

Diagnostic accuracy of two-dimensional coronary angiographic derived fractional flow reserve

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Funding Acknowledgement: Type of funding source: None

Background: Non-invasive fractional flow reserve (NiFFR) is an emerging method for evaluating the functional significance of a coronary lesion during diagnostic coronary angiography (CAG). The method relies on the computational flow dynamics and the 3D reconstruction of the vessel extracted from CAG. In the present study, we sought to evaluate the diagnostic performance and applicability of 2D-based NiFFR.

Methods: In this prospective observational study, we evaluated 2D-based NiFFR in 279 candidates for invasive CAG and invasive FFR. NiFFR was calculated via 2 methods: variable NiFFR, in which the contrast transport time was extracted from the angiographic view, and fixed NiFFR, in which a prespecified frame count was applied.

Results: The final analysis was performed on 245 patients (250 lesions). Variable NiFFR had an area under the receiver operating characteristic curve of 81.5%, an accuracy of 80.0%, a sensitivity of 82.2%, a specificity of 82.2%, a negative predictive value of 91.4%, and a positive predictive value of 63.6%. The mean difference between FFR and NiFFR was -0.0244 ± 0.0616 ($P \leq 0.0001$). A pressure wire-free hybrid strategy was possible in 68.8% of our population with variable NiFFR.

Conclusions: Our 2D-based NiFFR yielded results comparable to those derived from 3D-based software. Our findings should, however, be confirmed in larger trials.

Diagnostic performance of NiFFR

Diagnostic Measure	vNiFFR		fNiFFR		DS%	
	Cut = 0.8	Best cut = 0.81	Cut = 0.8	Best cut = 0.81	Cut = 45	Best cut = 42.5
AUC (95% CI)	0.875 (0.824–0.927)		0.840 (0.784–0.897)		0.696 (0.620–0.772)	
Accuracy (%)	81.5 (76.2–86.2)	82.4 (77.1–86.9)	74.0 (68.1–79.3)	75.2 (69.4–80.4)	72.3 (66.4–77.8)	65.2 (58.9–71.1)
Sensitivity (%)	80.0 (68.7–88.6)	87.1 (77.0–93.9)	74.4 (62.4–84.0)	87.1 (77.0–93.9)	47.1 (35.1–59.4)	65.7 (53.4–76.7)
Specificity (%)	82.2 (75.8–87.5)	80.6 (74.0–86.1)	73.9 (66.8–80.1)	70.6 (63.3–77.1)	88.3 (82.7–92.6)	65.0 (57.6–71.9)
PPV (%)	63.6 (52.7–73.6)	63.5 (52.5–73.2)	58.7 (48.2–68.4)	53.5 (43.3–63.5)	61.1 (46.9–74.1)	42.2 (32.8–52.0)
NPV (%)	91.4 (85.9–95.2)	94.2 (89.6–97.4)	87.9 (81.0–92.3)	93.4 (88.0–96.7)	81.1 (74.9–86.3)	83.0 (75.7–88.8)
LR+	4.49 (2.84–7.09)	4.49 (2.96–6.75)	2.85 (1.87–4.22)	2.96 (2.10–4.10)	4.02 (2.03–8.03)	1.88 (1.26–2.72)
LR–	0.24 (0.13–0.41)	0.16 (0.07–0.31)	0.35 (0.20–0.56)	0.18 (0.08–0.36)	0.60 (0.44–0.78)	0.53 (0.32–0.81)

AUC, Area under the curve; DS%, Diameter stenosis percentage; fNiFFR, Fixed flow non-invasive fractional flow reserve; vNiFFR, Variable flow non-invasive fractional flow reserve; LR, Likelihood ratio; NPV, Negative predictive value; PPV, Positive predictive value.

