CAD-RADS score, vascular inflammation, and plaque vulnerability

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Funding Acknowledgements: Type of funding sources: Private grant(s) and/or Sponsorship. Main funding source(s): Mrs. Gillian Gray through the Allan Gray Fellowship Fund in Cardiology. Mukesh and Priti Chatter through the Chatter Foundation.

Background: Coronary artery disease reporting and data system (CAD-RADS), which is widely used to report the severity of coronary artery disease on coronary computed tomography angiography (CTA), predicts the risk of future cardiovascular events. However, the relationship between the CAD-RADS score and vascular inflammation and plaque vulnerability has not been investigated.

Objective: The aim of this study was to correlate the CAD-RADS score with vascular inflammation and plaque vulnerability.

Methods: This is an observational, single-center cohort study with prospective clinical follow-up. Patients who underwent both coronary CTA and optical coherence tomography (OCT) before coronary intervention were enrolled. All OCT and CTA images were analyzed at the core laboratory. Patients were categorized into two groups according to the CAD-RADS score (≤4a or 4b/5). All coronary arteries were analyzed for high-risk plaque features (positive remodeling, low-attenuation plaque, napkin-ring sign, and spotty calcification) and peri-coronary adipose tissue (PCAT) attenuation. PCAT attenuation was measured around the culprit lesion and in the proximal segment of all 3 coronary arteries. OCT features of plaque vulnerability were evaluated in culprit vessels. Major adverse cardiovascular and cerebrovascular events (MACCE) were defined as composite endpoints of unplanned target vessel revascularization, unplanned non-target vessel revascularization, nonfatal acute coronary syndrome, stroke, and cardiac death.

Results: Among 369 patients with 902 lesions, 104 (28.2%) were categorized in CAD-RADS 4b/5 and 265 (61.8%) in CAD-RADS ≤4a. Patients with CAD-RADS 4b/5 had higher PCAT attenuation than those with CAD-RADS ≤4a at all three levels (mean of 3 coronary vessels: -67.9 ± 6.9 HU vs. -70.2 ± 6.5, P=0.004; culprit vessel: -67.4 ± 7.9 vs. -70.2 ± 7.6, P=0.004; culprit plaque: -67.0 ± 9.3 vs. -69.9 ± 10.5, P=0.009; respectively) (Figure 1A). Lipid-rich plaque and macrophage, as detected by OCT, were more prevalent in the culprit vessel in patients with CAD-RADS 4b/5 than in those with CAD-RADS ≤4a (89.0% vs. 78.5%, P=0.001; 76.6% vs. 64.9%, P=0.001; respectively) (Figure 1B). All HRP features, as detected by CTA, were more frequently observed in patients with CAD-RADS 4b/5 than those with CAD-RADS ≤4a (P for all <0.001) (Figure 2). The cumulative incidence of MACCE was higher in patients with CAD-RADS 4b/5 than in those with CAD-RADS ≤4a (15.0% vs. 5.8%, P=0.045).

Conclusions: Higher CAD-RADS score was associated with a higher level of pan-coronary vascular inflammation and plaque vulnerability.

Figure 1
Figure 2