Congratulations MRS

on 100 years!!!

Debra Monticciolo, MD, FACR

Dr. Robert and Alma Moreton Centennial Chair in Radiology

Professor of Radiology & Vice-Chair for Research, Radiology

Section Chief, Breast Imaging

Baylor Scott & White Healthcare, Central Texas

Past President, American College of Radiology

Use of Breast MRI in Women with Higher than Average Risk

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Past President, American College of Radiology

no COI or financial disclosures

ACR Guideline Creation

2010: women, average risk and high risk

2017: average risk separated from higher risk

ORIGINAL ARTICLE HEALTH SERVICES RESEARCH AND POLICY

Breast Cancer Screening for Average-Risk Women: Recommendations From the ACR Commission on Breast Imaging

EC: Editor's Choice

Debra L. Monticciolo, MD[a], Mary S. Newell, MD[b], R. Edward Hendrick, PhD[c], Mark A. Helvie, MD[d], Linda Moy, MD[e], Barbara Monsees, MD[f], Daniel B. Kopans, MD[g], Peter R. Eby, MD[b], Edward A. Sickles, MD[i]

Abstract

Breast cancer is the most common non-skin cancer and the second leading cause of cancer death for women in the United States. Before the introduction of widespread mammographic screening in the mid-1980s, the death rate from breast cancer in the US had remained unchanged for more than 4 decades. Since 1990, the death rate has declined by at least 38%. Much of this change is attributed to early detection with mammography. ACR breast cancer screening experts have reviewed data from RCTs, observational studies, US screening data, and other peer-reviewed literature to update our recommendations. Mammography screening has consistently been shown to significantly reduce breast cancer mortality over a variety of study designs. The ACR recommends annual mammography screening starting at age 40 for women of average risk of developing breast cancer. Our recommendation is based on maximizing proven benefits, which include a substantial reduction in breast cancer mortality afforded by regular screening and improved treatment options for those diagnosed with breast cancer. The risks associated with mammography screening are also considered to assist women in making an informed choice.

Key Words: Breast cancer screening, mammography screening, breast cancer, mammography, early detection

J Am Coll Radiol 2017;14:1137-1143.

published 2017

ORIGINAL ARTICLE CLINICAL PRACTICE MANAGEMENT

Breast Cancer Screening in Women at Higher-Than-Average Risk: Recommendations From the ACR

EC: Editor's Choice

SA-CME

Debra L. Monticciolo, MD[a], Mary S. Newell, MD[b], Linda Moy, MD[c], Bethany Niell, MD, PhD[d], Barbara Monsees, MD[e], Edward A. Sickles, MD[f]

Credits awarded for this enduring activity are designated "SA-CME" by the American Board of Radiology (ABR) and qualify toward fulfilling requirements for Maintenance of Certification (MOC) Part II: Lifelong Learning and Self-assessment. To access the SA-CME activity visit https://3s.acr.org/Presenters/CaseScript/CaseView?CDId=5qIPiG+nl6k%3d.

Abstract

Early detection decreases breast cancer mortality. The ACR recommends annual mammographic screening beginning at age 40 for women of average risk. Higher-risk women should start mammographic screening earlier and may benefit from supplemental screening modalities. For women with genetics-based increased risk (and their untested first-degree relatives), with a calculated lifetime risk of 20% or more or a history of chest or mantle radiation therapy at a young age, supplemental screening with contrast-enhanced breast MRI is recommended. Breast MRI is also recommended for women with personal histories of breast cancer and dense tissue, or those diagnosed by age 50. Others with histories of breast cancer and those with atypia at biopsy should consider additional surveillance with MRI, especially if other risk factors are present. Ultrasound can be considered for those who qualify for but cannot undergo MRI. All women, especially black women and those of Ashkenazi Jewish descent, should be evaluated for breast cancer risk no later than age 30, so that those at higher risk can be identified and can benefit from supplemental screening.

Key Words: Breast cancer screening, breast cancer, higher risk populations, breast MRI, digital breast tomosynthesis, breast cancer risk assessment

J Am Coll Radiol 2018;15:408-414.

published 2018

ORIGINAL ARTICLE ■ *Health Services Research and Policy*

Check for updates

Breast Cancer Screening Recommendations Inclusive of All Women at Average Risk: Update from the ACR and Society of Breast Imaging

VISUAL ABSTRACT

Debra L. Monticciolo, MD[a], Sharp F. Malak, MD, MPH[b], Sarah M. Friedewald, MD[c], Peter R. Eby, MD[d], Mary S. Newell, MD[e], Linda Moy, MD[f], Stamatia Destounis, MD[g], Jessica W. T. Leung, MD[h], R. Edward Hendrick, PhD[i], Dana Smetherman, MD[j]

Abstract

Breast cancer remains the most common nonskin cancer, the second leading cause of cancer deaths, and the leading cause of premature death in US women. Mammography screening has been proven effective in reducing breast cancer deaths in women age 40 years and older. A mortality reduction of 40% is possible with regular screening. Treatment advances cannot overcome the disadvantage of being diagnosed with an advanced-stage tumor. The ACR and Society of Breast Imaging recommend annual mammography screening beginning at age 40, which provides the greatest mortality reduction, diagnosis at earlier stage, better surgical options, and more effective chemotherapy. Annual screening results in more screening-detected tumors, tumors of smaller sizes, and fewer interval cancers than longer screening intervals. Screened women in their 40s are more likely to have early-stage disease, negative lymph nodes, and smaller tumors than unscreened women. Delaying screening until age 45 or 50 will result in an unnecessary loss of life to breast cancer and adversely affects minority women in particular. Screening should continue past age 74 years, without an upper age limit unless severe comorbidities limit life expectancy. Benefits of screening should be considered along with the possibilities of recall for additional imaging and benign biopsy and the less tangible risks of anxiety and overdiagnosis. Although recall and biopsy recommendations are higher with more frequent screening, so are life-years gained and breast cancer deaths averted. Women who wish to maximize benefit will choose annual screening starting at age 40 years and will not stop screening prematurely.

Key Words: Breast cancer, breast cancer screening, early detection, mammography, mammography screening

J Am Coll Radiol 2021;18:1280-1288.

published 2021

ORIGINAL ARTICLE CLINICAL PRACTICE MANAGEMENT

CrossMark

Breast Cancer Screening in Women at Higher-Than-Average Risk: Recommendations From the ACR

EC: Editor's Choice

SA-CME

Debra L. Monticciolo, MD[a], Mary S. Newell, MD[b], Linda Moy, MD[c], Bethany Niell, MD, PhD[d], Barbara Monsees, MD[e], Edward A. Sickles, MD[f]

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Key Words: Breast cancer screening, breast cancer, higher risk populations, breast MRI, digital breast tomosynthesis, breast cancer risk assessment

