The Role of Radiology Imaging In Detecting Ductal Dilation In Cases of Ductal Carcinoma In Situ

Presented By: Rizki AdriYudha
Lectured by : Dr. Hari Soekersi, dr., Sp.Rad(K)

DEPARTMENT OF RADIOLOGY
FACULTY OF MEDICINE PADJADJARAN UNIVERSITY
DR. HASAN SADIKIN HOSPITAL
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02 **Literatur Review**

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-ANDI (Aberrations of Normal Development and Involution)

-Ductal Carcinoma In Situ

-Breast Imaging Modality

-Differential Diagnosis

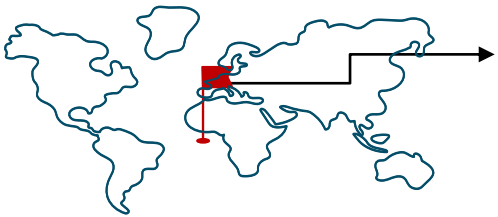
03 **Conclusion**

CHAPTER I

INTRODUCTION

Introduction

Ductal carcinoma in situ (DCIS) is a noninvasive malignancy



Worldwide, **12% of** all deaths are caused by cancer.

Ductal carcinoma in situ (DCIS) was rarely detected.

Mammography

- 62%-98% of DCIS lesions are detected due to calcification
- 2%–23% manifesting only as an asymmetric mass or density.

Case In Hasan Sadikin Hospital

A 44-year-old woman was referred by the Surgical Oncology clinic at Hasan Sadikin Hospital in Bandung to the Radiology Department for a breast ultrasound examination with a clinical diagnosis of Ca Mammae sinistra Post Mastectomy. The patient had the main complaint of enlarged right breast since 1 month ago, pain (+), redness (+), bleeding (-), pus (-), nipple retraction (+), Peau de orange (+).

TIME LINE

Chemotherapy for 6 cycles

February – August 2016

Oral Medicine

2018 - Now

2016

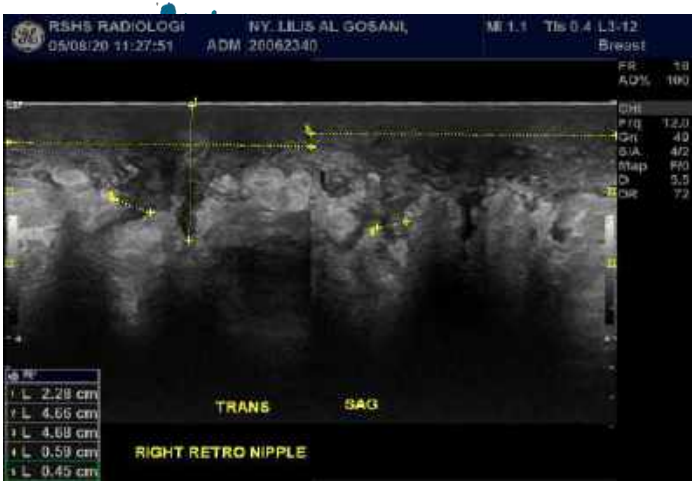
Ca Mammae Sinistra Post mastektomi. PA : IDCM grade III + Hasil IHC 2017(ER -, PR Positif sedang >80%, Her2Neu -, ki67 Positif >20% → High proliferation).

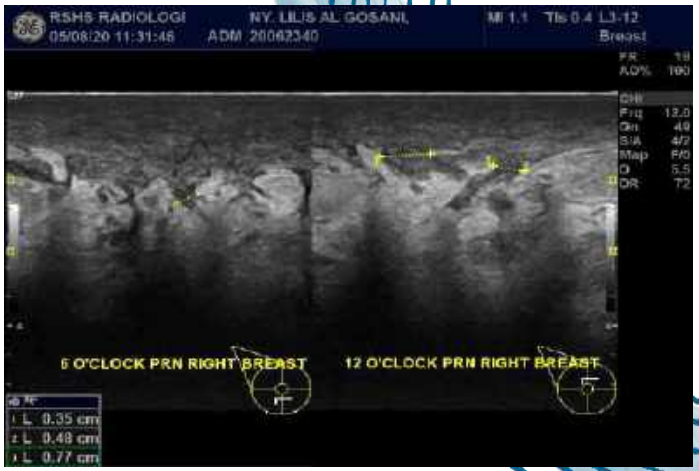
2016 – 2018

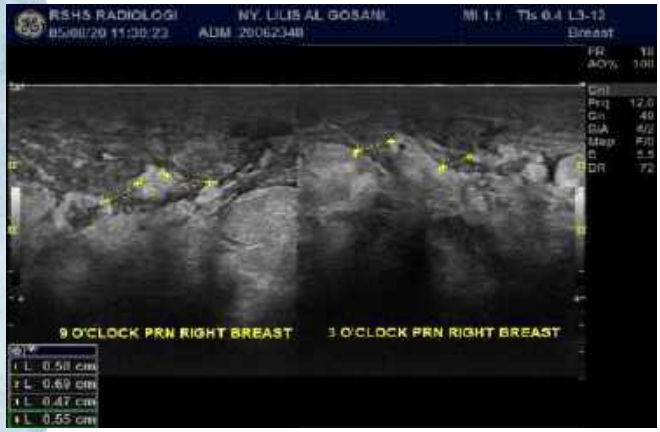
Injectable drugs

The patient has a history of menarche at the age of 13 years, menstrual cycle 28 days, with a menstrual period of 7 days, is married and has 2 children.

Radiology Imaging



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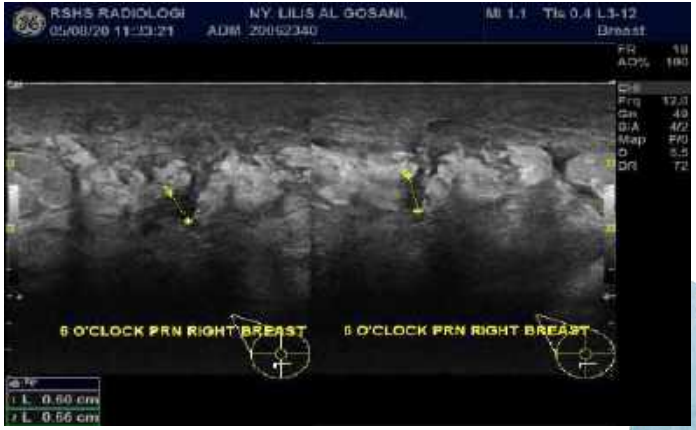
NY. LILIS AL GOSANI.
Breast
9 O'CLOCK PRN RIGHT BREAST
3 O'CLOCK PRN RIGHT BREAST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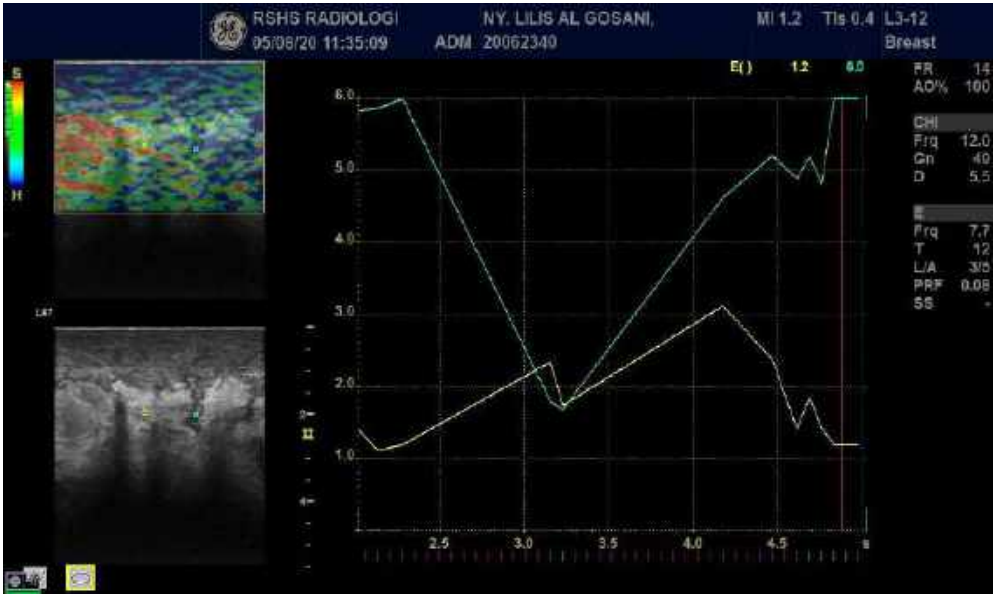
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s

Kesan :

Mammae kanan : Mammae kanan tampak membesar dengan lesi hipoechoik inhomogen, batas relatif tegas, tepi irreguler, spikula(+), distorsi jaringan (+), posterior shadowing (+) di retro nipple mammae kanan → Highly Suggestive of Malignancy (BIRADS 5).

Mammae kiri : Mammae kiri post op mastektomi
Pembesaran KGB multipel di axilla kanan setinggi level I dan di axilla kiri setinggi level 2.
Tidak tampak pembesaran KGB supraclavicula dan parasternal bilateral.
USG tiroid, hepar, uterus dan adnexa saat ini tidak tampak kelainan.

