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MINIMAL EFFECT OF COLLATERAL FLOW ON CALCULATION OF CORONARY MICROVASCULAR RESISTANCE WITH INTERMEDIATE AND NON-CRITICAL CORONARY STENOSES

i2 Poster Contributions
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Authors: *Maria Siebes, Bart-Jan Verhoeff, Jan J. Piek, Jos A. Spaan, Academic Medical Center, Amsterdam, The Netherlands*

Background: Coronary microvascular dysfunction is increasingly recognized as a major contributor to myocardial ischemia and is likely associated with an altered hyperemic coronary microvascular resistance, HMR. Selective measurement of HMR in an epicardial artery is influenced by collateral flow when a stenosis is present since it induces a pressure gradient between the ipsi- and contra-lateral vessels. Our aim was to assess the variability in HMR measurement due to collateral flow at different ranges of stenosis severity as indicated by fractional flow reserve, FFR.

Methods: Intracoronary pressure, Pd, and Doppler flow velocity, v, were measured in 29 patients a total number of 95 times distal to a coronary stenosis before and after stepwise percutaneous coronary intervention, PCI. Wedge pressure, Pw, was measured during balloon inflation as an index of collateral flow. The following calculations were made: HMR1 = Pd/v, HMR2 = Pa/v * (Pd-Pw)/(Pa-Pw). HMR2 compensates for potential collateral flow while HMR1 does not. The relative difference HMRrel = (HMR1 - HMR2)/HMR1 *100% was calculated to indicate the relative error made by neglecting collateral flow compensation.

Results: In 17 patients, group A, Pw 25 mmHg (32.3 + 4.5 mmHg). For FFR <= 0.6 HMRrel was about 50% over both groups, with a progressive difference between groups A and B at lower FFR. For the diagnostic relevant range of FFR between 0.6 and 0.8, HMRrel was 16.5 ± 10.4% but the difference between group A and B was only 12%. For FFR >= 0.8 the overall mean difference was 4.4 ± 3.4% and the difference between the two groups not more than 2%. For FFR >= 0.8 both microvascular indices varied between a minimum of 0.9 and maximum of 3 mm Hg · sec/cm.

Conclusions: Coronary hyperemic microvascular resistance is only weakly affected by coronary collateral flow contribution in the presence of non-critical or intermediate coronary stenosis. HMR can therefore be assessed by the ratio of Pd over v before and after a successful PCI.