IN THE NAME OF GOD

BREAST IMAGING

Common modalities for evaluation of breast diseases

1-Ultrasonography

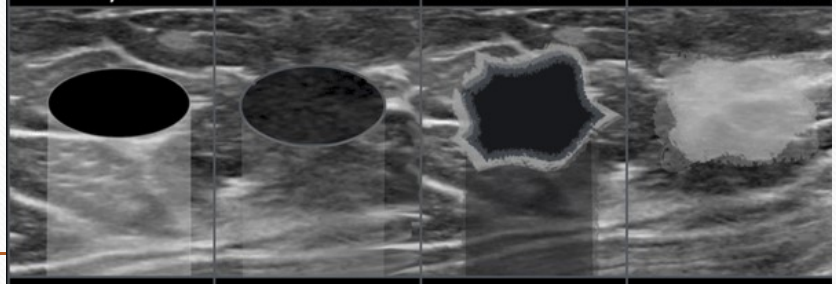
2-Mammography

3-MRI

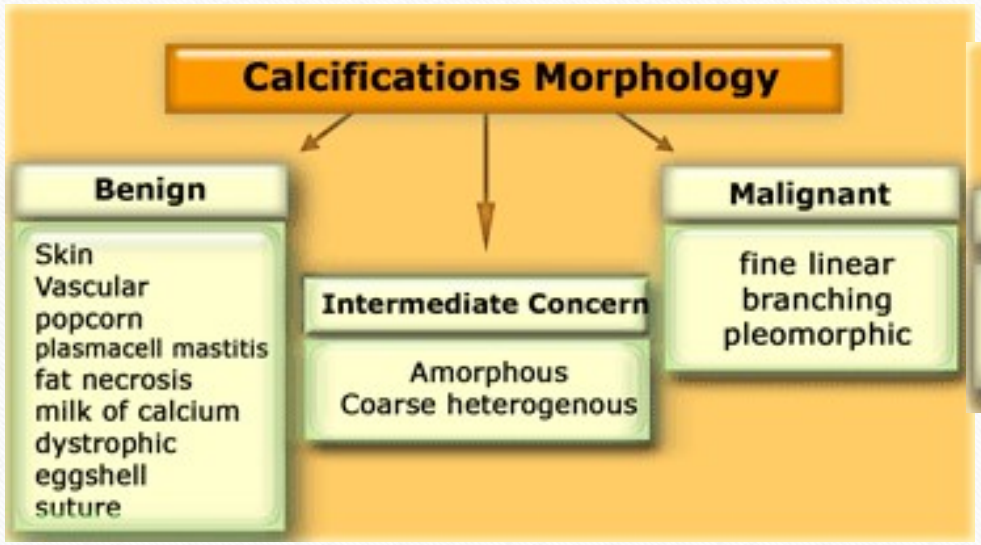
4-PET CT

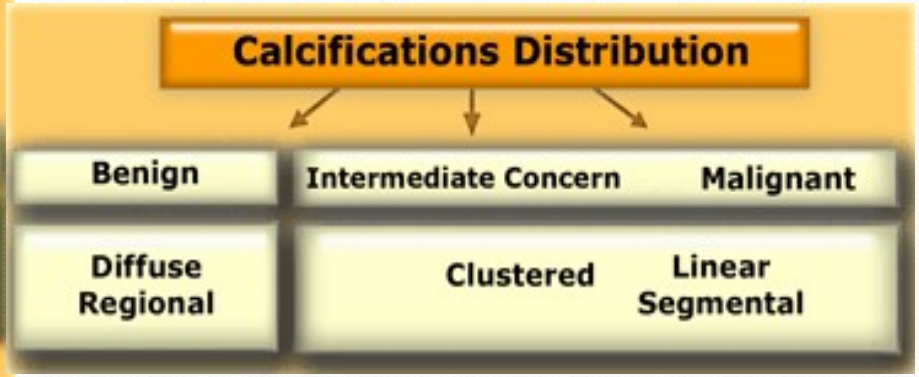
5-Some non common modalities ,just for research such as cone beam CT

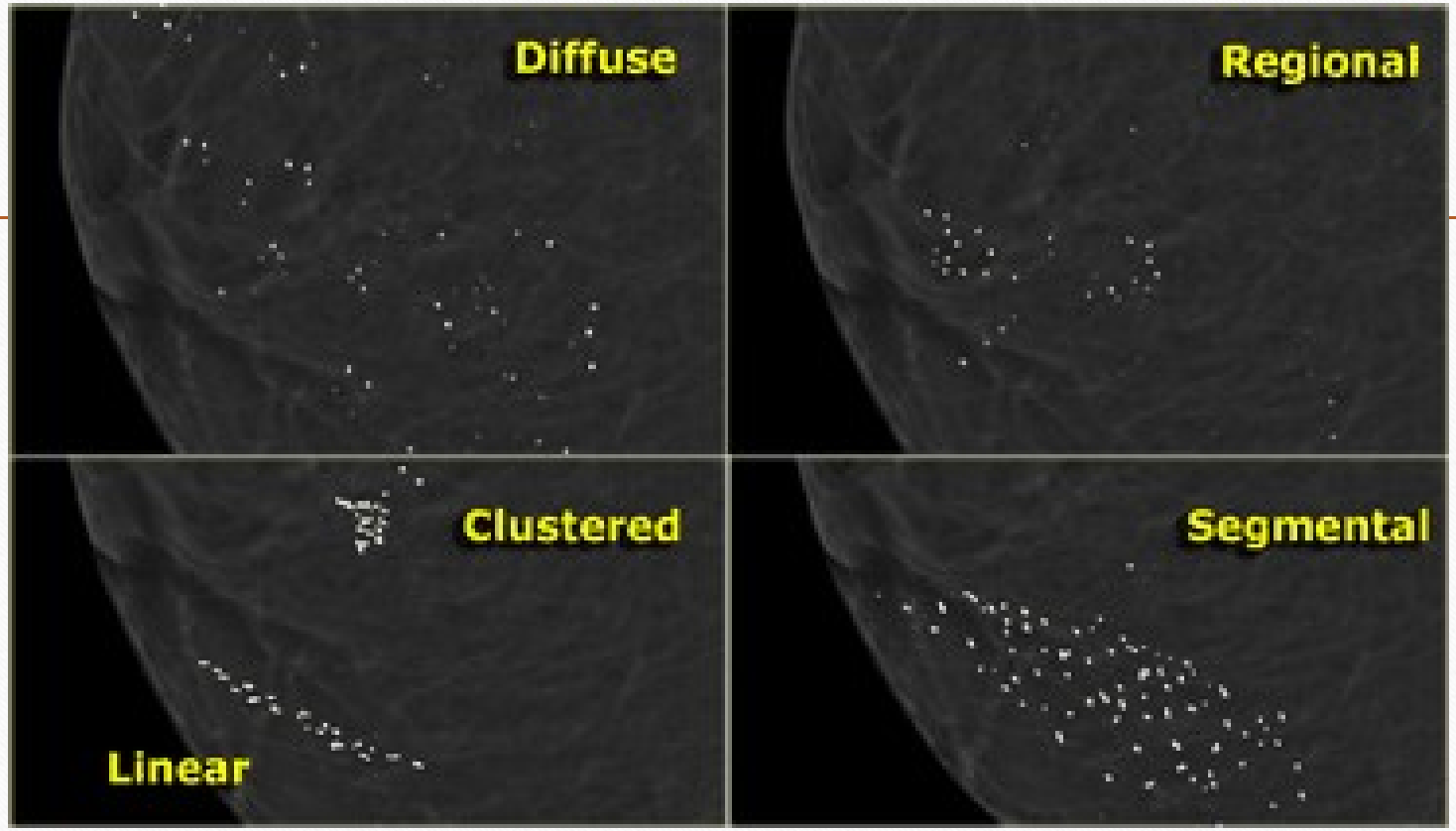
Ultrasonography of breasts

Cyst	Fibroadenoma	Cancer	Glandular tissue
			
Anechoic pattern	Hypoechoic	Hypoechoic	Hyperechoic
Oval or round shape	Most common: • oval or round Less frequent: • lobulated	Most common: • irregular shape Less frequent: • round or oval	Locally prominent glandular tissue
Circumscribed margin	Circumscribed margin	Margin is not circumscribed: • Indistinct • angular • microlobulated • spiculated	
Horizontal orientation	Horizontal orientation	Vertical orientation	
Posterior Enhancement	Sometimes minimal posterior enhancement	Frequently posterior shadowing	No feature
No calcifications	May have gross calcifications	May have small calcifications in or outside mass	No

