Breast Imaging Conundrums:

Case based approach to breast cancer detection

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Disclosures

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Christine Wilson, BC Cancer Agency • Dr Paula Gordon, BC Women's Hos

Outline

Part I: To elucidate the diagnostic imaging pathway for:

- The routine screen detected abnormalities
- The clinically detected abnormalities
- The imaging occult abnormalities

Part II:

- Introduction to male breast diseases
- Imaging recommendations

BC Screen vs Clinically detected abnormalities

Screening: Asymptomatic

- Biannual screening offered to asymptomatic women $\geq$ 40 yo
- Annual screening offered to women with higher risk: 1st degree family history, genetic mutation carrier, prior chest radiation

Clinically detected: Symptomatic

- Palpable abnormality, nipple discharge, nipple changes
- Pain is not a typical indication

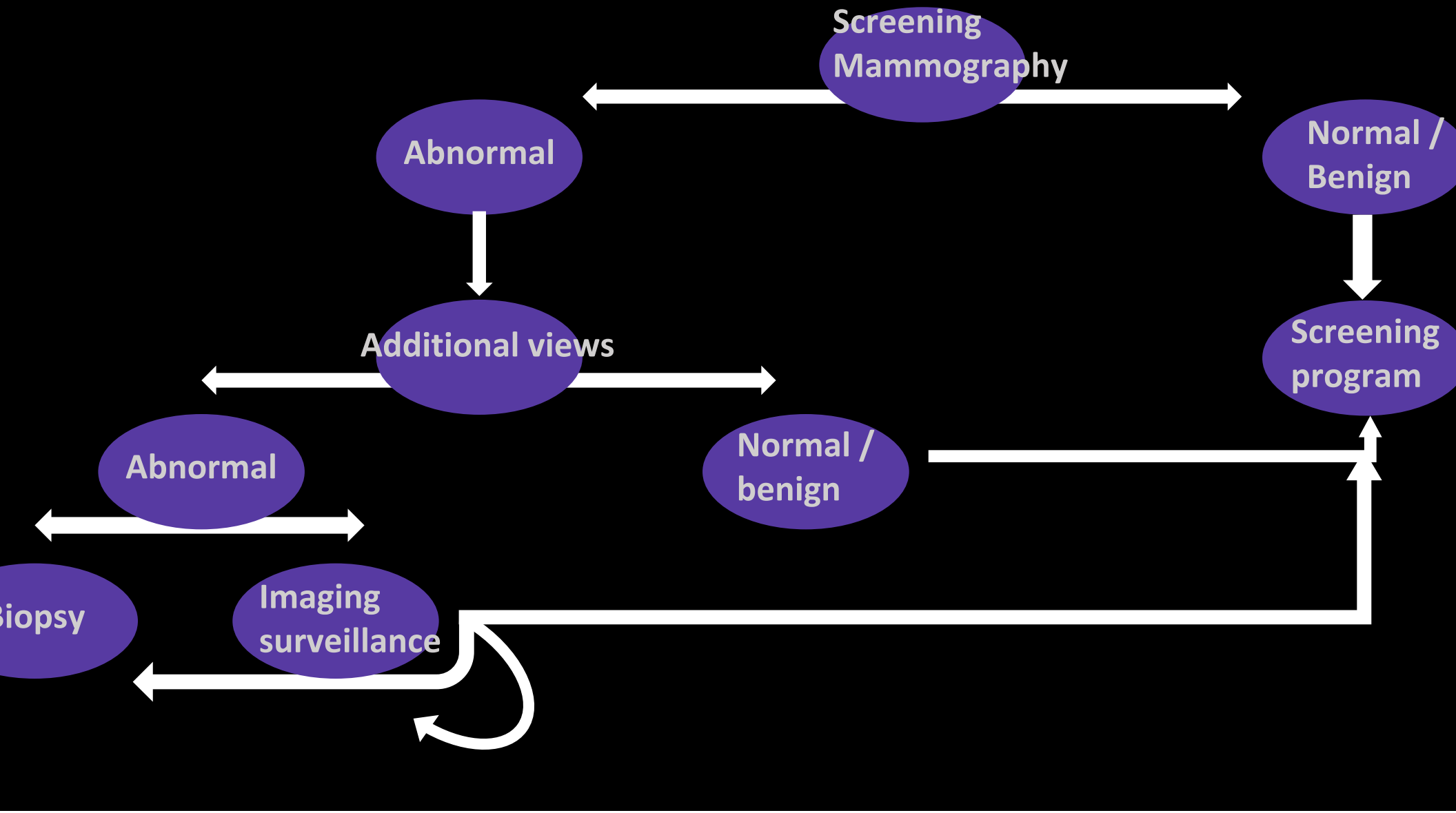
Screening Mammography Program

Program Overview	
Target Population	Women age 50-69 years Service also available to women age 40-49 & 70-74 and older
Screening Test	Two-view screening mammograms

Abnormal recall rate	2012	National target
Initial screen	17.3%	<10%
Subsequent screens	6.3%	<5%
Overall	6.9%	

Source: Screening Mammography Program 2015 Annual report

Screening Program Flow



Screening Mammogram: Case 1

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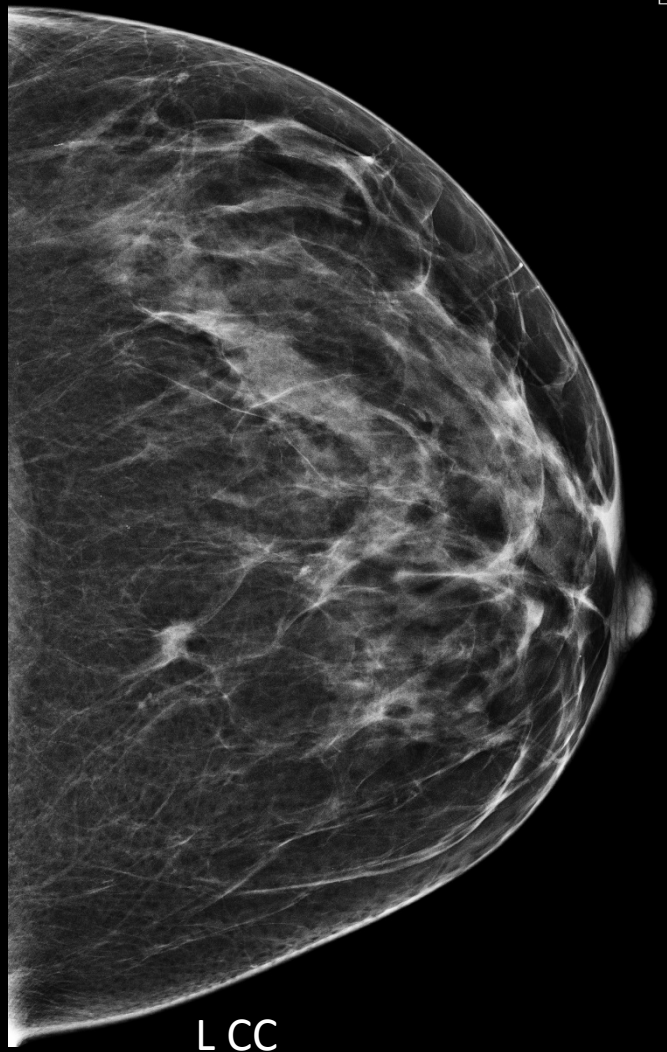

