



Macrobiopsy under X-Ray Guidance

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Radiology

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Breast Intervention Imaging

- Major domain in breast imaging
- **European guidelines recommend a pre surgical diagnosis in more than 90 % of cases :**
 - Better surgery
 - Pre surgical diagnosis is more accurate than extemporaneous histology
 - It is not possible to obtain an accurate extemporaneous diagnostic on microcalcifications
 - It is still better to inform patient before surgery
- Biopsy in case of BI-RADS 4 and 5 lesions
- Biopsy of BI-RADS 3 lesions in special cases :
 - High-risk women, before pregnancy, in case of a known breast cancer, no possible follow-up etc...

Stereotactic Biopsy : History

- First stereotactic breast biopsy : Sweden, 1970
- Development of automatical core biopsy : United States (Parker, 1990)
- Before :
 - Only opened surgical biopsies
- Accuracy :
 - Concordance surgery/ stereotactic biopsy : 87-96 % and 0-17 % of low quality samples
 - ***Gisvold, AJR 1994;162:815-820***
- 2013 : improvement of accuracy with large needles (7-10 G) :
 - 97-98 % concordance surgery/biopsy

Stereotactic Biopsy

- Principles
- Procedure on a prone table
- Procedure on a mammography unit + bed
- Stereotactic biopsy + radiofrequency : Intact ®

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Stereotactic Biopsy

- **Biopsy under radiological guidance :**
 - Dedicated prone table
 - Removable bed linked to mammography device
- Best indication :
 - BI-RADS 4 and BI-RADS 5 microcalcifications clusters
- It is also feasible to biopsy radiological non calcified lesions not seen on ultrasound
 - More challenging cases

Prone table



Bed linked to
mammography unit



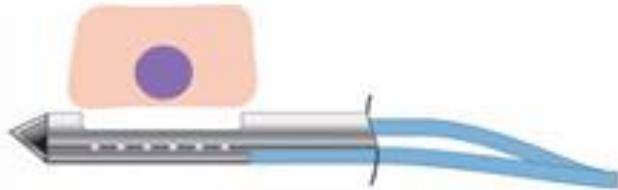
Limits

- Lesions not seen radiologically
 - Amorphous microcalc.
- Impossible to stay in prone or lying position
- Breast thickness < 2 cm under compression
 - Lateral arm?
- Difficulty to target :
 - Near axillary area
 - Close to pectoralis muscle
 - Very superficial lesions
- Rare side effects :
 - Hematoma (< 2 %), pain, pneumothorax (< 0,1 %), skin defect

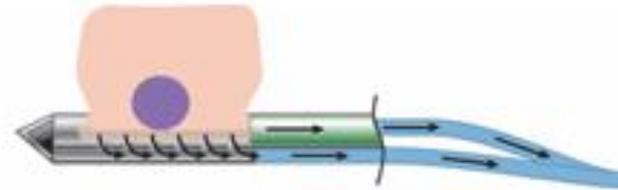
Vacuum-assisted Biopsy:

- Several manufacturers:
 - Mammotome ® (11G, 8G)
 - Senorx, Bard ® (10G, 7G)
 - Suros, Hologic ® (11G, 7G)
 - Vacora, Bard (10G)
 - *Finess, Bard (14G)*
 -
- Vacuum-assisted systems :
 - Lesion is stuck to the probe with the vacuum
 - The needle cuts the lesion on 360 ° for an extensive biopsy

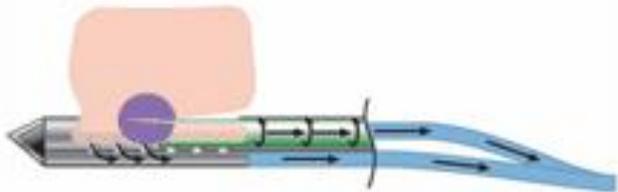
Vacuum-assisted Biopsy : Principles



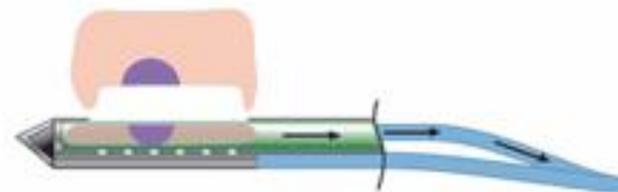
1. Position Probe under Lesion



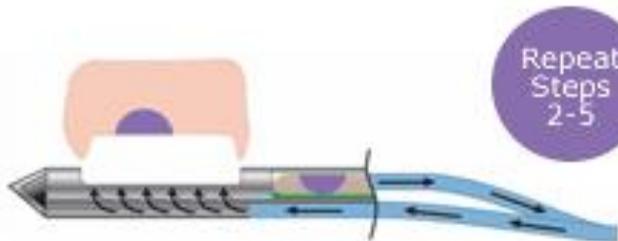
2. Vacuum Tissue into Aperture



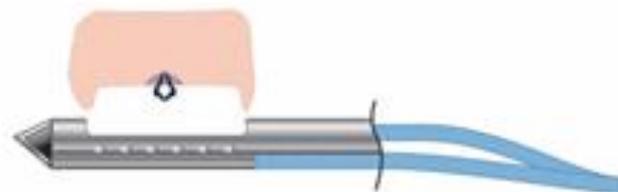
3. Transect Tissue



4. Transection Completed



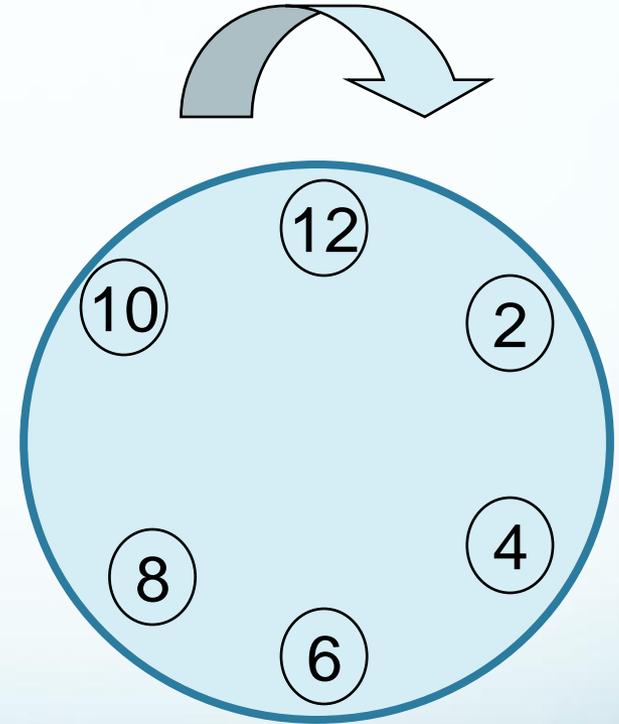
5. Transport Tissue



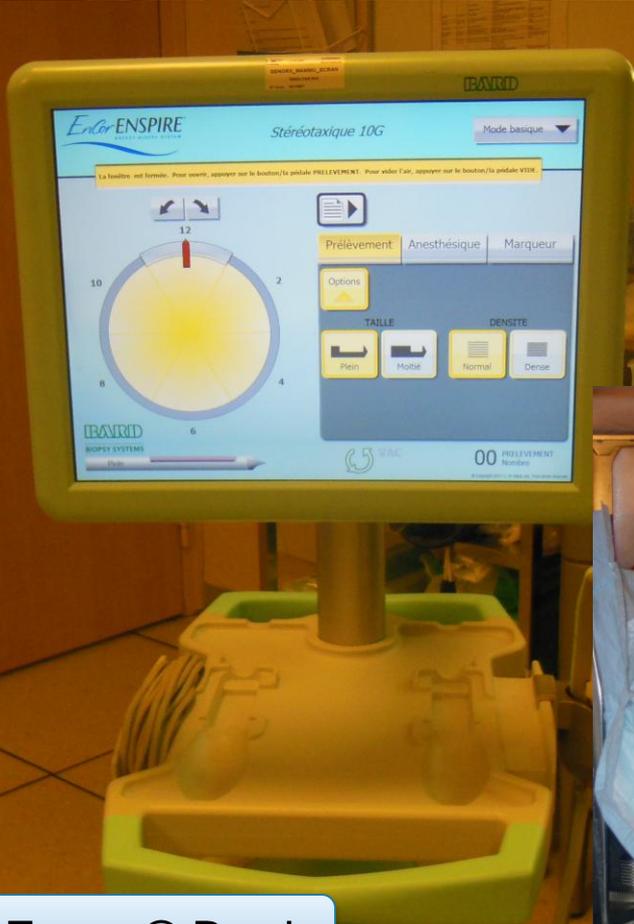
6. Mark Site

Vacuum-assisted Stereotactic Biopsy

- Principles : needle sampling in a circular area on 360°
 - 6-12 samples
 - A lesion may be entirely removed
- Need to place a titanium clip in the cavity if lesion is nearly or totally removed
- Accuracy :
 - Se = 98 %
 - Sp = 97 %



Examples of vacuum systems



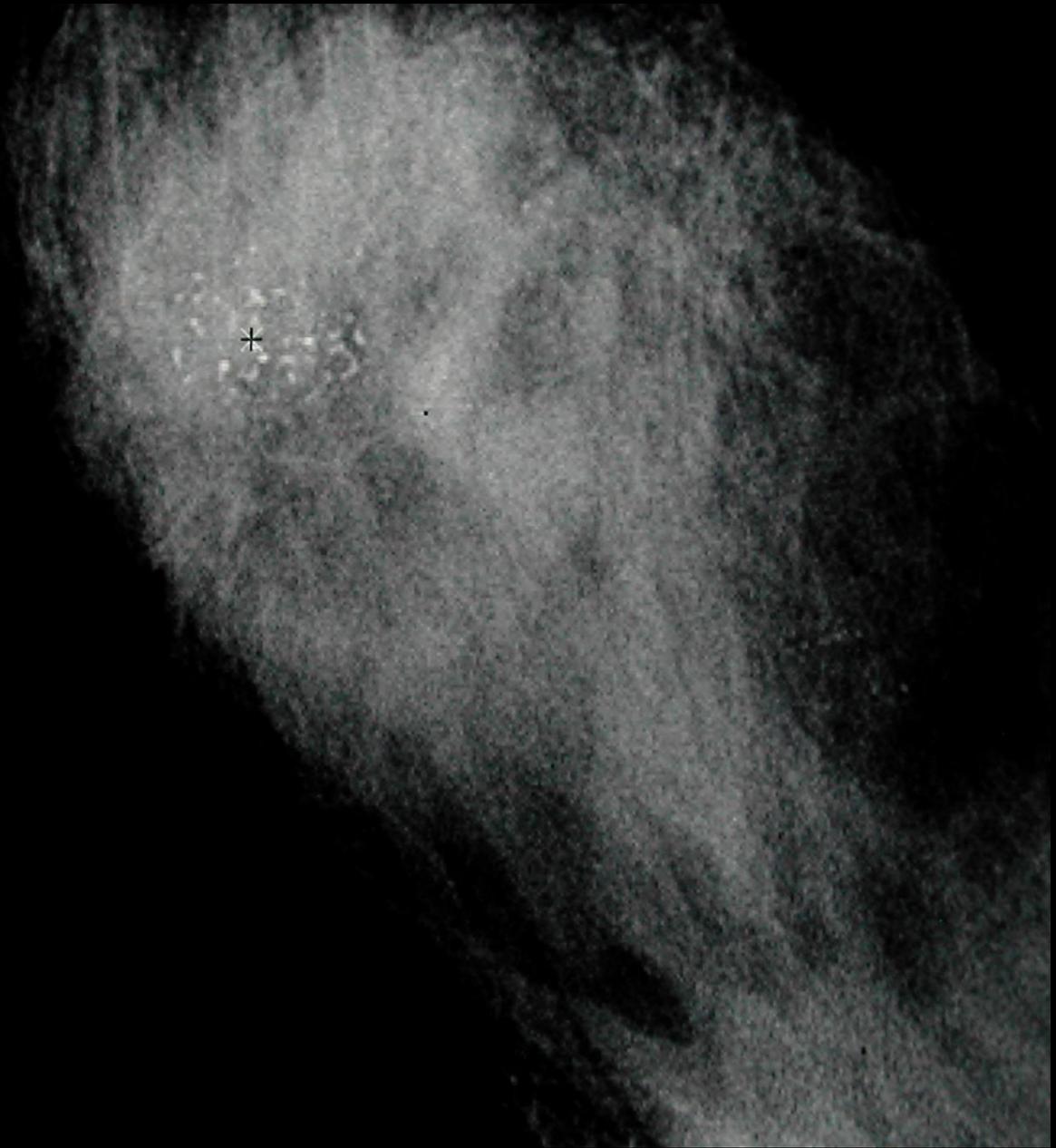
Encor ® Bard

Vacora Bard ®

Mammotome ®

Vacuum-assisted Biopsy

- Advantages :
 - Multiple sampling
 - Large samples
 - Accuracy for microcalcifications clusters
 - Reduced risk of hematoma with vacuum
- A target may be entirely removed but it is only a diagnostic procedure



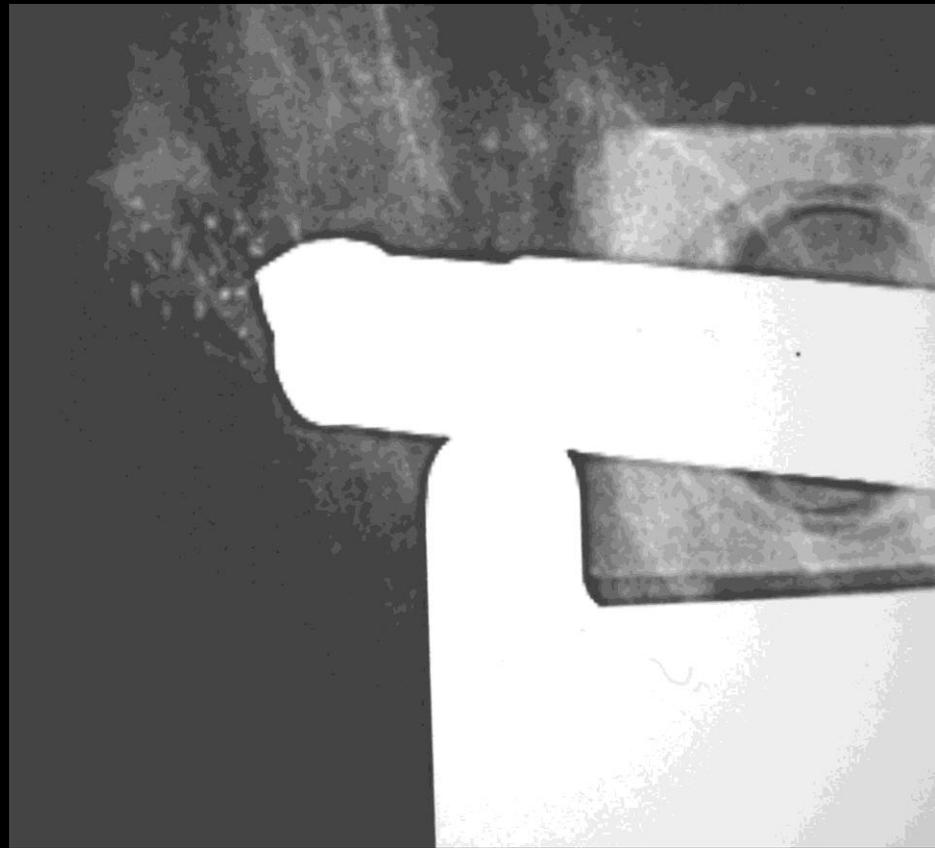
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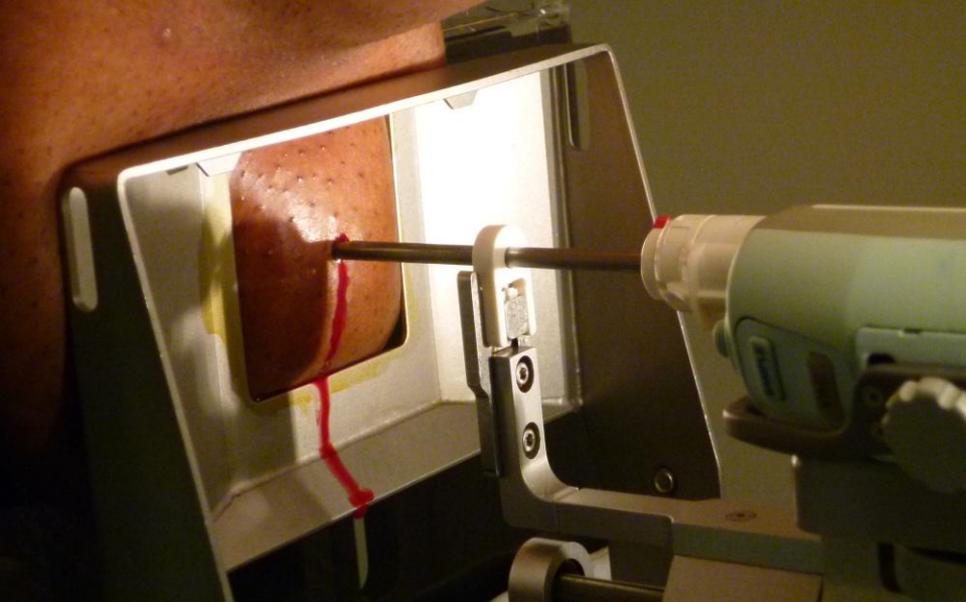
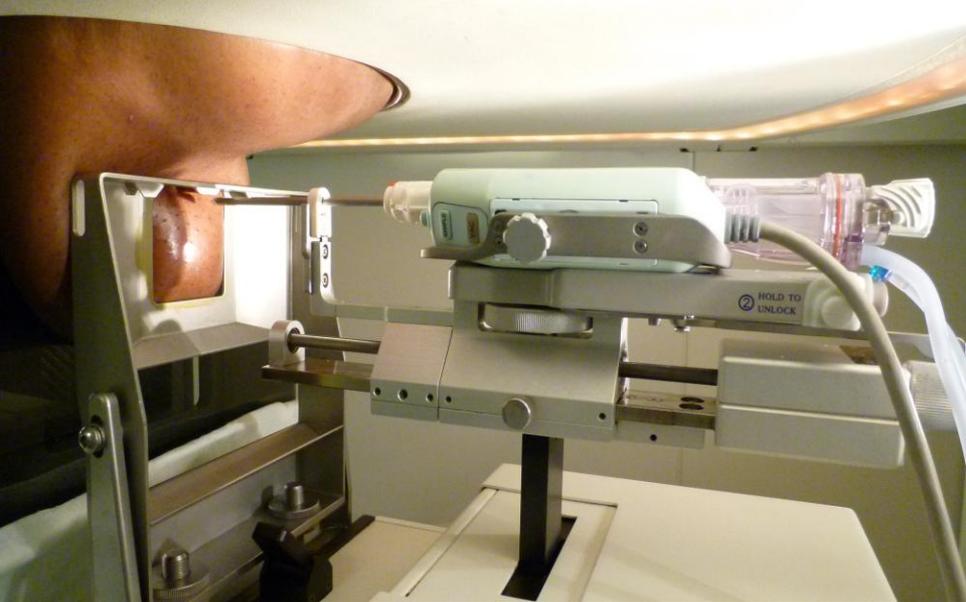
NEEDLE CORE BIOPSY

