PHYSIODAY
JOURNÉES DE PHYSIOLOGIE
EN CARDIOLOGIE INTERVENTIONNELLE

Principes de la FFR virtuelle

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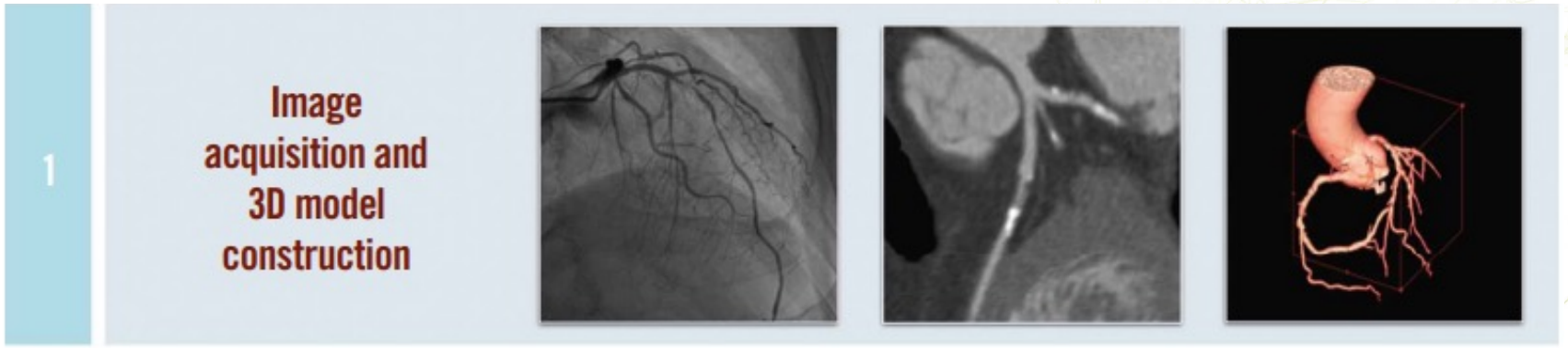
HÔTEL SHERATON · NICE

STEP 1

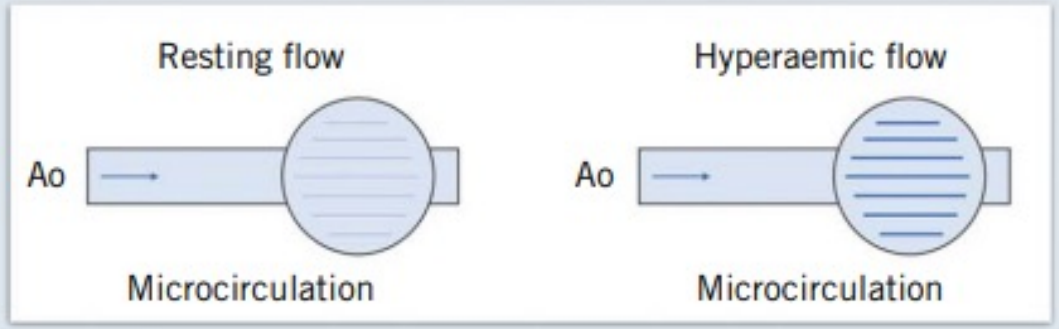


CT scan
Othogonal angiographic views DICOM

STEP 2

2

Boundary conditions specification



Influenced by cardiac cycle, extravascular compression and intrinsic microvascular resistance.
Mostly assumed
Inlet : Aortic pressure
Outlet: Microvascular resistance, Pv

STEP 3

3

Equation solving

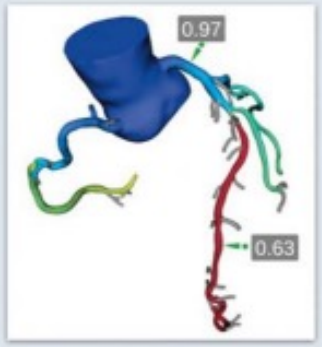
$$\rho\left(\frac{\partial v}{\partial t} + v \cdot \nabla v\right) = -\nabla p + \nabla \cdot T + f$$

Computational Fluid Dynamics (CFD), Navier-Stokes Equation
=> Simplified equation
Blood density and viscosity are assumed in large arteries
Blood flow velocity use TIMI frame count

STEP 4

4

Functional index result

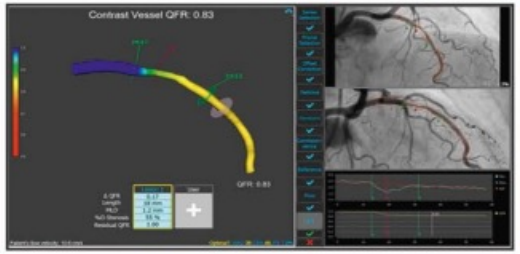
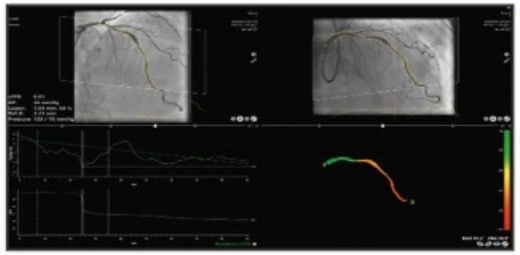
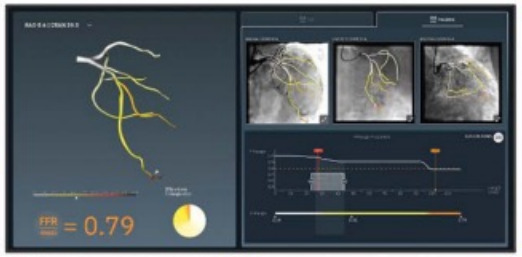
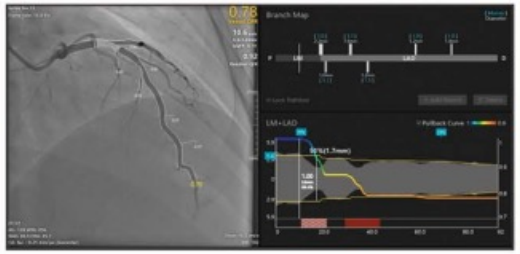