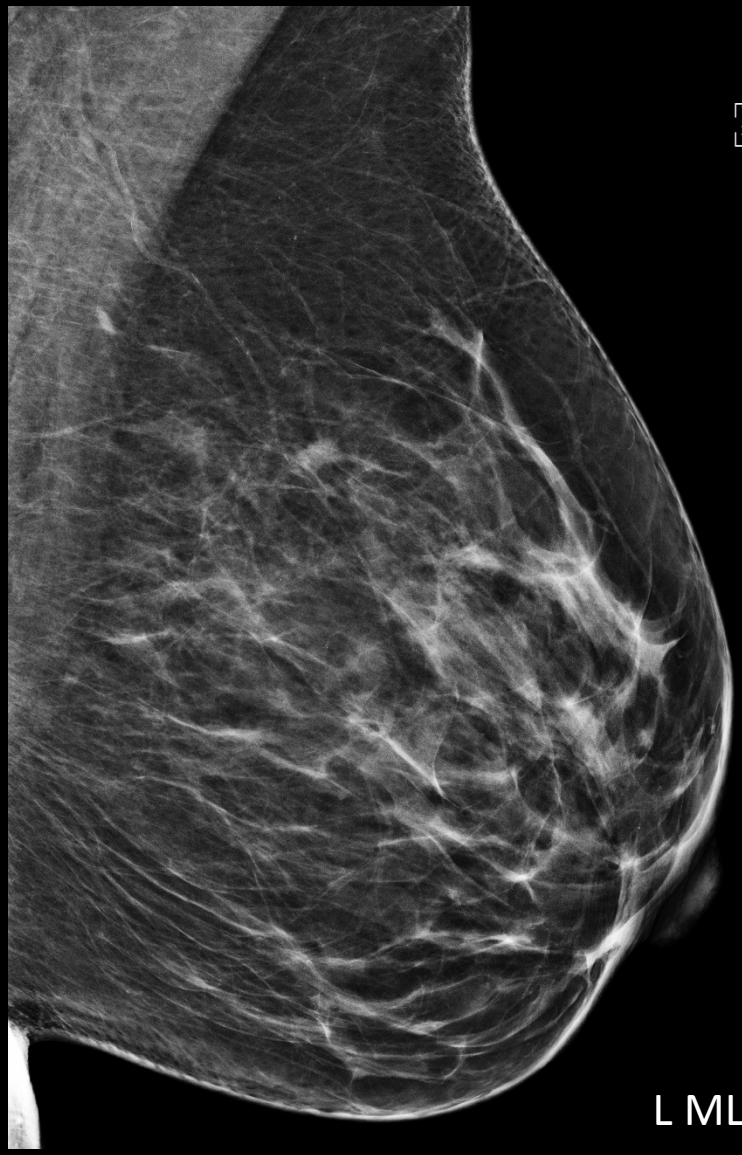

Screening Mammogram: Case 1

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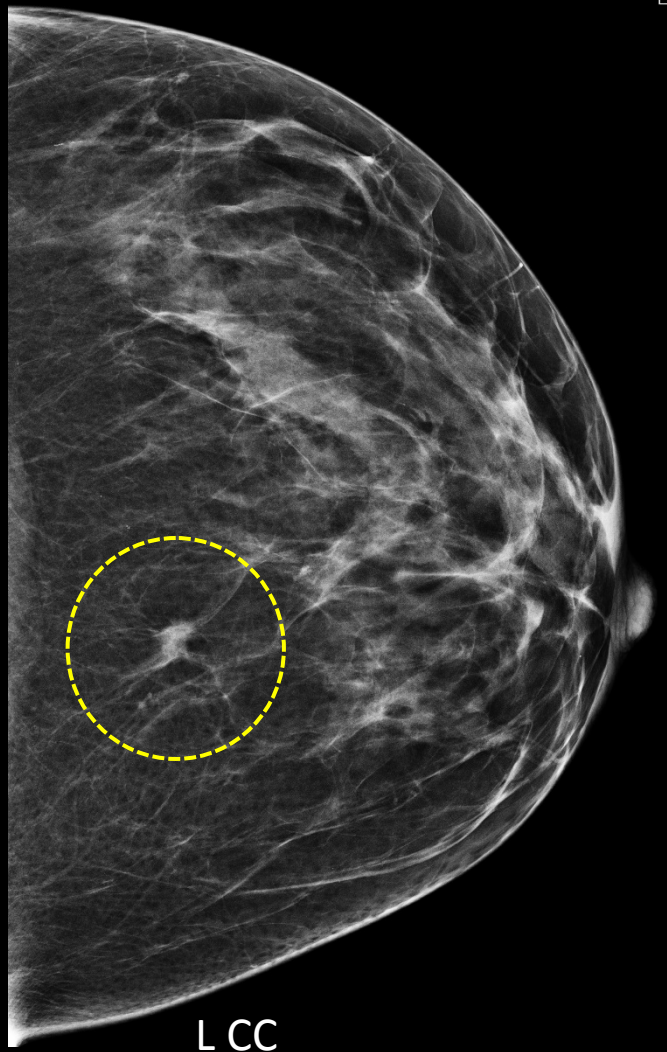
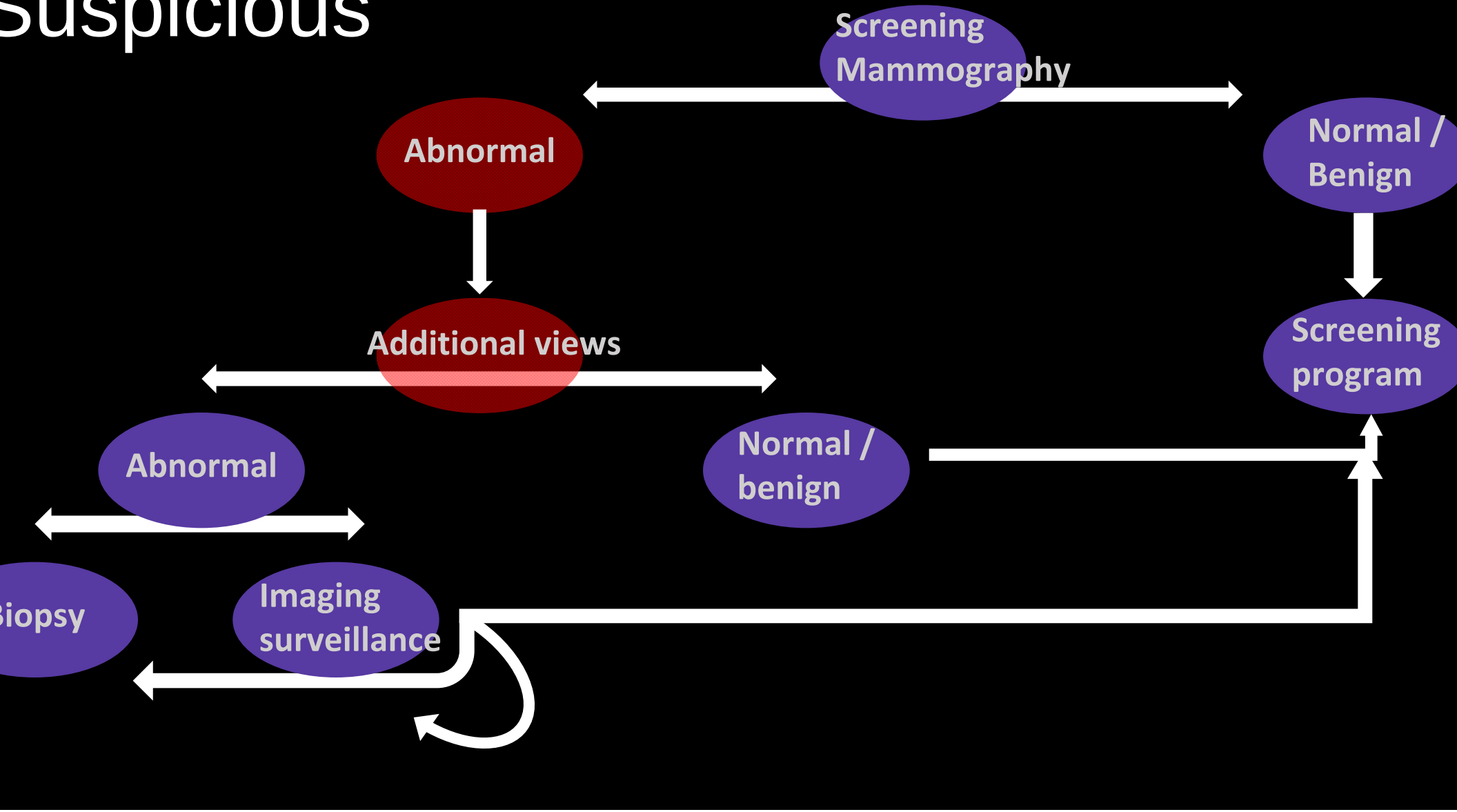
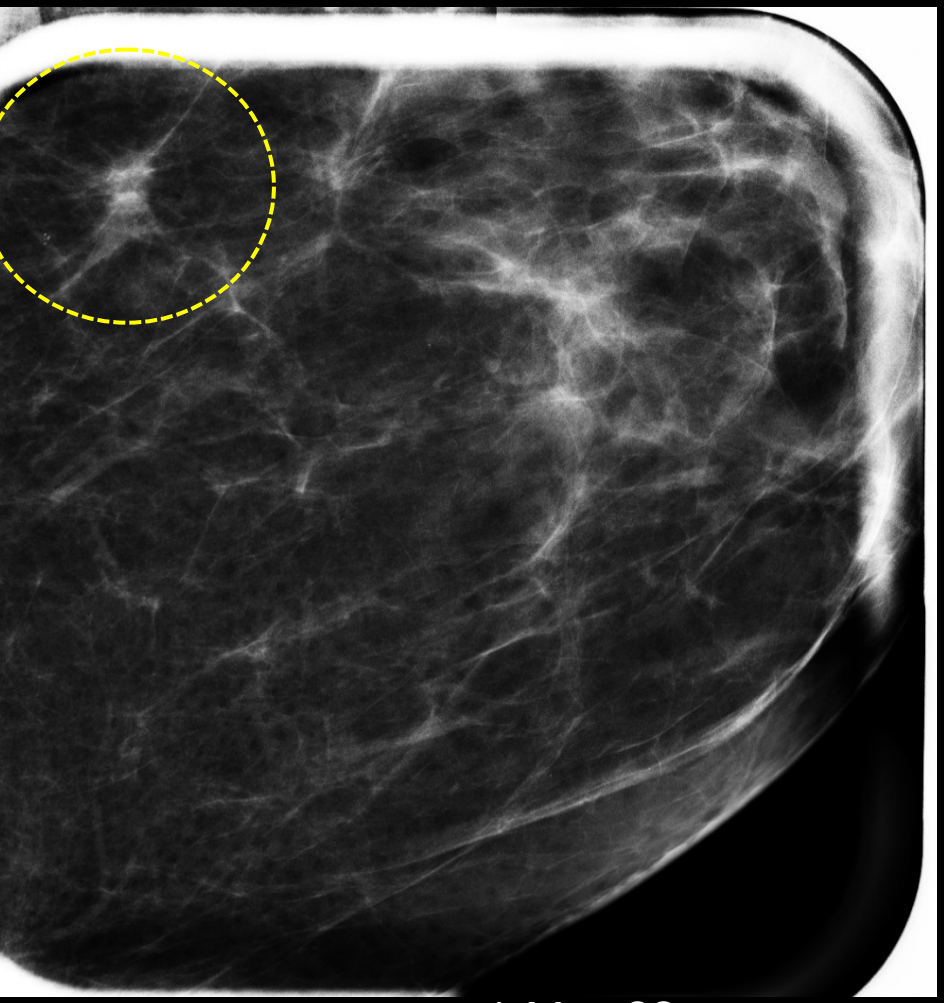


Screen Detected: Abnormal or Suspicious



Screen Detected: Additional Views



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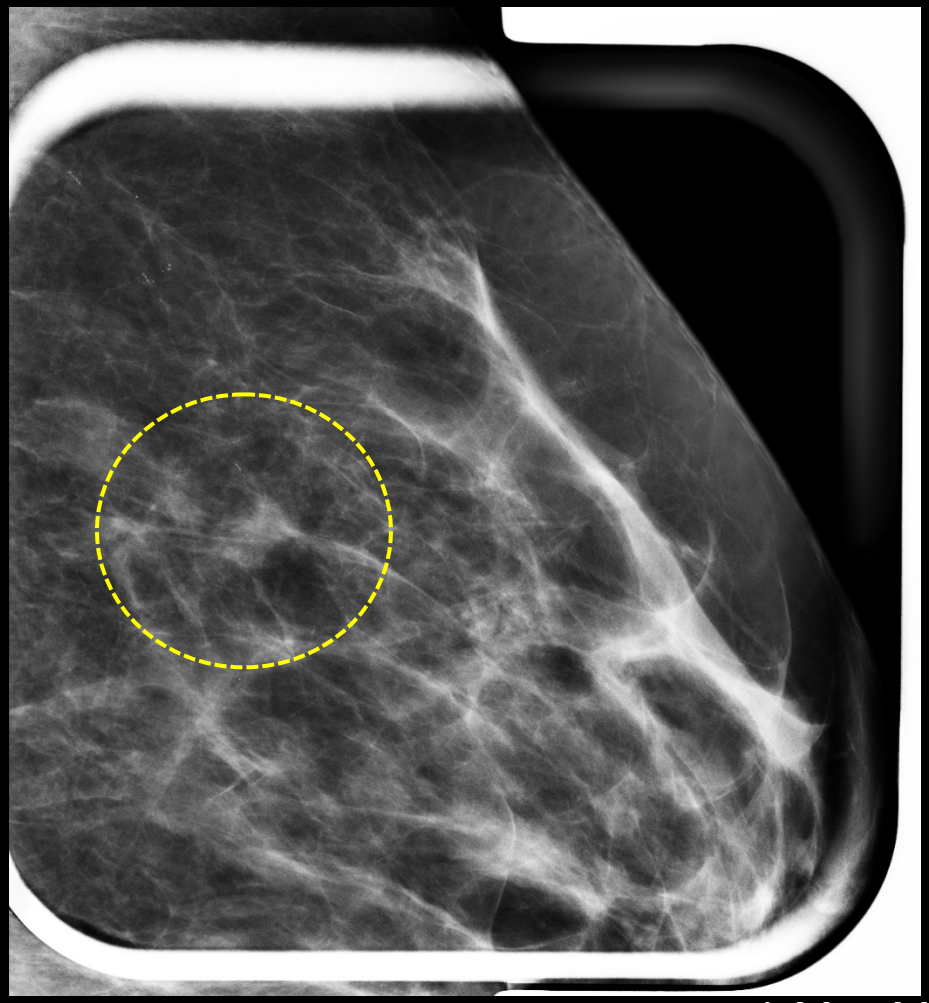