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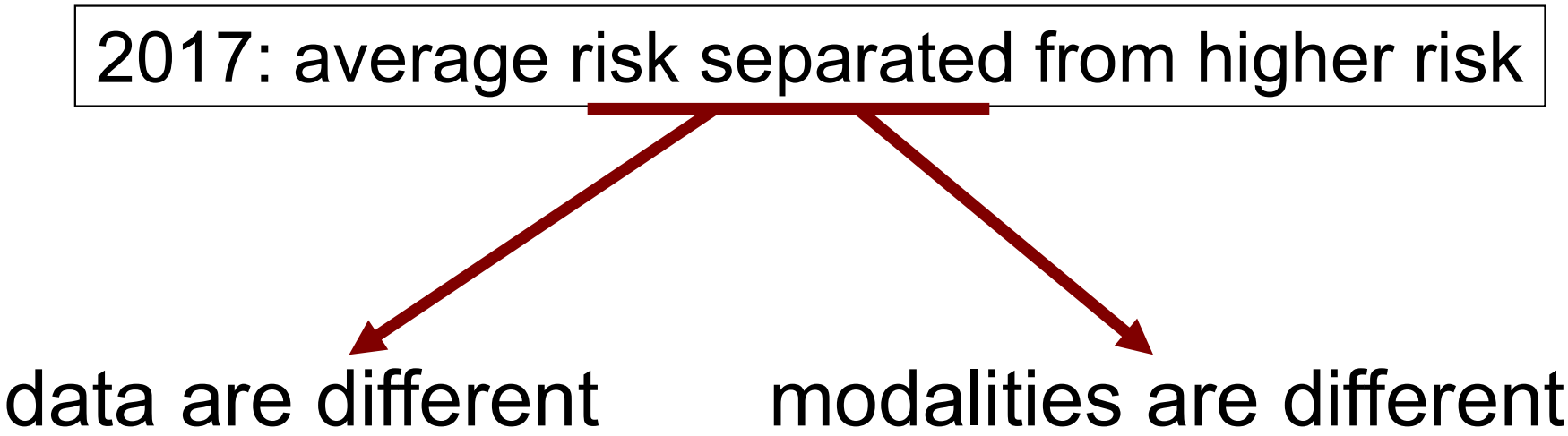
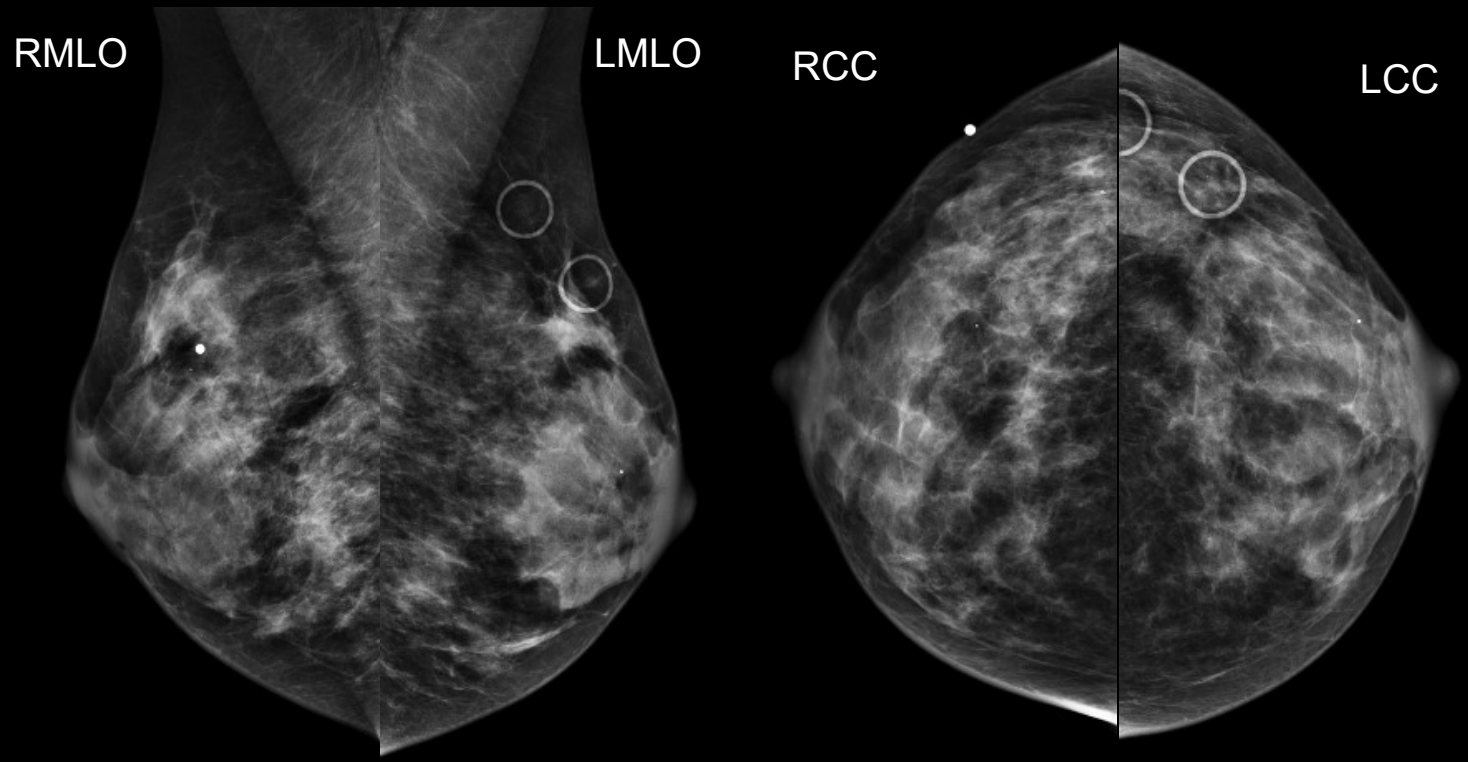
ACR Guideline Creation

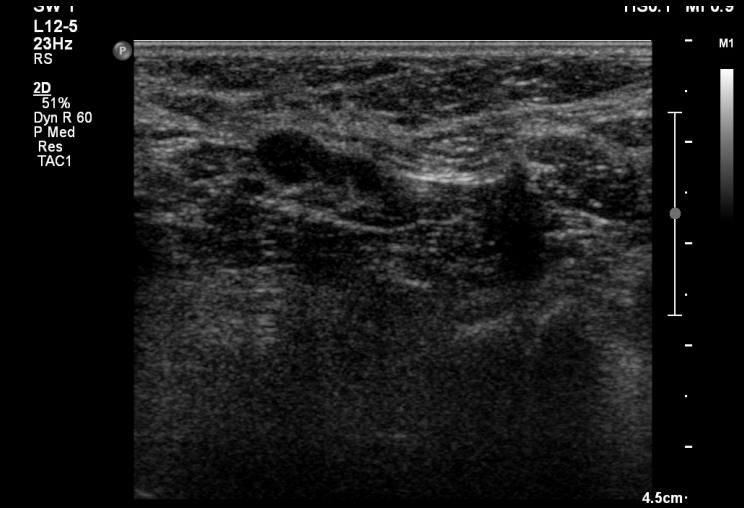


Breast MRI

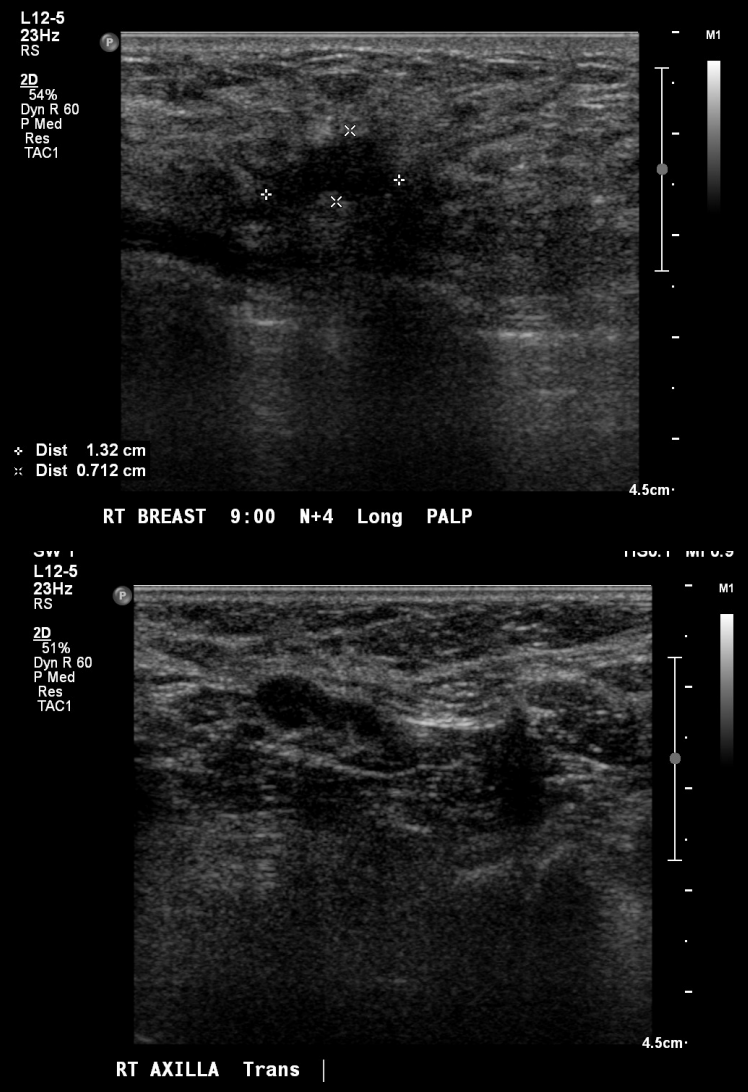
- game changing for breast cancer detection

The power of MRI in breast imaging

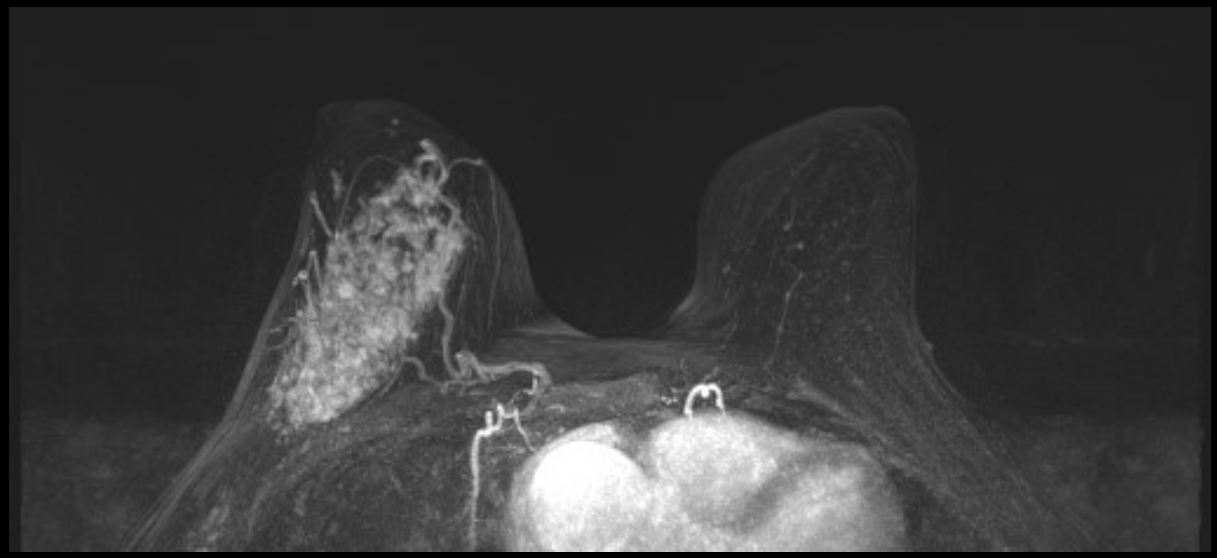




Mass & Node Positive for IDC



Much more disease on MR



+GD 0 min
MIP

Breast MRI

- game changing for breast cancer detection
- more accurate for tumor size
- finds lesions missed on conventional imaging

