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Influence of periplaque fat on coronary plaque vulnerability, a comparative analysis between atherosclerotic lesions located in the right versus left coronary arteries

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Background: The role of epicardial adipose tissue on coronary plaque vulnerability has been well established. However, the role of periplaque fat (PPF) has not been elucidated so far. Moreover, there is scarce data on the role of plaque location, in relation to peri-atheromatous adipose tissue on the vulnerability degree and morphology of coronary atherosclerotic lesions.

Purpose: To evaluate the influence of PPF on coronary plaque vulnerability, in a comparative analysis between atherosclerotic lesions located in the right and left coronary arteries.

Methods: This is an observational study which included 82 patients with stable CAD, who underwent 128-multislice CT coronary angiography, presented at least one coronary lesion with at least 50% degree of stenosis and exhibited ≥1 vulnerability markers in the respective coronary plaque. Plaques presenting features of vulnerability (spotty calcifications – SC, Napkin ring sign – NRS, low attenuation plaque – LAP, positive remodeling – PR), were defined as vulnerable plaques (VP). Image postprocessing was performed with the Syngo.via Frontier software and PPF was measured 10 mm around the analyzed VP. Based on the plaque location within the coronary tree, the study subjects were divided into: group 1 (location of VP in the right coronary artery - RCA) - n = 17; group 2 (location of VP in the left coronary artery - LCA) - n = 65.

Results: The analysis of the plaque characteristics indicated that the VPs from the RCA were significantly longer (20.81± 6.45 vs. 17.37 ± 4.59 mm, p = 0.02) and had a larger volume (269.3± 120.4 vs. 161.6 ± 80.89 mm3, p < 0.0001) compared to the VPs from the LCA. Compared to group 2, coronary plaques in group 1 exhibited a higher vulnerability degree, illustrated by a larger non-calcified volume (232.5 ± 111 vs. 134.5 ± 83.29 mm3, p = 0.0006), lipid-rich volume (19.4 ± 19.07 vs. 10.27 ± 17.08 mm3, p = 0.0106), and fibro-fatty volume (213 ± 101.3 vs. 124.2 ± 7.98 mm3, p = 0.0009). The PPF was significantly larger in VPs from the RCA (0.92 ± 0.48 mm3 vs. 0.57± 0.34 mm3, p = 0.0041) compared to VPs located in the LCA. No differences were found regarding the total epicardial fat between the two groups (p = 0.386).

Conclusions: Atherosclerotic plaques located in the RCA exhibited a higher number of vulnerability characteristics compared to those located in the left coronary system and PPF was more pronounced in the regions surrounding VPs located within the RCA. This difference in vulnerability features could be explained not only by geometrical and hemodynamical characteristics of the coronary circulation, but also by inflammation-mediated alteration of endothelial shear stress triggered by release of inflammatory mediators from the local epicardial fat.