



YOUNG WOMEN'S
BREAST CANCER
RESEARCH INSTITUTE

EMERGING ADVANCES IN BREAST IMAGING FOR YOUNG WOMEN

A 2026 Evidence Digest on Breast Cancer in Young Women

Selected Highlights · Emerging Evidence · Future Directions

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YWBCRI AND THE IMAGING SERIES

THE INSTITUTE

The Young Women's Breast Cancer Research Institute (YWBCRI), USA, is a global, collaborative research institute dedicated to understanding the earliest biological processes that influence breast cancer risk and progression among young women.

YWBCRI advances breast cancer research upstream—before tumors form or cancer becomes clinically visible. Its human-focused, systems-level approach examines early and potentially reversible biological states shaped by metabolism, mitochondrial function, immune regulation, hormonal influences, developmental timing, environmental exposures, and the surrounding tissue ecosystem.

Through this approach, the Institute seeks to generate knowledge that may support risk prediction, earlier detection, biological interruption, and prevention.

THREE INTEGRATED PROGRAMS

01 | MITOCHONDRIAL
FIELD EFFECT

02 | MICROINVASIVE
DCIS BIOLOGY

03 | SYSTEMIC
SIGNAL DETECTION

YWBCRI is a scientific research initiative of the Breast Cancer in Young Women Foundation.

THE SERIES

Emerging Advances in BCYW Imaging is an educational evidence series highlighting 12 recent studies and selected ongoing or completed NCI-listed clinical trials relevant to breast imaging in young women.

The series examines ultrasound, mammography, breast density, MRI, risk-based screening, genetic risk, AI, radiomics, surgical planning, and prognosis.

Each study follows a consistent framework: the evidence gap, population and design, principal findings, BCYW relevance, and a take-home message.

This educational digest presents emerging evidence, clinical-trial research, and future directions—not clinical guidelines or recommendations for individual care.

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Imaging Breast Cancer in Young Women: Moving Toward Early Detection and Biological Insights

Breast imaging has historically been organized by age because breast cancer incidence rises with age and screening is more effective when the disease is more prevalent. However, age alone doesn't capture all risk factors, including breast density, genetic predisposition, reproductive history, tumor characteristics, and how the disease presents in younger women.

For most women under 25–40 at average risk, routine screening is generally not recommended. Instead, breast cancer in this age group is typically evaluated after symptoms develop or through monitoring for known risk factors. Younger women present a unique imaging challenge: how to detect clinically significant disease earlier without exposing a large, low-risk group to unnecessary imaging, false alarms, biopsies, or anxiety.

This educational series examines studies and selected NCI-listed clinical trials addressing these challenges, including selective ultrasound follow-up for young women with benign masses, imaging during fertility treatment, MRI for women with familial risk, MRI's prognostic value, and its influence on surgical decisions.

Many studies are moving beyond traditional age-based screening and exploring personalized approaches, including risk-adapted screening, polygenic risk scores, breast-density notifications, AI, and radiomic analysis. MRI is used not only for detection but also to assess tumor characteristics, treatment response, and recurrence risk. These promising studies vary in age definitions, populations, imaging methods, outcomes, and clinical maturity. These advances show that breast imaging is gradually shifting away from a single age cutoff toward methods that integrate risk factors, density, genetics, clinical details, and biological data.

LOOKING AHEAD

For young women, the future of imaging hinges on more than just earlier traditional screening. It also requires smarter strategies and prospective research to determine who needs imaging, when to start screening, which modality to use, and what biological insights images can provide.



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THE 12 ADVANCES AT A GLANCE

Studies 01–06

01

BI-RADS 3 MASSES UNDER 35

In 191 average-risk women with 228 probably benign masses, all 71 biopsied lesions were fibroadenomas; no cancers or phyllodes tumors were found.

TAKE-HOME: Selected women may need one 6-month ultrasound followed by clinical surveillance.

02

ULTRASOUND DURING INFERTILITY CARE

Among 1,336 women aged 30–39, ultrasound detected four cancers; 95.6% had dense breasts and 88.6% of recalled women continued infertility treatment.

TAKE-HOME: Breast evaluation can be integrated into reproductive care with limited disruption.

03

HIGH-RISK MRI BEFORE 40

Only 7.9% of eligible women had ever received screening MRI, 3.6% had MRI in the preceding year, and 17.7% had genetic testing.

TAKE-HOME: Risk recognition and referral remain major implementation gaps.

04

PREOPERATIVE MRI AND SURGERY

In 102 women aged ≤ 40 , MRI found additional biopsy-worthy lesions in 53.9%; 45.5% were malignant. Additional carcinoma increased mastectomy likelihood more than sixfold.

TAKE-HOME: MRI can refine disease mapping and surgical planning.

05

PERITUMORAL EDEMA AND PROGNOSIS

In 149 women under 40, MRI-detected peritumoral edema independently predicted shorter disease-free survival (HR 3.65).

