Impact of Artificial Intelligence Decision Support Using Deep Learning on Breast Cancer Screening Interpretation with Single-View Wide-Angle Digital Breast Tomosynthesis

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Purpose

To compare radiologist performance when reading single-view wide-angle DBT images with and without an artificial intelligence (AI) system for decision and navigation support.

Materials and Methods

A retrospective observer study was performed with bilateral mediolateral oblique examinations and corresponding synthetic two-dimensional images acquired between June 2016 and February 2018 with a wide-angle DBT system. Fourteen breast screening radiologists interpreted 190 DBT examinations (90 normal, 26 with benign findings, and 74 with malignant findings), with the reference standard being verified by using histopathologic analysis or at least 1 year of follow-up. Reading was performed in two sessions, separated by at least 4 weeks, with a random mix of examinations being read with and without AI decision and navigation support. Forced Breast Imaging Reporting and Data System (categories 1–5) and level of suspicion (1–100) scores were given per breast by each reader.

The area under the receiver operating characteristic curve (AUC) and the sensitivity and specificity were compared between conditions by using the public-domain iMRMC software. The average reading times were compared by using the Wilcoxon signed rank test.

Results

The 190 women had a median age of 54 years (range, 48–63 years). The examination-based reader-averaged AUC was higher when interpreting results with AI support than when reading unaided (0.88 [95% CI: 0.84, 0.92] vs 0.85 [95% CI: 0.80, 0.89], respectively; P = .01). The average sensitivity increased with AI support (64 of 74, 86% [95% CI: 80%, 92%] vs 60 of 74, 81% [95% CI: 74%, 88%]; P = .006), whereas no differences in the specificity (85 of 116, 73.3% [95% CI: 65%, 81%] vs 83 of 116, 71.6% [95% CI: 65%, 78%]; P = .48) or reading time (48 seconds vs 45 seconds; P = .35) were detected.

Conclusion

Using a single-view digital breast tomosynthesis (DBT) and artificial intelligence setup could allow for a more effective screening program with higher performance, especially in terms of an increase in cancers detected, than using single-view DBT alone.

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