



Understanding Dense Breasts

Breast density is a term used to describe the amount of tissue versus fat in the breast. In dense breasts, there is more fibroglandular tissue — the lobules, ducts, and connective tissue — and less fat. In general, women whose breasts have more than 50% fibroglandular tissue are said to have high-density or dense breasts.^{1,2} Nearly half of all women aged 40+ who get mammograms have dense breasts.³ Women with dense breasts have a higher risk of breast cancer compared to women with less dense breast tissue, and the risk is higher with increasing breast density.³

Categories of Breast Density

Breast density is not based on how your breasts feel and it has nothing to do with breast size or firmness. Dense breast tissue is seen only on a mammogram and appears as a white solid area that is hard to see through.⁴

To determine the level of breast density, the radiologist who analyzes your mammogram will use the Breast Imaging Reporting and Data System (BI-RADS) to calculate the amount of dense tissue in your breast. BI-RADS classifies breast density into four groups: ^{2, 5}

- A – Almost Entirely Fatty- This level means the breasts are almost completely made up of fatty tissue (less than 25% glandular tissue). An estimated 10% of women fall into this category.
- B – Scattered Areas of Fibroglandular Density- Affecting about 40% of women, this level means there are scattered areas of density (from 25% to 50%), but most of the breast tissue is composed of fat.
- C – Heterogeneously Dense- At this level, most of the breast tissue (between 51% and 75%) is dense. About 40% of women have this classification.
- D – Extremely Dense- Affecting about 10% of women, this level indicates that more than 75% of the breast tissue is dense.

1 American Cancer Society. Breast Density and Your Mammogram Report. Accessible at: <https://www.cancer.org/cancer/breast-cancer/screening-tests-and-early-detection/mammograms/breast-density-and-your-mammogram-report.html>. Accessed July 1, 2020.

2 ACP Internist. Making Sense of Breast Density. June 2020. Accessible at: <https://acpinternist.org/archives/2020/06/making-more-sense-of-breast-density.htm>. Accessed July 1, 2020.

3 National Cancer Institute. Dense Breasts: Answers to Commonly Asked Questions. Accessible at: <https://www.cancer.gov/types/breast/breast-changes/dense-breasts#:~:text=Nearly%20half%20of%20all%20women,other%20factors%20can%20influence%20it>. Accessed July 1, 2020.

4 Mayo Clinic. Dense breast tissue: What it means to have dense breasts. Accessible at: <https://www.mayoclinic.org/tests-procedures/mammogram/in-depth/dense-breast-tissue/art-20123968>. Accessed July 1, 2020.

5 Centers for Disease Control and Prevention. What Does It Mean to Have Dense Breasts? Accessible at: https://www.cdc.gov/cancer/breast/basic_info/dense-breasts.htm. Accessed July 1, 2020

As you can see, it is common for women to have dense breasts. In fact, a large study published in the *Journal of the National Cancer Institute* estimates that more than 25 million U.S. women screened for breast cancer have dense breasts.⁶

Who Is Likely to Have Dense Breasts?

It is not clear why some women have a lot of dense breast tissue while others do not. What is known is that higher breast density is more likely if:

- You are younger- In one study of 7,000 women, about three-quarters of those in their 40s had dense breasts, compared to about one-third of those in their 70s.⁷ Breast density decreases with age, with the greatest change in density occurring during menopause.⁸
- You are taking hormones- Breast density changes with certain types of hormone therapy, such as hormone replacement therapy to treat menopause symptoms. According to a large study, women taking a combination of estrogen and progestin had a 6% increase in breast density after one year compared with a slight decrease among women not taking hormones.⁹
- You have a lower body weight- Typically women with less body fat are more likely to have more dense breast tissue compared with women who are obese.⁴

The Link between High Breast Density and the Risk of Cancer

Breast density is a lesser known risk factor for breast cancer which should be considered in addition to other more widely known risk factors such as family history or genetic profile.¹⁰ Research has shown women with dense breasts are more likely to develop breast cancer compared to women with non-dense breasts, and the risk increases with increasing breast density.³

