Breast Tomosynthesis
Practical Considerations

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KEYWORDS

• Digital breast tomosynthesis • Screening mammography • Hanging protocols • Magnification views • Diagnostic mammography • Skin calcifications

KEY POINTS

- DBT simultaneously decreases false-positive examinations and increases cancer detection.
- Practical approaches to interpretation of DBT enables accurate reading and increases speed.
- Ways to decrease recall requires appreciation of benign findings at the time of screening.
- Implementation of DBT may be stepwise because of financial constraints. Therefore, institutions may have different approaches to successful DBT integration into practice.

Video content accompanies this article at http://www.radiologic.theclinics.com/.

INTRODUCTION

Benefits of screening mammography have been proven with seven randomized controlled trials demonstrating a significant decrease in mortality when women are screened. Additionally, screening mammography is a low-cost imaging modality that is easily accessible to patients in many parts of the world.[1]

However, traditional digital mammography (DM) is limited in sensitivity, particularly in women with dense breasts. The Breast Cancer Surveillance Consortium published data on the sensitivity of DM in 365,426 women aged 40 to 74 years. The highest sensitivity of DM for the detection of breast cancer was found in women who have almost entirely fatty breasts, ranging from 81.2% to 92.7%, and the lowest sensitivity was reported in women with extremely dense breasts, ranging from 57.1% to 71.3%.[2]

DM has also undergone harsh criticism for the perceived risks associated with screening yearly. The United States Preventive Services Task Force (USPSTF) in 2009 published guidelines for breast cancer screening in women in the United States that differed from recommendations from medical societies, such as the American College of Radiology and the American Congress of Obstetricians and Gynecologists. Specifically, the USPSTF stated women should be offered screened biennially beginning at age 50 rather than annually at age 40.[3] These guidelines were updated in 2016 with similar recommendations.[4]

The USPSTF cited that the "harms" associated with screening, such as false-positive findings and unnecessary biopsies, burdens patients with a significant amount of anxiety and unnecessary biopsies. Other critics of mammography are concerned about the false-positives contributing to the rising cost of health care.

In 2015, the American Cancer Society emphasized the risks with screening, but stated that the "contentious nature of debates surrounding breast cancer screening" were concerning and that "a more productive discussion would be focused on how to improve the performance of screening mammography."[5]

Many published studies have shown that digital breast tomosynthesis (DBT) improves on these limitations, namely the decreased sensitivity and high false positives when screening with traditional DM. DBT has therefore been rapidly implemented

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Radiol Clin N Am ■ (2017) ■–■
http://dx.doi.org/10.1016/j.rcl.2016.12.004

into clinical practice since the United States Food and Drug Administration (FDA) approval in 2011 and at a significantly increased rate relative to DM from analog mammography. Review of the practical considerations of DBT is highlighted in this article.

SCREENING WITH TOMOSYNTHESIS

There are three sets of data obtained when screening patients with DM in combination with DBT (**Fig. 1**, Videos 1 and 2). The projection images represent the raw data and consist of multiple low-dose images acquired at varying angles across the breast. A set number of projection images are obtained, which are determined by the manufacturer, regardless of breast thickness. These projection images are then reconstructed into thin slices and are the data set interpreted by the radiologist. The number of reconstructed slices depends on the compression thickness of the breast. Therefore, the thicker the breast, the more images to interpret. Most manufactures of DBT systems set the slice thickness at 1 mm as a default; however, this can be adjusted. For example, if the breast compresses to 6 cm, there are 60 images to review in that single projection. Although decreasing the number of images by increasing the slice thickness is helpful in appreciating the relationship of calcifications in a group, the advantages of removing superimposed tissue is decreased. Therefore, one must consider this trade off when setting a standard protocol for interpretation.

The last data set includes the traditional DM images, which are useful for calcification evaluation and comparison with prior films. Asymmetries are also better appreciated with the DM images and therefore are necessary to review for optimal interpretation.

Image Interpretation

As with any type of imaging study, it is critical to have a systematic approach for interpretation of images. This becomes particularly important with tomosynthesis because of the large number of images that are generated for review. As proven with DM interpretation, optimal screening environments, such as reading in dark rooms with little to no interruptions, can contribute to improved performance. Additionally, batch reading where successive screening examinations are interpreted without the patient waiting has been shown to be superior to “on-line screening” interpretation,

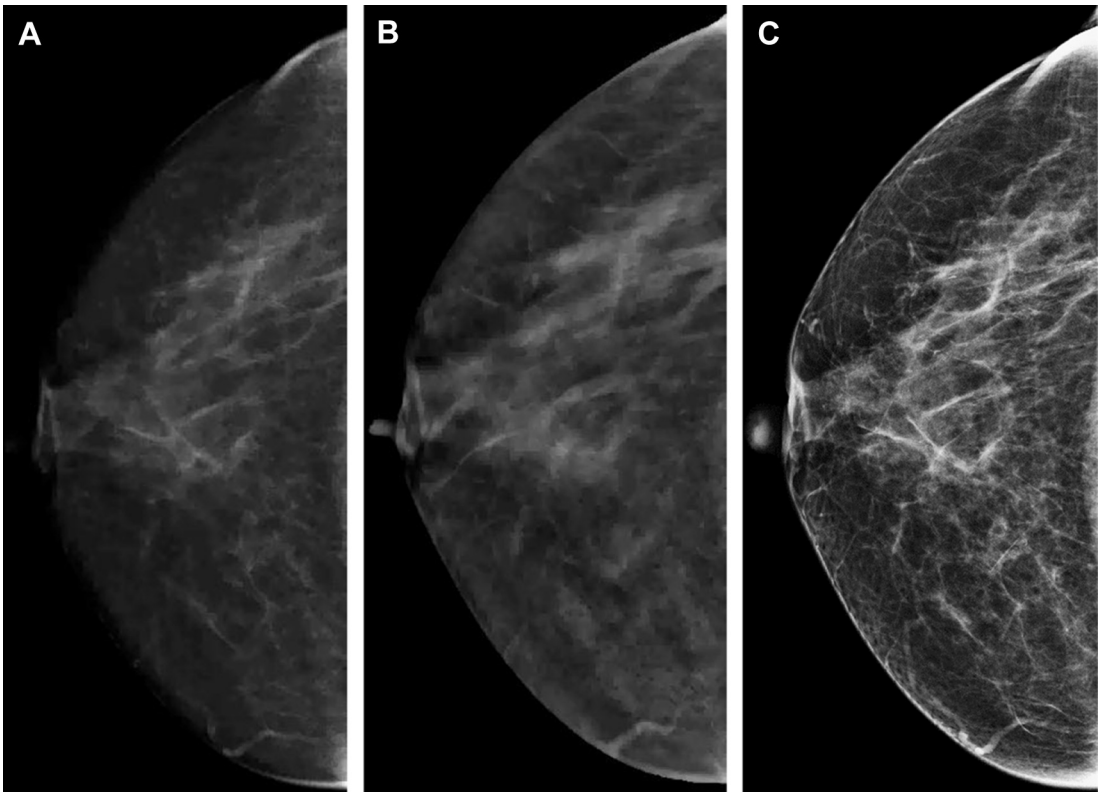

Fig. 1. Images acquired in a combination DM and DBT examination. (*A*) Projection images (video) (*B*) Reconstructed images (video) (*C*) DM obtained under the same compression, co-registered with the DBT images.