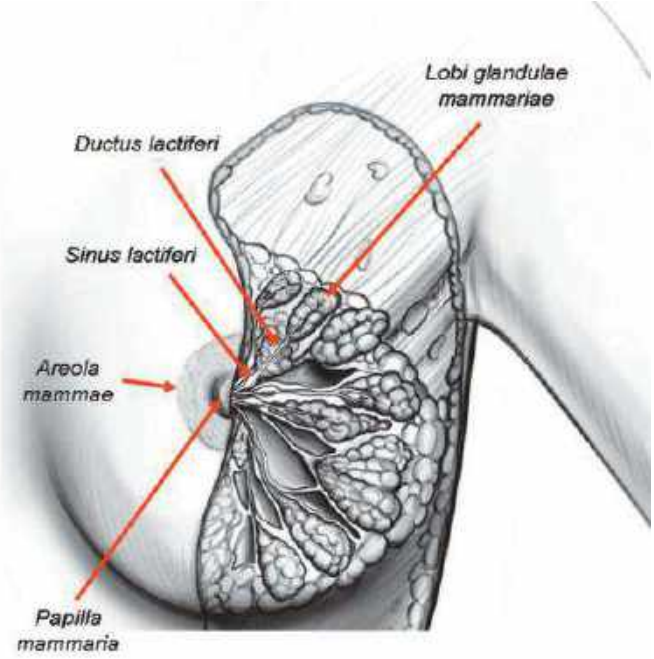
Saran :
MRI Breast dengan Kontras.
Biopsy.

CHAPTER II

LITERATURE REVIEW

Breast Anatomy

There are three anatomically distinct parts of the breast: **mammary glands**, mammary **papillae** and **areola**.



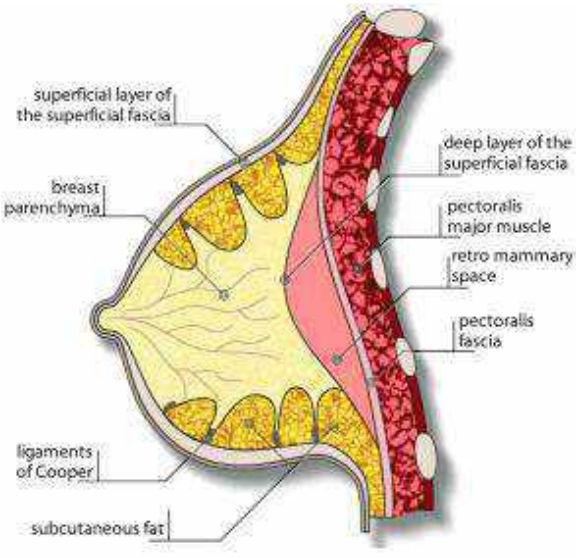
The mammary gland

- Formed by 15 to 20 lobes

Lactiferal ducts

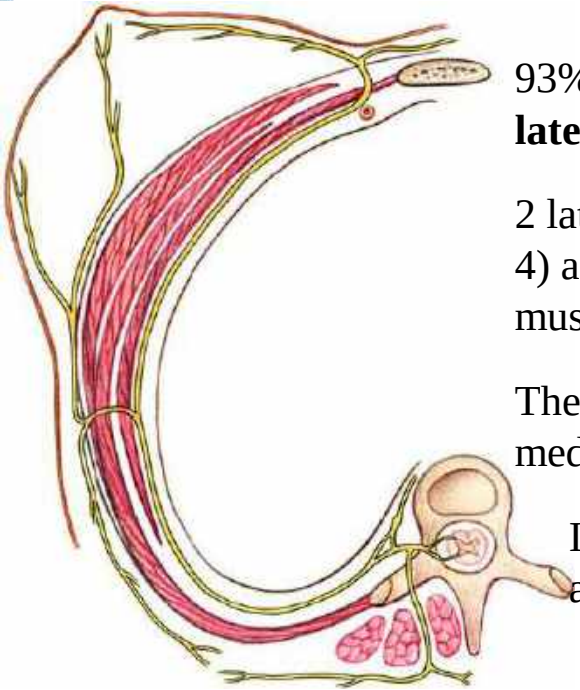
- The main ducts that drain milk into the **mammary papilla**.
- Each lobe is formed by the smallest functional unit, namely **lobules**.

Anatomy of the fascial system and ligaments



- The breast is covered by the superficial fascia on the anterior thoracic wall
- It continues superiorly with the **cervical fascia** and inferiorly with the **superficial abdominal fascia.**
- The superficial fascia and skin are connected to the inner layers by the Cooper's ligament.

Breast Innervation



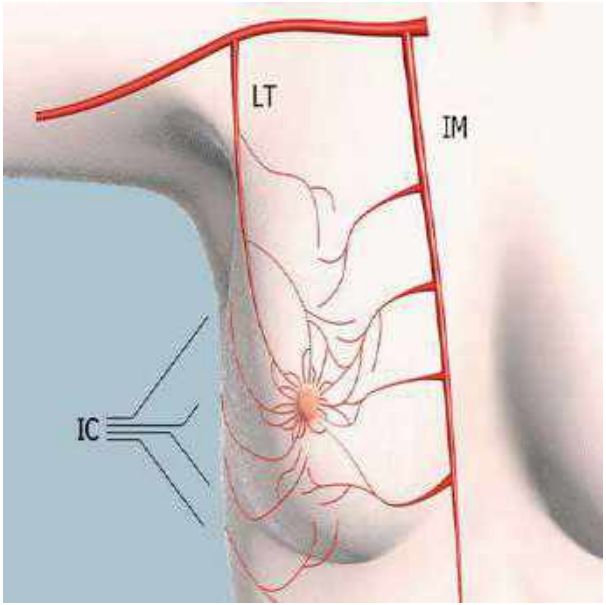
93% of the breast innervation is from the **lateral nerve.**

2 lateral nerve branches (n. intercostal 3 and 4) anastomose to the lateral of the pectoralis muscle

The anterior branches contribute to innervate the medial nipple and areola

It terminates at the periphery of the areola and arise from the 3, 4 dan 5 intercostal branches.

Breast Arterial System



The internal mammary artery

- Branch of the subclavian artery, provides 60% of the medial blood flow.

Lateral thoracic artery

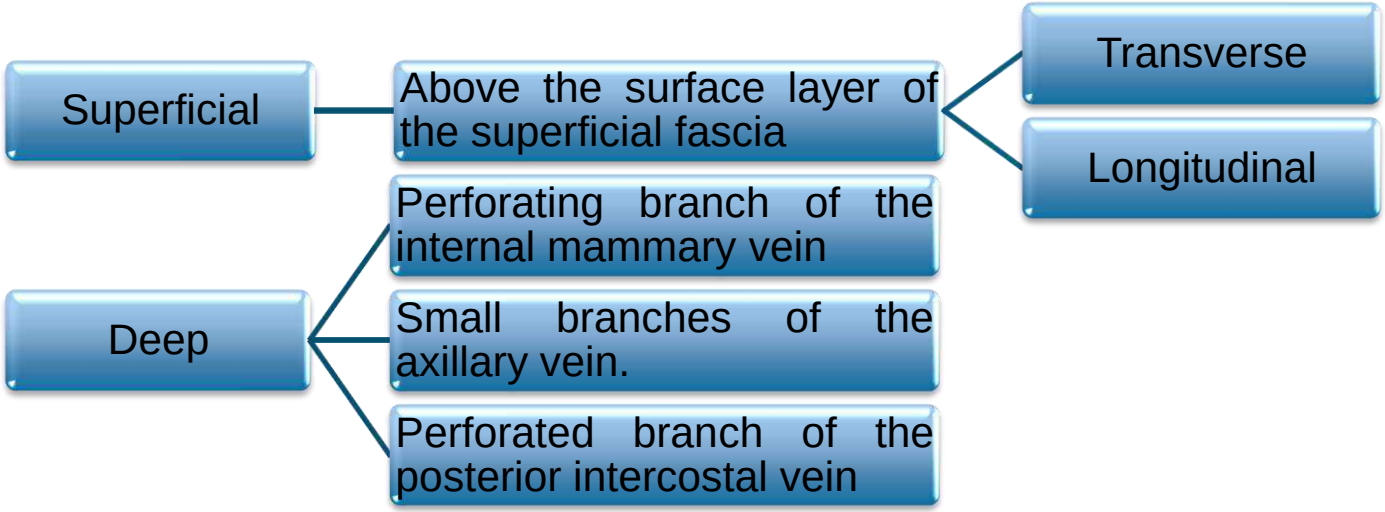
- These arteries supply nearly 30% of the blood flow to the lateral and superior parts of the breast.

Posterior intercostal arteries

- Supply the inferomedial quadrant of the breast

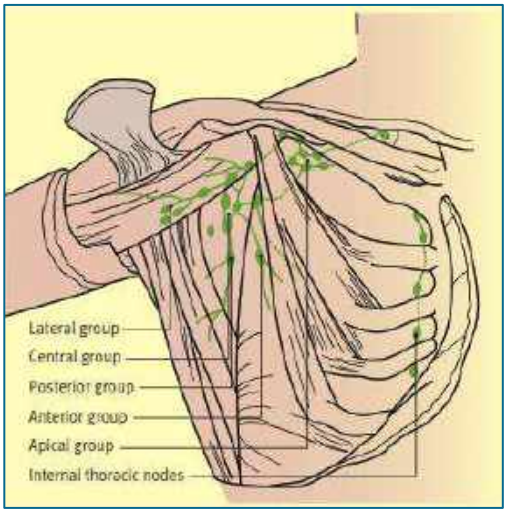
Breast Venous System

Drainage of the venos system of the breast is divided into **superficial** and **deep** systems



Breast Lymphatic System

The lymphatic system of the breast usually **parallels** the anatomy of the veins and intramammary and axillary lymph nodes.