TAKE-HOME: When MRI is performed, it may contain prognostic information reflecting tumor and peritumoral biology.

06

DENSITY AND INTERVAL CANCERS

Among 235,333 screened women, interval-cancer rates were two to six times higher in women notified of dense breasts.

TAKE-HOME: Density signals both masking and risk and may inform individualized supplemental imaging.

THE 12 ADVANCES AT A GLANCE

Studies 07–12

07

GENETIC RISK AND EARLIER SCREENING

In 800 women aged 35–49, polygenic risk moved 41.3% to earlier screening; 15.5% were advised to begin immediately.

TAKE-HOME: Biological risk may help determine when breast surveillance should begin.

08

SCREENING BY RISK, NOT AGE ALONE

WISDOM randomized 28,372 women aged 40–74. Risk-based screening was noninferior for stage $\geq$ IIB cancers but did not reduce biopsies.

TAKE-HOME: Risk may eventually guide screening modality, interval, and starting age.

09

AI RISK BEYOND BREAST DENSITY

A deep-learning model evaluated 123,091 mammograms from 67,019 women aged $\geq$ 30. It outperformed density for predicting future cancer (AUROC 0.71 vs 0.53).

TAKE-HOME: Routine mammograms may contain risk signatures that identify women needing additional surveillance.

10

MRI PHENOTYPE IN WOMEN $\leq$ 40

Compared with women aged $\geq$ 50, younger women more often showed dense tissue, greater background enhancement, rim enhancement, T2 iso/hyperintensity, and persistent kinetics.

TAKE-HOME: Age-related MRI phenotypes may reflect underlying tumor biology.

11

MRI RADIOMICS AND RECURRENCE

In 181 women aged $\leq$ 40, intratumoral-peritumoral radiomics predicted recurrence with AUCs of 0.899 in training and 0.849 in testing.

TAKE-HOME: Tumor and surrounding tissue may provide a pretreatment recurrence-risk signature.

12

MRI HABITATS AND HER2 BIOLOGY

Among 375 women under 40, habitat radiomics outperformed whole-tumor analysis for distinguishing HER2-positive from HER2-negative disease.

TAKE-HOME: Spatial imaging heterogeneity may provide noninvasive information about molecular phenotype.

BI-RADS 3 MASSES UNDER 35

Can Probably Benign Breast Masses in Very Young Women be Followed Less Intensively?

1 Can BI-RADS 3 Masses in Very Young Women Be Followed Less Intensively?

Probably benign breast masses are common on ultrasound in young women, but how much surveillance is truly necessary?



Source: -----
Shpanskaya K, et al. Follow-up recommendations for young, average-risk women with BI-RADS 3 masses. J Breast Imaging, 2026;8:22–31.

? The Evidence Gap



BI-RADS 3 lesions usually undergo serial imaging, yet evidence supporting this approach in average-risk women under 35 is limited. This study tested whether follow-up could be safely reduced.

Population and Design



Investigators reviewed 191 average-risk women under 35 with 228 oval, parallel, circumscribed BI-RADS 3 masses. During two-year follow-up, 71 lesions were biopsied, mostly for interval growth.

Results and BCYW Relevance



Most masses remained stable or decreased in size. All biopsied lesions were fibroadenomas; **no cancers or phyllodes tumors were found.** The authors suggest that **one 6-month ultrasound followed by clinical surveillance** may suffice in carefully selected women.

For BCYW Imaging, The Message Is Clear



Appropriate vigilance **need not mean repeated imaging or biopsy** when risk and imaging features strongly favor benignity.

Take-Home Message



In carefully selected very young women with probably benign, well-defined BI-RADS 3 masses, a single 6-month ultrasound followed by clinical surveillance can be a safe and reasonable management strategy.

Breast Ultrasound Enters a New Setting: Young Women Undergoing Infertility Treatment

2

Breast Ultrasound Enters a New Setting: Young Women Undergoing Infertility Treatment

Source: Nakano K et al. Breast ultrasound screening in young adult women undergoing infertility treatment at an infertility clinic: a retrospective observational study. *Breast Cancer*. 2026;33:1093–1101.

Women undergoing infertility treatment represent a distinct reproductive-age population in whom breast evaluation may intersect directly with fertility care.



?

The Evidence Gap

Little is known about the value and practical impact of breast ultrasound screening in women in their 30s undergoing infertility treatment, particularly in populations with very dense breasts.



Population and Design

Investigators evaluated 1,336 women aged 30–39 undergoing infertility treatment. Ultrasound screening generated a 10.5% recall rate; 95.6% of participants had dense breasts.



Results and BCYW Relevance

Four cancers were detected—three invasive cancers and one DCIS—for a detection rate of **0.30%**. Importantly, **88.6%** of recalled women continued infertility treatment after diagnostic evaluation.