Breast MRI

- game changing for breast cancer detection
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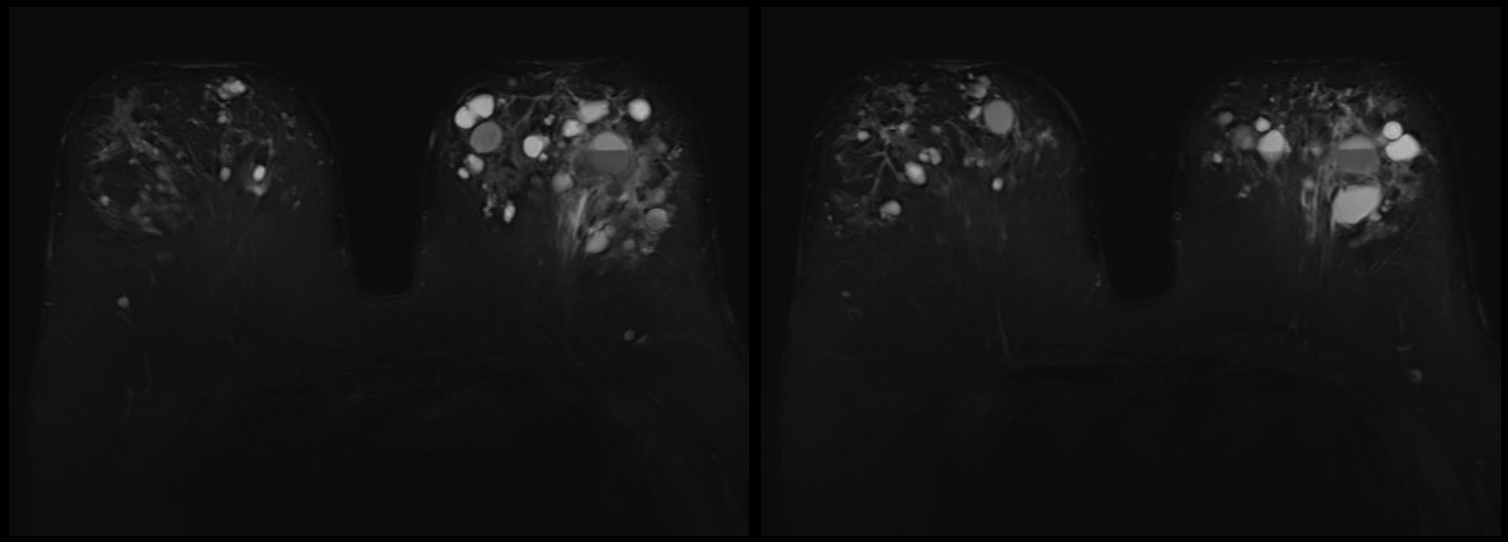
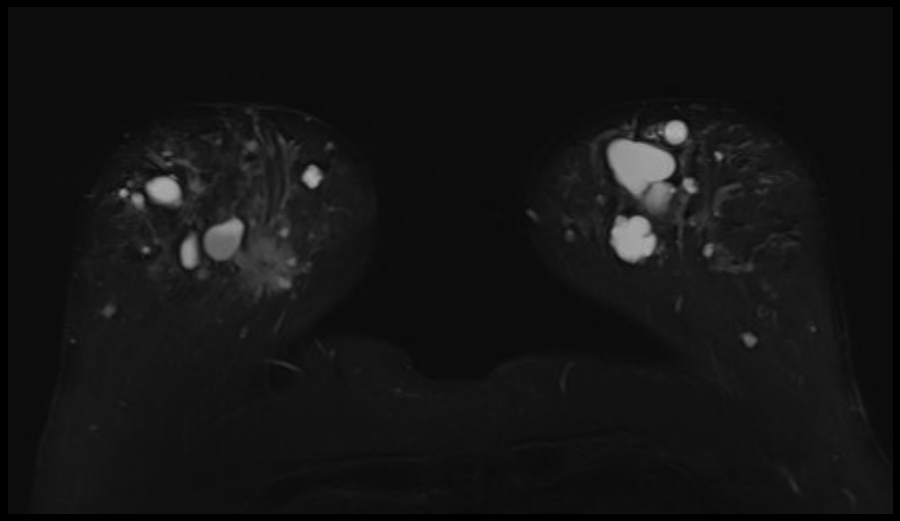
Dense, Complicated Mammogram



T2W with fat suppression



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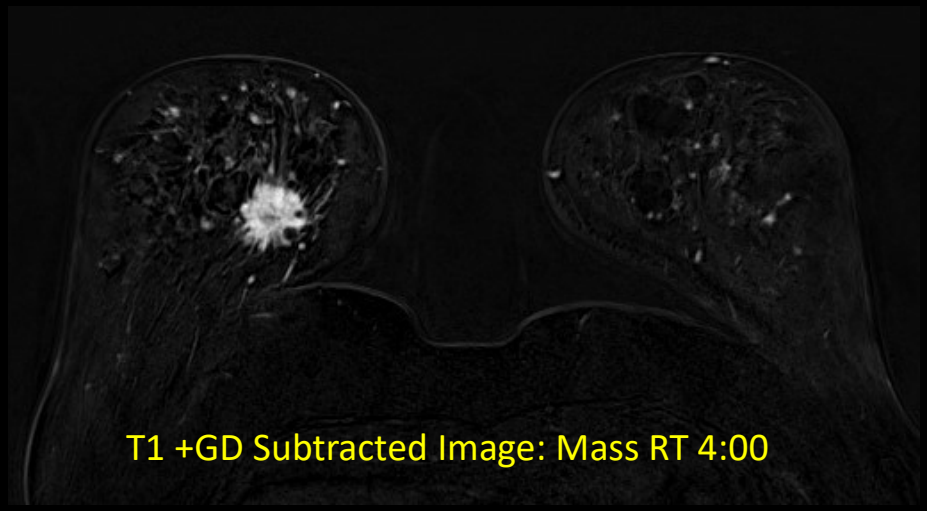
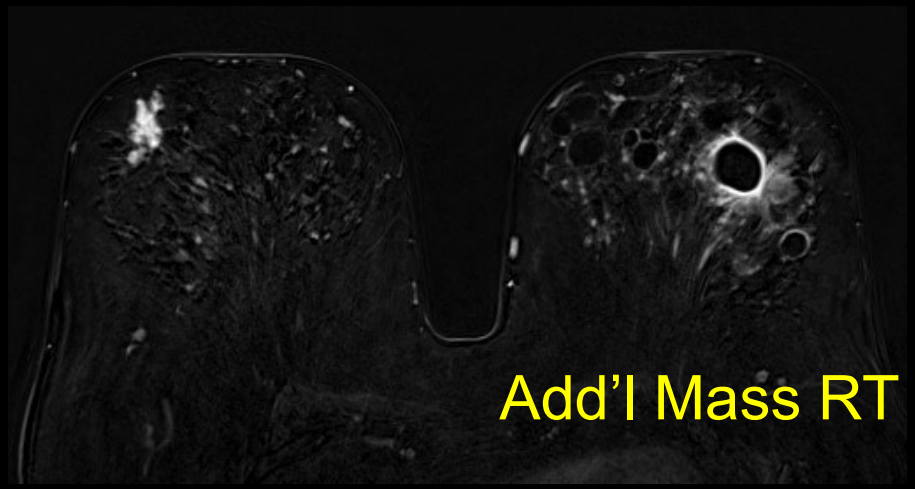
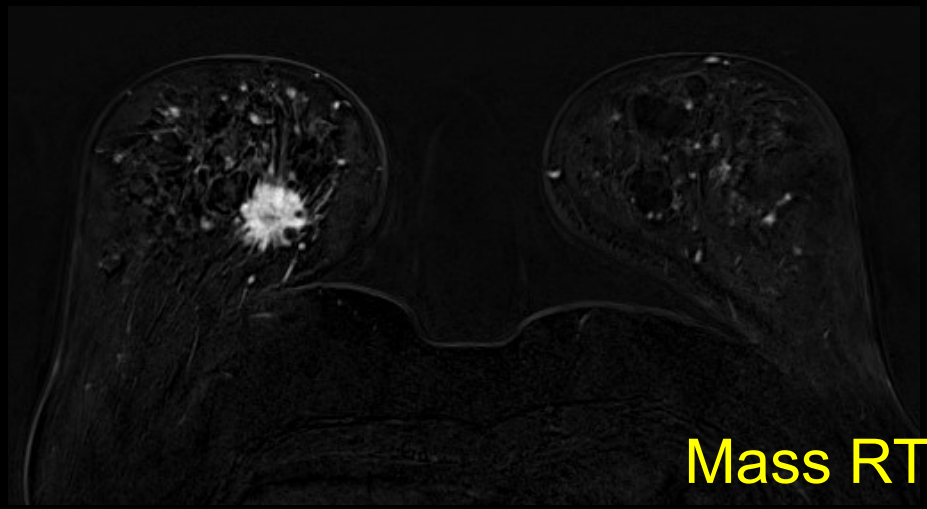


