SHORTENING BREAST MRI SCAN TIMES WITH DEEP LEARNINGAND REDUCED K-SPACE ACQUISITION: PILOT STUDY USING 3D T2 IMAGES INBREAST MRI

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PURPOSE

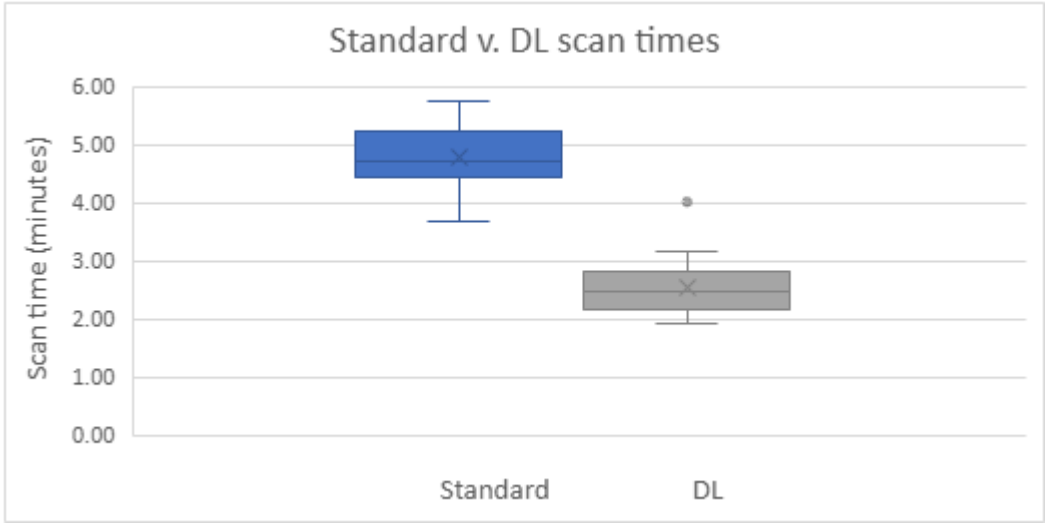
Resolution of 3D T2-weighted (T2) breast MRI can match that of 3D gradient echo T1-weighted imaging but is hampered by long scan times. Reduced k-space sampling coupled with AI-driven reconstruction methods have been shown to reduce scan times up to ten-fold while improving perceived spatial resolution. This pilot study assesses the feasibility of deep learning reconstruction to accelerate 3D T2 imaging without compromising image quality.

METHODS

15 consecutive subjects underwent standard-of-care breast MRI on a 3T scanner, which included both clinical3D T2 (standard) series and under sample 3D T2 Series reconstructed using a vendor-supplied, DL-based reconstruction prototype (SonicDL).

Three breast radiologists performed blinded assessments of pairs of standard vs. DL 3D T2 series, viewed side-by-side on a 12MP monitor. Series were randomly assigned to the left or right side of the screen. Readers evaluated several qualities, including perceived sharpness, T2 signal-to-noise ratio (SNR), and overall image quality, on a 5-point Likert scale. Readers assessed diagnostic adequacy for clinical evaluation of T2characteristics and recorded their series preference in paired comparisons. Ratings were compared using Wilcoxon Signed-Rank Test for each reader, W-value given small sample size, and significance set at $p < 0.05$.





RESULTS

Mean scan time for standard vs. DL series was 4.80±0.59 vs. 2.54±0.55 minutes, showing a 48% reduction in mean scan time with the DL series.

All readers rated the DL series as equal to or better than the standard series across all metrics, except for ghosting artifact in the axilla. DL series received significantly higher ratings ($P<0.05$) for sharpness across all readers and for SNR by two readers.

All standard and DL series were deemed adequate for T2 characterization and clinical interpretation. In 80%of cases, readers preferred the DL series, noting improved SNR and perceived sharpness.

CONCLUSION

Reduced k-space sampling coupled with AI-driven reconstruction methods using deep learning reconstruction for breast MR 3D T2 imaging achieved a 48% reduction in scan time, with maintained diagnostic quality and improved perceived sharpness.

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