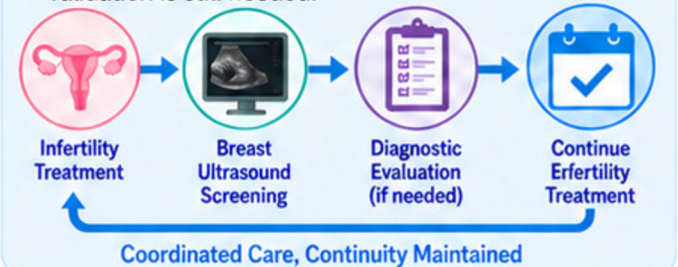
For BCYW Care, the Emerging Opportunity Is Integration

Breast imaging can be **integrated** with reproductive-age care **without unnecessarily disrupting** infertility treatment.



Take-Home Message

This study suggests a coordinated pathway is feasible: clinically important breast disease can be identified while most women continue infertility treatment. Prospective multicenter validation is still needed.



HIGH-RISK MRI BEFORE 40

High-Risk MRI Before 40: The Technology Exists, but Are We Reaching the Women Who Need It?

3 High-Risk MRI Before 40: The Technology Exists, but Are We Reaching the Women Who Need It?

Source:

Maini I, et al. Screening breast MRI and genetic testing utilization in high-risk population: analysis of National Health Interview Survey. *J Breast Imaging*. 2026;8:395–405.



MRI can support earlier surveillance in high-risk young women, but only if those at increased risk are identified and referred.

? The Evidence Gap



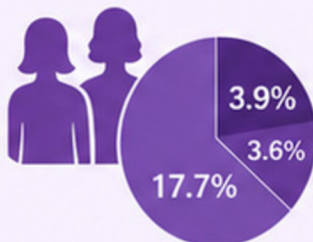
High-risk imaging pathways may begin years before routine mammography, yet the extent to which eligible women actually receive MRI or genetic evaluation remains uncertain.

Population and Design



Using U.S. National Health Interview Survey data, investigators examined women aged 25 or older with a first-degree relative diagnosed with breast cancer by age 50.

Results and BCYW Relevance



Only 7.9% had ever undergone screening breast MRI, 3.6% had MRI within the previous year, and 17.7% had completed genetic testing—revealing a substantial implementation gap.

For BCYW Care, the Key Challenge Is Not MRI Availability Alone



For BCYW care, the key challenge is not MRI availability alone, but **systematic early risk assessment, appropriate genetic evaluation, and reliable translation of risk into an imaging plan.**

Take-Home Message



Early risk identification and appropriate use of genetic testing and high-risk MRI are essential to ensure that high-risk young women receive the surveillance they need—early enough to make a difference.

PREOPERATIVE MRI AND SURGICAL PLANNING

Can Preoperative MRI Change Surgical Planning in Young Women?

4 Can Preoperative MRI Change Surgical Planning in Young Women?

Source:

Erguven T, et al. *Impact of breast MRI on the surgical management of young women with breast cancer. Clin Imaging.* 2026;129:110682.



MRI may contribute beyond tumor detection by defining disease extent and revealing otherwise occult malignancy before surgery.

? The Evidence Gap



The value of routinely adding preoperative MRI in young women remains debated, particularly whether additional findings meaningfully alter surgical management.

Population and Design



Investigators retrospectively studied 102 women aged 40 or younger with breast cancer treated at an academic practice.

Results and BCYW Relevance



MRI identified additional biopsy-worthy findings in **53.9%** of patients; **45.5%** were malignant, including **24** ipsilateral and **one** contralateral carcinoma. Additional carcinoma increased the likelihood of mastectomy more than **sixfold (aOR 6.34)**.

For BCYW Care, the Key Advance Is Upstream



For BCYW care, MRI is not simply another detection tool—it can **map otherwise occult disease and materially inform surgical planning** in appropriately selected young patients.

Take-Home Message



Preoperative MRI can identify additional clinically significant disease that may change the extent of surgery—supporting more personalized and effective surgical decisions for young women.

PERITUMORAL EDEMA AND PROGNOSIS

Breast MRI May Reveal Prognostic Biology: Peritumoral Edema in Women Under 40

5

Breast MRI May Reveal Prognostic Biology: Peritumoral Edema in Women Under 40

Source:

Tabar M, et al. Peritumoral edema on preoperative breast MRI is associated with reduced disease-free survival in young women with breast cancer. *Clin Imaging*. 2026;131:110735.



Breast MRI may offer information beyond tumor extent by revealing imaging features linked to disease behavior.

?

The Evidence Gap



Prognostic assessment relies largely on pathology, molecular subtype, and nodal status. Whether MRI features can provide additional biologically meaningful prognostic information in very young women remains less defined.

People

Population and Design



Investigators retrospectively analyzed preoperative breast MRI from 149 women younger than 40 with breast cancer and correlated imaging findings with disease-free survival.

