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Clinical outcome of fractional flow reserve-guided deferred lesions in patients with acute coronary syndrome versus stable angina

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Background and purpose: Fractional flow reserve (FFR) has become the reference standard for invasively assessing the functional significance of intermediate coronary artery disease. Lesions with FFR >0.8 were considered to be hemodynamically non-significant. In these non-significant lesions, clinical diagnosis would affect the prognosis of the lesions. We compared clinical outcome between acute coronary syndrome (ACS) and stable angina (SA) patients who had deferred lesions with FFR >0.8.
Methods: In 534 patients (mean age 64±10 years, male 62%), 613 deferred lesions with FFR measurement >0.80 (mean 0.89±0.05) were enrolled in this study retrospectively. The rate of target lesion revascularization (TLR) and major adverse cardiac events (MACE; TLR, myocardial infarction, and cardiac death) were evaluated up to 5 years follow up.
Results: 143 lesions were included in the ACS group and 470 lesions were included in the SA group. During a median follow-up of 2.3 years, 14 TLRs, 5 myocardial infarctions, 6 cardiac deaths, and 24 MACEs happened. There was no difference in FFR between the ACS and the SA group (0.89±0.05 vs. 0.89±0.05, p=0.175). However, the rate of TLR and MACE was significantly higher in the ACS group than in the SA group (4.9% vs. 1.5%, p=0.025; 7.7% vs. 2.8%, p=0.013, respectively). Using Kaplan-Meier survival analysis, the SA group showed better TLR (p=0.018) and MACE (p=0.009) compared to the ACS group.
Conclusions: Among the deferred lesions with FFR >0.8, the clinical outcome was different according to the clinical diagnosis. The SA group showed the better lesion-related events and clinical outcome compared to the ACS group.

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Assessment of the coronary microcirculation remote to an infarcted territory: insights for FFR-guided coronary revascularization of non-culprit vessels in the subacute phase of a myocardial infarction

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Purpose: To investigate the status of the microcirculation remote to an infarcted territory in patients with AMI and non-culprit vessels (NCVs) suitable for fractional flow reserve (FFR)-guided coronary revascularization.
Methods: We enrolled patients with AMI (non-ST elevation [NSTEMI] and ST-elevation myocardial infarction [STEMI]) and multivessel disease. Within the subacute phase of AMI, NCVs were evaluated with FFR and the index of microcirculatory resistance (IMR). The microcirculation status subtended to NCVs was compared with that of vessels in a cohort of stable angina (SA) patients, using a propensity score matching (1:1 vessels). The propensity model was adjusted by age range, sex, previous myocardial infarction and target vessel to reduce differences in clinical predictors of high IMR. Patients presenting with unstable angina were excluded.
Results: From 309 patients (418 vessels) evaluated with FFR and IMR, 56 patients (70 NCVs) presented with AMI (NSTEMI: 26 patients, 33 NCVs; STEMI: 30 patients, 37 NCVs). Mean time between AMI to physiological interrogation of NCVs was 5.9±2.4 days. By applying the propensity model, a control group of 46 SA-patients (59 vessels) was generated and compared to 49 AMI-patients (59 NCVs). The matching model efficiently avoided significant differences in age (62.3±9.9 vs. 63.7±10.7, p=0.52), sex (male 89.8% vs. 89.1%, p=0.92), previous MI (20.4% vs. 19.6%, p=0.92) and target vessel (left anterior descending coronary artery 45.8% vs. 45.8%, p=1.00). Stenosis severity was similar in AMI and SA groups, either as judged by angiography (%DS 51±10.7 vs. 49±22.9, p=0.597) or FFR (0.79±0.11 vs. 0.81±0.13, p=0.345). Microcirculatory resistance subtended to NCVs was similar to that of target vessels of SA patients (AMI group: mean IMR 17.6±9.2, median 15.6 [10.4–21.2] vs. SA group: mean IMR 18.9±10.8, median 16.8 [11.9–23.8]; p=0.496). Subtended microcirculatory resistance of NCVs was also similar between STEMI and NSTEMI patients (mean IMR 16.6±7.6, median 15.2 [10.2–18.9] vs. mean IMR 21.3±16.0, median 17.2 [11.2–24.8], respectively; p=0.125).
Conclusions: In the subacute phase of AMI, the microcirculation distal to non-culprit stenoses is not significantly affected, being similar to vessels in SA. This suggests that FFR-based physiological assessment of non-culprit stenoses is not affected by transient microcirculatory dysfunction in the subacute phase of AMI, as judged by IMR.

