Clinical implications of coronary artery morphology of patients with ischemia and non-obstructive coronary artery disease (INOCA) -An intracoronary OCT study-

K. Nishimiya, A. Suda, K. Hao, J. Takahashi, Y. Matsumoto, K. Satoh, J. Sugisawa, T. Shindo, S. Godo, Y. Kikuchi, T. Shiroto, H. Shimokawa

Tohoku University Graduate School of Medicine, Sendai, Japan

Funding Acknowledgement: Type of funding source: None

Introduction: Ischemia and non-obstructive coronary artery disease (INOCA), including microvascular spasm (MVS) and epicardial spasm, has recently attracted much attention, for which in vivo imaging evaluation for coronary artery morphology is warranted for better understanding of this disorder. Besides the improved diagnostic accuracy of optical coherence tomography (OCT) for coronary plaques, we have recently demonstrated its capability for in vivo visualization of coronary adventitial vasa vasorum (VV) and the enhanced VV formation in patients with epicardial spasm.

Purpose: We aimed to examine OCT-delineated morphological characteristics in patients with INOCA in vivo.

Methods: A total of 335 consecutive INOCA patients, who underwent pharmacological spasm provocation tests, lactate sampling, and OCT imaging over the entire length of the left anterior descending (LAD) coronary arteries, were enrolled at our institute over 68 months from April 2013. They were classified into 4 groups; control with non-cardiac chest pain, MVS, diffuse spasm (DS), or focal spasm (FS) (Fig. 1A). MVS was diagnosed when negative lactate extraction ratio (coronary orifice $<$ coronary sinus) was detected despite the absence of epicardial spasm during the spasm provocation test. DS was defined as epicardial spasm induced in more than 2 coronary segments in LAD, and FS as epicardial spasm in one segment. Quantitative analyses for adventitial inflammation and atherosclerotic changes were performed by calculating VV density and %area stenosis (AS) on OCT (Fig. 1B, E). Furthermore, index of microcirculatory resistance (IMR), a marker of microvascular disorder with a cut-off value of $\geq$25, was measured during intravenous infusion of adenosine, which was then correlated with VV densities in the MVS and DS groups. Coronary plaque with a necrotic core was classified as fibroatheroma (FA), and the number of OCT frames with internal VV (IVV) in the atheroma was counted.

Results: VV density was significantly higher in MVS as compared with the controls (Fig. 1B). DS was most prevalent in INOCA (Fig. 1A) with highest VV density (Fig. 1B). Patients with IMR$\geq$25 were predominantly distributed with a gradual increase in the MVS, DS, and FS groups, but none in the controls (Fig. 1C). Importantly, there was a significant positive correlation between VV densities and IMR in the MVS and DS groups (Fig. 1D). In addition, FS had the largest plaque size and showed the highest prevalence of FA and IVV (Fig. 1E–G).

Conclusions: These results indicate that MVS and DS are characterized by vasomotion abnormalities associated with adventitial inflammation and microvascular disorder, while FS by vulnerable atherosclerotic phenotype, suggesting that OCT may be useful for screening high-risk populations in INOCA.

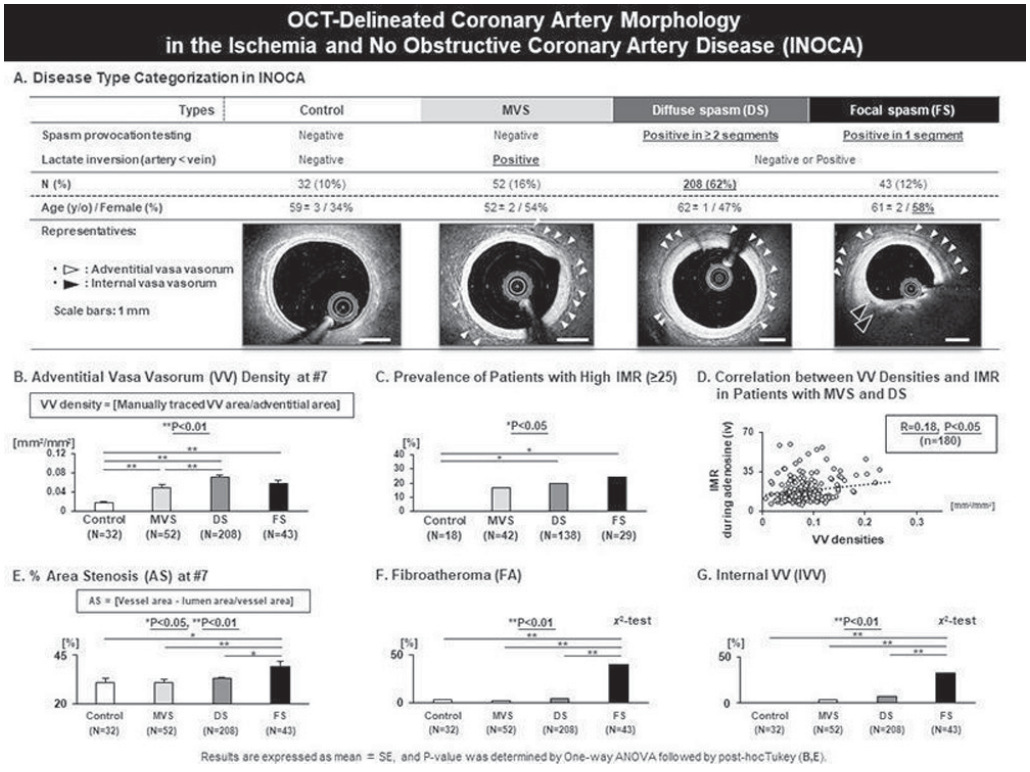

Figure 1