Diagnosi e Dose - sintesi di un compromesso

Il punto di vista del Radiologo

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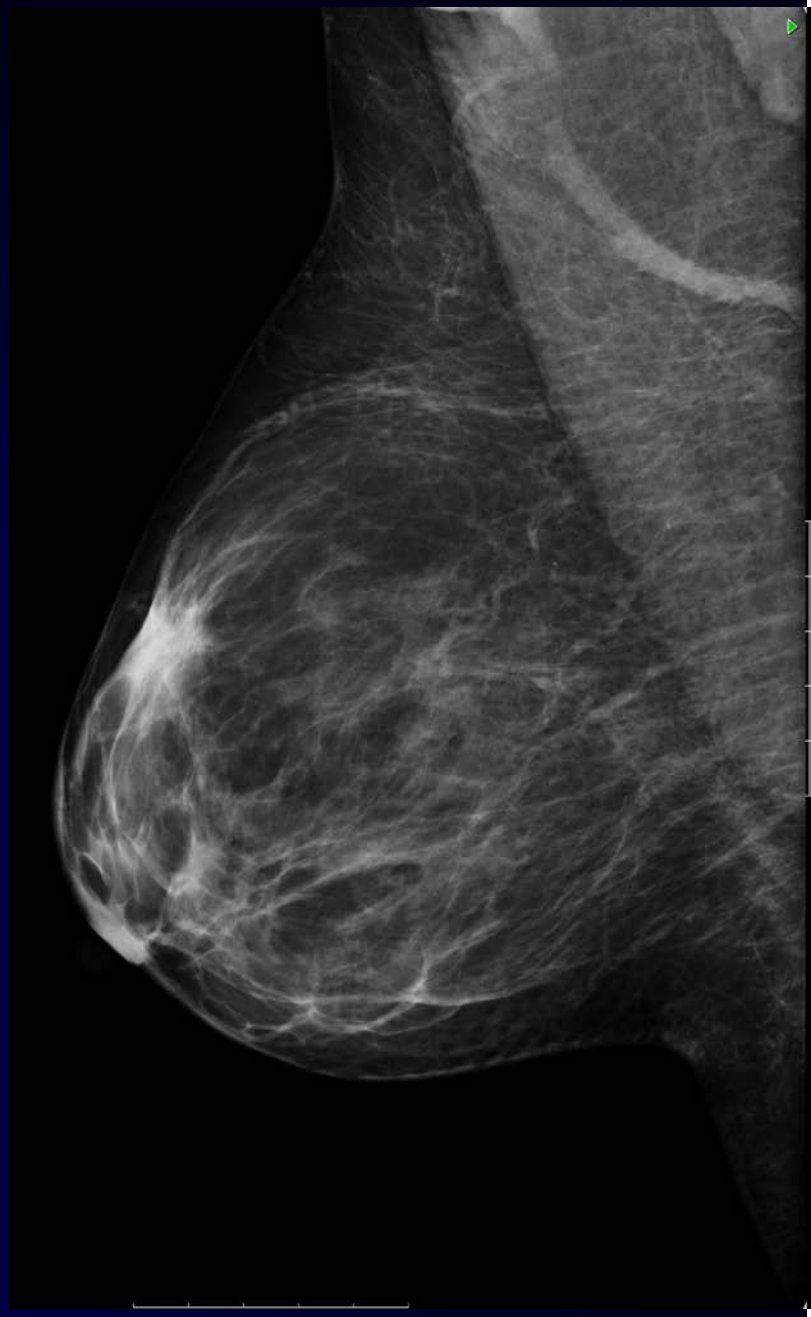
GISMa - corso TSRM - Torino 2013

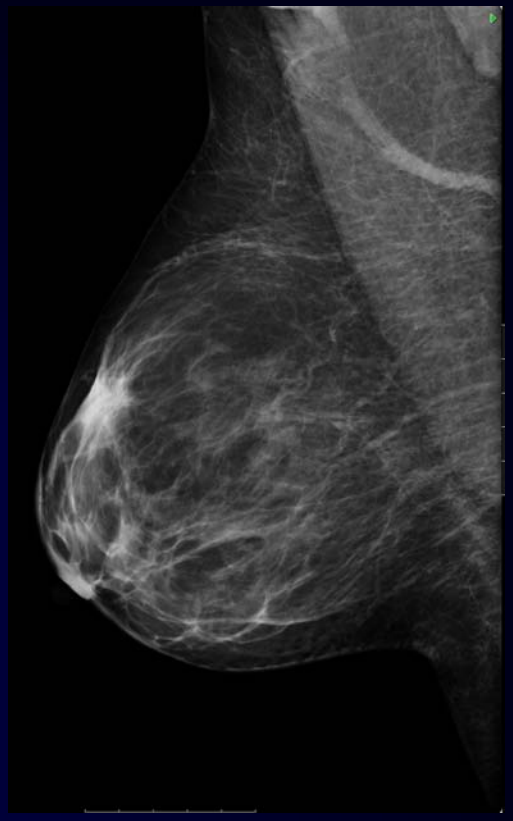
Qualita' dell' immagine

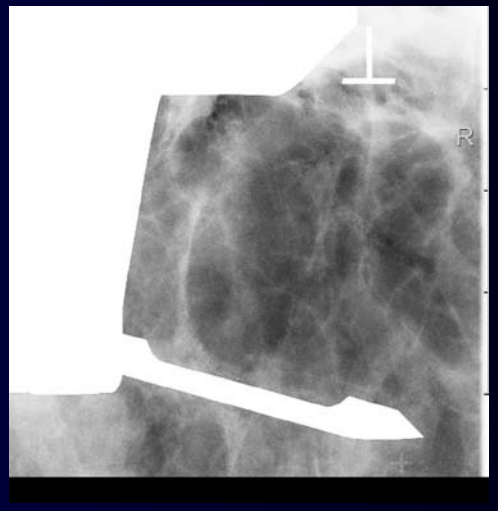
- Al radiologo spetta la valutazione dell'adeguatezza ai fini diagnostici
- Dipende dalla dose e da molteplici altri fattori



Compromessi?

- I livello: non sono ammissibili compromessi a scapito della qualita' dell'immagine e della sua possibilita' di identificare anomalie
- II livello: non sono ammissibili compromessi a scapito della possibilita' di tipizzazione dell'anomalia rilevata al I livello

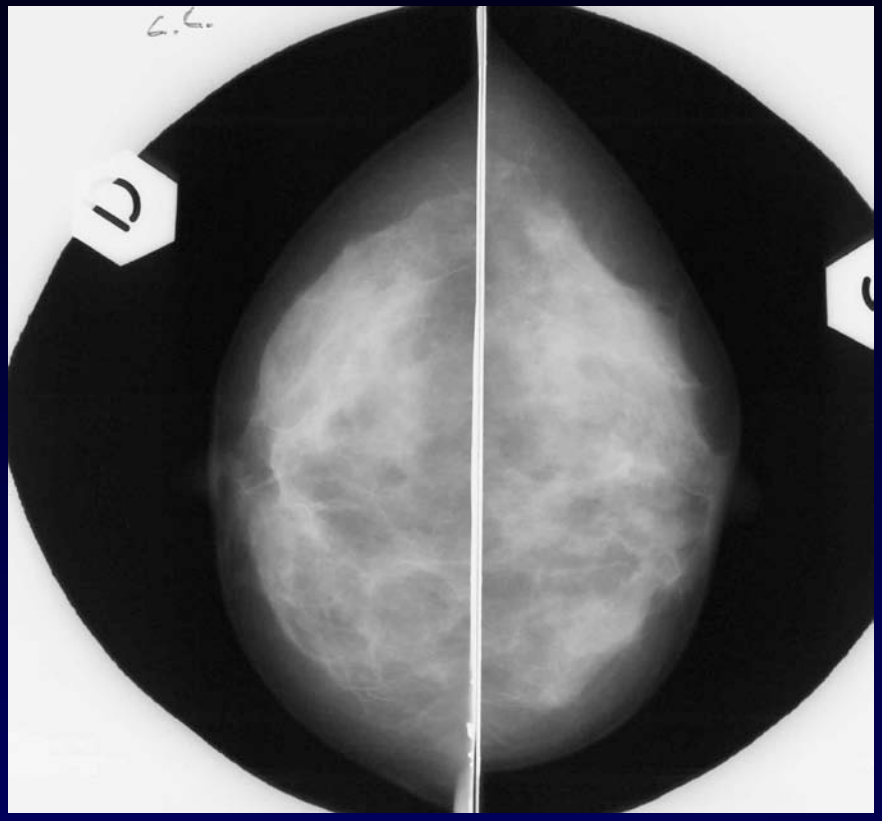


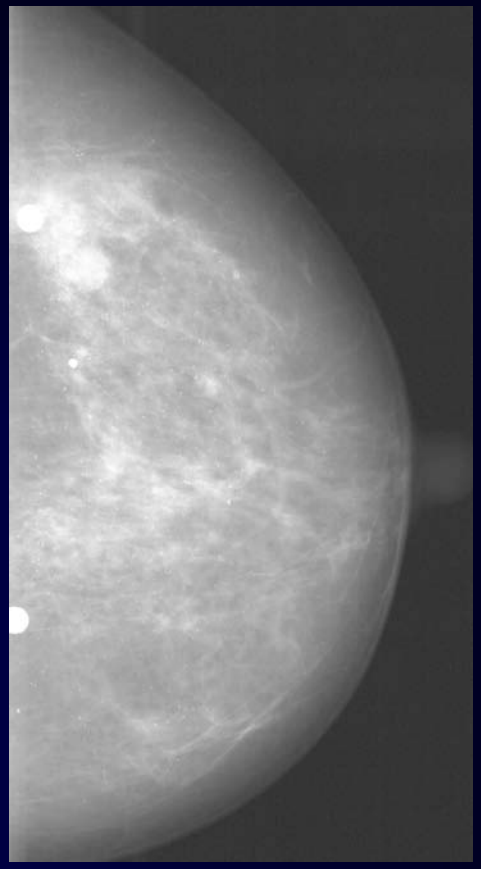


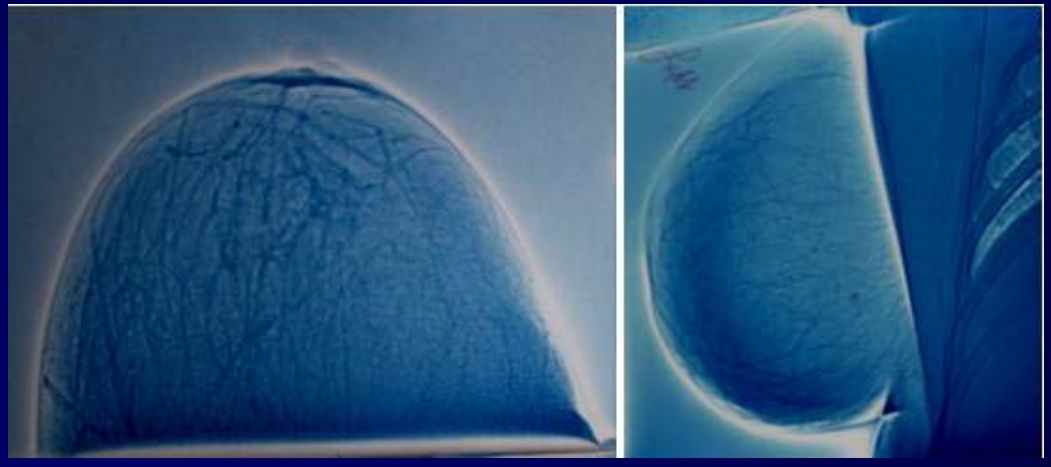
I livello: possibili "compromessi"

- TSRM: Grado di compressione della mammella
- Sistema utilizzato (SF - CR - DR)
- Case produttrici
- Gusti Personali
- Possibilita' di modifica (Interazione Radiologo - Casa Produttrice - Fisico Sanitario)

Storia della Mammografia: le prime immagini (1960-1980)