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Clinical significance of fractional flow reserve in patients with vasospastic angina and organic coronary stenosis

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Background: Vasospastic angina (VSA) is one of the important functional cardiac disorders and may play a role in the pathogenesis of atherosclerosis. Conversely, organic coronary stenosis is also known as an independent predictor of poor clinical outcomes in VSA patients. The pressure-derived fractional flow reserve (FFR) is a standard method for evaluating the functional significance of organic coronary stenosis in percutaneous coronary intervention (PCI). VSA patients frequently have a variable degree of organic coronary stenosis. However, clinical significance of FFR in VSA patients remains to be elucidated.
Purpose: The aim of this study was to examine clinical and prognostic significance of FFR in VSA patients with organic coronary stenosis.
Methods and results: We enrolled 214 consecutive patients with suspected angina who underwent acetylcholine provocation test for coronary spasm (M/F 134/81, 63.6±11.9 [SD] year-old). Of those, 153 patients (71.2%) were diagnosed as having VSA, while non-VSA patients were regarded as the control group (Group-C, n=61). We divided the VSA patients into 3 groups based on angiographical findings and FFR value; VSA patients with no organic stenosis (≥75%, AHA/ACC classification) (Group-NS, n=94), those with organic stenosis and high FFR (≥0.80) (Group-H, FFR 0.86±0.03, n=30), and those with organic stenosis and low FFR (<0.80) (Group-L, FFR 0.70±0.07, n=28). Group-L was characterized by higher prevalence of dyslipidemia (Group-C/NS/H/L, 32.3/34.0/40.0/67.9%, P<0.01), whereas age, sex, and prevalence of other traditional coronary risk factors were comparable among the 4 groups. A median of 20 days after provocation test, 26 patients (92.9%) in Group-L underwent scheduled PCI, while no patient did it in Group-NS or Group-H. All VSA patients received long-acting calcium channel blockers and/or nitrates. We then analyzed the incidence of major adverse cardiac events (MACE), including cardiovascular death (CVD), non-fatal myocardial infarction (MI), urgent PCI, and hospitalization due to unstable angina pectoris (UAP). During the median follow-up period of 557 days, MACE occurred in 14 patients (CVD/urgent PCI /UAP, 5/4/5). Kaplan-Meier survival analysis showed that Group-L had significantly worse prognosis (log-rank test, P=0.003) as compared with Group-NS, whereas clinical outcomes were comparable between Group-H and Group-NS (log-rank test, P=0.588) (Figure). Importantly, all 6 patients with MACE (CVD/urgent PCI/UAP, 2/3/1) in Group-L finished scheduled PCI for target lesions.

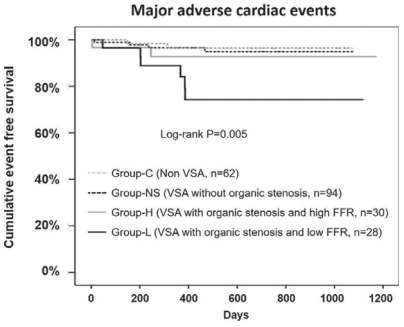

Figure 1

Conclusions: These results indicate that FFR is useful when developing strategies for VSA patients with organic coronary stenosis.

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Computationally simulated fractional flow reserve from coronary computed tomography angiography based on fractional myocardial mass

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Aims: Computed tomography angiography (CCTA) -based calculations of fractional flow reserve (FFR) can improve the diagnostic performance of CCTA for physiologically significant stenosis but the computational resource requirements are high. This study aimed to establish a simple and efficient algorithm for computing simulated FFR (S-FFR).
Methods and results: A total of 107 patients who underwent CCTA and invasive FFR measurements were enrolled in the study. S-FFR was calculated using 145 evaluable coronary arteries with off-the-shelf softwares. FFR≤0.80 was a reference threshold for diagnostic performance of diameter stenosis (DS)≥50%, DS≥70%, or S-FFR≤0.80. FFR≤0.80 was identified in 78 vessels (54%). In per-vessel analysis, S-FFR showed good correlation (r=0.83) and agreement (mean difference=0.02±0.08) with FFR. The sensitivity, specificity, positive predictive