Calcification patterns in mammography

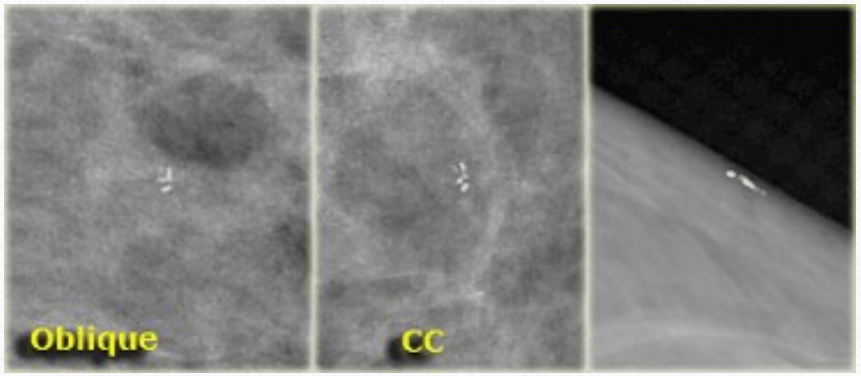




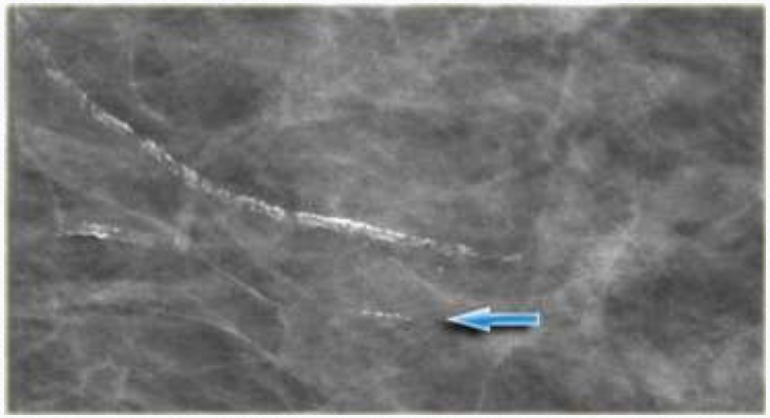

Diffuse
Regional
Clustered
Linear
Segmental

Benign calcifications

skin

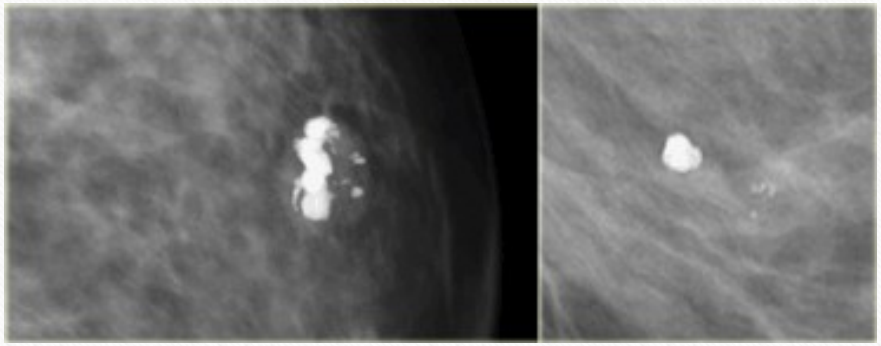


vascular

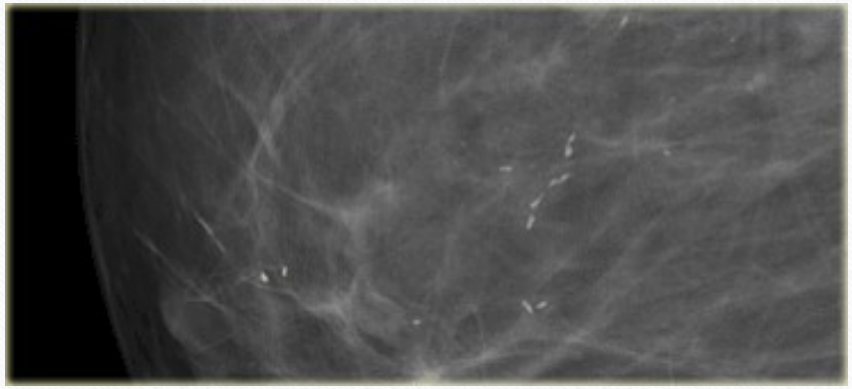


Benign calcifications

Popcorn(BR2)

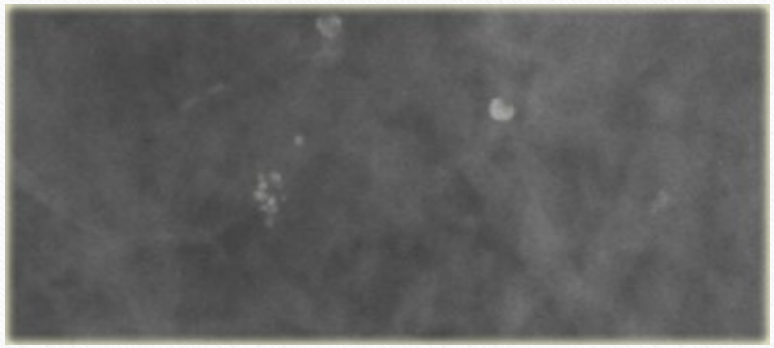


Rod-like(BR3)

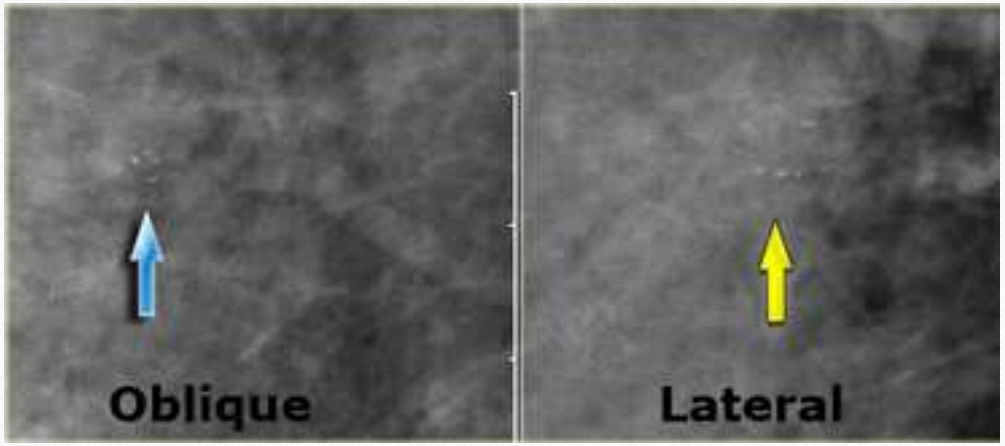


Benign calcifications

Round punctate(BR 3-4)

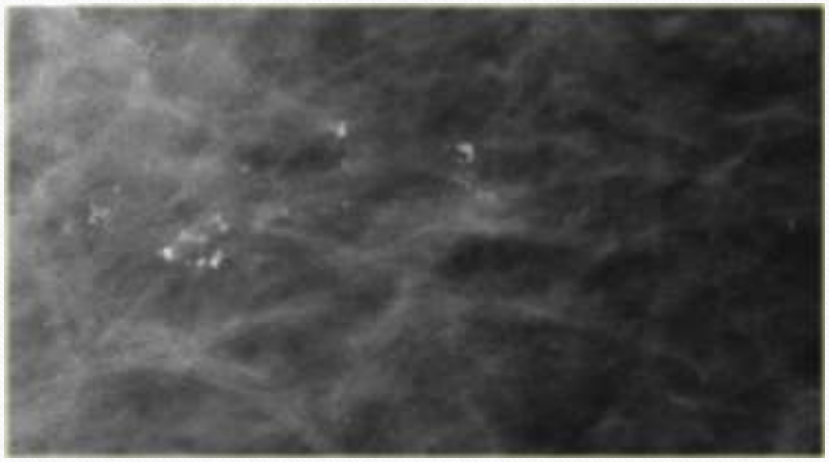


Milk of calcium(BR2)

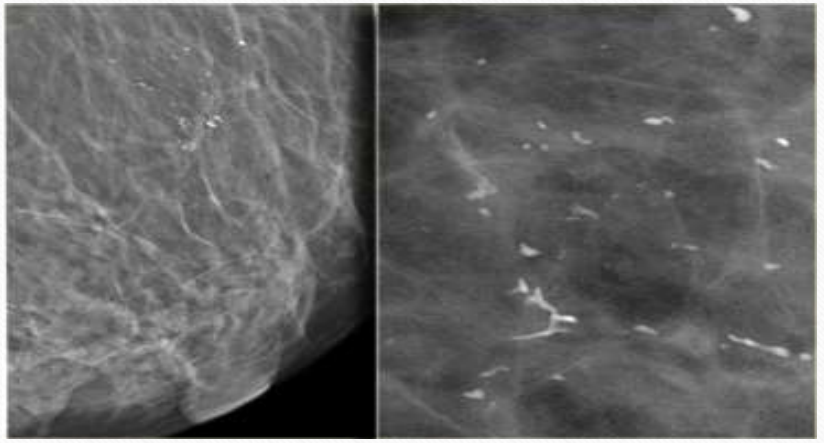


Suspicious calcifications

Amorphous(BR4)

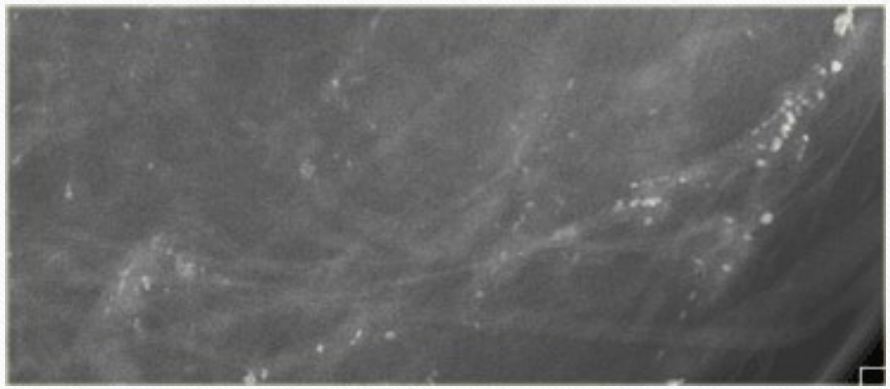


Coarse heterogenous(BR4)

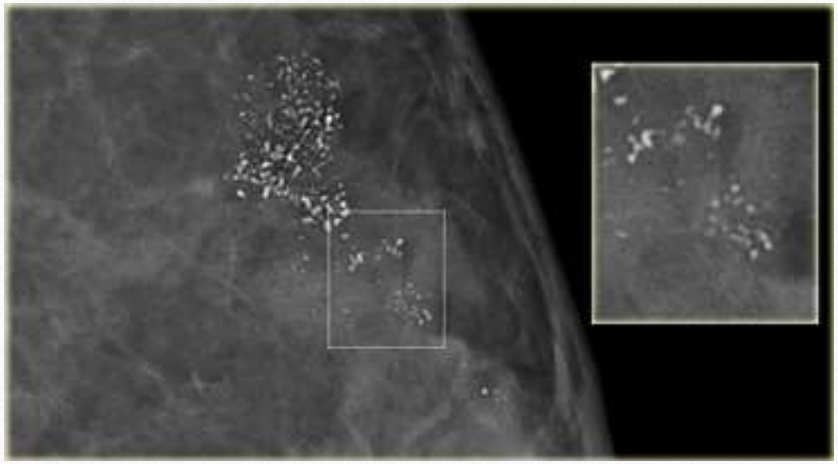


High risk calcifications

Fine pleomorphic(BR5)



Fine linear branching(casting)(BR5)



MRI

Indications of MRI

- High risk persons
- Extent of disease (EOD)evaluation in ipsilateral or contralateral side
- Positive magin
- Neo-adjuvant therapy:for residual tumor
- **In work up of metastatic axillary lymph nodes with unknown origin(70-80% sensivity**)
- R/O of chest wall invasion.

