MAYO CLINIC

Breast Density and Breast Cancer Risk: A Practical Review

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CME Activity

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Abstract

New legislation in several states requiring breast density notification in all mammogram reports has increased awareness of breast density. Estimates indicate that up to 50% of women undergoing mammography will have high breast density; thus, with increased attention and high prevalence of increased breast density, it is crucial that primary care clinicians understand the implications of dense breasts and are able to provide appropriate counseling. This review provides an overview of breast density, specifically by defining breast density, exploring the association between breast density and breast cancer risk, both from masking and as an independent risk factor, and reviewing supplemental screening options as part of a larger framework for counseling patients with dense breasts.

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Over the past few years, breast density has gone from an obscure medical term to break room conversation, which is in part due to the increased media attention after the efforts of Nancy Cappello, who had received a diagnosis of breast cancer without knowing that her previous mammograms had reported dense breasts. In 2009, with Ms Cappello's advocacy, Connecticut became the first state to require that women who have undergone mammography are informed of their breast density. A total of 14 states including Pennsylvania, Texas, California, and New York have followed suit,[1] though the content of laws varies by state. Currently, a statement of breast density is required only in states with a breast density law. A federal bill requiring that every mammography report inform women of their breast density was re-introduced in Congress in October 2013.[2] The Food and Drug

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Administration (FDA) is considering an amendment to the Mammography Quality Standards Act that would require breast density notification. With the increasing awareness of breast density by the public and medical community, it is essential that primary care professionals have a practical understanding of breast density and its implications for clinical practice.

MAMMOGRAPHIC BREAST DENSITY: DEFINITION AND TERMINOLOGY

Breast density refers to the mammographic appearance of the breast. Mammographic breast density reflects varying amounts of fat (dark areas on mammograms) and stromal and epithelial tissues (white areas on mammograms) in the breast. Breast density is measured as the absolute amount of dense or white areas in the breast (dense area) or a proportion of the mammogram that is composed of dense tissue (percent density). There are several tools to assess breast density. The most commonly used tool in clinical practice is the Breast Imaging Reporting and Data System (BI-RADS), which is used by radiologists at the time of mammography; it divides breast density into 4 categories as depicted in the Table and Figure 1. These categories are not to be confused with BI-RADS categories 0 to 6, which are used for standardized reporting of mammographic findings and follow-up recommendations.[3] In some clinical centers, D1, D2, D3, and D4 classifications are used to represent the respective BI-RADS 1 to 4 density categories to minimize confusion with the BI-RADS 0 to 6 scale for mammographic findings. For simplicity, we use the D1 to D4 classification system in this article.

One of the density phrases or values may be present on the screening mammogram reports. Population-based data have revealed that approximately 10% of women have almost entirely fatty breasts (D1), 40% of women have scattered fibroglandular densities (D2), another 40% have heterogeneously dense breasts (D3), and 10% have extremely dense breasts (D4).[4,5] Dense breasts are defined as either heterogeneously dense (D3) or extremely dense (D4). Thus, approximately 50% of the population undergoing mammography would be categorized as having dense breasts. The most common measure used in research is percent density, a semi-automated quantitative measure providing the ratio of dense tissue area to total breast area and is calculated by a trained expert with a computer algorithm.[6] Although widely used, these measures have limitations, including subjective assessment, 2-dimensional measure, and, for BI-RADS density, moderate interobserver agreement.[7,8] Automated density measures including volumetric density are now being studied.[9-11] Two automated volumetric density measures for full field digital mammography are now commercially available: Volpara (Mātakina, Wellington, New Zealand) and Quantra (Hologic, Inc., Bedford, MA, USA). Although these commercial systems have established correlation with BI-RADS density categories, these have not been directly studied in relation to breast cancer risk, to date.[12,13]

BREAST DENSITY: RELEVANCE IN CLINICAL PRACTICE

Masking of Breast Cancer

Increased breast density can make it more difficult to detect smaller cancers with mammography because cancers have the same X-ray attenuation as fibroglandular breast tissue[14-17](Figure 2). As expected, the sensitivity of mammography decreases with increasing breast density. The sensitivity of mammography for women with almost entirely fatty breasts (D1) is 88% as compared with 82% for women with scattered fibroglandular densities (D2), 69% for women with heterogeneously dense breasts (D3), and 62% for women with extremely dense breasts (D4).[15,18] Boyd et al[14] found that compared with women with breast density of less than 10%, women with breast density of 75% or more were 17.8 (95% CI, 4.8-65.9) times more likely to have a breast cancer detected within 12 months of the last screening examination. This markedly increased risk of breast cancer within 12 months of a screening mammogram

TABLE. BI-RADS Categories for Breast Density[3]

Density	Description	Glandular tissue
1 (lowest density)	Almost entirely fat	<25%
2	Scattered fibroglandular densities	Approximately 25%-50%
3	Heterogeneously dense, which could obscure detection of small masses	Approximately 51%-75%
4 (highest density)	Extremely dense, which may lower the sensitivity of mammography	>75%

BI-RADS = Breast Imaging Reporting and Data System.