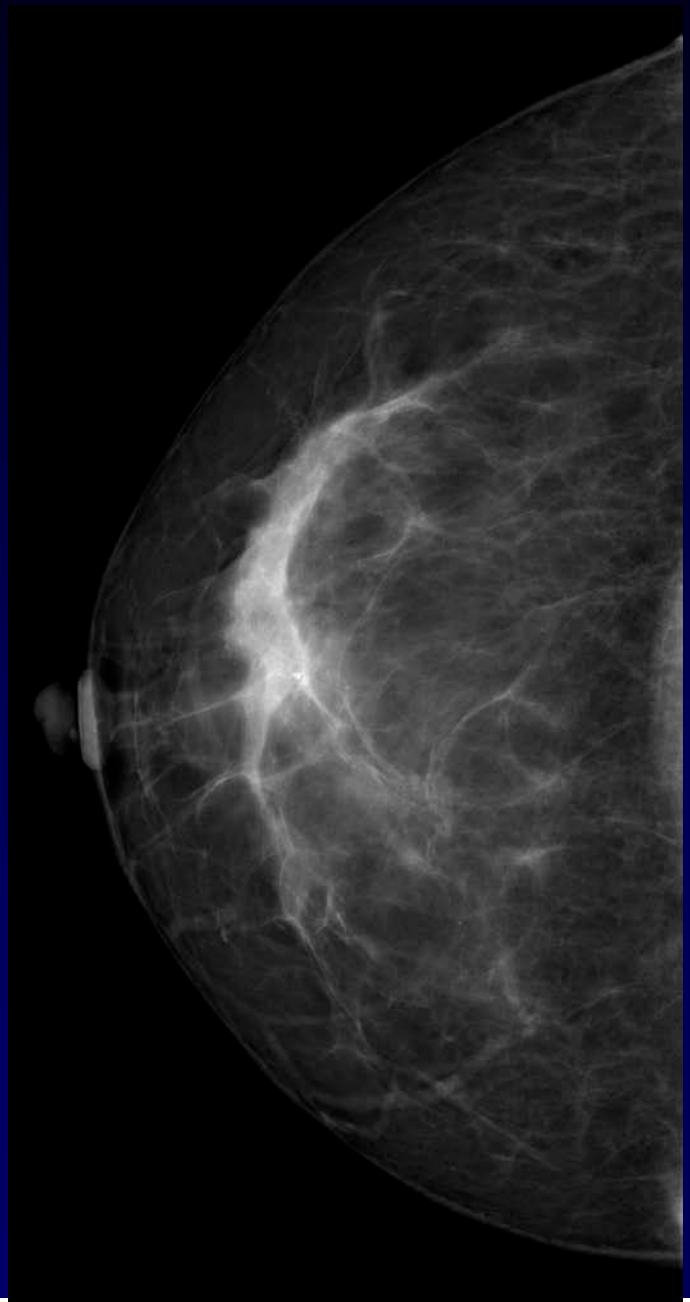


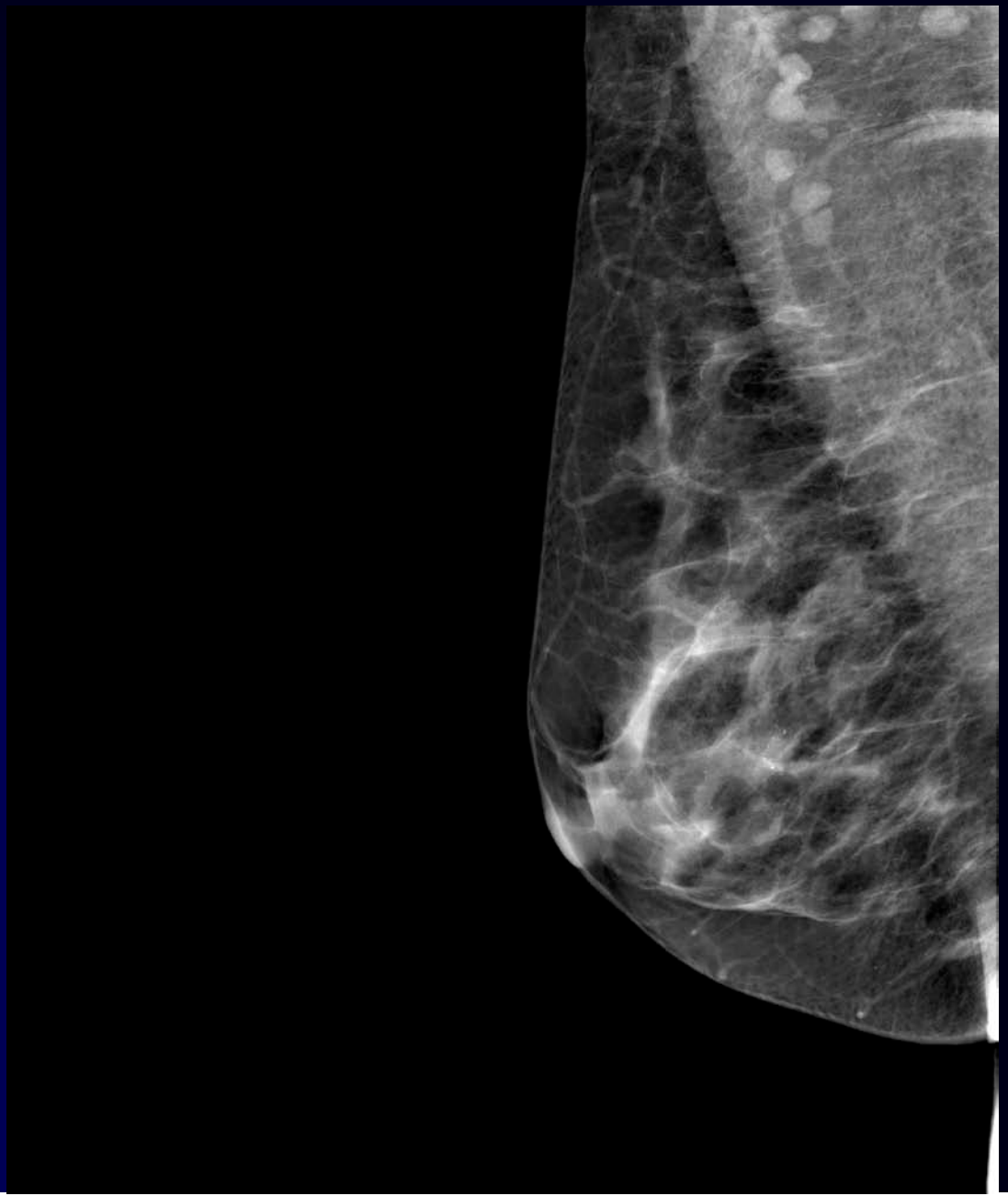


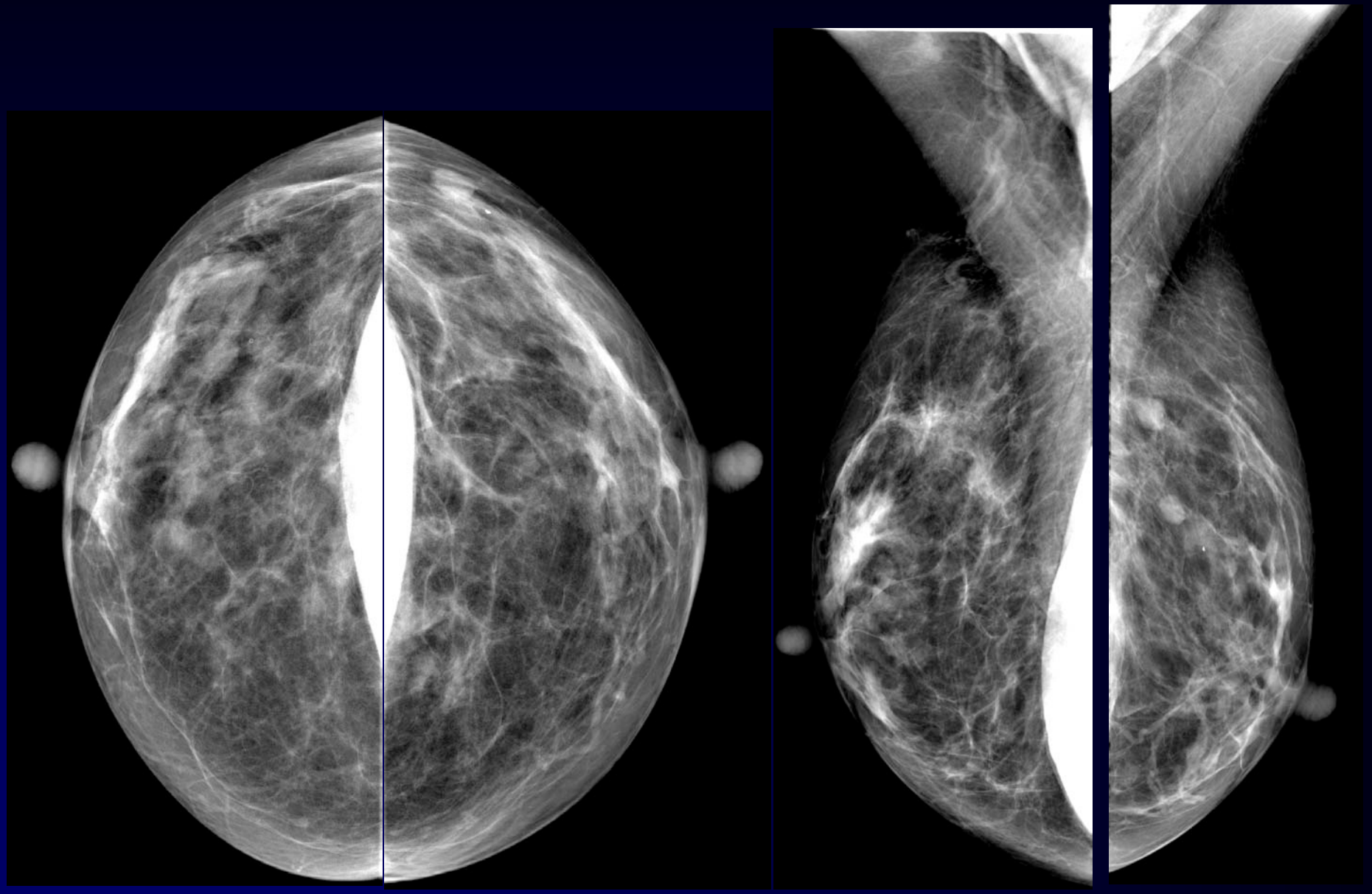


Storia della Mammografia: l’immagine analogica ad alto contrasto (dopo il 1985-1990)

Storia della Mammografia: l’immagine digitale (1999-oggi)








FL


FL

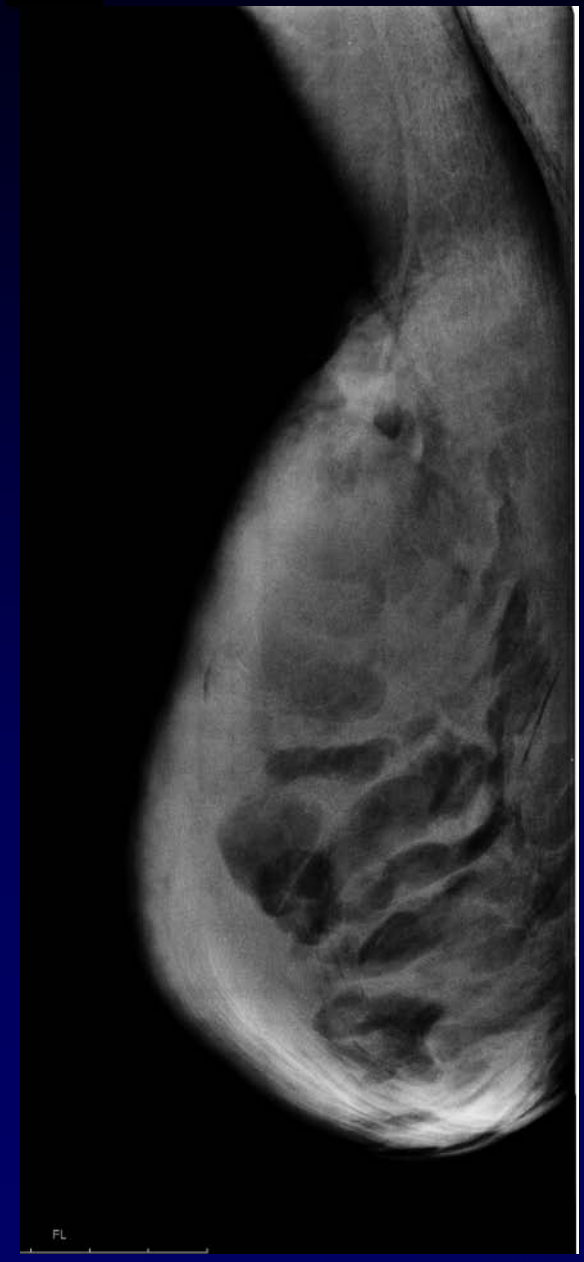
I livello: SF vs. CR

- Il passaggio dall'analogico alla CR corredata da adeguati apparati di gestione delle immagini (workstation, PACS, etc) puo' costituire una vantaggiosa fase di transizione per cominciare ad ottenere i vantaggi del digitale utilizzando mammografi analogici adattati, in attesa di apparecchiature digitali nuove.
- No vantaggi ne' svantaggi in termini di dose o potere diagnostico dell'immagine.

I livello in digitale: CR vs. DR

- Dose maggiore
- - dinamica
- + artefatti
- + possibilita' esposizione non corretta
- Utilizzo cassetta

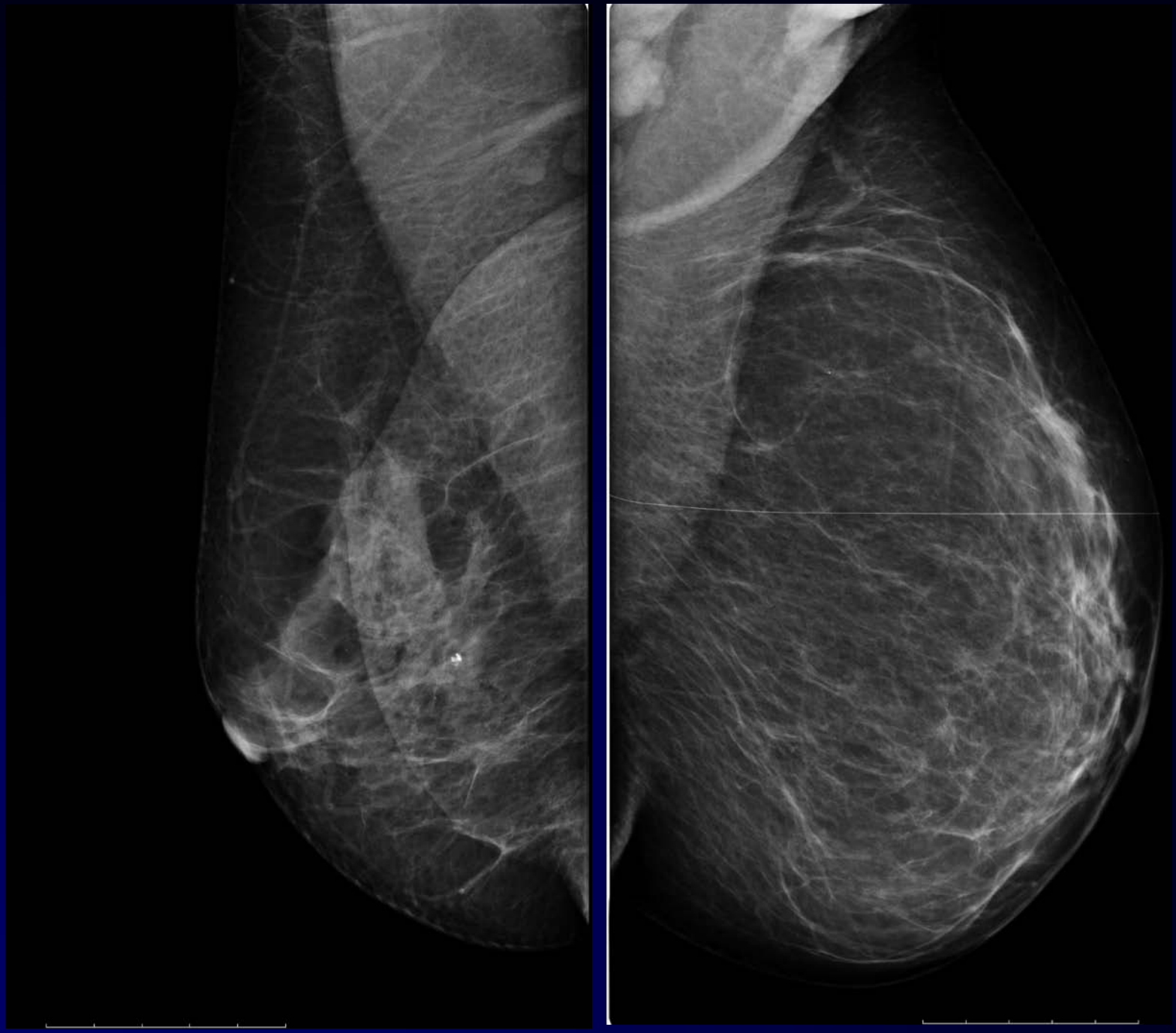
- Dose minore
- + dinamica
- Possibilita' implementazione nuove tecnologie (tomo, CESM, etc.)
- Qualita'