COORDINATES	X	Y	Z
STAGE	0.6mm	18.9mm	37.2mm
PASS A	0.6	18.9	40.9
DIFFERENTIAL	-0.0	-0.0	-3.7
COMPRESSION	64.8mm		
STROKE 22	STROKE MARGIN		16.3mm

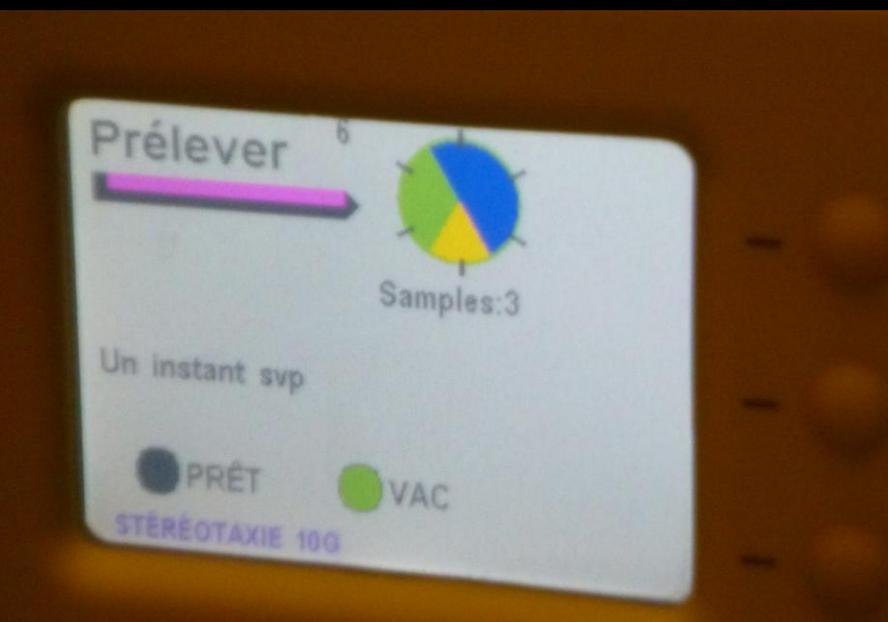








Senorx

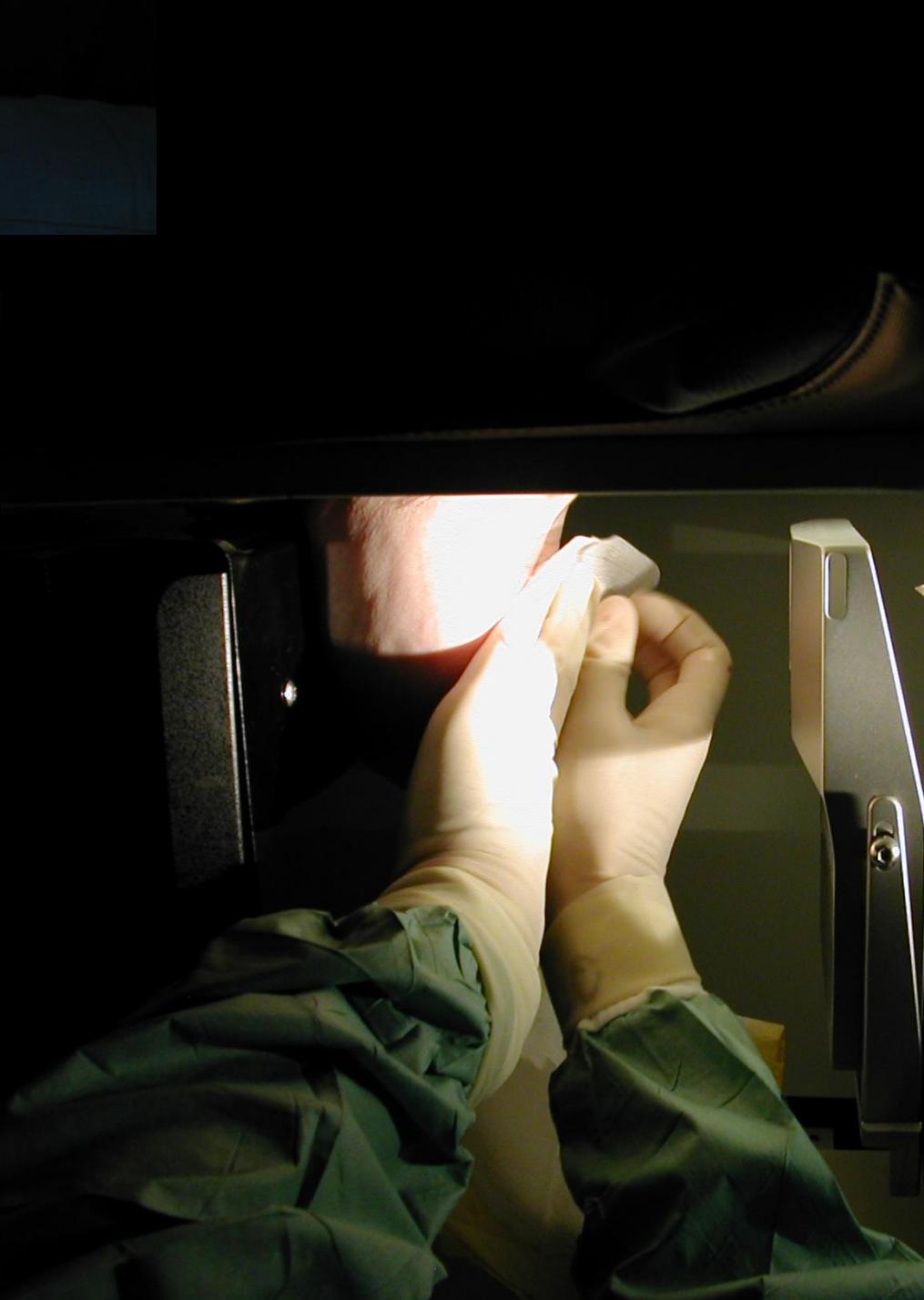
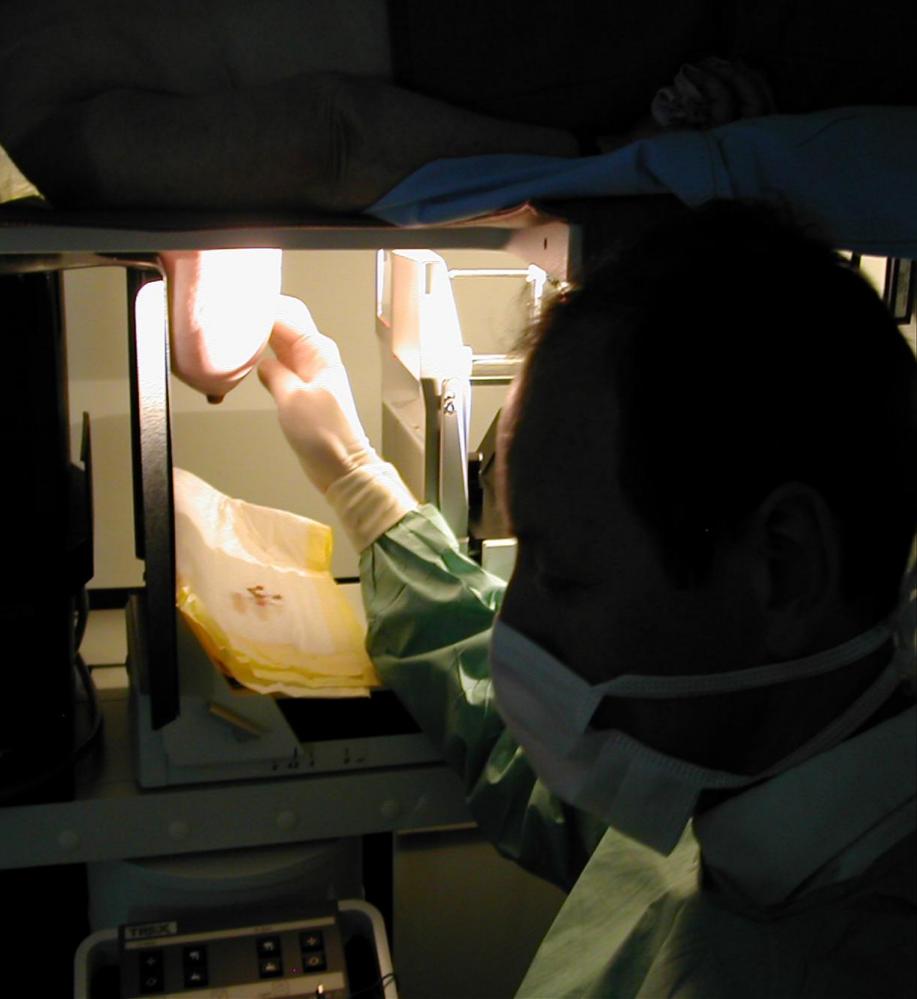




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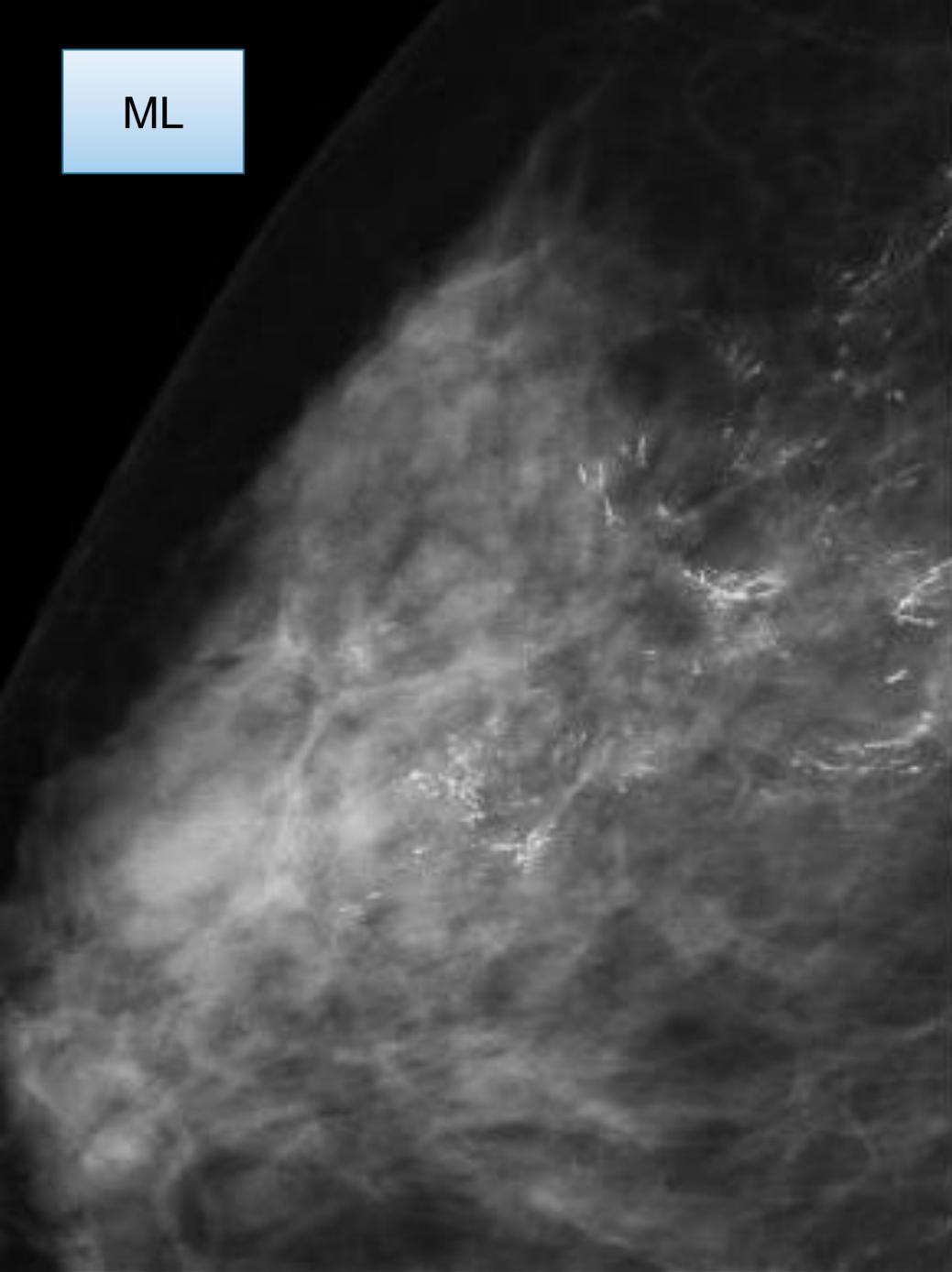
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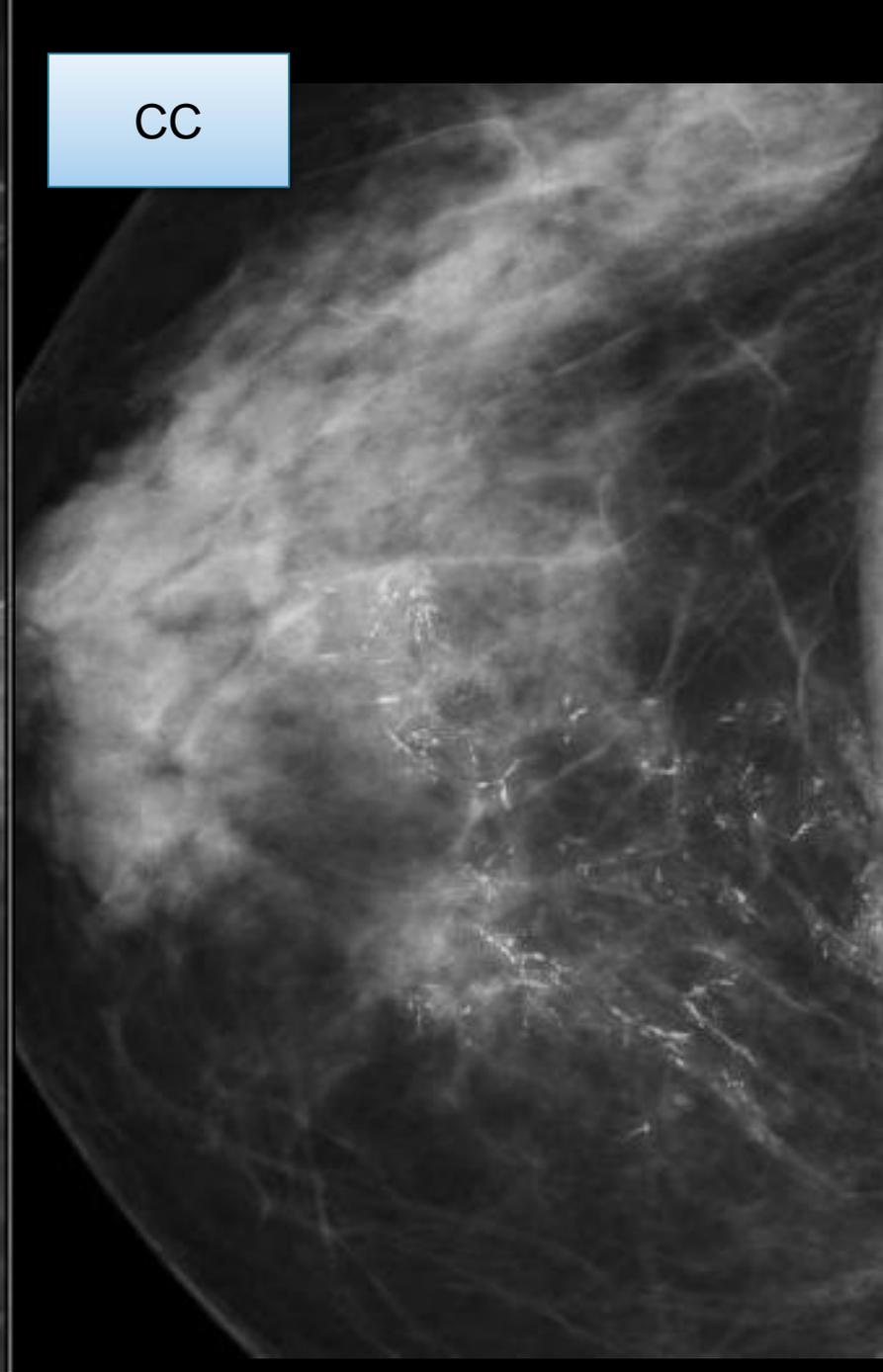
Extensive or Multiple microcalcifications clusters