T1 +GD Subtracted Image: Mass RT 4:00

monticciolo

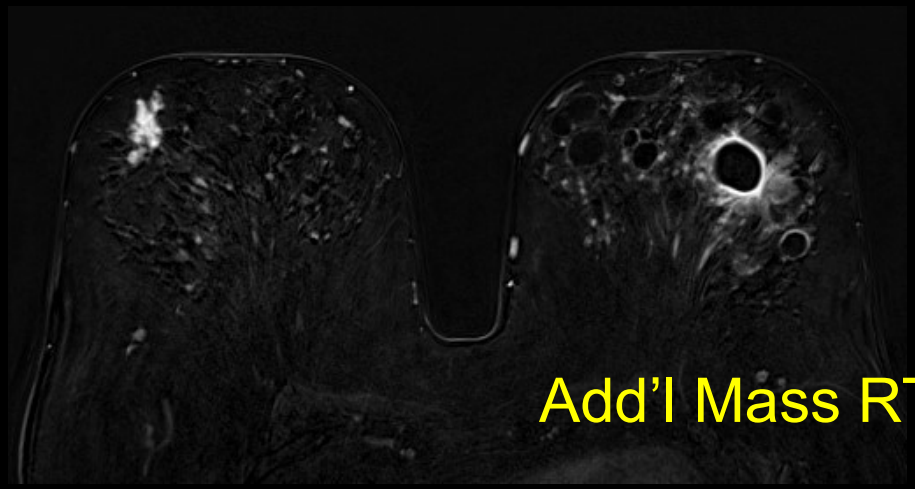
T1 +GD subtracted images

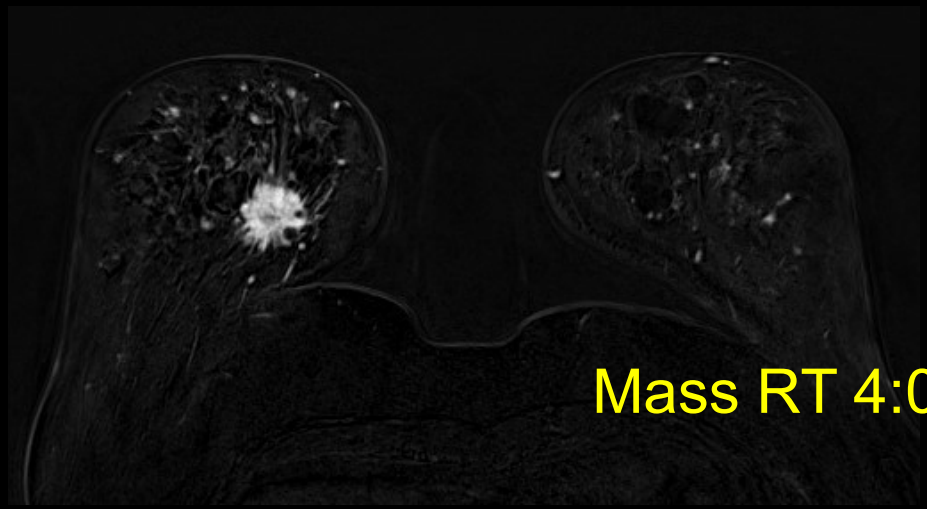




Multicentric Disease

IDC X 2





Breast MRI

- game changing for breast cancer detection
- more sensitive, more accurate
- even being looked at for average risk

Radiology

Supplemental Breast MR Imaging Screening of Women with Average Risk of Breast Cancer[1]

Christiane K. Kuhl, MD, PhD
Kevin Strobel, MD
Heribert Bieling, MSc
Claudia Leutner, MD
Hans H. Schild, MD, PhD
Simone Schrading, MD, PhD

Purpose: To investigate the utility and accuracy of breast magnetic resonance (MR) imaging as a supplemental screening tool in women at average risk for breast cancer and to investigate the types of cancer detected with MR imaging screening.

Materials and Methods: This prospective observational study was conducted at two academic breast centers in women aged 40–70 years without [illegible] risk <15%). [illegible]omen with [illegible] College of Radiology categories A–D) and normal conventional imaging findings (screening mammography with or without screening ultrasonography [US]) were invited to undergo supplemental MR imaging screening. Outcome measures were supplemental cancer detection rates, interval cancer rates,

Suppl CDR w/MRI = 15.5 / 1000

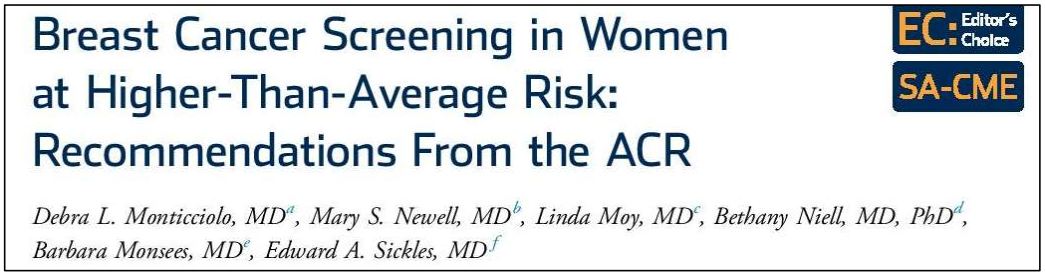
2017

Breast MRI

- game changing for breast cancer detection
- more sensitive, more accurate
- well tested in women at higher than average risk

High Risk Screening

- Who is at higher than average risk?
- MRI (and mammography) in these women
- Summary of ACR MRI recommendations



Populations at Higher Risk

- genetic predisposition

Populations at Higher Risk

- genetic predisposition

BRCA1, BRCA2
TP53, CHEK2 (Li-Fraumeni)
PTEN (Cowden, Bannayan-Riley-Ruvalcaba)
CDH1 (hereditary diffuse gastic cancer)
STK11 (Peutz-Jeghers)
PALB2 (interacts with BRCA2)
ATM

Populations at Higher Risk

- genetic predisposition

BRCA1, BRCA2

cumulative risk to age 80: 72% for *BRCA1*
69% for *BRCA2*

contralateral CA, 20-yr cumulative risk:
40% for *BRCA1*
26% for *BRCA2*

Kuchenbaecker et al. JAMA 2017

Populations at Higher Risk

- genetic predisposition

BRCA1, BRCA2

higher occurrence:
Ashkenazi Jewish Women
African American Women

BRCA Mutation Prevalence

- study of 46,276 women

African Ancestry	Western European
BRCA1, BRCA2	*BRCA1, BRCA2*
10.2% , 5.7%	6.9%, 5.2%

- inherited mutation: 22% of black women

Churpek et al. BrCaResTx 2014

BRCA Mutation Carriers

- disease is different, esp. for *BRCA 1* mutation

BRCA Mutation Carriers

Variable	BRCA1	BRCA2	Pvalue
Histology			0.002
IDC	**29 (96.7%)**	18 (62.1)	
ILC	0	1 (3.4)	
other	1 (3.3)	3 (10.3)	
DCIS	**0**	**7 (24.1)**	
Phenotype			<0.0001
luminal	3 (10.0)	20 (69.0)	
luminal HER2	0	0	
HER2 enriched	1(3.3)	0	
TNBC	**26 (86.7)**	7 (24.1)	

Japan

Adapted from Murakami et al. Breast Cancer;2019 Feb

BRCA Mutation Carriers

Cancer characteristic	BRCA1	BRCA2	High risk	P
Invasive Cancer Grade				<0.001
Grade 1	1/76(1.3)	4/44(9.1)	19/65(**29.2**)	
Grade 2	20/76(26.3)	32/44(**72.7**)	36/65(**55.4**)	
Grade 3	53/76(**69.7**)	6/44(13.6)	10/65(15.4)	
Receptor Status				<0.001
ER+,PR+,HER2-	26/76(34.2)	31/44(70.5)	49/65(**75.4**)	
HER2 +	4/76(5.3)	3/44(6.8)	11/65(16.9)	
TNBC	43/76(**56.6**)	5/44(11.4)	3/65(4.6)	

Germany

Adapted from Bick et al. Breast Cancer Res Treat. 2019 May;175(1)

BRCA Mutation Carriers

- disease is different, especially for *BRCA 1*

- more high grade tumors
- more invasive ds (*BRCA 1*)
- more TNBC

- can mimic benign disease on imaging

Populations at Higher Risk

- genetic mutation carriers
- strong family history

Strong Family History

- high risk even without known mutations
- number, age at dx, first-degree
- risk assessment tools often used

Strong Family History

- risk assessment
  - Tyrer-Cuzick most comprehensive
  - existing models: discrimination only moderate
  - deep learning will be changing how we assess risk

Yala et al. Radiol 2019

Portnoi et al. AJR 2019

Strong Family History

- risk assessment
  - Tyrer-Cuzick most comprehensive
  - existing models: discrimination only moderate
  - deep learning will be changing how we assess risk
  - regardless, family history will remain important

Populations at Higher Risk

- genetic mutation carriers
- strong family history
- hx chest radiation at young age

Populations at Higher Risk

- genetic mutation carriers
- strong family history
- hx chest radiation at young age
  - dose 10Gy or more before age 30
  - ⬆ risk starts about 8 yrs post tx

Populations at Higher Risk

- genetic mutation carriers
- strong family history
- hx chest radiation at young age
- personal history of breast cancer

