Diagnostic performance and clinical implications for enhancing a hybrid quantitative flow ratio and fractional flow reserve revascularization decision making strategy

J. Peper[1], R.W. Van Hamersvelt[2], B.J.M.W. Rensing[1], J.P. Van Kuijk[1], M. Voskuil[2], J.M. Ten Berg[1], J. Schaap[3], J.C. Kelder[1], D.E. Grobbee[2], T. Leiner[2], M.J. Swaans[1]

[1]St Antonius Hospital, Nieuwegein, Netherlands (The); [2]University Medical Center Utrecht, Utrecht, Netherlands (The); [3]Amphia Hospital, Breda, Netherlands (The)

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Background: Fractional flow reserve (FFR) adoption persists low mainly due to procedural and operator related factors as well as costs. An alternative for FFR, quantitative flow ratio (QFR) achieves a high accuracy mainly outside the intermediate zone without the need for hyperemia and wire-use. Currently, no outcome trials assess the role of QFR in the guidance of revascularization. Therefore, we evaluate a QFR-FFR hybrid strategy in which FFR is measured inside of the intermediate zone.

Methods: This retrospective multi-center study included consecutive patients who underwent both invasive coronary angiography and FFR in the participating centers. QFR was calculated for all vessels in which FFR was measured. Diagnostic performance of QFR was assessed using an FFR cut-off of 0.80 as reference standard. The QFR-FFR hybrid approach was modeled using the intermediate zone of 0.77 to 0.87 assuming that lesions within the intermediate zone follow the FFR binary cutoff.

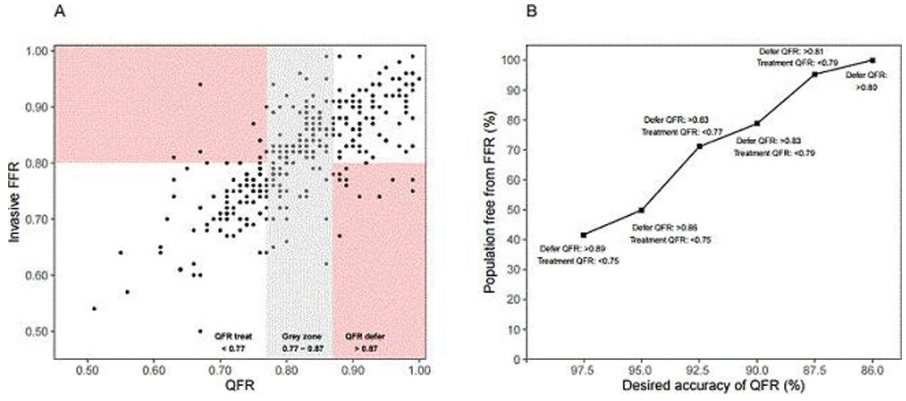
Results: In total, 381 vessels in 289 patients were analyzed. The sensitivity, specificity and accuracy on a per vessel-based analysis were 84.6%, 86.3% and 85.6% for QFR and 91.1%, 95.3% and 93.4% for the QFR-FFR hybrid approach. The diagnostic accuracy of QFR-FFR hybrid strategy with invasive FFR measurement is 93.4% and results in a FFR reduction of 56.7%.

Conclusion: QFR has a good correlation and agreement with invasive FFR and a high diagnostic accuracy. A hybrid QFR-FFR approach could extend the use of QFR and reduces the proportion of invasive FFR-measurements needed while maintaining a high accuracy.

Diagnostic test results QFR

	QFR diagnostic performance					
	QFR ≤0.80			QFR-FFR Hybrid approach (QFR: 0.77–0.87)		
	Estimate	95% CI		Estimate	95% CI	
Sensitivity	84.6	78.4	89.3	91.1	58.9	94.5
Specificity	86.3	81.0	90.3	95.3	91.5	97.4
NPV	87.6	82.4	91.4	93.1	88.9	95.8
PPV	83.1	76.8	88.0	93.9	89.1	96.7
Accuracy	85.6	81.7	88.7	93.4	90.5	95.5
AUROC	0.89			0.92		

The diagnostic performance of QFR with fractional flow reserve (FFR) as reference standard. Both, FFR ≤0.80 – QFR ≤0.80 and FFR ≤0.80 – grey zone QFR (0.77–0.87) are used as diagnostic cutoff values. 95% CI, 95% confidence interval; AUROC, area under the receiver operator characteristic curve; NPV, negative predictive value; PPV, positive predictive value.



Hybrid QFR-FFR strategy