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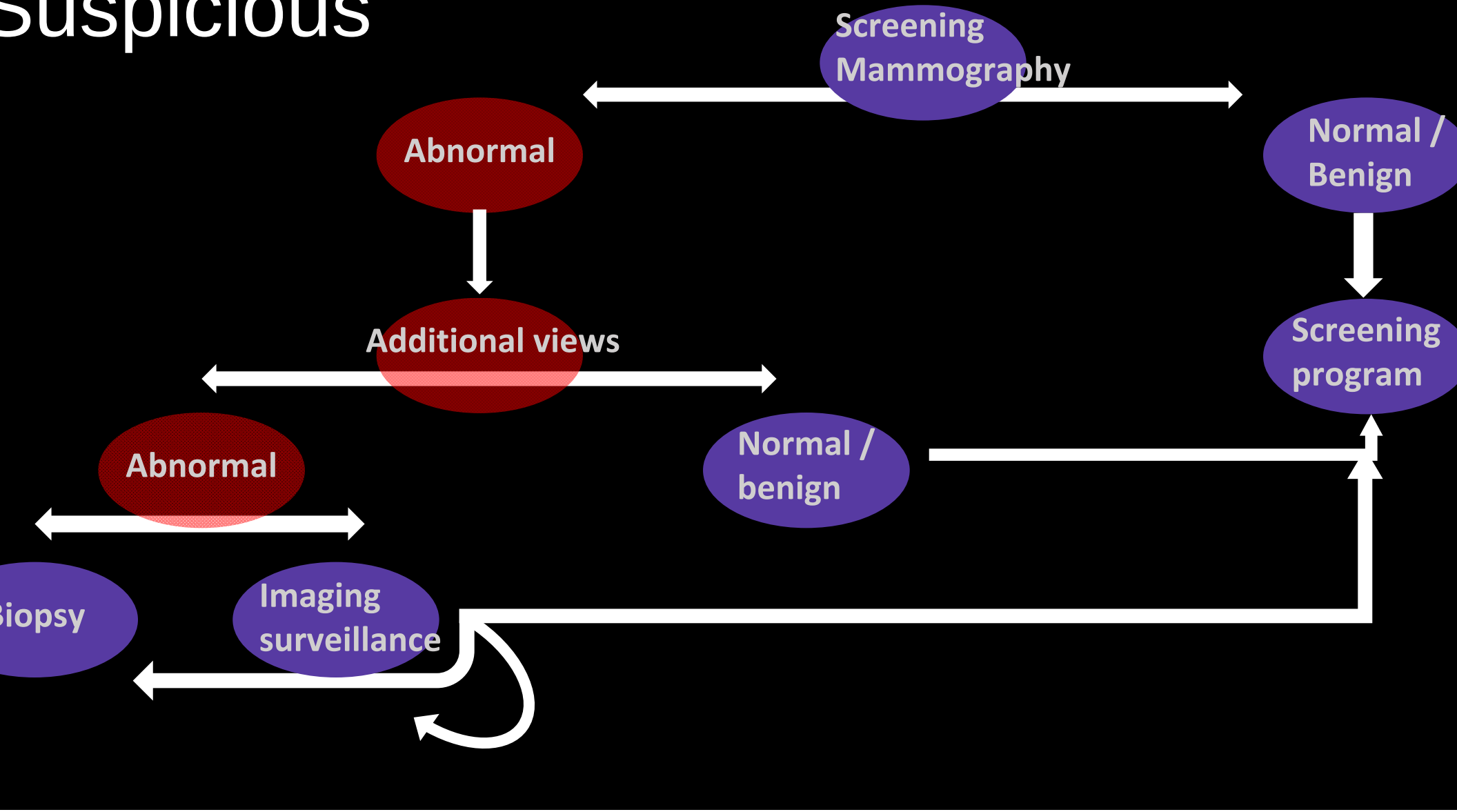
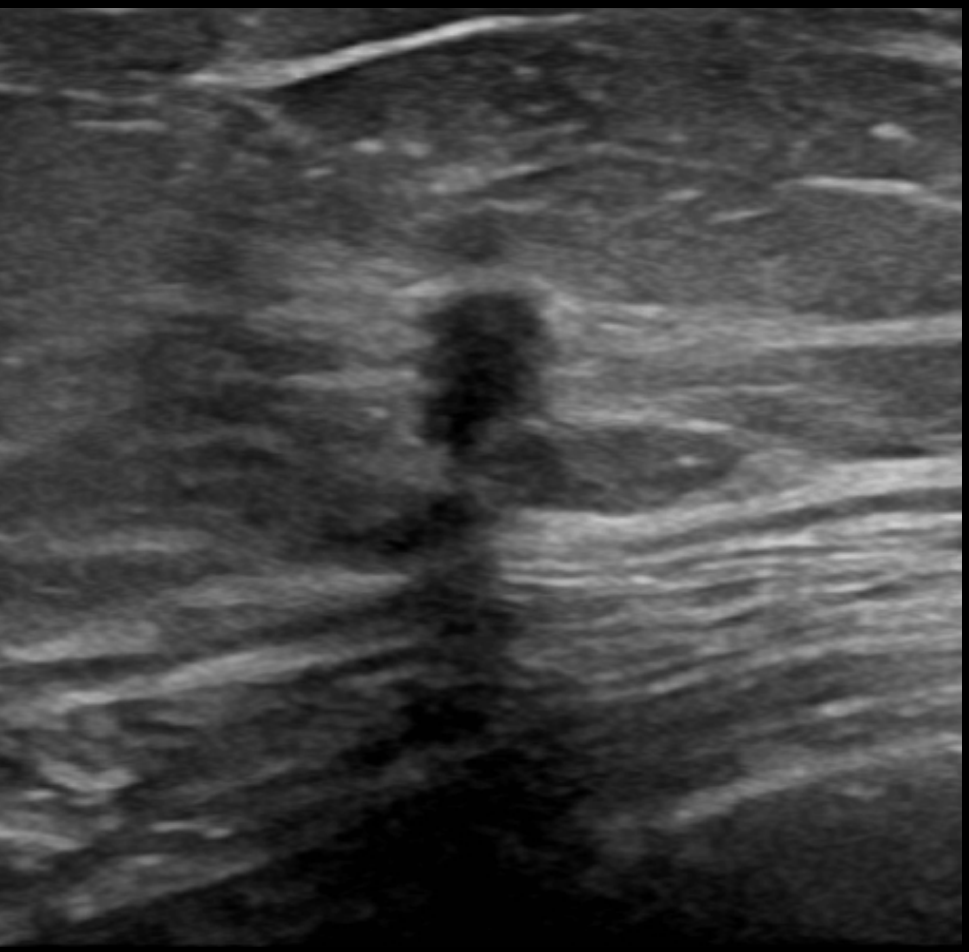
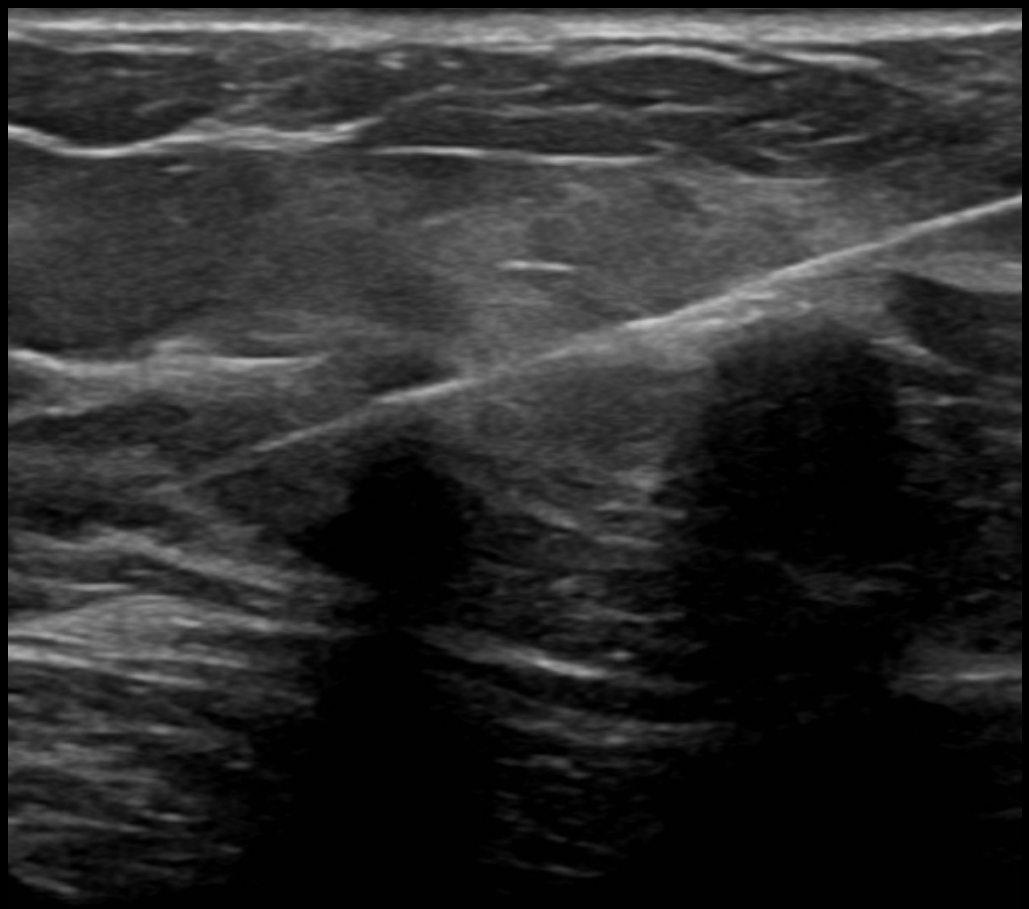
Screen Detected: Abnormal or Suspicious

