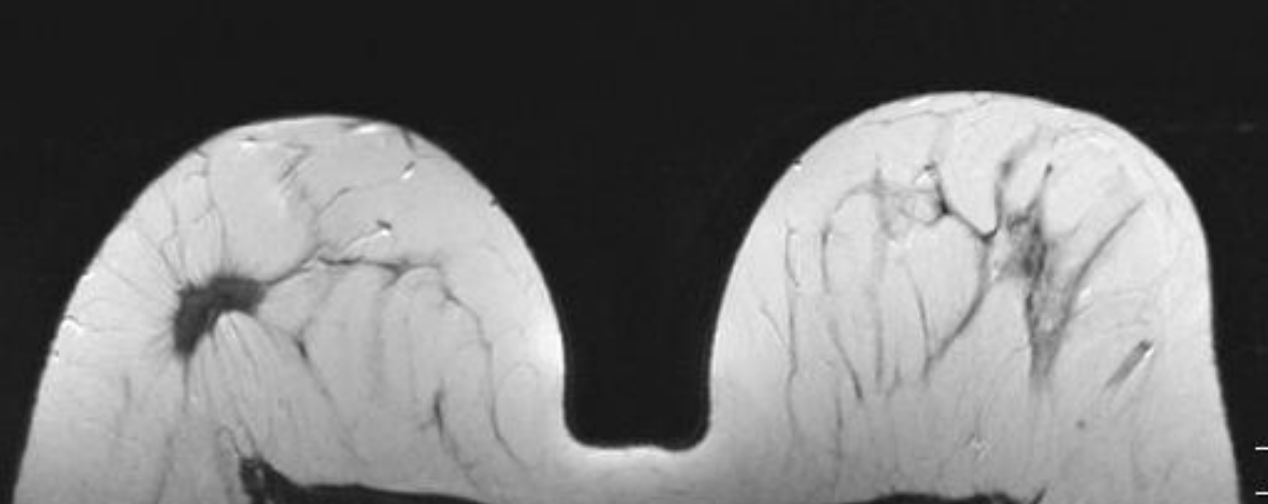


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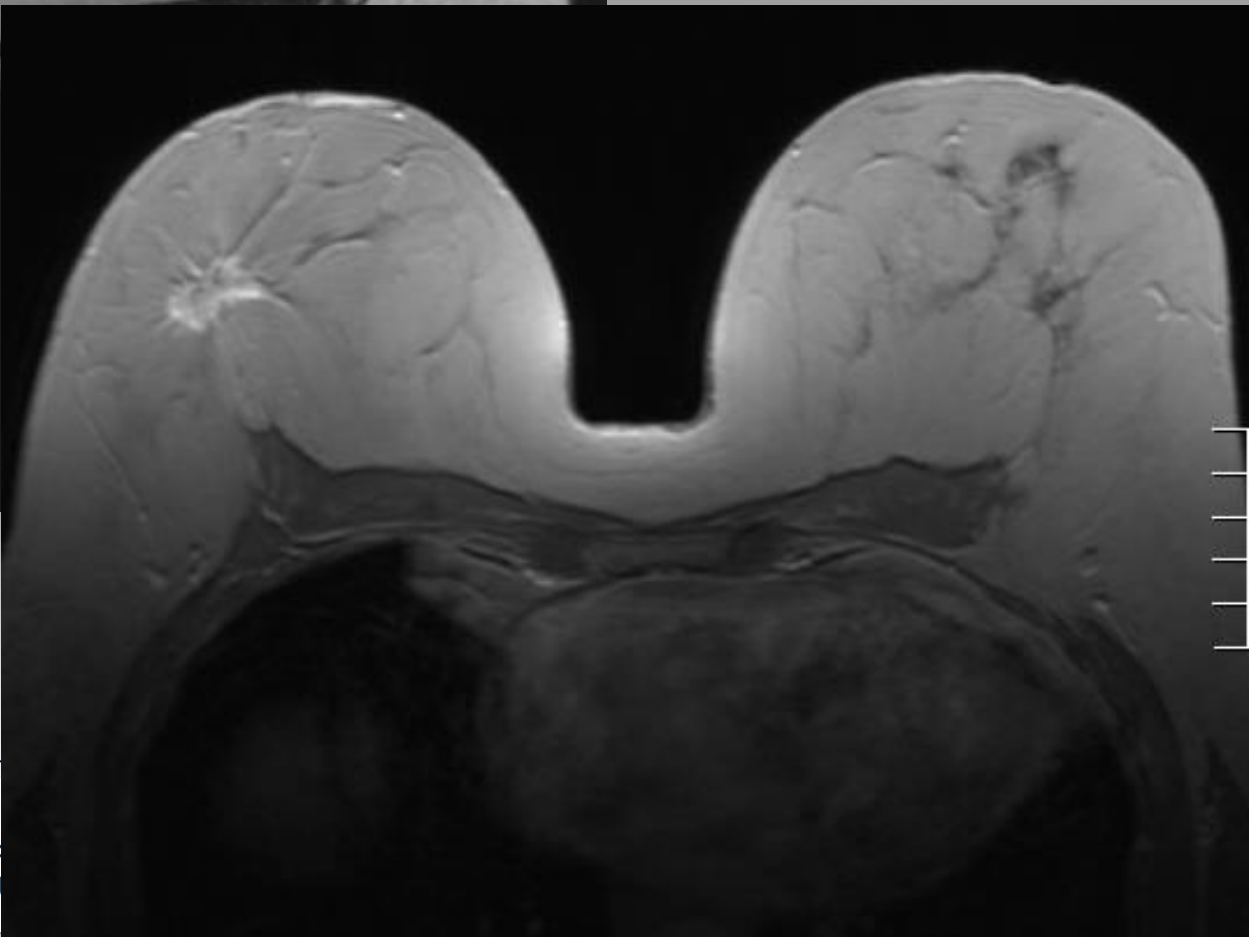
Institut für Diagnostische & Interventionelle
Radiologie, Neuroradiologie & Nuklearmedizin
Klinikum der Ruhr-Universität Bochum