Risk Assessment Models

Women, and especially women with dense breasts, should have a risk assessment conversation with their healthcare providers (HCPs), as there are validated risk assessment tools that take into consideration breast density. Individual risk assessment estimates a woman's 5-year, 10-year and lifetime risk of developing breast cancer and compares it to the general population risk. This is very helpful information. Women at elevated risk can take steps to lower their risk with lifestyle measures. Those who are at substantially increased risk may benefit from additional breast cancer screening and possibly even medication to lower their risk.^{11, 12}

6 Sprague BL, et al. Prevalence of Mammographically Dense Breasts in the United States. *JNCI: Journal of the National Cancer Institute*, Volume 106, Issue 10, October 2014

7 Checka CM, et al. The relationship of Mammographic Density and Age: Implications for Breast Cancer Screening. *American Journal of Roentgenology*. 2012;198, No.3

8 Mayo Clinic. Mayo Mammography Health Study. Do Changes in Breast Density Over Time Influence Breast Cancer Risk. Accessible at: <https://www.mayo.edu/research/centers-programs/mayo-mammography-health-study/research/do-changes-breast-density-over-time-influence-breast-cancer-risk>. Accessed July 1, 2020.

9 McTiernan A, et al. Estrogen-plus-progestin use and mammographic density in postmenopausal women: Women's Health Initiative randomized trial. *J Natl Cancer Inst*. 2005;97:1366–1376.

10 Centers for Disease Control and Prevention. What Are the Risk Factors for Breast Cancer? https://www.cdc.gov/cancer/breast/basic_info/risk_factors.htm. Accessed July 1, 2020.

11 Amir E, et al. Assessing Women at High Risk of Breast Cancer: A Review of Risk Assessment Models, *JNCI: Journal of the National Cancer Institute*, Volume 102, Issue 10, 2010.

12 Tamoxifen and Raloxifene for Lowering Breast Cancer Risk. American Cancer Society. Accessible at: <https://www.cancer.org/cancer/breast-cancer/risk-and-prevention/tamoxifen-and-raloxifene-for-breast-cancer-prevention.html>. Accessed October 30, 2020.

Today, three risk models are widely used. Designed by health professionals, these models take different approaches to understand a women's unique combination on risk factors as follows:

- The Gail Model- Created by researchers at the National Cancer Institute, the Gail Model uses personal information to estimate risk of developing invasive breast cancer over specific periods of time.¹³ Key factors are age, age when you got your first period, age when you had your first child, the number of "first-degree" relatives who have/had breast cancer, any breast biopsies you have had, and the presence of abnormal cells (called atypical hyperplasia) in a biopsy. As breast density information is not included, this model may underestimate the risk for a woman with dense breasts or with a family history of breast cancer outside of first-degree relatives.¹⁴
- The Claus Model- With the Claus Model, the lifetime risk of developing breast cancer is calculated based on family history, including the number of first- and second-degree relatives (grandparents, aunts, nieces, grandchildren and half-siblings) who have breast cancer and their ages at diagnosis. However, the model does not consider other non-hereditary risk factors such as body mass index (BMI) or reproductive information.¹⁴
- The Tyrer-Cuzick Model- Also used to calculate a woman's likelihood of carrying the BRCA1 and BRCA2 mutations associated with inherited breast cancer, the Tyrer-Cuzick Model estimates breast cancer risk based on a number of factors. These include age, body mass index, age when you had your first period, age when you had your first child, and if you are taking hormone replacement therapy. The model also considers the number of breast biopsies, the presence of abnormal ductal cells (called atypical ductal hyperplasia) in a biopsy, a type of breast change called lobular carcinoma in situ, and family history of breast and ovarian cancers in first-and second-degree relatives.¹⁵ The newest version of this model takes breast density into consideration, making this assessment tool very important for women with dense breasts.¹⁶

Using the information from one of these risk assessment tools, your HCP will be able to counsel you on your individual risk for breast cancer and make recommendations on when to start screening, how often to screen, and which screening tests to use.

Screening Options

For women with an elevated risk of developing breast cancer, mammography alone may not be adequate. Specifically, for women who are genetic mutation carriers, for those who have a strong family history of breast cancer or a history of prior chest radiation, and for those who have dense breasts and have a calculated lifetime risk (using risk assessment models) that is elevated (above 20% lifetime risk) mammography plus a second imaging method (MRI or ultrasound) may be appropriate.¹⁷ It is important for women to understand their risk, so they can discuss a more individualized approach to screening with their HCP.

