

Feasibility of virtual fractional flow reserve derived from coronary angiography and its correlation with invasive functional assessment

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Introduction: Invasive functional assessment (iFA) of coronary artery disease (CAD) needs expensive devices, has potential procedure-related complications and is still underutilized. Virtual Fractional Flow Reserve (vFFR) derived from invasive coronary angiography (ICA) has the potential to overcome these limitations.

Purpose: To investigate the feasibility of vFFR analysis and its correlation with iFA (iFR, RFR or FFR).

Methods: Retrospective analysis of consecutive patients (pts) who underwent iFA in a tertiary center between 2019 and 2020. vFFR was calculated using a dedicated software (CAAS Workstation 8.4) based on standard non-hyperaemic coronary angiograms acquired in ≥ 2 different projections, by operators blinded to iFA results. Diagnostic performance and accuracy of vFFR were evaluated. vFFR was considered positive when < 0.80 . FFR < 0.8 and iFR/RFR < 0.90 were classified as positive according to current clinical standards.

Results: Out of 113 coronary arteries of 102 pts, vFFR was successfully

analysed in 106 (94%). Reasons for vFFR analysis failure were: vessel projection overlap (48%), < 2 angiographic projections (28%) and table movement while acquisition (24%). From 106 coronary arteries of 95 pts with analysable vFFR (78% male, mean age 67.8 ± 9.7 years), 90 (85%) showed agreement with the respective iFA result. The vFFR predicted which lesions were physiologically significant and which were not with accuracy, sensitivity, specificity, positive and negative predictive values of 73%, 73%, 83%, 53%, and 92% respectively. The mean difference between vFFR and iFA were -0.0484 ± 0.096 and Pearson's correlation coefficient was 0.533 ($p < 0.001$). The ROC area under the curve was 0.839 (0.751–0.928, $p < 0.001$).

Conclusion: FFR were feasible in 94% of cases analysed retrospectively. As compared to gold-standard iFA, vFFR had an overall moderate accuracy in detecting ischemia-producing lesions and a negative predictive value $> 90\%$. vFFR has the potential to substantially simplify physiological coronary lesion assessment and thus improve its current uptake.