Bar chart

Results and BCYW Relevance



PERITUMORAL EDEMA
HR 3.65
Shorter DFS



AXILLARY LYMPH-NODE POSITIVITY
Independently Adverse



Peritumoral edema independently predicted shorter **disease-free survival (HR 3.65)**; axillary lymph-node positivity was also independently adverse. Although retrospective and single-center, the study suggests routinely acquired MRI may capture features reflecting tumor biology.

Person

For BCYW Imaging, The Emerging Opportunity



For BCYW imaging, the emerging opportunity is to move beyond detection toward **imaging phenotypes that may contribute to individualized prognostic assessment.**

Shield with checkmark

Take-Home Message



Preoperative MRI features—such as peritumoral edema—may provide independent prognostic information in women under 40 and help move imaging from detection alone to **biologically informed, personalized care.**

DENSITY AND INTERVAL-CANCER RISK

Does Breast Density Identify Women at Greater Risk of Interval Cancer?

6

Does Breast Density Identify Women at Greater Risk of Interval Cancer?

Source:

Stone J, et al. The impact of breast density notification on interval cancer rates. *J Med Imaging Radiat Oncol.* 2026;70:169–174.



Dense breasts increase breast cancer risk and can reduce mammographic sensitivity, making interval cancers a screening concern.



The Evidence Gap



How density notification influences interval-cancer detection and screening-performance metrics remains incompletely defined.



Population and Design



Investigators analyzed 401,254 screening records from 235,333 women in the BreastScreen Western Australia program during 2016–2019, comparing interval-cancer rates by notification status and timing after screening.



Results and BCYW Relevance



Interval-cancer rates were **2–6 times higher** among women notified of dense breasts and were at least similar or higher during the first 12 months than months 13–24.



For BCYW Imaging, The Promise Is Striking



For BCYW imaging, density is not a reason to abandon mammography; rather, it identifies women in whom **masking, risk assessment, and supplemental imaging** deserve consideration.



Take-Home Message



Breast density is a powerful signal for interval-cancer risk and a guide for personalized screening strategies rather than a reason to avoid mammography.

GENETIC RISK AND EARLIER SCREENING

Can Genetic Risk Identify High-Risk Women Before Routine Screening Age?

7

Can Genetic Risk Identify High-Risk Women Before Routine Screening Age?

Source:

Tamm M, et al. *Clinical Implementation study of genetic risk-based breast cancer screening. Clin Breast Cancer. 2026;26:204–215.*



The BRIGHT study tested whether genetic risk assessment could move breast screening from fixed age thresholds toward individualized pathways.



The Evidence Gap



Age-based programs may miss younger women whose inherited risk warrants earlier surveillance.



Population and Design



The study enrolled 800 healthy Estonian women aged 35–49. Participants underwent polygenic risk-score testing, with monogenic variant testing when indicated, and received personalized screening recommendations.



Results and BCYW Relevance



Elevated polygenic risk led **330 women (41.3%)** to earlier screening recommendations; **124 (15.5%)** were advised to start immediately. One stage 0 cancer and one precancerous lesion were identified.



For BCYW Care, The Key Advance Is Upstream Identification



Biological **risk—not age alone**—may determine when breast surveillance should begin.



Take-Home Message



Genetic risk assessment can identify high-risk women earlier and guide personalized screening pathways—moving from fixed-age screening toward risk-informed care in young women.

SCREENING BY RISK, NOT AGE ALONE

Can Breast Screening Be Guided by Risk Rather Than Age Alone?

8

Can Breast Screening Be Guided by Risk Rather Than Age Alone?

Source: Esserman LJ, et al. *Risk-Based vs Annual Breast Cancer Screening: The WISDOM Randomized Clinical Trial.* JAMA. 2026;335:763–774.



The WISDOM trial tested whether screening intensity could be personalized according to an individual woman's risk rather than applied uniformly each year.



The Evidence Gap



Age-based screening is simple but does not capture major differences in inherited, clinical, and breast-density-related risk.



Population and Design



A total of 28,372 women aged 40–74 were randomized to annual or risk-based screening. Risk assessment incorporated clinical factors, breast density, polygenic risk, and pathogenic variants, with imaging ranging from delayed/biennial mammography to alternating mammography and MRI every six months.



Results and BCYW Relevance



Risk-based screening was **noninferior** for **stage $\geq$ IIB cancers** but did not reduce biopsy rates.



For BCYW Imaging, The Conceptual Advance Is Important



For BCYW imaging, the conceptual advance is important: **future screening may increasingly be determined by biological and inherited risk—not age alone.**



Take-Home Message

LOW RISK
Delayed/Biennial Mammography

INTERMEDIATE RISK
Annual Mammography

HIGH RISK
Mammography + MRI
Every 6 Months

Risk-based approaches tailor when and how women are screened—a future in which risk, not age alone, determines screening intensity.