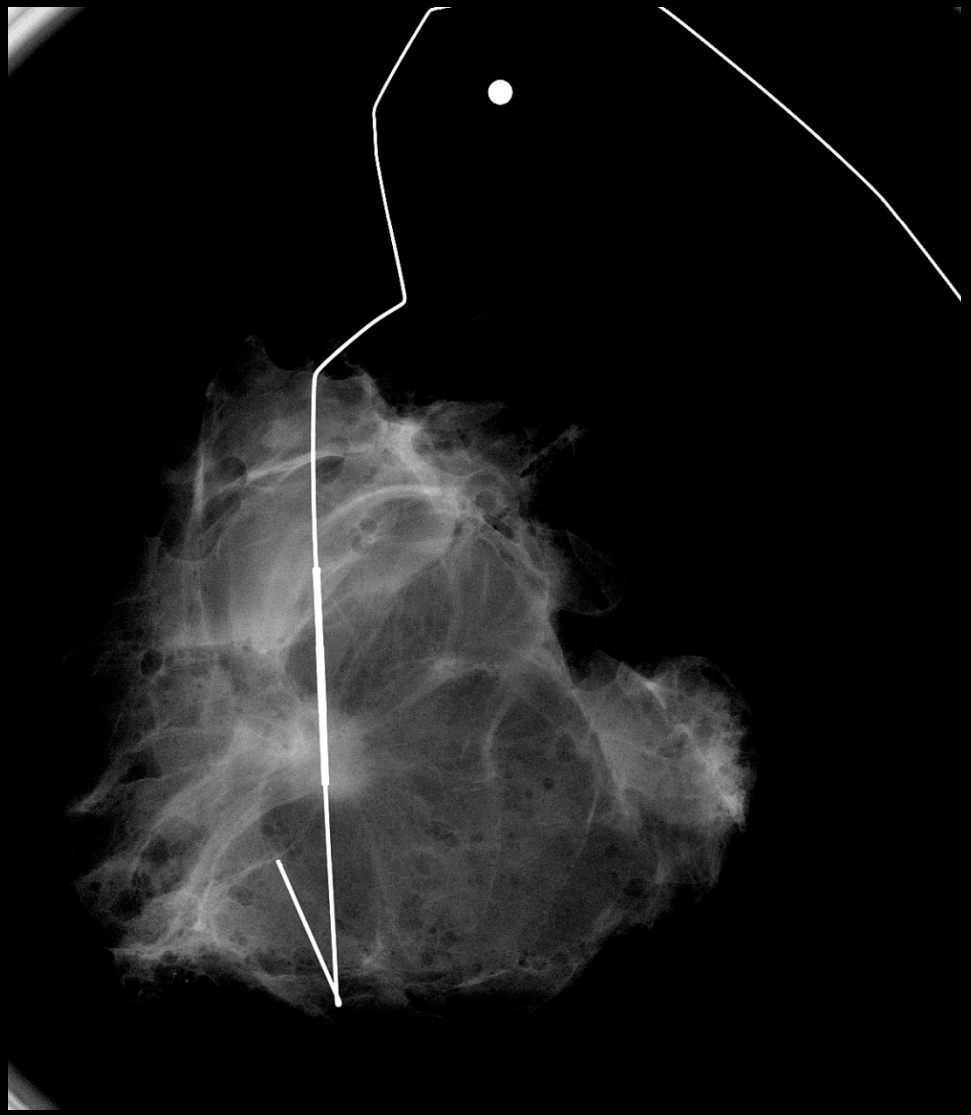


Screen Detected: BIRADS 4 Image guided Biopsy

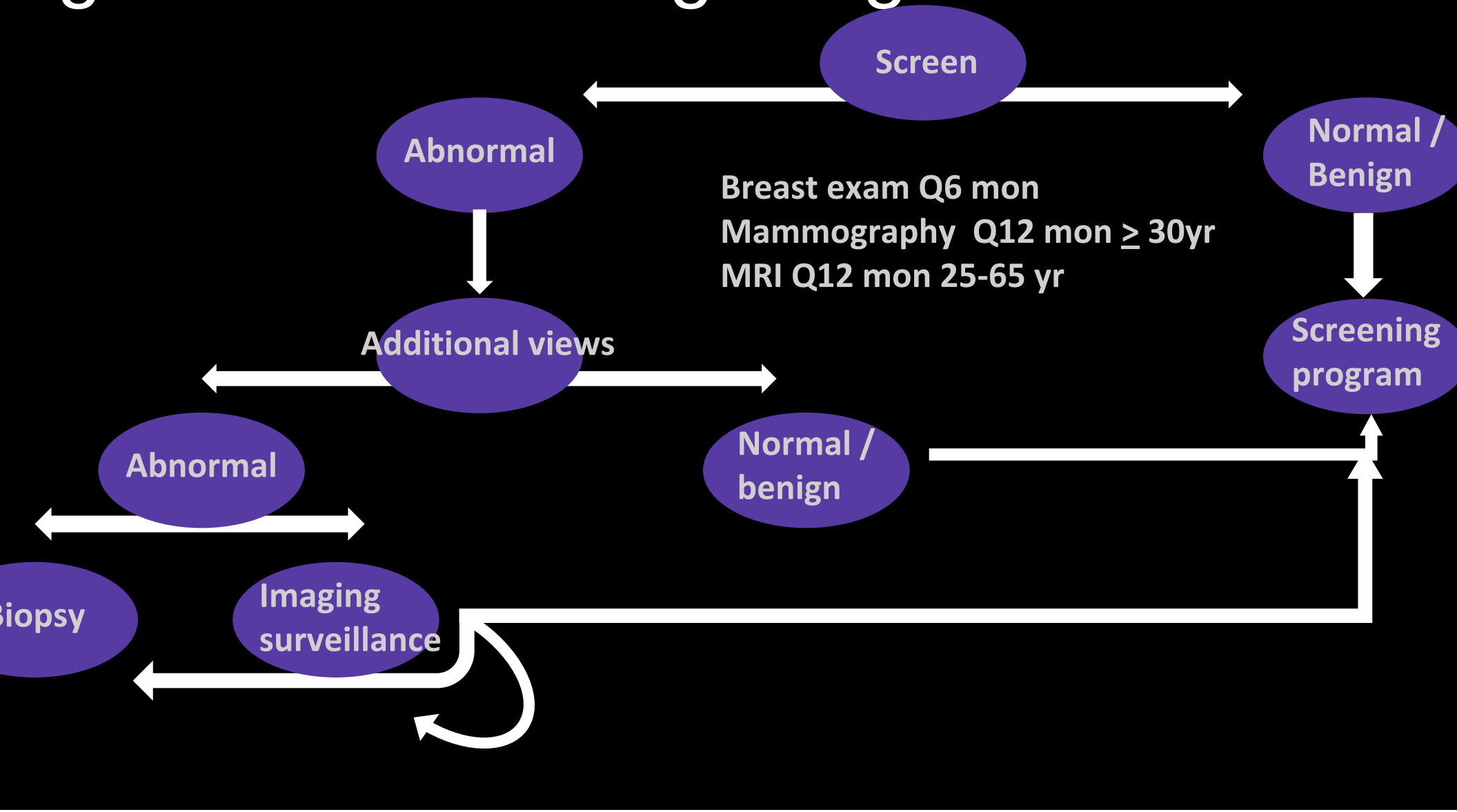




creen Detected: Biopsy showed IDC. Fine wire localization and exci



High Risk Screening Program Flow



High Risk MRI Screen: Case 2

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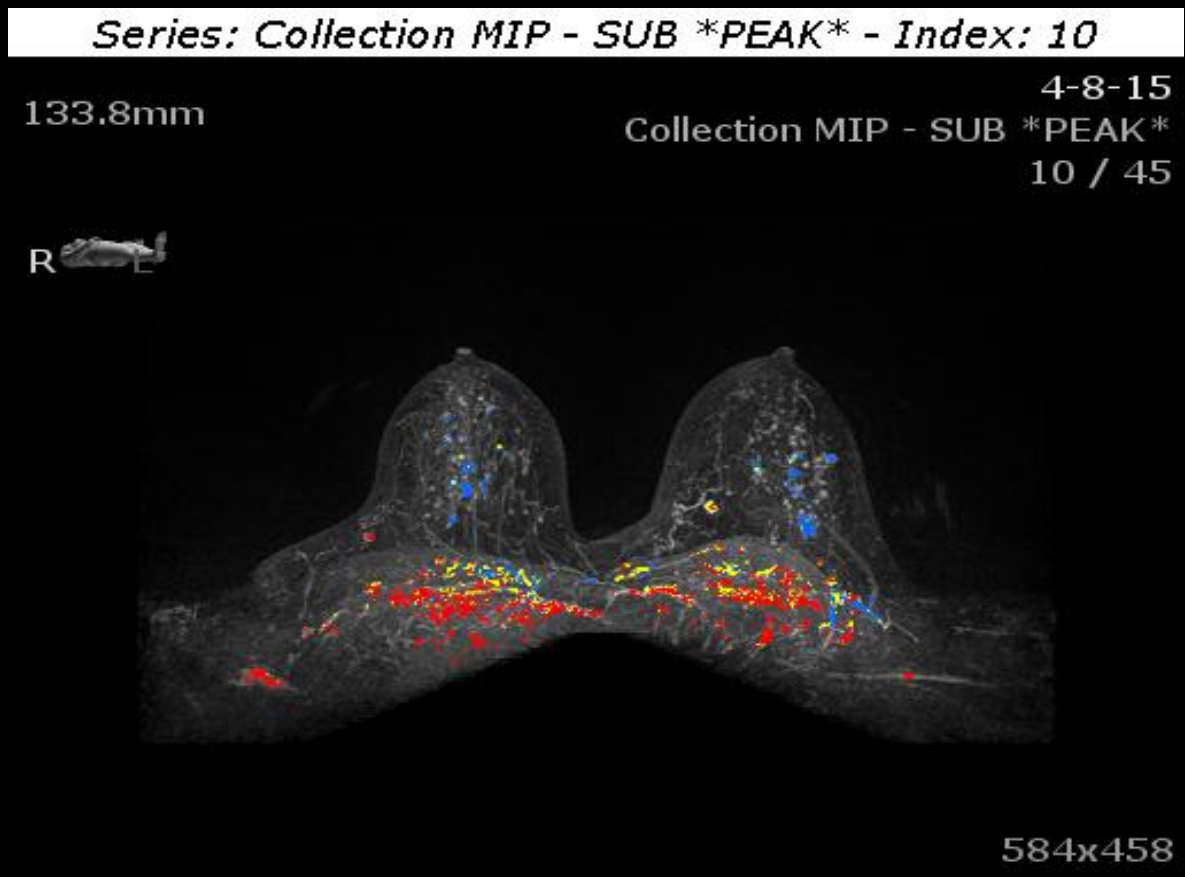
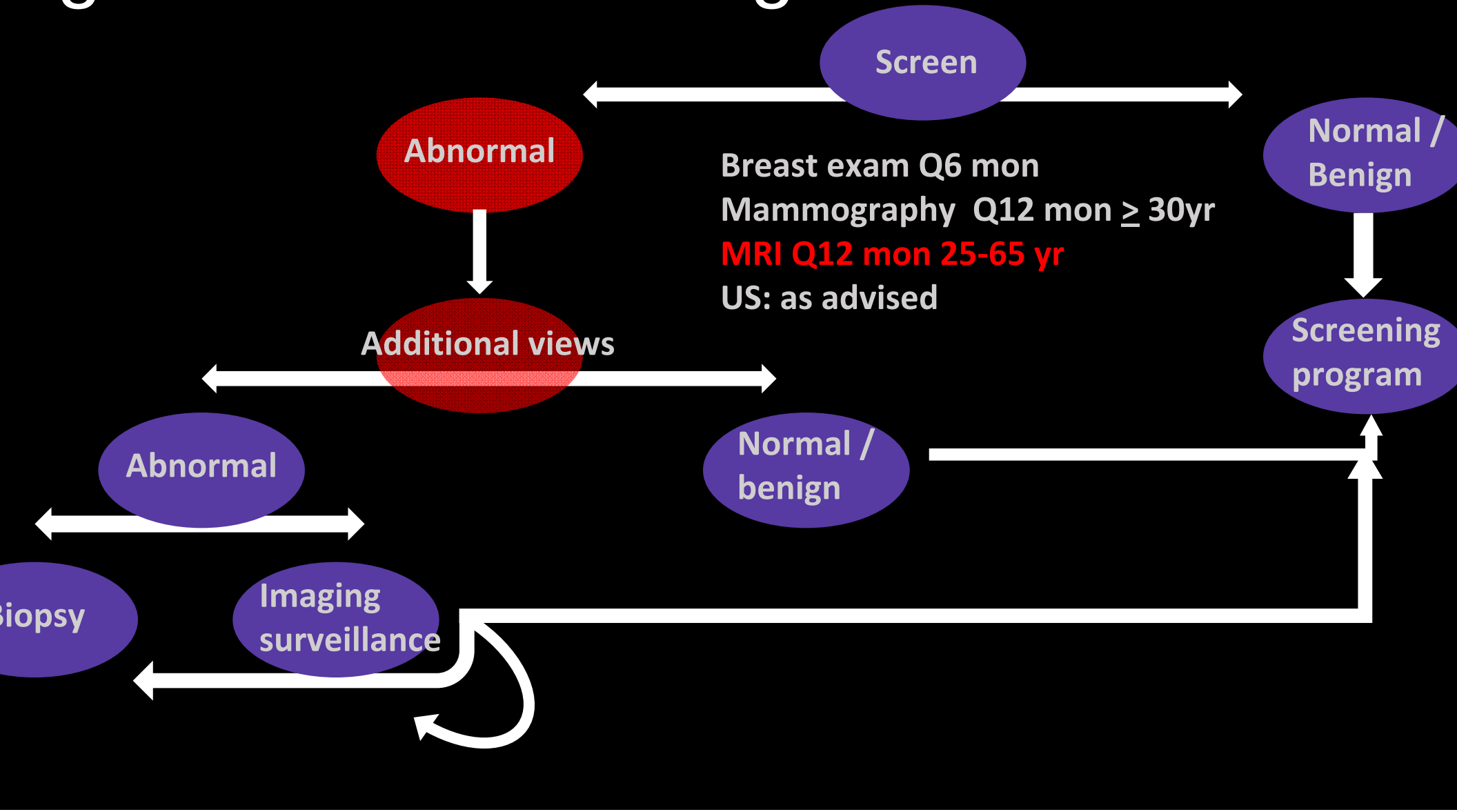
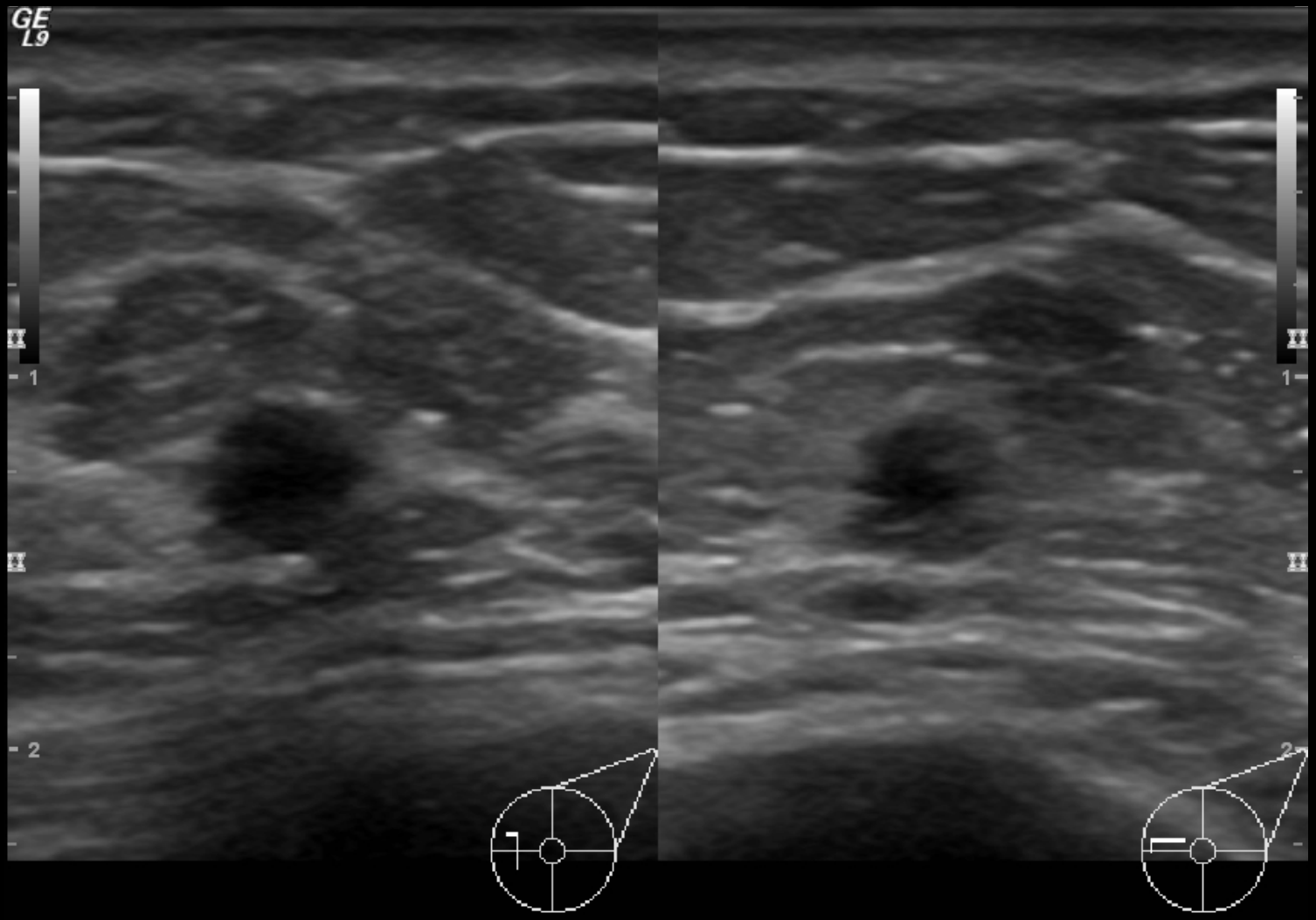
BRCA1