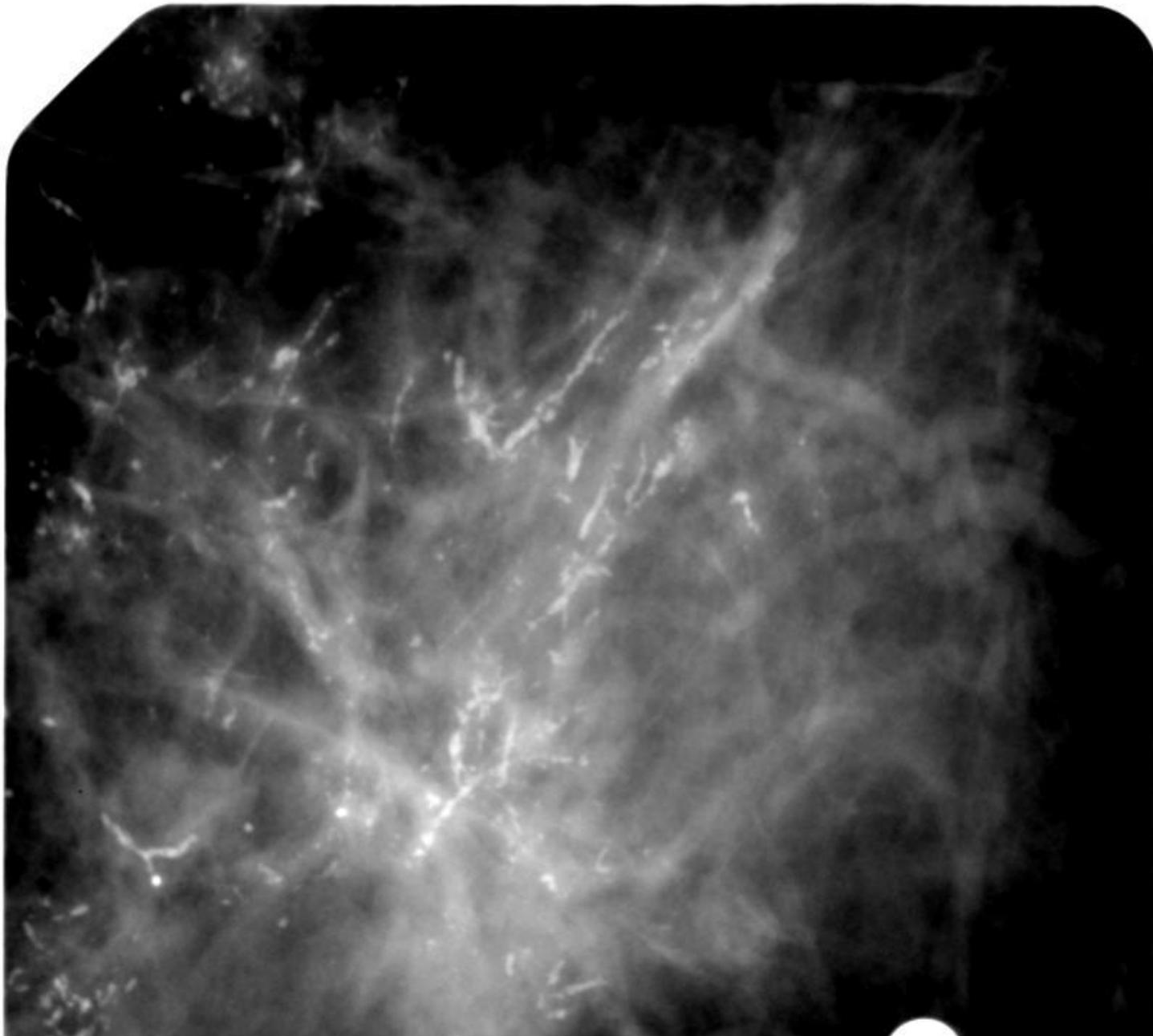
- **If microcalc. cluster is larger than 3 cm or multiple**
 - Double vacuum-assisted biopsy must be performed on the more distant micro
 - To decide a mastectomy
 - Possibility to perform a mastectomy + immediate reconstruction

ML

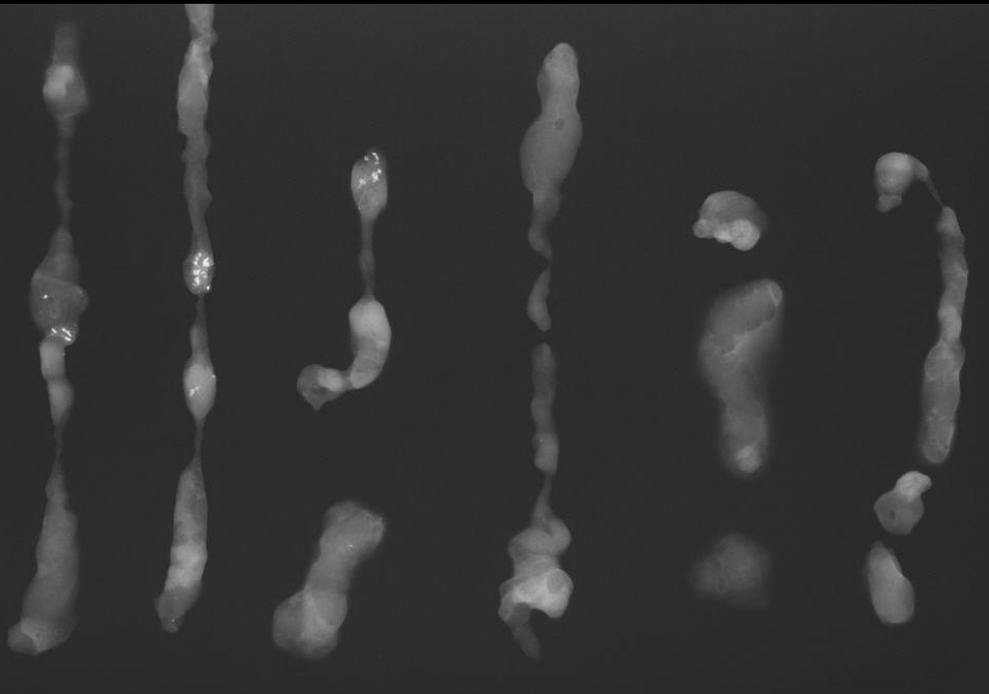


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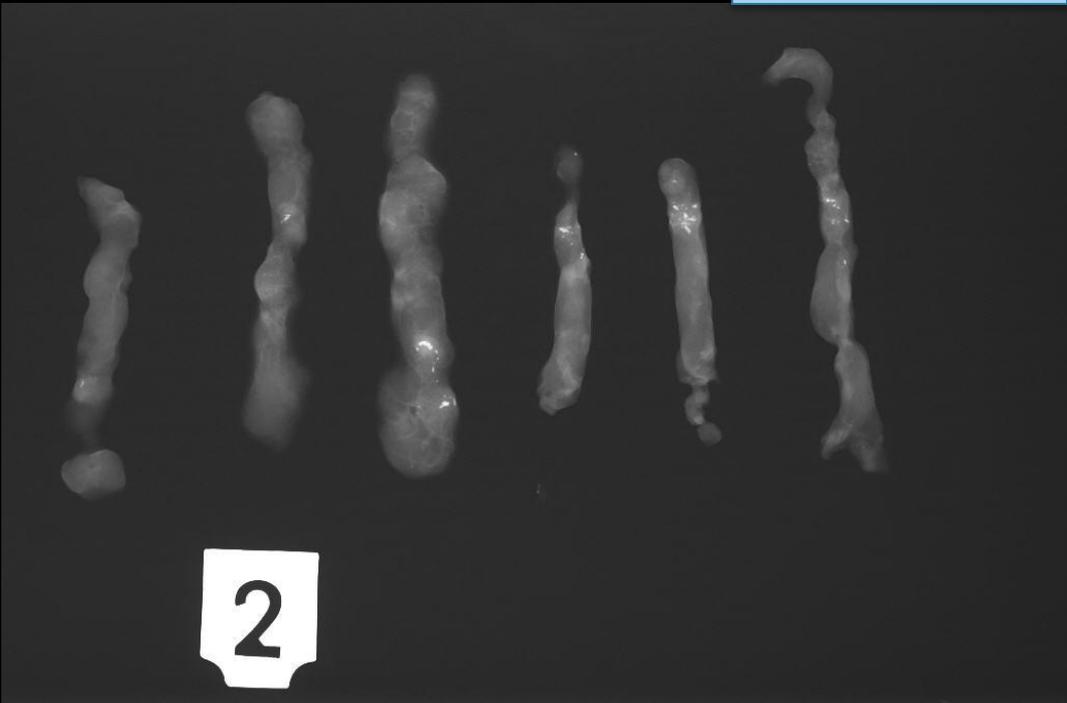


Target: MOLYBDENUM

: 63mAs

Bio 1

Bio 2



Extensive DCIS
Mastectomy

Challenging cases

- Very deep lesion :
 - It is feasible to reach deep lesions with new prone table
 - Arm through the table to gain deeper part of the breast

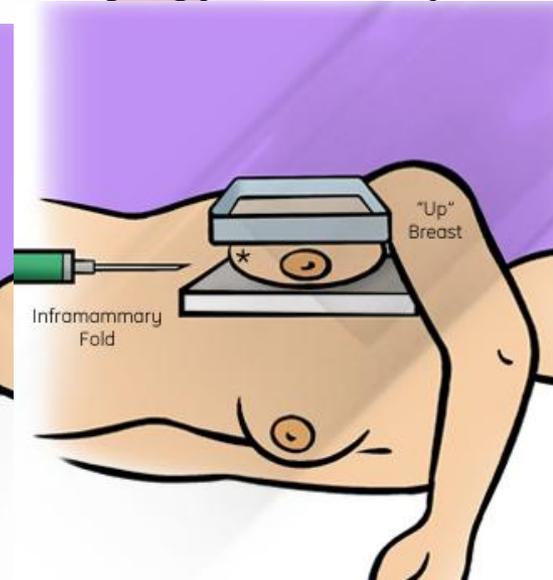
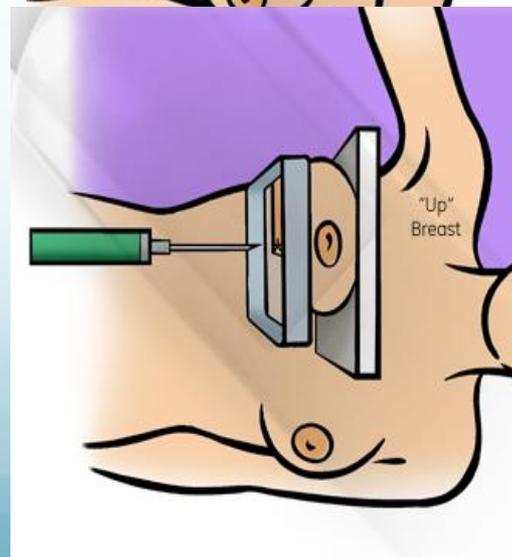
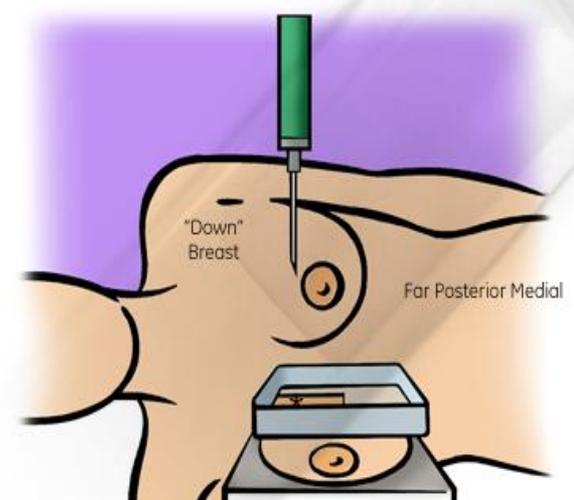
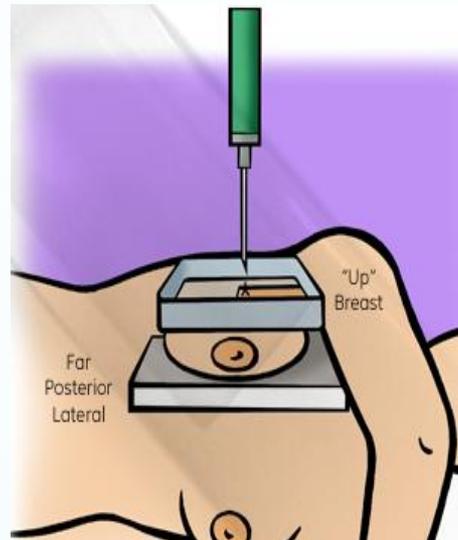


Stereotactic Biopsy

- Principles
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- Procedure on a mammography unit + bed
- Stereotactic biopsy + radiofrequency : Intact®

Dedicated Bed and Mammography

- In very deep lesion, targeting on a bed linked to the mammography device may be more accurate
- More various solutions to target a lesion



General Electric [®]