FL


C: 2047,0, W: 4096,0
C=2047,0, W=4096,0 1/2
RCC

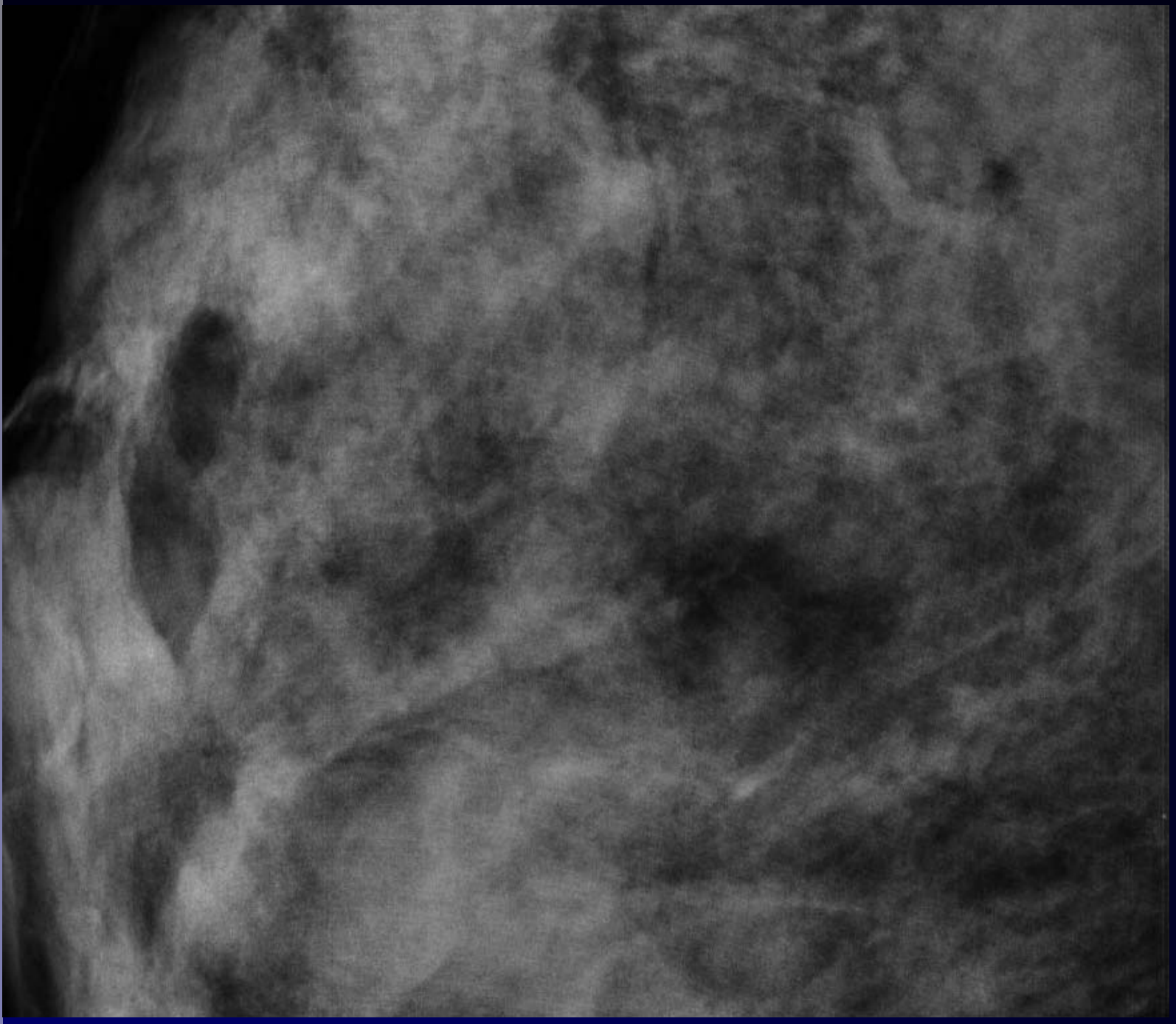

C: 2047,0, W: 4096,0
C=2047,0, W=4096,0 1/2
LCC

+ - --



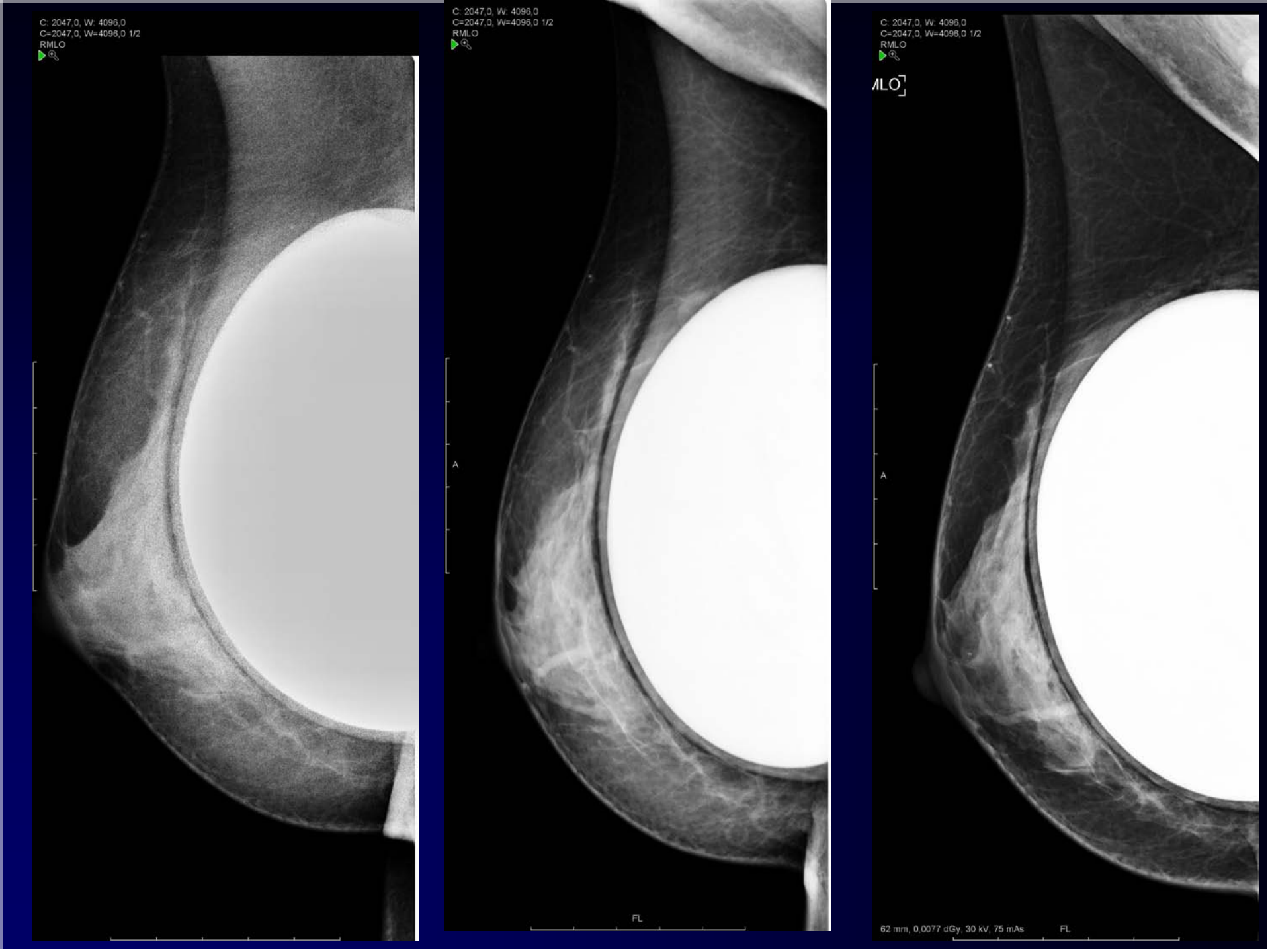
Artefatti

CR



Artefatti

CR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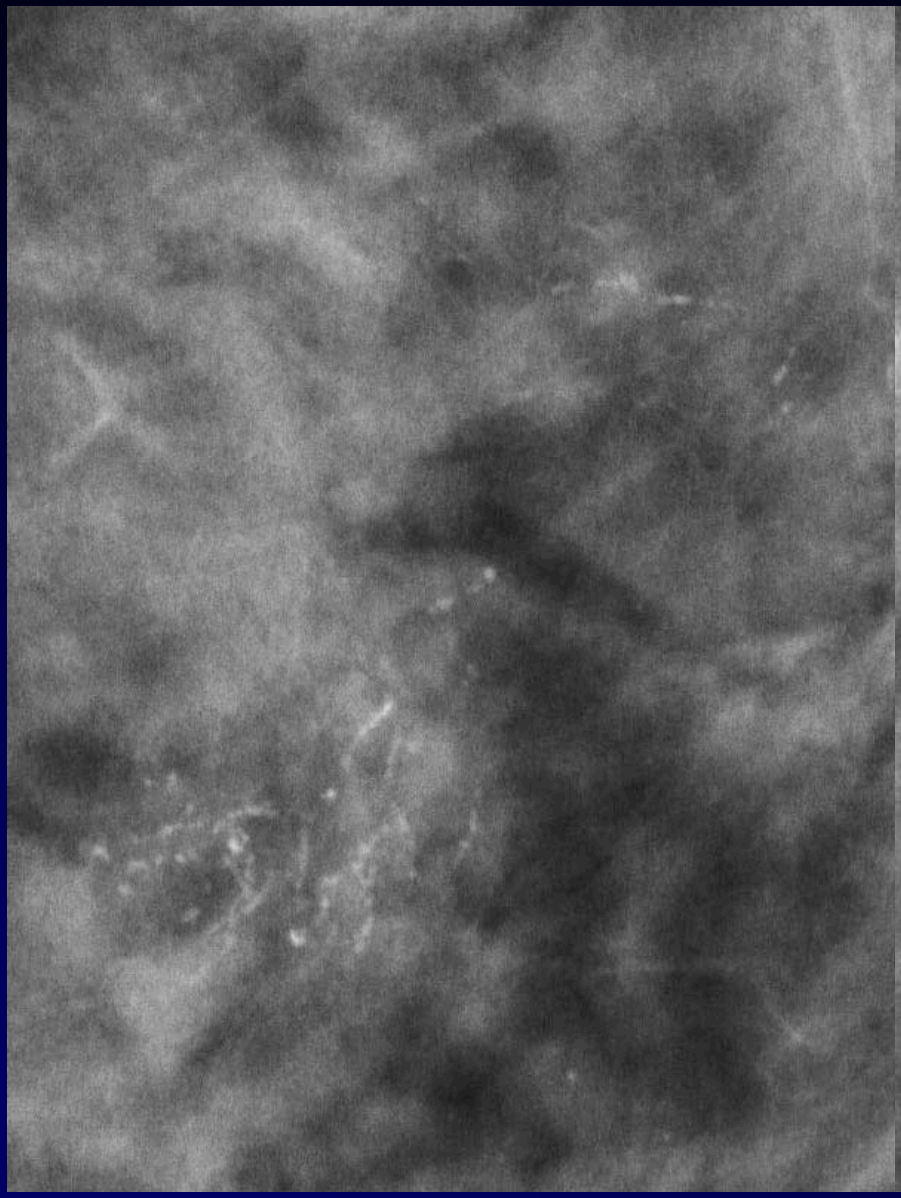
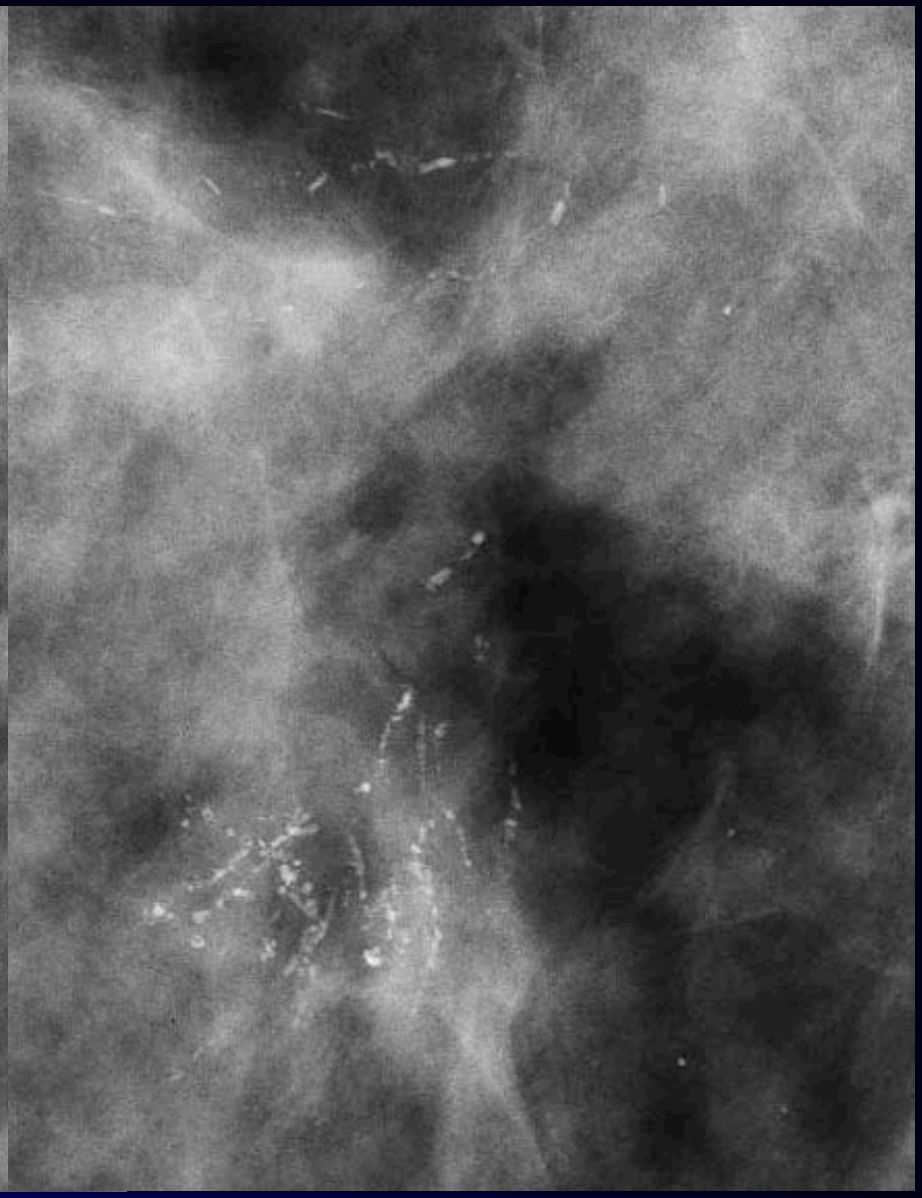
C=2047,0, W=4096,0 1/2
RMLO
C: 2047,0, W: 4096,0
C=2047,0, W=4096,0 1/2
RMLO
A
FL
C: 2047,0, W: 4096,0
C=2047,0, W=4096,0 1/2
RMLO
A
62 mm, 0,0077 dGy, 30 kV, 75 mAs
FL

