Prognostic value of peri-coronary adipose tissue attenuation and whole vessel and lesion plaque quantification on Coronary Computed Tomography Angiography

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Background: Peri-coronary adipose tissue attenuation expressed by fat attenuation index (FAI) on coronary CT angiography (CCTA) reflects peri-coronary inflammation and is associated with cardiac mortality. CCTA also provides two-dimensional and three-dimensional quantification of the individual component of atherosclerotic plaque and entire vessel. The atherosclerotic burden or disease extent in entire epicardial coronary arteries provides prognostic information in patients with coronary artery disease.

Purpose: This study sought to explore the prognostic significance of FAI values and whole vessel and lesion plaque quantification on CCTA in stable patients with intermediate epicardial stenosis evaluated by fractional flow reserve (FFR).

Methods: A total of 277 patients (277 lesions) with intermediate coronary stenosis who underwent FFR measurement and CCTA were studied. FAI was assessed by the crude analysis of the mean CT attenuation value (−190 to −30 Hounsfield units; higher values indicating inflammation) on CCTA. CT findings including whole vessel and lesion plaque quantification, and target vessel myocardial mass were investigated. Major adverse cardiovascular outcome (MACE) was defined as all cause death, cardiac death, myocardial infarction, unplanned revascularization, and heart failure requiring admission. Survivals from MACE were assessed.

Results: The mean FAI and the median FFR values were −71.6 and 0.77, respectively. FFR values were weakly albeit significantly correlated with FAI values. (r=−0.016, P=0.008.) MACE was occurred 43 (15.5%) patients during 5 years F-up. ROC analyses revealed that best cut-off value of FAI to predict MACE was −73.1. Kaplan-Meier analysis revealed that lesions with FAI $\geq$−73.1 had a significantly higher risk of MACE. (Chi-square 5.5, P=0.019) FFR values and the percutaneous coronary intervention were not predictive of MACE. Multivariate COX proportional hazards regression analysis revealed that age, remodeling index, and lesions with FAI $\geq$−73.1 were independent predictors of MACE.

Conclusion: The peri-coronary inflammation evaluated by FAI and CT remodeling index enhances cardiac risk prediction in chronic coronary syndrome patients with intermediate lesions. Non-invasive comprehensive CT assessment may help identify high risk patients of subsequent clinical events and provide enhanced patient management.