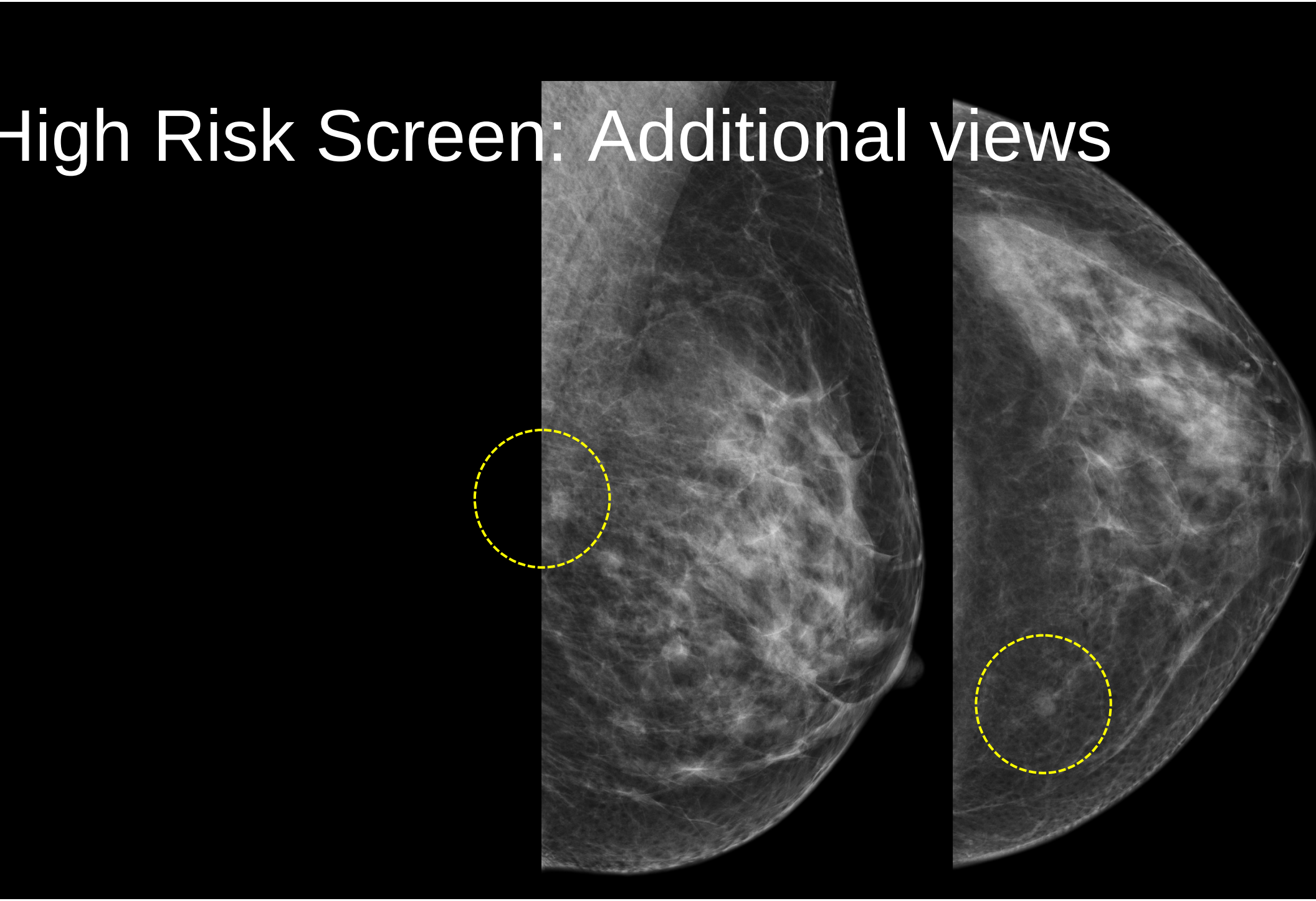
High Risk Patient Program Flow



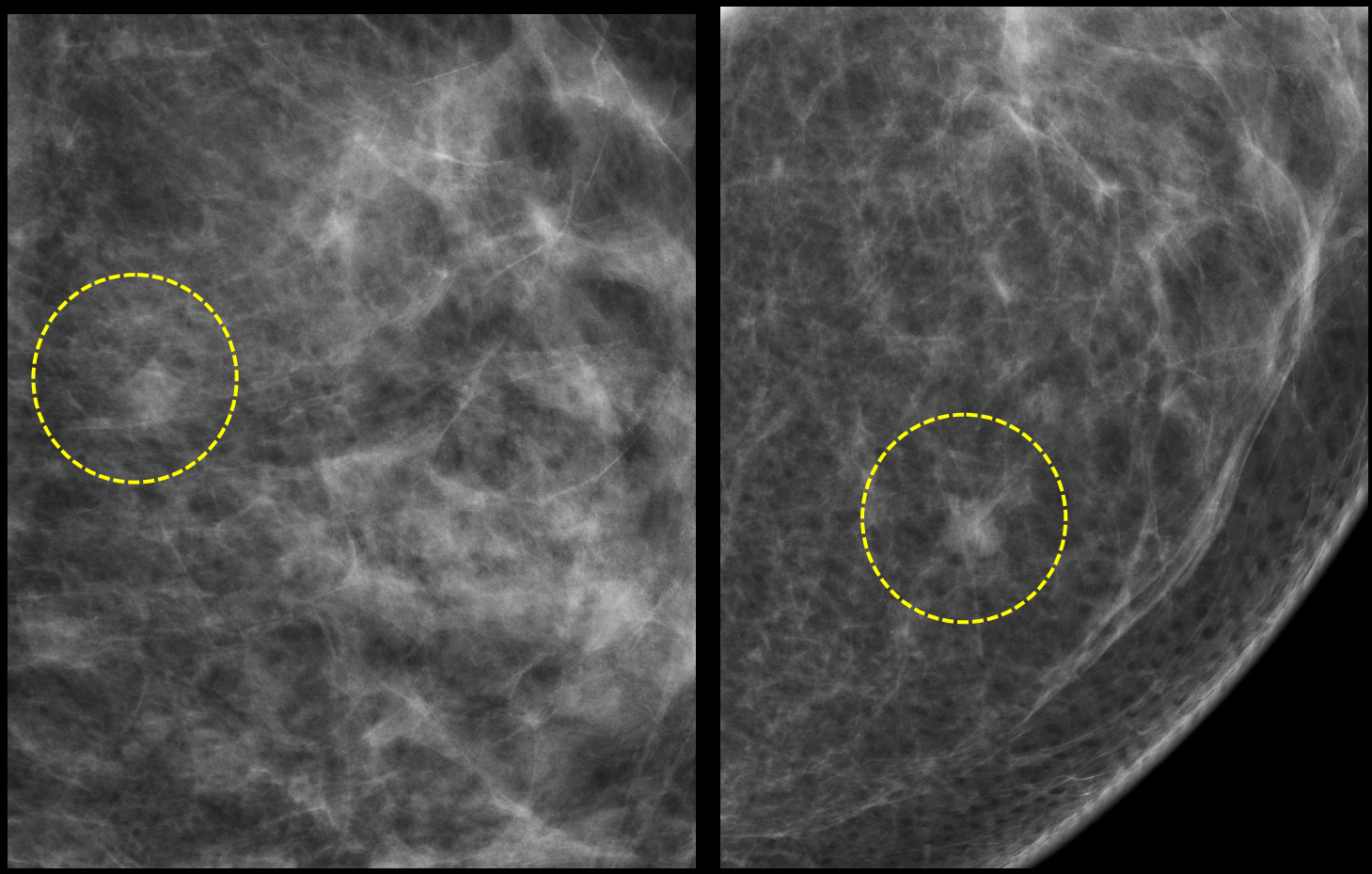
High Risk Screen: Additional views



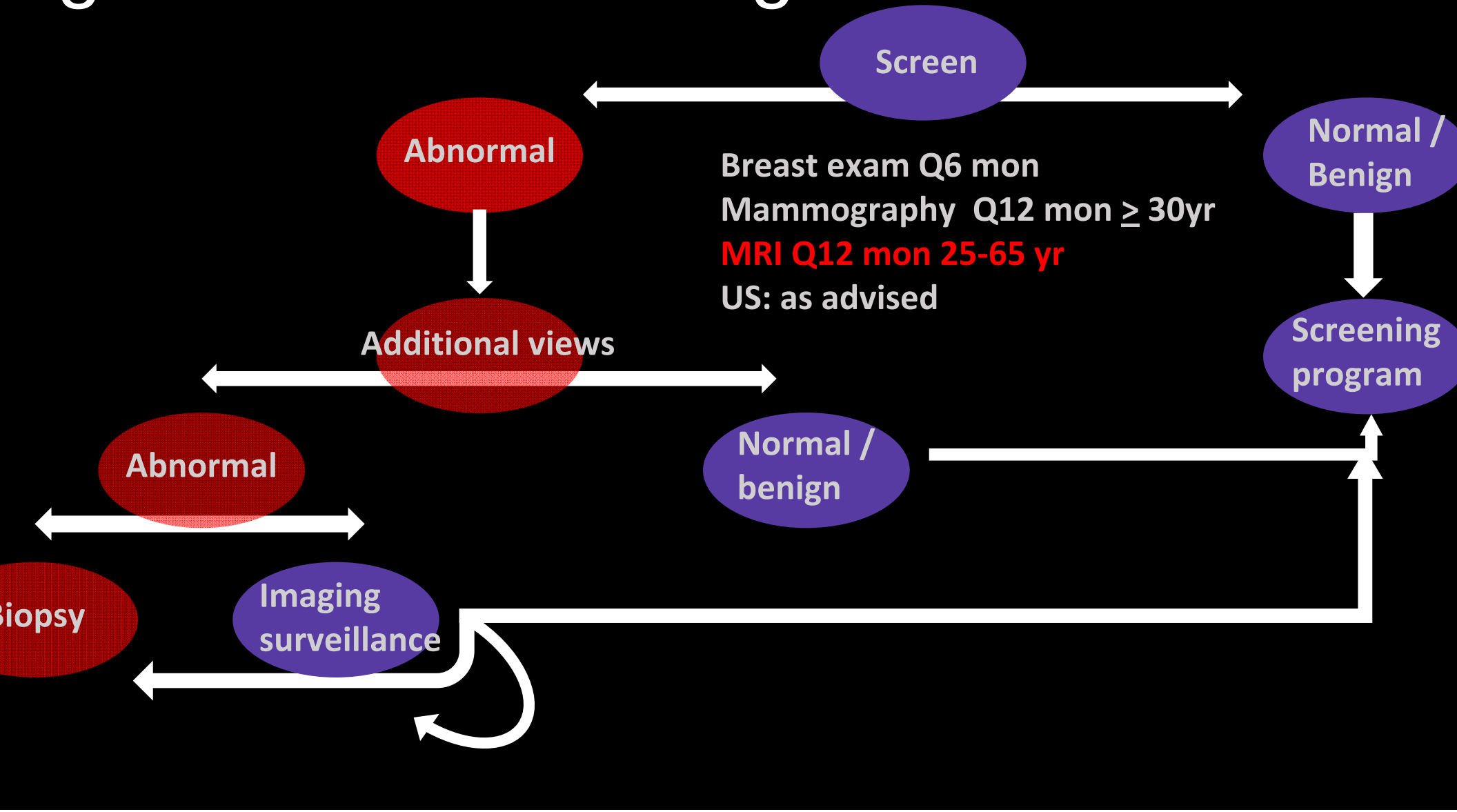
High Risk Screen: Additional views



High Risk Screen: Additional views



High Risk Patient Program Flow



igh Risk Screen: Image guided biopsy showed IDC

Pathway for clinically detected Abnormality

- The most common presenting clinical finding is of a palpable abnormality, discharge, new nipple inversion, nipple changes
- The initial diagnostic pathway is always physical examination

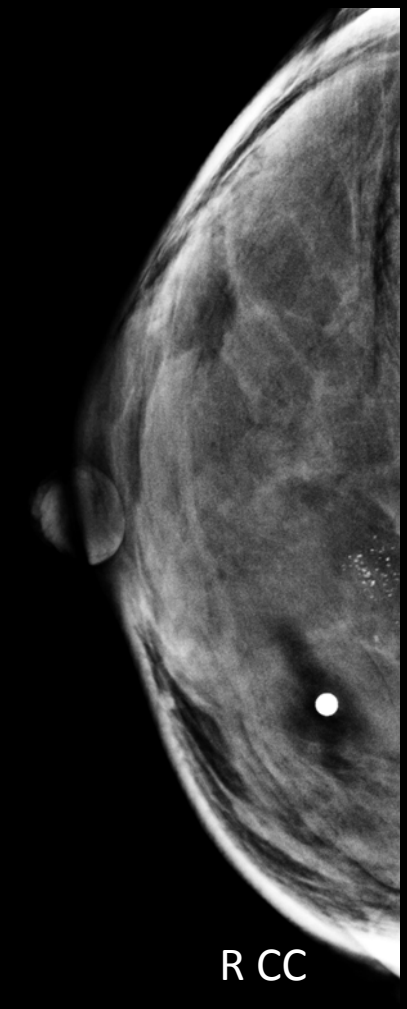
Mass	Nipple discharge	Nipple changes
	Physical examination	
Diagnostic work up	• Spontaneous, Single duct, Bloody or clear • Diagnostic work up • Cytology • galactogram	• If no mass, SMP if not up to date • Suspicious: diagnostic work up • ± surgical consult

Clinically detected Abnormality

- Mammography and ultrasound are often used concurrently for palpable breast masses
- A negative diagnostic exam (BIRADS 1 or 2) has an estimated cancer rate and a negative predictive value of 0.3 % and 99.7% respectively [3]
- Dennis et al suggests that breast biopsy may be avoided in women with palpable abnormalities when both the ultrasound and mammography depict normal tissue at the lump site [4]
- Clinical followup is recommended following a negative imaging exam since an MRI or palpation guided biopsy is reserved for those with persistent high clinical suspicion