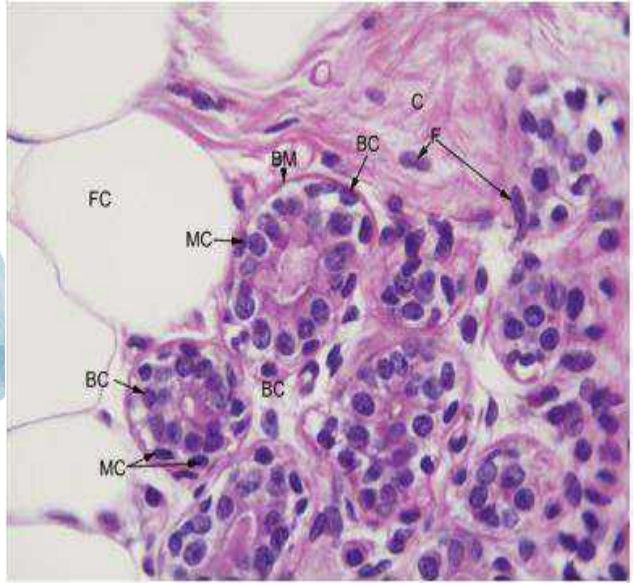
Deep lymphatic system

- communicates with the lymphatic plexus in the superficial layers of the skin
- especially around the nipples of the subareolar plexus.

Drains

- The lymphatic system drains mainly from the subareolar plexus to the axillary lymph nodes

Breast Histology



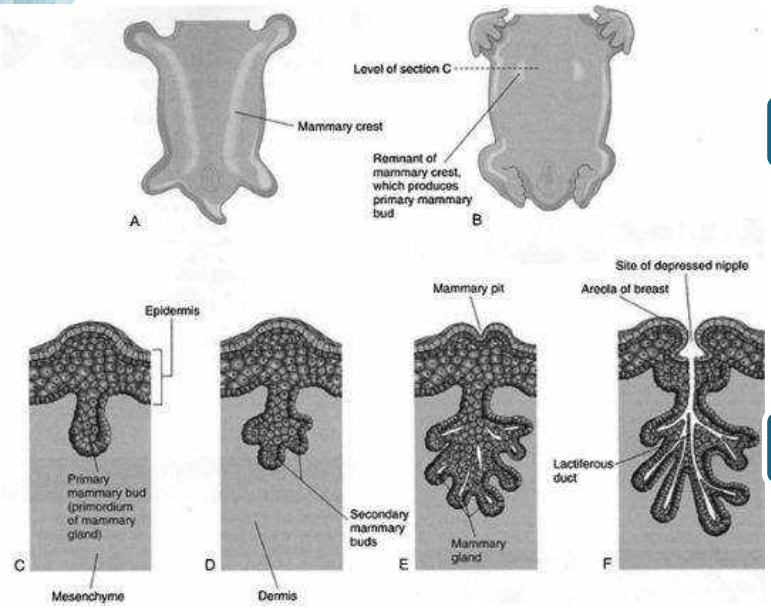
Lobule

- Each breast lobule is formed by several ducts consisting of three types of cells:
  - basal cells
  - luminal cells
  - myoepithelial cells

Intralobular stroma

- Formed by connective tissue consisting of:
  - collagen and fibroblasts
  - blood vessel
  - lymphocytes
  - plasma cells

Breast Embryology



4 to 6 weeks

- mammary-specific progenitor cells begin to appear

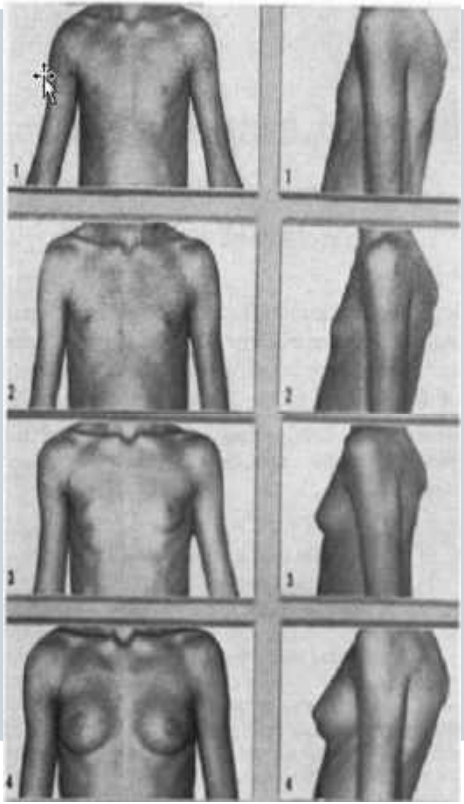
End of the first trimester

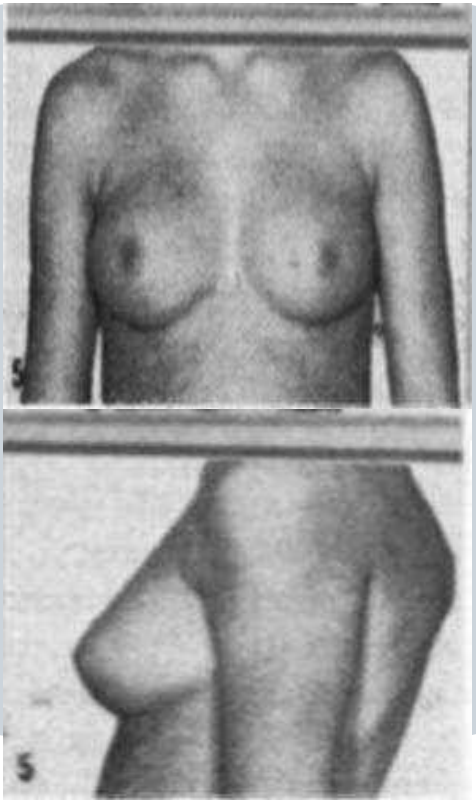
- mammary bud penetrates into the upper dermis
- Secondary epithelial buds will emerge from the grooves on the main mammary bud

Aterm

- approximately 15 to 20 lobes of the breast glands have formed

Human Breast Development

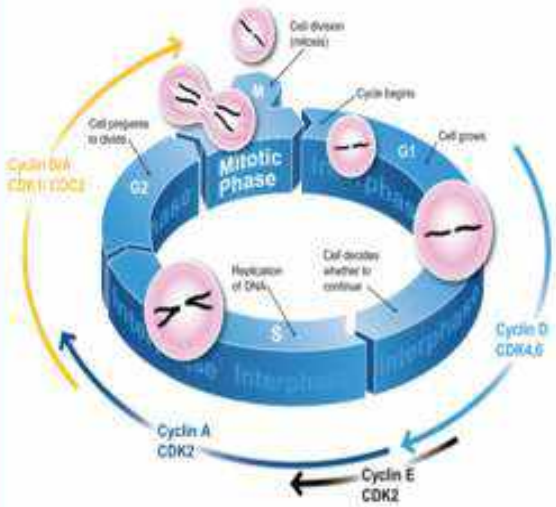




ANDI
(Aberrations of Normal Development and Involution)

Stage (peak age in yrs)	Normal process	Aberration		Disease state
		Underlying condition	Clinical presentation	
Early reproductive period (15–25)	Lobule formation	Fibroadenoma	Discrete lump	Giant fibroadenoma Multiple fibroadenomas
	Stroma formation	Juvenile hypertrophy	Excessive breast development	
Mature reproductive period (25–40)	Cyclical hormonal effects on glandular tissue and stroma	Exaggerated cyclical effects	Cyclical mastalgia and nodularity generalised or discrete	
Involution (35–55)	Lobular involution (including microcysts, apocrine change fibrosis, adenosis)	Macrocysts	Discrete lumps	
		Sclerosing lesions	X-ray abnormalities	
	Ductal involution (including periductal round cell infiltrates)	Duct dilatation	Nipple discharge	Periductal mastitis with bacterial infection and abscess formation
		Periductal fibrosis	Nipple retraction	
	Epithelial turnover	Mild epithelial hyperplasia	Histological report	Epithelial hyperplasia with atypia

CYCLE CELL

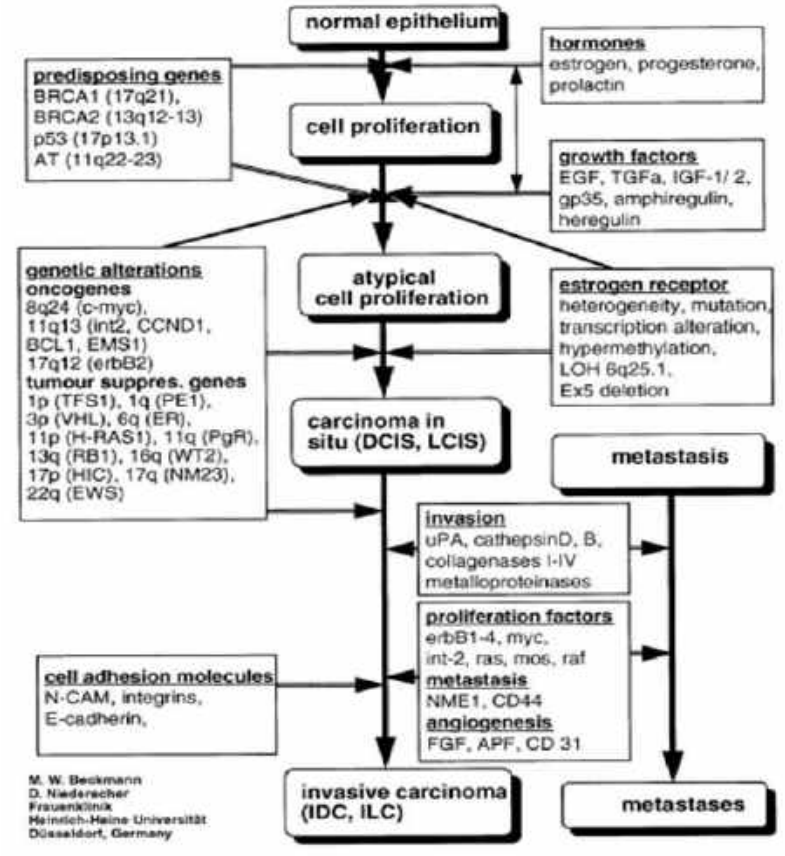


The cell cycle consists of two specific and distinct phases: **interphase**, consisting of G1 (Gap 1), S (synthesis), and G2 (Gap 2), and **the mitotic phase**: M (mitosis).