AI RISK BEYOND BREAST DENSITY

Can Mammograms Reveal Future Risk Beyond Breast Density?

9 Can Mammograms Reveal Future Risk Beyond Breast Density?

Source: Lamb LR, Mercaldo SF, Carney A, Lehman CD. *A Deep Learning Breast Cancer Risk Model for Precise Supplemental Screening*. JAMA Network Open. 2026;9.



Deep learning may extract future breast-cancer risk directly from routinely acquired mammograms.

? The Evidence Gap



Breast density guides supplemental imaging but is a relatively imprecise, visually assessed risk marker. The study asked whether image-derived AI risk could better identify women needing additional surveillance.

Population and Design



Investigators analyzed 123,091 screening mammograms from 67,019 women aged ≥ 30 across five sites, assessing cancers within five years and false-negative screens.

Results and BCYW Relevance



Deep learning outperformed breast density for predicting future cancer (AUROC **0.71 vs 0.53**); high-risk scores also identified substantially more false-negative examinations.

For BCYW Imaging, The Promise Is Striking



The mammogram itself may carry **a risk signature** that helps determine who warrants supplemental surveillance—**beyond density alone**.

Take-Home Message



Image-based AI risk modeling may enable more precise identification of young women who could benefit from supplemental screening.

Can MRI Phenotype Reveal Distinctive Breast Cancer Biology in Women ≤40?

10

Can MRI Phenotype Reveal Distinctive Breast Cancer Biology in Women ≤40?

Source:

Gundogdu O, et al.
Distinct MRI phenotypes of breast cancer in women aged 40 and younger compared to older women.
Acta Radiol. 2026.



Breast MRI may show distinctive features in young women that reflect differences in tumor biology.



The Evidence Gap

Breast cancer in young women can differ biologically from disease diagnosed later in life, yet it is not well known whether these differences are reflected in recognizable MRI phenotypes. This study directly compared MRI characteristics by age.



Population and Design



- Investigators compared **80 women aged ≤40** with **80 women aged ≥50** with breast cancer.
- Evaluated breast composition, background parenchymal enhancement, tumor morphology, T2 signal, and contrast-enhancement characteristics.



Results and BCYW Relevance

- Younger women more frequently had dense fibroglandular tissue, greater background parenchymal enhancement, rim enhancement, T2 iso/hyperintensity, and persistent enhancement kinetics.
- Rim enhancement was associated with HER2-positive disease in younger women, while showing a different subtype relationship in older women.
- These findings suggest that imaging features may differ by age and reflect underlying tumor biology in young women.



For BCYW Imaging, The Promise Is Striking



MRI phenotype may reflect age-related differences in tumor biology—not simply tumor detection.

Apparent lower-risk imaging features should not automatically imply less aggressive disease in young women.



Take-Home Message



MRI characteristics in young women may provide important biological information that can support more personalized diagnosis, prognosis, and treatment planning.

Can MRI Radiomics Predict Recurrence in Women ≤ 40 Before Treatment?

11

Can MRI Radiomics Predict Recurrence in Women ≤ 40 Before Treatment?

Source:

Wu Z, et al. Pretreatment MRI-based radiomics for predicting recurrence and disease-free survival in young women with breast cancer after neoadjuvant chemotherapy. *J Comput Assist Tomogr.* 2026;50:390–402.



MRI contains quantitative information within and around a tumor that may help predict recurrence before treatment begins.



The Evidence Gap

Young women with breast cancer have heterogeneous outcomes, and conventional clinical and pathological factors do not capture all recurrence risk. Whether intratumoral and peritumoral MRI radiomics can improve pretreatment risk prediction specifically in women ≤ 40 remains insufficiently studied.



Population and Design



- Investigators studied **181 women aged ≤ 40** with breast cancer undergoing neoadjuvant chemotherapy.
- Radiomic features were extracted from both the tumor and surrounding peritumoral tissue on pretreatment MRI and integrated with clinical variables to develop prediction models.



Results and BCYW Relevance

- Combined intratumoral-peritumoral radiomics predicted recurrence with AUCs of **0.899** (training) and **0.849** (test).
- Adding clinical variables further improved performance to AUCs of **0.925** and **0.880**, respectively.
- The model also stratified disease-free survival.



For BCYW Imaging, The Promise Is Striking



Quantitative information from both the tumor and its surrounding tissue may provide an imaging signature of recurrence risk before treatment begins—an important step toward biologically informed, personalized imaging in young women.



Take-Home Message



MRI radiomics has the potential to identify young women at higher risk of recurrence and support more personalized treatment and follow-up strategies.

Can MRI “Habitat” Radiomics Reveal HER2 Biology in Young Women?

