Relationship Between Patterns of Calcification and Arterial Remodeling of Culprit Lesions: Comparing Patients With Acute Coronary Syndromes With Those With Stable Angina

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Background: There is conflicting evidence for the link between calcification and plaque instability. Intravascular ultrasound (IVUS) studies have shown that calcified plaques are associated with stable plaques. In contrast, recent histopathological studies have revealed that plaque calcification is present in 69% of ruptured plaques in sudden coronary death. Furthermore, studies using electron-beam computed tomography have reported that calcium score relates to acute coronary events. The purpose of this study is to investigate the relationship between patterns of calcification and arterial remodeling of culprit lesions, comparing patients with acute coronary syndromes (ACS) with those with stable angina (SAP).

Methods and Results: Preinterventional intravascular ultrasound (IVUS) images of 178 patients were studied; 61 with acute myocardial infarction (AMI), 70 with unstable angina pectoris (UAP) and 47 with SAP. The presence of calcifications within an arc of less than 90° for all calcifications was significantly higher in patients with either AMI or UAP than in SAP (P<0.001). Moreover, the average number of calcium deposits within an arc of less than 90° per patient was significantly higher in AMI than in SAP (P<0.0001) (AMI: 1.4±1.3, SAP: 0.5±0.8, mean±SD). Conversely, the length of the calcium deposits was significantly longer in SAP patients (P<0.001) (AMI: 2.2±1.6, UAP: 1.9±1.8, SAP: 4.3±3.2, mean±SD). In AMI patients, the typical pattern was spotty calcification, associated with a fibrofatty plaque and positive remodeling. In ACS patients showing negative remodeling, no calcification was the most frequent. Conversely, in SAP patients, the frequency of extensive calcification was the highest. Conclusion: These findings show that IVUS allows the identification of vulnerable plaques in coronary arteries, not only by identifying a large lipid core and positive remodeling, but also by identifying a spotty pattern of calcification.

9:30 a.m.

Multiple Plaque Ruptures Are Not Frequent in Acute Coronary Syndrome: A Three-Vessel Intravascular Ultrasound Study

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Background: Systemic inflammation plays an important role in plaque rupture in acute coronary syndrome (ACS). Thus, ruptured plaque may be observed not only in culprit lesions, but also in non-culprit lesions in ACS patients.

Methods: A total of 46 patients with a first ACS (<4 weeks from onset, 37 acute myocardial infarction (AMI), 9 unstable angina pectoris (UAP)) were included in the present study. Pre-interventional intravascular ultrasound (IVUS) was attempted in all 3 major coronary arteries (at least 2/3 segment of each artery) in each patient. Remodeling index was calculated as lesion divided by average reference (Ref.) external elastic membrane (EEM) cross-sectional area (EEM CSA). Eccentricity index was calculated as the ratio of minimal to maximal plaque thickness.

Results: Pre-intervention IVUS could be performed in 41 culprit and 81 non-culprit arteries. Plaque rupture was observed in 20 culprit lesions (49%). Conversely, there were only 7 non-culprit plaques (15%) – 6 in a non-culprit artery. Thrombi were more common, plaque burden larger, and minimum lumen CSA smaller in culprit lesions, but also in non-culprit lesions in ACS patients. There were no significant differences for lumen area, vessel area and percent of plaque area during procedure. Pre-procedural soft plaques were more prevalent in group A (group A 86.4%, group B 56.4%, P=0.049), group A had more lipid core (group A 33.3%, group B 6.8%, P=0.002). Positive vessel remodeling was more common in group A (group A 33.3%, group B 6.0%, P=0.003).

Conclusion: Soft plaques and presence of lipid core found by IVUS during procedure