

Diagnostic Tests

What Physicians Need to Know

Digital Breast Tomosynthesis for Breast Cancer Screening

Kathleen Barry, MD, and Chelsea Evans, MD, University of Massachusetts Medical School, Worcester, Massachusetts

Digital breast tomosynthesis (DBT), or 3D mammography, is a breast imaging technique in which multiple radiographs are used to reconstruct a 3D picture. Approved by the U.S. Food and Drug Administration in 2011, DBT is purported to be more sensitive and specific than digital mammography, especially in women with dense breasts.¹ Although DBT has not been universally accepted as the standard for breast cancer screening, it has supplanted digital mammography for screening in some parts of the United States; areas with higher DBT use tend to be wealthier and have larger White populations.²

Accuracy

In experimental studies of mastectomy specimens, DBT was superior to digital mammography in lesion detection and margin identification.³ It is not clear how this difference translates to real-life screening. The ongoing Tomosynthesis Mammographic Imaging Screening Trial compares the effectiveness of DBT and digital mammography in preventing advanced breast cancers through screening of average-risk women in the United States.⁴ Trial recruitment has been challenging as more hospitals adopt the newer technology. Hospitals and patients are reluctant to accept digital mammography despite the lack of evidence that DBT is superior.⁵ Retrospective studies suggest that when used in conjunction with digital mammography, DBT decreases recall rate and improves cancer detection in women.⁶

A systematic review found low-quality evidence that DBT plus digital mammography increases the overall and invasive breast cancer detection rates.⁷

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Test	Indication	Population	Cost*
Digital breast tomosynthesis	Screening for breast cancer	Women 40 years or older	\$208

*—The fair price represents reasonable out-of-pocket costs based on price comparisons. Actual cost will vary with insurance and by region. Information obtained at <https://healthcarebluebook.com> (accessed February 16, 2021; zip code: 66211).

Digital mammography alone detected 7 breast cancers per 1,000 screenings and 5 invasive breast cancers per 1,000 screenings. With the addition of DBT, detection rates increased to 10 per 1,000 screenings and 7 per 1,000 screenings, respectively. However, the review found no moderate- or high-quality evidence that DBT decreases recall rates, false-positive rates, or false-negative rates.⁷ In a meta-analysis of 11 studies at low risk of bias, no significant difference occurred between DBT alone and DBT plus digital mammography in cancer detection rates.⁸ Digital mammography is not equivalent to a 2D mammogram generated from DBT images.

Benefit

A review of seven systematic reviews from the Canadian Agency for Drugs and Technologies in Health found that DBT plus digital mammography may improve cancer detection rates (relative risk = 1.09 to 1.3) and recall rates compared with digital mammography alone. Recall rates were lowered by between 0.5 and 2 recalls per 1,000 screenings.⁹ 3D reconstruction with DBT allows radiologists to better qualify lesions noted on digital mammography as benign, rather than calling the patient back for additional views. In the United States, however, DBT is not routinely performed with digital mammography, which may negate the benefit of a decreased recall rate.

The U.S. Preventive Services Task Force states that there is insufficient evidence to assess the benefits and harms of DBT for primary breast

cancer screening in all women and in women with dense breasts.¹⁰ The American College of Radiology categorizes both digital mammography and DBT as “usually appropriate” for average- and intermediate-risk women. For high-risk women, both modalities, as well as magnetic resonance imaging with contrast, are categorized as “usually appropriate.”¹¹ No studies have evaluated mortality as an outcome in women screened with DBT compared with digital mammography.

Harms

From a patient perspective, DBT is similar to digital mammography because both tests require that the breast be compressed between two plates and both take approximately 15 minutes to complete. The total radiation dose from DBT is almost three times that from digital mammography, but this level of radiation is still considered to be very low and safe.⁹ It is not known whether adding or substituting DBT for digital mammography increases the likelihood of breast cancer overdiagnosis (i.e., the detection of lesions that would never progress to symptomatic breast cancer in a normal lifetime).

Cost

Bilateral DBT costs approximately \$208. In comparison, bilateral digital mammography costs about \$148.¹² The decreased recall rate may offset some of the total higher cost of DBT.