12 Can MRI “Habitat” Radiomics Reveal HER2 Biology in Young Women?

Source:

Jiang Y, et al.
MRI-based radiomics with intratumoral habitat analysis for prediction of HER2 expression in young women with breast cancer. *Front Oncol.* 2026.



Multiparametric MRI can capture intratumoral heterogeneity and may reveal molecular biology such as HER2 expression in young women.



The Evidence Gap



HER2 expression has major biological and therapeutic implications, including the emerging distinction between HER2-zero and HER2-low disease. Whether multiparametric MRI can capture intratumoral heterogeneity and noninvasively characterize HER2 expression specifically in women under 40 remains insufficiently studied.



Population and Design



- Investigators studied **375 women aged ≤40** with breast cancer from two centers, including **206** in the training cohort and **169** in an external validation cohort.
- Multiparametric DCE-MRI and DWI were used to divide tumors into distinct imaging “habitats.”
- Habitat-based radiomic features were compared with conventional whole-tumor radiomics and integrated with clinicopathological variables.



Results and BCYW Relevance



- The MRI habitat model outperformed conventional whole-tumor radiomics for distinguishing HER2-positive from HER2-negative disease (AUC **0.761** vs **0.731**).
- Combining habitat, whole-tumor, and clinicopathological information achieved an AUC of **0.768**.
- The study also explored imaging discrimination of HER2-zero versus HER2-low tumors.



For BCYW Imaging, The Promise Is Striking



Mapping distinct intratumoral “habitats” may reveal **spatial biological heterogeneity** and provide noninvasive information about **molecular phenotype**—another step toward biologically informed, personalized imaging in young women.



Take-Home Message



MRI radiomics with intratumoral habitat analysis has the potential to noninvasively identify HER2 biology in young women, supporting more personalized diagnosis, prognosis, and treatment planning.



CLINICAL TRIALS AND IMAGING RESEARCH TO WATCH

Selected Registered Studies with Relevance to Young Women

These ClinicalTrials.gov-registered studies examine imaging before routine screening age, surveillance for elevated risk, MRI-derived biological information, and imaging after a breast cancer diagnosis. Registry listing does not necessarily indicate NCI sponsorship.

NCT00989638

High-Risk Multimodality Surveillance

ACTIVE, NOT RECRUITING

Evaluates coordinated mammography and breast MRI surveillance in women at elevated risk, including some beginning surveillance at age 25 or earlier and survivors who received chest irradiation before age 30.

NCT05268913

MRI-Based Lipid Imaging in High-Risk Premenopausal Women

STATUS NOT RECENTLY VERIFIED; RELATED FINDINGS PUBLISHED IN 2026

Uses MRI and magnetic resonance spectroscopy to examine breast lipid composition in premenopausal women at elevated risk, including BRCA1/2 carriers, moving imaging beyond detection toward biological risk characterization.

NCT00610181

MRI-Detected Disease in Women Under 40

COMPLETED

Examined how often breast MRI identified additional areas of cancer in women diagnosed before age 40. The study is directly relevant to evaluating disease extent and informing surgical planning in younger patients.

NCT00165412

MRI Surveillance After Mediastinal Irradiation

COMPLETED

Compared breast MRI with mammography in women previously treated with mediastinal irradiation for Hodgkin lymphoma. It remains relevant to young survivors who may require surveillance before standard screening age.

WHAT THE TRIAL LANDSCAPE REVEALS

Very few contemporary imaging trials are designed specifically for women under 40. Most focus on inherited or familial risk, previous chest irradiation, imaging after diagnosis, or biological information derived from MRI. This reinforces the need for prospective, multicenter studies with clearly defined young-women populations and clinically meaningful outcomes.

For information about these and other registered clinical trials, visit [ClinicalTrials.gov](https://clinicaltrials.gov).

Breast Imaging in Young Women: Myths, Misconceptions, and Reality

How imaging really works in young women—and what every young woman must understand about breast imaging

Rakesh Kumar, PhD, and Samantha Heller, MD, PhD

Breast imaging in young women is often misunderstood because it differs from routine population screening. There is no one-size-fits-all approach, and imaging may involve multiple tests. The right approach depends on symptoms, age, breast density, individual risk, and the clinical question.

Myth 1: Mammograms Don't Work in Young Women

Reality: Younger women often have dense breast tissue, which can reduce mammographic sensitivity. However, “less sensitive” does not mean “ineffective.” Mammography remains important for diagnostic evaluation and is the best imaging method for detecting microcalcifications, which may be an early sign of ductal carcinoma in situ.

Myth 2: Dense Breasts Make Imaging Useless

Reality: Dense tissue can make abnormalities harder to detect on mammography, but imaging remains useful. When appropriate, complementary methods can offer additional information. Mammography, ultrasound, and MRI each have strengths and limitations, and one test may reveal what another does not fully show.

