Virtual fractional flow reserve derived from coronary angiography – artery and lesion specific correlations

T. Mano, V. Ferreira, R. Ramos, P. Bras, J. Reis, A. Grazina, S. Jacinto, R. Teixeira, E. Oliveira, A. Santana, J. Melo, D. Cacela, R. Cruz Ferreira

Hospital de Santa Marta, Lisbon, Portugal

Funding Acknowledgement: Type of funding sources: None.

Introduction: Virtual Fractional flow reserve (vFFR) from standard non-hyperaemic invasive coronary angiography (ICA) has emerged as a promising non-invasive test to assess hemodynamic severity of coronary artery disease (CAD).

Purpose: To investigate the difference in vFFR analysis between vessels and specific lesions.

Methods: Retrospective analysis of consecutive patients (pts) who underwent invasive functional assessment (iFA) in a tertiary center between 2019 and 2020. vFFR was calculated using dedicated software (CAAS Workstation 8.4) based on coronary angiograms of the acquired in $\geq$2 different projections, by operators blinded to iFA results. Diagnostic performance of vFFR was evaluated and correlated with iFA, according to coronary vessel, vessel diameter at stenosis, diameter stenosis and area stenosis at lesion. 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: 106 coronary arteries of 95 pts (78% male, mean age 67.8±9.7 years) underwent vFFR evaluation. ICA indications were chronic coronary syndrome in 63% or acute coronary syndrome (non-culprit lesion) in the remaining pts. VFFR accuracy was good (AUC 0.839 ($p<0.001$) and Pearson's correlation coefficient 0.533 ($p<0.001$) when vFFR was measured in the distal vessel segment. The correlation improved when vFFR were assessed at lesion site ($r=0.631$, $p<0.001$) or up to 1cm below the stenosis (0.610, $p<0.001$). Binary concordance of 89% were observed in RCA and LAD (Sensibility -S 68%, Specificity-Sp 96%, False positive -FP 3.8%, False negative - FN 31%, predictive positive value-PPV 87%, predictive negative value- PNV 89%), while in the circumflex coronary artery binary concordance were of 77% (S 50%; Sp 82%; FP 18%; FN 50%; PPV 33% and PNV 90%). Correlation between vFFR and iFA was higher in vessels $\geq$2mm ($r=0.730$, $p<0.001$). and in lesions in the extremes of the severity spectrum (Table 1).

Conclusion: vFFR has a moderate to high linear correlation to iFA, depending on the artery and type of lesion studied. The higher correlation was found when vFFR were measured at lesion site, in non-circumflex artery stenosis, in vessels $\geq$2mm and in vessels with mild or severe stenosis.

Table 1. Correlation of virtual Fractional Flow Reserve and Invasive functional assessment derived from coronary angiography, according to diameter and area of stenosis.

	Diameter of stenosis		Area of stenosis	
	<30%	>50%	<1.0mm2	>6.0mm2
Correlation (R)	0.720	0.708	0.826	0.835
(p value)	P<0.001	p=0.02	p<0.001	p=0.001