Personal History Breast CA

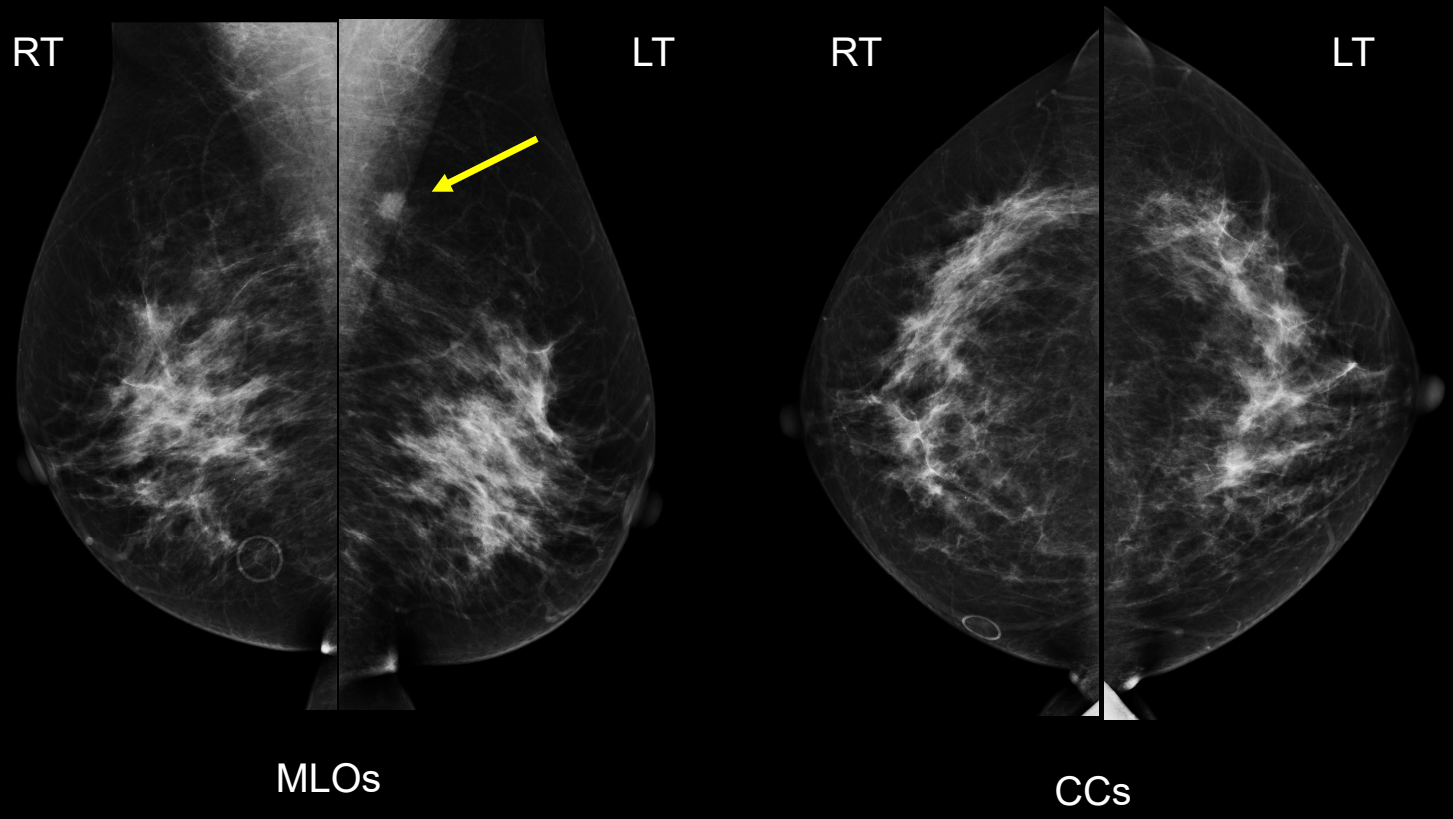
- meta-analysis 10,801 women
  - 10yr recur rate = 19.3%
  - 15yr cancer death rate = 21.4%

Darby et al. Lancet 2011

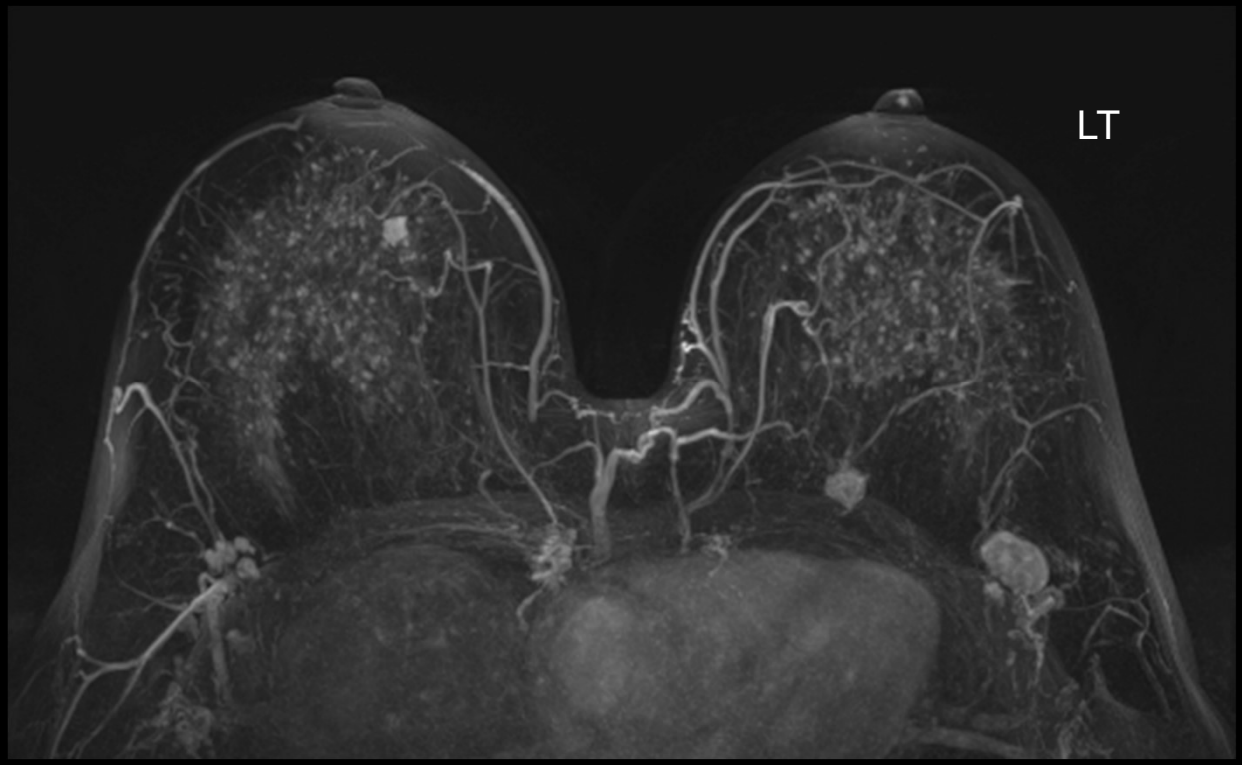
- contralateral risk 0.5-1.0% per year

Fowbie et al. IntJRadOncBioPhy 2001

Left Mass on Mammo



LT CA with RT CBC on MR



+Gd MIP

Personal History Breast CA

- contralateral surveillance
  - synchronous CBC = 4%
  - meta-analysis newly dx BrCA pts
  - 22 studies, N=3253

Brennan et al (2009) J Clin Oncol

Personal History Breast CA

- contralateral surveillance
  - synchronous CBC = 4%
  - metachronous CBC - decreased

Personal History Breast CA

- meta-analysis 10,801 women
  - 10yr recur rate = 19.3%
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Darby et al. Lancet 2011

- contralateral risk 0.5-1.0% per year

Fowbie et al. IntJRadOncBioPhy 2001

- dx before age 50 = >20% lifetime risk

Punglia et al. JClinOnc 2010

Populations at Higher Risk

- genetic mutation carriers
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- hx chest radiation at young age
- personal history of breast cancer
- hx ADH, ALH, or LCIS

Populations at Higher Risk

- genetic mutation carriers
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  - RR invasive ds with ADH 4-5X
  - RR invasive ds with LCIS 6-10X

Populations at Higher Risk

- genetic mutation carriers
- strong family history
- hx chest radiation at young age
- personal history of breast cancer
- hx ADH, ALH, or LCIS
- black women

Risk for Black Women

- higher incidence of genetic mutation

- CA incidence now equals Non-Hispanic Whites
- death rate 39% higher than Non-Hispanic Whites

- 2-fold higher rate of TNBC

Amirikia et al. Cancer 2011
Kohler et al. JCNI 2015
Newman et al. JAMA Surg 2017

Populations at Higher Risk

- genetic mutation carriers
- strong family history
- hx chest radiation at young age
- personal history of breast cancer
- hx ADH, ALH, or LCIS
- black women

ACR is the
FIRST guideline
to recognize this group

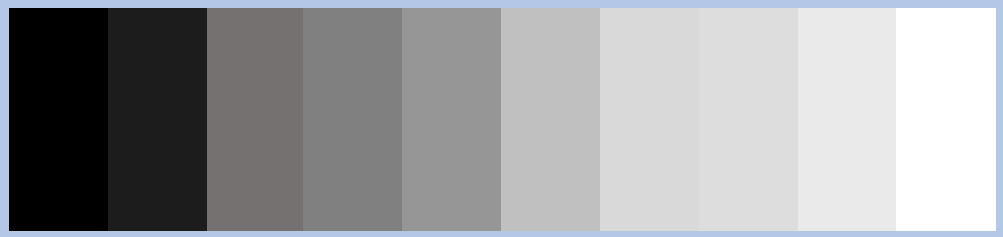
Populations at Higher Risk

- genetic mutation carriers
- strong family history
- hx chest radiation at young age
- personal history of breast cancer
- hx ADH, ALH, or LCIS
- black women
- dense breasts