During interphase, the cell grows (G1), accumulates the energy necessary for duplication, replicates cellular DNA (S), and prepares to divide (G2)

Cell Based Assays: the Cell Cycle, Cell Proliferation and Cell Death, Laura Cobb, University of California at Los Angeles, 2012

Breast Carcinogenesis



Intratumoral Heterogeneity Models

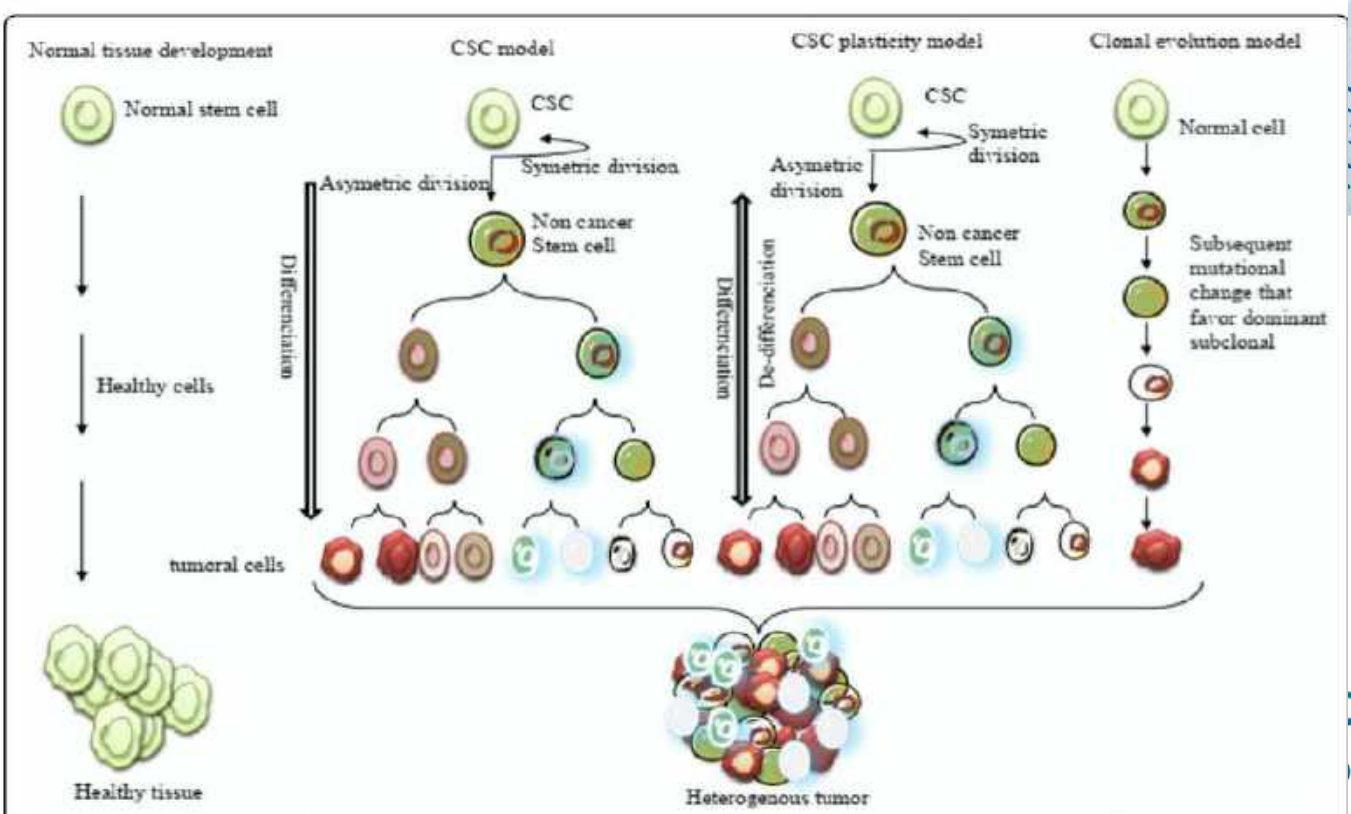
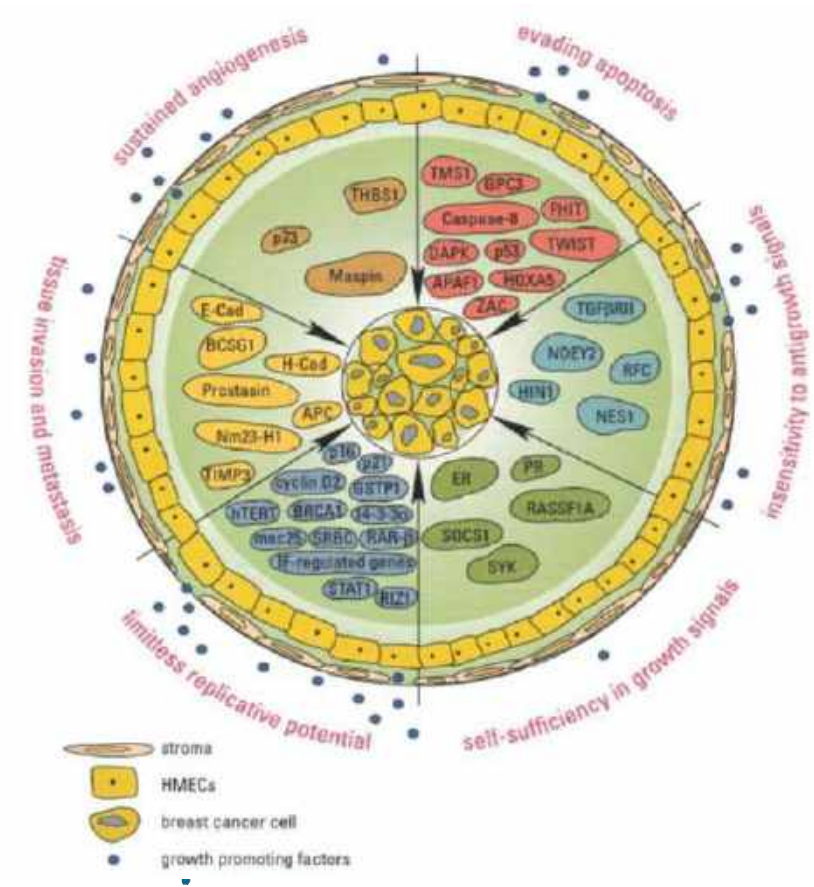


Fig. 2 Intratumoral heterogeneity models. The clonal evolution model suggests that intratumoral heterogeneity emerges from Subsequent mutational change that favors dominant sub clonal cells. Intratumoral heterogeneity sets up through cell differentiation according to the cancer stem cell model. The cancer stem cell plasticity model supports that intratumoral heterogeneity could be sourced from dedifferentiation of neoplastic cells

The six new capabilities, that a cell has to acquire to become malignant



(1) Limitless replicative potential

(2) Self-sufficiency in growth signals

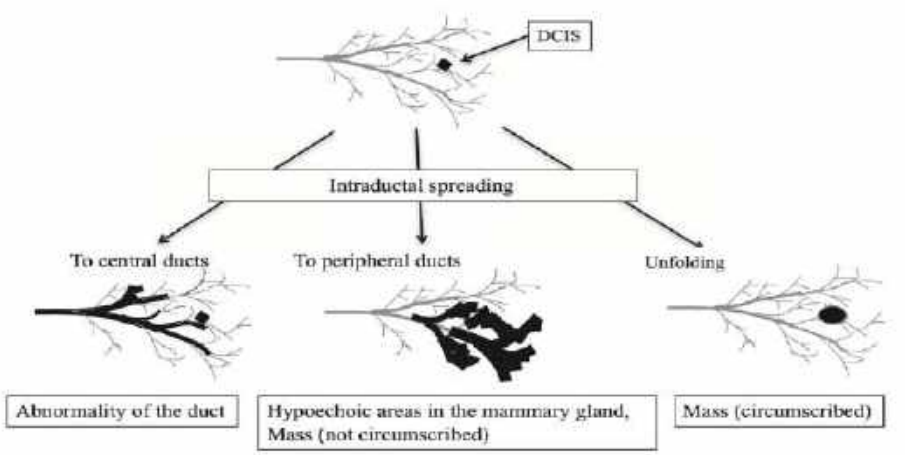
(3) Insensitivity to growth-inhibitory signals

(4) Evasion of programmed cell death

(5) Sustained angiogenesis

(6) Tissue invasion and metastasis

Ductal Carcinoma In Situ



Ductal Carcinoma In Situ (DCIS)

- Develops primarily in the Terminal Duct Lobular Unit (TDLU) and extends to the mammary ductal lobular system.

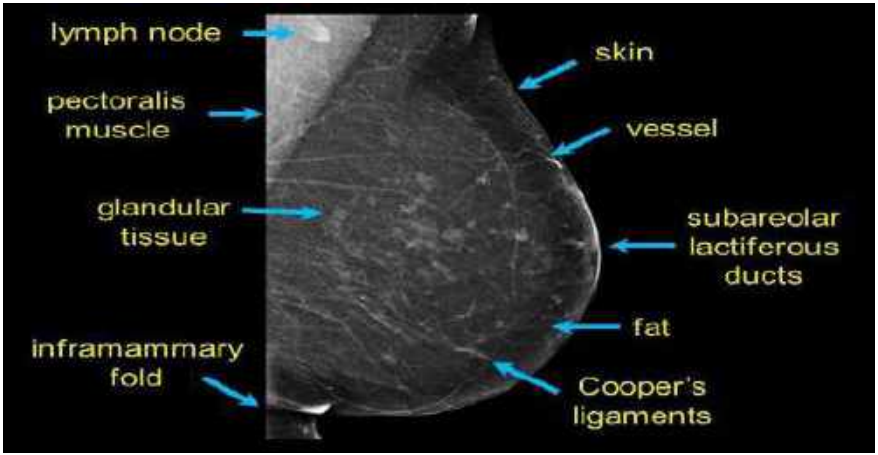
Studies using 3-D and computerized reconstruction

- DCIS is primarily unicentric and extends along a complex, lobular system of ducts branching in a pyramidal shape towards the nipple.
- When progressing primarily to the peripheral tract and TDLU, detect it as a hypoechoic area.

