

Tomosynthesis: The Effect of Detecting Breast Cancer

Introduction

“Breast cancer is one of the most common types of cancer affecting women. Each year there are more than one million new cases in the world and more than 450,000 deaths due to breast cancer”¹ With the use of both 2D and 3D imaging systems, there will be a higher percentage of breast cancer detection; digital breast tomosynthesis has the capability to demonstrate masses and lesions more accurately and efficiently. Having a 3D image taken with an already acquired 2D image of the breast will significantly help diagnose cancer rather than just using the 2D image. Even though there is an increase in diagnose rates with digital breast tomosynthesis, there are still limitations and disadvantages to using this imaging technique that researchers are working to improve each day.

What is Digital Breast Tomosynthesis

Digital breast tomosynthesis is a newly developing digital mammography technique that provides cross-sectional data and thin section tomographic images. These images are constructed from several projection images that vary in angles of x-rays passing through the breast. This technique for detecting cancer cells in the breast has been approved for use since 2011 by the Food and Drug Administration (FDA).

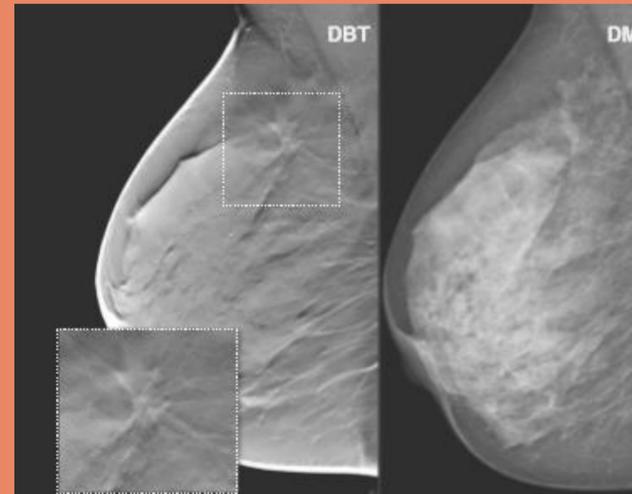


Image 2- The image on the left is a breast scanned under DBT and the image on the right is of a breast imaged under DM⁶

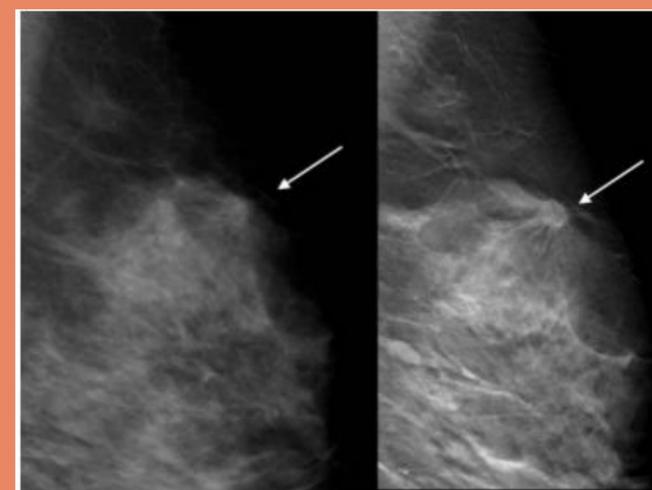


Image 3- The image on the left is a breast scanned under DM and the image on the right is of a breast imaged under DBT²

Increased Breast Cancer Detection

- 3D and 2D imaging combined will increase detection rate.
- No cancers that were detected by the 2D reading were not detected on the 2D and 3D imaging²
- A study of 65 cancers were found and 10 of those would not have been found without DBT⁹
- More cancers were found while being read by radiologist
- 5.3 cancers per 1000 screens were found with 2D reading alone versus 8.1 cancers per 1000 screens for integrated 2D and 3D readings.²