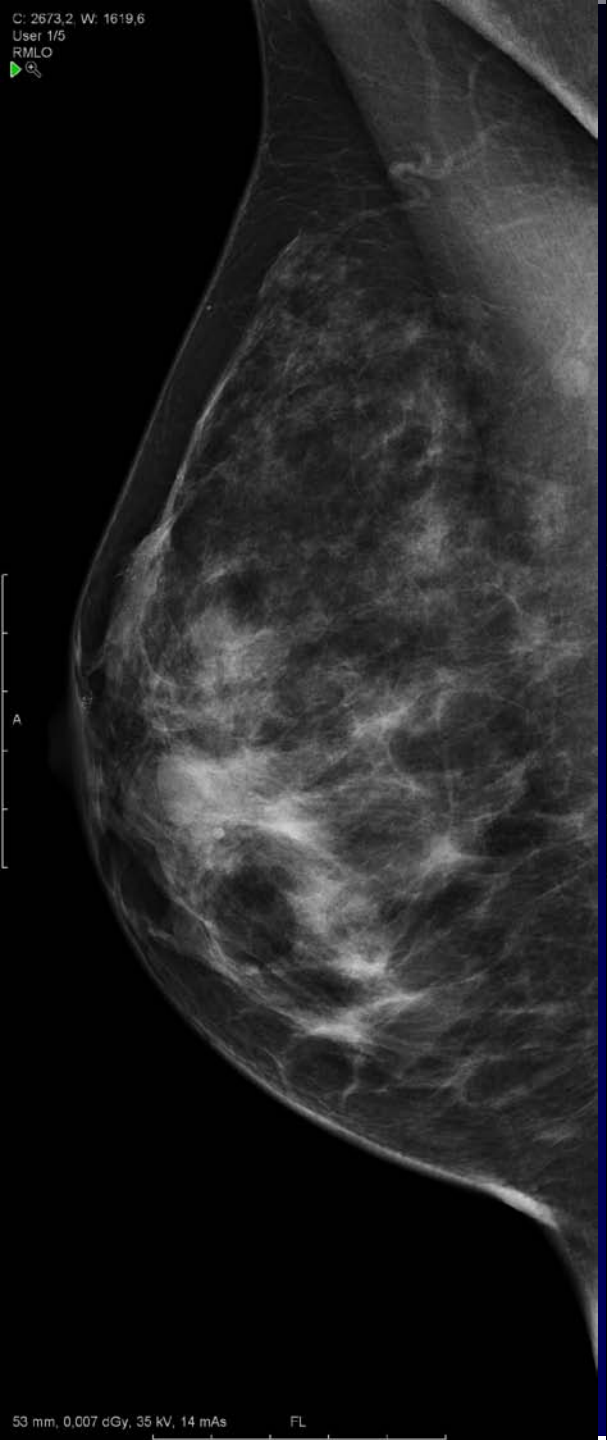



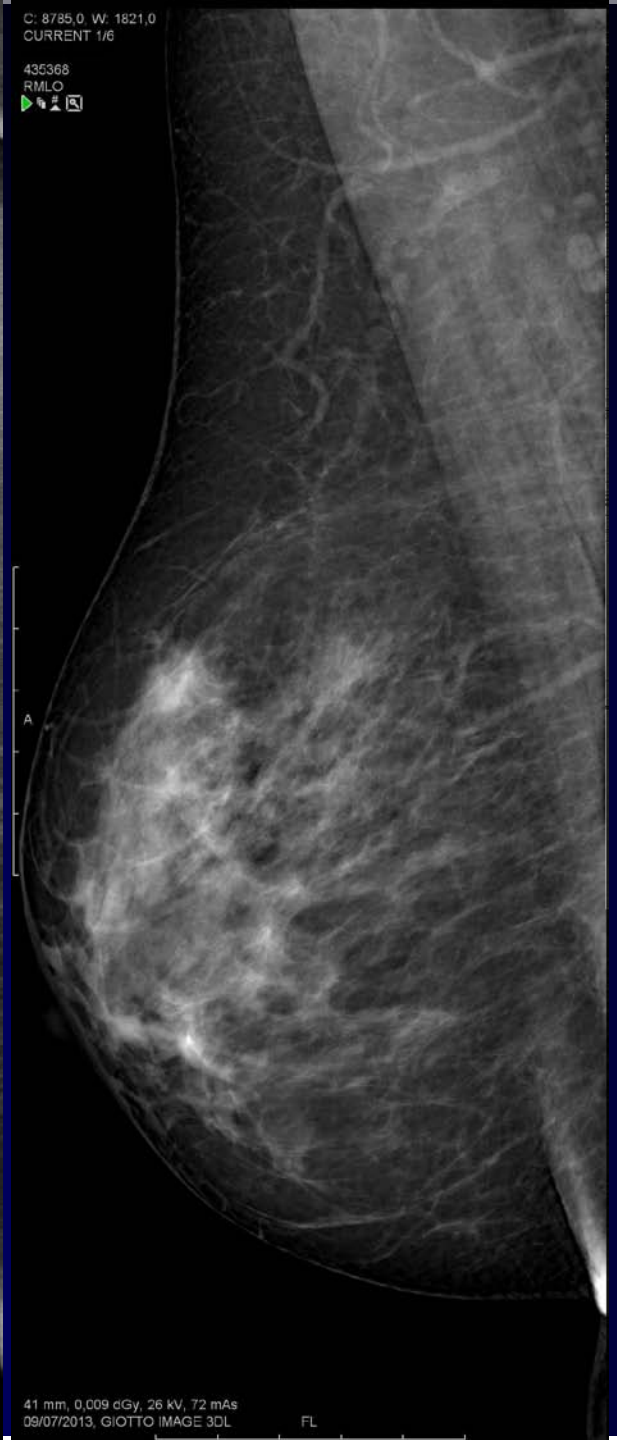
CR 43µ

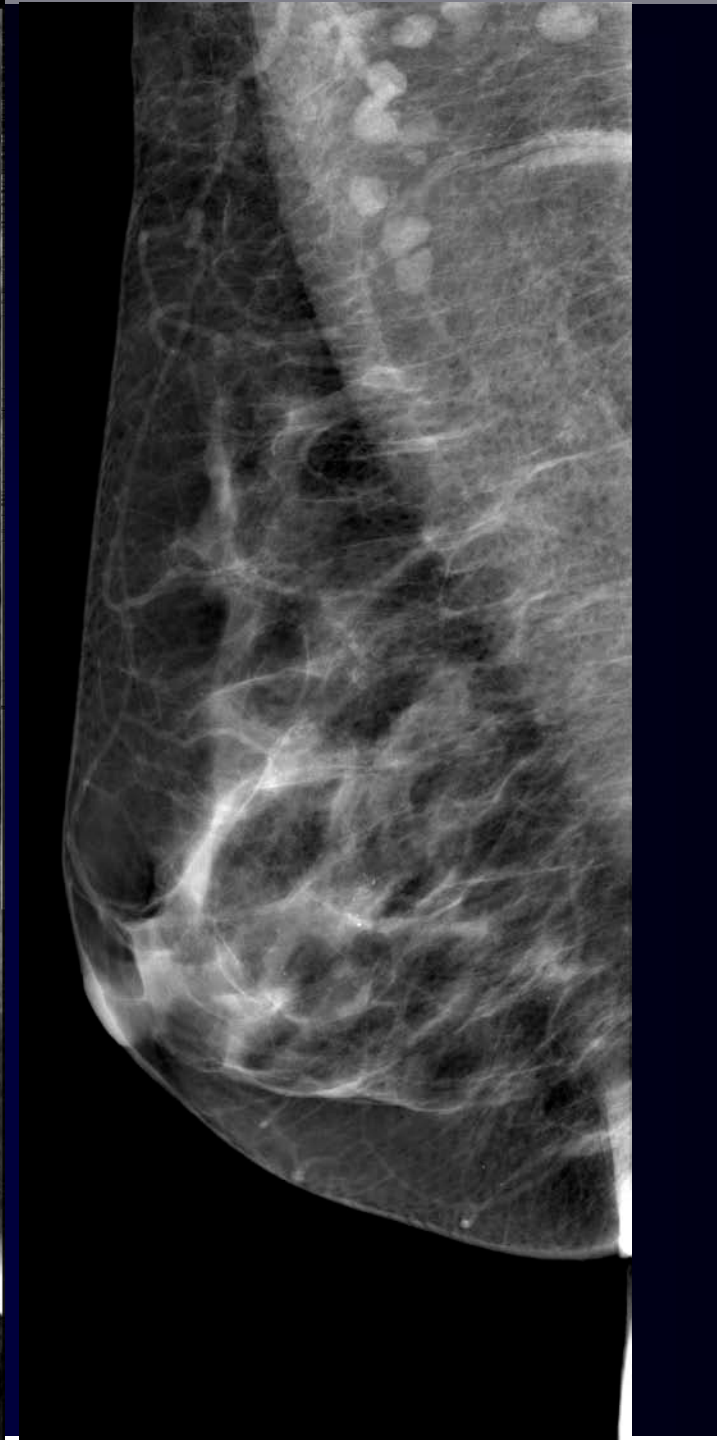


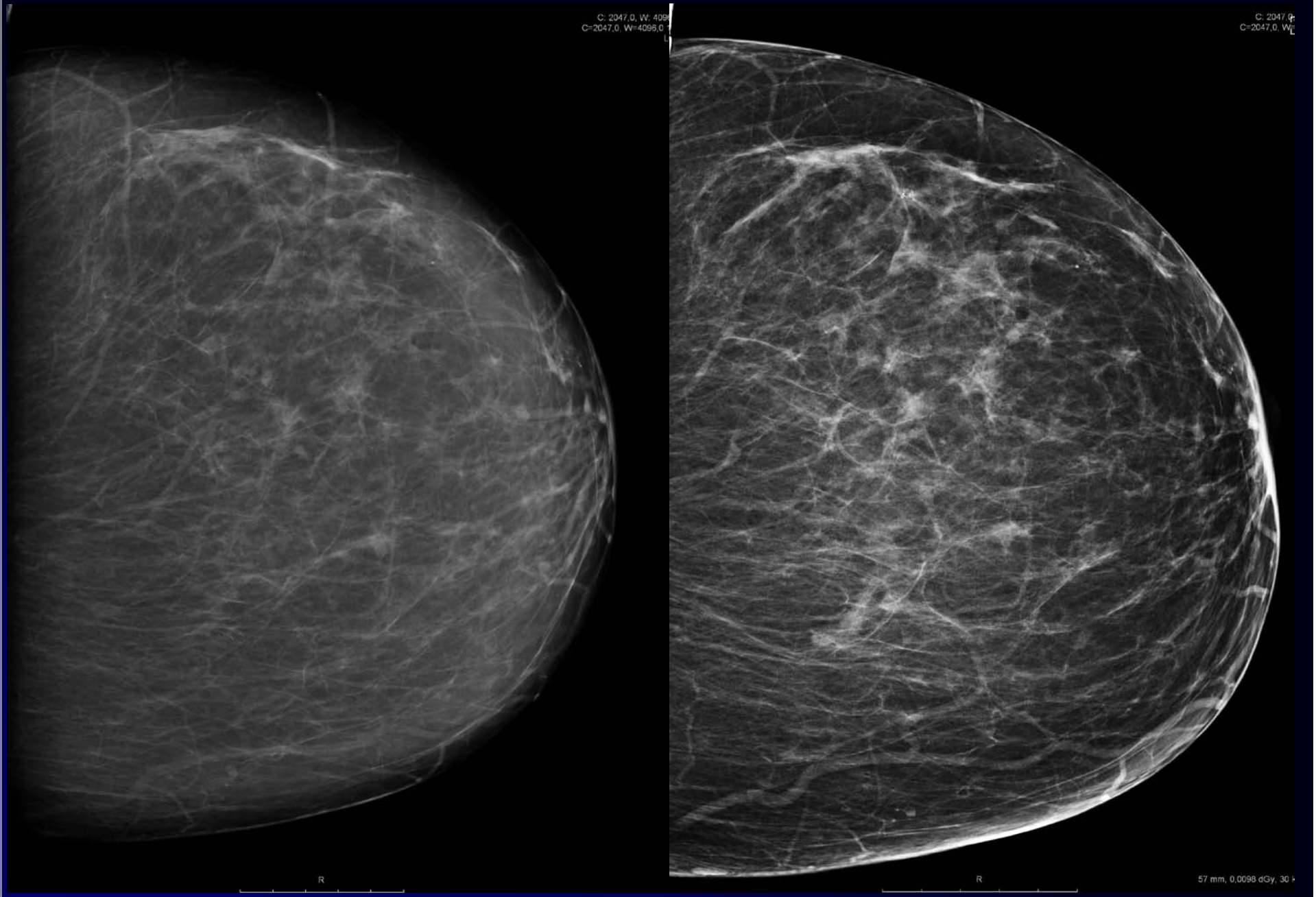
DR 100µ ID 2x (50µ effettivi)