Breast Imaging Modalities

Mammography	**Breast ultrasound**	Magnetic resonance imaging (MRI)
Positron emission tomography (PET)	Scintimammo-graphy	Optical imaging
	Computed tomography (CT).	

Mammography



- Mammography is the most widely used method of breast imaging.
- This imaging uses low-dose X-ray waves
- Good for detecting Ductal Carcinoma In Situ (DCIS)

Randomized screening mammography → Early diagnosis and treatment of breast cancer → Reduce breast cancer mortality.

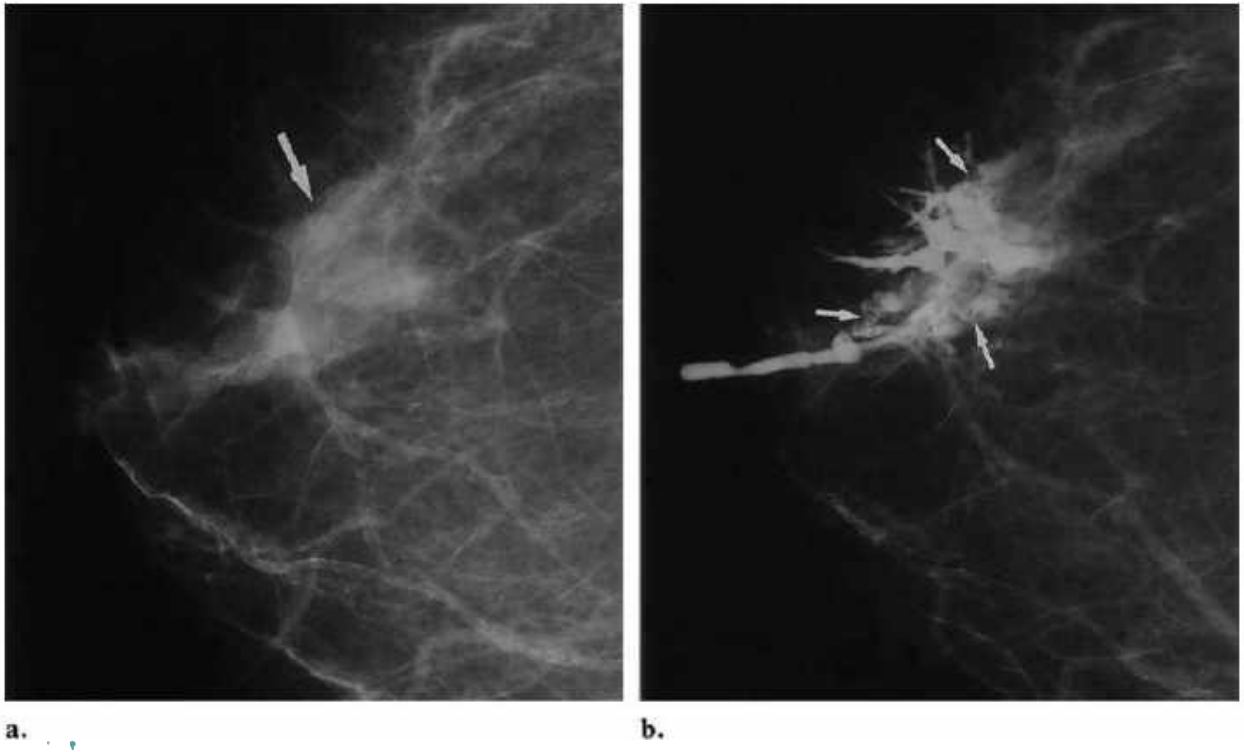
Mammography

Calcification

- Various calcifications in the breast
- calcium deposits in necrotic foci → thickened secretions or damaged cells → calcification
- Microcalcification → the result of an active secretory process from tumor cells rather than mineralization of necrotic debris

Pathogenesis

- The pathogenesis of intramammary calcifications is not uniform.
- Inflammation, degenerative, metabolic processes, and mechanisms of injury.



DCIS Papilary. Dikutip dari: Moon[2]

Papillary DCIS in a 77-year-old woman with bloody nipple discharge. (a) Craniocaudal mammogram showing charged density in the sub areolar region (arrows). (b) Craniocaudal ductogram showing multiple filling defects in the distended duct (arrows)

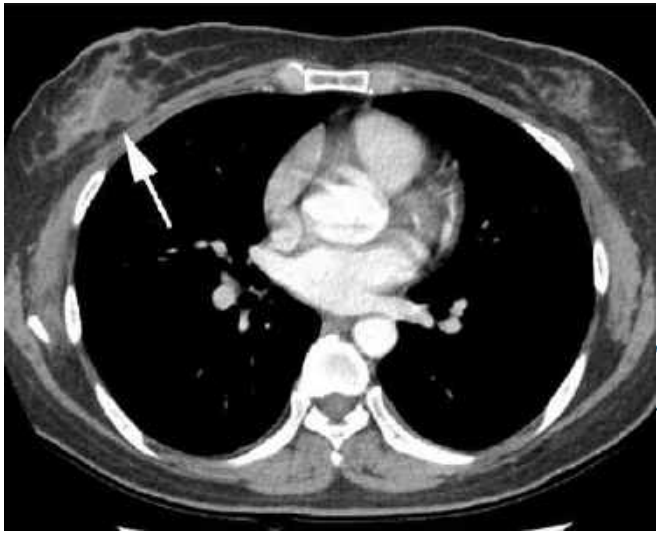
Computed Tomography Scan

Disadvantages

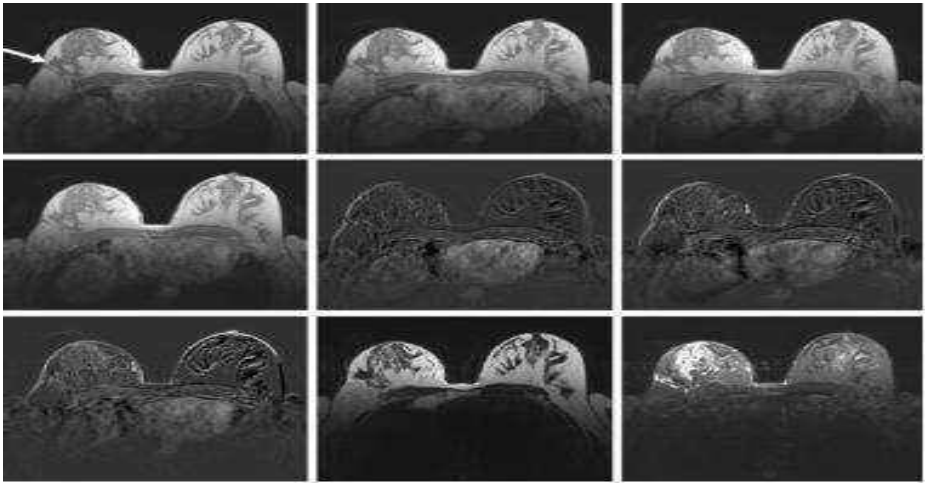
- Not the main method
- Exposing radiation to breast tissue

Advantage

- Detects unexpected breast lesions
- Breast cancer detected incidentally using a CT scan varies from 24% - 70%