Clinically detected Abnormality: Case 3

31 F with enlarging mass and pinching sensation to chest wall



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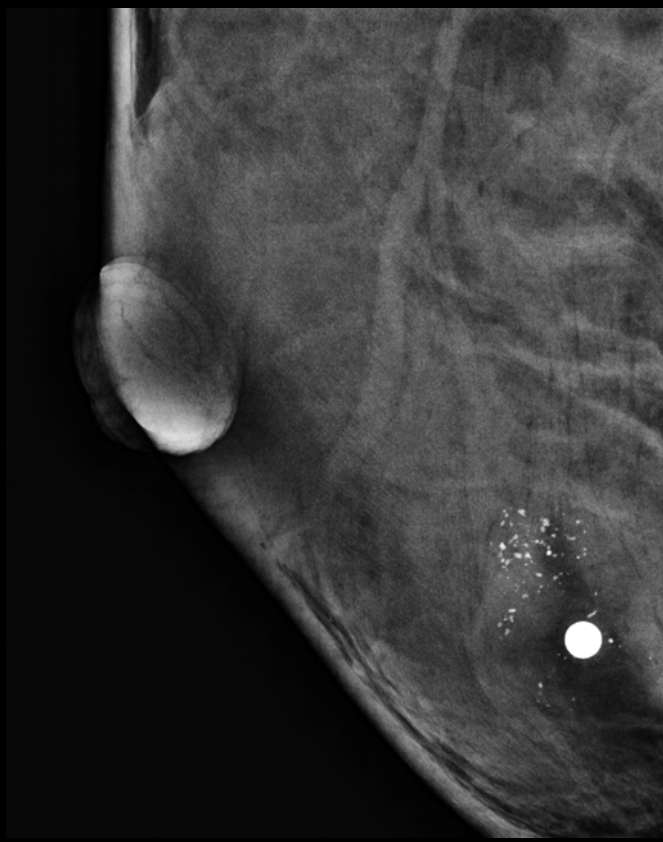

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Palpable mass: Diagnostic Targeted US

Solid papillary carcinoma

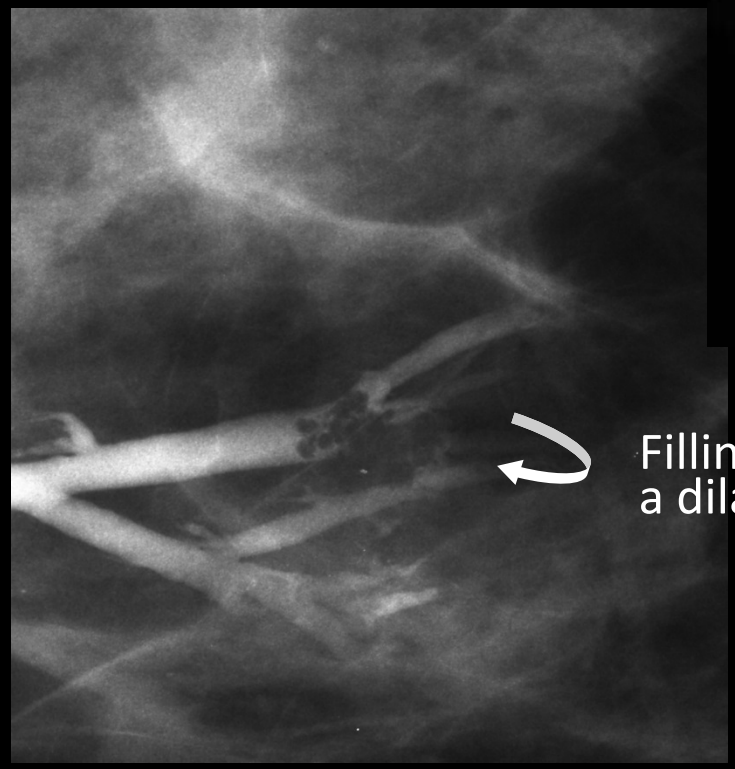
Galactography: Case 4

ma is the most common cause
dy discharge

discovered, surgical excision is
mended to:

% upgrade to carcinoma

% upgrade to a high risk lesion
s DIN1B



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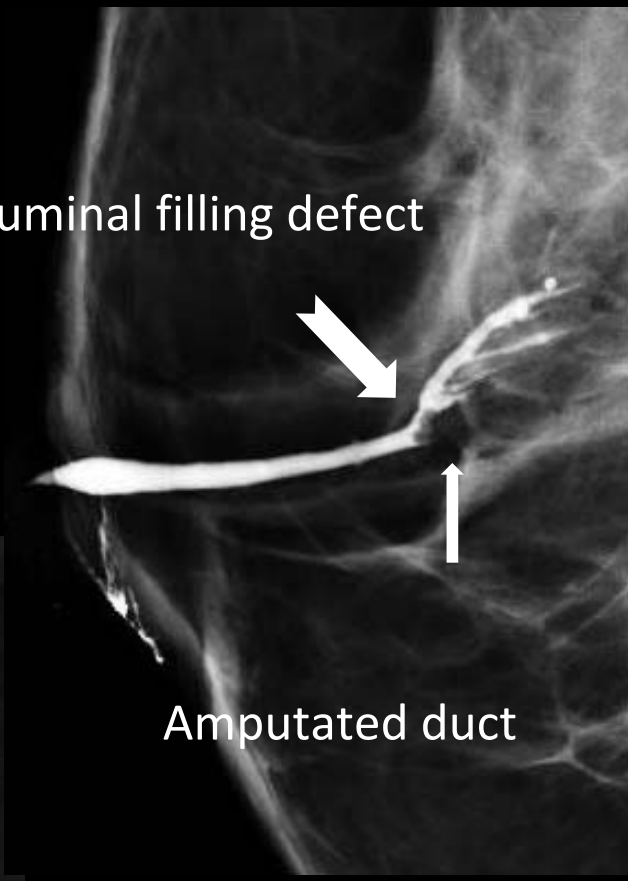


Filling defect within
a dilated duct

maging and clinically occult breast cancers

15-30% of breast cancers are not detectable by standard screening mammography [7]. This has been shown to be higher in <50 years and in those with dense breast (BIRADS C or D)

The primary limitation of full field digital mammography is overlapping dense fibroglandular tissue [9-10]

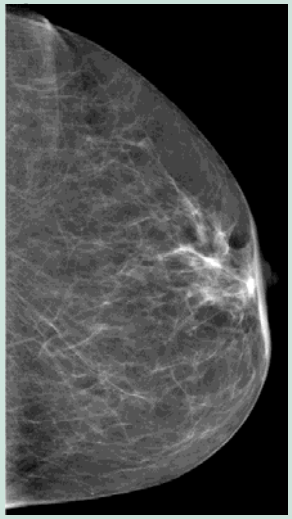
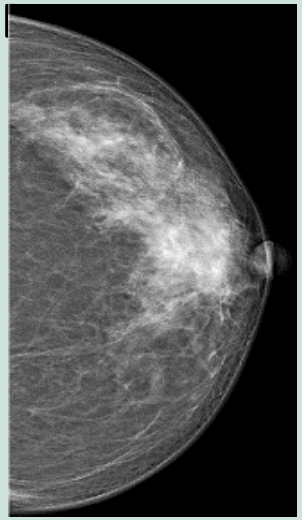
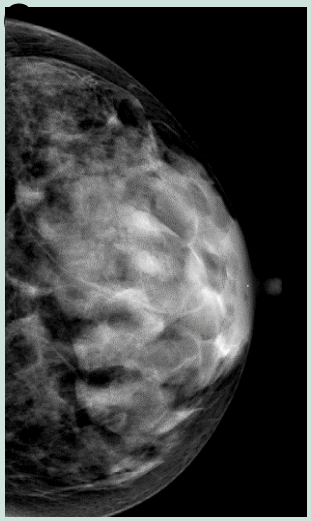
Dense breast is an independent risk factor for breast cancer

This can be overcome in part by the advent of digital breast tomosynthesis when used in a screening setting [8] in combination with US

naging and clinically occult breast cancer

dy of 27,825 asymptomatic women (1995 – 2000) with combined screening mammography, ultras
hysical exam[10] found breast density was the most significant predictor of mammographic sensitivi
nd hormonal status. ** 15% of cancers detected only with US

Sensitivity of screening modalities for cancer detection in women of varying densities

Modality				
Mammography	98.0	82.0	64.4	47.8
US	NP	65.9	81.4	76.1
Physical exam*	22.0	31.7	28.8	34.78

* Breast density can not be determined by physical examination

maging and clinically occult breast cancers

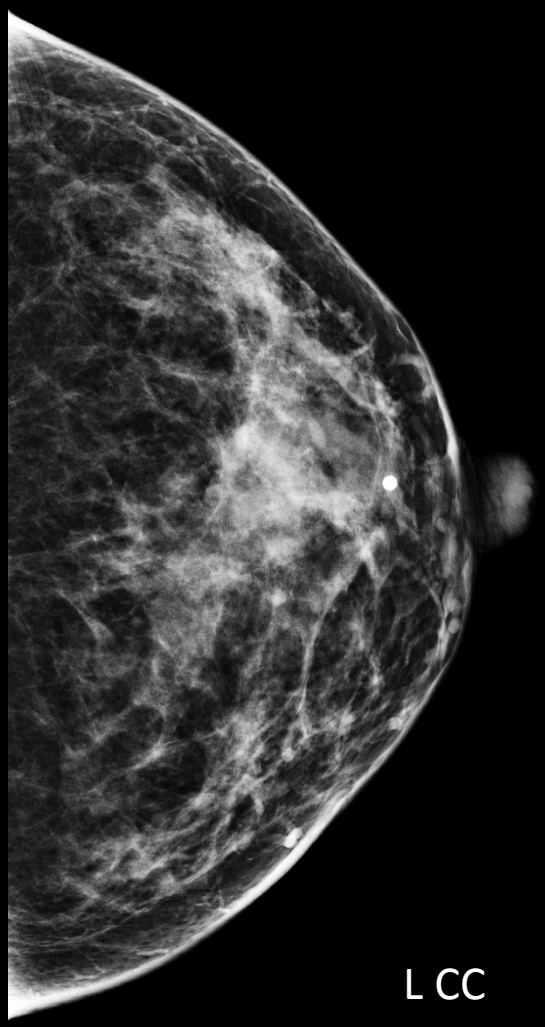
Mammography alone detects 4–5 cancers/1,000 women screened each year [14]

Addition of screening ultrasound in women with mammographically normal but dense breasts improves breast cancer detection by finding an additional 2.3 cancers per 1,000 women screened and 3.8 cancers/high-risk lesions per 1,000 women screened[15]

To date, unlike some US States, there is no existing legislation in Canada to inform women of their breast density or to provide coverage of supplemental screening US to women with dense breast

Mammographically occult: Case 4

35 F



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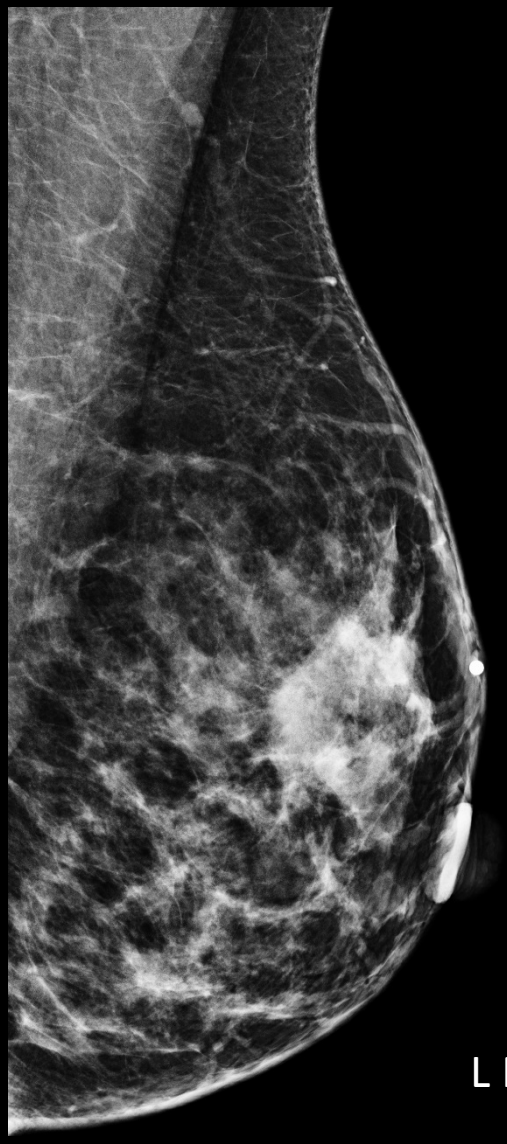
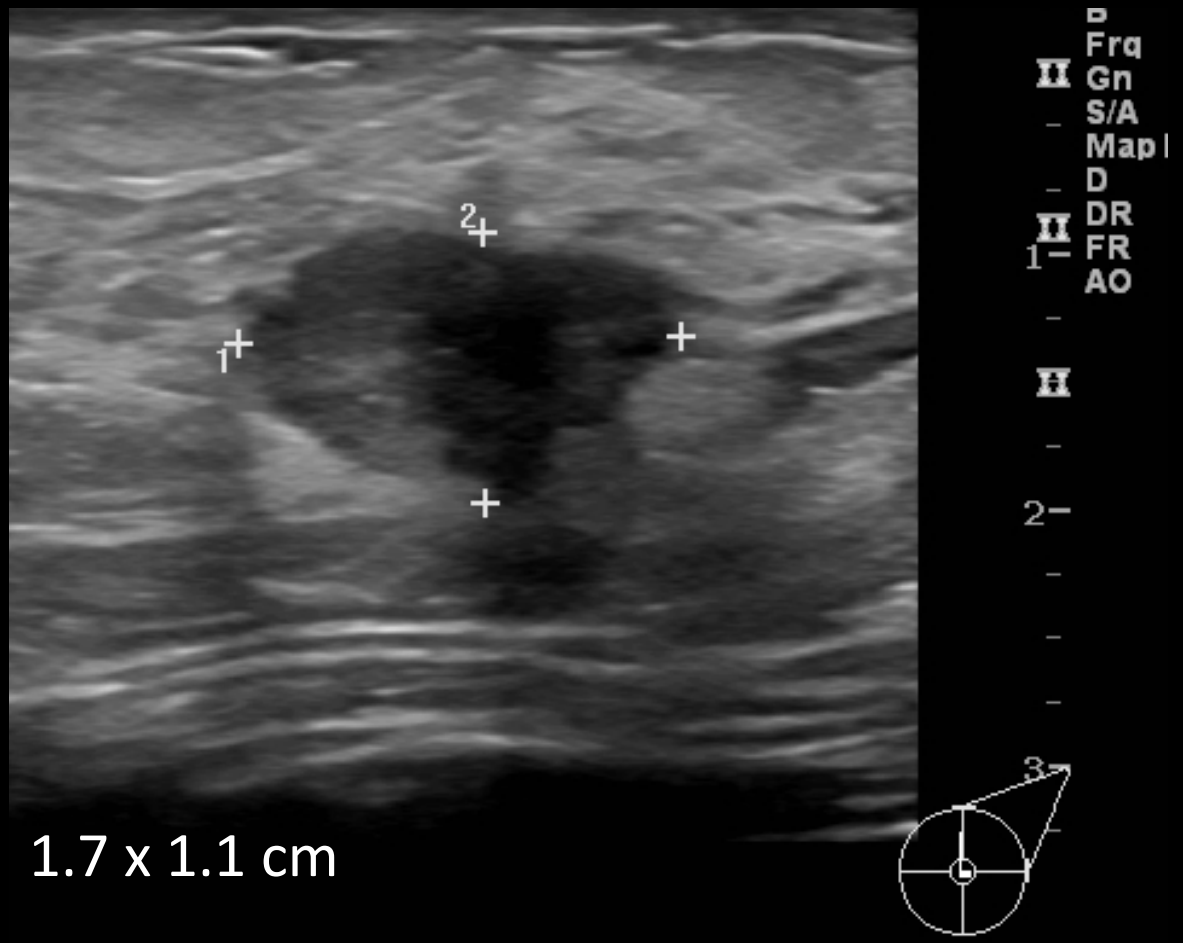


