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Association between n-3 and n-6 polyunsaturated fatty acids and plaque vulnerability by optical coherence tomography in acute myocardial infarction patients

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Background: The values of n-3 and n-6 polyunsaturated fatty acids (PUFAs) like low eicosapentaenoic acid (EPA) /arachidonic acid (AA) ratio are known to be associated with cardiovascular events, however their relationship with coronary plaque vulnerability in acute myocardial infarction (AMI) is not revealed.

Purpose: We evaluated the relationship between n-3 and n-6 PUFAs and coronary plaque vulnerability assessed by optical coherence tomography (OCT) in AMI patients.

Methods: We investigated 79 AMI lesions (51 ST elevated myocardial infarction (STEMI) lesions and 28 non-STEMI lesions) that had undergone emergency percutaneous coronary intervention using OCT. Coronary plaque characteristics by OCT were compared with n-3 and n-6 PUFAs values which were measured on admission.

Results: Of all AMI lesions (n=79), 43 thin-cap fibroatheroma (TCFA) and 35 plaque rapture (PR) were detected by OCT. Lesions with TCFA had no significant relationship with n-3 and n-6 PUFAs values, whereas lesion with PR had significantly lower EPA values than those without (55.8±29.5 vs 74.3±37.1 μg/ml, p=0.018). Median low-density lipoprotein (LDL) cholesterol value was 117 (98–137) mg/dl and sub-analysis in patients who had lower LDL cholesterol values than median (n=39) revealed that EPA values were significantly lower in lesions with TCFA (56.3±30.9 vs 85.3±47.7 μg/ml, p=0.03). In STEMI patients, the values of EPA and EPA/AA ratio were significantly lower in lesions with TCFA (EPA: 55.5±22.8 vs 80.8±46.1 μg/ml, p=0.01; EPA/AA ratio: 0.34±0.16 vs 0.50±0.36, p=0.03). STEMI patients who had lower LDL cholesterol values <114 mg/dl of median (n=26), the values of EPA, EPA/AA ratio, and EPA+ docosahexaenoic acid (DHA) /AA ratio were significantly lower in lesions with TCFA (EPA: 51.4±20.7 vs 93.1±53.0 μg/ml, p=0.01; EPA/AA ratio: 0.37±0.16 vs 0.67±0.41, p=0.01; EPA+DHA/AA ratio: 1.13±0.41 vs 1.63±0.76, p=0.04). In STEMI patients with lower LDL cholesterol values, EPA/AA ratio positively correlated with fibrous cap thickness (Spearman, ρ=0.35, p=0.08). The cutoff value of EPA/AA ratio predicting the existence of TCFA was 0.52 (area under the curve 0.78, sensitivity 93.8%, specificity 70.0%, p=0.02).

Conclusion: This study demonstrated that n-3 and n-6 PUFAs values were associated with coronary plaque vulnerability by OCT in AMI patients, especially in STEMI. These results suggest that n-3 and n-6 PUFAs may be residual risk markers of severe acute cardiovascular events in patients with low LDL cholesterol values.