Breast MRI

Focus and foci < 5mm - cannot be specified

Masses

Shape *round - oval - lobulated - irregular (32% ca)*

Margin *smooth - irregular - spiculated (80% ca)*

T1 ⬆ *lymphnode - fat necrosis - hamartoma*

T2 fatsat ⬆ *cyst - lymphnode - fibroadenoma fat necrosis - colloid carcinoma*

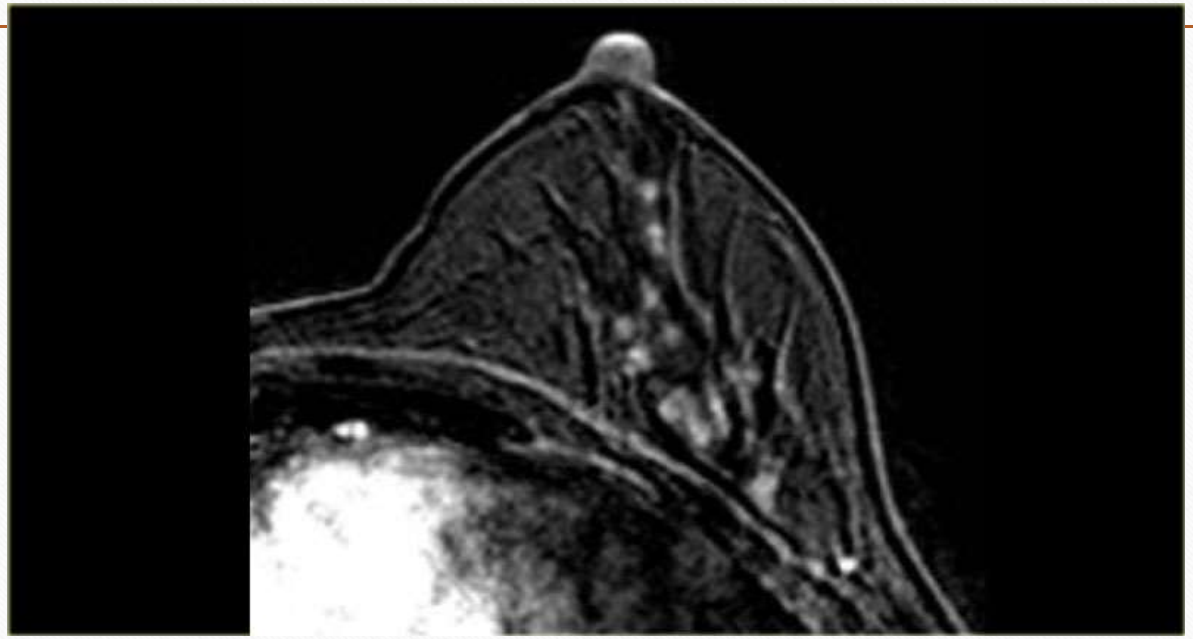
Enhancement *homogeneous - rim - septa etc.*

Kinetics *type I (6% ca) - type II - type III (29-77% ca)*

Nonmass-like enhancement

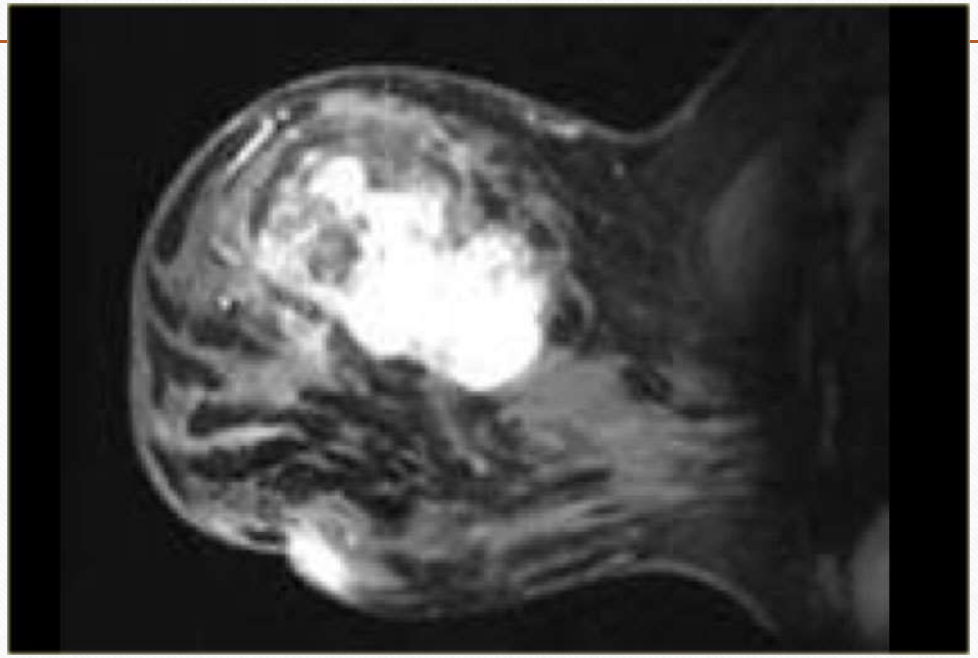
Linear - ductal - segmental - clumped etc

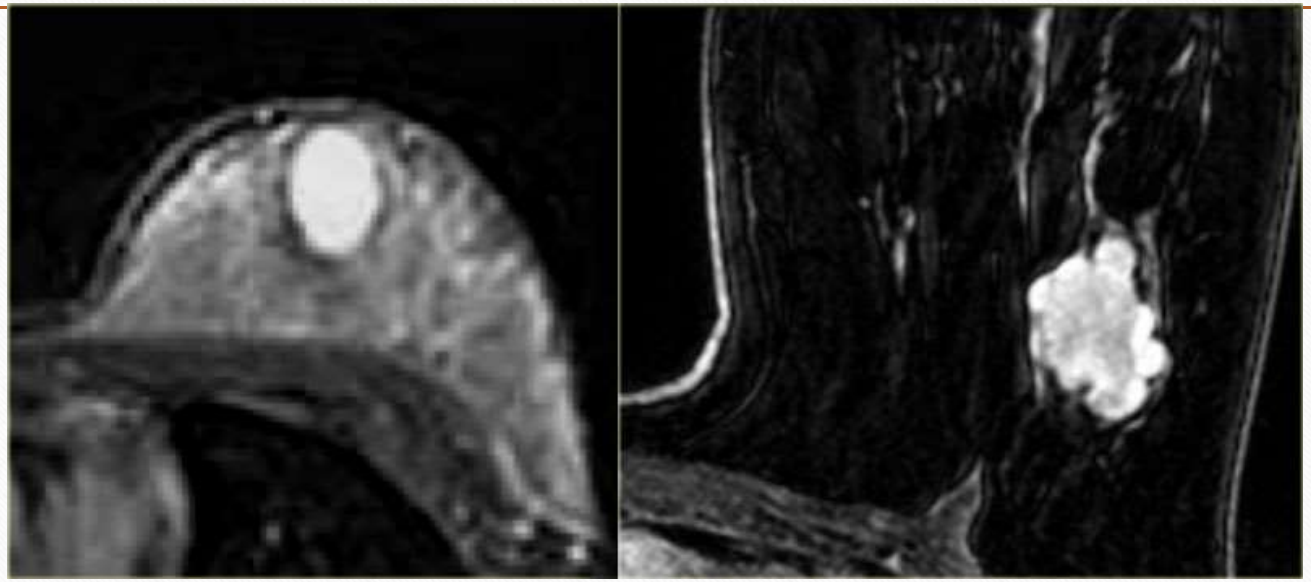
FOCI



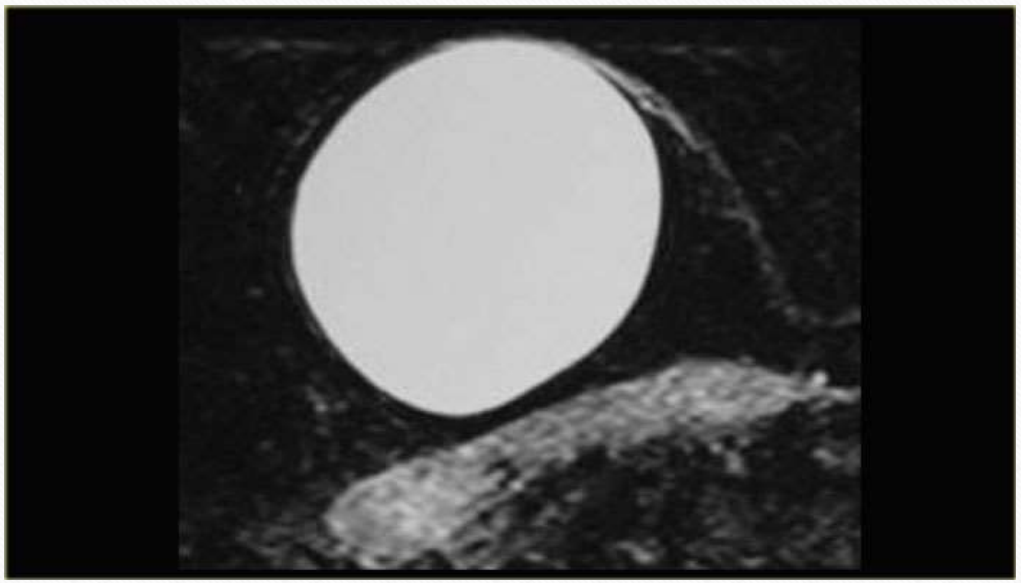
MASSES

shape(Round,oval ,lobulated ,irregular)