Essential

Siemens ®



Mammomat inspiration

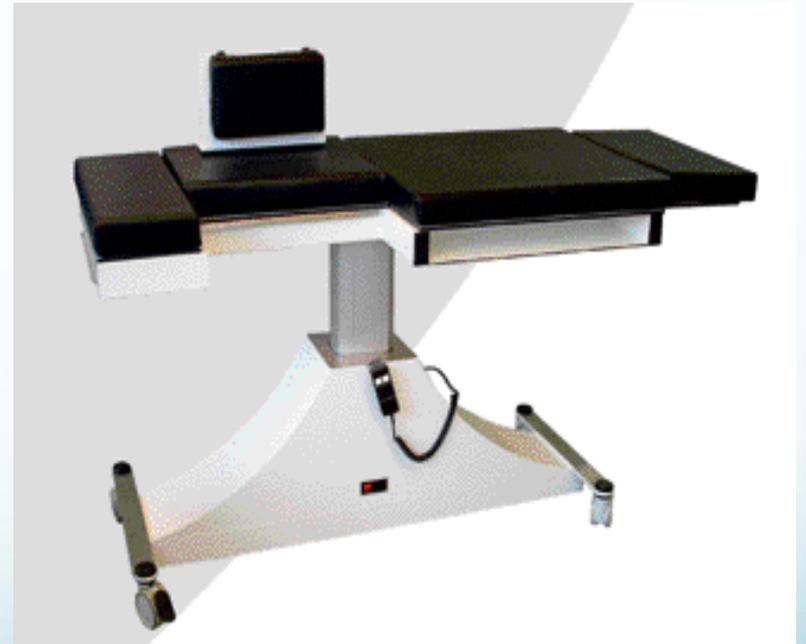


Table Elisa



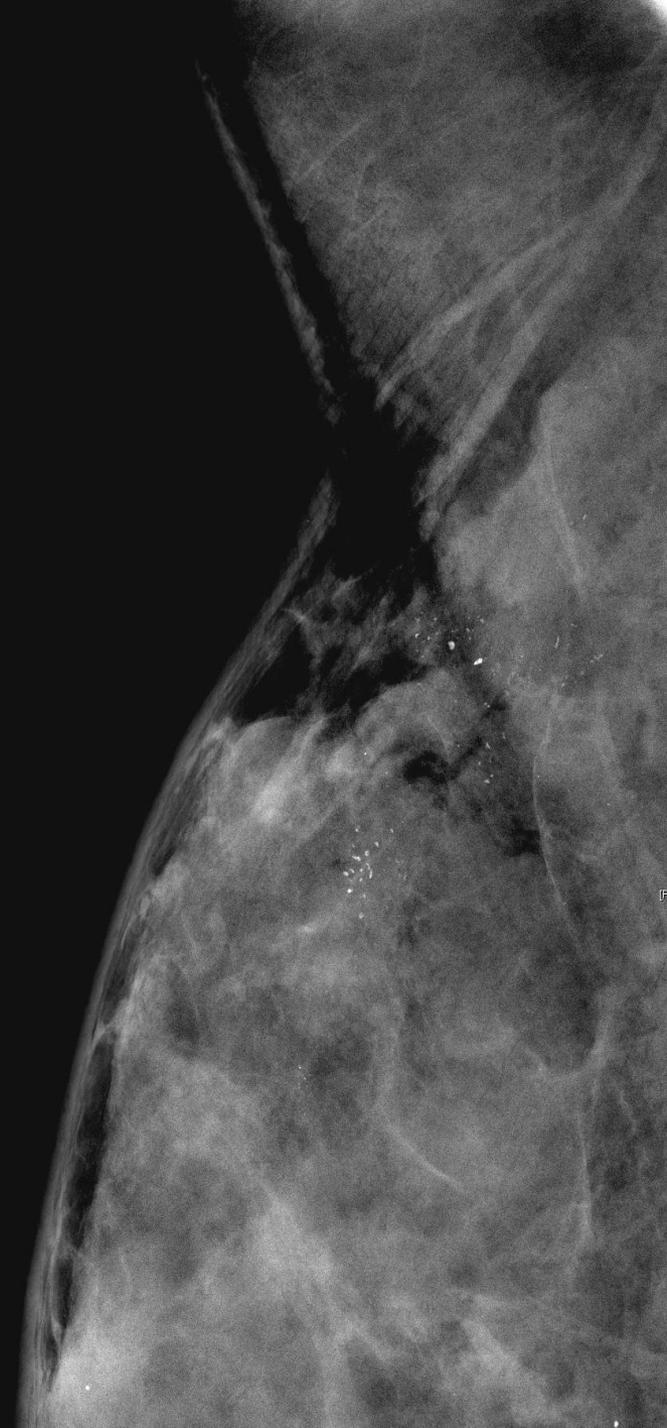
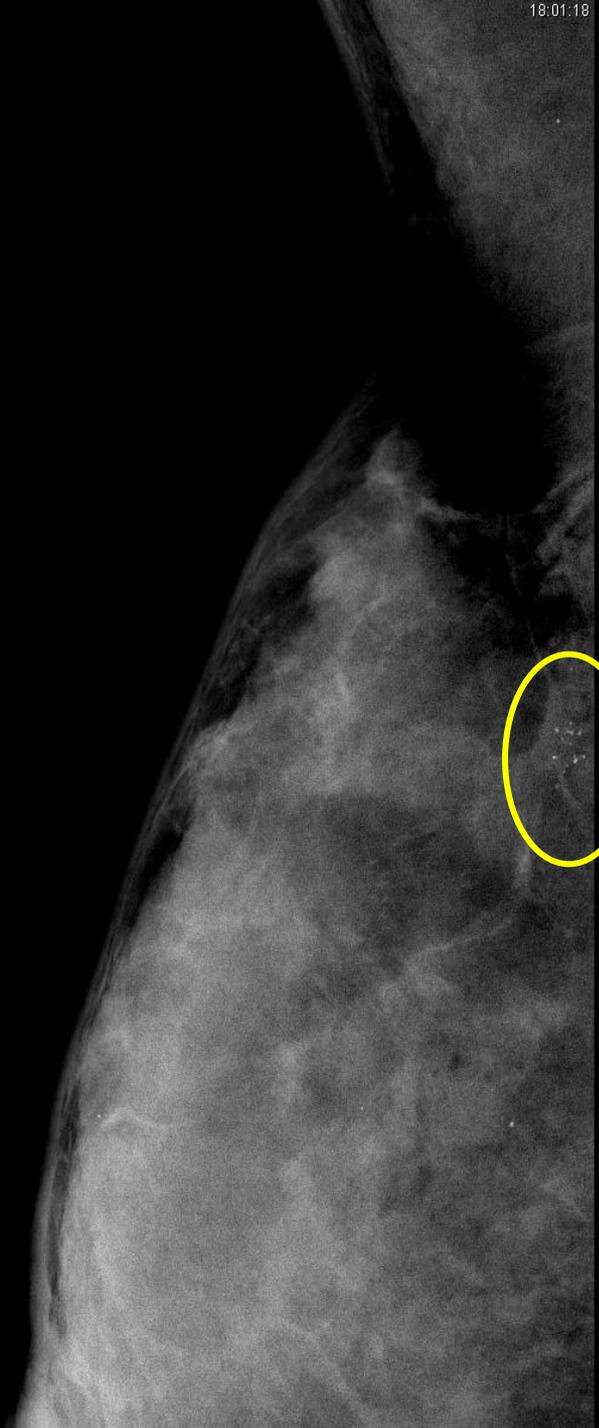
- External approach



- Inner approach

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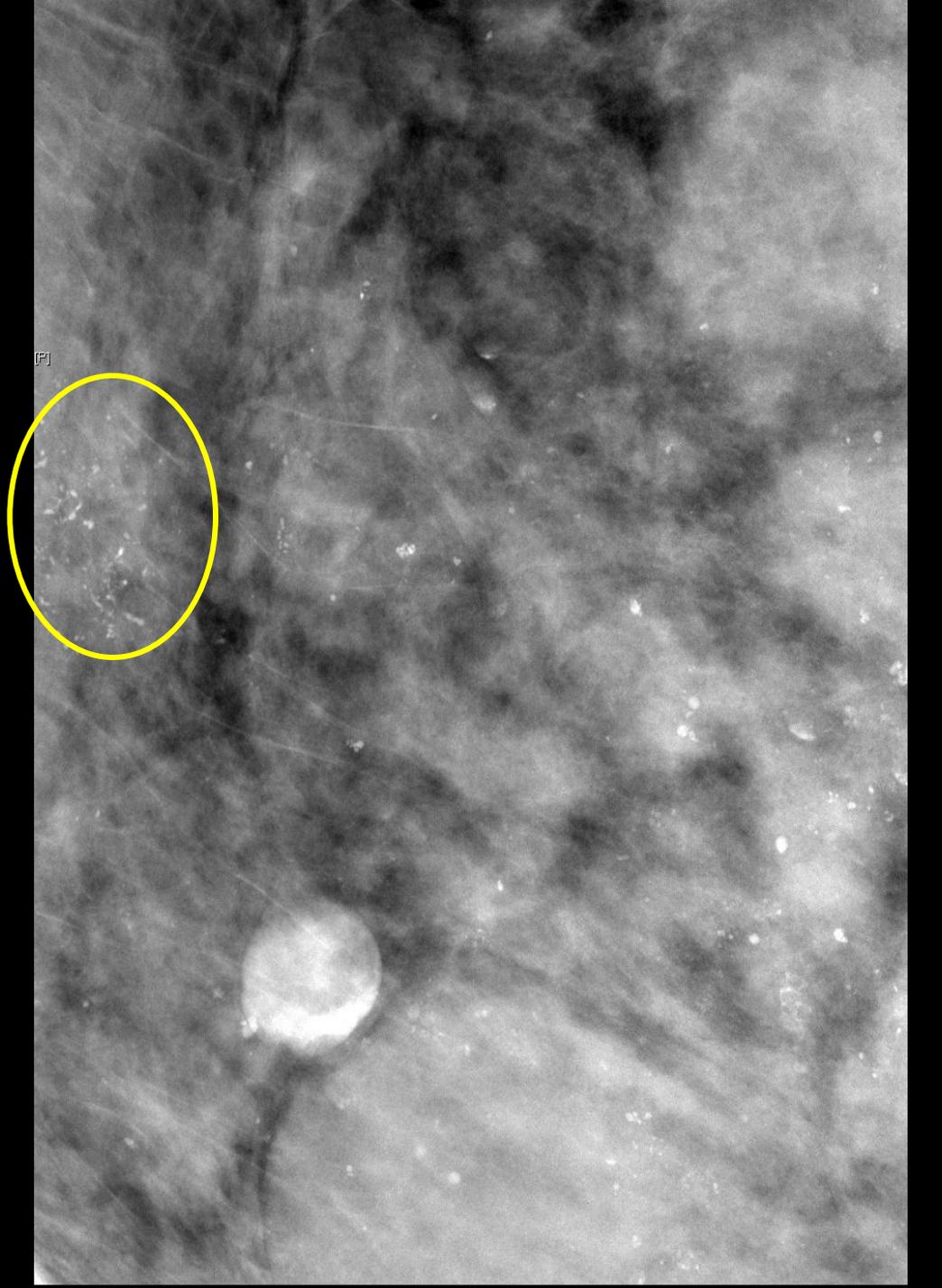
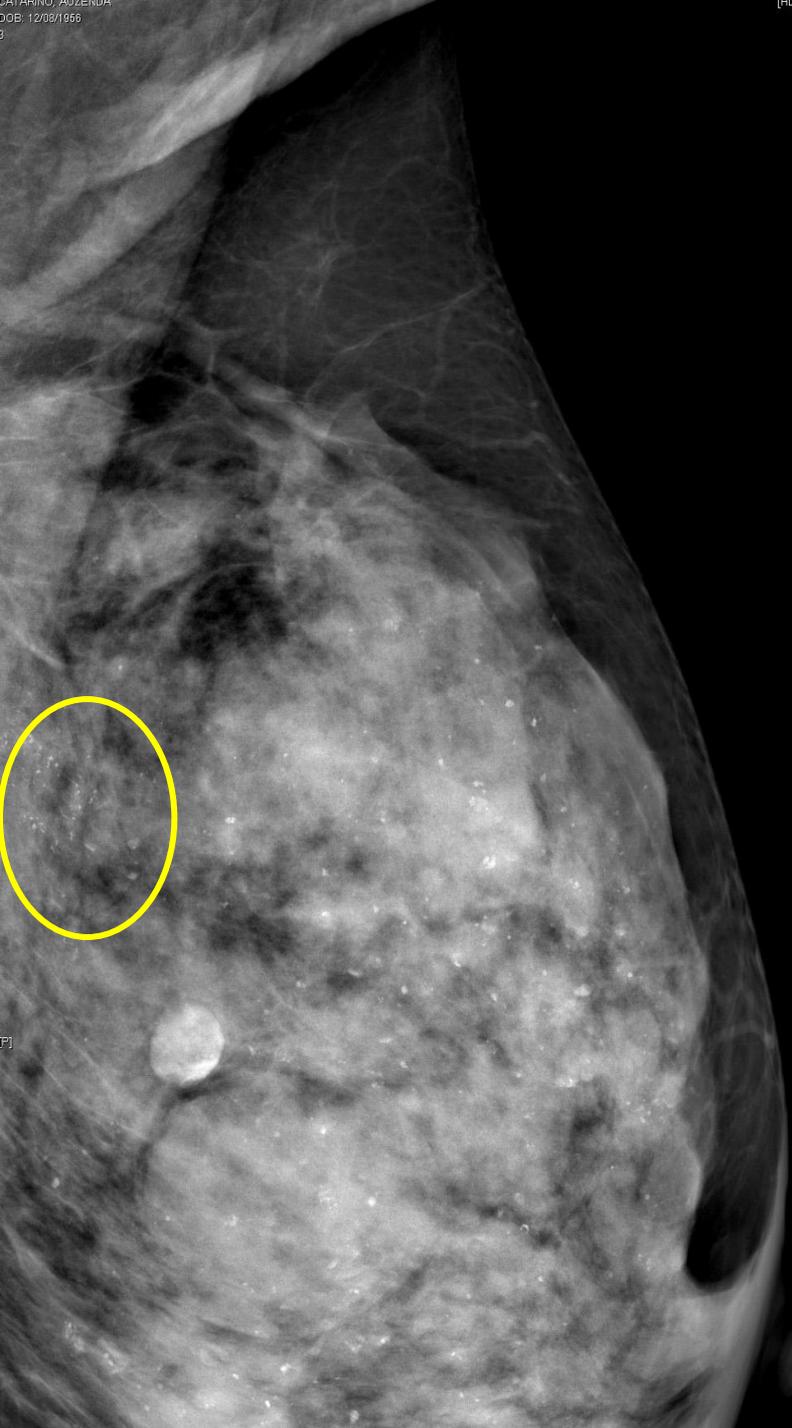
oblique

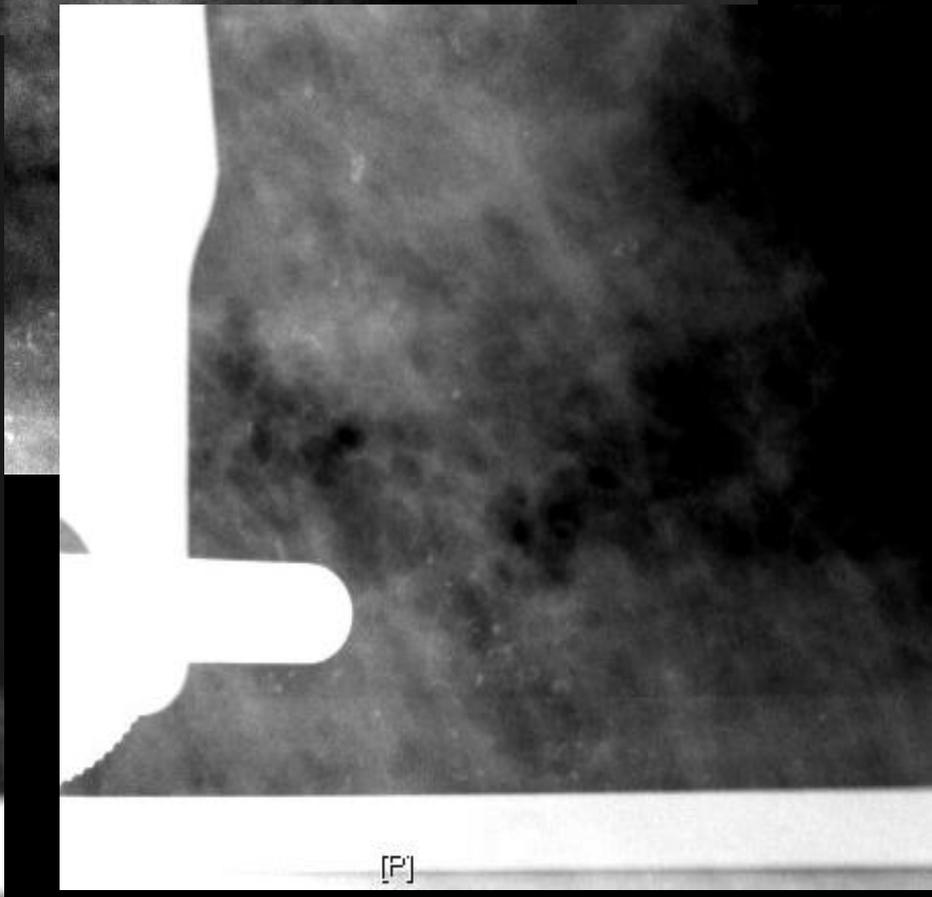
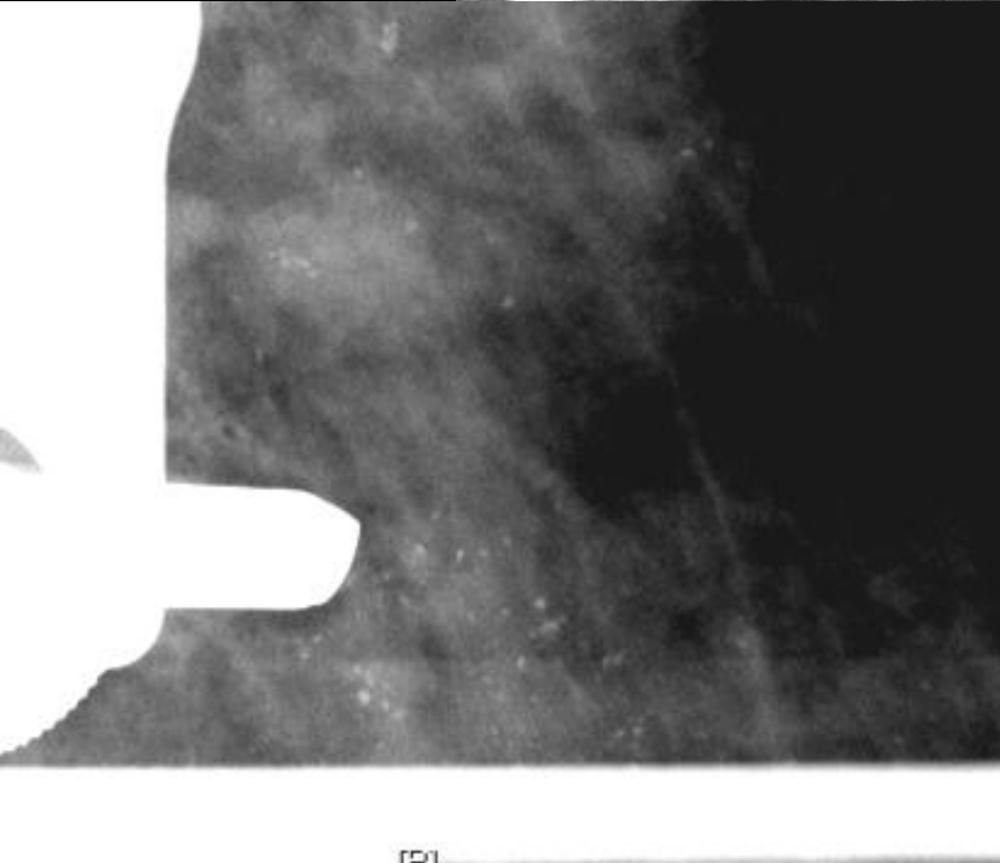
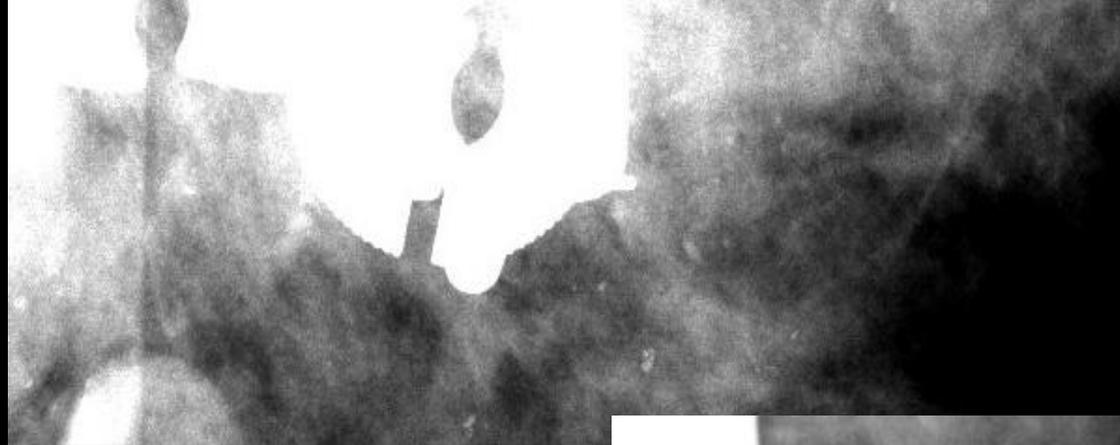




