SUPPLEMENTAL MATERIAL

Supplement to: Evaluation of coronary artery stenosis by quantitative flow ratio during invasive coronary angiography. The wire-free functional imaging (WIFI II) study

Supplemental results

Clinical characteristics according to binary FFR/QFR agreement

Appendix figure 2 summarizes the baseline clinical and lesions characteristics grouped by FFR/QFR agreement/disagreement. QFR was significantly lower for mismatches compared to matching observations (p=0.01). For the mismatches, significant more lesions were located in the LAD compared to matching LAD observations (p=0.04). In LAD observations with mismatch, 46 % of FFR values were in the 0.77-0.83 interval compared to 19 % for the matching LAD observations (p=0.006). For the numerical precision (mean difference FFR-QFR), there was no statistical significant difference for LAD (0.006 for matches versus 0.008, p=0.90) nor for other vessels.

Predictors of absolute FFR and QFR agreement

There was no correlation between FFR and 2D-QCA (Spearman's rho -0.20). Hence, both were evaluated in the same model. In the unadjusted analysis, body mass index (BMI), vessel (Obtuse marginal branch), %DS (2D-QCA) and FFR were predictors of the absolute FFR-QFR difference (all $p<0.02$) and were thus included in the multiple regression model. In the adjusted model, only FFR was an independent predictor of FFR-QFR agreement (Supplemental table 3).

Supplemental tables

Supplemental table 1: Lesion characteristics (2D-QCA)

Lesion characteristics (2D QCA)	
Overall (n=240)	
Diameter stenosis (%)	42±17
Minimum lumen diameter (mm)	1.25±0.68
Reference diameter (mm)	2.44±1.10
Lesion length (mm)	8.36±5.33
Values are mean ± SD	

Supplemental table 2: Baseline characteristics grouped by FFR and QFR binary agreement

	Match (n=198)	Mismatch (n=42)	p
Clinical			
Age, years	62±8	62±8	0.12
Male	130 (67%)	33 (79%)	0.15
Smoking	122 (62%)	27 (64%)	0.86
BMI, kg/m^2	27 (IQR:24-29)	26 (IQR:24-29)	0.68
Hypertension	55 (27%)	9 (21%)	0.45
Diabetes	17 (9%)	6 (14%)	0.25
Family history of CAD	79 (40%)	15 (36%)	0.30
Clinical presentation			
Stable angina	57 (29%)	16 (38%)	0.27
Atypical angina	76 (38%)	11 (26%)	0.16
Non specific angina	27 (11%)	5 (12%)	1.00
Diamond-Forrester score	0.46 (IQR:0.29-0.63)	0.48 (IQR:0.36-0.76)	0.36
Lesion location			
Left main stem	8 (4%)	2 (5%)	0.21
LAD	96 (50%)	28 (67%)	
Diagonal branch	17 (9%)	0 (0%)	
Left circumflex artery	25 (13%)	3 (7%)	
Obtuse marginal branch	19 (10%)	3 (7%)	
Right coronary artery	33 (17%)	6 (14%)	
Proximal disease	103 (52%)	17 (40%)	
Multivessel disease	66 (33%)	13 (31%)	
Lesion characteristics			
FFR	0.85 (IQR:0.77-0.91)	0.81 (IQR:0.78-0.87)	0.10
QFR	0.85 (IQR: 0.77-0.90)	0.80 (IQR:0.75-0.85)	0.01
% DS	43 (IQR:35-53)	43 (IQR:35-56)	0.80
Values are n (%), mean±SD or median(IQR)			

Mismatch was defined as FFR>0.80 and QFR≤0.80 or FFR≤0.80 and QFR>0.80. BMI denotes body mass index, CAD: coronary artery disease, FFR: Fractional flow reserve, QFR: Quantitative flow reserve, DS: diameter stenosis and IQR: Interquartile range.