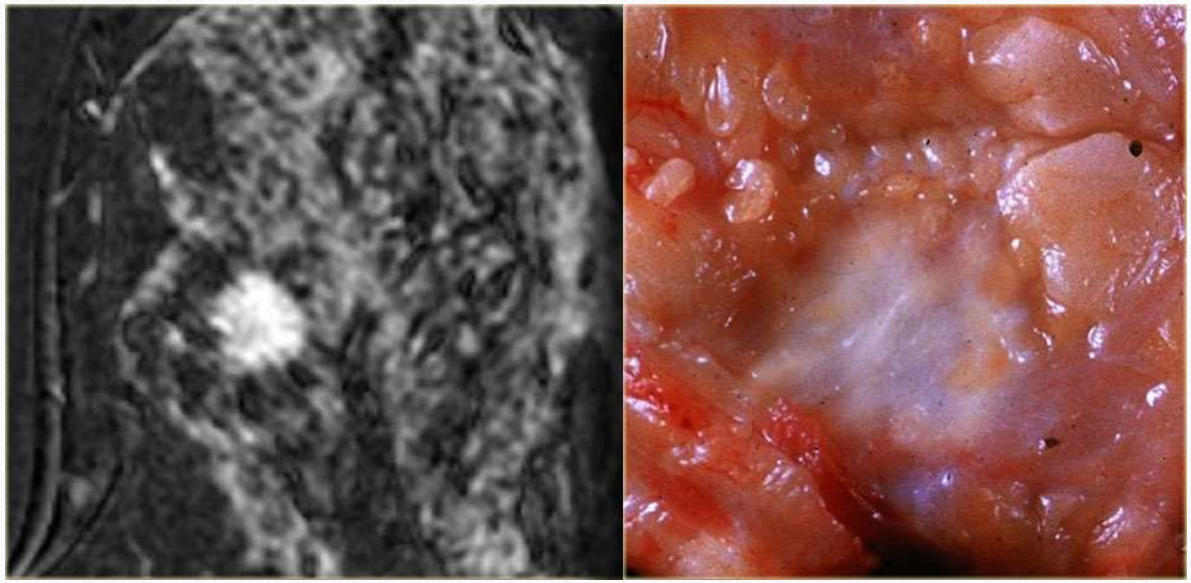


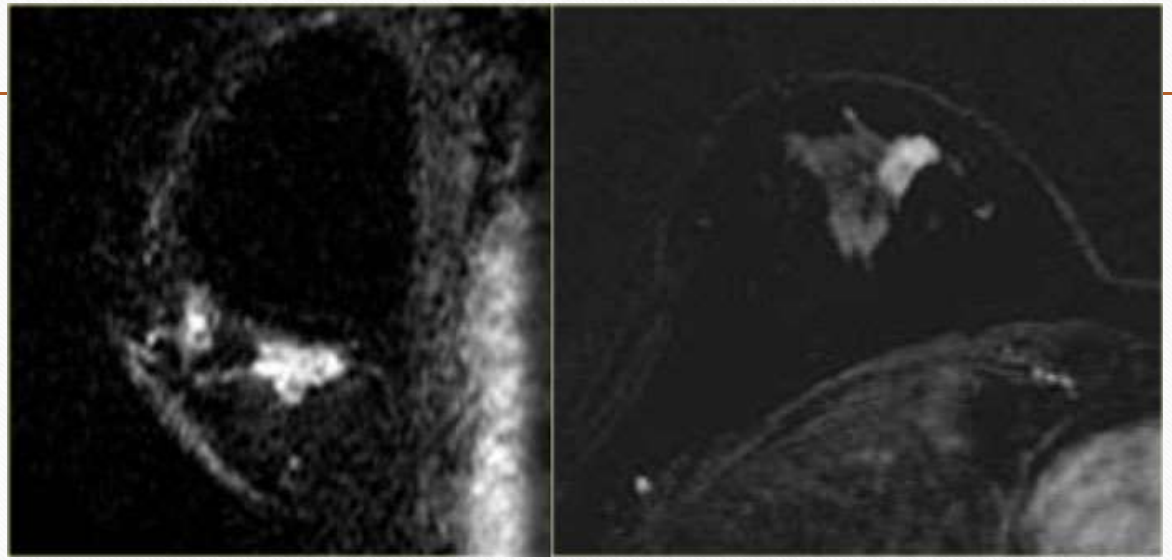


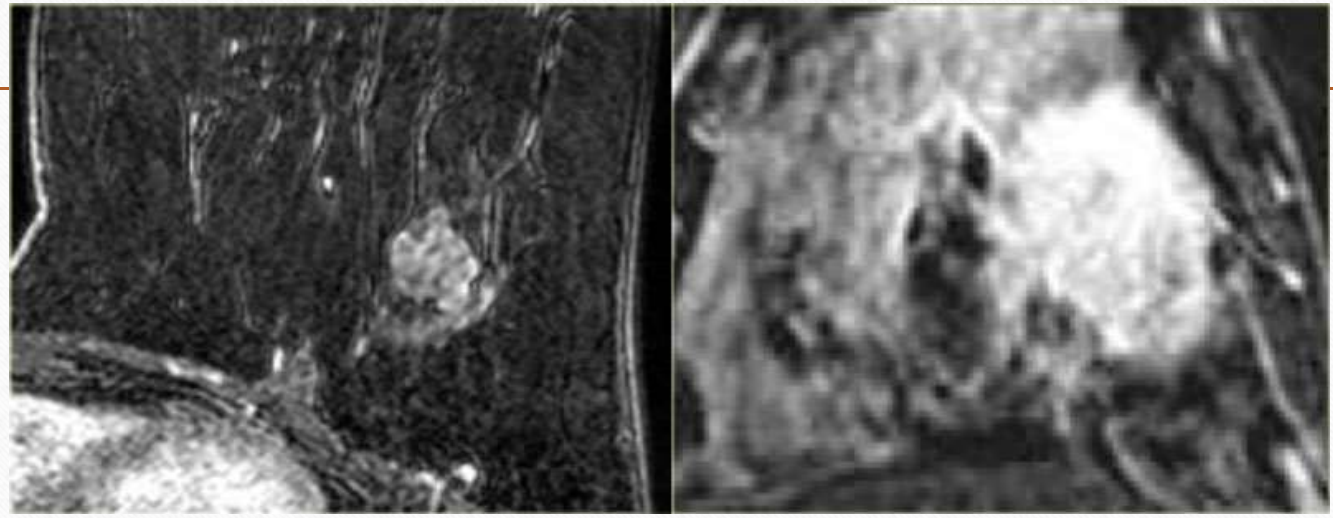
Margin(smooth,irregular,speculated)



Speculated margin mass

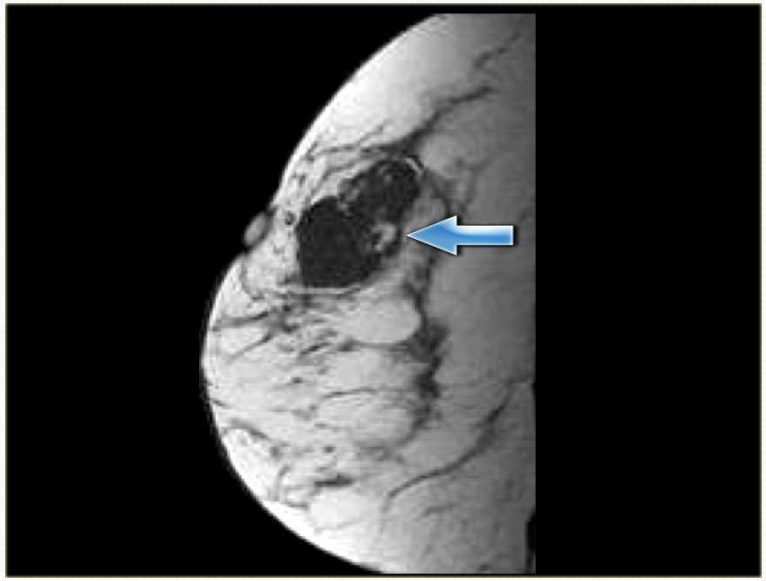






T1,T2 characterization

Fat containing lesions are mainly benign unless they are rapidly growing.

