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Characterization of the calcium component of vulnerable coronary plaque in patients with NSTEMI: prospective comparison between coronary CT and optical coherence tomography

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Background: Acute Coronary Syndrome (ACS) remains a leading cause of mortality worldwide with a high risk of recurrence. Apart culprit plaques, the presence of vulnerable plaques could be associated with the occurrence of future cardiac events and need to adapt treatments. Several studies have demonstrated a role for Coronary Computed Tomographic Angiography (CCTA) to predict the vulnerability of the plaque but with limited analysis of its calcium component. Recent works suggest a role for calcification in this vulnerability.

To our knowledge, no studies have been performed to assess if the study of the calcium component of plaques with CCTA can help to predict vulnerability in non-ST elevation myocardial infarction (NSTEMI).

Purpose: To assess if the CCTA study of the calcium component of plaques can help to predict plaque vulnerability defined by intracoronary OCT analysis in patients with non-ST elevation myocardial infarction (NSTEMI).

Methods: Monocentric prospective study of consecutive patients referred for NSTEMI with elevated high-sensitivity cardiac troponin I level (hs-TnI>50 ng/ml) from January to October 2018. CCTA was systematically performed before coronary angiography to assess the presence of CAD. When CCTA demonstrated significant lesions, coronary angiography was performed within 24 hours associated with systematic OCT study of three coronary arteries. Apart culprit plaques, vulnerable plaques were defined in OCT by a fibrous screed thickness <65 microns. Calcified plaques were analysed with CT and then classified into 3 groups: vulnerable culprit plaque (VCP), vulnerable non-culprit plaque (VNCP) and stable plaque (SP).

Results: Of 1478 patients with chest pain, 257 (17%) had NSTEMI with high level of hs-TnI. From this 257 NSTEMI patients, 44 (17%) were without known CAD and among these, 33 (75%) had received coronary angiography with 29 (66% - mean age 59±13 years, 73% men) having coronary anatomy compatible with OCT assessment. A total of 123 calcified plaques were identified. Among them, OCT allowed to identify 77 (63%) SP and 47 calcified vulnerable plaques; 28 (23%) VNCP and 19 (15%) VCP. After CCTA analysis of the calcium component, predictive factors of plaque vulnerability were identified: longer calcification length (p<0.001), larger calcification volume (p<0.001), lower calcium mass (p=0.003), higher single plaque Agatston score (p<0.001), lower sphericity index (p=0.001), more spotty calcifications (p=0.001), as well as more intimal position in the wall (p<0.001). No significant differences were observed comparing VNCP and VCP (Figure).

Conclusion: CCTA study of the calcium component of plaque allows to identify predictors of plaque vulnerability defined by OCT in patients with NSTEMI.
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CCTA study of the calcium component of plaque allows to identify predictors of plaque vulnerability defined by OCT in patients with NSTEMI.

OCT and "Virtual Histology" CT

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