FFR_{CT}

QFR

vFFR

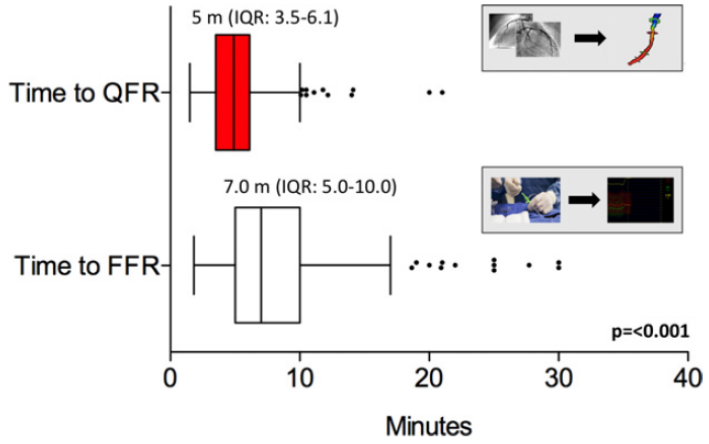
Current Angio-derived FFR

	User display	Projections needed	Pressure sensor	Microcirculation	Side branches	Available data
QFR		2	No	Yes	No	
CAAS vFFR		2	No	No	No	
caFFR		2	Yes	Yes	No	
FFR angio		3	Yes	No	Yes	
µQFR		1	No	Yes	Yes	

Faria et al, EuroIntervention 2023

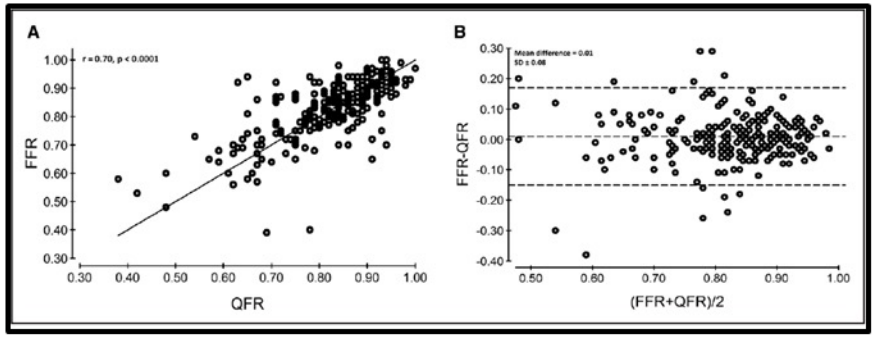
Hallmarks

- Invasive angiography based
- Pressure-wire free
- Hyperhemia free
- Short time duration
- 3-D computation from angiographic views (2 at least) MEDIS Netherland
- Estimation of coronary flow velocity (eCFV) by frame count analysis