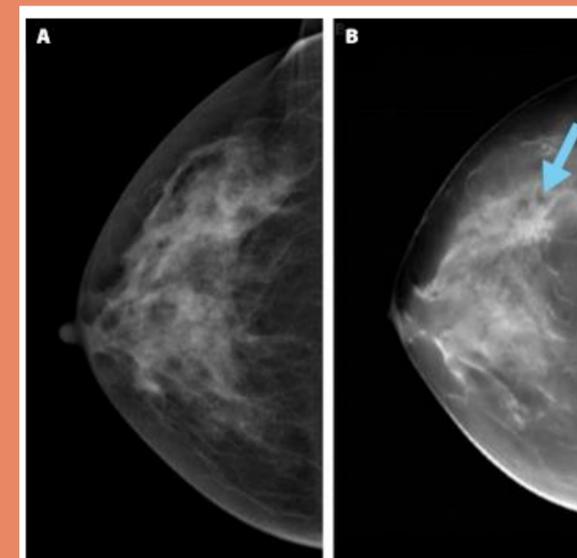


Image 4- The image on the left is a breast scanned under DM and the image on the right is of a breast imaged under DBT⁴

Improvement of Visualization of Lesions and Masses

- Lesions are often hidden behind superimposed tissues
 - DBT can reveal distortion and changes in surrounding tissue clearer³
 - Margins are clearer and detailed with DBT
- Digital breast tomosynthesis has better equipment
 - Smaller scan times due to high frame rates and fast readouts⁴
 - Filtration is used to decrease dose with higher frame rates⁴
 - Increased angles help have better depth and resolution⁴
- Using digital breast tomosynthesis will increase the radiologist diagnostic performance¹

Disadvantages

- There will be an increase in false positive feedbacks.
 - There was an increase in the false positive fraction by 20%.⁷
 - The overall recall rate associated with DBT was 69% that of 2D mammography³
- Women with a false-positive mammogram initially experienced a significant increase in anxiety¹
 - Among women with a false-positive mammogram, anxiety was reported as moderate or higher by 50.6% and as extreme by 4.6%⁸
- The patient dose will increase with the addition of digital breast tomosynthesis to 2D mammography.
 - Digital breast tomosynthesis acquisitions increased a patient's breast dose from 34% to 61%.⁵
 - DBT acquisition resulted in an 8 % higher mean glandular dose.⁵

Conclusion

Breast cancer affects millions of families all over the world. Digital breast tomosynthesis is becoming more popular around the world for the diagnosis of breast cancer. This will give the doctors a higher chance of diagnosing the early stages of breast cancer and saving more lives every day. By introducing the use of tomosynthesis in the normal routine for breast cancer screenings, doctors can allow more people to have the opportunity to get diagnosed easier and way more efficiently. With the use of digital breast tomosynthesis many lives could potentially be saved.

References

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DBT image acquisition

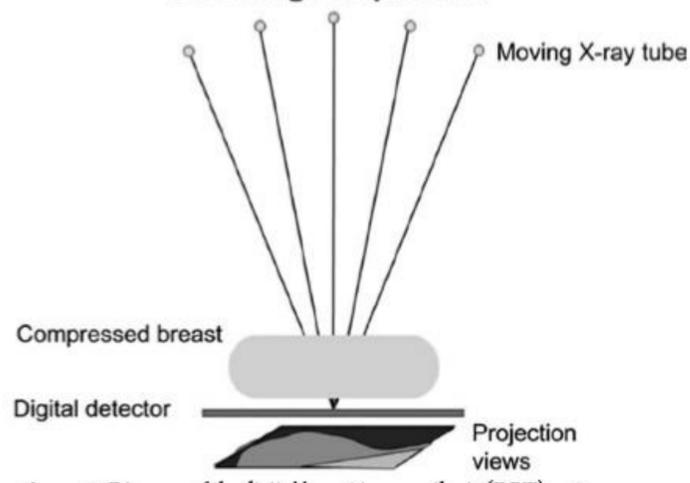


Image 1- A diagram of a digital breast tomosynthesis imaging machine⁴