HISTOMORPHOMETRIC CHARACTERISTICS OF HIGH-RISK PLAQUES

ACC Poster Contributions
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Background: Although the degree of luminal stenosis to risk of plaque rupture is controversial, clinical practice has continued to perform stress echocardiographic or nuclear tests for prognostication. NHLBI Registry data has demonstrated that 6% of initially non-obstructive lesions result in coronary events over 1-year follow-up with significant occlusion at the time of the acute event. Recently reported PROSPECT study has also confirmed such findings. To evaluate the role of various histomorphological characteristics in determining plaque vulnerability, we examined a large number of coronary plaques from victims of sudden coronary death.

Methods and Results: Histomorphometric analysis was performed on 102 plaque ruptures (PR), 88 thin-cap fibroatheromas (TFCA, defined by a necrotic core and fibrous caps thickness <65-μm), and 105 stable plaques (SP); distal lesions and TCFA’s adjacent to PRs were excluded. Approximately, two-thirds of PRs exhibited >75% (cross-sectional area, CSA) stenosis, while 25% were between 50-75%; on the contrary, TCFA were less occlusive with 45% and 40% of lesions. PRs showed greater lesion area, necrotic core (NC) size, and macrophage (Mac) content compared to TCFA and SPs; no differences were found for lumen area, % stenosis (CSA) and calcification. A recursive partitioning analysis was performed to identify morphologic contributors to discriminate the 3 lesion types. For plaques with 50-75% CSA stenosis, Mac area was the strongest contributor (G^2=52) followed by NC size (G^2=8). In contrast for lesions with >75% CSA stenosis, Mac and NC area had a similar impact in detecting plaque type (Mac:G^2=51, NC:G^2=32).

Conclusion: These data suggest that expansion of plaque size in TCFA may precede PR and that plaque composition determines lesion instability with macrophage infiltration and necrotic core size playing the largest role. Strategy directed at an early detection of macrophage volume will be necessary to significantly reduce clinical events.