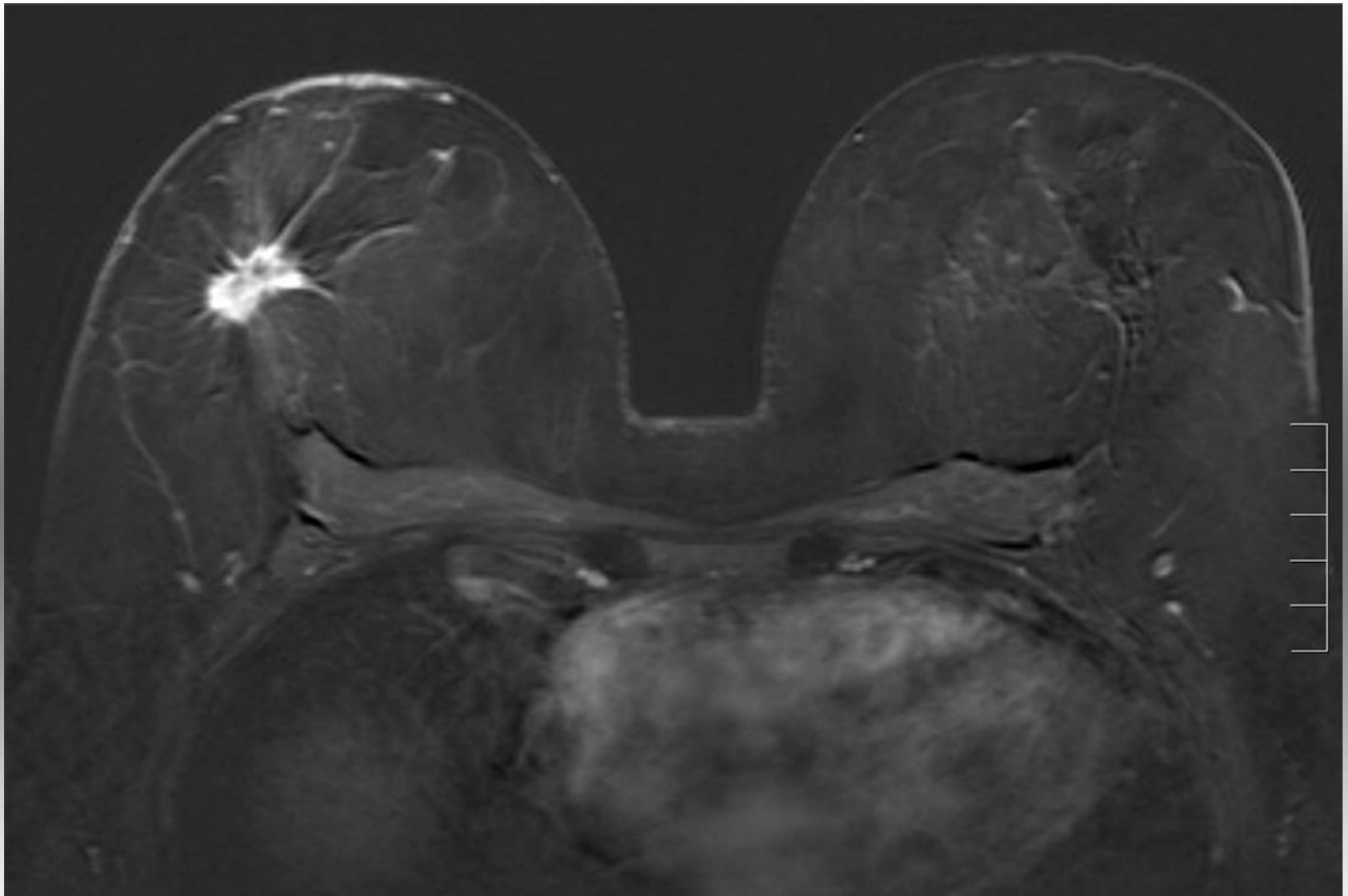


Vor KM



nach KM



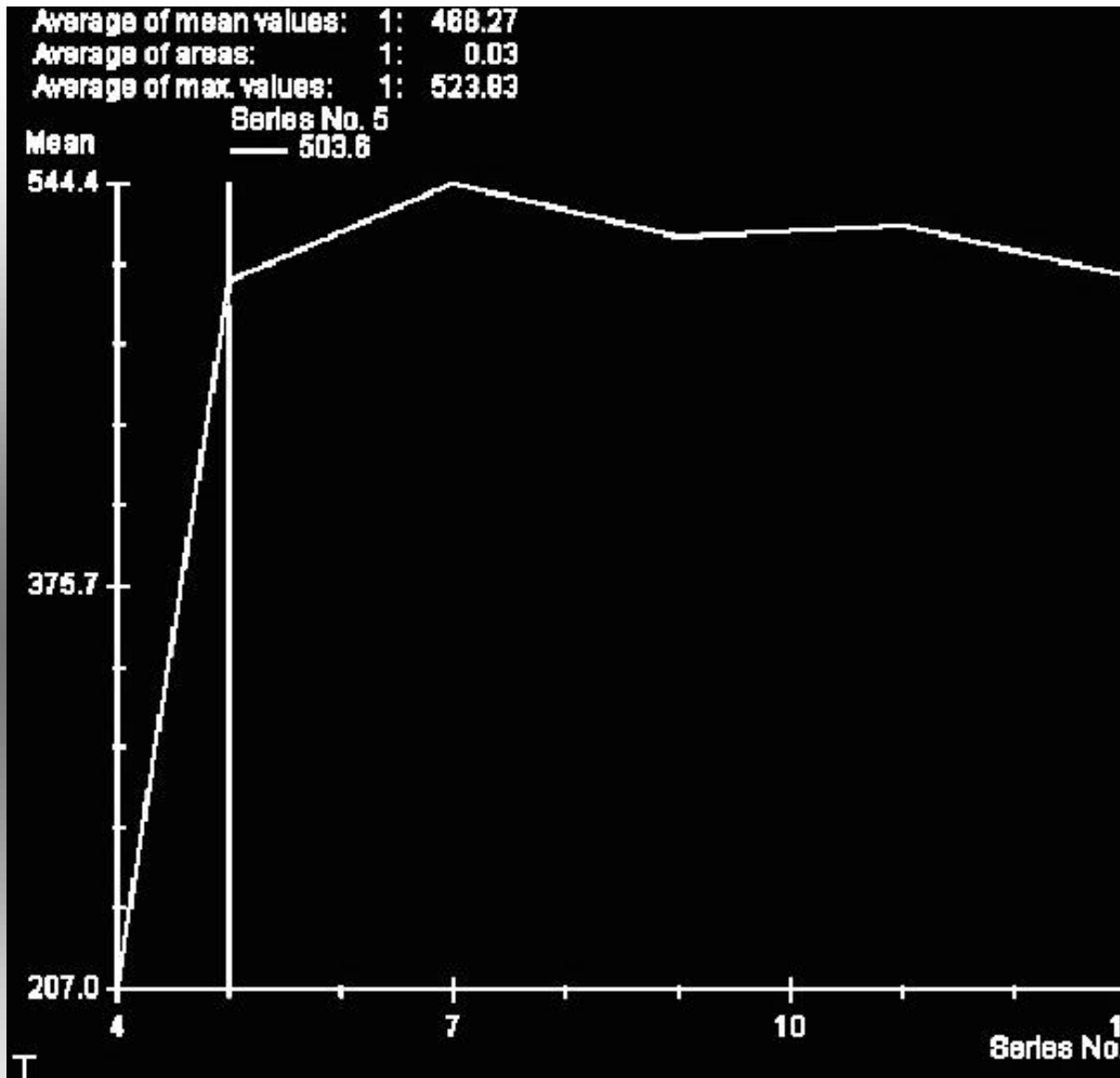


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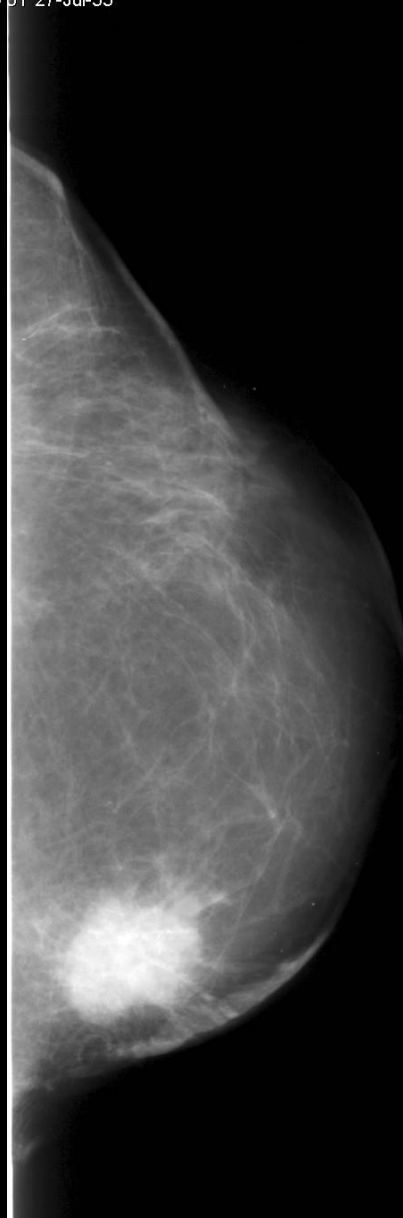
