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Current CTA Technology for the Detection and Prediction of ACS

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Background: Pathological studies have indicated that ACS lesions have either ruptured-fibrous (RFC-ACS) or intact (IFC-ACS) fibrous caps. Whereas CT-angiographic characteristics of RFC-ACS include low-attenuation plaques (LAP) and positive remodeling (PR), features associated with IFC-ACS have not been previously described. Furthermore, the prediction of ACS and long-term prognosis of patients having high risk plaque (HRP) have not yet fully understood.

Methods and Results: Firstly, we performed multiple imaging procedures including CT-angiography (CTA), optical coherence tomography (OCT), angioscopy, intravascular ultrasound (IVUS) in 57 patients with ACS or stable angina. While intraluminal thrombus was assessed by OCT or angioscopy, culprit lesions were classified further by OCT-based demonstration of fibrous-cap integrity. Of 35 culprit lesions with ACS, OCT revealed IFC with thrombus in 10 (29%) and RFC in the remaining 25 (71%). Although CT-verified low-attenuation plaques (LAP) and positive remodeling (PR) were more frequently observed in RFC-ACS than IFC-ACS and stable angina ($p=0.001$) lesions, none of the specific CT-angiography features clearly distinguished IFC-ACS from stable lesions. Secondary, we evaluated plaque characteristics such as PR and LAP of lesions resulting in ACS in 1059 patients with CTA in 2.3 years. Finally, we estimated the impact of high risk plaque (HRP) and significant stenosis (SS) of >70% on the occurrence of fatal and nonfatal ACS in 3158 patients with CTA during follow-up of 3.9 years.

Conclusion: While IFC-ACS in our study would represent plaque erosions, distinct culprit lesion characteristics with IFC-ACS are not identified by CTA. Whilst patients demonstrating PR and LAP were at a higher risk of ACS developing in 2.3 years, plaque progression by serial CTA was also an independent predictor of ACS in 3.9 years.