

# Breast Cancer Risk Estimation Using Parenchymal Texture Analysis in Digital Breast Tomosynthesis

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## Abstract

Mammographic parenchymal texture has been shown to correlate with genetic markers of developing breast cancer. Digital breast tomosynthesis (DBT) is a novel x-ray imaging technique in which tomographic images of the breast are reconstructed from multiple source projections acquired at different angles of the x-ray tube. Compared to digital mammography (DM), DBT eliminates breast tissue overlap, offering superior parenchymal tissue visualization. We hypothesize that texture analysis in DBT could potentially provide a better assessment of parenchymal texture and ultimately result in more accurate assessment of breast cancer risk. As a first step towards validating this hypothesis, we investigated the association between DBT parenchymal texture and breast percent density (PD), a known breast cancer risk factor, and compared it to DM. Bilateral DBT and DM images from 71 women participating in a breast cancer screening trial were analyzed. Filtered-backprojection was used to reconstruct DBT tomographic planes in 1mm increments with 0.22mm in-plane resolution. Corresponding DM images were acquired at 0.1mm pixel resolution. Retroareolar regions of interest (ROIs) equivalent to 2.5cm<sup>3</sup> were segmented from the DBT images and corresponding 2.5cm<sup>2</sup> ROIs were segmented from the DM images. Breast PD was mammographically estimated using the Cumulus scale. Overall, DBT texture features demonstrated a stronger correlation than DM to PD. The Pearson correlation coefficients for DBT were  $r=0.40$  ( $p<0.001$ ) for contrast and  $r=-0.52$  ( $p<0.001$ ) for homogeneity; the corresponding DM correlations were  $r=0.26$  ( $p=0.002$ ) and  $r=-0.33$  ( $p<0.001$ ). Multiple linear regression of the texture features versus breast PD also demonstrated significantly stronger associations in DBT ( $R^2=0.39$ ) compared to DM ( $R^2=0.33$ ). We attribute these observations to the superior parenchymal tissue visualization in DBT. Our study is the first to perform DBT texture analysis in a screening population of women, showing that DBT could potentially provide better breast cancer risk assessment in the future.