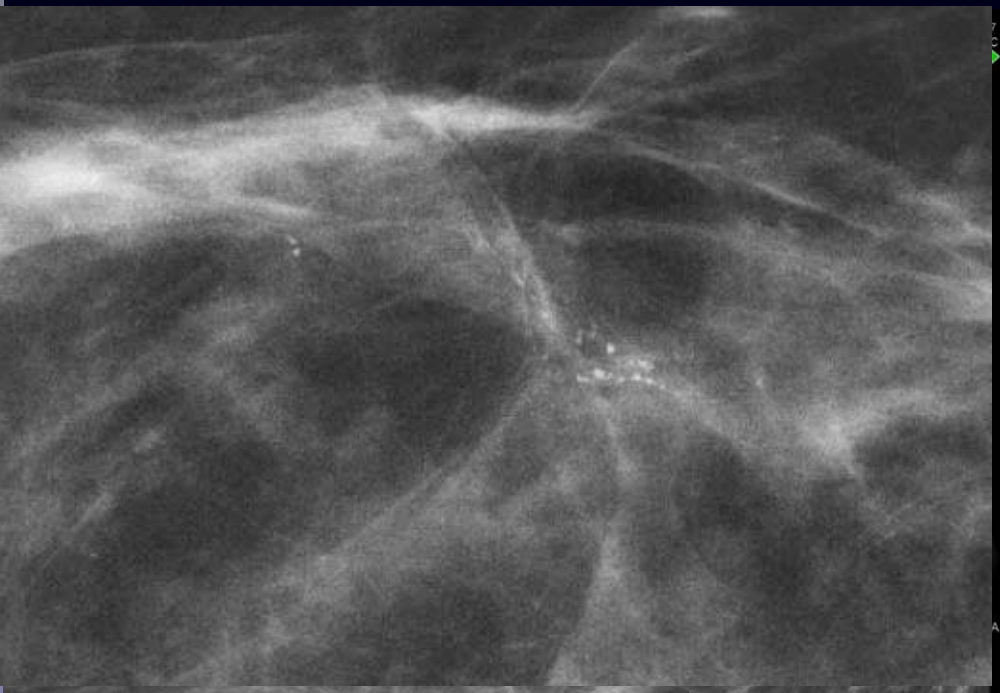
DR vs. DR……..

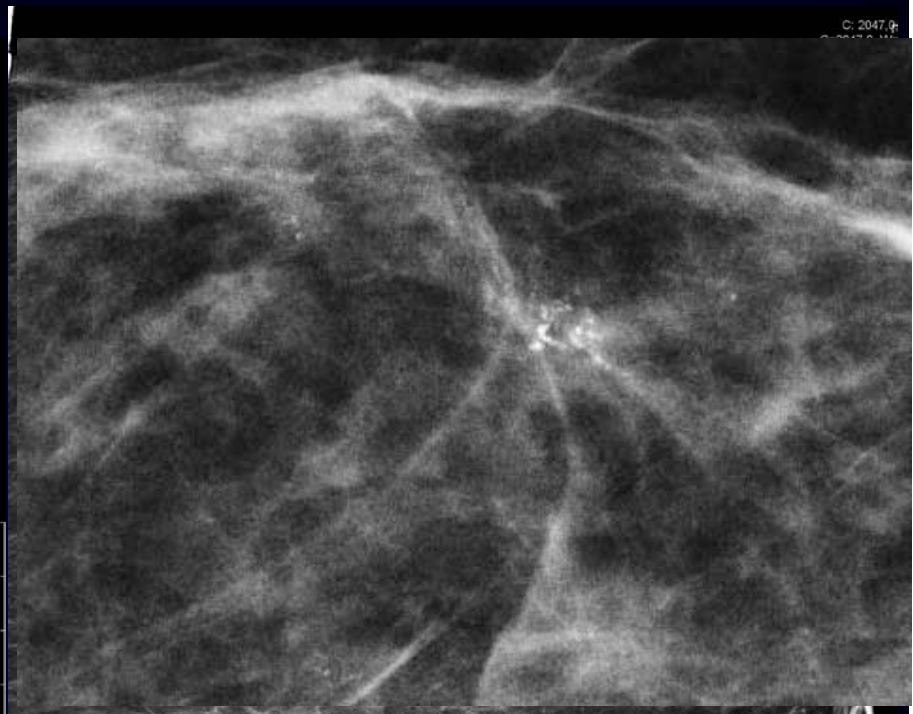

C: 2673,2 W: 1619,6
User 1/5
RMLO
A
53 mm, 0,007 dGy, 35 kV, 14 mAs
FL

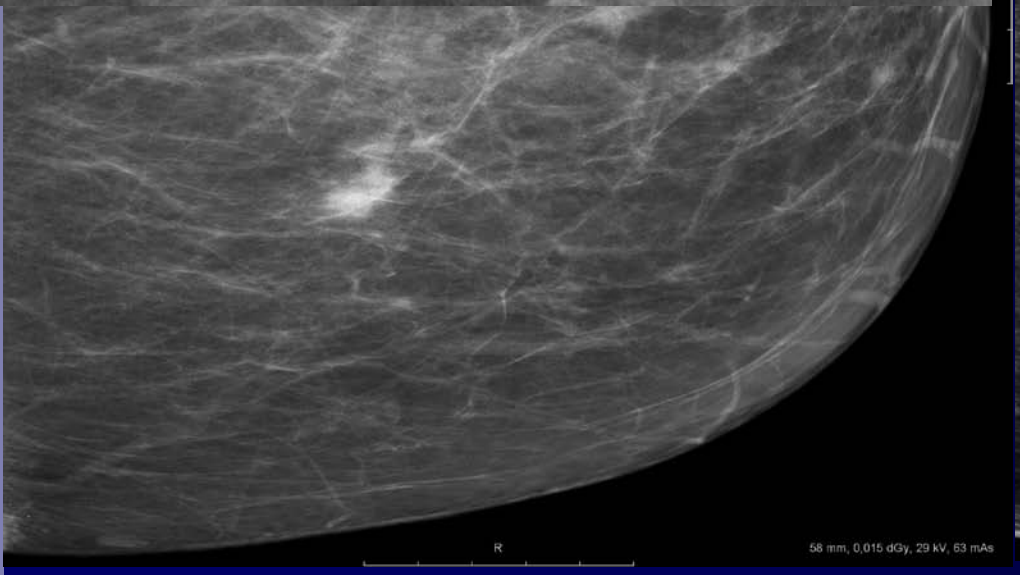

C: 8785,0 W: 1821,0
CURRENT 1/6
435368
RMLO
A
41 mm, 0,009 dGy, 26 kV, 72 mAs
09/07/2013, GIOTTO IMAGE 3DL
FL

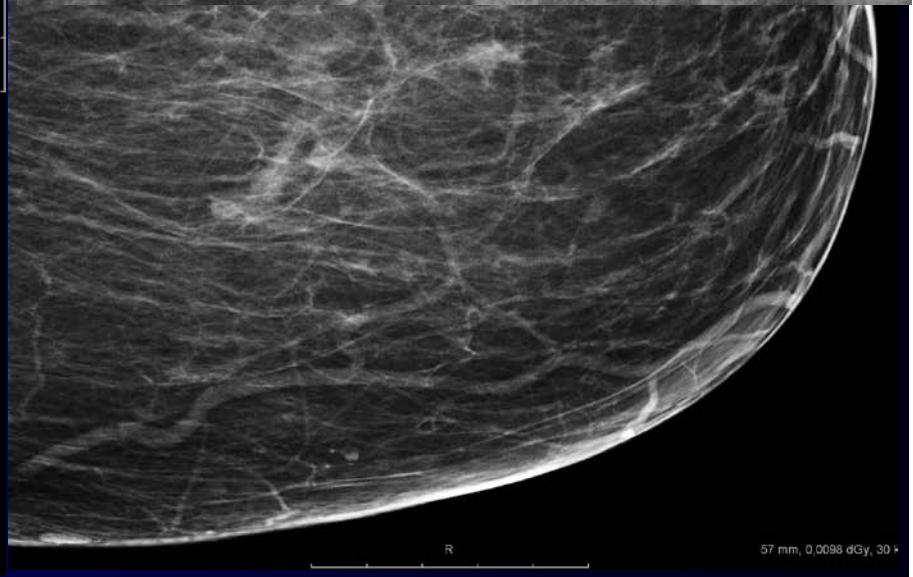



R
R
57 mm, 0,0098 dGy, 30






R
58 mm, 0,015 dGy, 29 kV, 63 mAs

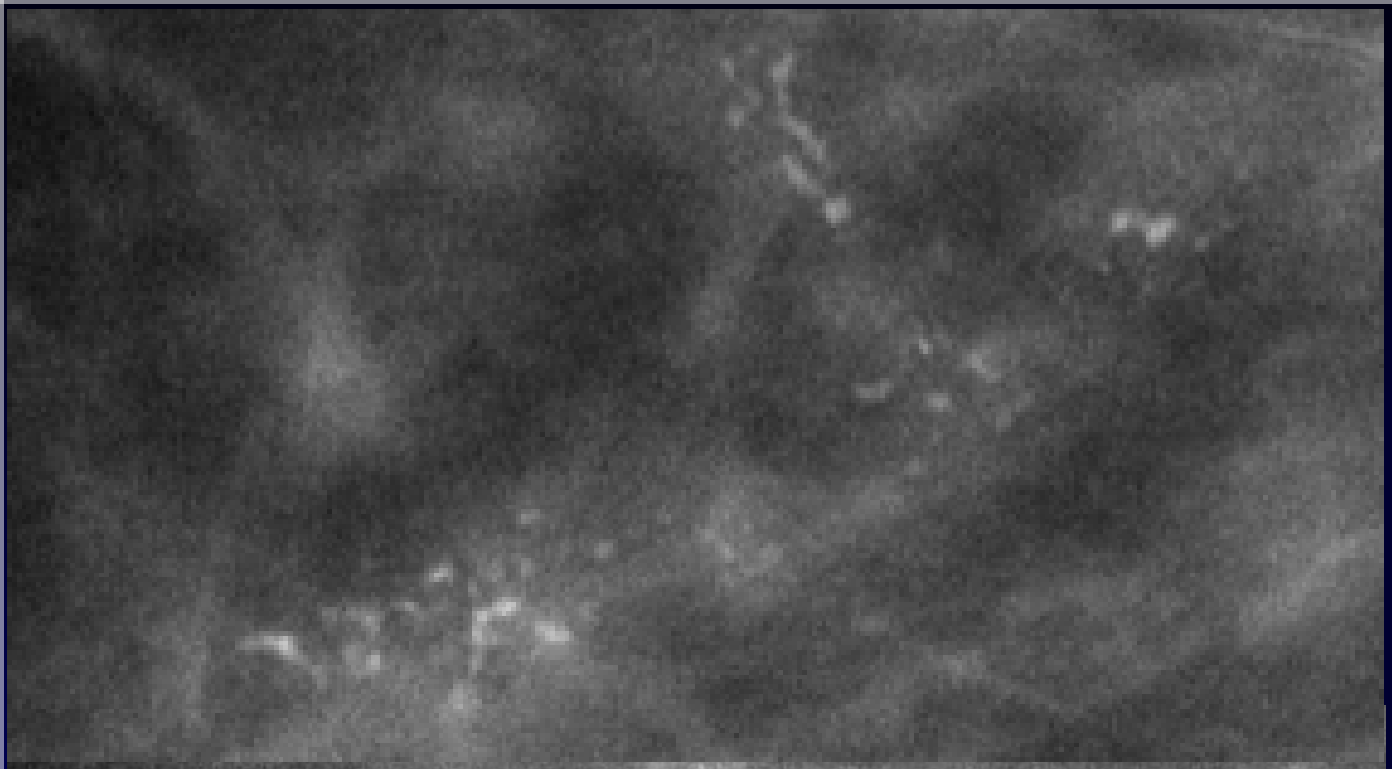

R
57 mm, 0,0098 dGy, 30

I livello: conclusioni

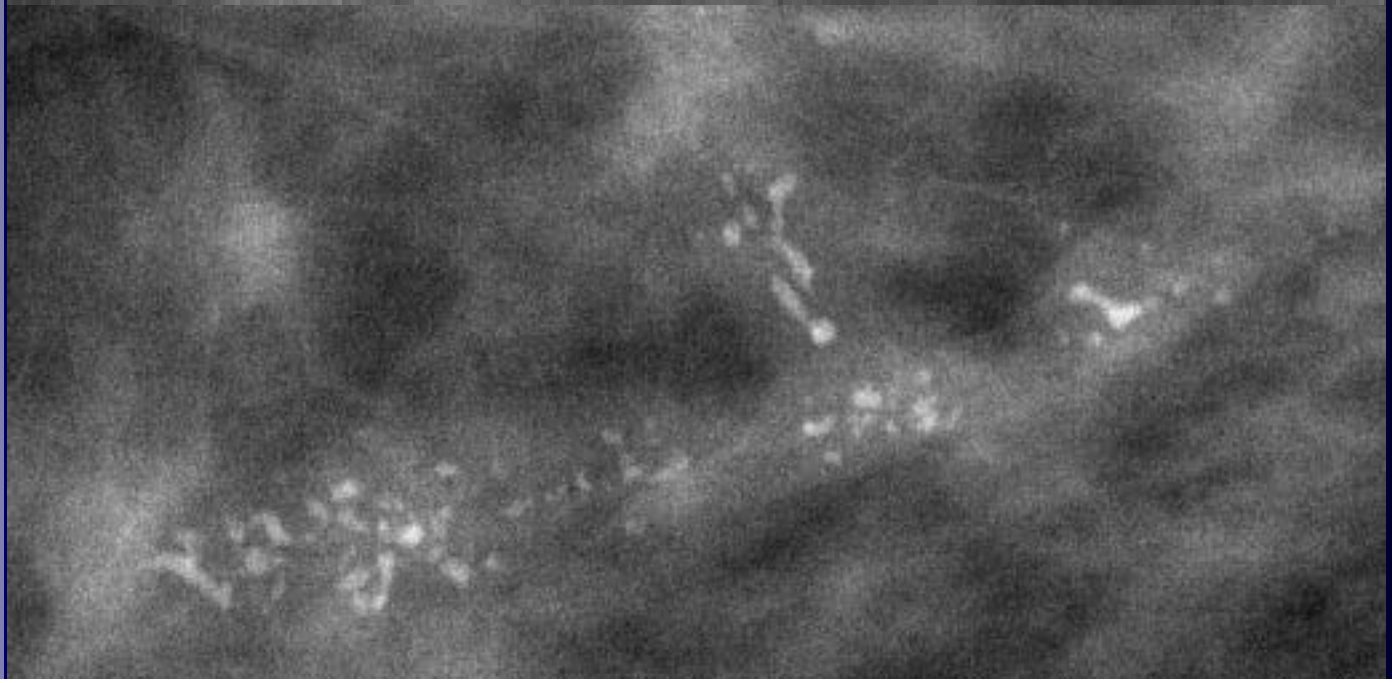
- Passare al DR appena possibile
- Una tappa intermedia con CR puo' essere vantaggiosa se corredata da workstation dedicate e PACS
- Per la scelta del DR guardare la dose ma anche la versatilita', I gusti personali sull'immagine, etc.