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GE MEDICA





Stereotactic Biopsy

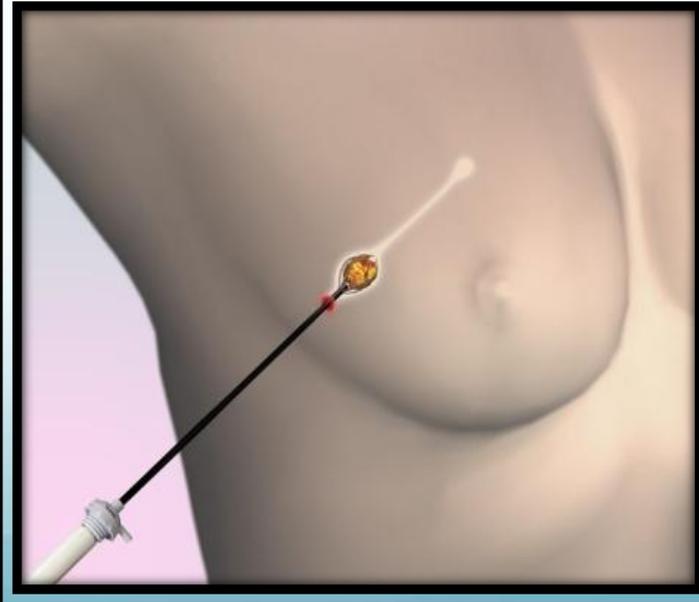
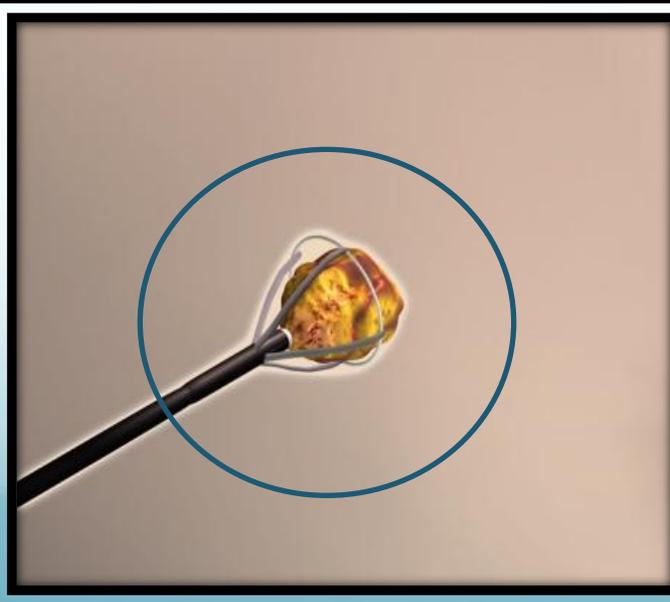
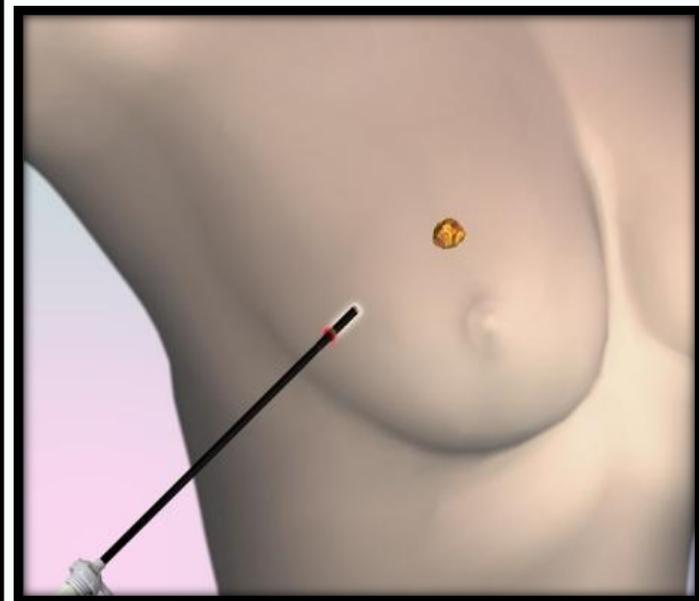
- Principles
- Procedure on a prone table
- Procedure on a mammography unit + bed
- Stereotactic biopsy + radiofrequency : Intact®

INTACT ® : BLES biopsy (Breast Lesion Excision Sample ®)

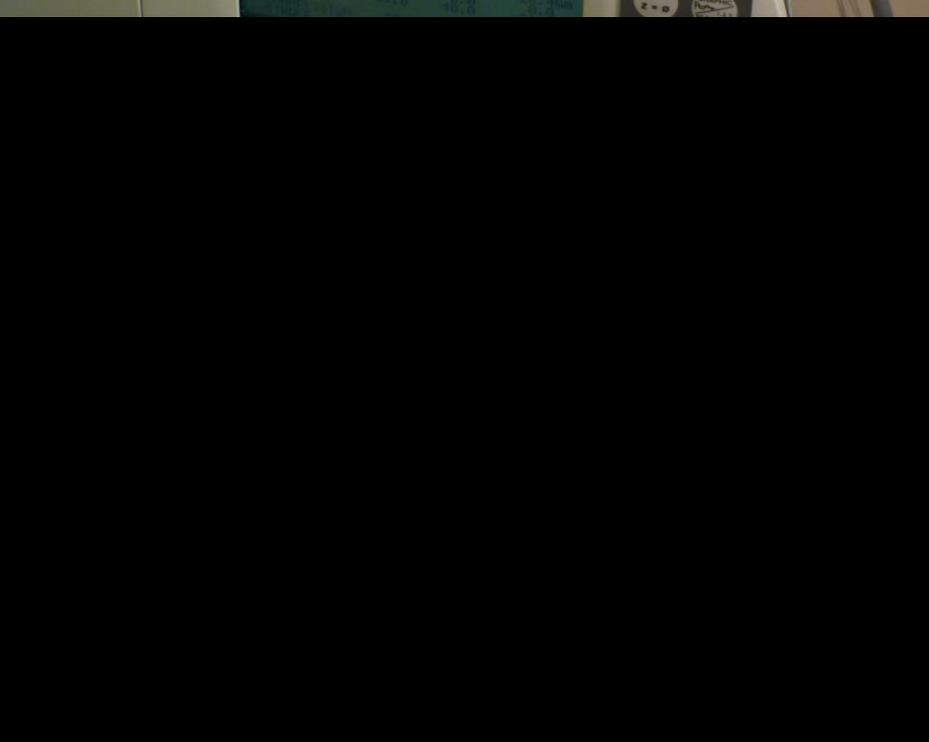
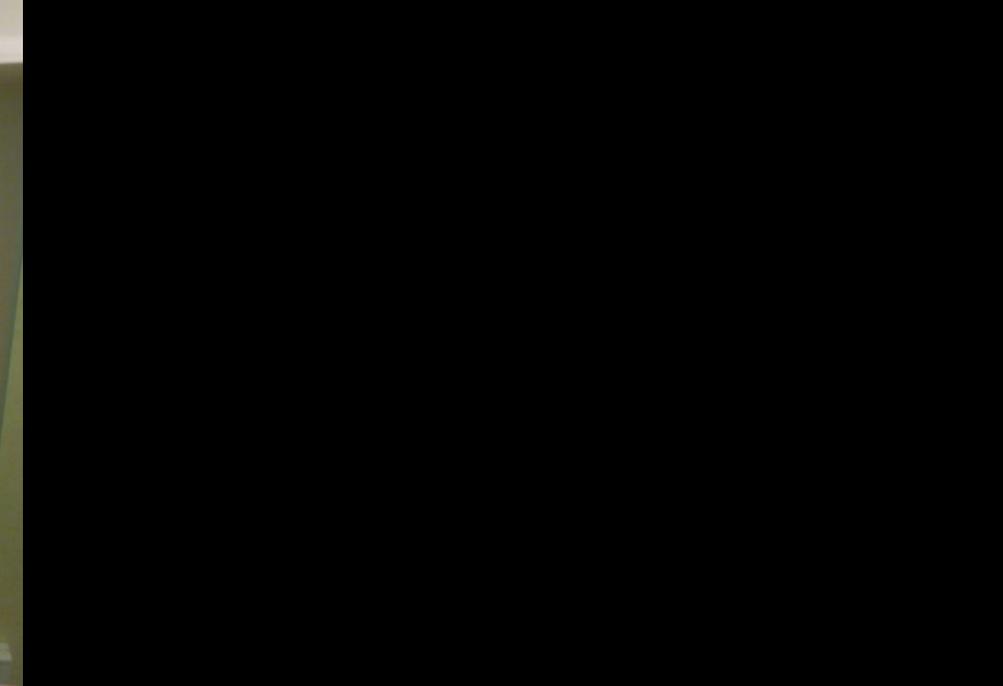
- Biopsy : macrobiopsy + Radiofrequency
- Aim :
 - To remove entirely in one sample a lesion

Breast Lesion Excision System (Intact™)