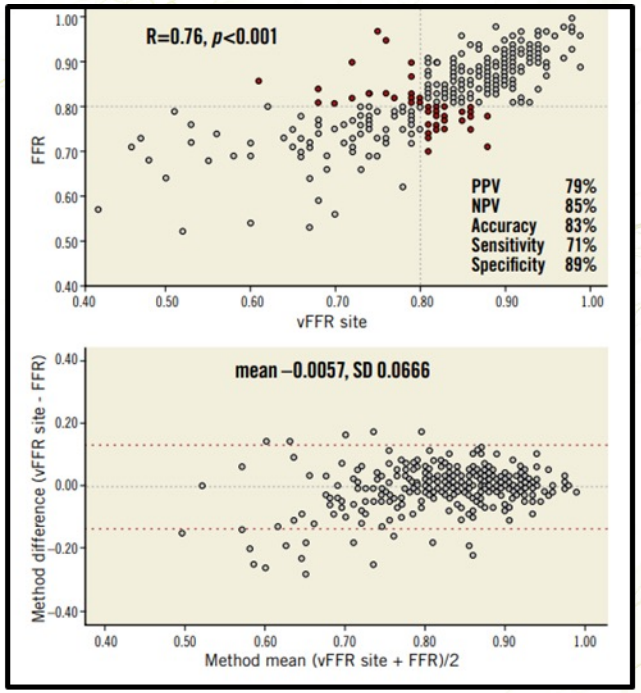


Favor II study,
Westra et al, J Am Heart Association, 2018

Correlation with FFR

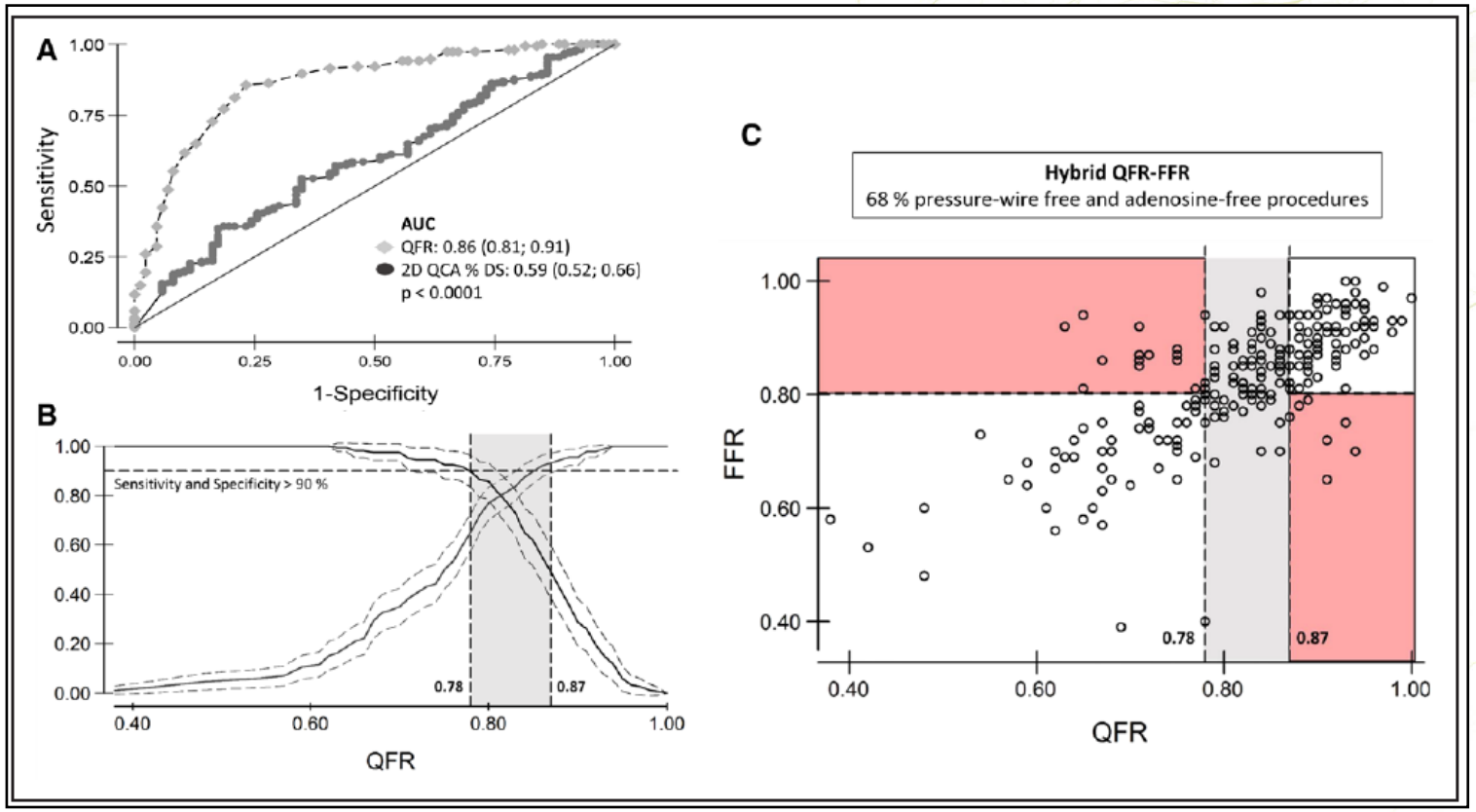


Wifi 2 study,
Westra et al, Circ Cardiovasc Imaging 2018



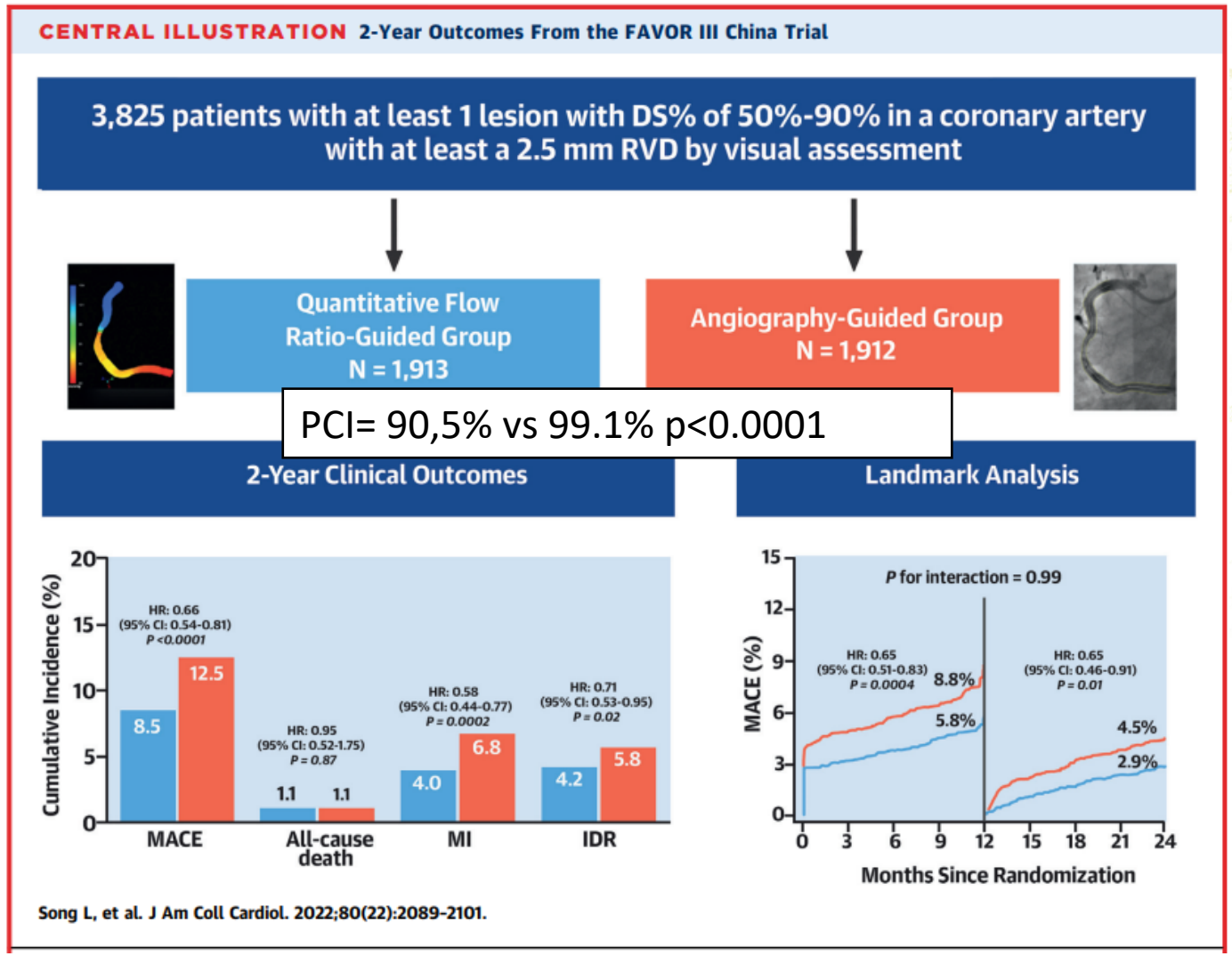
FAST 2 study,
Masdjedi et al, EuroIntervention 2022