L MLO

Mammographically occult: Case 4

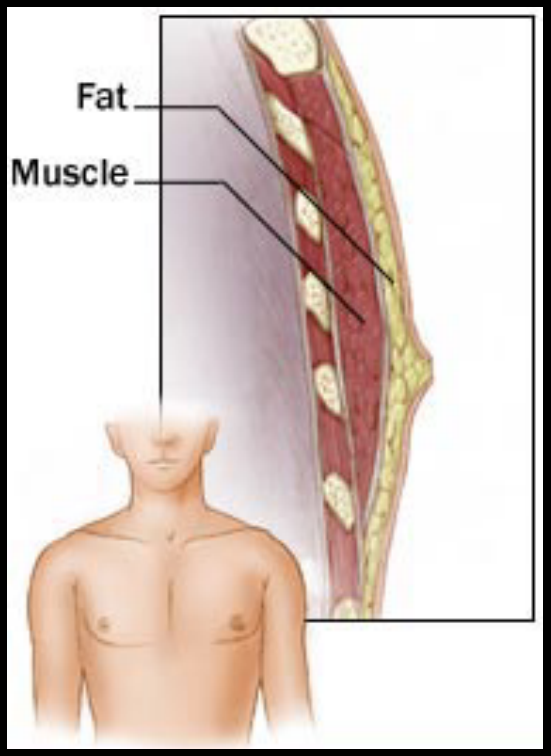


1.7 x 1.1 cm

Biopsy proven Invasive ductal carcinoma

Male breast disease

Male breast cancer comprises 1% of all male cancers and 0.6% of all breast cancers[1]



o Foundation for Medical Education and Research

Category	Males	Females
New Cases	200	23,800
Incidence (per 100,000)	1	99
Deaths	60	5,000
Death rate (per 100,000)	0.3	19
5 yr survival (2006-8)	80%	88%

2015 Screening BC[4]

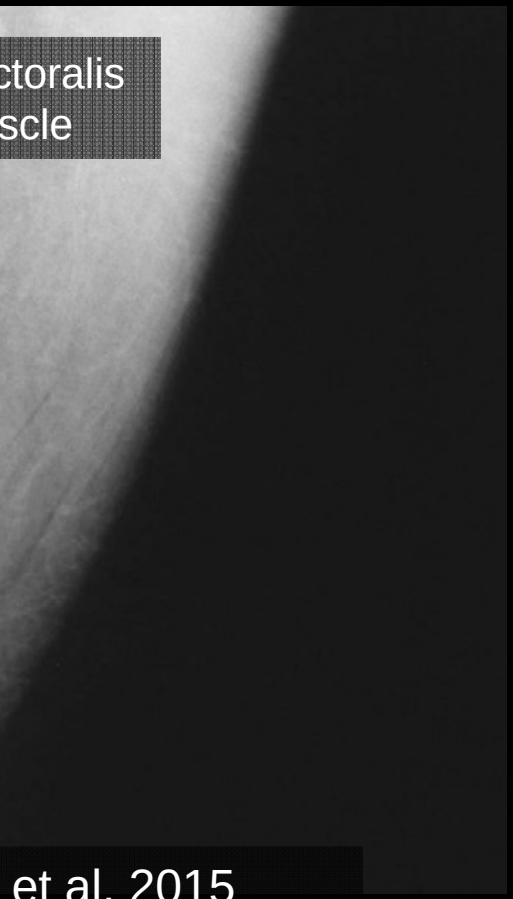
Normal Male Breast

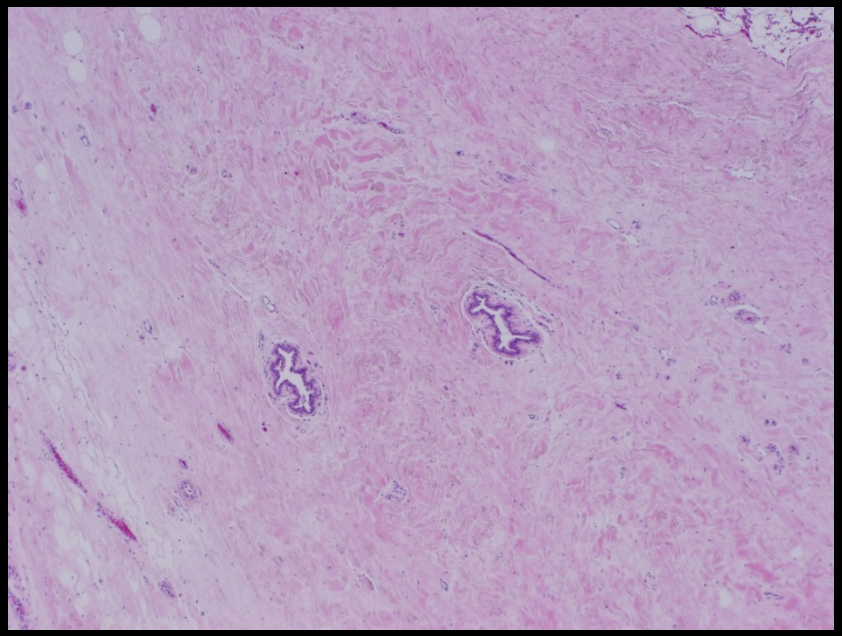
Breast tissue of both sexes are identical at birth and remains quiescent until hormonal stimulation at puberty

1. Estrogen: Temporary proliferation of ducts and stroma
2. Testosterone: Involution of ducts
3. No Progesterone: No development of terminal lobular units (unless exposed to increased level of estrogen.

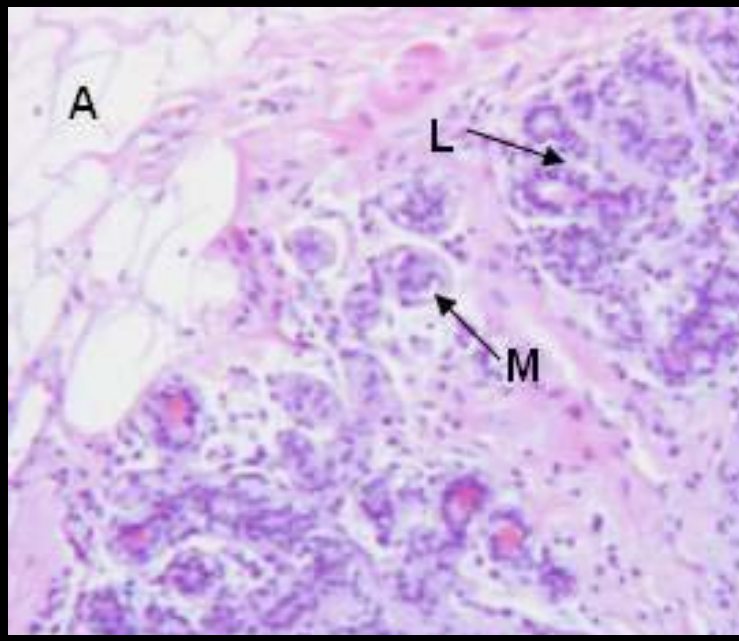
Normal Male Breast

Contains ductal and connective tissue. No suspensory ligaments of Cooper





Male: scattered ducts without lobules



Female: organized ducts and lobu

Male Breast Imaging

- Male breast disease is too few to justify screening mammography
- When mammography yields suspicious findings not characteristic of gynecomastia, sonography is effective
- The small breast size facilitates optimal ultrasound penetration allowing assessment of deep regions

Nova Scotia experience

Review of 1466 male patient encounters over a 13 year period

Gynecomatia is very common and can often be difficult to differentiate from malignancy by imaging particularly on ultrasound which does not add to diagnostic accuracy and can decrease specificity [11]

Found that false positives were more likely to occur when US was also used compared to mammography alone (23.7%, 83/350 vs 7.3%, 60/818)

A final diagnosis of gynecomastia very commonly resulted in a false positive imaging test (22 out of 45 pathology proven cases of gynecomastia receiving a BI-RADS of 3 or higher

	PPV	NPV	+LR	Sens	Spec	Accuracy
Mx	10.4 %	100 %	13.5	100 %	92.6 %	60.6 %
US +/ Mx	2.4 %	100 %	4.2	100 %	76.1 %	58.6 %

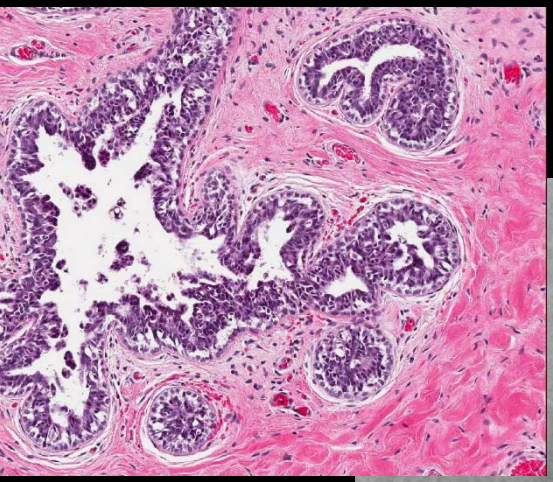
Greenlaw, Yen et al. 2

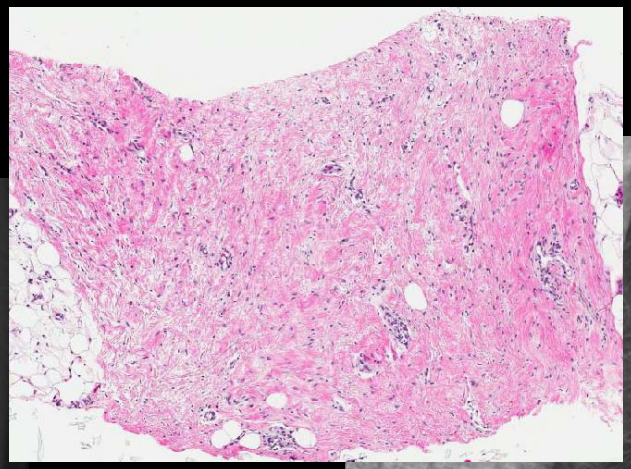
Male Breast disease: Gynecomastia

- The abnormal increase in the stromal and ductal component of the male breast which is in response to increased estrogen : testosterone ratio
- Most common male breast pathology. Found in up to 55% of male breasts in one autopsy series [6]
- Pathologically, gynecomastia progresses through several stages
- There are many recognized causes with non-hormonal causes frequently associated with unilateral gynecomastia