¹³ National Cancer Institute. Breast Cancer Risk Assessment Tool: The Gail Model. Accessible at: <https://bcrisktool.cancer.gov/about.html>. Accessed July 1, 2020.

¹⁴ UT Southwestern Medical Center. Hereditary Breast Cancer: Guide for Health Pros. Accessible at: <https://utswmed.org/conditions-treatments/genetics-and-hereditary-cancers/guide-hereditary-cancer-health-pros/hereditary-breast-cancer-guide-health-pros/#:~:text=With%20the%20Claus%20model%2C%20lifetime,between%20maternal%20and%20paternal%20relatives>. Accessed July 1, 2020.

¹⁵ Medscape. What Is the Tyrer-Cuzick model (IBIS tool) for breast cancer risk assessment. Accessible at: <https://www.medscape.com/answers/1945957-180248/what-is-the-tyrer-cuzick-model-ibis-tool-for-breast-cancer-risk-assessment#:~:text=The%20Tyrer%2DCuzick%20model%2C%20or,the%20course%20of%20her%20lifetime>. Accessed July 1, 2020.

¹⁶ Risk Model Explanation. DenseBreast-info.org. Accessible at: <https://densebreast-info.org/explanation-of-dense-breast-risk-models.aspx>. Accessed October 30, 2020.

¹⁷ The American Society of Breast Surgeons. Position Statement on Screening Mammography. Accessible at: <https://www.breast-surgeons.org/docs/statements/Position-Statement-on-Screening-Mammography.pdf>. Published 2019. Accessed July 1, 2020.

Mammograms

For women with an average risk of breast cancer, a yearly mammogram to screen for breast cancer is recommended. For women who have an average risk and dense breasts, supplemental imaging should be considered. Although most breast cancers can be seen on a mammogram, having dense breasts makes it harder for radiologists to see cancer on a mammogram.¹⁷ This is because dense tissue looks white on a mammogram, like a mass or tumor, making it difficult for the radiologist to tell the difference between a tumor and dense breast tissue.⁵ In contrast, fatty tissue looks almost black on a mammogram, so it is easier to see a tumor that looks white. Therefore, mammograms can be less accurate in women with dense breasts, producing false negative or false positive results, leading to either missed cancers or unnecessary follow-up tests.¹⁸

According to several studies, three-dimensional (3D) mammograms are more helpful in finding breast cancers in dense breasts than the older two-dimensional (2D) mammogram.¹⁹ Compared to the 2D mammogram, where two X-rays are taken — one from the top and a second from the side — 3D mammograms collect multiple images of the breast from several angles, allowing doctors to see the breast tissue more clearly in three dimensions. As a result, breast centers are increasingly using 3D mammograms, especially in women with dense breasts. In fact, a recent study found that from 2015 to 2017, 3D mammography increased from 13% of screening examinations to 43%.²⁰

Supplemental Screenings

In general, screening mammograms miss one in five breast cancers in women and may miss one-third of breast cancers in women with dense breasts.^{18, 21}

Therefore, many breasts specialists recommend adding supplemental screening tests along with mammography for women with dense breasts, based on evidence that the combination increases the detection of early breast cancer in women with dense breasts. These tests are mentioned below:

- Breast Ultrasound- Ultrasound imaging of the breast uses sound waves to produce pictures of the internal structures of the breast and analyze tissue. A recent study found that adding ultrasound screening to mammography can increase breast cancer detection rates by 1.9% to 4.2%.²²
- Breast MRI- Breast MRI (magnetic resonance imaging) uses radio waves and strong magnets to make detailed pictures of the inside of the breast. According to a Dutch study published in The New England Journal of Medicine, screening with MRI in addition to regular screening mammograms may improve breast cancer detection in women with extremely dense breasts.²³ The addition of breast MRI to mammography is recommended by the American College of Radiology (ACR) for women with an elevated risk calculated to be greater than 20% over their lifetime.²⁴

¹⁸ American Cancer Society. Limitations of Mammograms. Accessible at: <https://www.cancer.org/cancer/breast-cancer/screening-tests-and-early-detection/mammograms/limitations-of-mammograms.html>. Accessed July 1, 2020.

