Artificial Intelligence Detection of Missed Cancers at Digital Mammography That Were Detected at Digital Breast Tomosynthesis

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Purpose

To investigate how an artificial intelligence (AI) system performs at digital mammography (DM) from a screening population with ground truth defined by digital breast tomosynthesis (DBT), and whether AI could detect breast cancers at DM that had originally only been detected at DBT.

Materials and Methods

In this secondary analysis of data from a prospective study, DM examinations from 14 768 women (mean age, 57 years), examined with both DM and DBT with independent double reading in the Malmö Breast Tomosynthesis Screening Trial (MBTST) (ClinicalTrials.gov: NCT01091545; data collection, 2010–2015), were analyzed with an AI system. Of 136 screening-detected cancers, 95 cancers were detected at DM and 41 cancers were detected only at DBT. The system identifies suspicious areas in the image, scored 1–100, and provides a risk score of 1 to 10 for the whole examination. A cancer was defined as AI detected if the cancer lesion was correctly localized and scored at least 62 (threshold determined by the AI system developers), therefore resulting in the highest examination risk score of 10. Data were analyzed with descriptive statistics, and detection performance was analyzed with receiver operating characteristics.

Results

The highest examination risk score was assigned to 10% (1493 of 14 786) of the examinations. With 90.8% specificity, the AI system detected 75% (71 of 95) of the DM-detected cancers and 44% (18 of 41) of cancers at DM that had originally been detected only at DBT. The majority were invasive cancers (17 of 18).

Conclusion

Almost half of the additional DBT-only screening-detected cancers in the MBTST were detected at DM with AI. AI did not reach double reading performance; however, if combined with double reading, AI has the potential to achieve a substantial portion of the benefit of DBT screening.

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