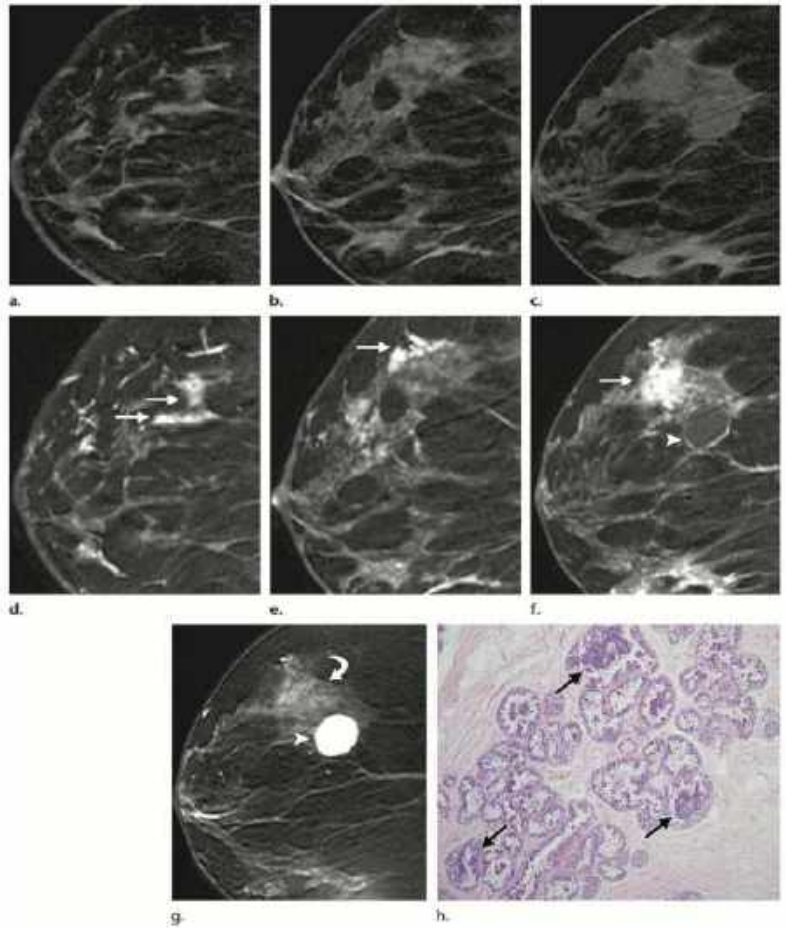


Magnetic Resonance Imaging



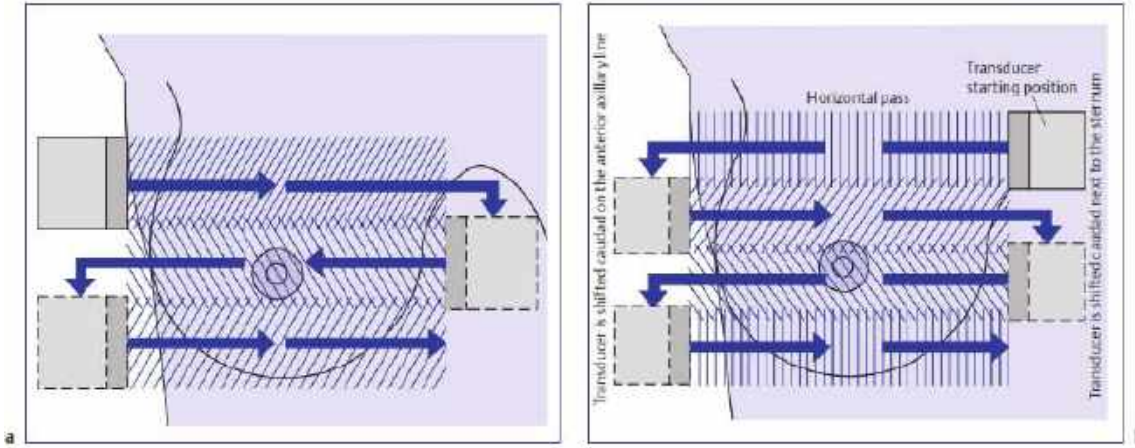
Disadvantage
- Detect breast cancer early
- Better image resolution
- Has no side effects because it does not use ionizing radiation

Advantage
- Not optimal in diagnosing DCIS → false positives
- Long inspection about 30-60 minutes
- Expensive
- Cannot show all types of calcification



Breast MRI in DCIS cases. Dikutip dari : Mossa[1]

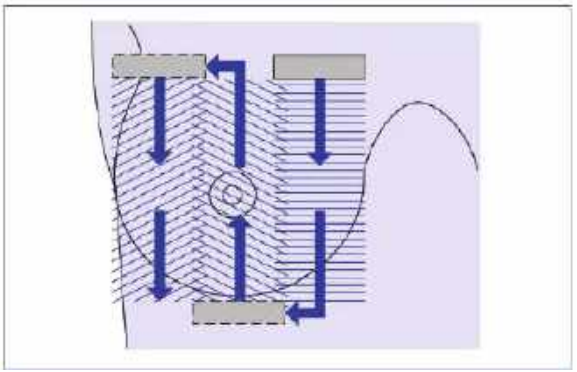
Ultrasound Examination Technique



Sagittal ultrasound scan pattern of the breast.

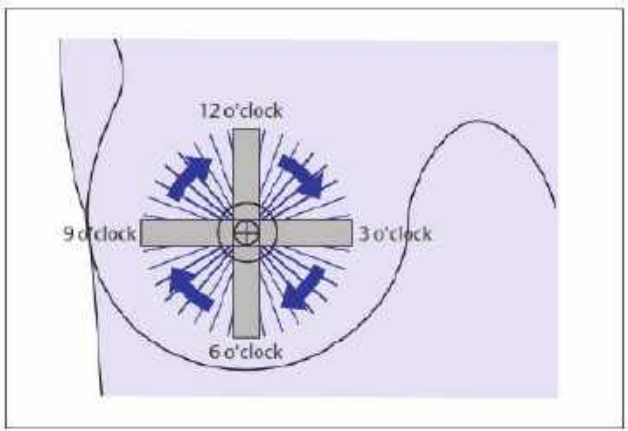
- a. three-line pattern (for transducers with a 5-6 cm image),
- b. four-line pattern (for small transducers with a 4 cm image).

Ultrasound Examination Technique

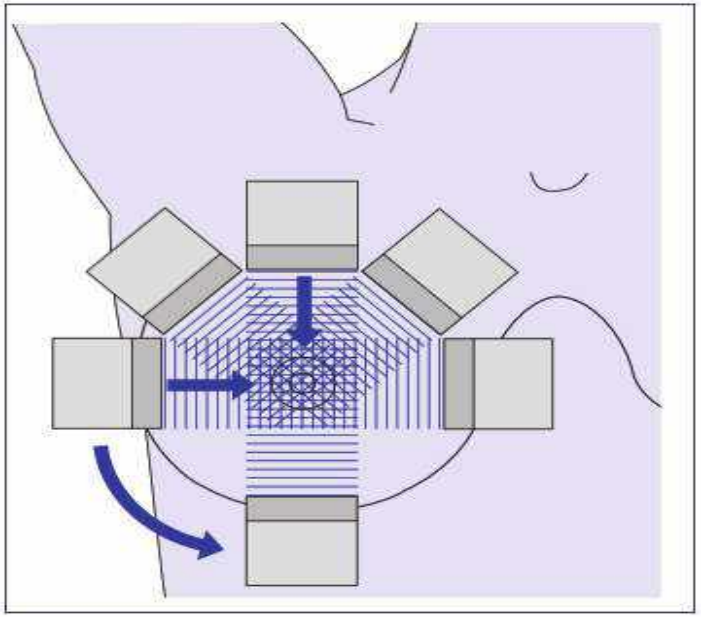


Transverse scan pattern

Radial scan pattern



Ultrasound Examination Technique



tangensial scan

Ultrasound Examination Technique

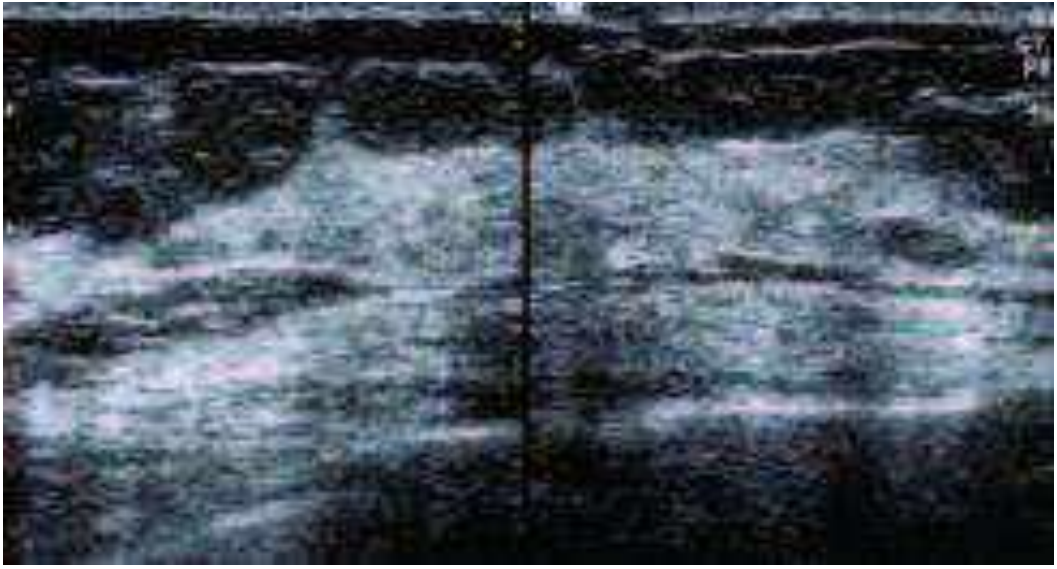
DCIS

- Radial → useful for delineating intraductal masses and evaluating the spread of disease
- Antiradial → more helpful for evaluating the surface characteristics of masses.

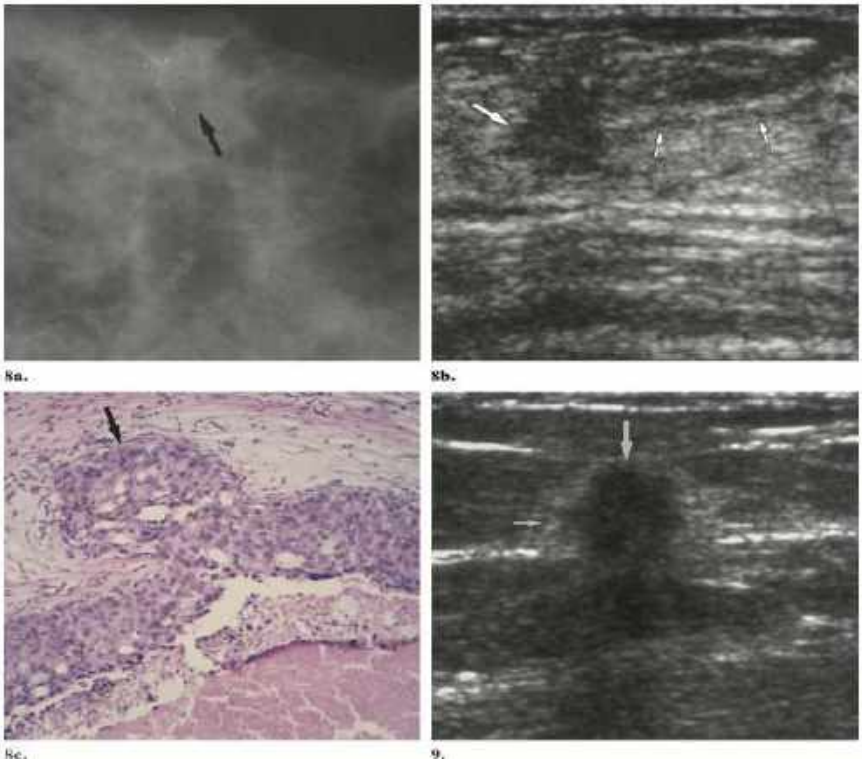
Uncertainty

- Small radiopaque markers can be placed on the skin over the lesion
- The area is then reassessed by mammography in the upright position.