Myth 3: Ultrasound Is Better Than Mammography

Reality: Ultrasound is particularly useful for evaluating palpable lumps and distinguishing cystic from solid masses. It is widely available, uses no radiation, and provides real-time imaging. However, it may miss microcalcifications, is operator-dependent, and can yield false-positive results. Ultrasound complements mammography but does not replace it in every case.

Myth 4: MRI Is the Best Test, So Everyone Should Get It

Reality: MRI is highly sensitive and may detect cancers that mammography or ultrasound miss. However, it can also uncover noncancerous findings that lead to further imaging or biopsies and cause anxiety. MRI is especially useful for women at elevated risk, but it isn't right for everyone.

THE CENTRAL PRINCIPLE

Breast imaging isn't about one test always being better than another. Choosing the right modality depends on a woman's symptoms, age, breast density, and risk.

What Every Young Woman Should Understand

Myth 5: If My Imaging Is Normal, I'm Fine

Reality: Most women with negative breast imaging results do not have cancer. Still, every imaging method has limitations, so false-negative results can occur—particularly with dense breast tissue, subtle lesions, or fast-growing tumors. A persistent or clinically suspicious lump, bloody nipple discharge, or another concerning change should be evaluated further, even if imaging does not reveal a cause.

Myth 6: Radiation From Mammograms Is Dangerous

Reality: Radiation exposure from mammography is very low—roughly equivalent to two months of natural background radiation. When clinically appropriate, the potential benefit of detecting cancer outweighs this small risk. Avoiding necessary imaging may delay diagnosis rather than reduce risk.

Myth 7: Only Women with a Family History Need Imaging

Reality: Family history matters, but breast cancer can also develop in people with no family history. Risk depends on several factors, including inherited variants, breast density, hormonal and reproductive factors, previous medical exposures, and other biological influences. Symptoms—not family history alone—should guide diagnostic evaluation.

THE CLINICAL TRUTH: THERE IS NO SINGLE “BEST” TEST

For symptoms:

- **Under age 30:** Ultrasound is typically the initial test; mammography may be added as needed.
- **Ages 30–39:** Either ultrasound or diagnostic mammography may be appropriate initially, depending on the finding and clinical context.
- **Age 40 or older:** Diagnostic mammography is typically the initial examination, often supplemented by ultrasound.

For women at high risk:

MRI may begin around ages 25–30, with mammography commonly added around age 30, depending on the individual risk profile and professional guidance.

For persistent clinical concern:

Do not dismiss a suspicious finding solely because imaging is negative. Continued clinical assessment—and biopsy when indicated—may still be necessary.

A THOUGHT TO CARRY

Breast imaging is about choosing the right test at the right time and for the right reason. If something feels new, different, or persistent, don't wait—get evaluated. For young women, early detection begins not with a machine, but with noticing a change, taking it seriously, and seeking appropriate clinical care.

Adapted from the BCYWF Breaking the Myths Science Series. For the full article and supporting references, visit: breastcancerinyoungwomen.org/resources/

WHAT FEATURED STUDIES COLLECTIVELY REVEAL

Recent studies illustrate how breast imaging is evolving from a tumor-detection method to a comprehensive tool that provides insights into personal risk, hidden disease, tumor biology, prognosis, treatment options, and likelihood of recurrence. This shift is especially important for young women with breast cancer, since routine screening usually begins after the disease has already developed.

1 | The Future Is Not Simply Earlier Screening—It Is More Selective Imaging

Evidence indicates that a one-size-fits-all imaging schedule isn't suitable for young women. Screening should be personalized based on risk factors like genetics, breast density, imaging features, family history, and clinical background. The BI-RADS 3 study shows some very-low-risk findings may need less frequent screening, while the familial-risk MRI study reveals women who could benefit from more surveillance are often missed or misclassified.

2 | Risk May Eventually Determine When Imaging Begins

The BRIGHT and WISDOM studies challenge that age alone should dictate screening start and intensity. Factors like polygenic risk, variants, clinical history, and breast density shape risk profiles. Although WISDOM excluded women under 40 and doesn't provide direct evidence for screening younger women, its key insight is that future strategies could focus on biological and inherited risk rather than a fixed age threshold.

3 | Breast Density Is Both a Masking Factor and a Risk Signal

Dense tissue is vital for younger women as it can conceal cancers on mammograms and is linked to higher breast cancer risk. The density-notification study found increased interval cancer rates with dense breasts. An AI study indicated mammograms may provide additional predictive info beyond density. Thus, density should be part of a broader risk assessment and imaging plan.

4 | Imaging Is Moving Beyond Detection Toward Biological Interpretation

Multiple studies show images contain data on disease progression. Peritumoral edema independently links to reduced disease-free survival. MRI features differ between younger and older women, related to tumor subtypes by age. Both intratumoral and peritumoral radiomics help predict recurrence, and habitat-based radiomics reveal HER2 expression.