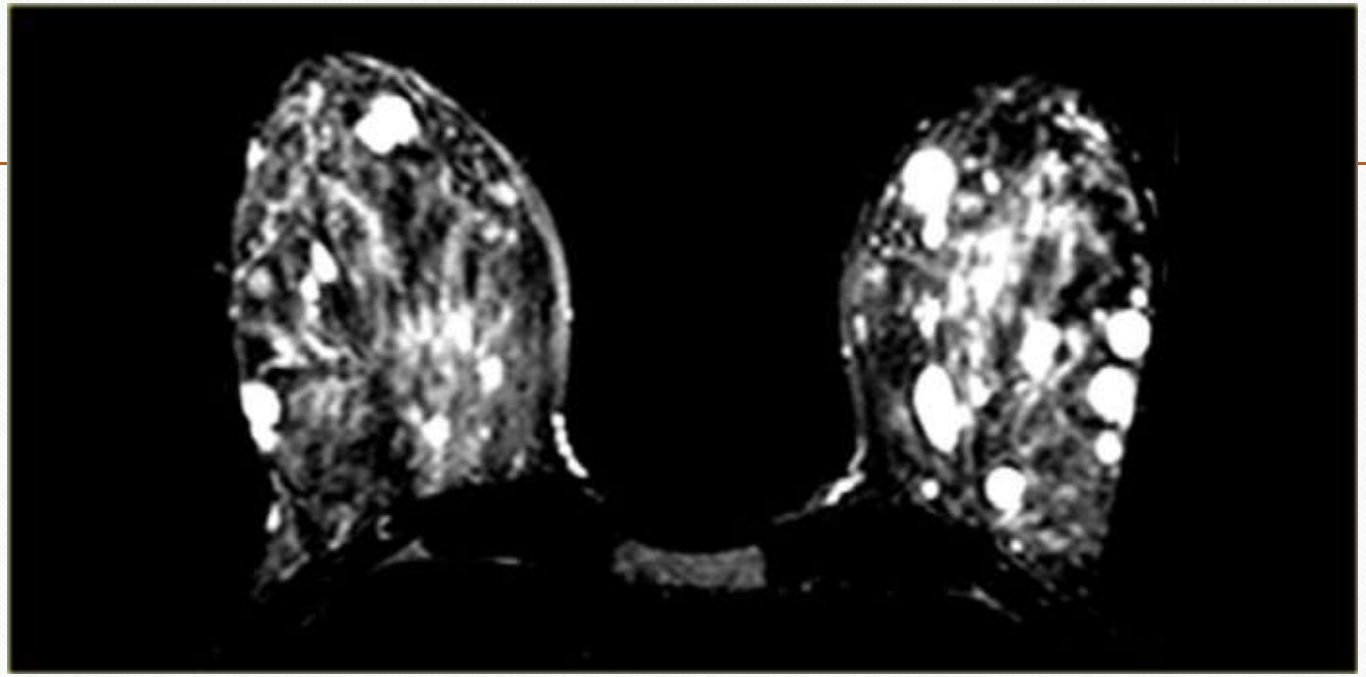


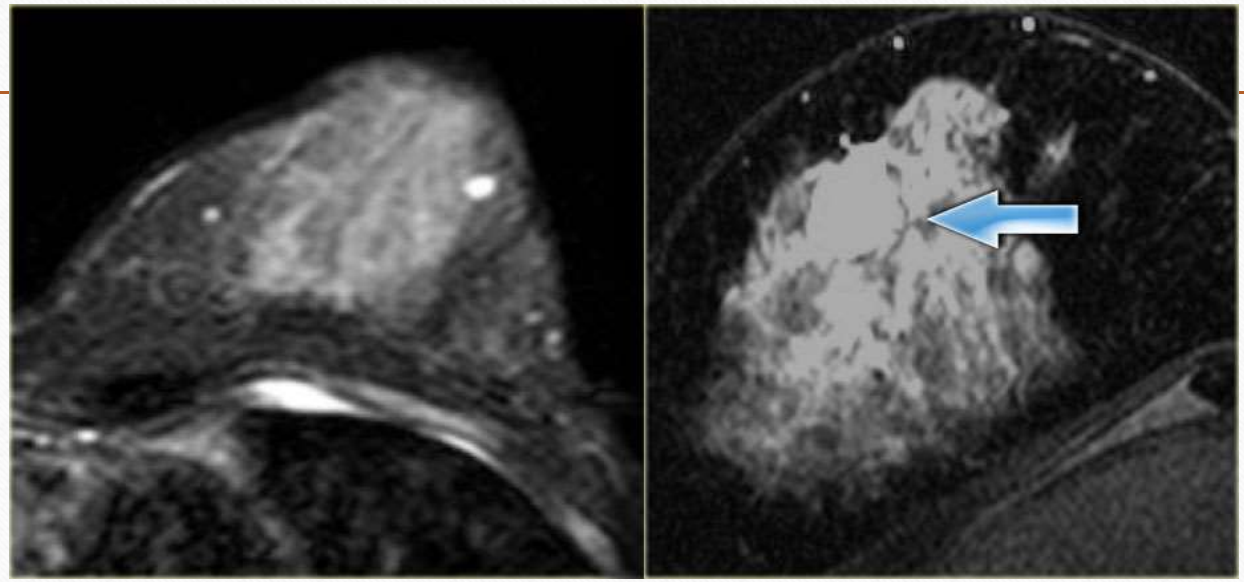
Increase T1 signal in non-fat suppressed images

- Fat containing lesions such as hamatomas
- Intramammary lymph nodes.

Marked increased T2 signal (bright)in fat suppressed images

- Cysts
- Fat necrosis
- Lymph nodes
- Colloid carcinoma.
- Maybe fibradenoma
- Rule: All of lesions which are hypersignal in T2 fat suppressed images are benign except of **colloid carcinoma**.





T2 Fat Suppressed

Moderate signal

- Invasive lobular ca
- DCIS
- Fibrocystic change

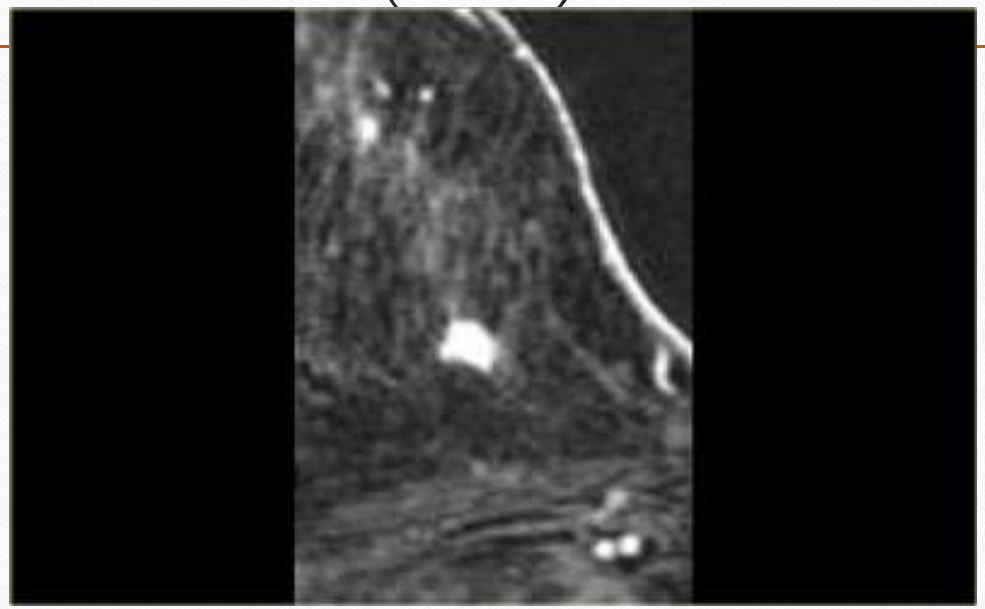
Low signal

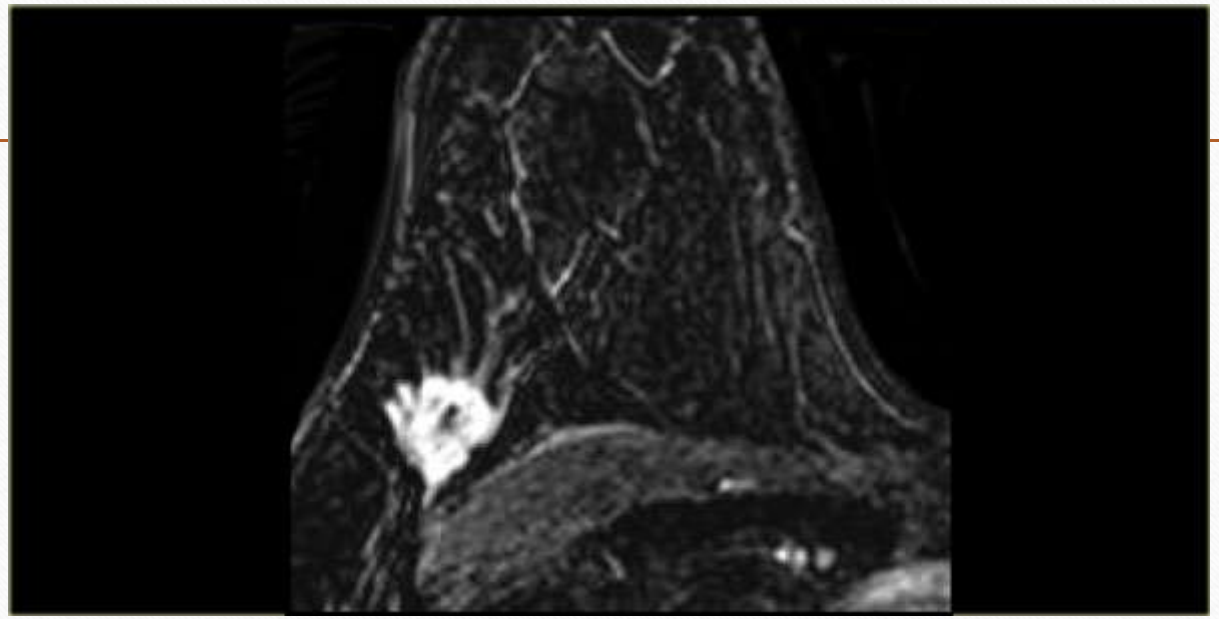
- Invasive ductal ca
- Sclerotic fibroadenoma
- Scar

Patterns of enhancement

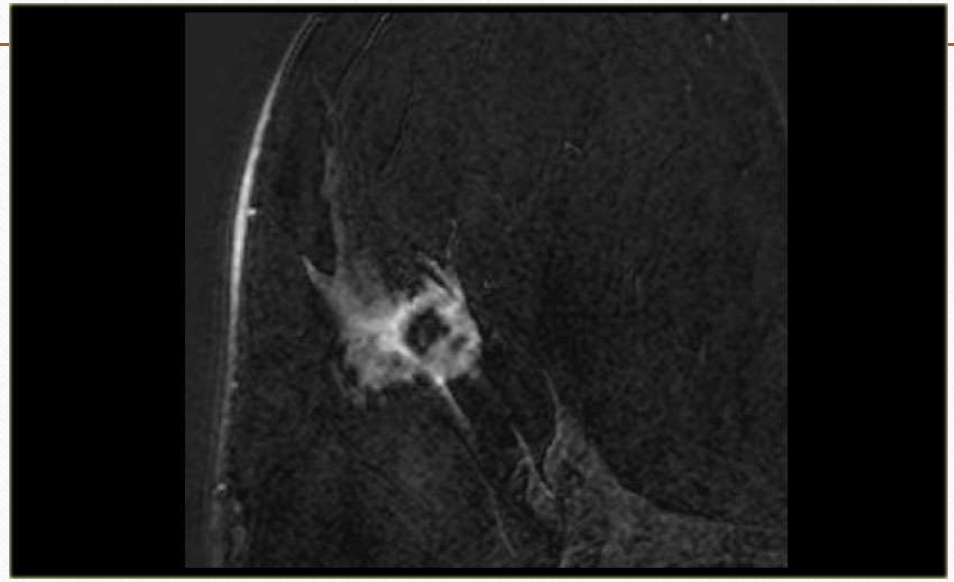
- 1-homogenous enhancement
- 2-Heterogenous enhancement
- 3-Rim enhancement
- 4-Dark internal septation
- 5-Enhancing internal septation
- 6-Central enhancement

Homogenous enhancement (IDC)