II livello: possibili "compromessi"

- Proiezioni aggiuntive si vs. no
- Ingrandimento diretto vs. zoom digitale
- Compressione mirata/ID vs. tomosintesi
- Prelievi sotto guida eco vs. stx
- RM vs. CESM



Zoom digitale



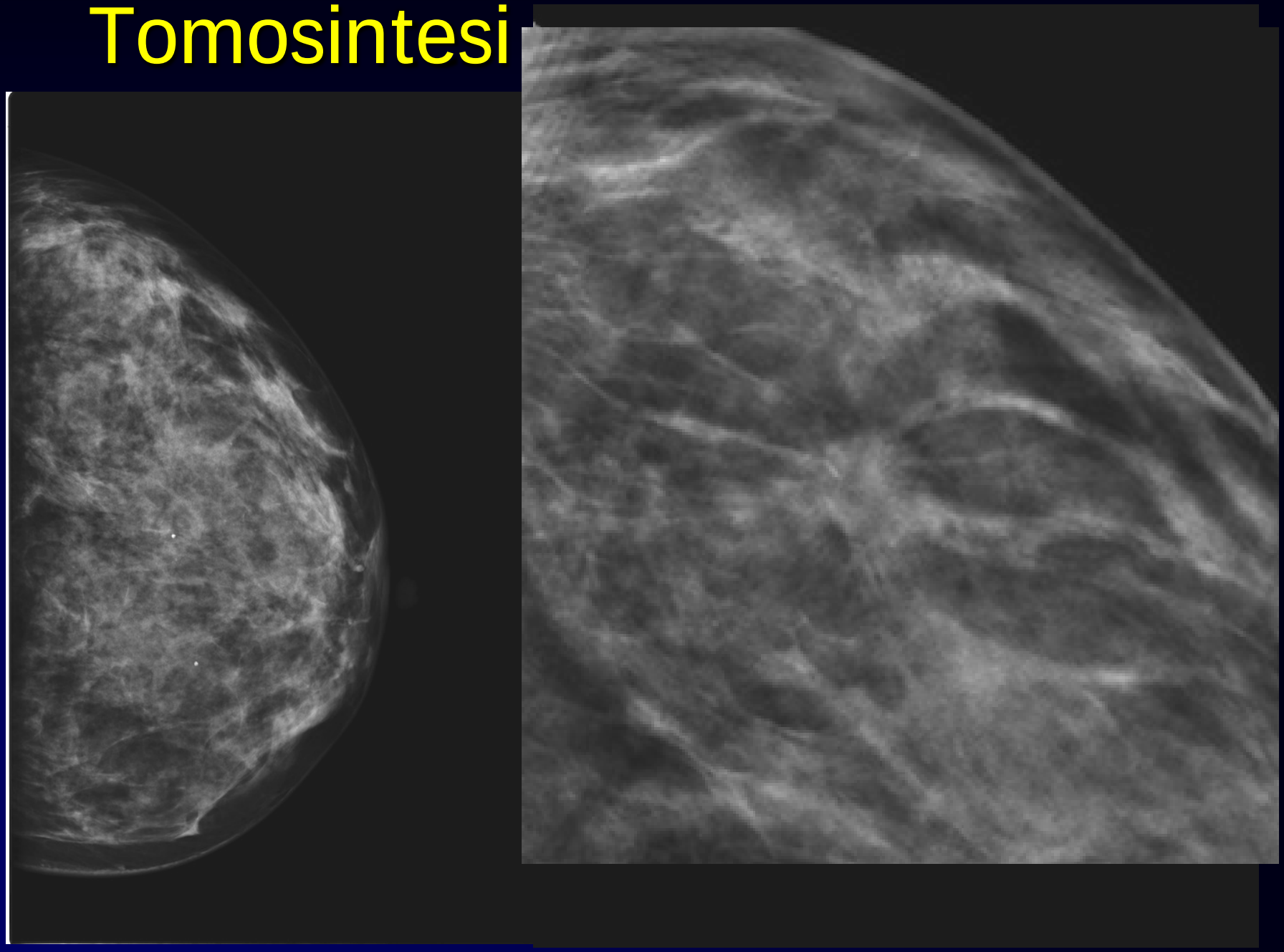
Ingr. geometrico

Mirate/ID vs. tomo

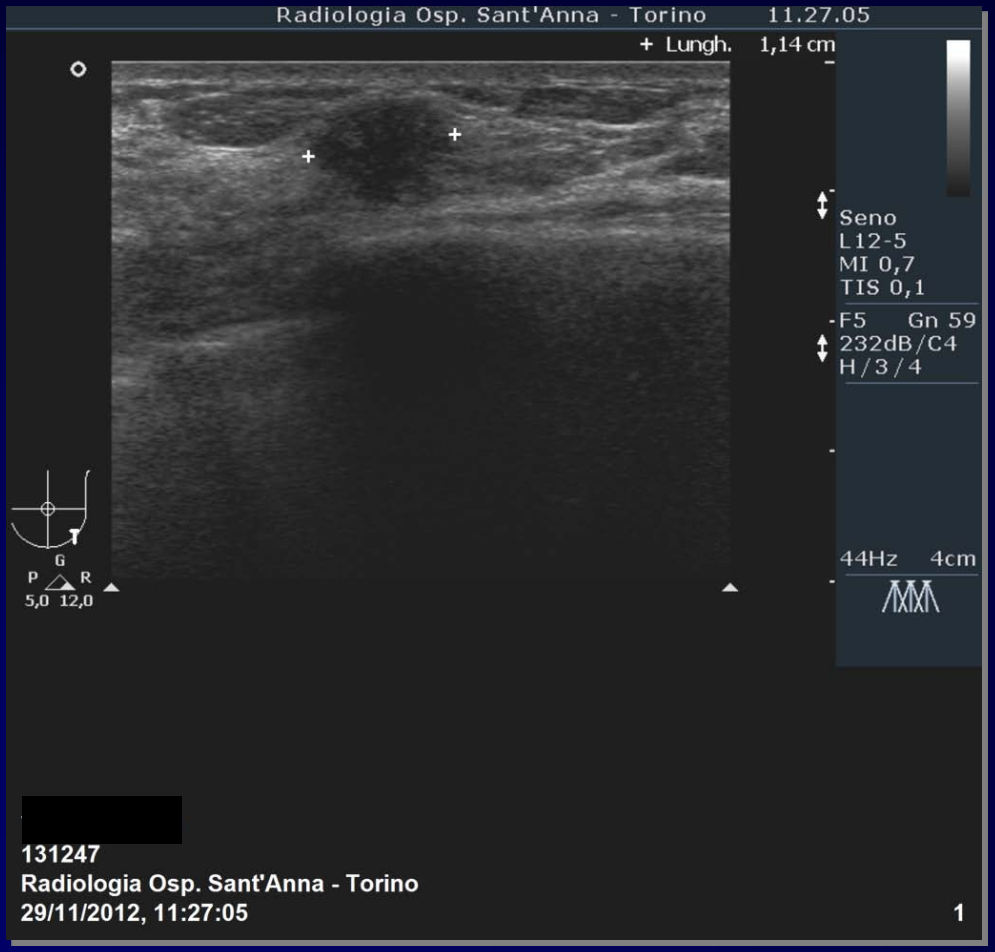
- Collimazione fascio
- Maggior dettaglio e visione d'insieme su microcalcificazioni
- + Disponibilita'
- Centratura lesione

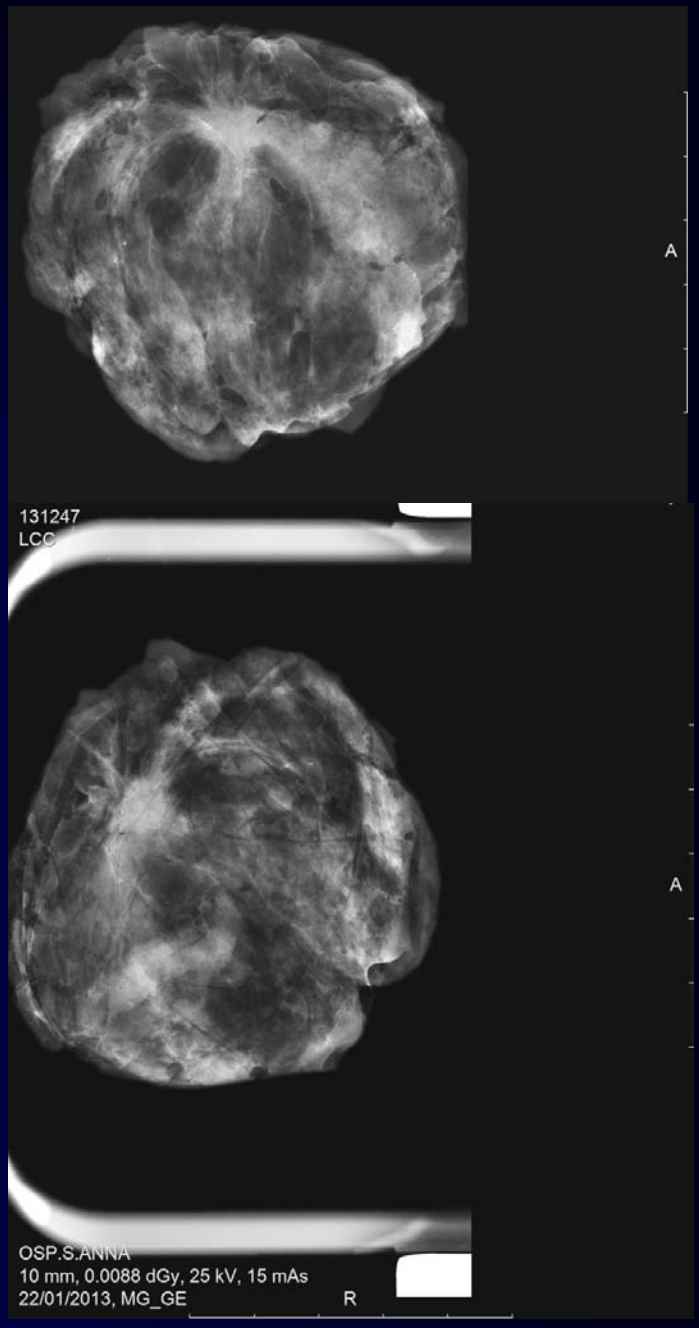
- Dose su tutta la ghiandola
- Ottima evidenza delle spicule in opacita' e distorsioni
- Collocazione spaziale di lesioni visibili in 1P 2D
- No necessita' centratura

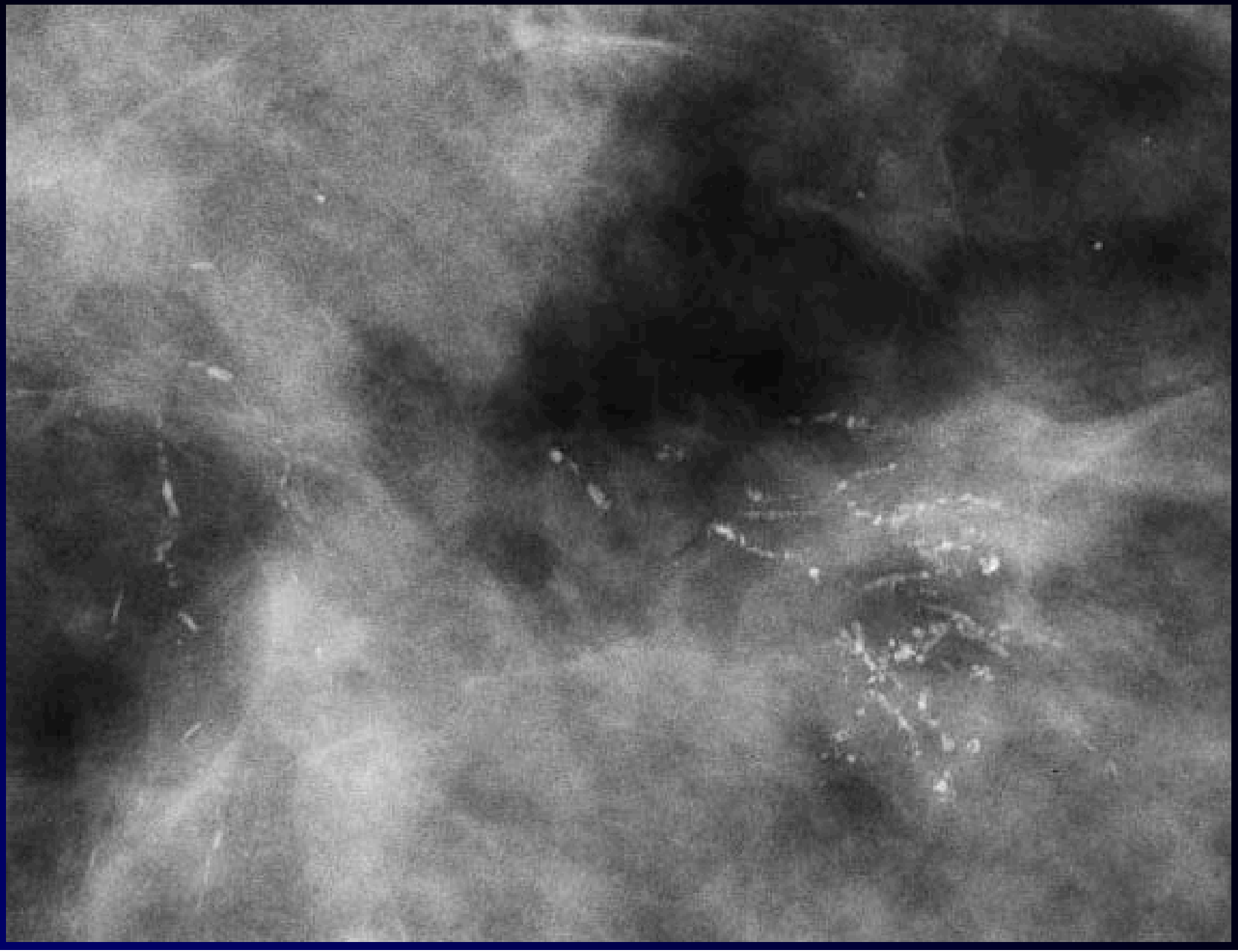
Tomosintesi



Ca identificato con Tomosintesi







Mirate/ID vs. tomo

Radiology. 2013 Jan;266(1):89-95. doi: 10.1148/radiol.12120552. Epub 2012 Nov 9.