5 | The Tissue Around the Tumor Matters

Radiomics and peritumoral edema studies highlight that clinically relevant information goes beyond the tumor. Surrounding tissue reflects vascular, stromal, immune, and metabolic processes related to invasion, treatment response, and recurrence. This aligns with YWBCRI's perspective, as breast cancer develops within a tissue ecosystem, and imaging could offer a noninvasive view into it.

6 | Imaging Can Influence Decisions Across the Care Continuum

The studies cover surveillance of benign lesions, screening, diagnosis, surgical planning, prognosis, and treatment risk. Preoperative MRI detected additional malignancies affecting surgery. Ultrasound in infertility care shows imaging can be integrated with other healthcare without disrupting treatment.

7 | Access and Implementation Remain as Important as Technology

Advanced imaging's effectiveness is limited if high-risk women are not identified, referred, or able to access it. The underuse of MRI and genetic testing among women with significant family histories shows that implementation gaps can remain, despite the availability of technologies and guidelines.

8 | Promising Evidence Is Not Yet the Same as Practice-Changing Evidence

The studies vary in age range, design, population, endpoints, and maturity. Some are retrospective or single-center. Some focus on women aged 40 or younger, while others include broader groups to support BCYW care. AI and radiomics models require external validation, calibration across populations and imaging systems, and further evidence demonstrating improved clinical outcomes.

COLLECTIVE INTERPRETATION

Imaging's role is expanding from determining who needs exams to guiding treatment and monitoring established disease. Advancements in BCYW imaging will depend on coordinated risk assessment, genetic counseling, referral pathways, and informed clinical interpretation—not just on technological advances. Therefore, these studies should be viewed as directional indicators rather than a definitive set of new clinical guidelines.

Featured studies show strong momentum in breast imaging, but they also reveal important limitations. Before many of these approaches can be incorporated into routine care for young women, several questions remain unanswered.

1 | Too Few Studies Target Young Women

Results from older groups may not apply to this group. Future research should prospectively recruit young women and report outcomes by specific age groups rather than combining them with older populations.

2 | “Age-cutoff” Is Not Defined Consistently

Studies of young women use various age cutoffs (under 35, 39, 49, or 55), making comparisons difficult and grouping women with different reproductive, hormonal, breast-density, and tumor-biological traits.

3 | Much of the Evidence Is Retrospective

Several MRI, radiomics, and utilization studies relied on retrospective data. These studies can identify important associations but cannot determine whether using an imaging feature or prediction model improves patient outcomes.

4 | Imaging Models Need External Validation

AI and radiomics models may perform well on training data but lose accuracy when applied elsewhere. These models should be validated across diverse technical settings before routine clinical use.

5 | Better Prediction Should Improve Outcomes

Research is needed to determine whether imaging-guided decisions reduce advanced disease, unnecessary procedures, treatment burden, recurrence, or death. The goal is not just prediction accuracy but whether acting on predictions improves patient care.

6 | Potential Harms Remain Partially Measured

More intensive imaging increases recalls, false positives, biopsies, anxiety, contrast exposure, costs, and overdiagnosis. Preoperative MRI may find more disease, but its effect on surgery and outcomes might need more data.

7 | Reproductive and Life-Stage Contexts Require More Attention

Pregnancy, lactation, postpartum involution, fertility treatment, hormonal exposure, and other reproductive transitions can affect breast tissue, symptoms, imaging, and risk.

THE CENTRAL RESEARCH NEED

Future advances require age-specific, multicenter research combining imaging, genetics, breast density, reproductive history, tissue biology, treatment, and outcomes. Imaging signals are meaningful only if they are reproducible, actionable, and improve outcomes.



IMPLICATIONS FOR IMAGING YOUNG WOMEN

This series of studies does not support universal imaging or routine screening for women under 40. Instead, it advocates for a tailored approach that differentiates between diagnostic evaluation, risk-based surveillance, and screening for the broader population.

- 1 | Symptoms Should Be Evaluated Regardless of Age**
- 2 | Risk Assessment Should Begin Before Screening Age**
- 3 | The Imaging Modality Should Match the Clinical Question**
- 4 | Dense Breasts Require Contextual Interpretation**
- 5 | Imaging May Provide Information Beyond Detection**
- 6 | More Imaging Is Not Automatically Better Imaging**
- 7 | Imaging Should Accommodate Young Women's Lives**
- 8 | Shared Decision-Making Remains Essential**

MOVING FORWARD

The future of BCYW imaging is unlikely to center on a single screening age. Instead, it will prioritize earlier risk evaluations, thorough symptom analysis, tailored imaging options, and the integration of quantitative imaging with biological and clinical data. The goal is to offer suitable imaging for each young woman when it is most appropriate, rather than increasing the total number of imaging procedures.

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EMERGING ADVANCES IN BREAST IMAGING FOR YOUNG WOMEN

A 2026 Evidence Digest on Breast Cancer in Young Women



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