Dense Tissue and Risk

entirely fatty
10%

extremely dense
10%

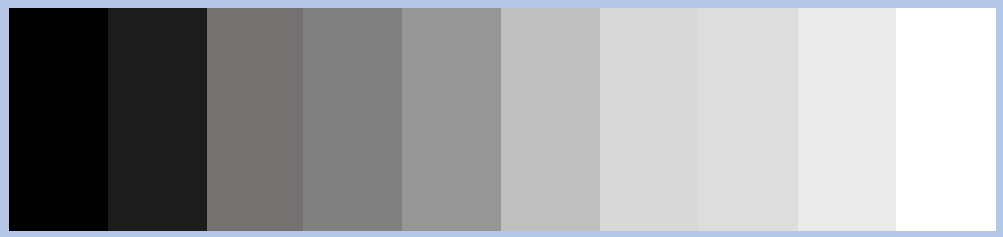


4.5 X

Dense Tissue and Risk

entirely fatty
10%

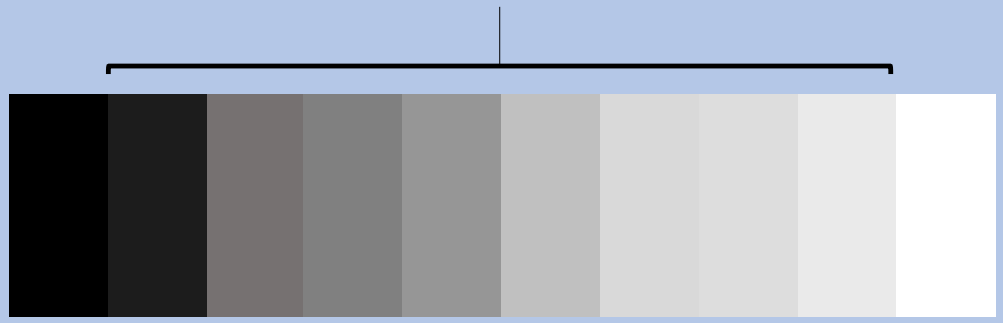
extremely dense
10%



usually discuss risk
compared to the average woman

Dense Tissue and Risk

average woman
80%

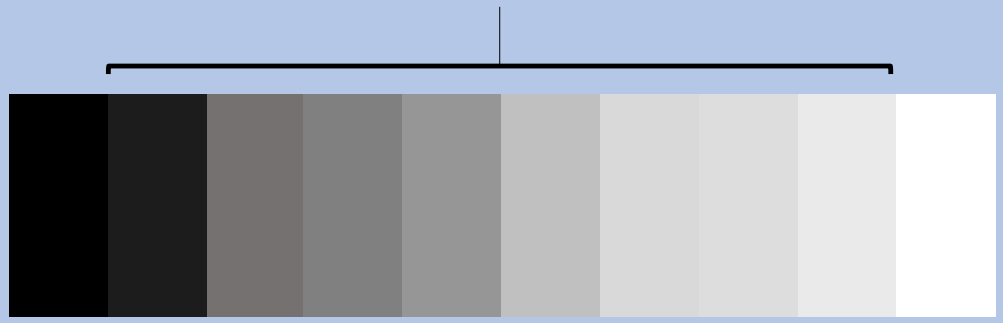


usually discuss risk
compared to the average woman

Dense Tissue and Risk

average woman

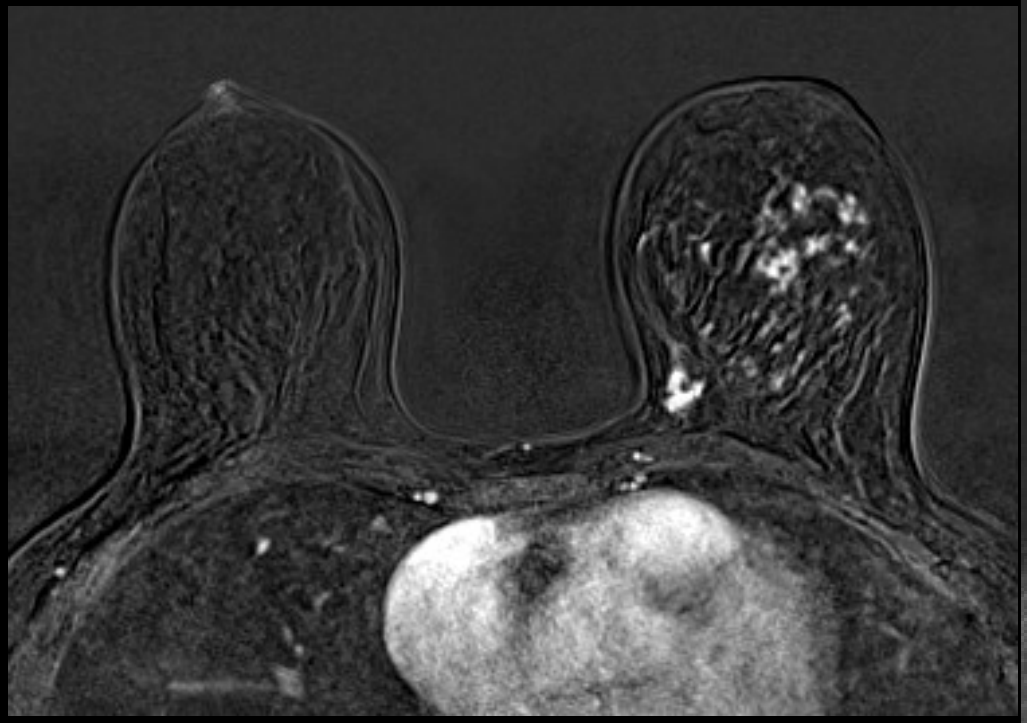
80%

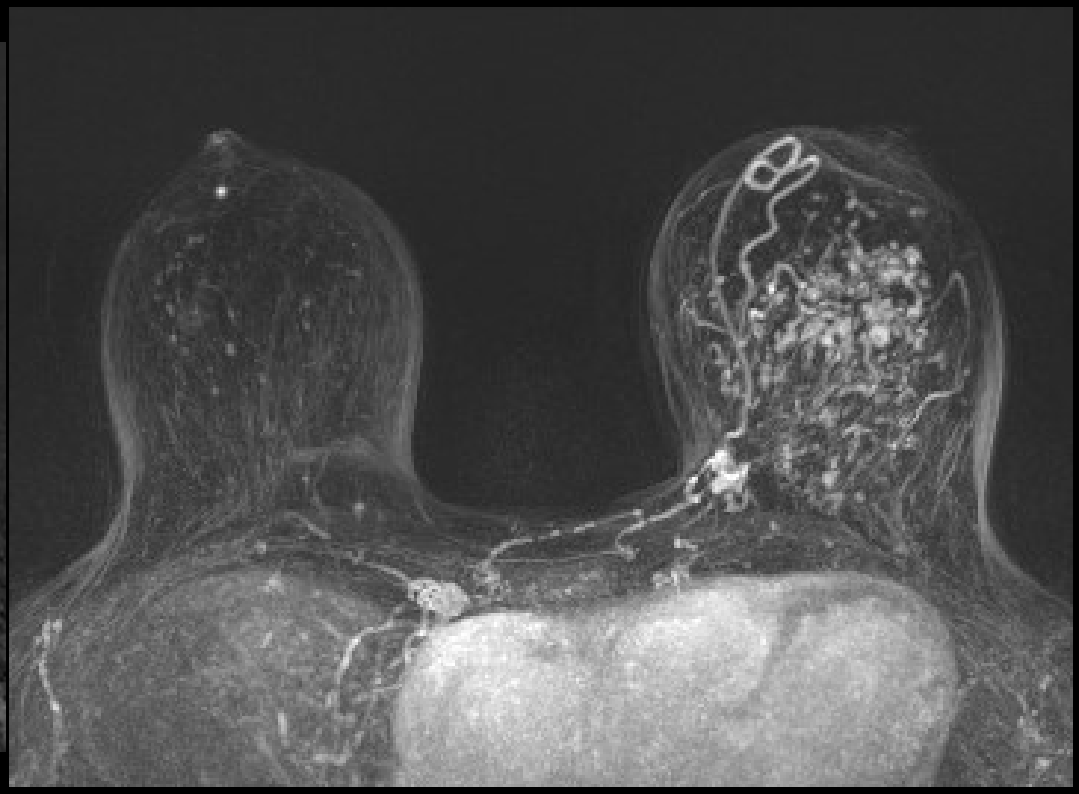


risk is 1.5X

Sprague et al. JNCI 2014
Cummings et al. JNCI 2009

much more disease than seen on mammo / US



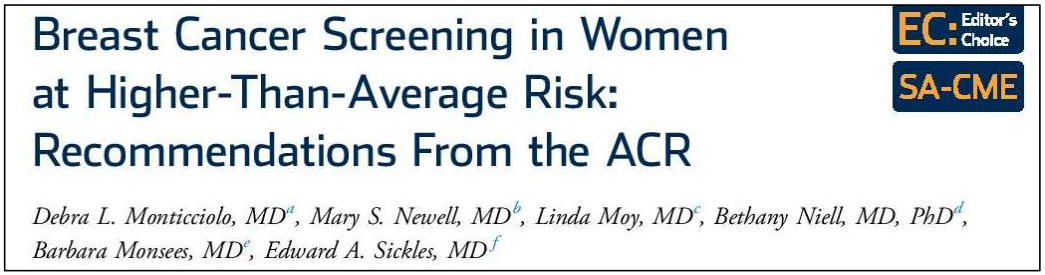


Populations at Higher Risk

- genetic mutation carriers
- strong family history
- chest RT at young age
- personal history of breast cancer
- hx ADH, ALH, or LCIS
- black women
- dense breast tissue