¹⁹ American Cancer Society. Mammogram Basics. Accessible at: <https://www.cancer.org/cancer/breast-cancer/screening-tests-and-early-detection/mammograms/mammogram-basics.html>. Accessed July 1, 2020.

²⁰ Richman IB, et al. Adoption of Digital Breast Tomosynthesis in Clinical Practice. JAMA Intern Med. 2019;179(9):1292-1295

²¹ George Washington University Cancer Center. Are Your Breasts Dense? Accessible at: <https://cancercenter.gwu.edu/cancer-type-condition/breast-cancer/are-your-breasts-dense>. Accessed July 1, 2020.

²² Thigpen D, et al. The Role of Ultrasound in Screening Dense Breasts – A Review of the Literature and Practical Solutions for Implementation. Diagnostics. 2018 Mar; 8(1): 20.

²³ Bakker MF, et al. Supplemental MRI Screening for Women with Extremely Dense Breast Tissue. N Engl J Med 2019; 381:2091-2102.

²⁴ Monticciolo DL, et. al. Breast Cancer Screening in Women at Higher-Than-Average Risk: Recommendations From the ACR. J Am Coll Radiol. 2018;15:408-414.

- Contrast Enhanced Mammography (CEM)- An emerging technology, CEM is a type of mammogram which is different than a standard mammogram as it uses a special dye, called a contrast agent, that is injected into the veins before the mammogram images are taken. There is ongoing research being performed to evaluate its use in women with dense breasts. ²⁵
- Molecular Breast Imaging (MBI)- MBI uses a radio tracer injected into the body through a vein in the arm that lights up any areas of cancer inside the breast. In combination with mammography, MBI may be an option for finding tumors in high-risk women with dense breasts. ²⁶ At this time, further advances in detector technology to allow lower dosing are underway, and prospective trials are needed to recommend MBI as a screening tool for women with a high risk of breast cancer. ¹⁷

For women with dense breasts, the ASBrS recommends supplemental imaging such as breast MRI or ultrasound be considered in addition to annual mammography.¹⁷ For women with personal histories of breast cancer and dense breasts, the ACR recommends an annual breast MRI. Annual breast MRIs are also recommended for women with a known BRCA gene mutation, strong family history, prior chest radiation, or certain inherited disorders that increase the risk of developing breast cancer. ²⁴

When considering possible screening options, the best strategy is to think in terms of the total breast cancer risk, including breast density. This means talking to your HCP about all your breast cancer risks so they can determine what tests are right for you. It is also important to find out if or when your health plan will cover supplemental imaging tests. While many states now require that women with dense breasts be covered by insurance for supplemental imaging tests, this is not universal. ³

Taking Charge of Your Breast Density

Because having dense breasts is a risk factor for breast cancer, it is important to take charge of your breast health by learning about breast density and its implications for you. Ask about breast density at your next mammogram and make sure you get a copy of your mammography report, which will include an assessment of your breast density and categorize the amount of dense breast tissue in your breasts. Your HCP can also tell you if your mammogram shows you have dense breasts.

Also ask your HCP about the option of getting a risk assessment to determine your personal risk for breast cancer and the protective factors. The findings will help you and your physician weigh the pros and cons of additional screening tests. It is important to always remember to speak with your HCP about all your healthcare needs.

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²⁵ Guy's and St Thomas' NHS Foundation Trust. Contrast-enhanced spectral mammography (CESM). Accessible at: [https://www.guysandstthomas.nhs.uk/resources/patient-information/radiology/contrast-enhanced-spectral-mammography-\(cesm\).pdf](https://www.guysandstthomas.nhs.uk/resources/patient-information/radiology/contrast-enhanced-spectral-mammography-(cesm).pdf). Accessed October 30, 2020.

²⁶ BreastCancer.org. Molecular Breast Imaging. Accessible at: <https://www.breastcancer.org/symptoms/testing/types/mbi#:~:text=MBI%20uses%20a%20radioactive%20tracer,more%20than%20normal%20cells%20do.>