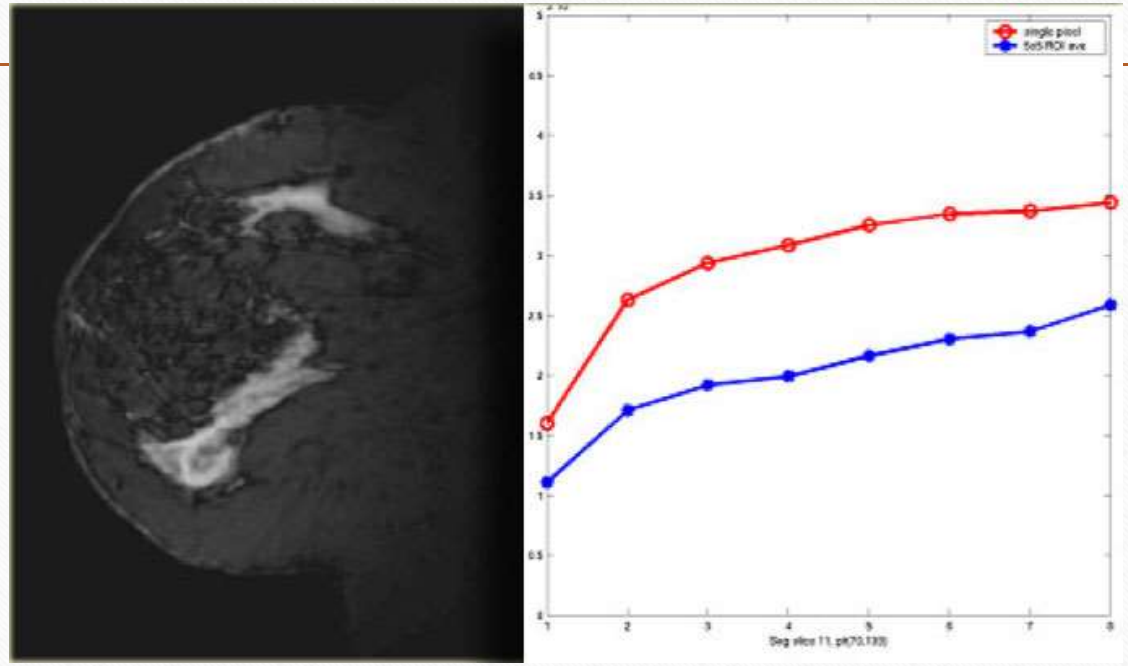




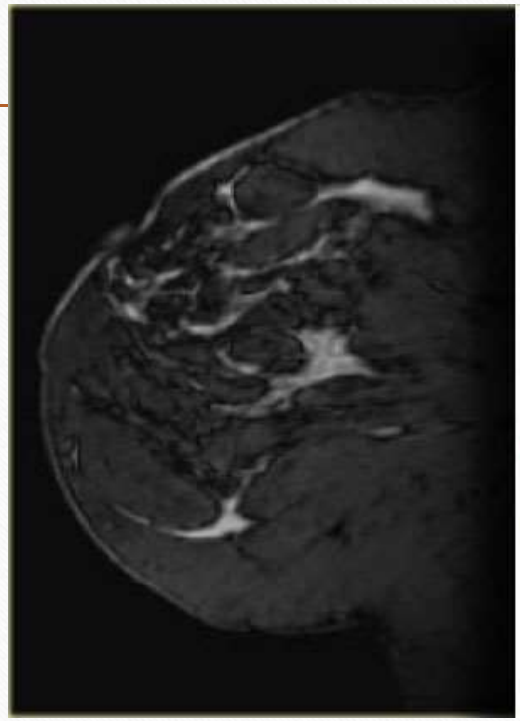
Rim enhancement

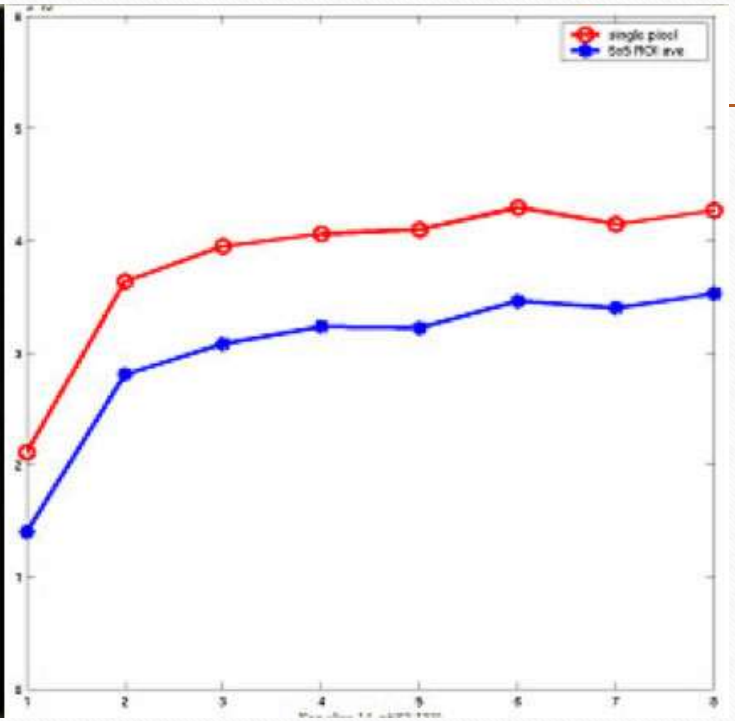


Enhancement curves type 1

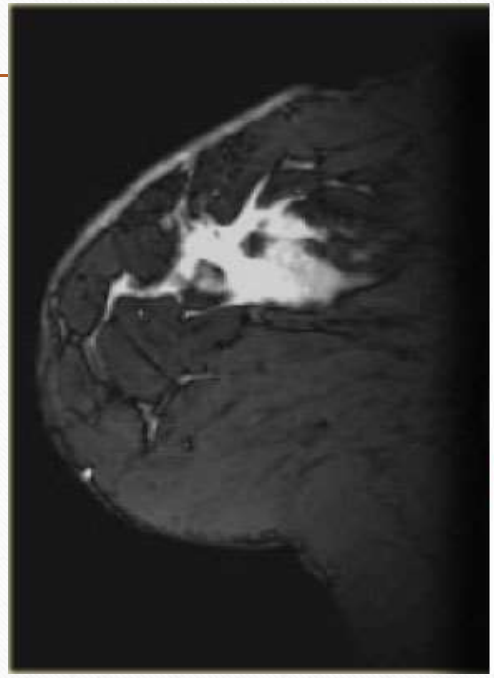


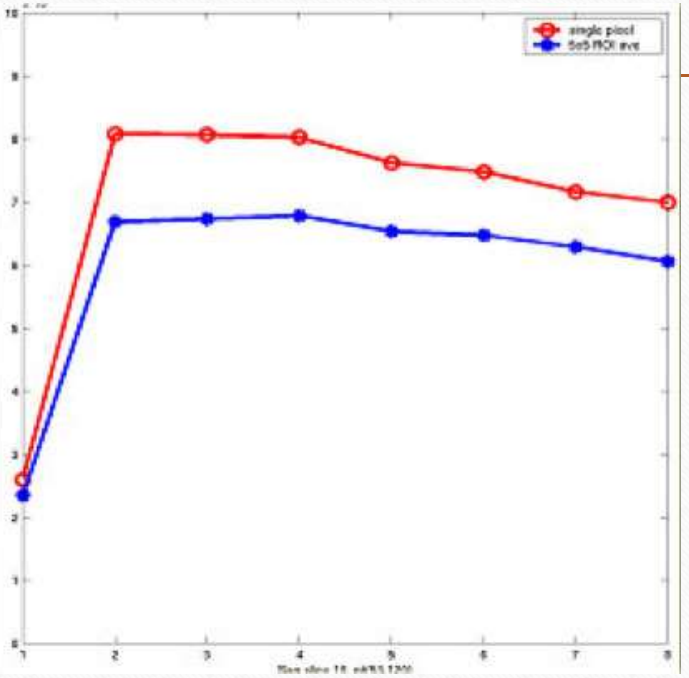
type2



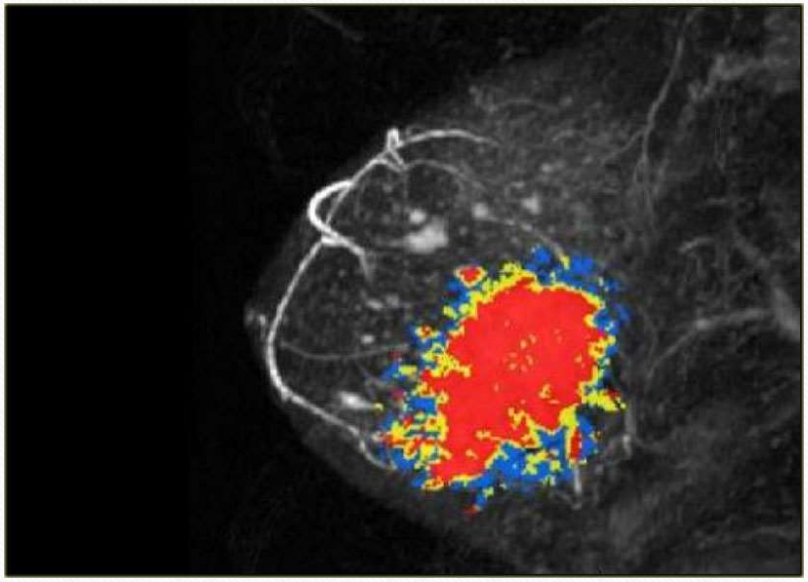


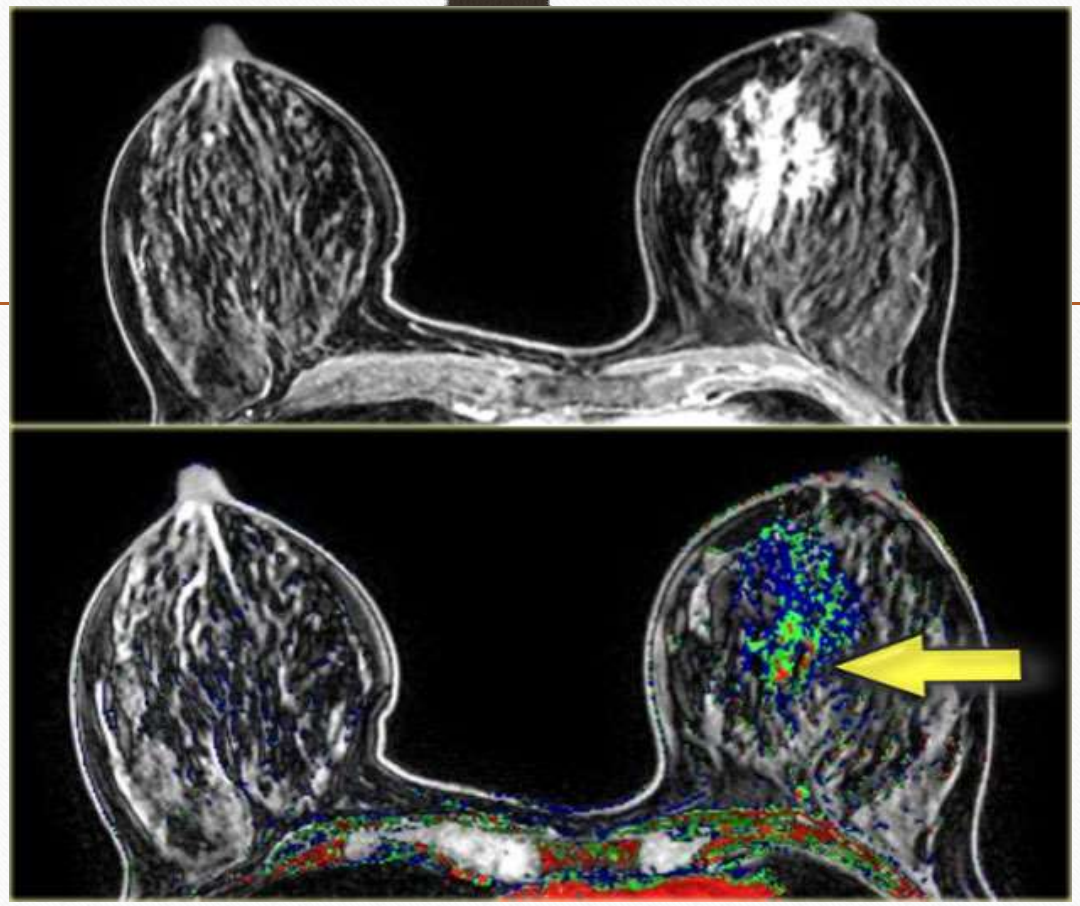
Type 3





CAD
(Computer Aided Detection)



