Purpose: To reduce image noise and radiation dose in Digital Breast Tomosynthesis (DBT) reconstructions.

Methods: A retrospective study was performed on clinical data sets acquired at a normal dose with Hologic Selenia Dimensions DBT systems. The Prior Image Constrained Compressed Sensing (PICCS) algorithm was used to reduce image noise. In addition, a prospective study was performed on an American College of Radiology breast phantom at various dose levels and the PICCS algorithm was used to reconstruct images at the corresponding radiation dose levels. The reconstructed images were inspected visually, and the noise levels in various regions of interest were quantitatively measured and compared between images.

Results: In the case of the clinical data, the PICCS reconstructions showed dramatic noise reduction (over 35%) with no loss of diagnostically important features such as calcifications or low contrast lesions; visibility of low contrast lesions was improved with PICCS. Dose reduction of 28% was possible with the phantom data, and the low dose PICCS reconstructions of phantom data show improved low contrast lesion detectability and lower noise.

Conclusions: The work indicates potential dose savings in digital breast tomosynthesis. The diagnostic quality of the phantom reconstructions at 28% reduced dose was equivalent to or better than those acquired at full dose. The noise suppression in the clinical data sets improved visibility of low contrast lesions without sacrificing important diagnostic features.

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