High Risk Screening

- Who is at higher than average risk?
- MRI (and mammography) in these women
- Summary of ACR MRI recommendations



MRI for High Risk Women

MRI for High Risk Women

Sensitivity (%)

Study	N	MAM	US	MRI
Kriege et al 2004	1909	33	-	80
Warner et al 2004	236	36	33	77
Kuhl et al 2005	529	33	40	91
Weinstein et al 2009	609	33	17	71
Kuhl et al 2010	687	33	37	93
Sardanelli et al 2011	501	50	52	91

MRI for High Risk Women

	Sensitivity (%)		
Study	**MAM**	**US**	**MRI**
Riedl et al 2015 *BRCA 1,2;* 20% or higher risk	**37.5**	**37.5**	**90.0**
van Zelst et al 2017 *BRCA 1,2* positive only	**37**	**32**	**68**
Lo et al 2017 mixed high risk population	**31**	**----**	**96**
Vreemann et al 2018 *BRCA 1,2;* 20% or higher risk	**57.4**	**----**	**91.5**

MRI for High Risk Women

- more sensitive than conventional imaging
- more favorable outcomes

RCT: MRI in High Risk Women

- randomized controlled trial (RCT) reported **2019**

- at least 20% risk; excluded mutation carriers

12 hospitals; Netherlands; N=1587; patients 30-55 yrs; screened 2011-2017

Saadatmand et al,FaMRIsc study group.
Lancet Oncol. 2019 Jun 17[epub ahead of print]

RCT: MRI in High Risk Women

- randomized controlled trial (RCT) reported **2019**

MRI GROUP

annual MRI
biennial mammo
clinical exam

MAMMO GROUP

annual mammo
clinical exam

Saadatmand et al,FaMRIsc study group.
Lancet Oncol. 2019 Jun 17[epub ahead of print]

RCT: MRI in High Risk Women

	MRI group N=674	Mammo group N=680	p value
cancers detected	40	15	0.0017
median size, cm (invasive)	**0.9**	**1.7**	0.010
node positive	4/24 (**17%**)	5/8 (**63%**)	0.023

Saadatmand et al,FaMRIsc study group.
Lancet Oncol. 2019 Jun 17[epub ahead of print]

RCT: MRI in High Risk Women

Incident Rounds tumor stage	MRI group N=674	Mammo group N=680	p value
			0.035
Tis	7/25 (28%)	7/15 (47%)	
T1a+T1b	12/25 (**48%**)	1/15 (**7%**)	
T1c	5/25 (20%)	5/15 (33%)	
T2 or higher	1/25 (4%)	2/15 (13%)	

Saadatmand et al,FaMRIsc study group.
Lancet Oncol. 2019 Jun 17[epub ahead of print]

RCT: MRI in High Risk Women

Incident Rounds node status	MRI group N=674	Mammo group N=680	p value
positive	2/18 (**11%**)	5/8 (**63%**)	0.014
negative	16/18 (89%)	3/8 (38%)	

Saadatmand et al,FaMRIsc study group.
Lancet Oncol. 2019 Jun 17[epub ahead of print]

RCT: MRI in High Risk Women

MRI Group

- cancers smaller and less node +
- tumors earlier stage in incident rounds
- lower number of late stage cancers

first RCT to show shift in tumor stage by adding MRI

Saadatmand et al,FaMRIsc study group.
Lancet Oncol. 2019 Jun 17[epub ahead of print]

ACR RECOMMENDATION

MRI for High Risk Women

- MRI recommended for:
  - gene + and 1st degree relatives
  - chest RT at young age
  - calculated risk 20% or more

ACR RECOMMENDATION

MRI for High Risk Women

- *BRCA 1/2* carriers:
  - start MRI at age 25
  - mammo at age 30

consider data on mammo in BRCA 1:
only small gain if <age40 and having yearly MRI

MRI vs Mammo in BRCA 1/2

- BRCA 1 considered more radiation sensitive

- many studies small, retrospective
- early studies: film mammography; no DBT

- gain is 4-9% in sensitivity for BRCA 1 carriers

MRI vs Mammo in BRCA 1/2

- 1/3 of all BRCA 2 cancers = mammo ONLY

Phi et al. Br J Cancer 2016;114:631-637

- BRCA 2 more cancers with calcs (61.5%)

Murakami et al. Breast Cancer;2019 Feb

ACR RECOMMENDATION

MRI for High Risk Women

- *BRCA 1/2* carriers:
  - start MRI at age 25
  - mammo at age 30
- chest RT patients:
  - start MRI at age 25
  - mammo 8 yrs after RT/not before 25

ACR RECOMMENDATION

MRI for High Risk Women

- MRI recommended for:
  - gene + and 1st degree relatives
  - chest RT at young age
  - calculated risk 20% or more

- ? others with elevated risk?

Prior Recommendations: Neither For nor Against

- lifetime risk 15-20%
- personal history of breast cancer
- atypia: ADH, ALH, or LCIS
- heterogeneously or extremely dense breasts

(black women not previously considered high risk)

ACR - JACR 2010
ACS - CA Cancer J Clin 2007

Women Who Want Breast MRI:

- lifetime risk 15-20%
- personal history of breast cancer
- atypia: ADH, ALH, or LCIS
- heterogeneously or extremely dense breasts

(black women not previously considered high risk)

ACR - JACR 2010
ACS - CA Cancer J Clin 2007

Populations at Higher Risk

- genetic mutation carriers
- strong family history
- chest RT at young age
- personal history of breast cancer
- hx ADH, ALH, or LCIS
- black women
- dense breast tissue

MRI in Women with a Personal History of Breast Cancer

Author (year)	N	CDR (per 1000)	Sensitivity (%)	Specificity (%)
Brennan (2010)	144	118.1	---	---
Gweon (2014)	607	18.1	91.7	82.2
Schacht (2014)	208	28.8	---	---
Giess (2015)	691	10	100	89.9
Weinstock (2015)	249	44.2	84.6	95.3
Lehman (2016)	915	19.7	80.0	94.0
Cho (2017)	754	7.3	88.2	89.9
Choi (2018)	725	15.0	100	89.2

Choi et al. Breast Cancer Res Treat 2018

MRI in Women with a Personal History of Breast Cancer

- Choi et al (2018) used AB-MRI in women w/ personal hx breast cancer

- CDR = 15.0
- 58.3% of cancers NOT visible on US or mammo
- ZERO interval cancers with MRI surveillance

Choi et al. Breast Cancer Res Treat 2018

MRI in Women with a Personal History of Breast Cancer

- performs better than with genetic/family hx

fewer recalls and false positives
equivalent CDR and sensitivity

Lehman et al. JNCI 2016; Cho et al. JAMA Oncol 2017
Gweon et al. Radiol 2014; Punglia et al. JClinOnc 2010

MRI in Women with a Personal History of Breast Cancer

- performs better than with genetic/family hx
- beneficial < age 65, especially 50 or less

Punglia et al. JClinOnc 2010
Cho et al. JAMA Oncol 2017

- beneficial with dense tissue

Nadler et al. Breast 2017

MRI in Women with a Personal History of Breast Cancer

Imaging in women 50 years or younger at diagnosis and treated with breast conservation therapy

	MRI + MAMMO	MAMMO ONLY
CDR (per 1000)	8.2	4.4
SENSITIVITY	100%	53%
SPECIFICITY	87%	96%
(note: no interval cancers occurred)		

Cho et al. JAMA Oncol 2017

MRI in Women with a Personal History of Breast Cancer

recommend yearly MRI screening for those diagnosed under age 50 or with dense breasts

MRI in Women with a Personal History of Breast Cancer

- Sippo et al 2019
- N=2637; 5170 scr exams

four groups

- BRCA/RT
- Family History (FH)
- Personal BrCa History (PH)
- History of High Risk Lesion (HRL)

Sippo et al. Radiology. 2019 Jul;292(1):51-59

MRI in Women with a Personal History of Breast Cancer

GROUP	CDR (/1000)	P c/w BRCA/RT	PPV3	P c/w BRCA/RT
BRCA/RT	26		41%	
FH	8	0.02	14%	.048
PH	12	0.14	41%	0.63
HRL	15	0.18	36%	0.37
ALL	13			

Sippo et al. Radiology. 2019 Jul;292(1):51-59

Populations at Higher Risk

- genetic mutation carriers
- strong family history
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MRI and Atypia, LCIS

LCIS

- relative risk: 10-fold increase
- either breast
- long interval to invasive disease

CA Detection with MR

Pt with LCIS	Other High Risk Groups
2-5%	2-7%

good, but limited data

MRI for High Risk Women

- LCIS, atypia: not enough data
- same for black women, dense tissue

as independent risk factors

MRI for High Risk Women

- LCIS, atypia: not enough data
- same for black women, dense tissue

DENSE TISSUE

Dense Tissue

- how best to image?
- US considered; High Risk = ACRIN 6666

US in High Risk Women

ACRIN 6666 (high risk + dense;N=2809)

false positives double

biopsies double

94% of biopsies generated by US only are NEGATIVE

US in High Risk Women

ACRIN 6666 (high risk + dense)