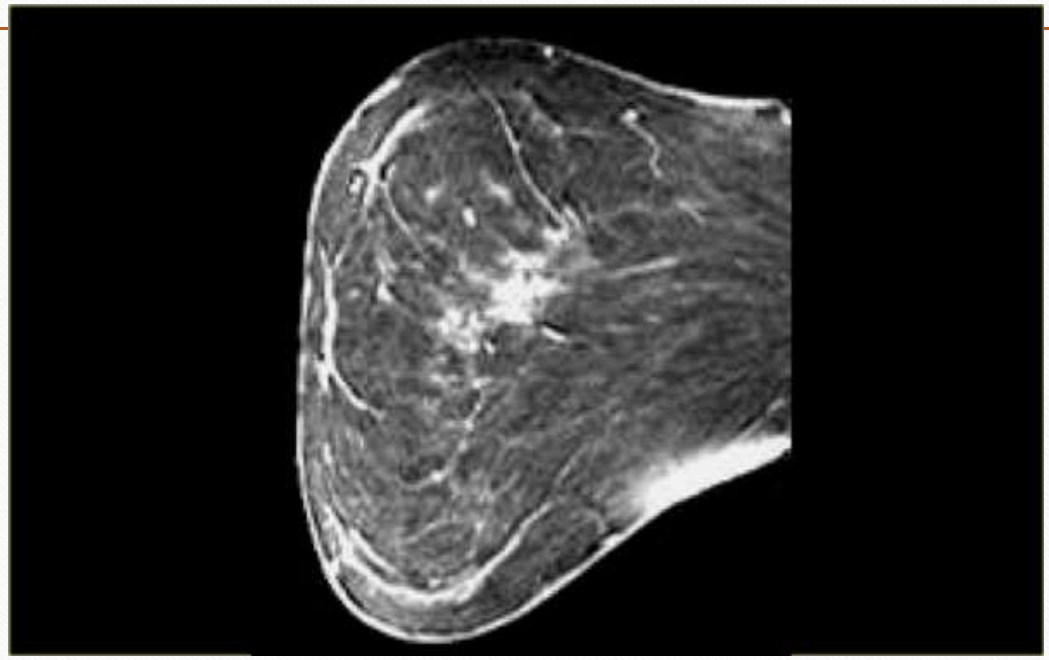


Non-mass enhancement

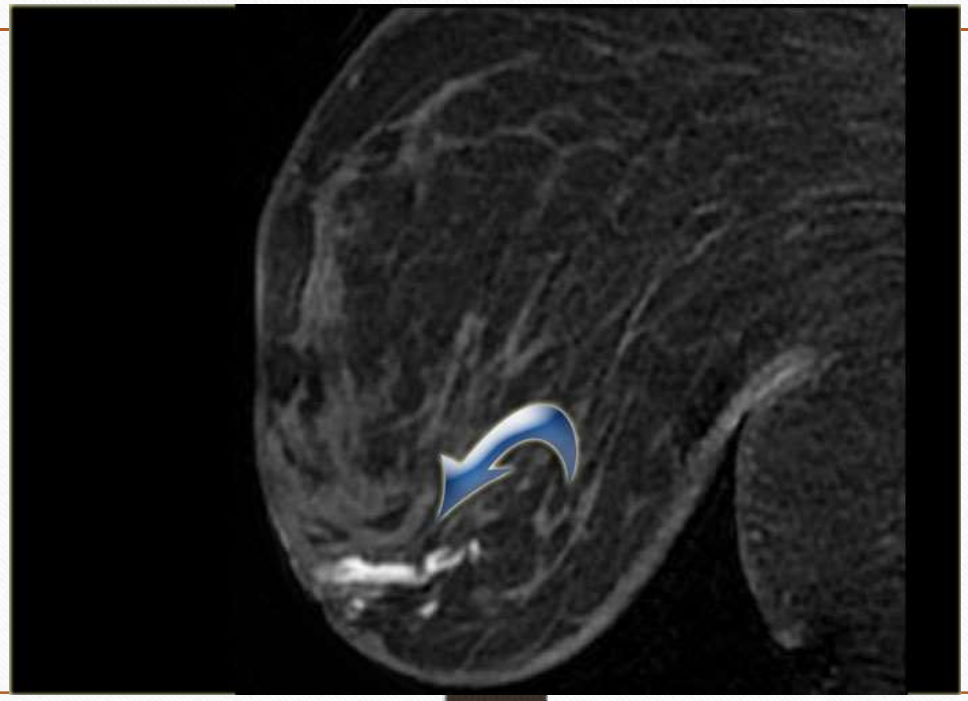
Distribution – Non-mass enhancement

Focal	< 25% of a quadrant
Ductal	– 60% cancer
Linear	– Not ductal orientation – 31% cancer
Segmental	– Multiple ducts – 78% cancer
Regional	– Not ductal or segmental – 21% cance
Diffuse	

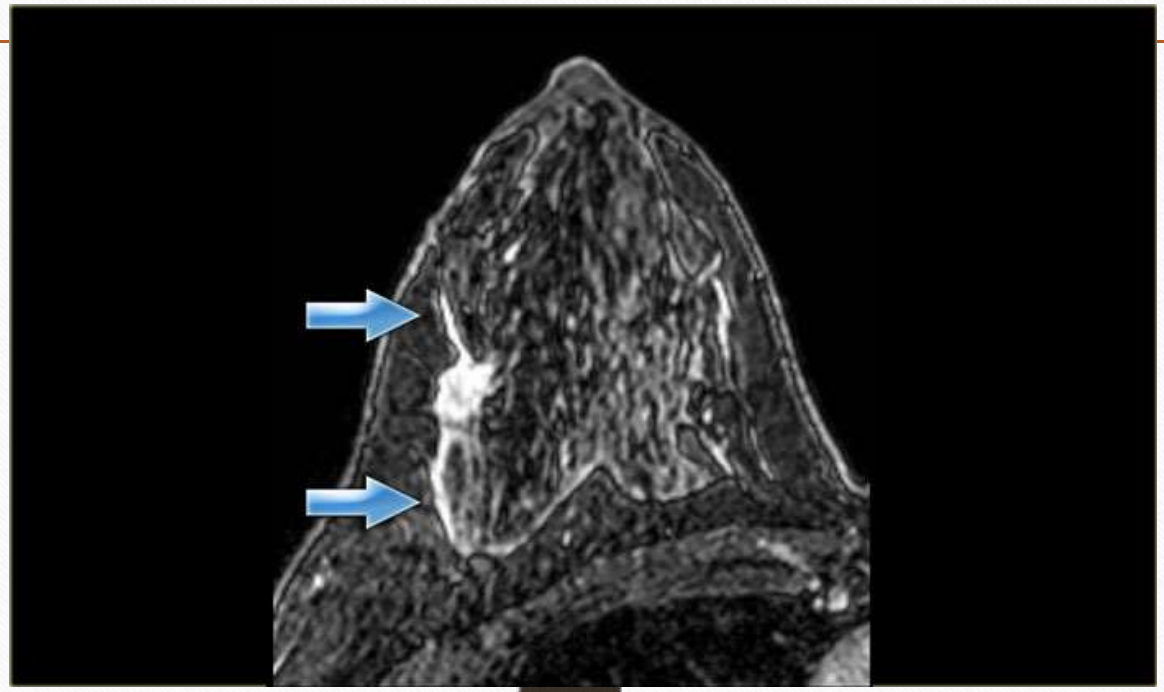
Focal non-mass enhancement(DCIS)



