Association between near-infrared spectroscopy defined lipid rich plaque and pericoronary adipose tissue inflammation on computed tomography angiography

M. Yamaguchi[1], M. Hoshino[1], K. Nogami[1], H. Ueno[1], T. Misawa[1], Y. Sumino[1], M. Hada[1], Y. Kanaji[1], T. Sugiyama[1], T. Yonetsu[2], T. Kakuta[1]

[1]Tsuchiura Kyodo Hospital, Department of Cardiovascular Medicine, Tsuchiura, Japan; [2]Tokyo Medical and Dental University, Department of Cardiovascular Medicine, Tokyo, Japan

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Background: A recent study has shown that lipid-rich plaque (LRP) detected by near-infrared spectroscopy (NIRS) is a significant predictor of future adverse events. Pericoronary adipose tissue inflammation (FAI; fat attenuation index) evaluated by computed tomography angiography (CTA) has also been reported to be linked with cardiac events. The relationship between NIRS-defined LRP and FAI remains to be determined.

Methods: A total of 82 de novo culprit lesions in 82 patients with chronic coronary syndromes (CCS) who underwent perprocedural CTA and NIRS was retrospectively studied. FAI was assessed by the crude analysis of the mean CT attenuation value (–190 to –30 Hounsfield units; higher values indicating inflammation) of pericoronary adipose tissue. Plaque morphology was assessed by coronary CTA and grey-scale intravascular ultrasound (IVUS). NIRS-defined LRP was defined as a maximum lipid core burden index (LCBI) in 4 mm $\geq$400. Relationship between NIRS-defined LRP, CTA/grey-scale IVUS findings, and FAI was assessed. Univariate and multivariate logistic regression analyses were performed to determine the predictors for NIRS-derived LRP.

Results: NIRS-defined LRP was observed in 35 (42.6%) patients. Maximum LCBI showed modest correlations both with FAI (r=0.29, p-value=0.007) and CT-derived remodeling index (r=0.51, p$<$0.001). Receiver operating characteristic (ROC) curve analysis revealed that the best cut-off values of FAI and CT-derived remodeling index for predicting NIRS-defined LRP were –70.7 (AUC: 0.65, 95% CI: 0.53–0.71, P$<$0.05) and 1.11 (AUC: 0.74, 95% CI: 0.63–0.86, P$<$0.01), respectively. Multivariate logistic regression analysis showed FAI $\geq$–70.7 (odds ratio [OR]: 4.27; 95% CI: 1.28–14.3; p-value = 0.02) and CT-derived remodeling index (OR: 10.7; 95% CI: 2.99–32.2; p-value $<$0.001) were independent predictors of the presence of NIRS-defined LRP, whereas there was no statistically significant and independent predictor of IVUS-derived factors for NIRS-defined LRP. When stratified according to the presence or absence of FAI $\geq$–70.7 and CT-derived remodeling index $\geq$1.11, 93% of the lesions showed NIRS-derived LRP when both factors were present, and NIRS-derived LRP was safely ruled out (88%) when both factors were absent.

Conclusions: FAI of the culprit lesion in CCS was an independent predictor of NIRS-defined LRP, supporting the notion that local pericoronary adipose tissue inflammation may correlate to the presence of LRP. Comprehensive assessment of coronary CTA including FAI evaluation may provide a highly accurate information with high sensitivity and specificity for identifying high risk lesions potentially leading to future cardiac events.