Cancer Detection Rate (CDR)

CDR for US = 4 / 1000

US in High Risk Women

ACRIN 6666 (high risk + dense)

Cancer Detection Rate (CDR)

CDR for US = 4 / 1000

after 3 years of negative US, **1** MRI was offered

US in High Risk Women

ACRIN 6666 (high risk + dense)

Cancer Detection Rate (CDR)

CDR for US = 4 / 1000

after 3 years of negative US, **1** MRI was offered

CDR for MRI = 15 / 1000

Breast MR and Dense Breasts

- extremely dense only – **DENSE TRIAL** (Netherlands)
- suppl MRI for women 50-75 with extremely dense neg mammo
- **interval cancers**: first indicator of morbidity/mortality change

Bakker et al. NEJM 2019

DENSE trial – Netherlands; RCT

	Interval CA Rate per 1000	
	Mammo Only	MR + Mammo
invitation to MR*	5.0	2.5 (p<0.001)
actually had MR	5.0	0.8

*59% accepted

Bakker et al. NEJM 2019

DENSE trial – Netherlands; RCT

second round: published 2021

N=3436 w/ second MRI screening

incremental CDR: 5.8 per 1000
(c/w 16.5 per 1000 first round)

all tumors stage 0-I and node negative

marked reduction in false positives

Veenhuizen et al. Radiology 2021;299:278-286

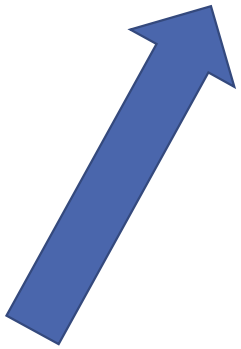
Dense Breasts: Abbrev MRI vs DBT

Digital Breast Tomosynthesis

monticciolo

EA1141, Comstock et al. JAMA 2020;323:746-756

Dense Breasts: Abbrev MRI vs DBT



Abbreviated MRI

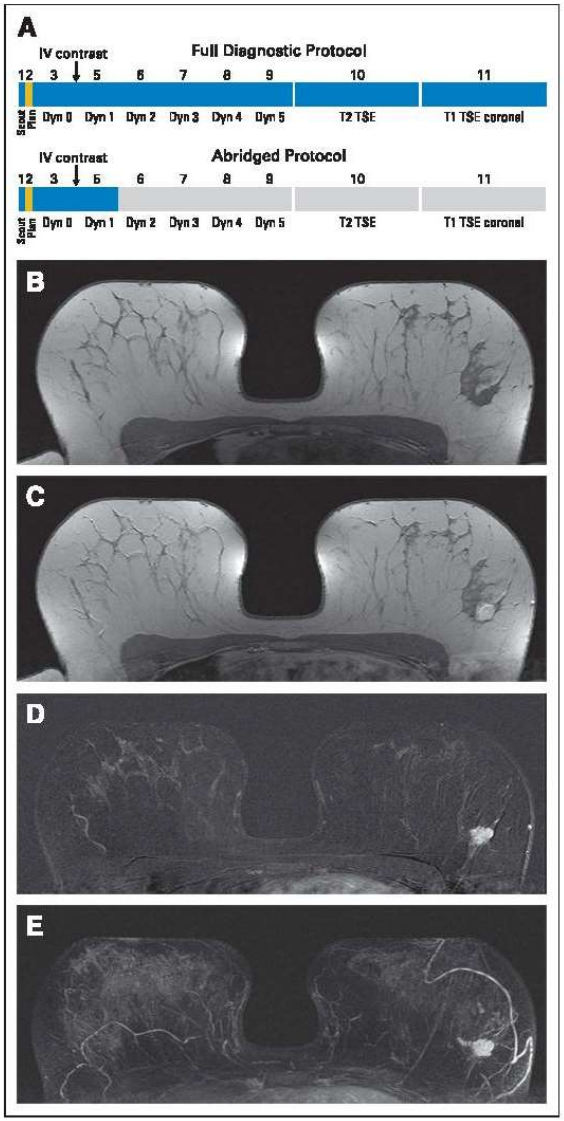
- introduced by Kuhl (2014)
- limited pulse sequences to save time in screening

Kuhl et al. J Clin Oncol 2014

Abbreviated MRI

- introduced by Kuhl (2014)

- pre&post
- subtracted image
- MIP



Kuhl et al. J Clin Oncol 2014

Abbreviated MRI

abbreviated

full protocol

Table 3. Diagnostic Indi

Index	MIP Images*		FAST Images		FDP	
	%	95% CI	%	95% CI	%	95% CI
First screening round (n = 443)						
Sensitivity	90.9	58.7 to 99.7	100.0	71.5 to 100.0	100.0	71.5 to 100.0
Specificity	NA	NA	94.4	91.8 to 96.4	94.9	92.4 to 96.8
PPV	NA	NA	31.4	16.9 to 49.3	33.3	18.0 to 51.8
NPV	99.7	98.2 to 100.0	100.0	99.1 to 100.0	100.0	99.1 to 100.0
Entire screening period (n = 606)						
Sensitivity	90.9	58.7 to 99.7	100.0	71.5 to 100.0	100.0	71.5 to 100.0
Specificity	NA	NA	94.3	92.1 to 96.0	93.9	91.7 to 95.7
PPV	NA	NA	24.4	12.9 to 39.5	23.4	12.3 to 38.0
NPV	99.8	98.7 to 100.0	100.0	99.3 to 100.0	100.0	99.3 to 100.0

Abbreviations: FAST, first postcontrast subtracted; FDP, full diagnostic protocol; MIP, maximum-intensity projection; NA, not applicable; NPV, negative predictive value; PPV, positive predictive value.

*MIP images were read as positive or negative depending on whether significant enhancement was observed; no actual differential diagnosis was attempted based on MIP images.

Kuhl et al. J Clin Oncol 2014

Dense Breasts: Abbrev MRI vs DBT

Rate of detection of Invasive cancer and DCIS

	Imaging modality	DBT	AB-MRI
	Total participants	1444	1444
Primary end points	Invasive cancer detected	7	17
	DCIS detected	2	6[b]
	Invasive cancer or DCIS detected	9	22[b]
Secondary end points	Sensitivity (95% CI)[c]	39.1% (22.2%-59.2%) [9/23]	95.7% (79.0%-99.2%) [22/23]
	Specificity (95% CI)[c]	97.4% (96.5%-98.1%) [1371/1407]	86.7% (84.8%-88.4%) [1220/1407]
	PPV of biopsy (95% CI)[c]	31.0% (17.0%-49.7%) [9/29]	19.6% (13.2%-28.2%) [21/107]
	Additional imaging recommendation (95% CI)[c]	10.1% (8.7%-11.8%) [146/1444]	7.5% (6.2%-9.0%) [108/1444]

EA1141, Comstock et al. JAMA 2020;323:746-756

Dense Breasts: Abbrev MRI vs DBT

invasive cancer detection rate (CDR) per 1000

MRI =11.8

DBT =4.8

EA1141, Comstock et al. JAMA 2020;323:746-756

MRI for High Risk Women

- LCIS, atypia: not enough data
- same for black women, **dense tissue**

- Dense Tissue and Early Breast Neoplasm Screening (DENSE) trial
- EA1141: Abbreviated Breast MRI for Screening Women w/Dense Breast

Populations at Higher Risk

- genetic mutation carriers
- strong family history
- chest RT at young age
- personal history of breast cancer
- hx ADH, ALH, or LCIS
- black women
- dense breast tissue

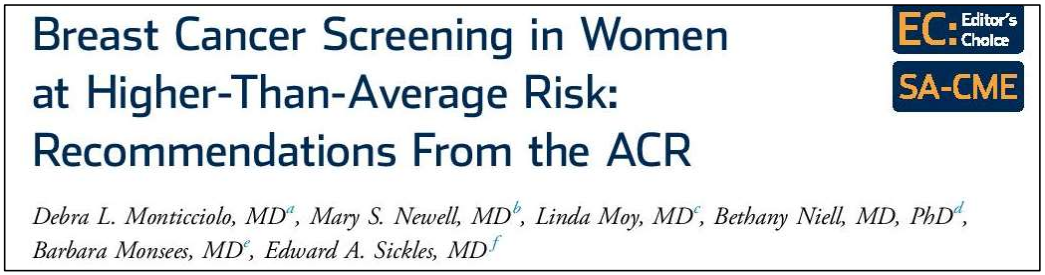
ACR RECOMMENDATION

MRI recommendations:

- **genetic mutation carriers**
- **strong family history**
- **chest RT at young age**
- **personal history of breast cancer**
- hx ADH, ALH, or LCIS
- black women
- dense breast tissue

High Risk Screening

- Who is at higher than average risk?
- Mammography and MRI in these women
- Summary of ACR MRI recommendations



Summary of Breast MRI in High Risk Pts

- highest risk groups should have supplemental MRI

genetic mutation carriers
RT treated young age
family history
personal history

Summary of Breast MRI in High Risk Pts

- highest risk groups should have supplemental MRI
- more data needed for atypia, dense breasts

Summary of Breast MRI in High Risk Pts

- highest risk groups should have supplemental MRI
- more data needed for atypia, dense breasts
- black women should be recognized as high risk

THANK YOU

Use of Breast MRI in Women with Higher than Average Risk

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