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Agatston-2.0: A Next-Generation AI-Based Coronary Calcium Quantification Framework Associated with Non-Calcified Plaque Burden Among Individuals with Zero Agatston Scores - Part II

An AI-CVD Study within the Miami Heart Study

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Background

A conventional Agatston coronary artery calcium (CAC) score of zero is associated with low cardiovascular risk, but does not exclude coronary atherosclerosis or non-calcified plaque (NCP). Earlier work found that Agatston-2.0 can detect an AI-derived CAC signal associated with coronary heart disease among individuals with a conventional CAC score of zero.

Objective

To evaluate whether AI-derived CAC positivity (AI-CAC > 0) is associated with greater coronary CT angiography (CCTA)-defined NCP burden among asymptomatic individuals with Agatston-1.0 CAC = 0.

Methods

This baseline cross-sectional analysis included 1,348 asymptomatic Miami Heart Study participants with Agatston-1.0 CAC = 0 who underwent non-contrast cardiac CT and same-day CCTA. NCP was measured using AI-guided quantitative CCTA and expert human-reader assessment. Multivariable analyses evaluated associations between AI-CAC status and NCP, adjusting for traditional risk factors.

Results

AI-CAC was greater than zero in 212 participants (15.7%). Median NCP volume was higher in participants with AI-CAC > 0 than in those with AI-CAC = 0 (43.4 [IQR, 14.9-91.2] mm3 vs 22.6 [IQR, 4.6-55.1] mm3; P < 0.001). After adjustment, AI-CAC > 0 remained associated with greater NCP volume (beta = 0.21; P = 0.002) and higher odds of reader-identified NCP (odds ratio, 2.59; 95% CI, 1.81-3.71; P < 0.001).

Conclusions

Among asymptomatic people with a conventional CAC score of zero, Agatston-2.0 AI-CAC status stratified CCTA-defined NCP burden. AI-CAC positivity was associated with greater NCP burden, suggesting a possible role in identifying residual atherosclerotic risk not captured by conventional CAC scoring. Further validation is needed to determine clinical utility.

Keywords: coronary artery calcium; non-calcified plaque; coronary CT angiography; artificial intelligence; AI-CVD

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