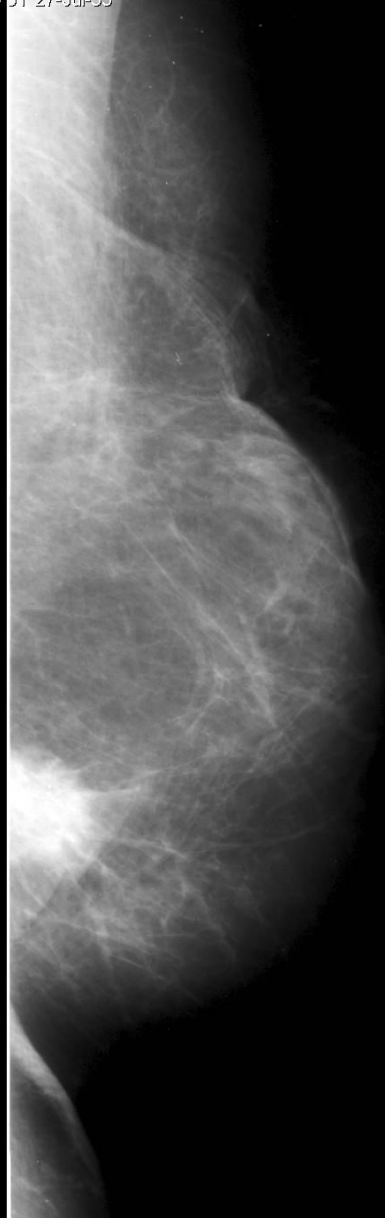
RUB

Institut für Diagnostische & Interventionelle
Radiologie, Neuroradiologie & Nuklearmedizin
Klinikum der Ruhr-Universität Bochum



