Phenotyping coronary plaque by computed tomography in premature coronary artery disease

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Background: Premature coronary artery disease (CAD) is an aggressive chronic disease with multiple recurrences mostly related to the progression or complication of new coronary lesions.

Purpose: To compare coronary plaque characteristics of individuals with premature CAD with those of incidental plaques found in matched individuals free of overt cardiovascular disease, using coronary computed tomography angiography (CCTA).

Methods: 106 individuals with premature CAD were matched by age, sex, smoking status, family history of CAD, and dyslipidemia with 106 controls free of overt cardiovascular disease. CCTA were standardly analyzed for CAD-RADS score, plaque composition (calcified, partially or non-calcified), and the following four high-risk plaque (HRP) features: spotty calcification, positive remodeling, napkin-ring sign, and low-attenuation plaque.

Results: At least one coronary plaque was found in 85% of individuals with premature CAD vs. 62% of matched controls. The prevalence of non-calcified plaques was higher among individuals with premature CAD (65.1% vs. 30.2%, p<0.001), as well as spotty calcification (42.5% vs. 17.9%, p<0.001), positive remodeling (41.5% vs. 9.4%, p<0.001), low-attenuation plaques (24.5% vs. 3.8%, p<0.001) and napkin-ring sign (1.9% vs. 0.0%) (Figure 1). Individuals with premature CAD exhibited an average of 2.2 (±2.7) HRP features per person, while the control group displayed 0.4 (±0.8) HRP per person (p<0.001). Within a median follow-up of 24 [16,34] months, 24 ischemic recurrent events occurred in 24 individuals, all in the premature CAD group. Individuals with premature CAD and recurrent ischemic event had more high-risk plaque features (4.3±3.9) than those without ischemic recurrence (1.5±1.9). They displayed more frequently non-calcified plaques (91.7% vs. 57.3%) with positive remodeling (75.0% vs. 31.7%) and low-attenuation plaques (45.8% vs. 18.3%) as compared to those without ischemic recurrence (Figure 2).

Conclusions: Coronary atherosclerosis in individuals with premature CAD is characterized by a high and predominant burden of non-calcified plaque and unusual high prevalence of high-risk plaque features, contributing to disease progression with multiple recurrences in this setting.

HRP features in study population
HRP according to ischemic recurrence