

Diagnostic performance of automatic computer-assisted algorithm for the detection of significant coronary artery disease in patients with acute chest pain at emergency department

Sunyoung Lee, Yeon Hyeon Choe, Ji Hye Min, Sung Mok Kim

Samsung Medical Center, Korea.

yh.choe@samsung.com

PURPOSE: The purpose of our study was to evaluate the performance of computer-aided algorithm for automated stenosis detection at coronary CT angiography (CCTA).

MATERIALS AND METHODS: We investigated 131 consecutive patients (87 male, mean age 65 ± 12 years) who had acute chest pain and underwent 128-slice dual-source CCTA and coronary angiography (CAG) between June 2009 and August 2011 in the emergency department (ED). All CCTA data were analyzed using a software algorithm for automated, without human interaction, detection of coronary artery stenosis. The performance of the automatic computer-assisted detection (auto-CAD) for evaluation of stenosis of 50% or more was compared with CAG. In addition, the accuracy of the semi-quantitative assessment of CCTA by two experienced radiologists was compared with CAG.

RESULTS: In 111 of 131 patients (20 were excluded due to failure of data processing or previous history of stent insertion / CABG), CAG demonstrated significant coronary artery stenosis in 65 of 111 patients (58.6%) of which the auto-CAD algorithm correctly identified 64 (98.5%). For the detection of the 50% or more coronary artery stenosis, per-patient analysis of auto-CAD revealed the following: 98.5% sensitivity, 34.8% specificity, 68.1% positive predictive value (PPV), 94.1% negative predictive value (NPV). Per-vessel analysis of auto-CAD showed 88.4% sensitivity, 58.4% specificity, 45.9% PPV, 92.7% NPV. The visual inspection of CCTA had 96.8%/98.5 sensitivity, 94.5%/ 82.6% specificity, 87.6% /88.9% PPV, and 98.7%/ 97.4 NPV for diagnosing stenosis of > 50% on per-vessel/per-patient analysis, respectively.

CONCLUSION: Auto-CAD algorithm showed the high NPV for the detection of > 50% CAD on CCTA in the setting of acute chest pain. If used as a second reader, the auto-CAD algorithm can be used to exclude significant stenosis and facilitate the decision-making process in the ED.

CLINICAL RELEVANCE/APPLICATION: Auto-CAD algorithm may enhance the confidence of human interpreters for excluding significant stenosis in coronary arteries at coronary CT angiography.