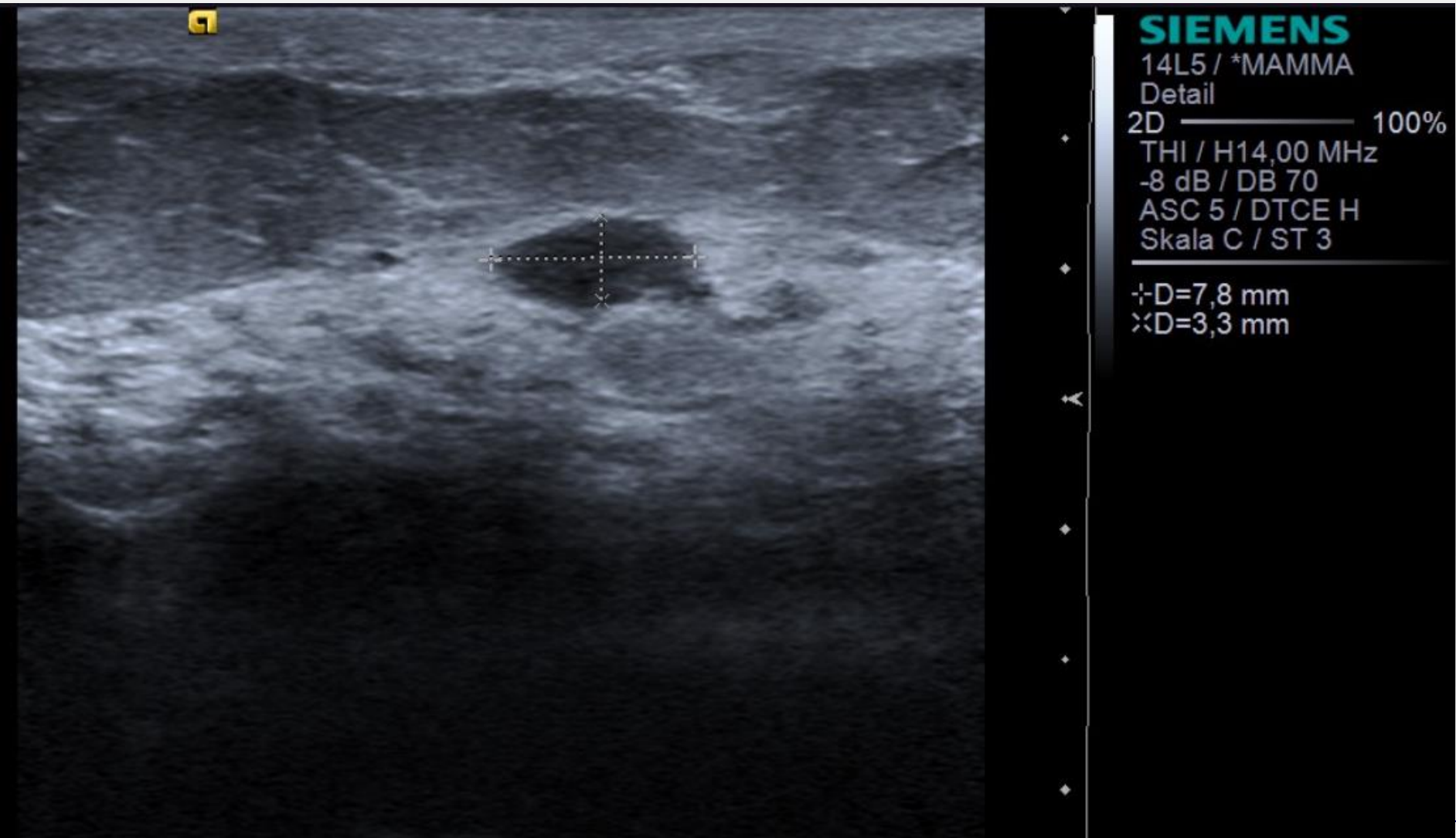
KM-Dynamik ist typisch für ein Karzinom:

- Schnelle und starke KM-Aufnahme
- Auswasch-Phänomen

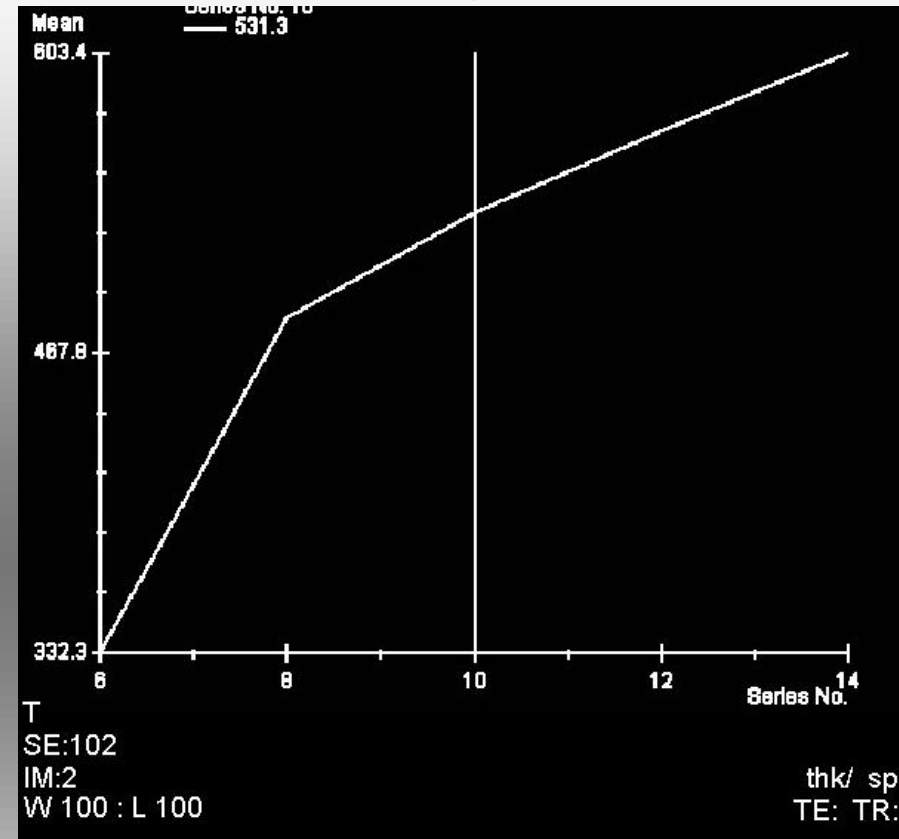
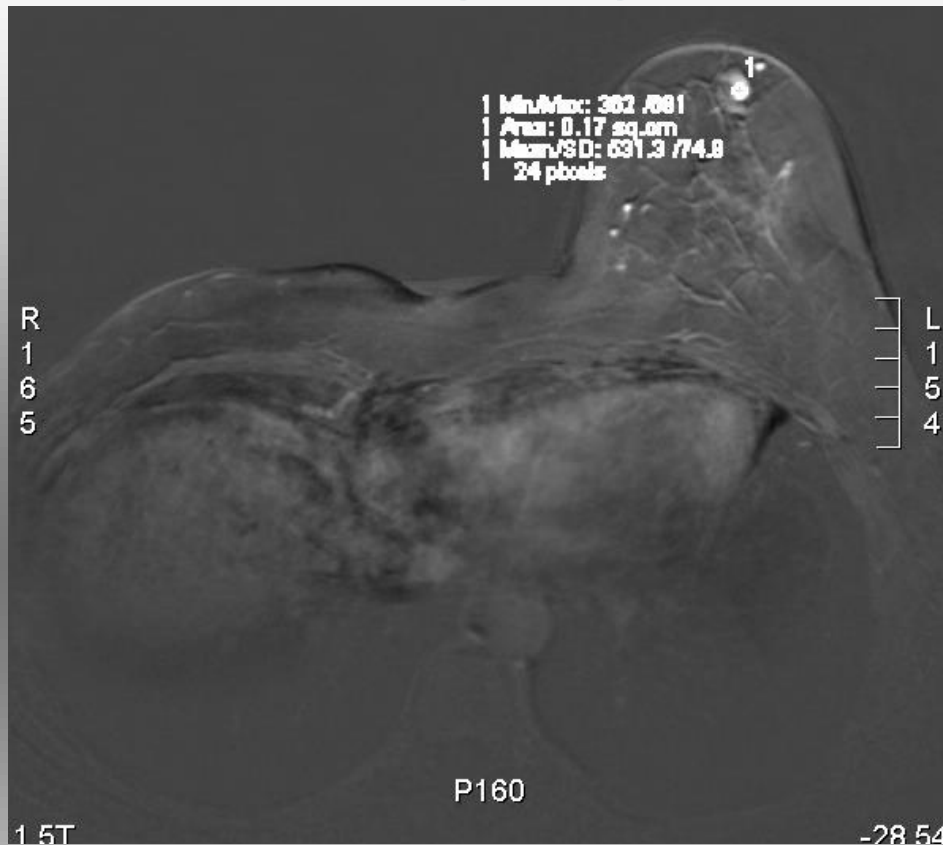