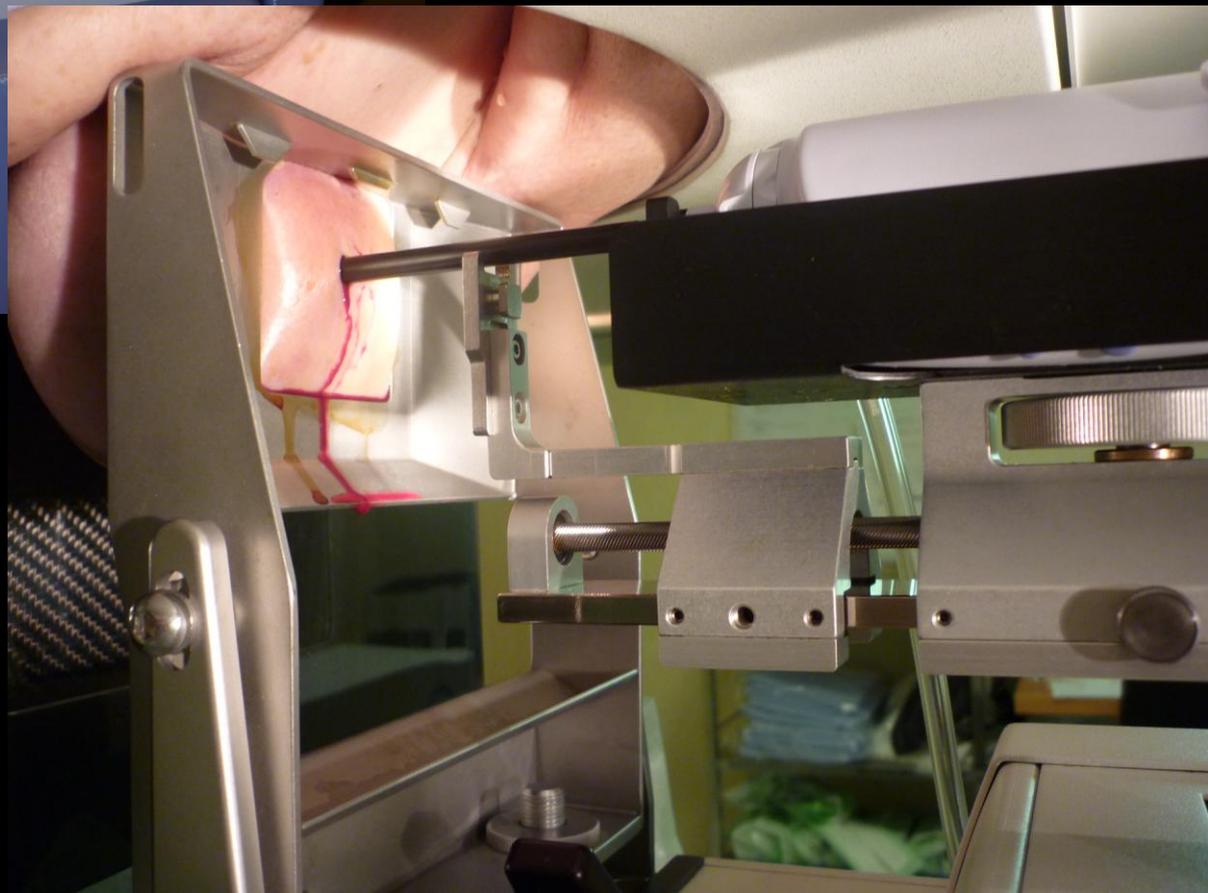


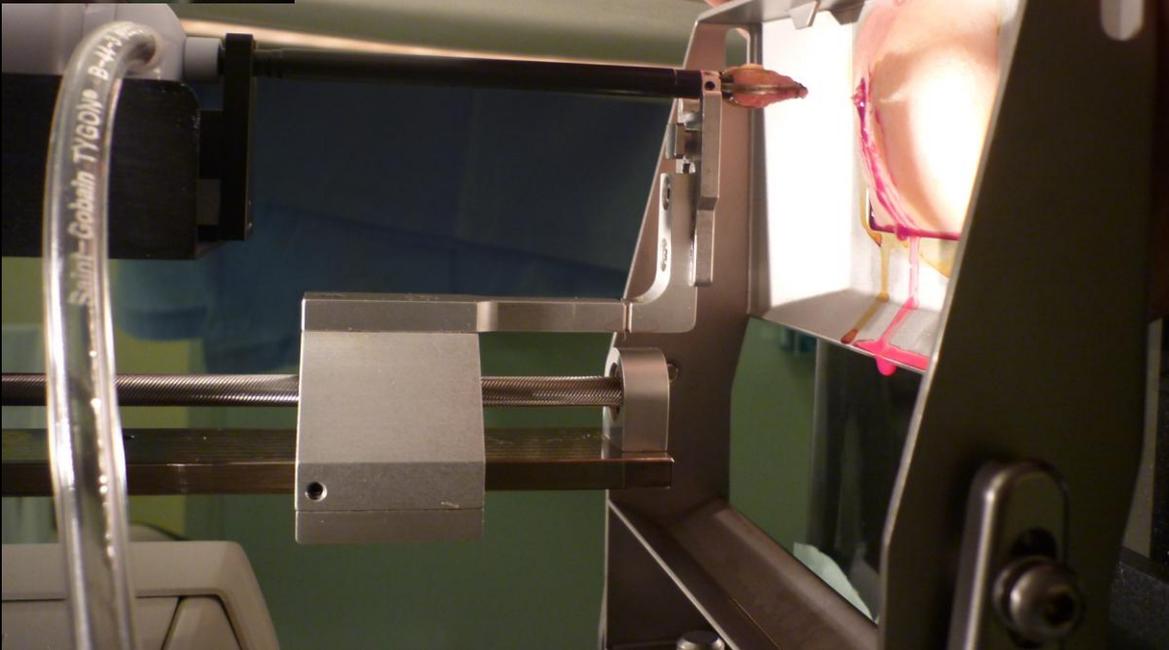
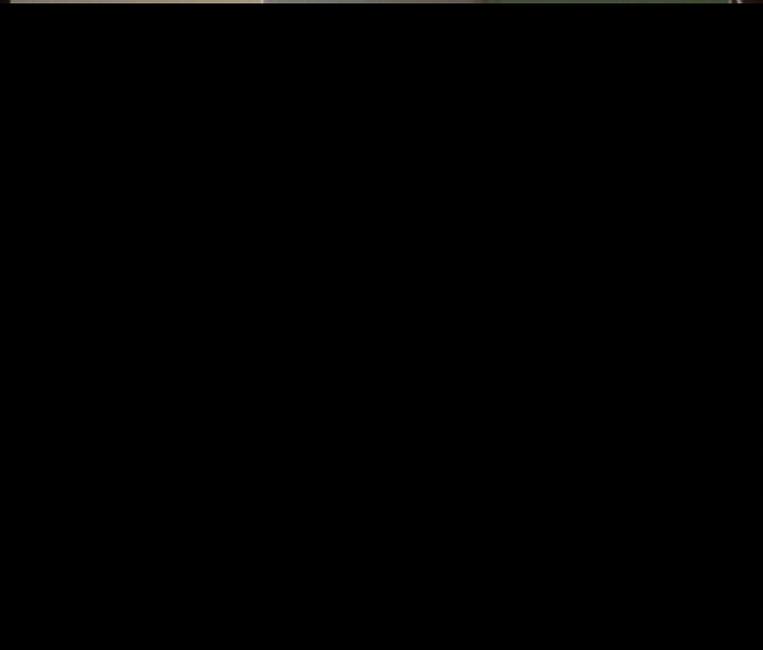
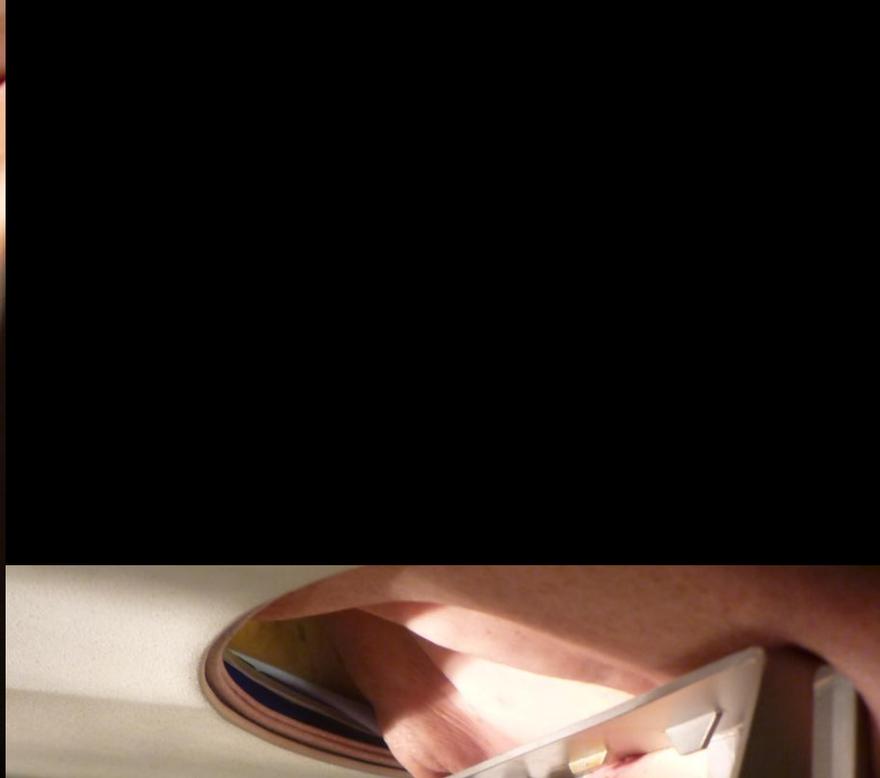
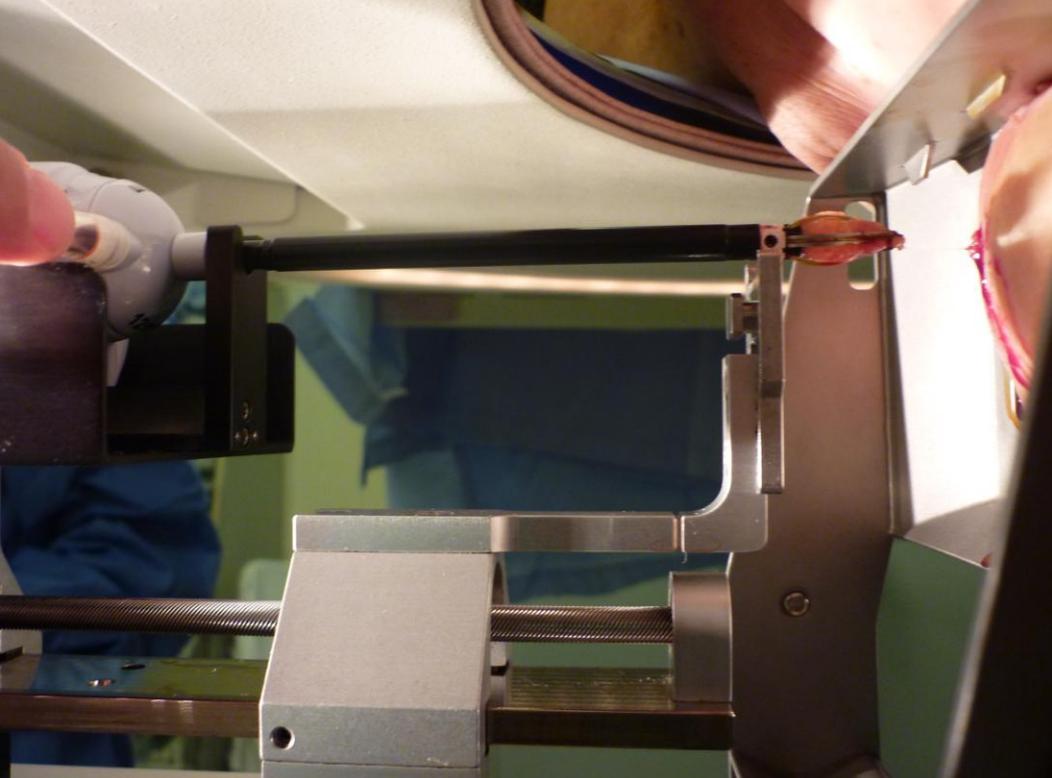


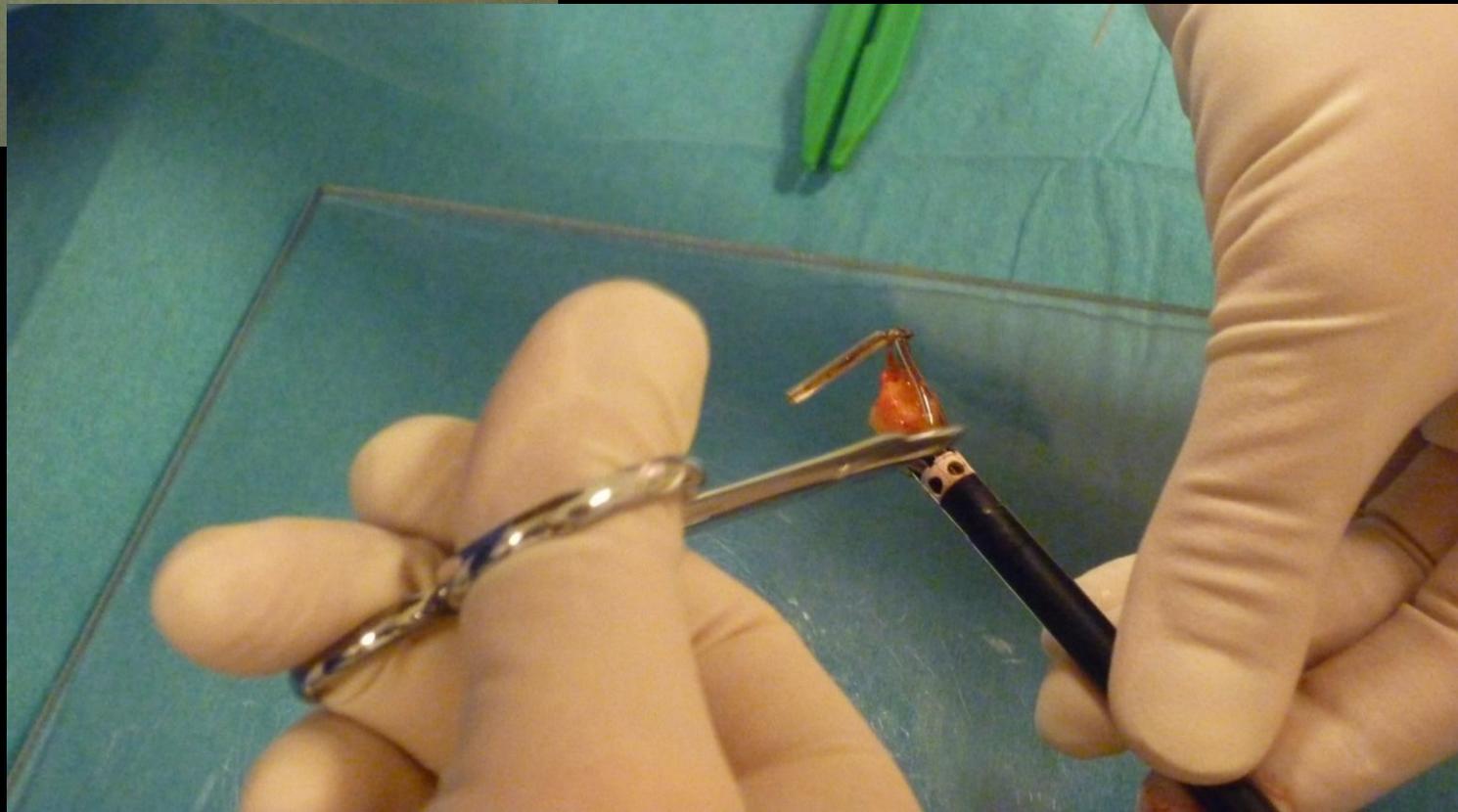
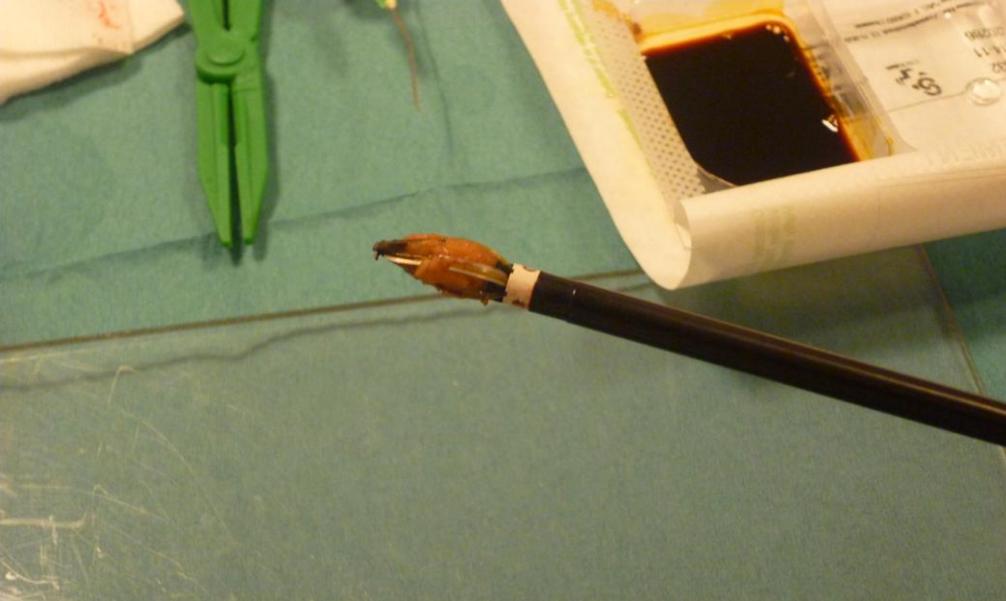














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Indications

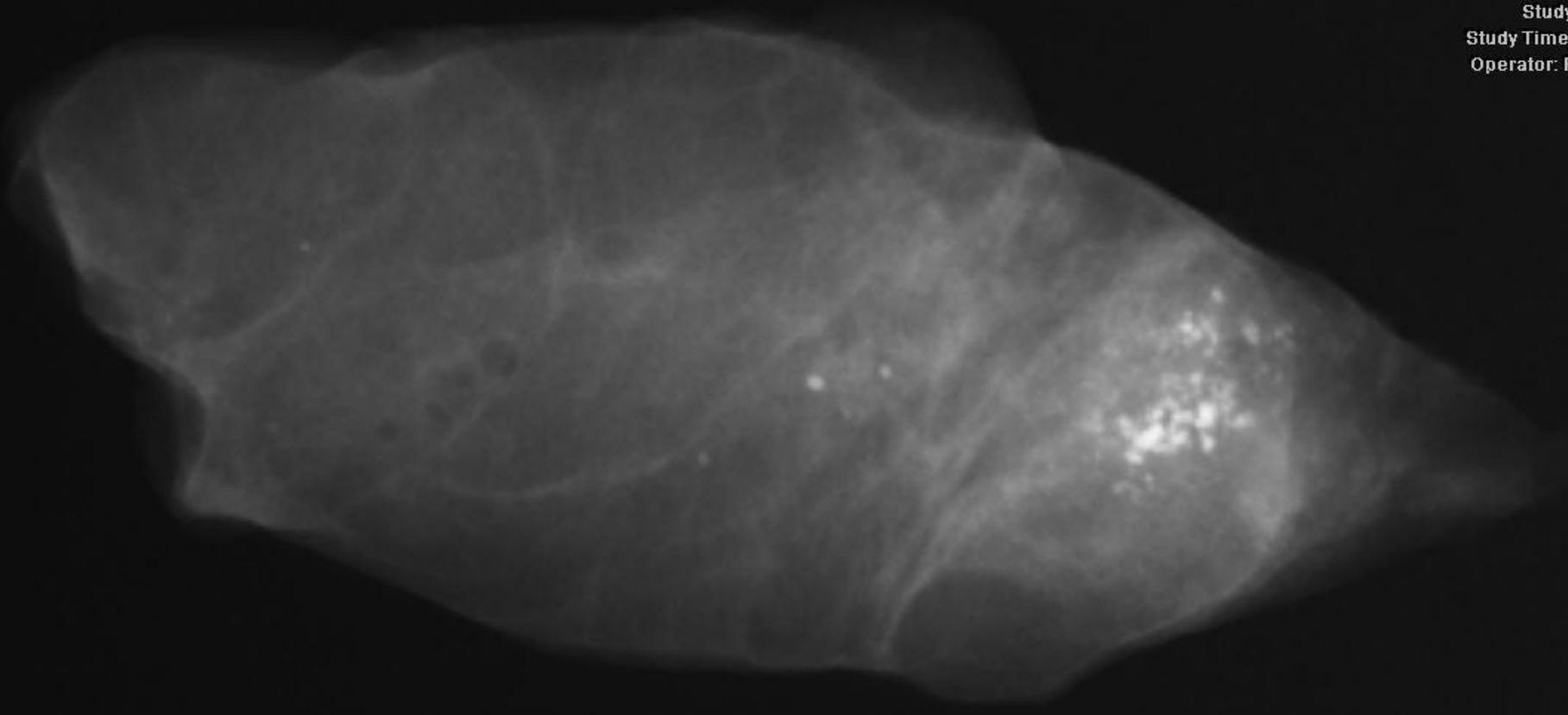
- Microcalcifications clusters
 - < 2 cm
 - BI-RADS 4a, b, c; BI-RADS 5
- Small non calcified lesion BI-RADS 4 not seen on US
 - More challenging
- Advantages :
 - Unique sample, no fragmentation, easier histological analysis
 - Technical treatment is reduced
 - Complete excision is feasible
 - Low risk of bleeding
- Limits :
 - Technical limits :
 - Small breast