Supplemental table 3: Predictors of absolute FFR and QFR agreement

Multiple linear regression *Predictors of QFR-FFR absolute difference*	
Constant	-1.90 (0.57)
Obtuse marginal branch	0.30 (0.23)
BMI	-0.13 (0.013)
FFR	-1.17 (0.53) *
% DS (2D-QCA)	0.00 (0.00)
Coefficient (SE). *95% significance	

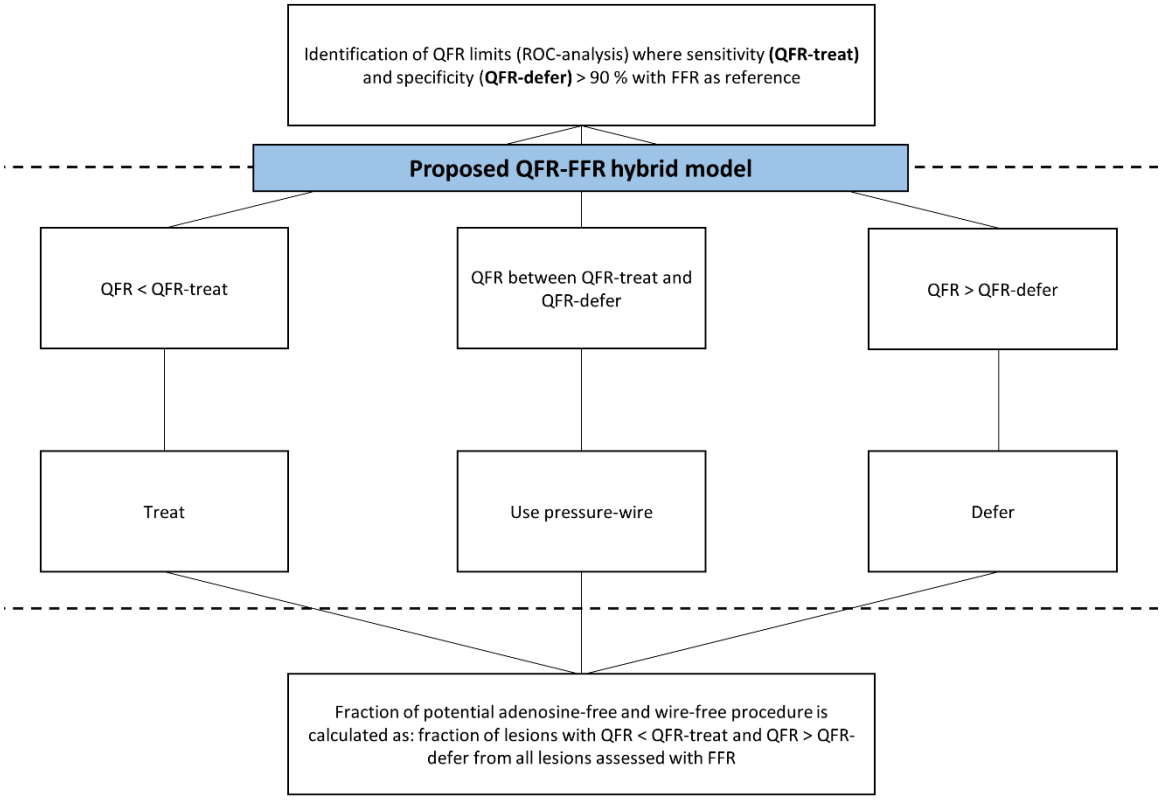
Supplemental table 4: Studies on FFR computation based on coronary CTA and invasive coronary angiography

	Modality	Design	Patients (Vessels)	FFR	FFR≤0.80	SD	AUC
Noergaard et al[1]	CTA (HeartFlow)	Prospective, multicenter	254 (484)	-	17 *	0.07	0.93
Renker et al[2]	CTA (Siemens)	Retrospective, singlecenter	53 (67)	-	30	-	0.92
Kim et al[3]	CTA (HeartFlow)	Prospective, multicenter	44 (48)	0.70±0.14	-	0.14	-
Nakazato et al[4]	CTA (HeartFlow)	Prospective, Multicenter	82 (150)	0.85±0.08	23	0.05 †	0.79
Koo et al[5]	CTA (HeartFlow)	Prospective, Multicenter	103 (159)	-	-	0.12	0.90
Tu et al[6]	ICA (QFR)	Prospective, multicenter	73 (84)	0.84±0.08	32	0.06	0.92
Papafaklis et al[7]	ICA (VFAI)	Retrospective, multicenter	120 (139)	0.84 (range: 0.75-0.90)	37	0.09	0.92
Morris et al[8]	ICA (vFFR)	Prospective, singlecenter	19 (22) ‡	-	20	0.10	-
Westra et al (WIFI II)	ICA (QFR)	Prospective, singlecenter	191 (292)	0.85 (range: 0.35-1.04)	36	0.08	0.86