Grey Zone 0.78-0.87

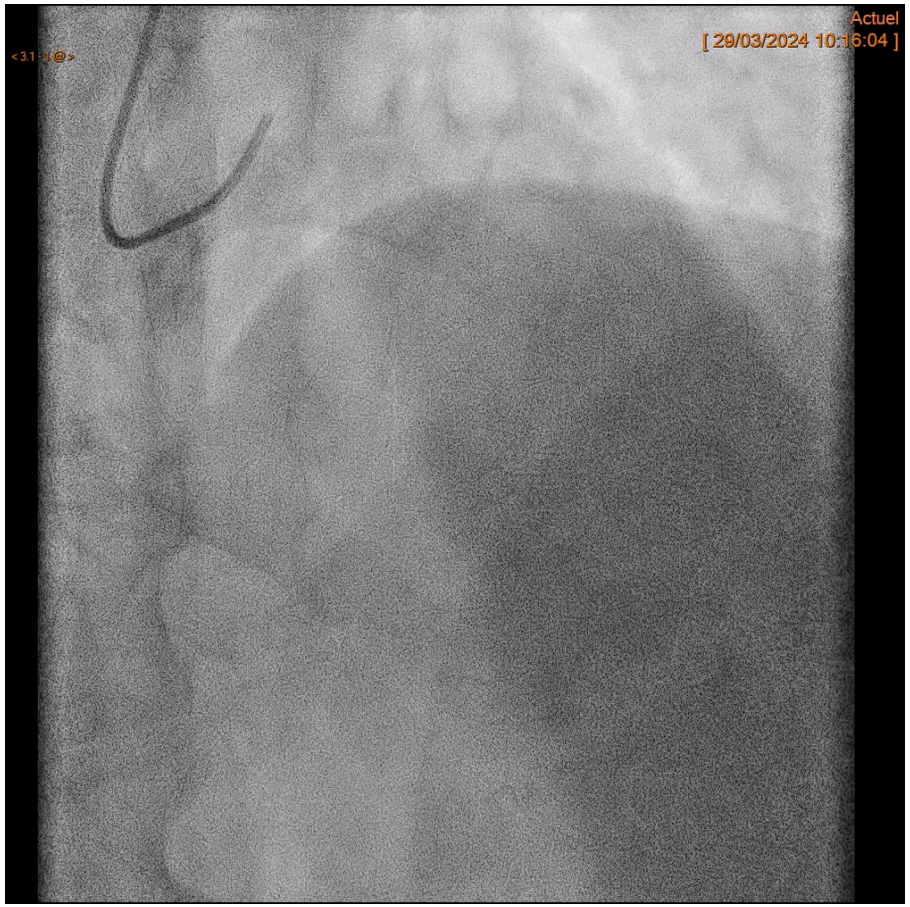


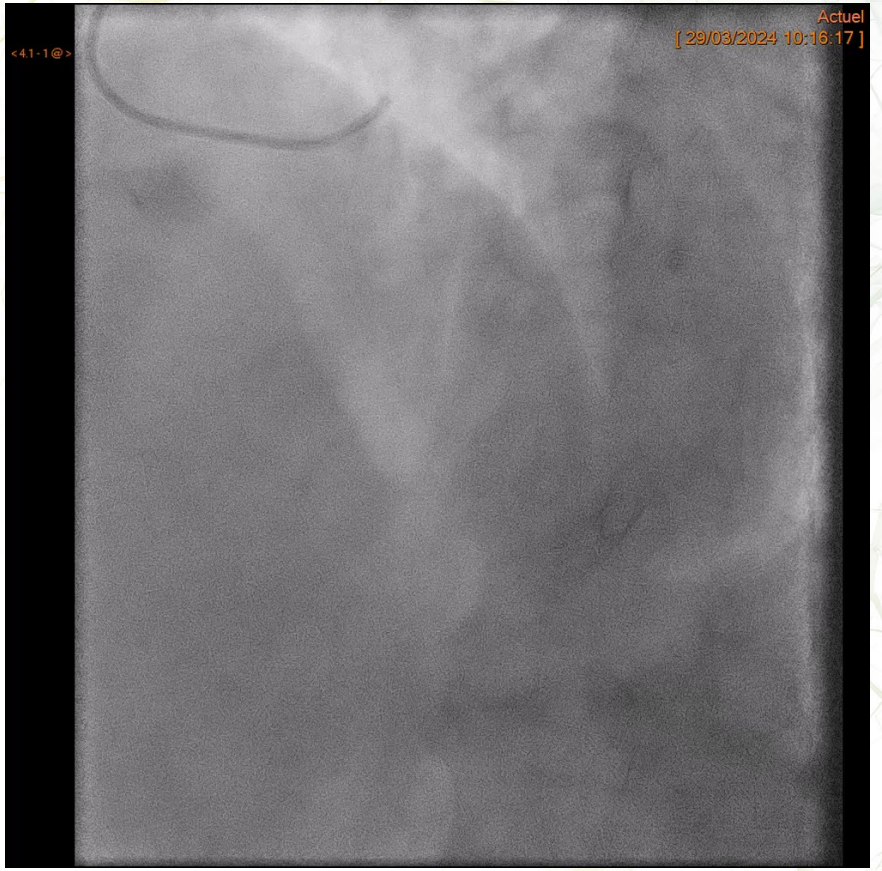
Wifi 2 study,
Westra et al, Circ Cardiovasc Imaging 2018