Digital breast tomosynthesis versus supplemental diagnostic mammographic views for evaluation of noncalcified breast lesions.

Zuley ML, Bandos AI, Ganott MA, Sumkin JH, Kelly AE, Catullo VJ, Rathfon GY, Lu AH, Gur D.

Department of Radiology, Magee-Womens Hospital, University of Pittsburgh Medical Center, 300 Halket St, Pittsburgh, PA 15213, USA. zuleyml@upmc.edu

Abstract

PURPOSE: To compare the diagnostic performance of breast tomosynthesis versus supplemental mammography views in classification of masses, distortions, and asymmetries.

MATERIALS AND METHODS: Eight radiologists who specialized in breast imaging retrospectively reviewed 217 consecutively accrued lesions by using protocols that were HIPAA compliant and institutional review board approved in 182 patients aged 31-60 years (mean, 50 years) who underwent diagnostic mammography and tomosynthesis. The lesions in the cohort included 33% (72 of 217) cancers and 67% (145 of 217) benign lesions. Eighty-four percent (182 of 217) of the lesions were masses, 11% (25 of 217) were asymmetries, and 5% (10 of 217) were distortions that were initially detected at clinical examination in 8% (17 of 217), at mammography in 80% (173 of 217), at ultrasonography (US) in 11% (25 of 217), or at magnetic resonance imaging in 1% (2 of 217). Histopathologic examination established truth in 191 lesions, US revealed a cyst in 12 lesions, and 14 lesions had a normal follow-up. Each lesion was interpreted once with tomosynthesis and once with supplemental mammographic views; both modes included the mediolateral oblique and craniocaudal views in a fully crossed and balanced design by using a five-category Breast Imaging Reporting and Data System (BI-RADS) assessment and a probability-of-malignancy score. Differences between modes were analyzed with a generalized linear mixed model for BI-RADS-based sensitivity and specificity and with modified Obuchowski-Rockette approach for probability-of-malignancy-based area under the receiver operating characteristic (ROC) curve.

RESULTS: Average probability-of-malignancy-based area under the ROC curve was 0.87 for tomosynthesis versus 0.83 for supplemental views ($P < .001$). With tomosynthesis, the false-positive rate decreased from 85% (989 of 1160) to 74% (864 of 1160) ($P < .01$) for cases that were rated BI-RADS category 3 or higher and from 57% (663 of 1160) to 48% (559 of 1160) for cases rated BI-RADS category 4 or 5 ($P < .01$), without a meaningful change in sensitivity. With tomosynthesis, more cancers were classified as BI-RADS category 5 (39% [226 of 576] vs 33% [188 of 576]; $P = .017$) without a decrease in specificity.

CONCLUSION: Tomosynthesis significantly improved diagnostic accuracy for noncalcified lesions compared with supplemental mammographic views.

II livello, biopsie: eco vs. stx

- Maggior manualita’
- Maggior semplicita’
- No rad. ionizzanti

- Maggior durata
- Occupazione sala rx
- Rad. ionizzanti

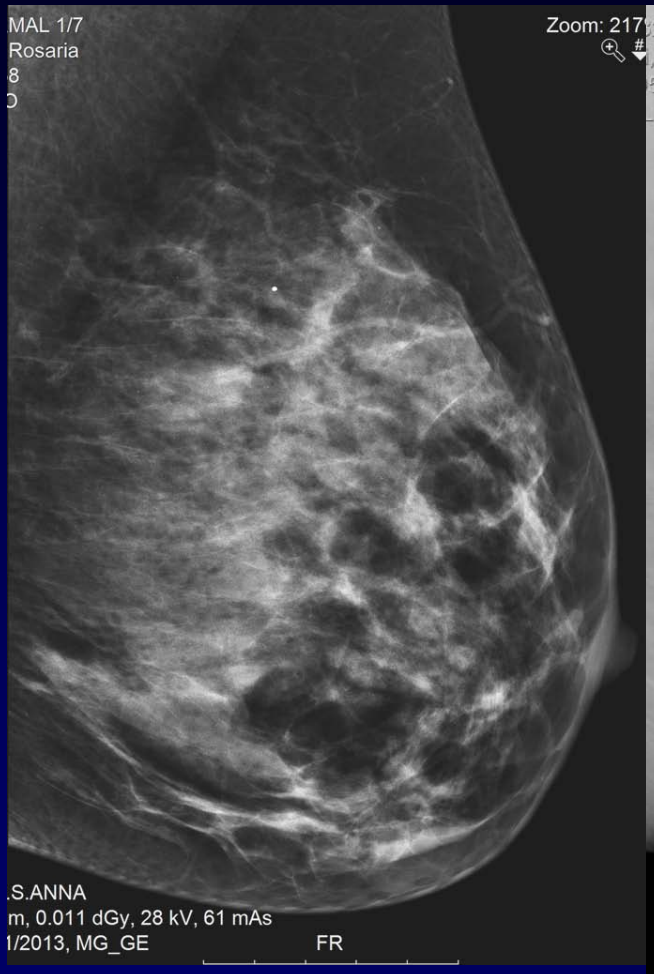
I scelta: ecoguida

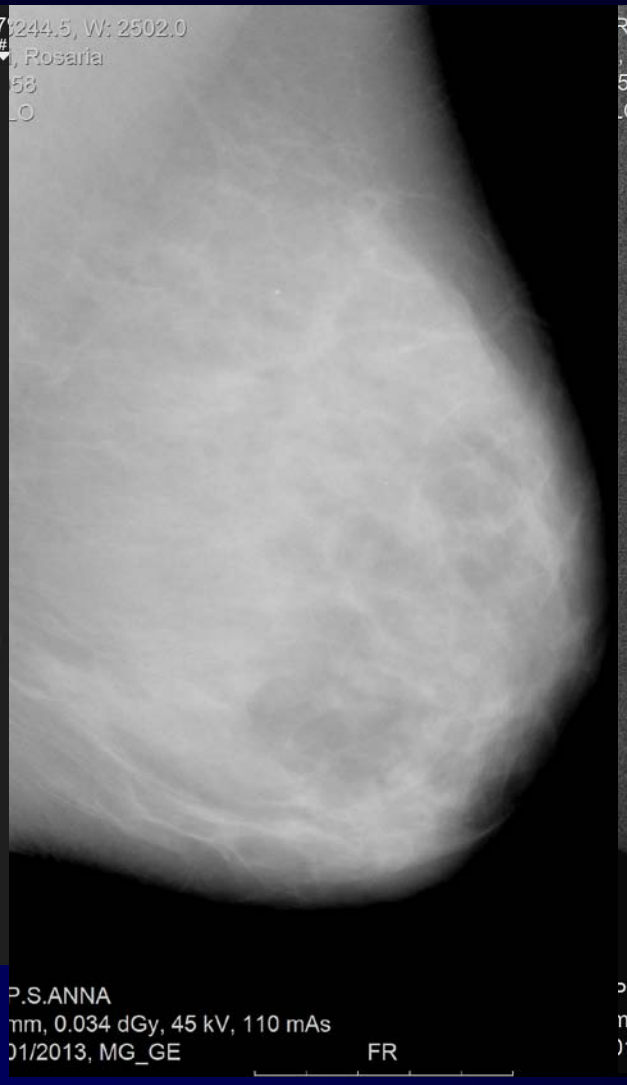
RM vs. CESM

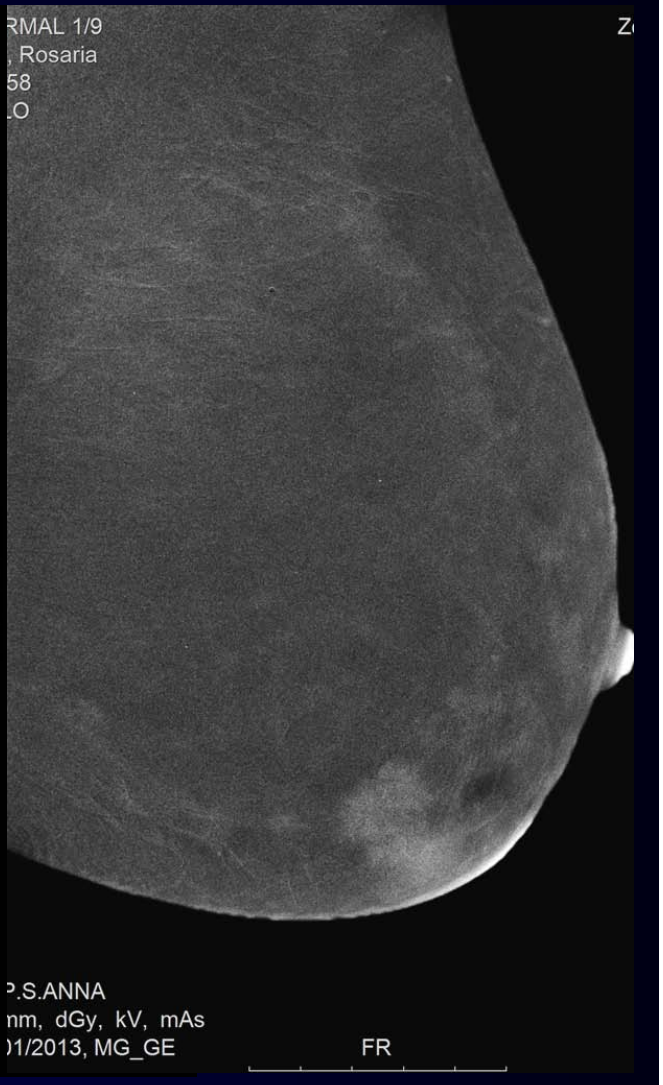
- Disponibilita' RM
- No rad. Ionizzanti
- Durata 10 -30 min
- Immagine sottratta e non
- Sempre due esami (Mx + RM)

- Singola casa prod.
- Si rad. Ionizzanti
- Durata 5-10 min.
- Efficacia paragonabile a RM?
- 1 (solo clinica) o 2 Mx

CESM (Contrast Enhanced Spectral Mammography)







RM vs. CESM

Eur Radiol. 2013 Sep 19. [Epub ahead of print]

Contrast-enhanced spectral mammography versus MRI: Initial results in the detection of breast cancer and assessment of tumour size.

Fallenberg EM, Dromain C, Diekmann F, Engelken F, Krohn M, Singh JM, Ingold-Heppner B, Winzer KJ, Bick U, Renz DM.

Clinic of Radiology, Charité - Universitätsmedizin Berlin, Augustenburger Platz 1, 13353, Berlin, Germany, eva.fallenberg@charite.de.

Abstract

OBJECTIVES: To compare mammography (MG), contrast-enhanced spectral mammography (CESM), and magnetic resonance imaging (MRI) in the detection and size estimation of histologically proven breast cancers using postoperative histology as the gold standard.

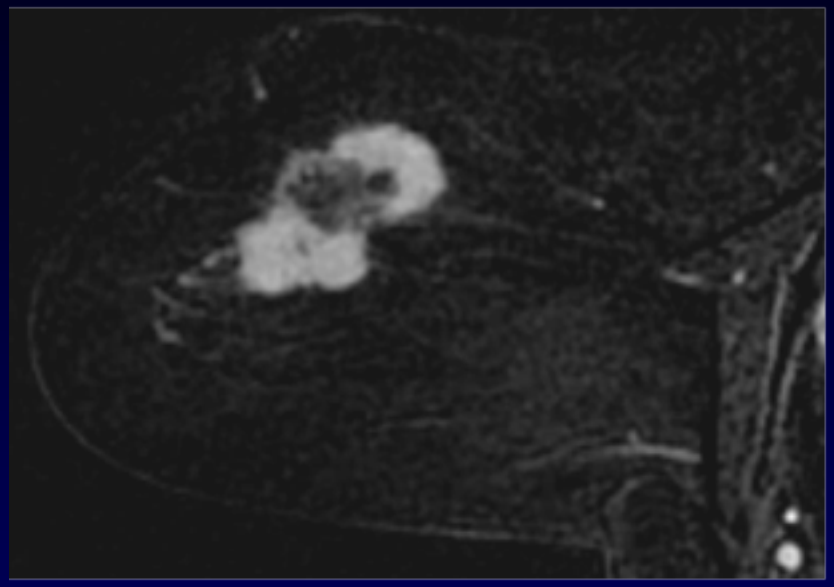
METHODS: After ethical approval, 80 women with newly diagnosed breast cancer underwent MG, CESM, and MRI examinations. CESM was reviewed by an independent experienced radiologist, and the maximum dimension of suspicious lesions was measured. For MG and MRI, routine clinical reports of breast specialists, with judgment based on the BI-RADS lexicon, were used. Results of each imaging technique were correlated to define the index cancer. Fifty-nine cases could be compared to postoperative histology for size estimation.