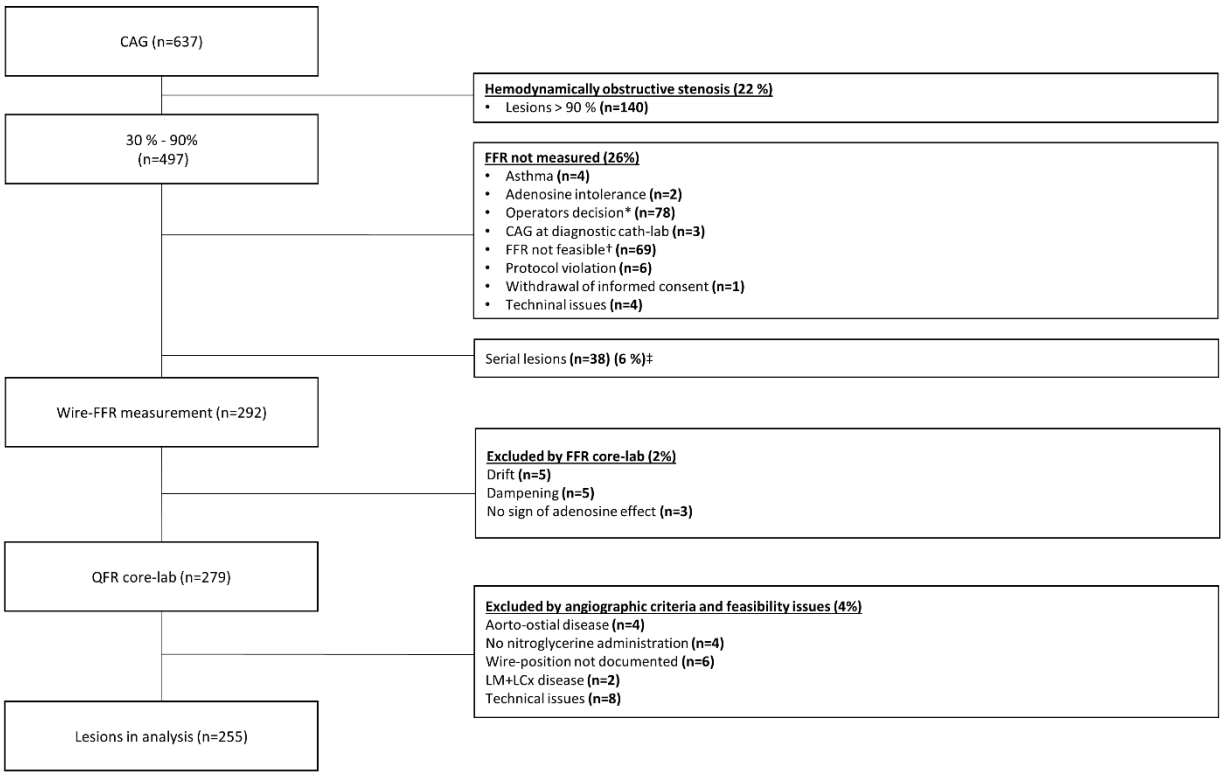
* In the NXT trial manuscript, the authors report 21% lesions with FFR≤0.80. However, an FFR value of 0.50 was assigned to lesions with %DS > 90% (n=16). We reported the number of lesions with wire-based FFR≤0.80. † Reported in original manuscript as "bias". It is unclear if bias represents the mean difference (mean CT-FFR was 0.80 and FFR 0.85), standard deviation or absolute error. ‡ Results are reported for the pre-stenting comparison between FFR and vFFR. CTA denotes computed tomography angiography, FFR: Fractional flow reserve, SD: Standard deviation and AUC: Area under the receiver-operating characteristic curve.

Supplemental figures

Supplemental figure 1



Supplemental figure 2



Supplemental figure legends

Supplemental figure 1: QFR-FFR hybrid model flowchart.

Supplemental figure 2: Study enrolment flowchart per lesion. Numbers n are lesions. * Lesions evaluated as < 30 % by visual estimate during the procedure are noted here and accounted for the largest portion. † This portion accounted for tortuous vessels, ICA performed at diagnostic cath-labs and time issues related to complexity of the procedure. ‡ Only the distal FFR value was used in vessels with multiple lesions.

Supplemental references

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