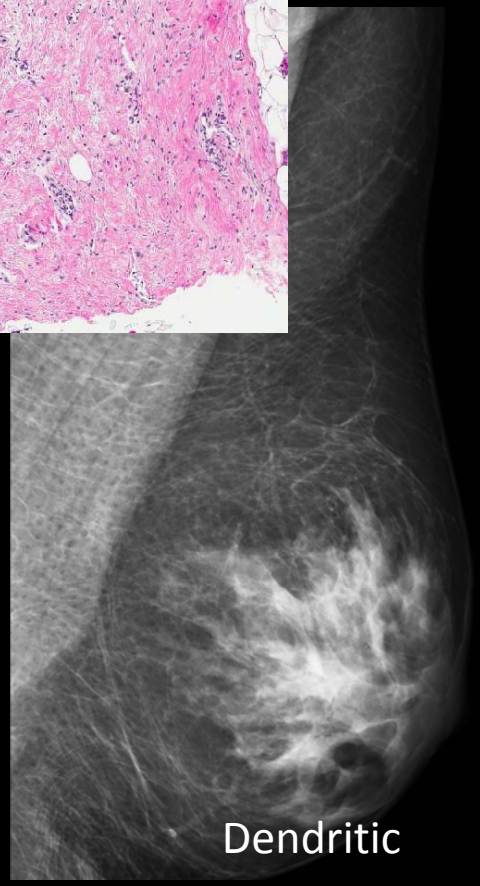
Idiopathic: 25%	**Cirrhosis: 8%**
Puberty: 25%	Drugs: 10-20 %

Gynecomastia

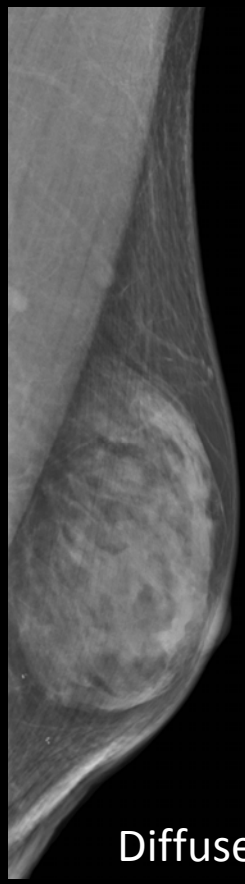




Nodular



Dendritic



Diffuse

Yen et al

Male Breast Cancer

Past studies have suggested an increased incidence of male breast malignancy from 0.85 to 1.3 per 100,000 between 1973 and 2000 [2]

Mean age: 67 (only less than 6% of cancer in < 40 yo)

Current principles of management are based on female breast cancer trials

Reported to present at a more advanced stage even though cancer behavior and aggressivity are considered equivalent to that of postmenopausal female breast cancer

Reported risk Factors:

Genetic	Lifestyle	Work	Disease
BRCA2	Obesity	High ambient temp	Testicular damage
Klinefelter	Alcohol	Exhaust emission	Liver damage
	Estrogen		Chest radiotherapy

***** Gynecomastia is NOT a risk factor***

Male Breast Cancer: Subtypes

ll of the histological subtypes identified in the female breast have been observed in the male breast

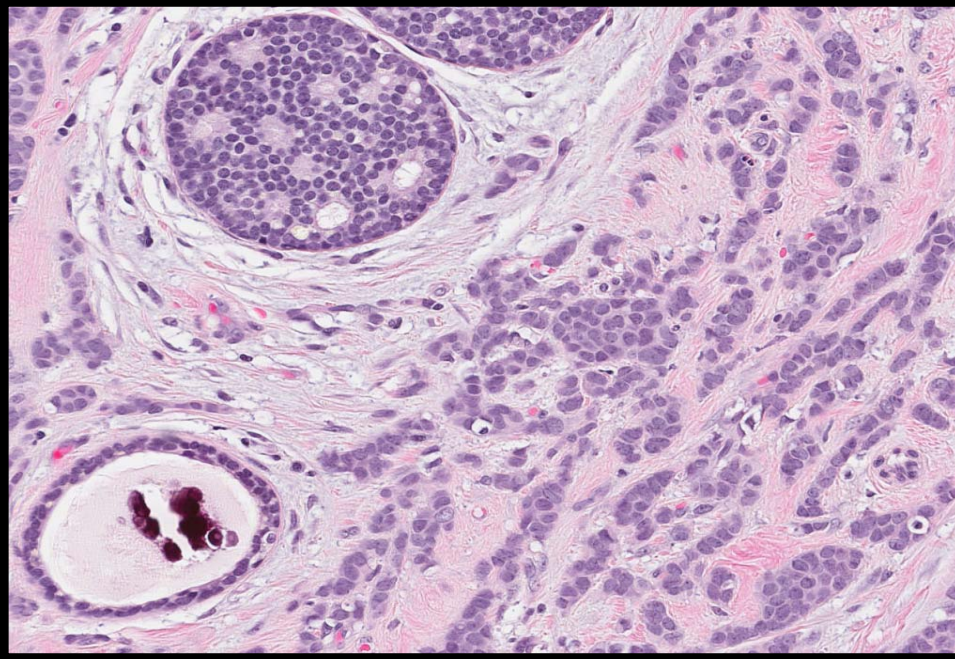
Histology	Proportion
Invasive Ductal	90%
Ductal carcinoma in situ	10
Invasive papillary	2
Medullary	2
Mucinous	1
Paget's	1
Lobular	1

Lancet 2006 [5]

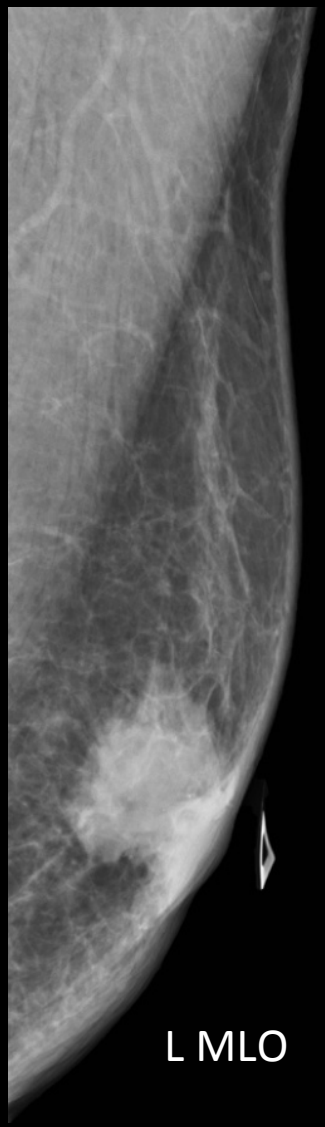
Male Breast Cancer

vasive ductal carcinoma. 72-year-old male with a three month history of new right
pple retraction and tender retroareolar firmness

R Mag CC



Male Breast Cancer



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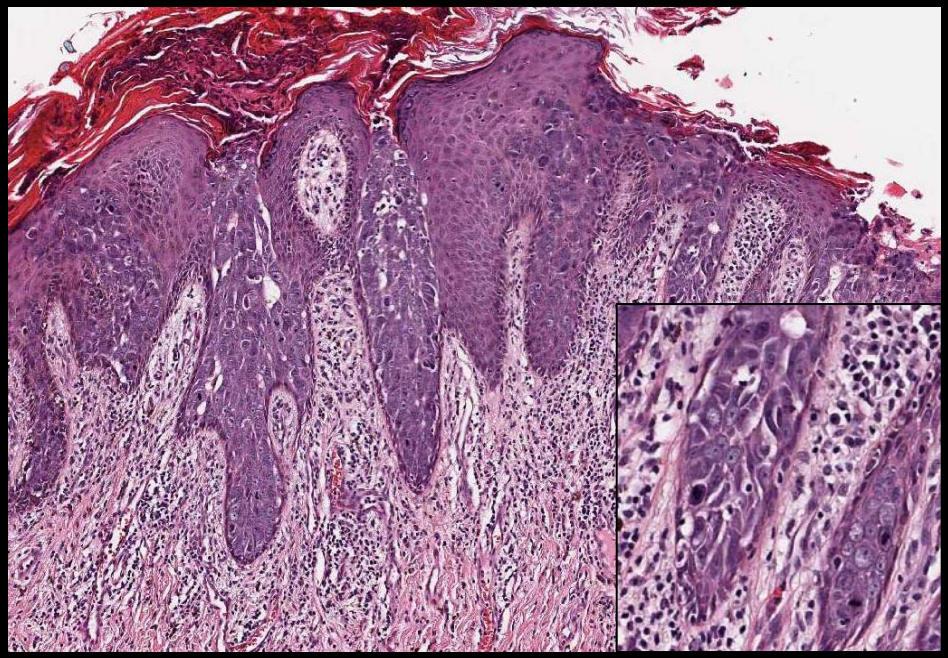
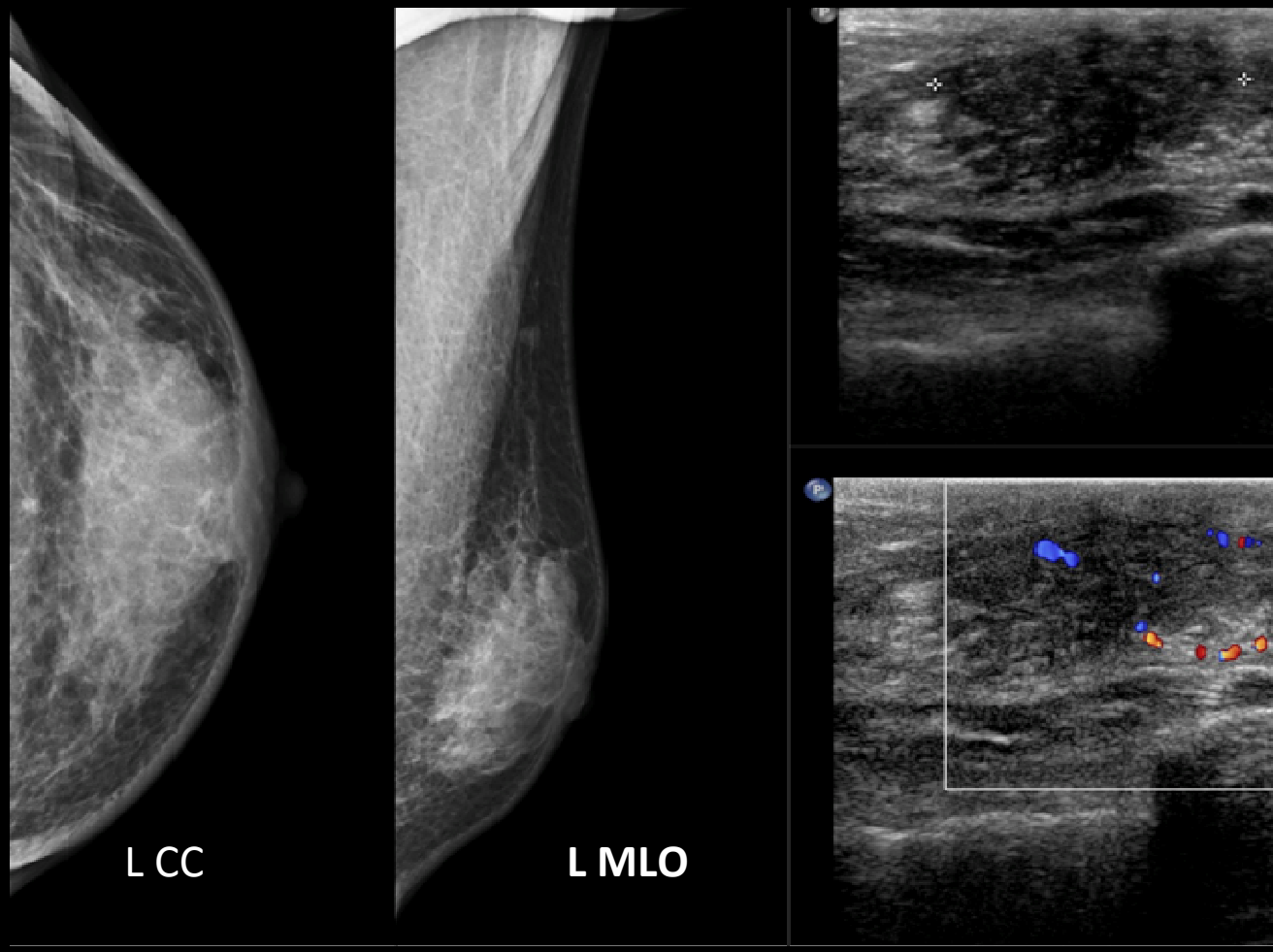
Paget's disease. 80-year-old male with a firm mobile lump under the left



Male Breast Cancer

year old male presents with swelling around the L nipple for 2 weeks. Reported as BI-RAD
d stereotactic biopsy was performed Pathology showed unilateral gynecomastia, florid typ



Summary

Review of the flow of diagnostic imaging in the identification of female breast cancer

Review of the flow of diagnostic imaging in the setting of a clinical finding

Review of the limitations of mammography in the detection of breast lesions

Review of the male breast disease and the role of diagnostic imaging

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