Mamma-CA mit Hautinfiltration

Sonographisch: Fibroadenom



Bestätigung durch MR-Mammographie



KM-Dynamik typisch für Fibroadenom: Akumulationstyp

Tomosynthese

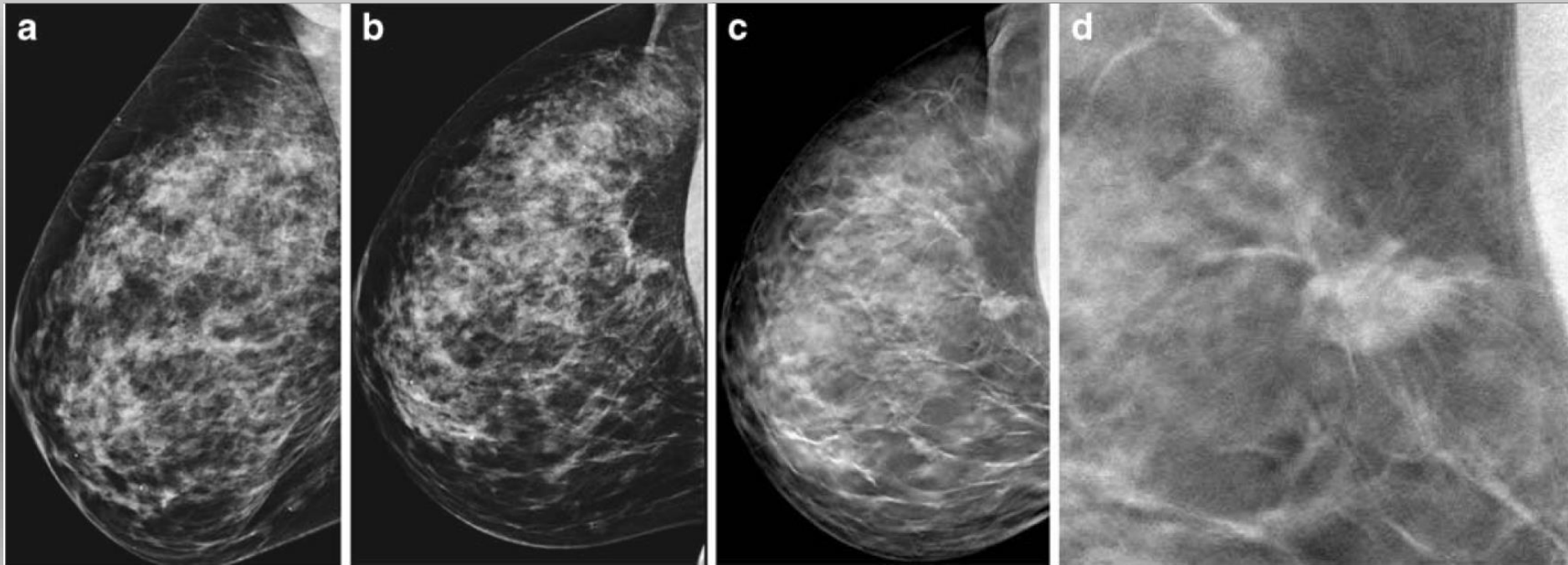
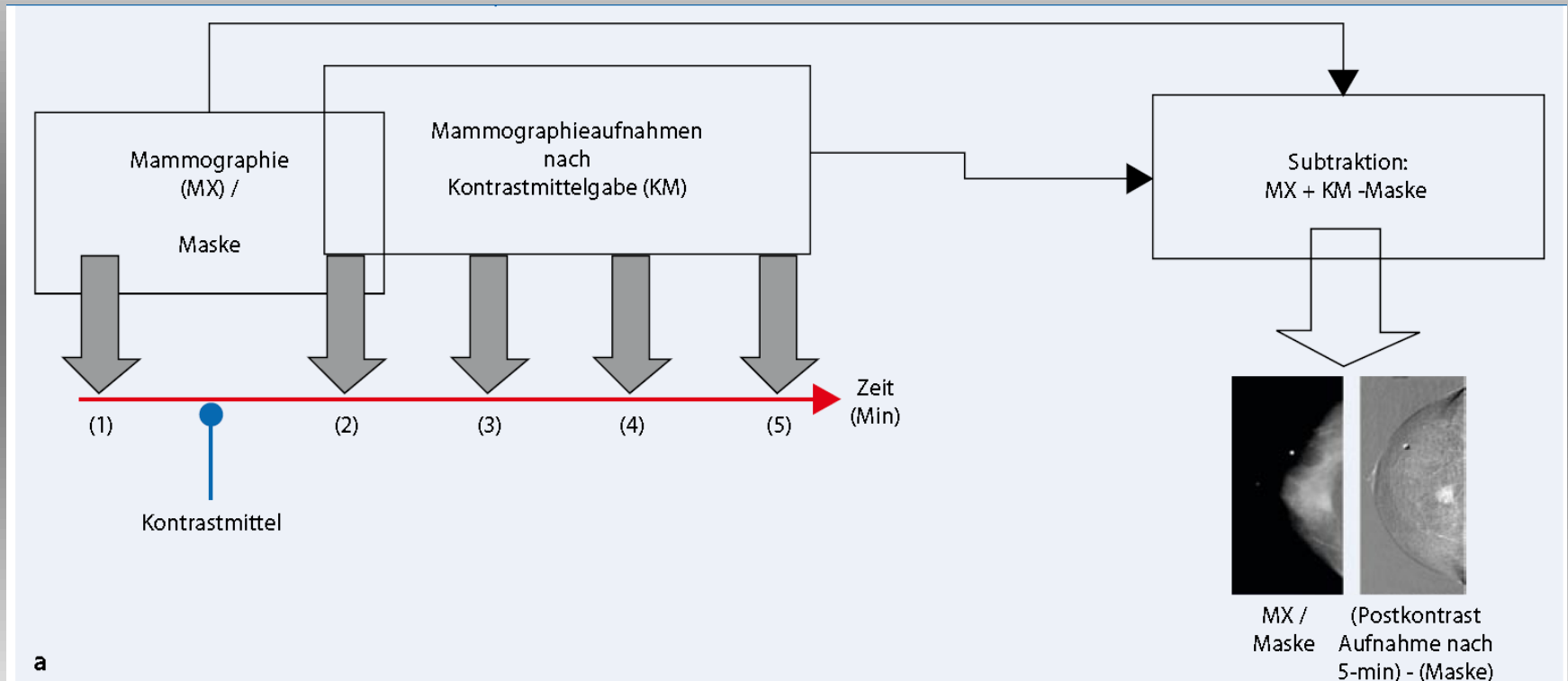


Fig. 1 Case 1. **a** MLO projection (mammography), classified BI-RADS-1. Carcinoma detected with ultrasound. **b** CC projection (mammography), classified BI-RADS-1. **c** One slice of CC projec-

tion (tomosynthesis), classified BI-RADS-4. **d** Magnification of one slice of CC projection (tomosynthesis), classified BI-RADS-4