Clinical outcomes: FAVOR III



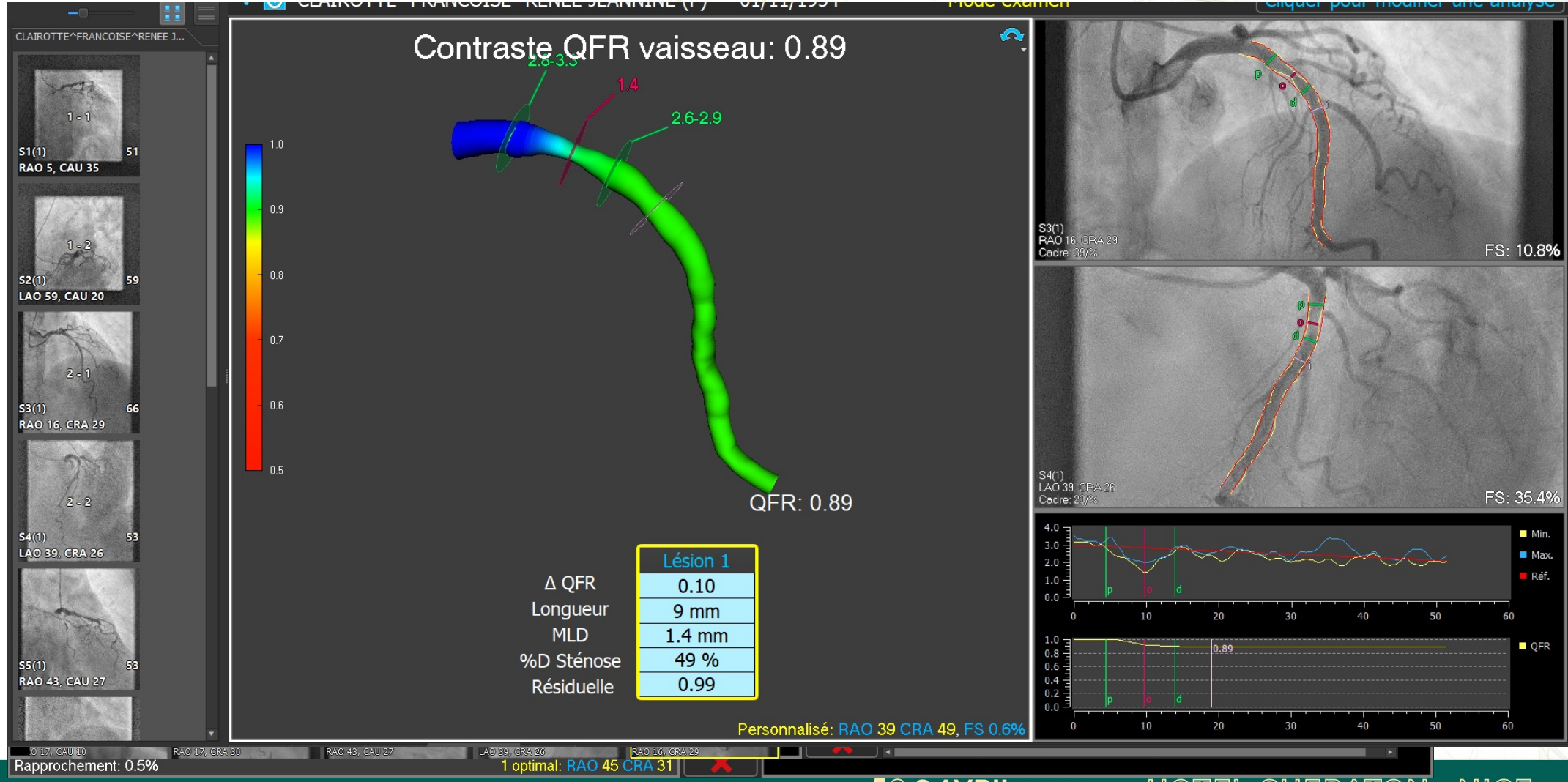
Clinical case: QFR Process



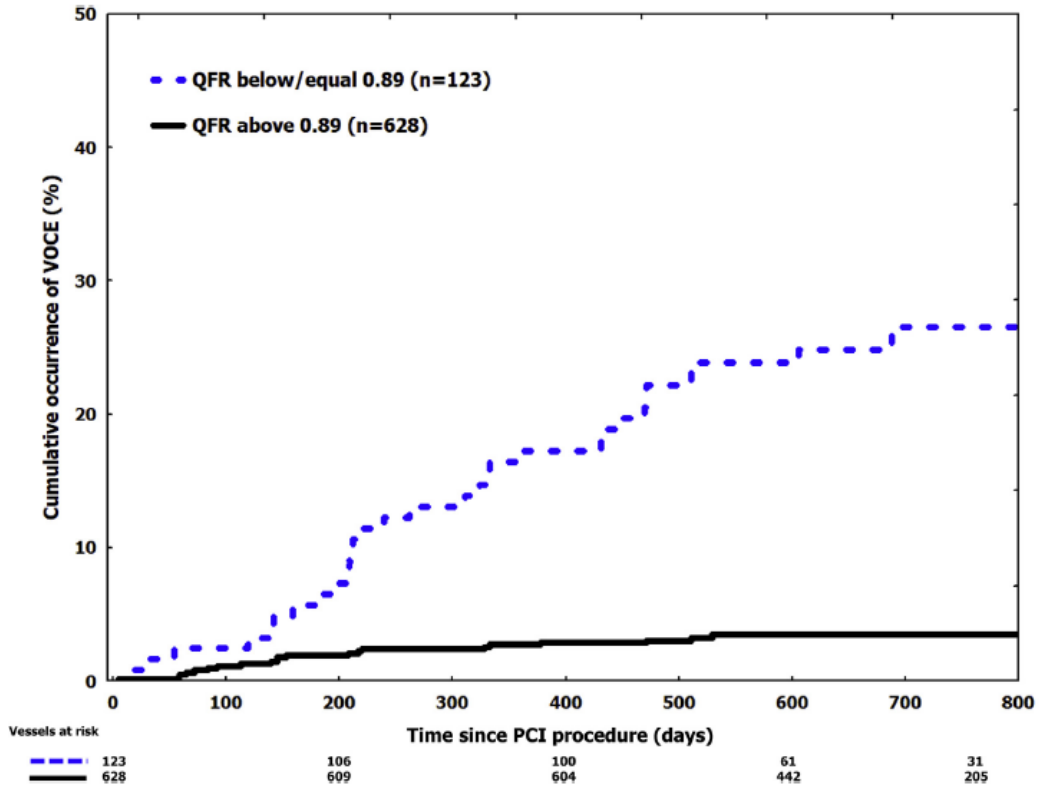


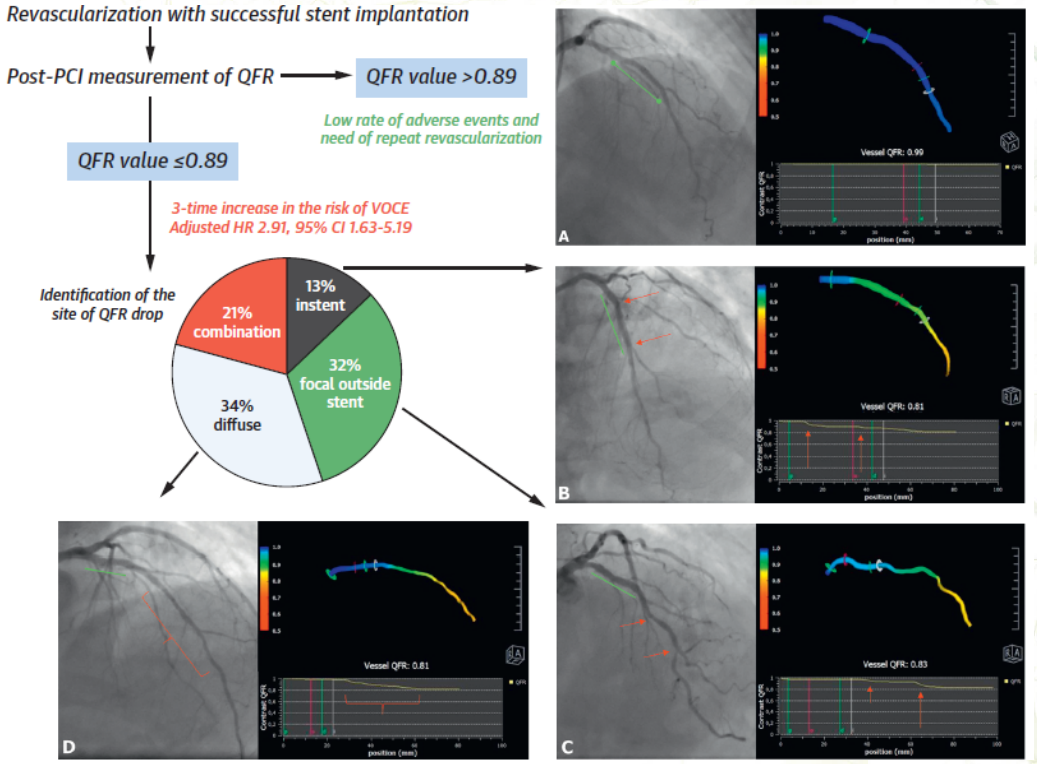
