Impact of Plaque Composition Assessed by iMap™-intravascular Ultrasound on Elevation of High Sensitive Cardiac Troponin T After Percutaneous Coronary Intervention

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Background: It remains unclear whether coronary plaque composition is associated with peri-procedural myocardial injury (PMI) after percutaneous coronary intervention (PCI). This study sought to determine the impact of plaque composition analysis by iMap™-intravascular ultrasound (iMap-IVUS) (Boston Scientific, Boston, MA), a recently developed intracoronary imaging system for tissue characterization, on PCI assessed using a highly sensitive assay for cardiac troponin T (hs-TnT).

Methods: We examined 56 culprit plaques in patients with 52 stable and 4 unstable angina pectoris by iMap-IVUS. The major tissue characteristics at minimal luminal area were classified as iMap-IVUS as fibrotic, necrotic and calcified components, and these are described herein as relative plaque areas. The hs-TnT values were measured before and 24 hours after PCI, and differences were expressed as Δhs-TnT. High hs-TnT elevation was defined as Δhs-TnT level ≥ 0.073 pg/mL of median value. Patients were divided into 2 groups according to the presence (Group I, n = 28) or absence (Group II, n = 28) of high hs-TnT elevation.

Results: Compared with Group II, Group I had significantly higher percent necrotic area (45.2% vs. 24.7%, p = 0.01) and lower percent fibrotic area (42.1% vs. 58.3%, p = 0.016). The percent lipid and calcified areas were similar between the two groups. Group I also had longer lesion length (17.9 ± 9.9 vs. 13.0 ± 4.9 mm, p = 0.024), a lower frequency of direct stenting (18.5% vs. 54%, p = 0.011), and a higher frequency of post-dilation (89 vs. 61%, p = 0.014) than Group II. The Δhs-TnT level correlated positively with percent necrotic area (r = 0.40, p = 0.003), lesion length (r = 0.31, p = 0.021), and negatively with percent fibrotic area (r = -0.35, p = 0.008). In multivariate logistic regression analysis, a larger percent necrotic area (odds ratio [OR], 1.08; 95% confidence interval [CI], 1.02 - 1.14; p = 0.005) and less direct stenting (OR, 0.11; 95%CI, 0.025 - 0.51; p = 0.005) were independent predictors of high hs-TnT elevation.

Conclusions: Plaque composition analysis by iMap-IVUS is useful to predict the elevation of hs-TnT after PCI.

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Epidermal fat volume and coronary plaque characteristics

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Background: Unlike subcutaneous fat, epidplanic fat has a higher secretion of inflammatory cytokines. Recent study have shown that epicardial fat volume (EFV) may be linked with the development of coronary atherosclerosis. The aim of this study is to assess the relationship of EFV and plaque vulnerability using a 40MHz IVUS imaging system (Map-IVUS) in significant coronary stenotic lesion.

Methods: We analysed consecutive 118 patients (73 men and 45 women, mean age 70.0 ± 9.5 years) with suspected coronary artery disease who underwent 64-slice dual-source CT (DSCT) and cardiac catheterization. Culprit lesions were imaged by iMap-IVUS before stenting. The iMAP-IVUS system analyzed coronary plaques as fibrotic, lipidic, necrotic, or calcified tissue based on the radiofrequency spectrum. Cross-sectional computed tomographic cardiac slices (1.0mm thick) from base to apex were traced semiautomatically. Using a 3D workstation (Ziostation; Amin, Tokyo, Japan), EATV was measured by assigning Hounsfield units ranging from -190 to -30 and was obtained as the sum of fat areas on short axis images.

Results: EFV was 67.6±22.8 (range, 20.8 to 112.8). A positive correlation was found between EFV and the percentage of necrotic plaque (r=0.38, p=0.016). However, significant correlation was not observed between EFV and the percentage of fibrotic plaque (r=0.22, p=0.182), lipid plaque (r=0.20, p=0.214), or calcified plaque (r=0.04, p=0.852). Additionally, multivariate analysis by linear regression (adjustment for age, BMI, LDL cholesterol level) revealed that increased EFV remained as an independent parameter associated with the percentage of necrotic plaque (r=0.34, p=0.023).

Conclusions: Our data showed that increased EFV was associated with the development of coronary atherosclerosis and potentially the most dangerous type of plaques. The measurement of EFV using cardiac computed tomography before percutaneous coronary intervention may be a useful marker for detecting the presence of vulnerable plaques.