Mammographie mit Kontrastmittel



Mammographie mit Kontrastmittel

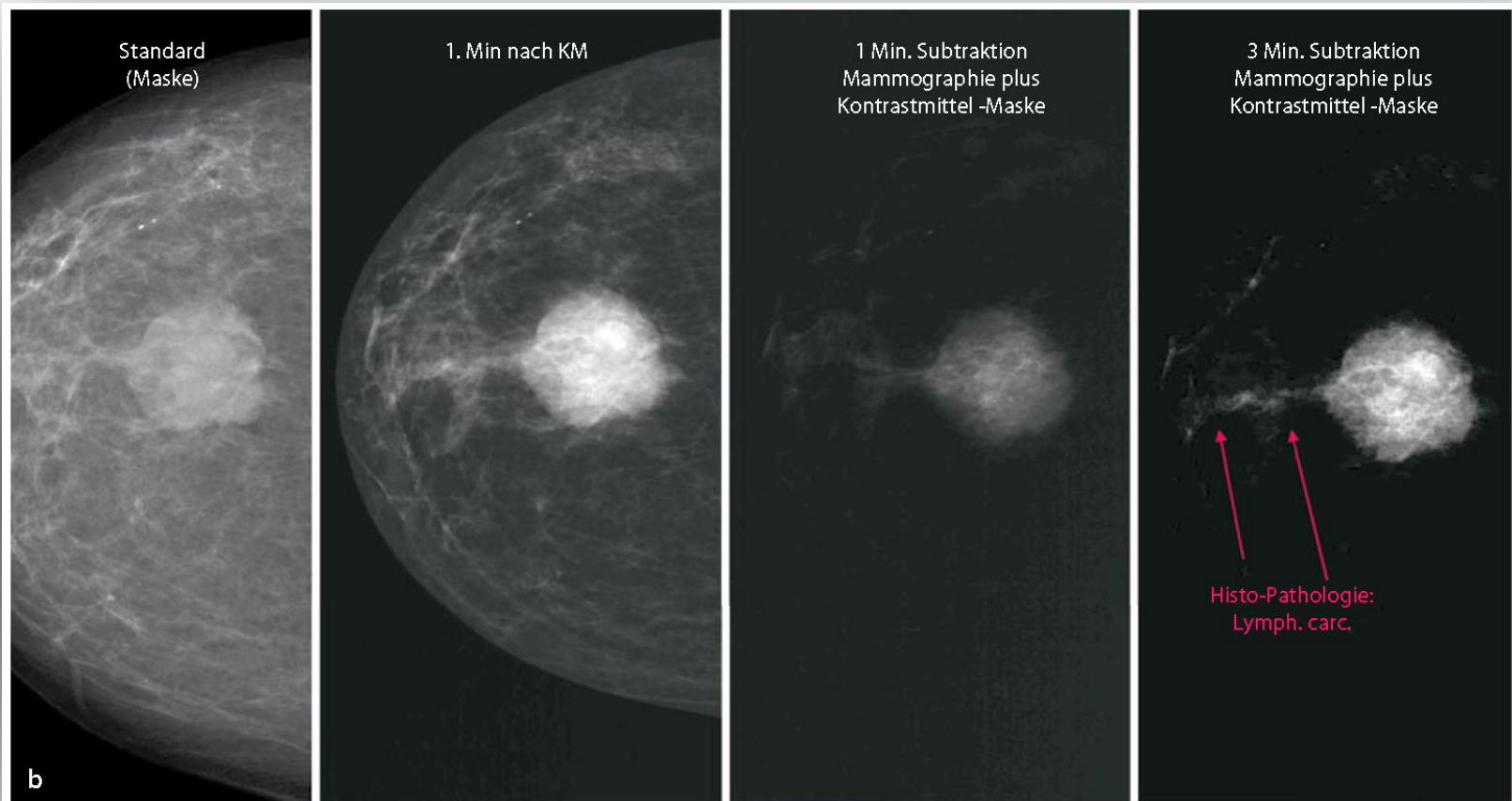


Abb. 5 ▲ **a** Digitale Kontrastmittelmammographie (Schematische Darstellung). **b** Digitale Kontrastmittelmammographie (Beispiel)

R. Schulz-Wendtland, K.-P. Hermann, T. Wacker, W. Bautz: Radiologe 2008 - 48:324–334

Spezielle Mammadiagnostik

- Aufgaben -

- **Frühe Diagnostik von Läsionen**
- **Artdiagnose /
Differentialdiagnose**
 - **Rö-Mammographie**
 - **Sonographie**
 - **MR-Mammographie**
- **Biopsie / Verlaufskontrolle**
- **Indikation zur OP**