Clinical case: QFR Process

LAD FFR 0.87



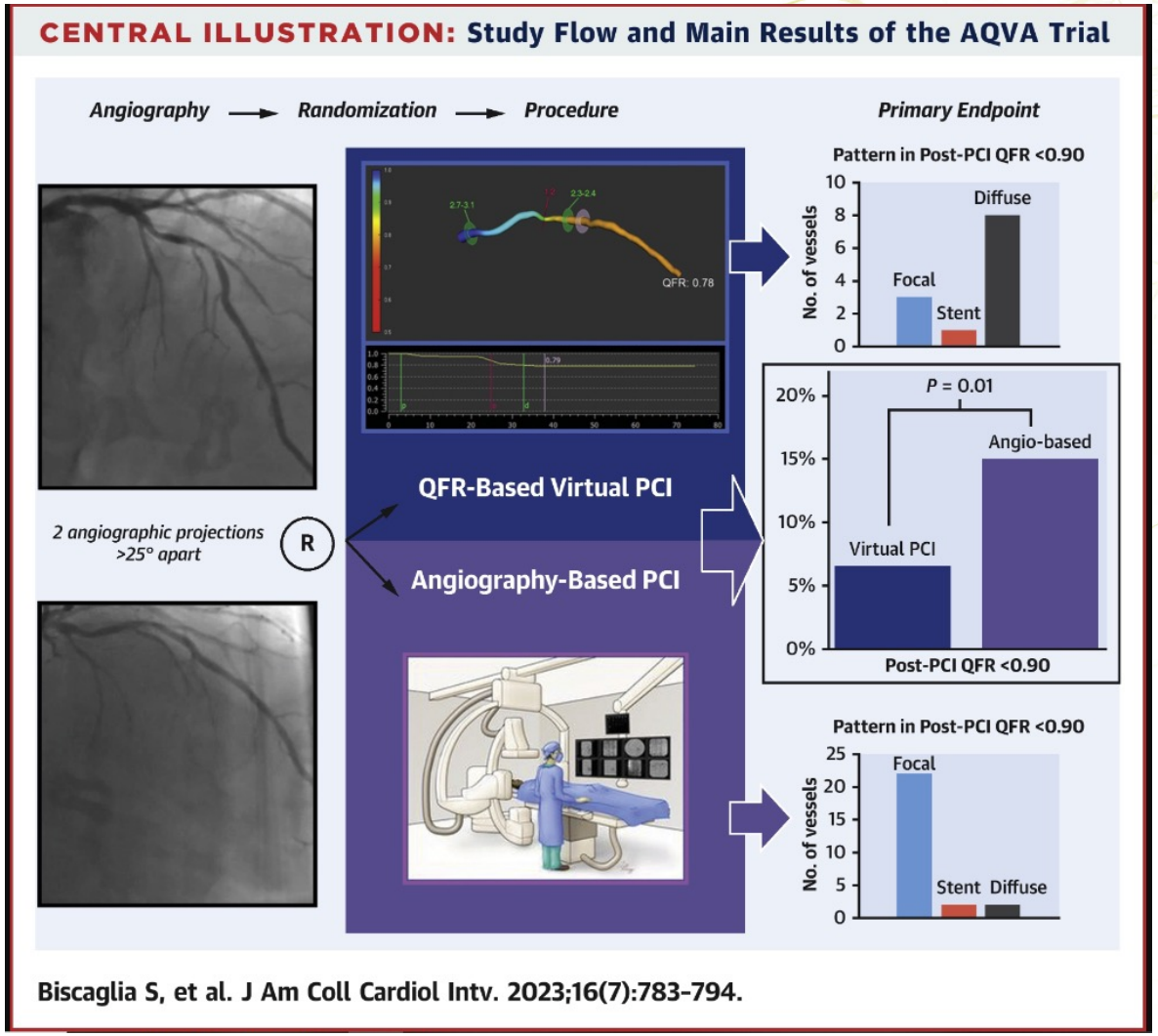
Pronostic impact of QFR post-PCI





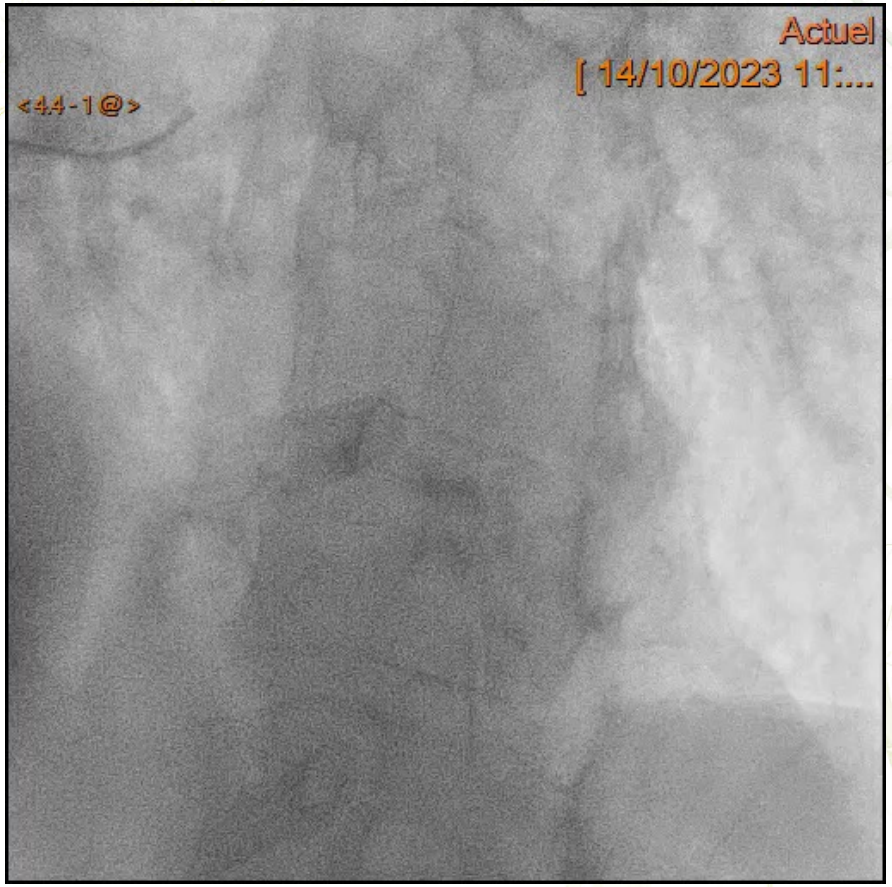
