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Diagnosis of coronary plaque rupture, plaque erosion, and calcified nodule by using near-infrared spectroscopy intravascular ultrasound

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Topic(s):
Acute Coronary Syndromes: Angiography, Invasive Imaging, FFR

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Objectives: This study sought to investigate the ability of near-infrared spectroscopy intravascular ultrasound (NIRS-IVUS) to differentiate among plaque rupture (PR), plaque erosion (PE), and calcified nodule (CN) in acute myocardial infarction (AMI) using an optical coherence tomography (OCT) diagnosis as a reference standard.

Background: In vivo, precise differentiation among PR, PE and CN is a major challenge for intravascular imaging.

Methods: The study enrolled 156 AMI patients who had a de novo culprit lesion in a native coronary artery. The culprit lesions were assessed by both NIRS-IVUS and OCT.

Results: OCT identified 112 PR, 29 PE, and 15 CN. IVUS-detected plaque ulceration showed a high specificity (100%) to identify OCT-PR although the sensitivity (62%) was intermediate. IVUS-detected convex calcium showed a high sensitivity (93%) and specificity (100%) to identify OCT-CN. In NIRS, the maximum lipid core burden index in 4 mm (maxLCBI4mm) was greatest in OCT-PR (values are median [interquartile range]) (671 [530 to 853]), followed by OCT-CN (355 [303 to 432]) and OCT-PE (283 [89 to 357]) (p<0.001). MaxLCBI4mm of <422 was the best cut-off to discriminate OCT-PE from OCT-PR and OCT-CN. The NIRS-IVUS classification algorithm using plaque ulceration, convex calcium, and maxLCBI4mm <422 showed a sensitivity and specificity of 96% and 95% for identifying OCT-PR, 93% and 95% for OCT-PE, and 93% and 100% for OCT-CN, respectively.

Conclusion: Lipid component assessed by NIRS-IVUS was different among OCT-PR, OCT-PE and OCT-CN. The NIRS-IVUS classification algorism was highly sensitive and specific for differentiating these unstable lesion types in AMI.
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