

Detecting cardiovascular diseases from mammography using deep learning

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Introduction - Cardiovascular disease (CVD) remains the leading cause of death in females, yet detection strategies remain limited. Mammography is one of the most widely performed imaging tests in females and may contain latent vascular and cardiometabolic information beyond oncologic findings. As a routinely performed population-level screening test, mammography offers a scalable platform for opportunistic cardiovascular risk assessment within an established workflow. Beyond prior known findings, mammography may reflect systemic vascular health. We hypothesized that deep learning applied to routine mammograms could identify established cardiovascular diseases.

Purpose -To develop a deep learning–based algorithm for detecting established cardiovascular diseases from routine mammography images and to evaluate its diagnostic performance for hypertension (HTN), ischemic heart disease (IHD), and cerebrovascular accident (CVA).

Methods - We conducted a retrospective cohort study including females who underwent at least one mammography examination between 2011 and 2025 at a tertiary referral center. Patients without available clinical data were excluded. HTN, IHD, and CVA were defined using structured clinical diagnoses extracted from electronic medical records, supplemented by relevant medication prescriptions, procedural and imaging findings, and documented in-hospital measurements. A convolutional neural network (CNN) was developed to predict the presence of HTN, IHD, and CVA directly from mammographic images. Model performance was evaluated using receiver operating characteristic (ROC) curves and their area under the curve (AUC) for each disease. Prespecified sensitivity analyses were conducted stratified by oncological status, mammographic view, and age.

Results - The study included 29,921 females (median age 54 years [IQR 47–65]) contributing 97,364 mammography examinations, with 5,485 patients (18%) having breast cancer. Median follow-up was 7.3 years (IQR 4.0–11.0). Throughout the cohort, disease prevalence consisted of 4,787 (16%) for HTN, 748 (2.5%) for IHD and 755 (2.5%) for CVA. Algorithm evaluation yielded AUC of 0.79 for HTN, 0.78 for IHD and 0.86 for CVA. Sensitivity analyses showed consistent results, with improved performance for mediolateral oblique (MLO) views (AUC 0.80 for HTN and IHD; 0.88 for CVA).

Discussion - In this large cohort, a deep learning model identified HTN, IHD, and CVA directly from routine mammography with significant discriminative performance. These findings suggest that mammography may serve as a dual-purpose screening platform, extending beyond cancer detection to enable opportunistic cardiovascular identification, and offering a scalable approach to reduce the persistent underdiagnosis of CVD in females.