Biscaglia et al, J Am Coll Cardiol Intv; 2019

QFR guided PCI improves QFR post PCI

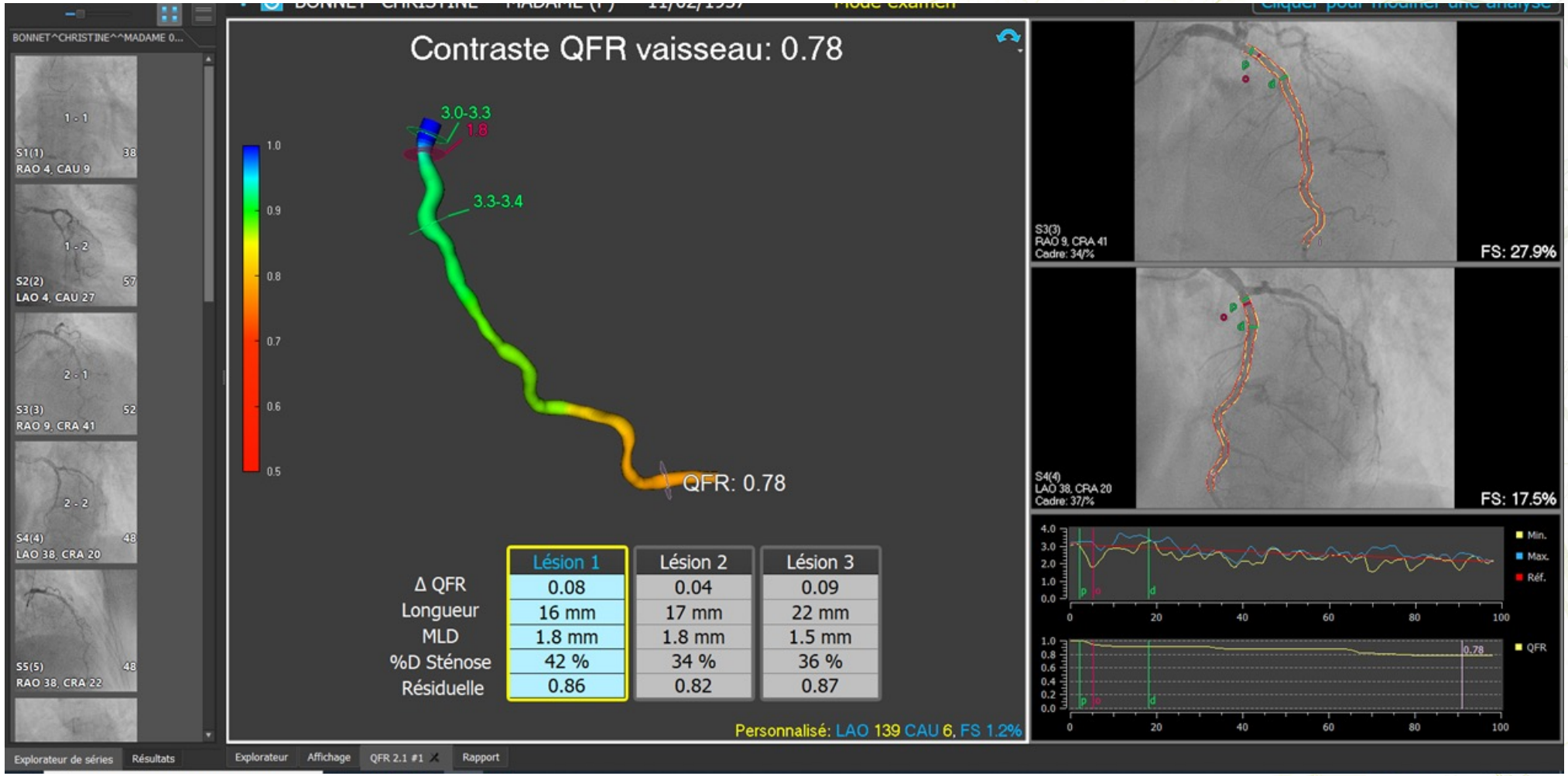


Biscaglia S, et al. J Am Coll Cardiol Intv. 2023;16(7):783-794.