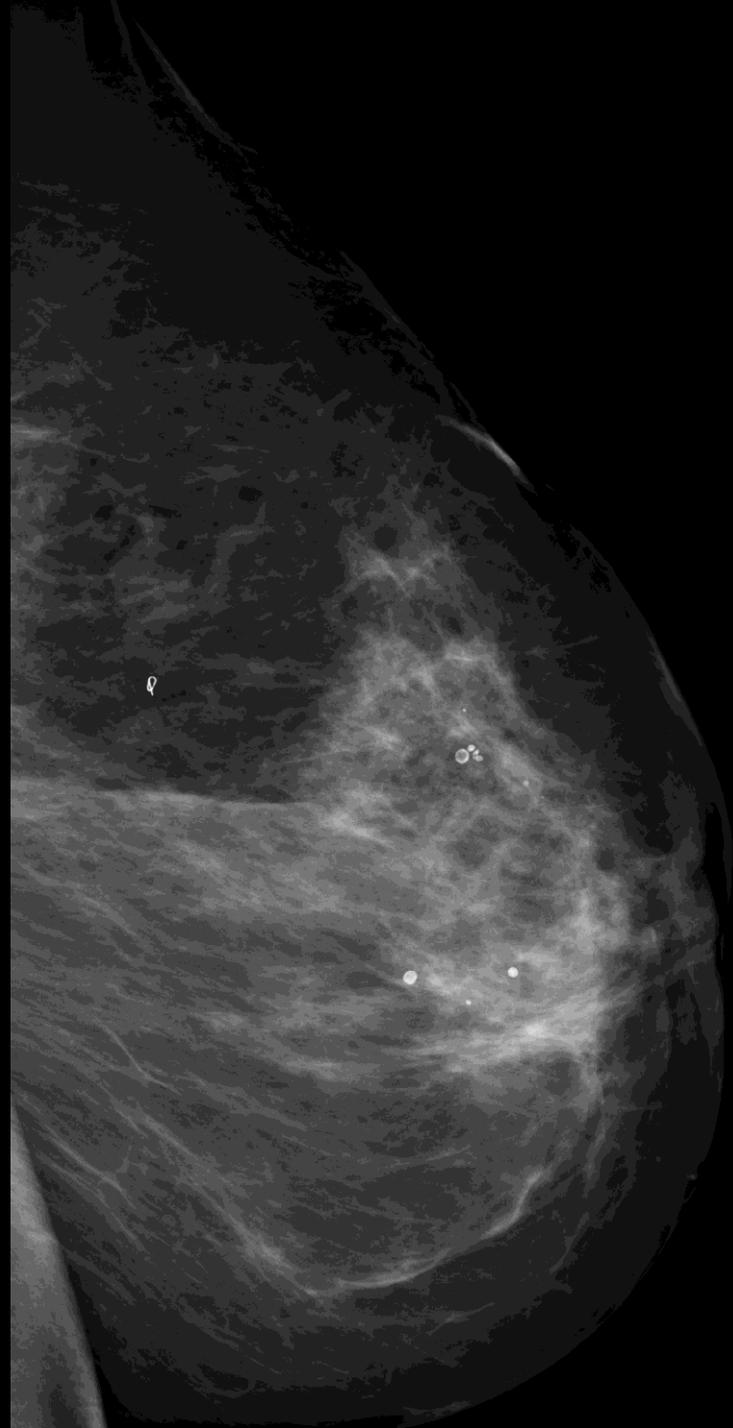
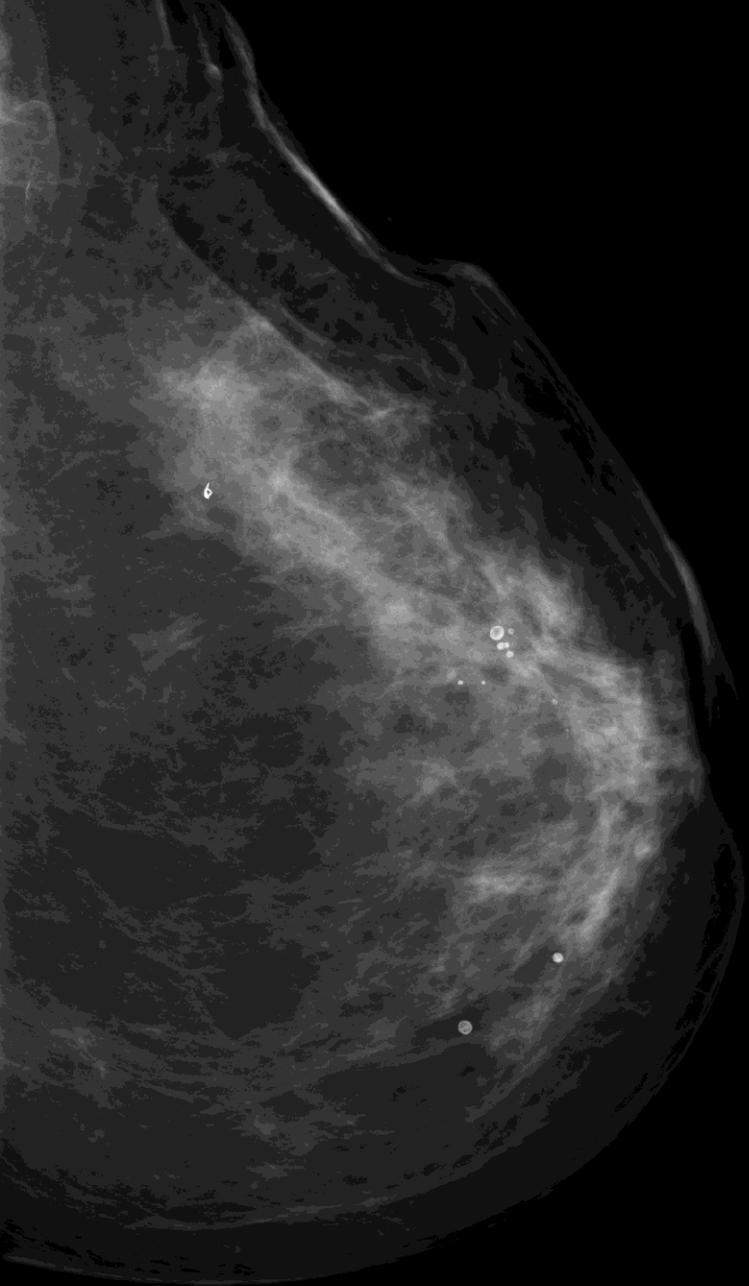
Intact ® :

- Histological underestimation is reduced / vacuum biopsy
- Complete excision of atypical or malignant lesions : 40-60 % according studies
- Predictive factor or complete excision :
 - Margins > 1 mm with Intact ® biopsy
 - *Seror et al., Eur J Radiol 2012*

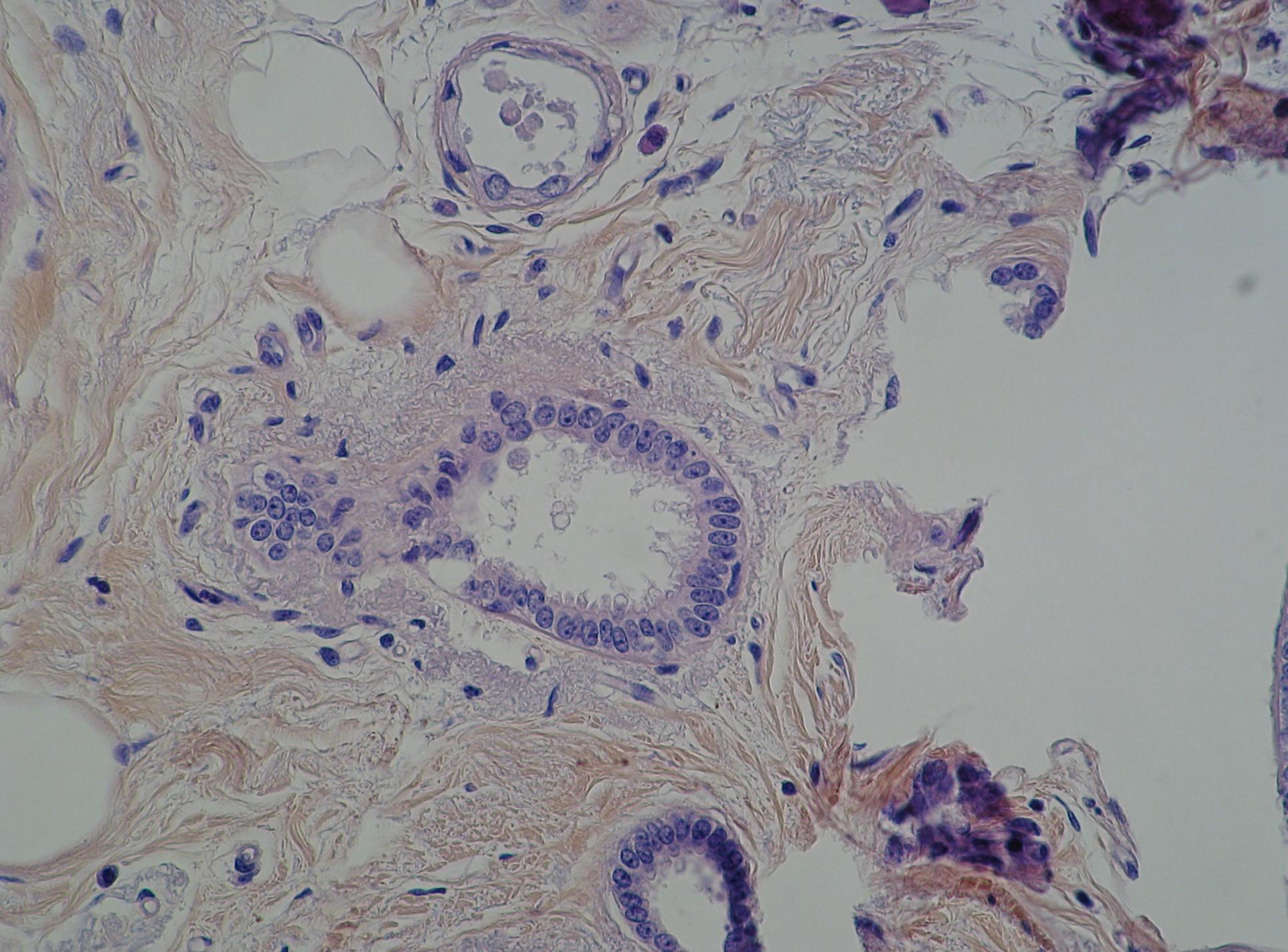


Study Date:
Study Time: 1541
Operator: Pas d
ST





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INTACT and HR lesions

Pat W. Whitworth, MD and al. Definitive Diagnosis for High-Risk Breast Lesions Without Open Surgical Excision: The Intact Percutaneous Excision Trial (IPET). *Ann Surg Oncol* (2011) 18:3047–3052

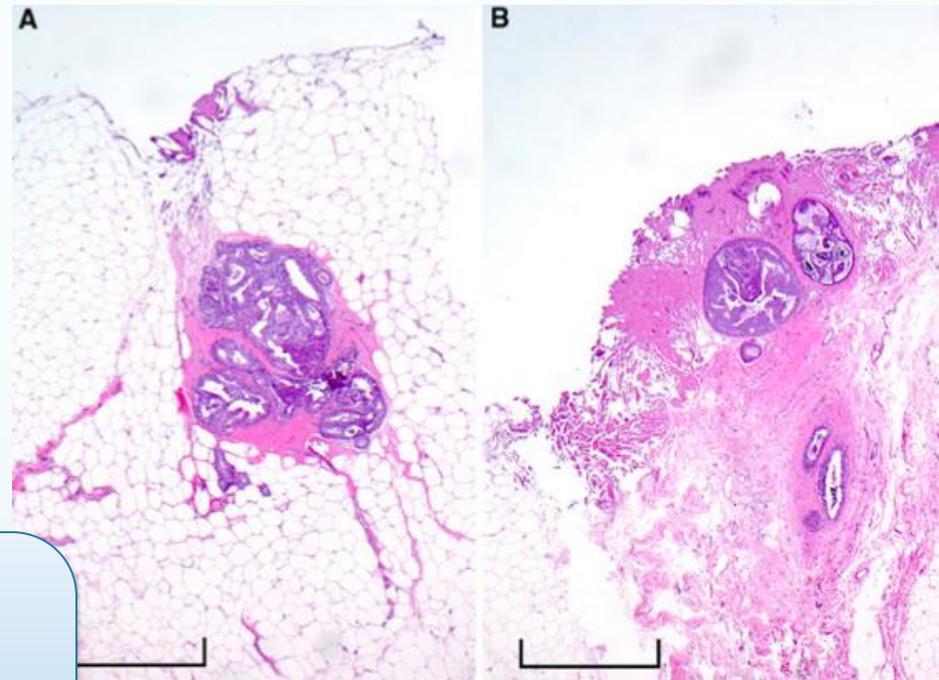
Prospective study: 1,170 / 25 institutions

Comparison between result of BLES biopsy and surgical specimen

TABLE 1 Cancer and HRL diagnoses by intact percutaneous lesion excision at enrollment ($N = 1,170$)

IPEX biopsies	1,170
Carcinoma	191 (16%)
HRL	83 (7%)
ADH	32 (3%)
LN	20 (2%)
Papilloma	24 (2%)
RS	7 (1%)

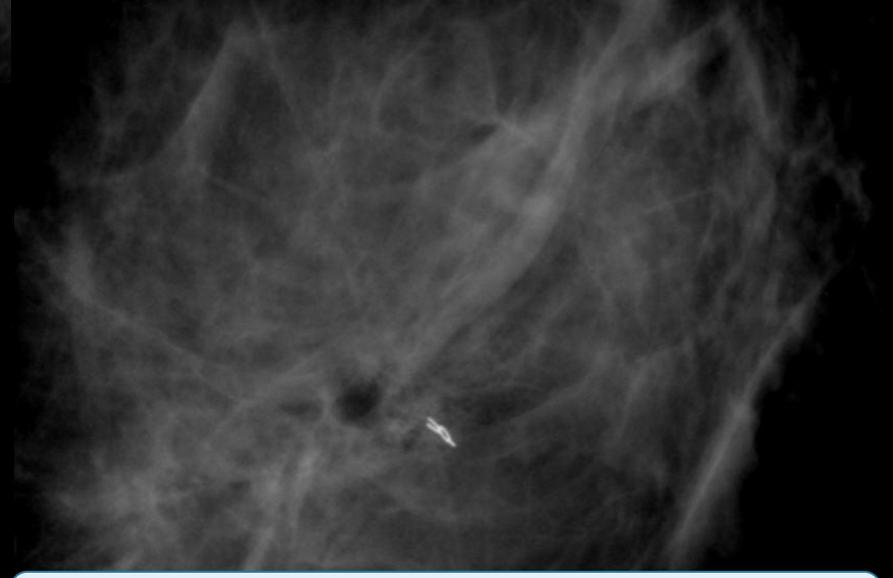
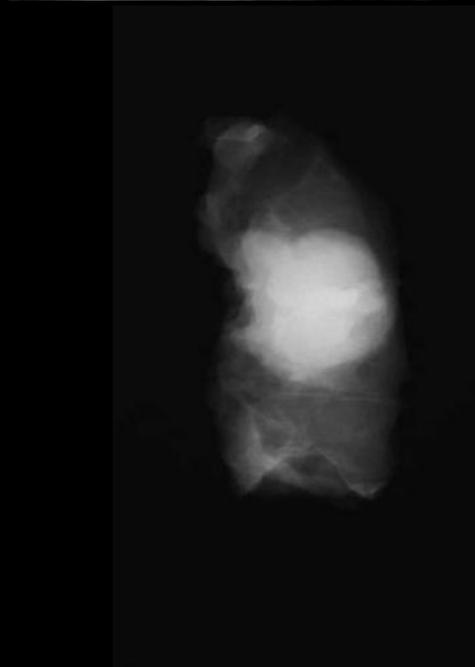
ADH atypical ductal hyperplasia, *HRL* high-risk lesion, *IPEX* intact percutaneous excision, *LN* lobular neoplasia, *P* papilloma, *RS* radial scar



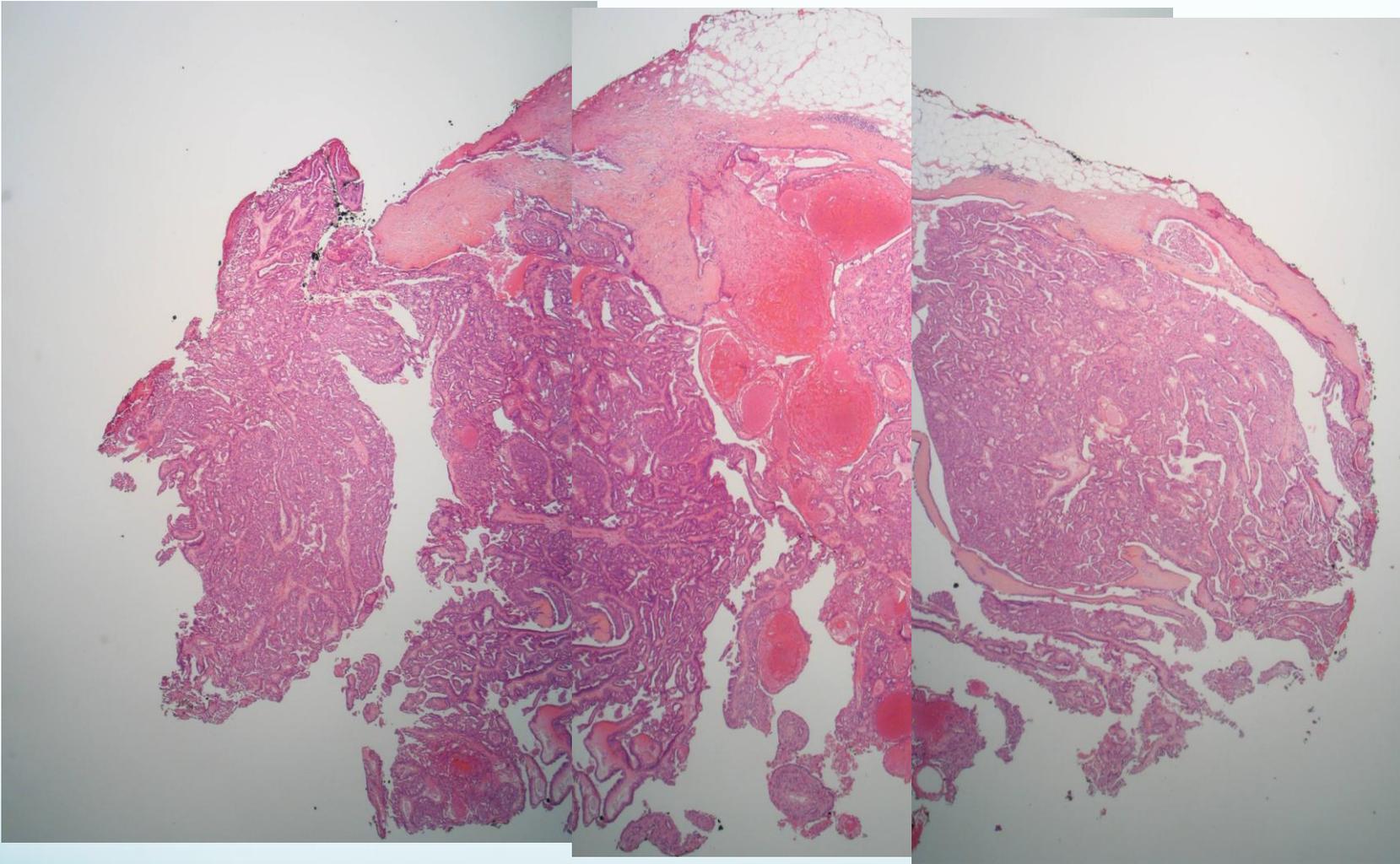
No upgrade to carcinoma of 51 non ADH HRL
No upgrade to carcinoma in ADH with safe > 1 mm margins with BLES
Follow-up of HRL with BLES complete excision?