Ultrasound



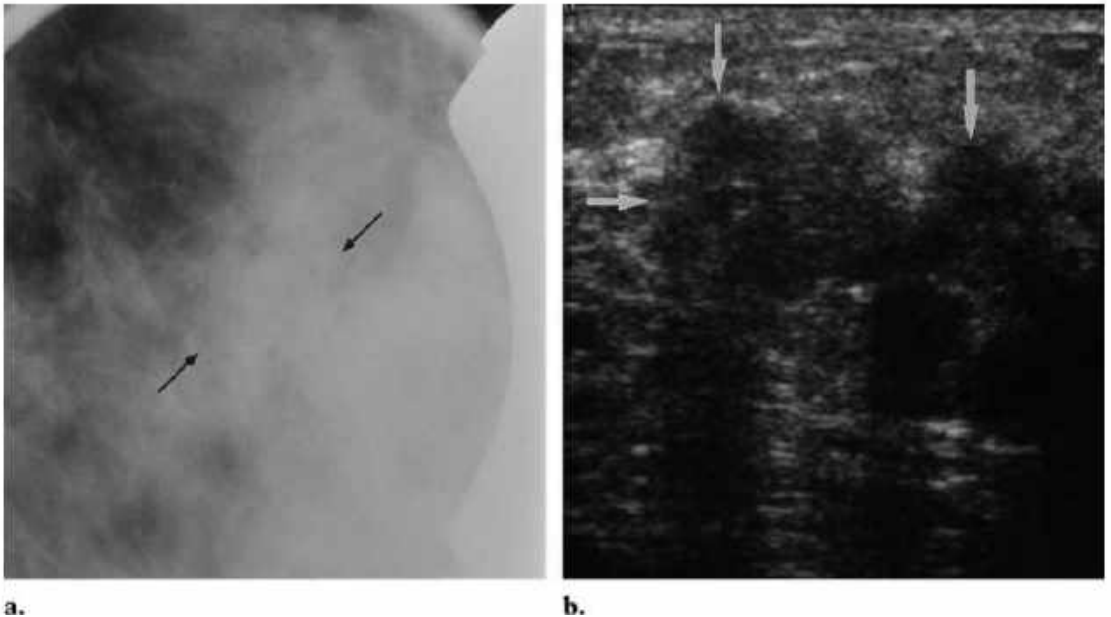
- Detect the location of suspicious lesions on the breast.
- Additional examination on mammography.
- The ultrasound transducer delivers high-frequency sound waves.



Gambar 2.16 Comedone-type DCIS

Dikutip dari: Moon[2]

Comedone-type DCIS with micro-invasion in a 53-year-old woman. (a) Enlarged craniocaudal point mammogram showing an irregular spicule mass 9 mm in diameter with granular microcalcifications (arrows). (b) Radial US image shows a spiculated hypoechoic mass (large arrow) with ductal extension extending toward the nipple (small arrow). (c) Photomicrograph (original magnification, 100; HE staining) shows intermediate-grade extension of cancer cells beyond the basement membrane (arrows) with associated comedone-type necrosis. (9) Invasive breast cancer in a 65-year-old woman with a spicular mass detected on mammography. Antiradial US image shows a hypoechoic spiculatory mass 11 mm in diameter (large arrow) with posterior acoustic shadow and a thick echogenic border best seen at the lateral edge of the mass (small arrow)



Gambar 2.17 Papilary DCIS dengan mikroinvasi

Dikutip dari: Moon[2]

Papillary DCIS with micro-invasion in a 63-year-old woman with a palpable mass. (a) Enlarged craniocaudal point mammogram showing an indistinct 20 mm mass without calcification (arrows). (b) Antiradial US image shows a diffuse indistinct hypoechoic lesion (arrows) with posterior acoustic shadow.

Differential Diagnosis

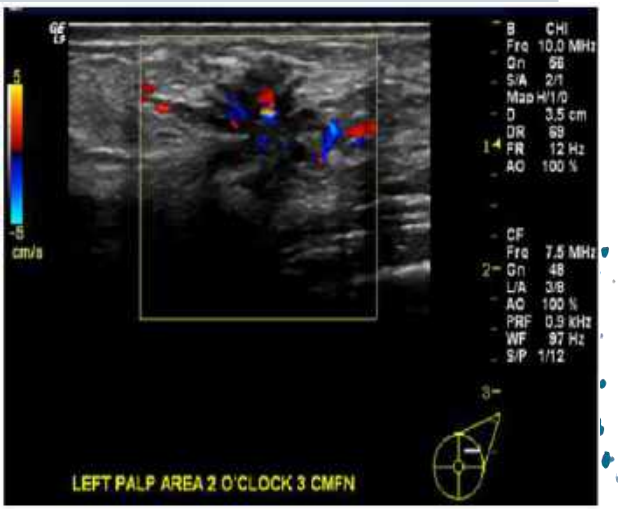
Fibroadenoma

Fat Necrosis

Differential Diagnosis

Papilloma

Radial Scar



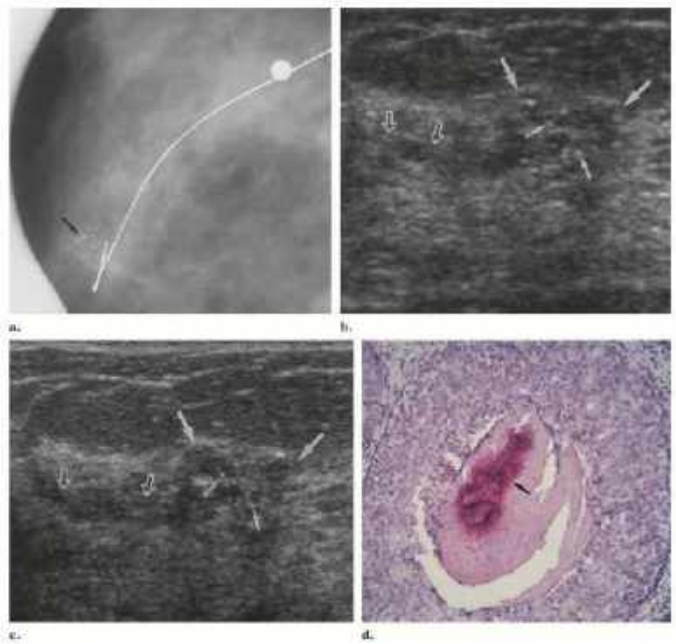
Differential Diagnosis

Breast Inflammatory Disease

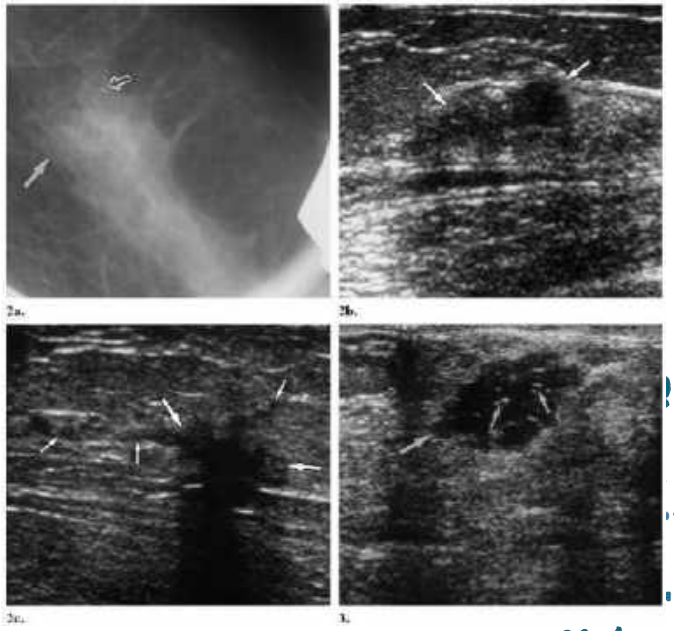
DCIS with Calcification

Slightly hypo-echoic but may be isoechoic relative to fat or breast parenchyma

DCIS with Calcification



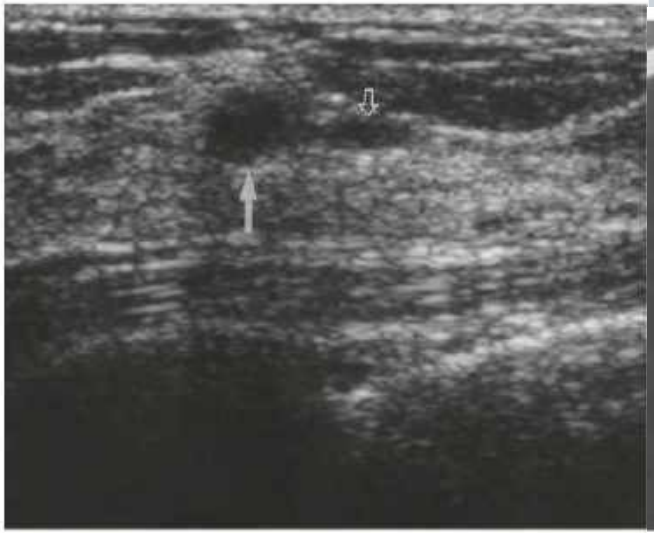
Comedo-type DCIS in a 41-year-old woman



Comedone-type DCIS with micro-invasion in a 53-year-old woman

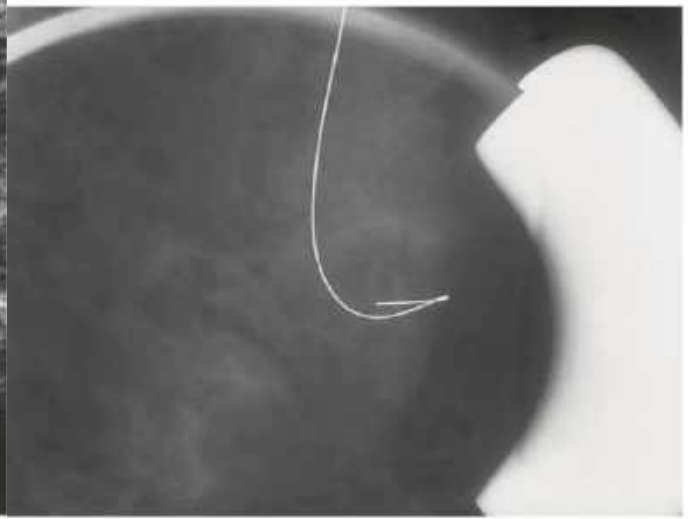
Differential Diagnosis

DCIS without Calcification



a.

