Clinical case: digital breast tomosynthesis benefits in ductal carcinoma in situ

Augustė Rakšytė¹, Džiugas Jagminas², Margarita Šalašidži³, Dalia Bartuškaitė³

¹ Vilnius University, Faculty of medicine, Vilnius, Lithuania;
² Lithuanian University of Health Sciences Kaunas Clinics, Kaunas, Lithuania; Lithuanian University of Health Sciences, Faculty of medicine, Kaunas, Lithuania.
³ Lithuanian University of Health Sciences Kaunas Clinics, Kaunas, Lithuania.

Abstract

Our goal is to reveal digital breast tomosynthesis (DBT) benefits in real clinical practice by analyzing a case of ductal carcinoma in situ in Hospital of Lithuanian University of Health Sciences (LSMU) Kaunas clinics.

There are distinct benefits of tomosynthesis over mammography with radiologists having fewer false positives and more accurate detections. There is a significant and meaningful disadvantage with tomosynthesis in that it takes longer to evaluate each patient.

DBT is a new, promising, mammographic technique, which has the potential to improve the two inherent limitations of conventional mammography: the low sensitivity in women with dense breast parenchyma caused by overlying breast parenchyma, and the low specificity caused by summation of normal breast parenchyma.

Higher specificity in staging BI-RADS final assessment is another advantage of DBT, keeping that in mind, fewer examinations are assessed as BI-RADS 3 (probably benign finding), which results in fewer additional follow-up diagnostic studies.

As our clinical case analysis showed, DBT is specific, sensitive, time and cost efficient option to choose in case of inconclusive results of breast ultrasonography and conventional 2D mammography.

Keywords: breast cancer, breast imaging, mammography, screening, tomosynthesis.
Background

Mammography is a low-dose X-ray examination of a woman’s breasts used to detect breast cancer when that cancer is too small to be felt as a lump. Screening mammography is carried out on women aged 50–69 years, the age group in which screening mammography has been shown to have the greatest potential to reduce the death rate [1].

Images of tomosynthesis are acquired as the x-ray tube travels across a limited arc above the breast and multiple low-dose x-ray exposures are obtained. The motion of the tube, the length of the arc, and the time it takes to obtain a complete set of projection images — reconstructed into thin image slices spaced at 0.5-1.0 mm. Although the Digital breast tomosynthesis (DBT) images are low in dose, combination of 2D and DBT studies increases patient radiation exposure by approximately two-fold, which is still far less than approved safety limits [2]. In keeping with ALARA principles, it is possible to compute synthesized 2D mammography images out of DBT raw data.

There are distinct benefits of tomosynthesis over mammography with radiologists having fewer false positives and more accurate detections. There is a significant and meaningful disadvantage with tomosynthesis in that it takes longer to evaluate each patient. [3]

Clinical case

A 42-year-old woman, with no history of breast cancer in her family, was recalled after inconclusive breast ultrasonography examination in multi-specialty practice center.

Breast ultrasonography (US) performed in the Hospital of Lithuanian University of Health Sciences (LSMU) Kaunas clinics revealed a 10x5x11 mm hypoechoic irregular infiltration zone close to the pectoral muscle at 2 o’clock with visible deformation of ductal structure and multiple cysts (Fig. 1). Findings were not clear enough and because of high-density heterogeneously dense tissue, which may obscure masses in the right breast, it was recommended to perform tomosynthesis in order to clarify abnormalities. Ultrasonographic examination of axilla’s lymph nodes was not suspicions.

Figure 1 Ultrasonography of right breast.

A digital breast tomosynthesis (Fig. 2) revealed a spiculated architectural distortion, measuring 10x9 mm and located in the lower intermediate portion of the right breast. These distortions were not visible in conventional mammograms due to summation of normal breast parenchyma (Fig. 2). Evaluation of tomosynthesis was concluded with BI-RADS 4, suggesting core needle biopsy to be executed as finding of US and DBT was suspicions.
Figure 2 Digital breast tomosynthesis showed a spiculated architectural distortion (A, B) compared to conventional 2D study (C, D), mediolateral oblique and craniocaudal views.

The patient then underwent core needle biopsy due to discordance of DBT imaging and findings. Histopathological examination of tissues showed high-grade ductal carcinoma in situ (DCIS).

The resection surgery of DCIS masses was planned. Before surgery the magnetic resonance imaging (MRI) was completed to define accurate extent of abnormalities. There was spiculated architectural distortion, measuring 9 mm and located in the lower lateral portion of the right breast.

Discussion

Digital breast tomosynthesis (DBT) is a new, promising, mammographic technique, which has the potential to improve the two inherent limitations of conventional mammography: the low sensitivity in women with dense breast parenchyma caused by overlying breast parenchyma, and the low specificity caused by summation of normal breast parenchyma. A study by Srinivasan et al. reported improvements in sensitivity, specificity, and predictive values with DBT [4].

Several studies showed that DBT is essentially equivalent to conventional mammography diagnostic views [5] [6] [7], but magnification of calcification lesions are still required, the workup of most soft tissue lesions might be improved in the near future. Routine mediolateral oblique and craniocaudal DBT views often provide enough information for lesion characterization, often making additional studies unnecessary. Therefore, conventional mammography diagnostic views are less frequently required. It is important to note that when additional diagnostic views are necessary to confirm a subtle finding on DBT, combination of 2D (or synthesized 2D) plus DBT views is recommended for optimal examination.

Higher specificity in staging BI-RADS final assessment is another advantage of DBT, keeping that in mind, fewer examinations are assessed as BI-RADS 3 (probably benign finding), which results in fewer additional follow-up diagnostic studies [8]. As a result, diagnostic examinations are greatly simplified and expedited faster, benefitting patients and improving breast imaging workflow in clinical practice.
Conclusion

Tomosynthesis improves the clinical accuracy of mammography by increasing both sensitivity and specificity. The increase in radiation exposure associated with DBT will decrease in a long term with future advances in technology and increased acceptance of improved synthesized 2D mammography. DBT is a new promising mammographic technique that solves many of the limitations of conventional mammography.

As our clinical case analysis showed, DBT is specific, sensitive, time and cost efficient option to choose in case of inconclusive results of breast ultrasonography and conventional 2D mammography.

Literature