BLES as an alternative Procedure to Surgery in special cases ?

- No validation
- Main interest for benign HR lesions :
 - Atypia
 - Papilloma?
 - Radial Scar?
- Small carcinoma if surgery is not possible
 - To be discussed in multidisciplinary session

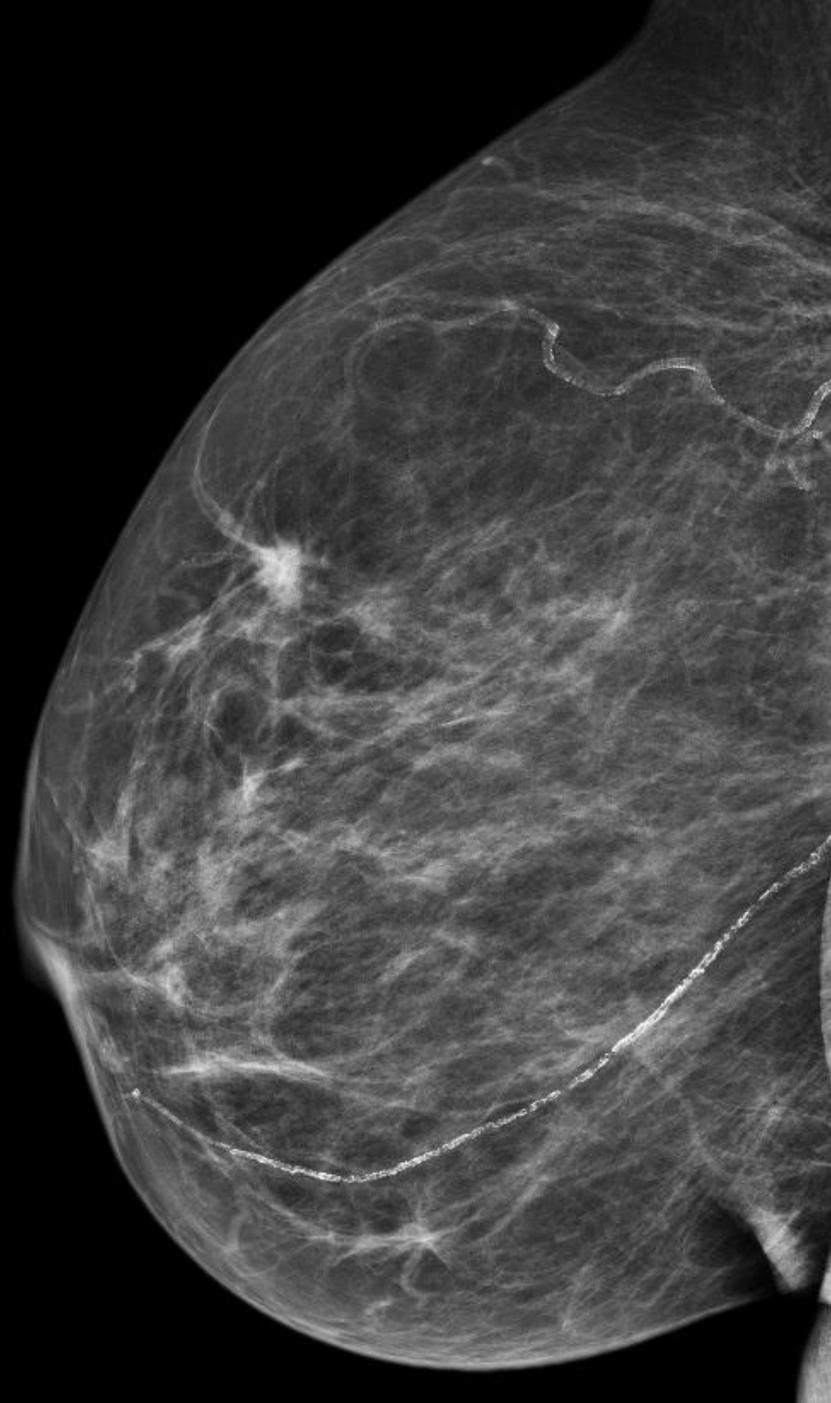
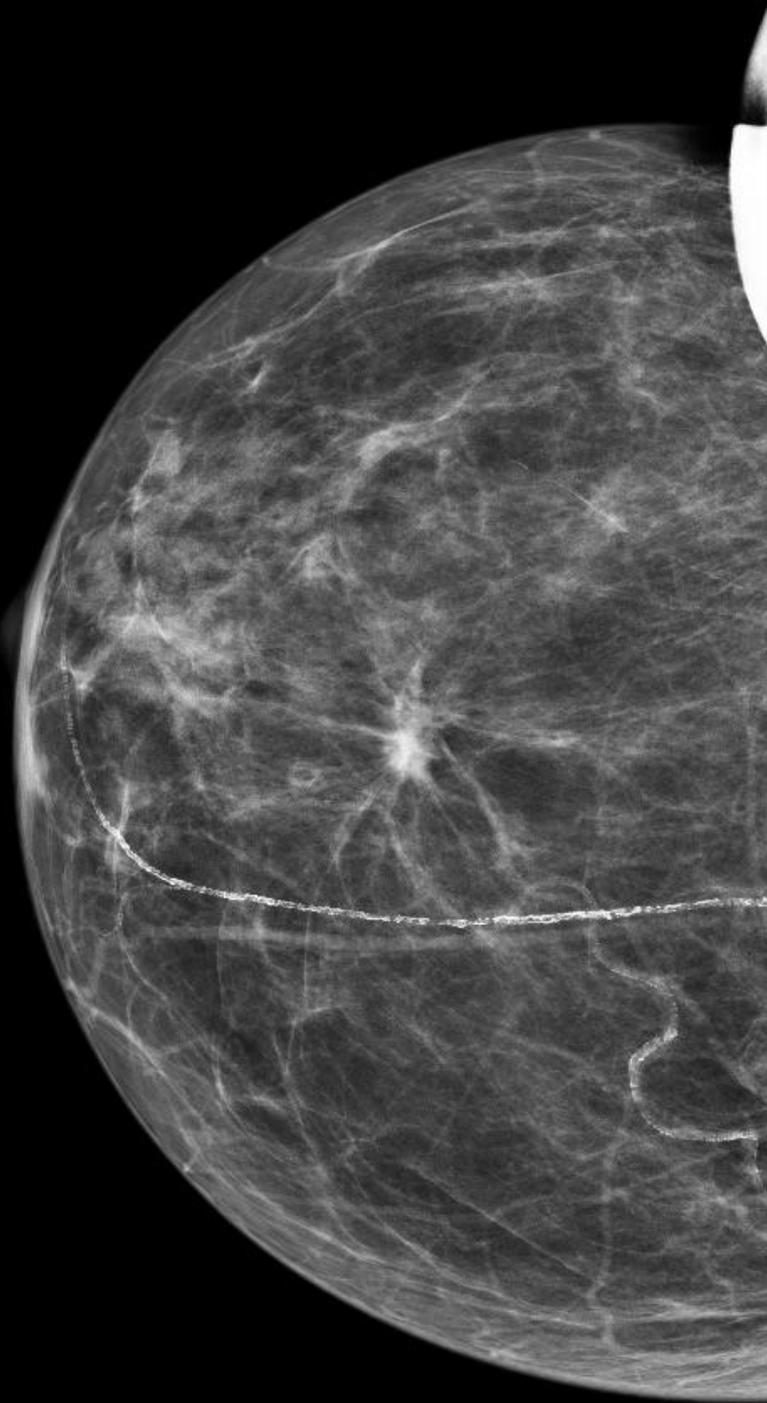


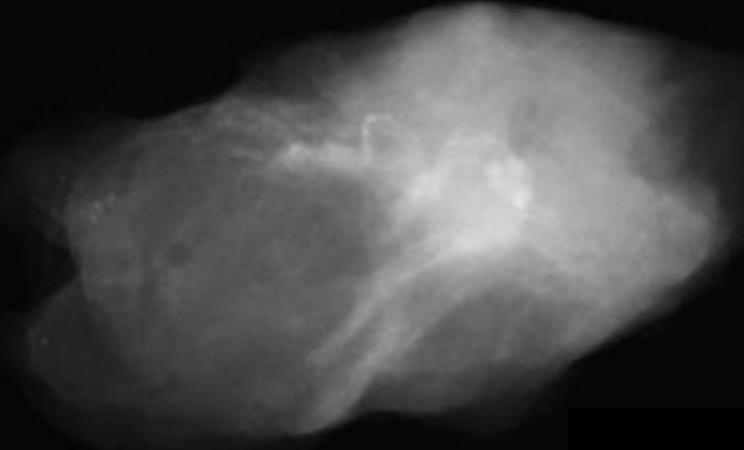
Complete excision of a papilloma



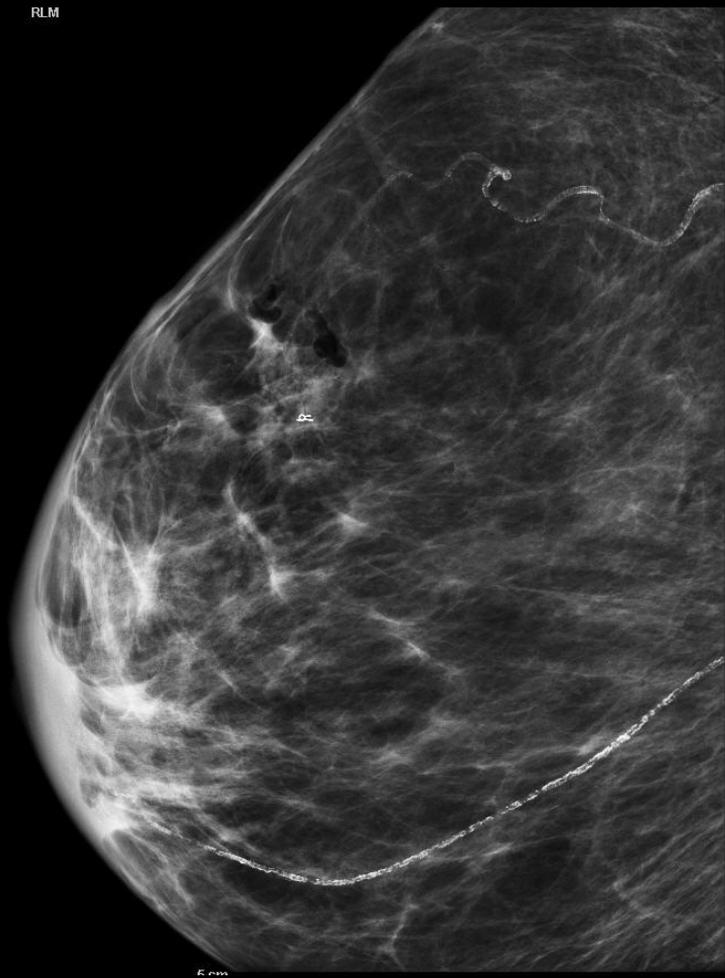
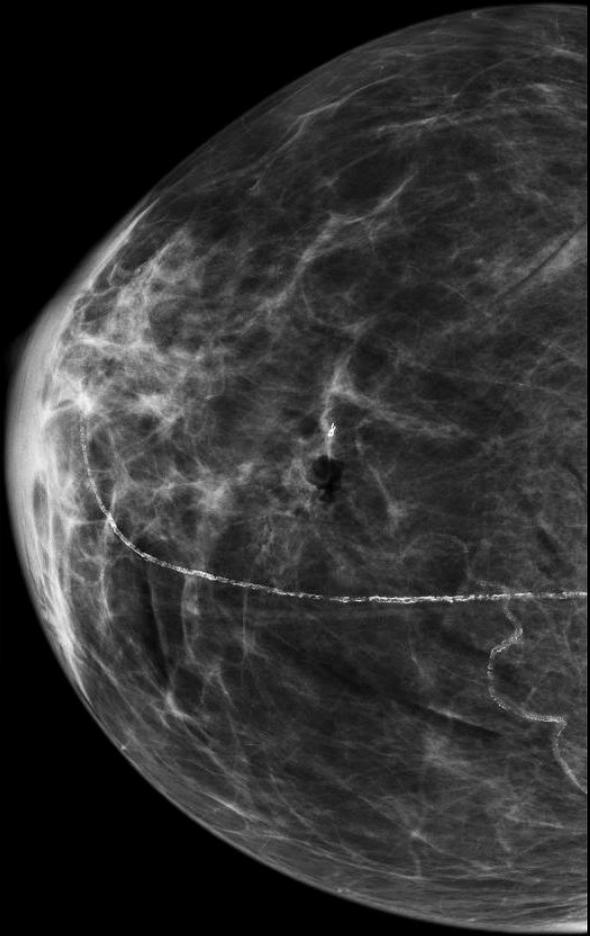
Papilloma no atypia

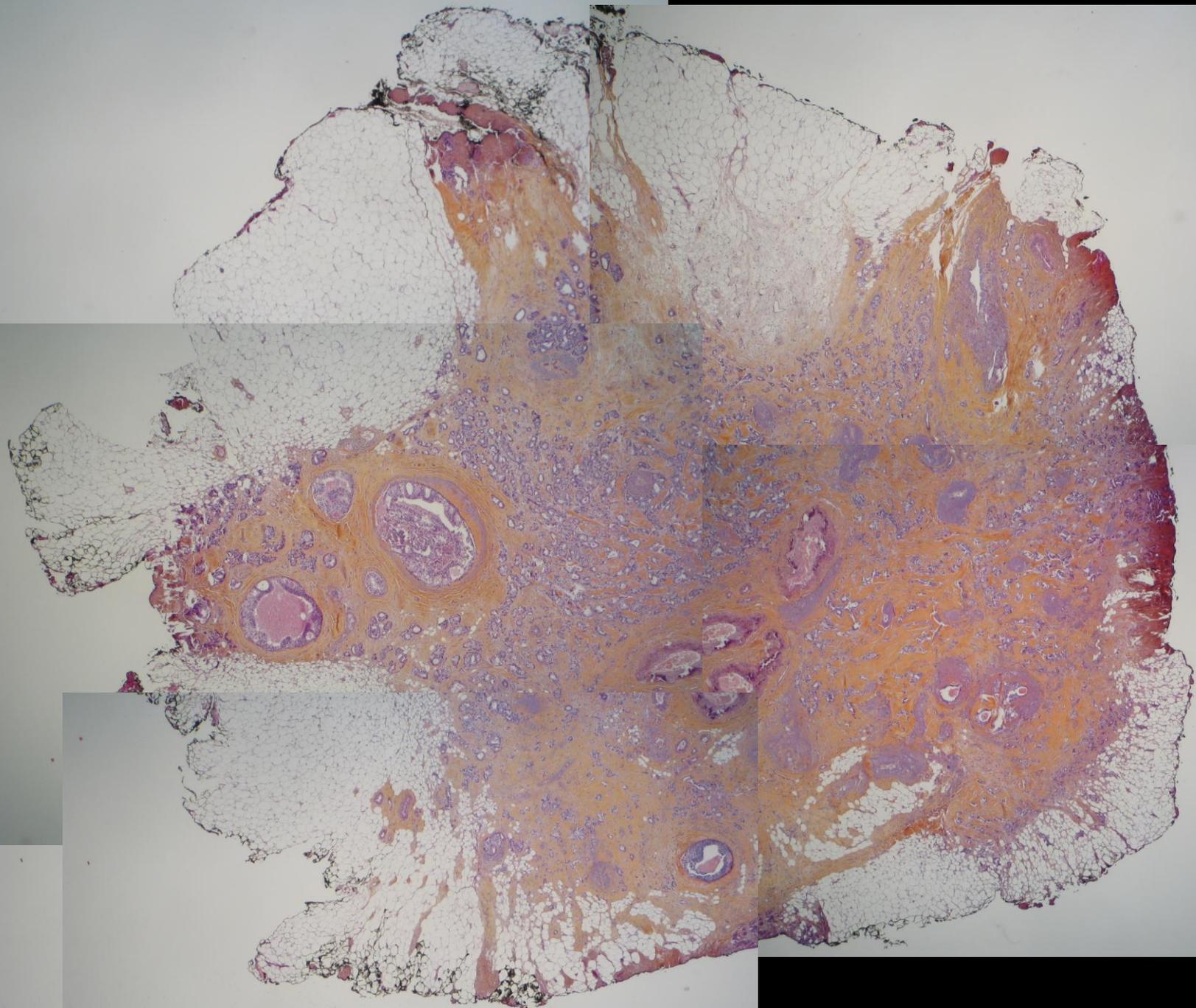
Intact[®] complete excision





83 yo, heart failure,
BI-RADS 5 spiculated
mass





Conclusion

- **Stereotactic biopsy is a major domain in breast intervention :**
 - **Percutaneous procedure equivalent to surgical biopsy if quality criteria are reached**
- Multiple :
 - Techniques
 - Needles, devices
- Diagnostic procedure which could lead to treatment strategy in special cases :
 - Intact
 - Small lesion
 - Elderly women
 - Contra-indication to surgery