Invasive Ductal Carcinoma Mammae (IDCM)

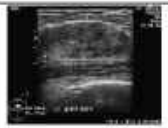
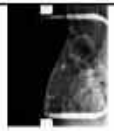
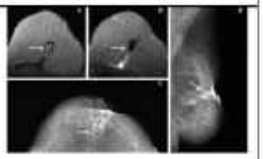
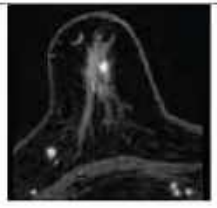
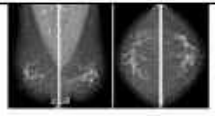
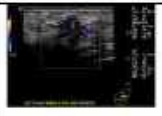
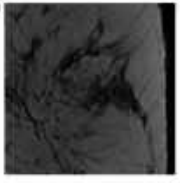


b.

Differential Diagnosis

Characteristics of sonogram evaluation in breast cancer

Lexicon	Malignant tumors	Benign tumors
Shape	Irregular	Oval, round
Orientation	Vertical, taller than wide, indifferent	Parallel, wider than tall
Margin	Indistinct	Circumscribed, identifiable, thin echogenic capsule
Margin contour	Irregular, angular, spiculate	Smooth, three or fewer gentle lobulations
Echogenicity	Markedly hypoechoic	Hyperechoic, isoechoic or mildly hypoechoic
Geneity	Homogeneous	Heterogeneous
Posterior features	Shadowing	Enhancement, no changes
Calcification	Microcalcification	Absent
Surrounding tissue	Architectural distortion	Compression, no alteration
Retraction phenomena	Present	Absent

		Patofisiologi	Patologi Anatomi	Mammografi	USG	MRI
	dat yang umum payudara. Sekitar 30% muncul dengan gejala jinak	Patofisiologi fibroadenoma mammae (FAM) sebagian besar dipengaruhi oleh aktivitas hormonal	Berasal dari fibroblas jaringan ikat yang menunjukkan proliferasi pada jaringan ikat dan epitelial			
Nekrosis Lemak	Penyakit yang umum, jinak, dan proses inflamasi yang biasanya diakibatkan oleh cedera	Suatu kondisi timbulnya kerusakan pada jaringan lemak	Jaringan lemak yang mengalami nekrosis			
Papilloma	Neoplasma duktus jinak yang biasanya terletak di daerah retroareolar	Tumor kecil jinak yang terbentuk di dalam saluran susu di payudara. Papilloma intraductal dapat berupa soliter (tunggal) atau multipel (papillomatosis)	Hilangnya fibrous vascular core, epitel tersusun berlapis-lapis dengan jenis sel yang uniform dan derajat anaplasia yang berbeda			
Skar Radial	lesi jinak, yang mana secara histopatologis menyerupai karsinoma tubular yang diyakini merupakan awal kanker payudara	Sampai saat ini patofisiologi untuk skar radial masih belum ditemukan, dicurigai berdasarkan kelainan patologis	Gambaran PA menyerupai kardinoma tubular			

Potential Role of Ultrasound in DCIS Evaluation

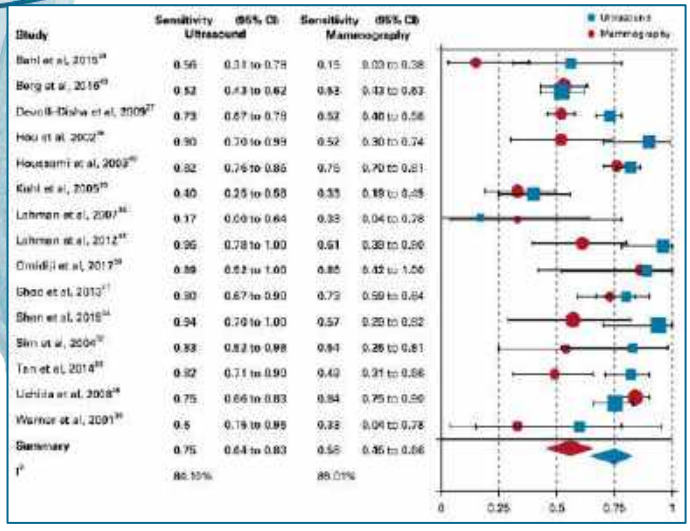
Ultrasonography can be used to visualize large microcalcifications (>10mm) with a suspected malignancy rate of 75%

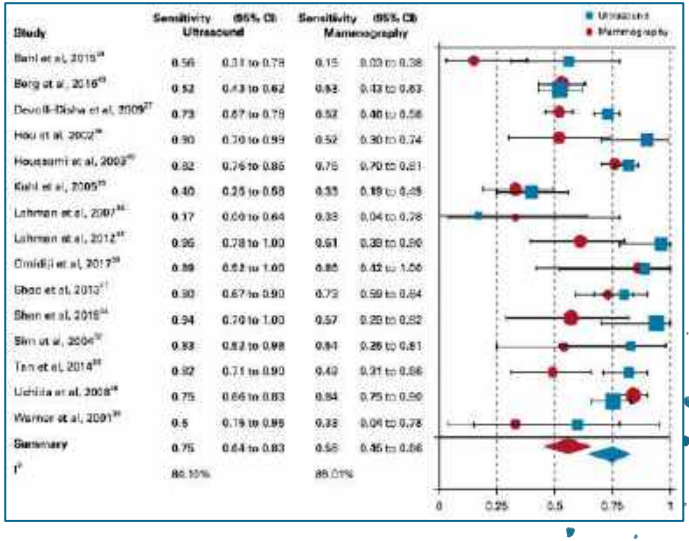
Ultrasonography can be used to increase the specificity of mammography

Ultrasonography can be used to reveal hidden DCIS

Ultrasonography can be used to evaluate patients with nipple discharge when ductography is not possible

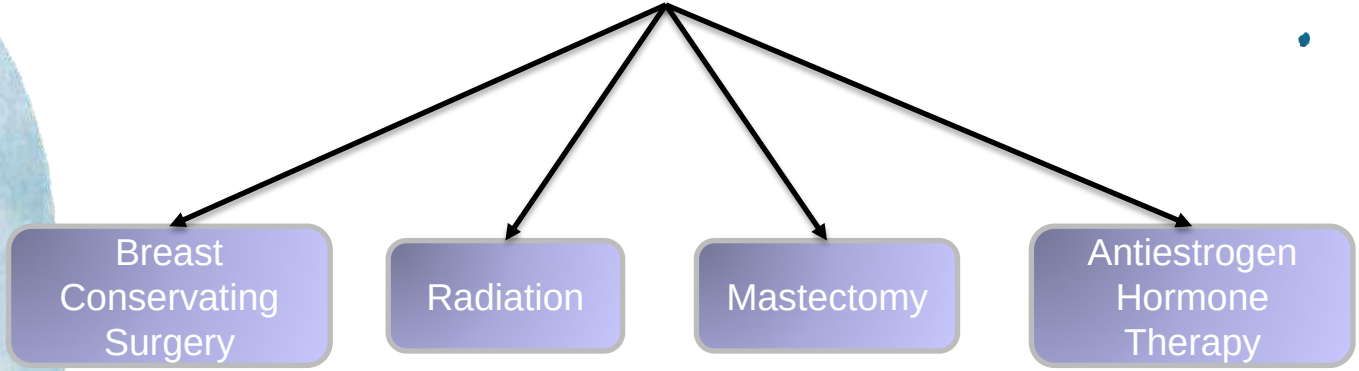
Potential Role of Ultrasound in DCIS Evaluation





The meta-analysis conducted by Sood et al from Johns Hopkins University also stated that **ultrasound** has the **potential** to detect breast cancer because it has **high sensitivity and specificity**.

Therapy in DCIS Patients



CHAPTER III

CONCLUSION

Conclusion

Ductal Carcinoma In Situ (DCIS) develops mainly in the Terminal Duct Lobular Unit (TDLU) and then spreads to the central duct, peripheral duct and unfolding.13

Ultrasonography can be used as a screening and detection tool for early breast cancer which has good efficiency and effectiveness when compared to mammography. In addition, ultrasonography also has high sensitivity and specificity for evaluating breast cancer

Mammography is a good modality for detecting Ductal Carcinoma In Situ (DCIS) and calcifications. It can also detect early-stage breast cancer, before the lesions can be clinically palpated

Conclusion

MRI can be used as a modality to detect Ductal Carcinoma In Situ (DCIS). But it has several disadvantages, namely the price is expensive, the examination time is long and causes false positive results. While CT Scan does not include the recommended modality for detecting DCIS.1,16

Treatment therapy in DCIS cases is quite varied with different results including a combination of breast conserving surgery (BCS) with or without radiation, unilateral or bilateral total mastectomy, contralateral prophylactic mastectomy, breast reconstruction, and antiestrogen hormone therapy.

Thank You