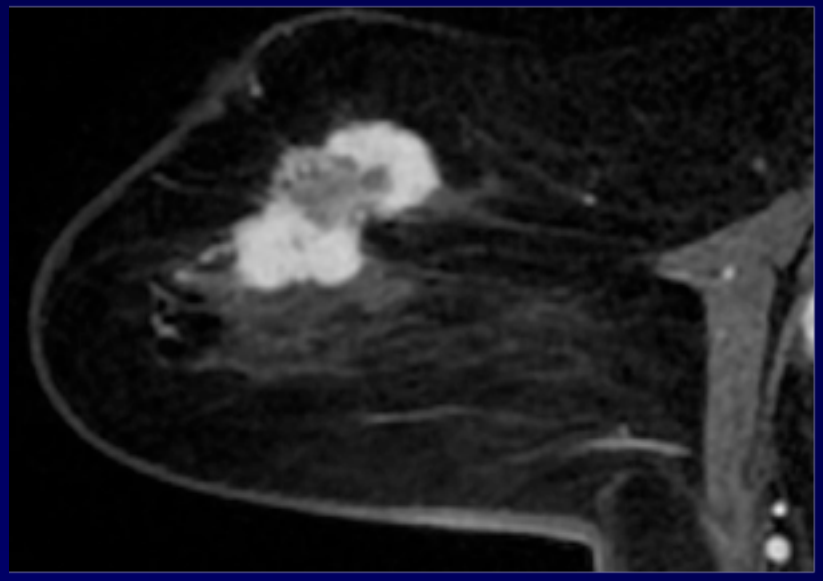
RESULTS: Breast cancer was visible in 66/80 MG, 80/80 CESM, and 77/79 MRI examinations. Average lesion largest dimension was 27.31 mm (SD 22.18) in MG, 31.62 mm (SD 24.41) in CESM, and 27.72 mm (SD 21.51) in MRI versus 32.51 mm (SD 29.03) in postoperative histology. No significant difference was found between lesion size measurement on MRI and CESM compared with histopathology.

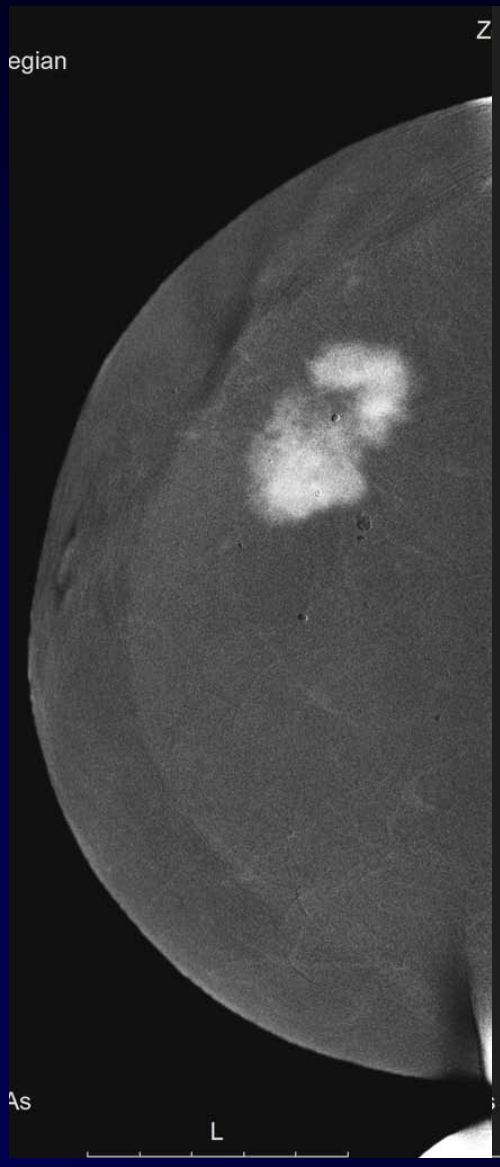
CONCLUSION: Our initial results show a better sensitivity of CESM and MRI in breast cancer detection than MG and a good correlation with postoperative histology in size assessment.

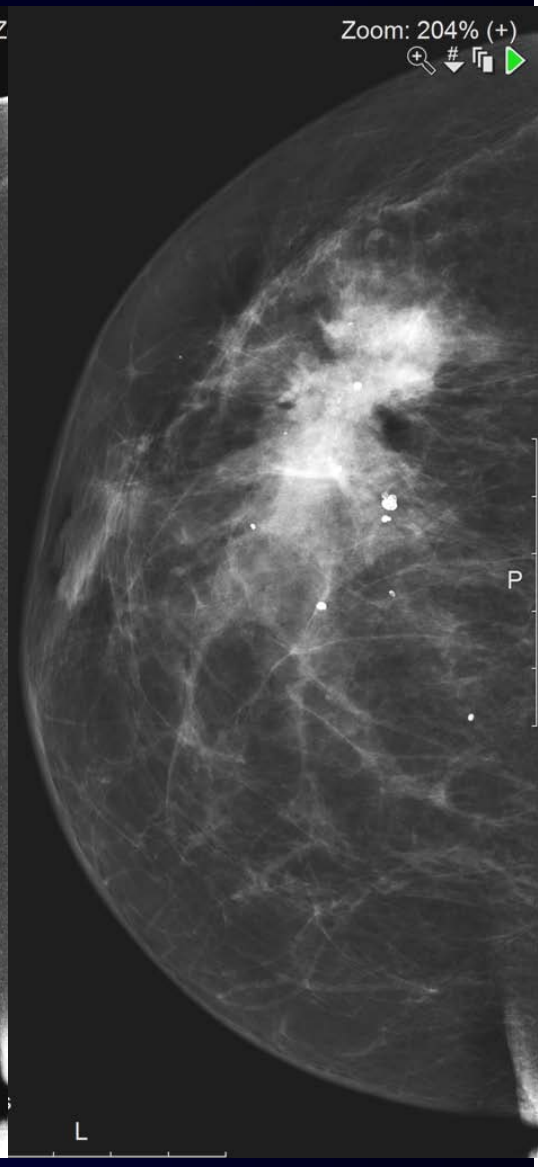
KEY POINTS: • Contrast-enhanced spectral mammography (CESM) is slowly being introduced into clinical practice. • Access to breast MRI is limited by availability and lack of reimbursement. • Initial results show a better sensitivity of CESM and MRI than conventional mammography. • CESM showed a good correlation with postoperative histology in size assessment. • Contrast-enhanced spectral mammography offers promise, seemingly providing information comparable to MRI.

RM vs CESM

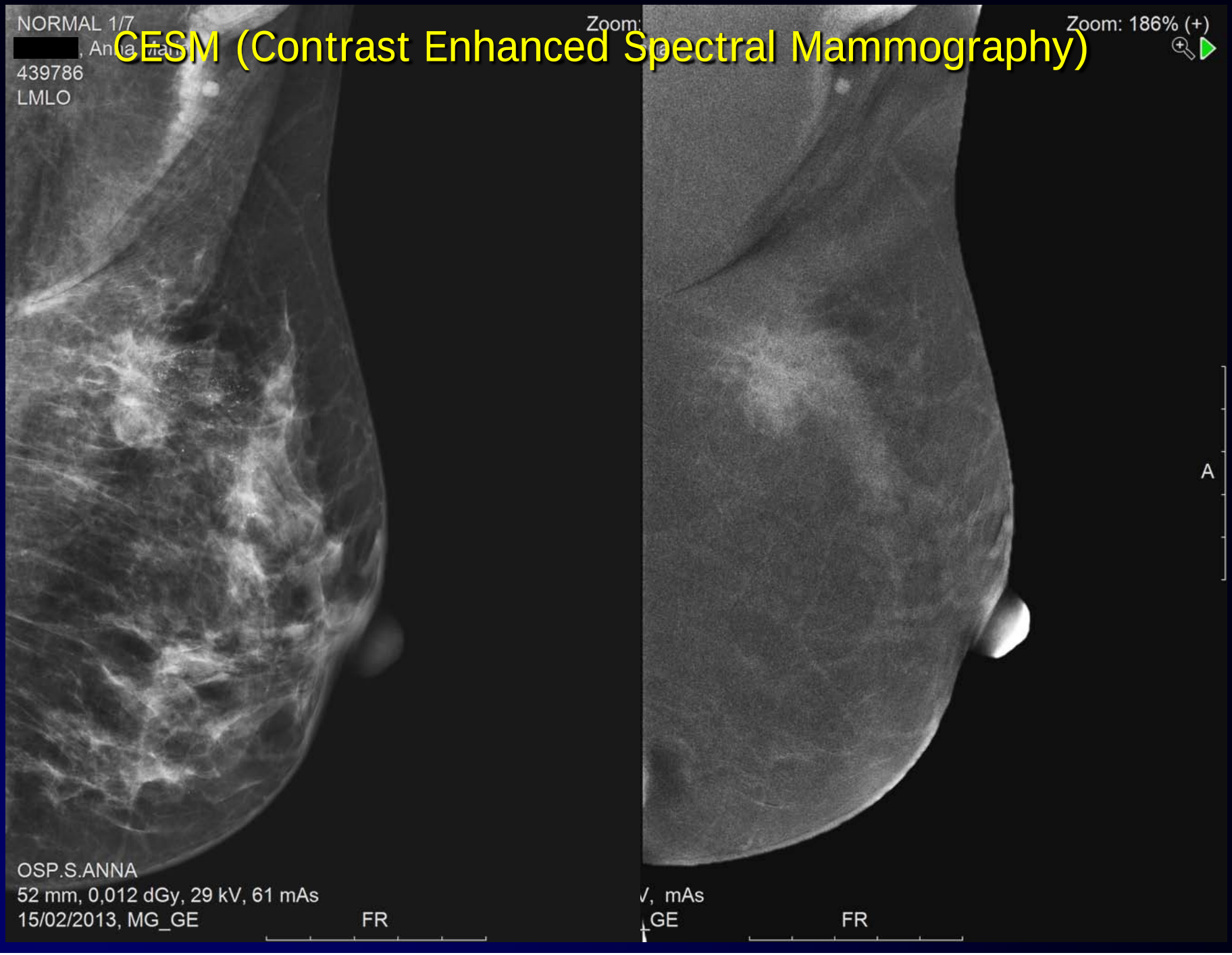


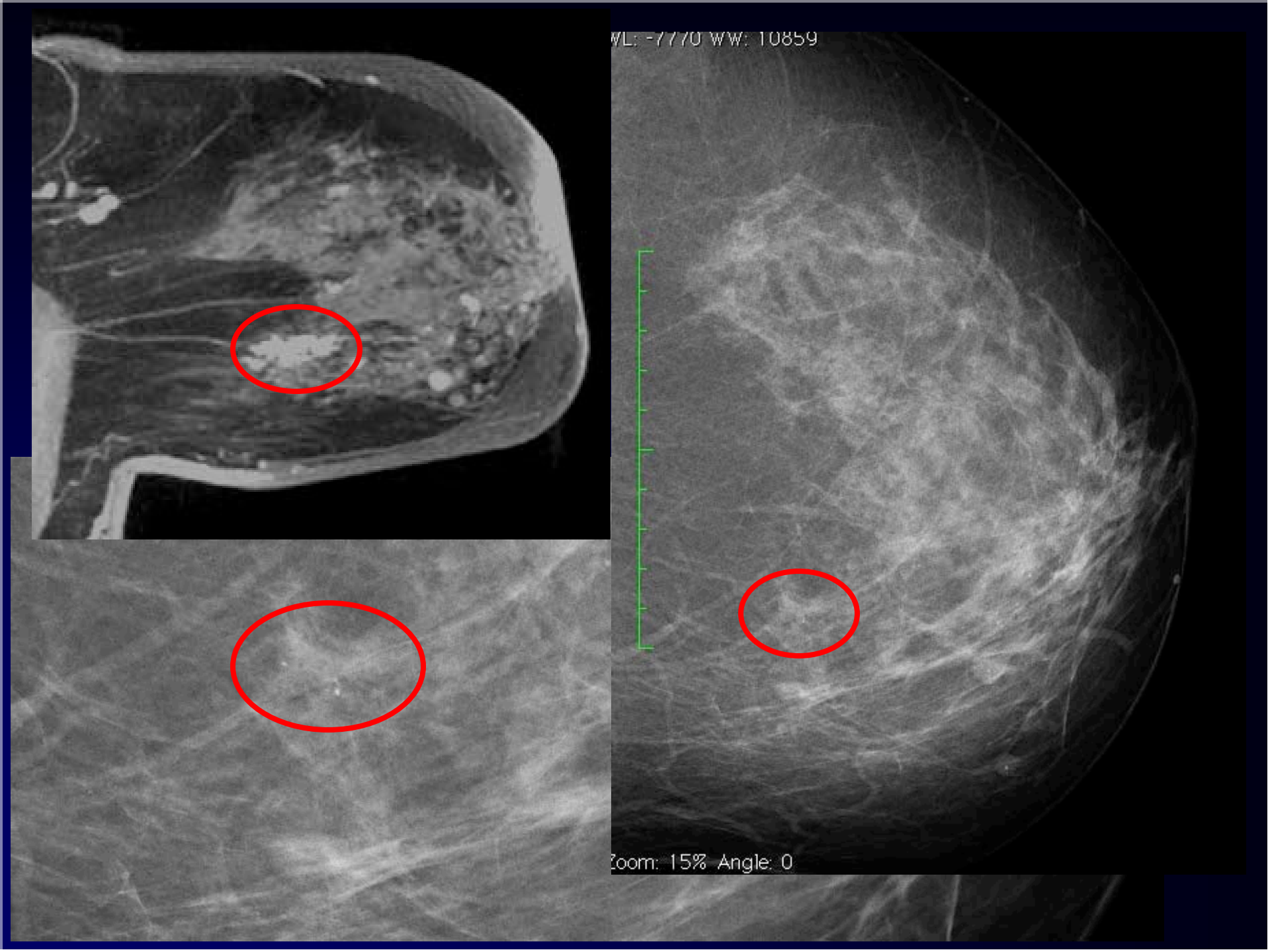






CESM (Contrast Enhanced Spectral Mammography)




WL: -7770 WW: 10859
Zoom: 15% Angle: 0

II livello: conclusioni

- Effettuare proiezioni aggiuntive se si attendono informazioni utili; lo zoom digitale non sostituisce l'ID
- Se si dispone di tomosintesi questa puo' essere vantaggiosamente utilizzata in II livello al posto delle proiezioni mirate per le distorsioni e le opacita', mentre per le microcalcificazioni si consiglia di continuare ad utilizzare l'ingrandimento diretto
- Utilizzare la guida stereotassica/tomo solo in caso di mancata visualizzazione ecografica
- Se si dispone di CESM, questa puo' essere utilizzata al posto della risonanza magnetica: in caso di segni clinici sospetti, la mammografia diagnostica puo' direttamente essere eseguita con CESM (la decisione spetta comunque al radiologo).

Grazie per l'Attenzione!

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