Although older cost-effectiveness studies showed that DBT plus digital mammography was cost-effective compared with digital mammography alone and was most cost-effective in women 40 to 49 years of age, a larger 2019 analysis showed that the overall cost of DBT remains higher than digital mammography if performed annually.¹³ For DBT, the benefit may be greater, and the cost difference may be lower with biennial screening.¹⁴

Bottom Line

There is currently not enough evidence to replace digital mammography with DBT for breast cancer screening in women at average or high risk. DBT offers a modestly increased cancer detection rate but comes at a higher monetary cost to the patient and the health care system, without any demonstrable mortality benefit.

Address correspondence to Kathleen Barry, MD, at kathleen.barry@umassmemorial.org. Reprints are not available from the authors.

References

1. Bian T, Lin Q, Cui C, et al. Digital breast tomosynthesis: a new diagnostic method for mass-like lesions in dense breasts. *Breast J*. 2016;22(5):535-540.
2. Richman IB, Hoag JR, Xu X, et al. Adoption of digital breast tomosynthesis in clinical practice. *JAMA Intern Med*. 2019;179(9):1292-1295.
3. Seo N, Kim HH, Shin HJ, et al. Digital breast tomosynthesis versus full-field digital mammography: comparison of the accuracy of lesion measurement and characterization using specimens. *Acta Radiol*. 2014;55:661-667.
4. National Cancer Institute. TMIST (Tomosynthesis Mammographic Imaging Screening Trial). Accessed February 20, 2021. <https://www.cancer.gov/about-cancer/treatment/clinical-trials/nci-supported/tmist>
5. Mulcahy N. Hard times for America's \$100M breast cancer screening trial. Medscape. February 13, 2020. Accessed February 20, 2021. <https://www.medscape.com/viewarticle/925193>
6. Hofvind S, Holen AS, Aase HS, et al. Two-view digital breast tomosynthesis versus digital mammography in a population-based breast cancer screening programme (To-Be): a randomised, controlled trial [published correction appears in *Lancet Oncol*. 2019;20(7):e346]. *Lancet Oncol*. 2019;20(6):795-805.
7. Giampietro RR, Cabral MVG, Lima SAM, et al. Accuracy and effectiveness of mammography versus mammography and tomosynthesis for population-based breast cancer screening: a systematic review and meta-analysis. *Sci Rep*. 2020;10(1):7991.
8. Alabousi M, Zha N, Salameh JP, et al. Digital breast tomosynthesis for breast cancer detection: a diagnostic test accuracy systematic review and meta-analysis. *Eur Radiol*. 2020;30(4):2058-2071.
9. Thompson W, Argaez C. Digital breast tomosynthesis for the screening and diagnosis of breast cancer: a review of the diagnostic accuracy, cost-effectiveness and guidelines. Canadian Agency for Drugs and Technologies in Health. October 28, 2019. Accessed February 20, 2021. <https://cadth.ca/digital-breast-tomosynthesis-screening-and-diagnosis-breast-cancer-review-diagnostic-accuracy-cost-0>
10. U.S. Preventive Services Task Force. Final recommendation statement. Breast cancer: screening. January 11, 2016. Accessed February 20, 2021. <https://www.uspreventiveservicestaskforce.org/uspstf/recommendation/breast-cancer-screening>
11. American College of Radiology. ACR Appropriateness Criteria. Breast cancer screening. Accessed February 20, 2021. <https://acsearch.acr.org/docs/70910/Narrative/>
12. Healthcare Bluebook. Accessed February 16, 2021 (zip code: 66211). <https://www.healthcarebluebook.com>
13. Kalra VB, Wu X, Haas BM, et al. Cost-effectiveness of tomosynthesis in annual screening mammography. *AJR Am J Roentgenol*. 2016;207(5):1152-1155.
14. Marinovich ML, Hunter KE, Macaskill P, et al. Breast cancer screening using tomosynthesis or mammography: a meta-analysis of cancer detection and recall. *J Natl Cancer Inst*. 2018;110(9):942-949. ■