Significance of advanced coronary atherosclerosis in development of atrial fibrillation

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Introduction: Atrial fibrillation (AF) has emerged as a major public health problem with increasing age of the society. Although coronary computed tomography angiography (CCTA) provides comprehensive evaluation of coronary atherosclerosis, one of the well-known risk factors of AF, data regarding the risk of AF occurrence according to CCTA results remain paucity. We aimed to examine the association between risk of AF and CCTA-derived characteristics in general population.

Methods: We retrospectively reviewed 24,826 cases who performed 12-lead electrocardiography (ECG) and CCTA with calcium scan on the same day for a routine health checkup between 2003 and 2017. The primary endpoint was AF documentation on ECG. Coronary artery calcium scores (CACS) were presented using Agatston units. The presence, location, and extent of coronary atherosclerosis and maximal diameter stenosis (DS) were evaluated on CCTA. Plaque composition was categorized as non-calcified, mixed, or calcified according to the volume of calcified component (>130 Hounsfield Units).

Result: Of total enrolled subjects (mean age 56.6 year, male 72.7%), AF was detected in 210 subjects (0.8%). Univariate analysis showed age ≥60, male sex, obesity, smoking, a history of hypertension, diabetes mellitus, hyperlipidemia, and chronic kidney disease, and elevated serum T4 level were significantly associated with AF. Among CCTA parameters, CACS ≥400, presence of calcified plaque (CP), DS ≥50%, left main disease, and 3-vessel involvement were significantly related with AF occurrence. Particularly, CACS and extent of coronary atherosclerosis had a stepwise association with AF. After adjusting for clinical parameters which were significant in the univariate analysis, CACS ≥400 (adjusted OR 2.15, p=0.011), 3-vessel involvement (adjusted OR 1.34, p=0.041), and presence of CP (adjusted OR 3.61, p<0.001) each remained significant.

Conclusion: Advanced coronary atherosclerosis, presented by higher CACS, multi-vessel involvement, and presence of CP, was significantly associated with AF. It can provide a new insight of pathophysiology of AF and a solid evidence for AF prevention via effective management of atherosclerosis risk factors.