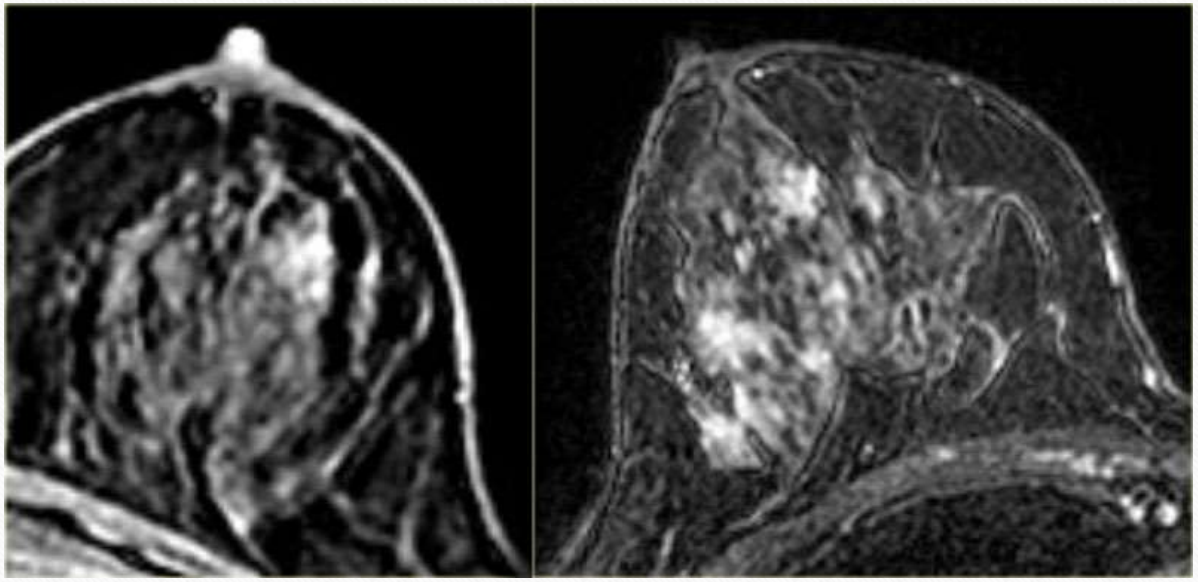
Linear enhancement(stromal fibrosis in this case)



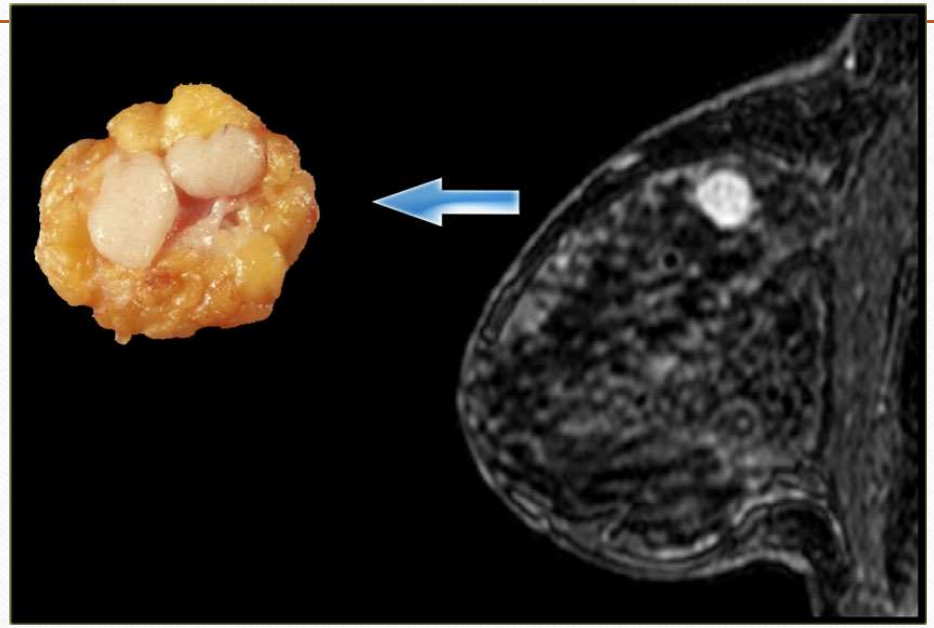
Mass with linear non-mass enhancement(DCIS with IDC)



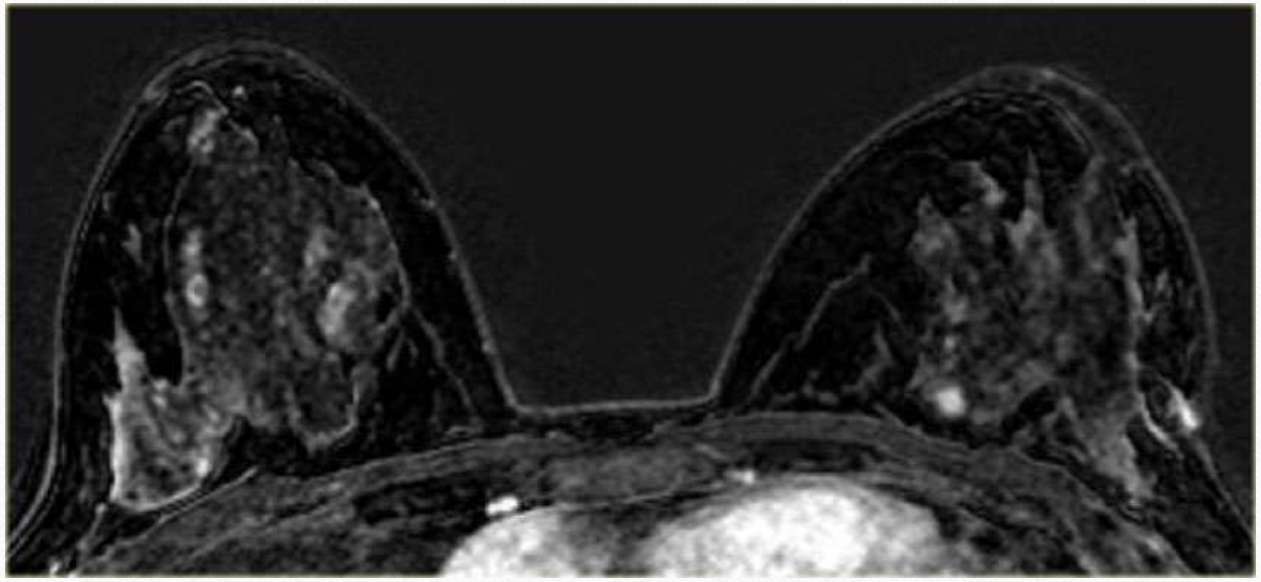
Clumped enhancement

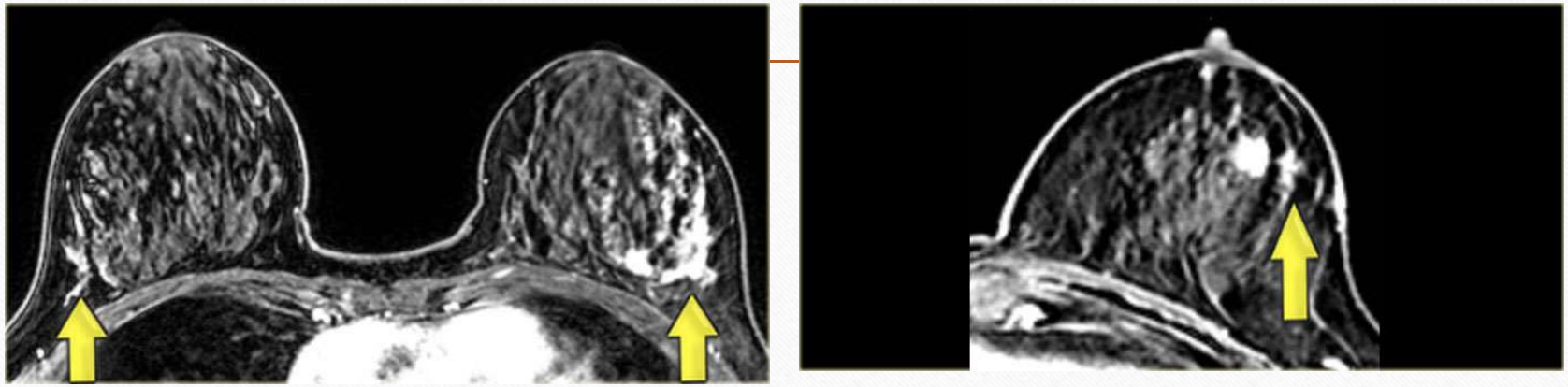


Fibradenoma:Benign morphology/non-enhancing internal septation/Curve type1

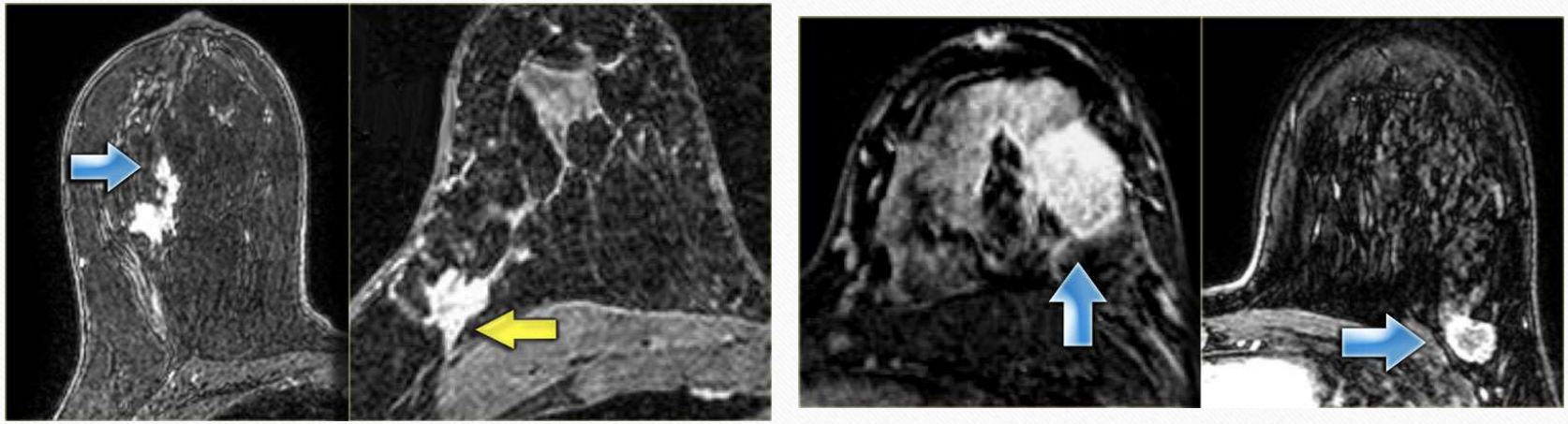


DCIS:commomnly presented with non-mass enhacement(mostly ductal,segmental and linear forms)





Invasive Ductal Carcinoma(IDC): usually presents as a mass lesion with malignant caractristics



Thanks for your attention