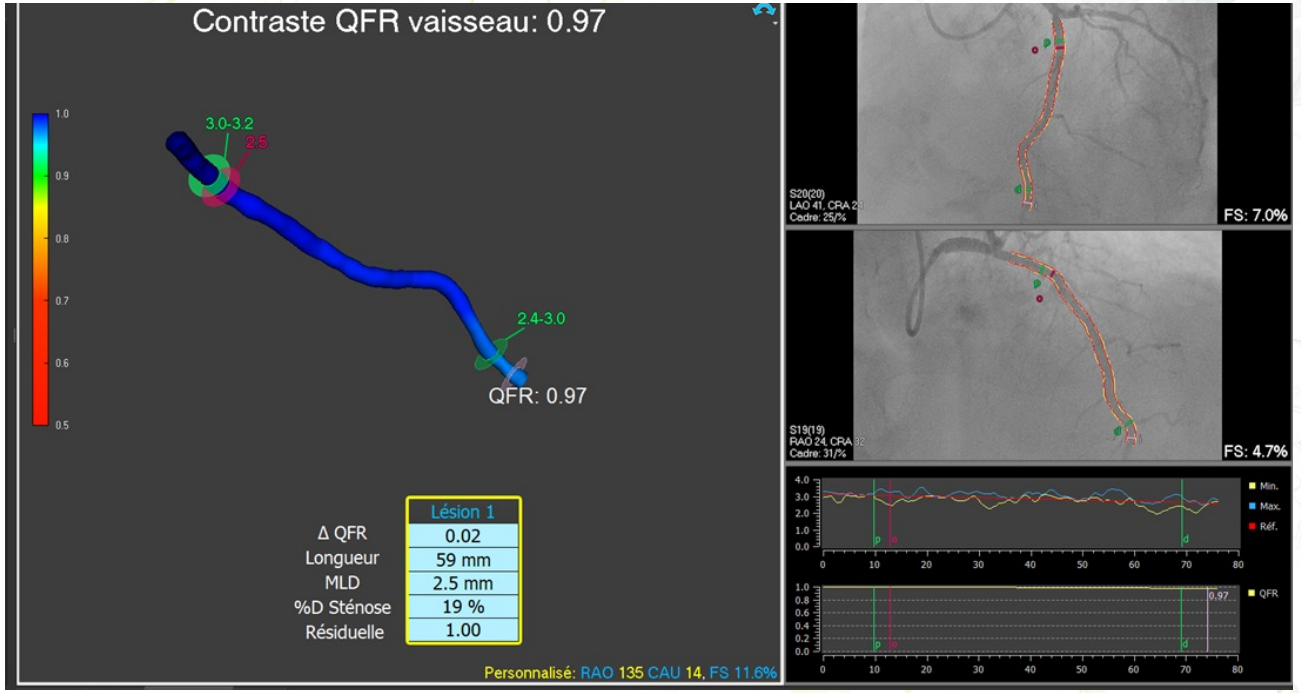
QFR implementation
Serial stenosis on LAD FFR 0.79



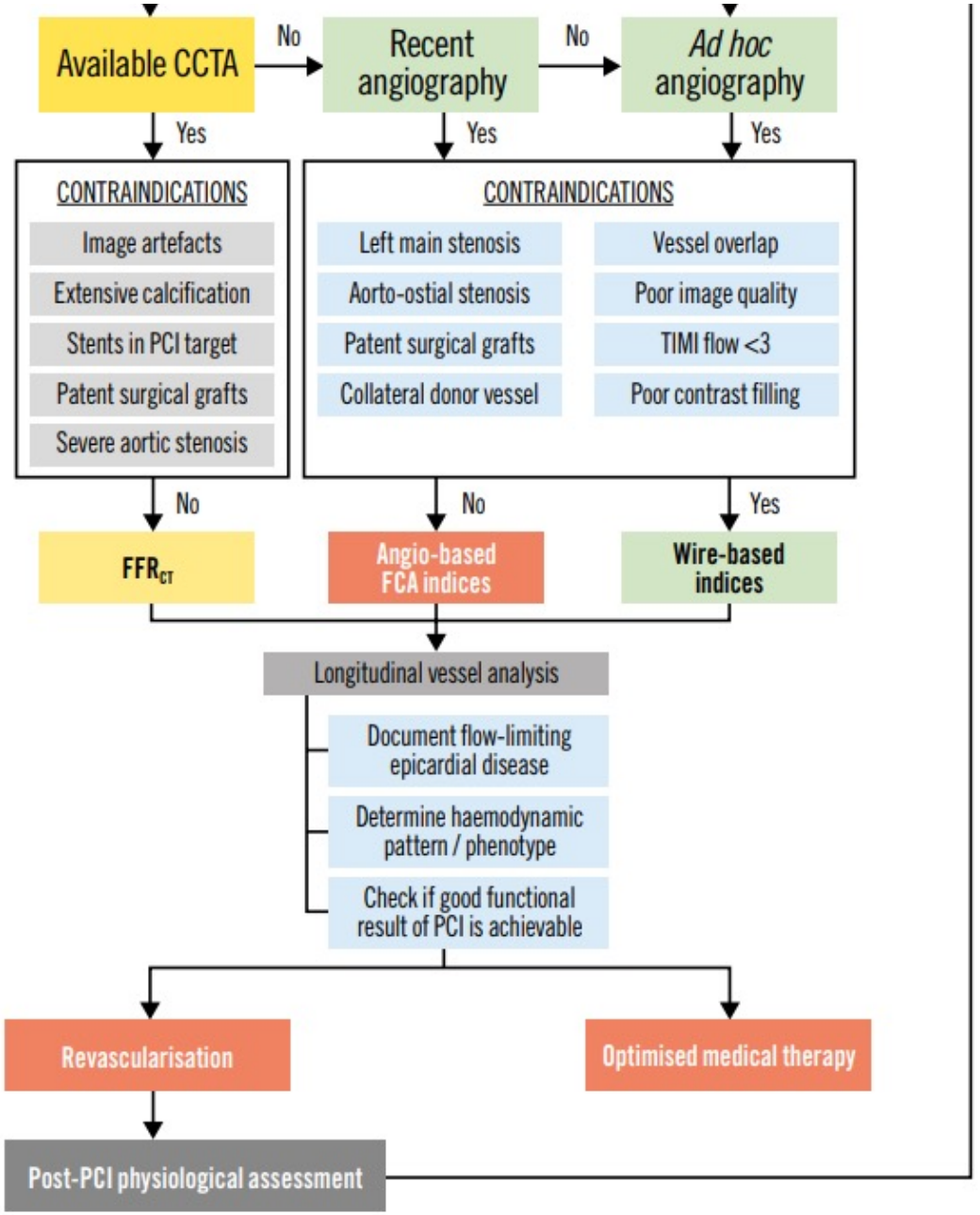
Serial stenosis on LAD
PCI planning to anticipate post-PCI result



QFR post-PCI
Serial stenosis PCI

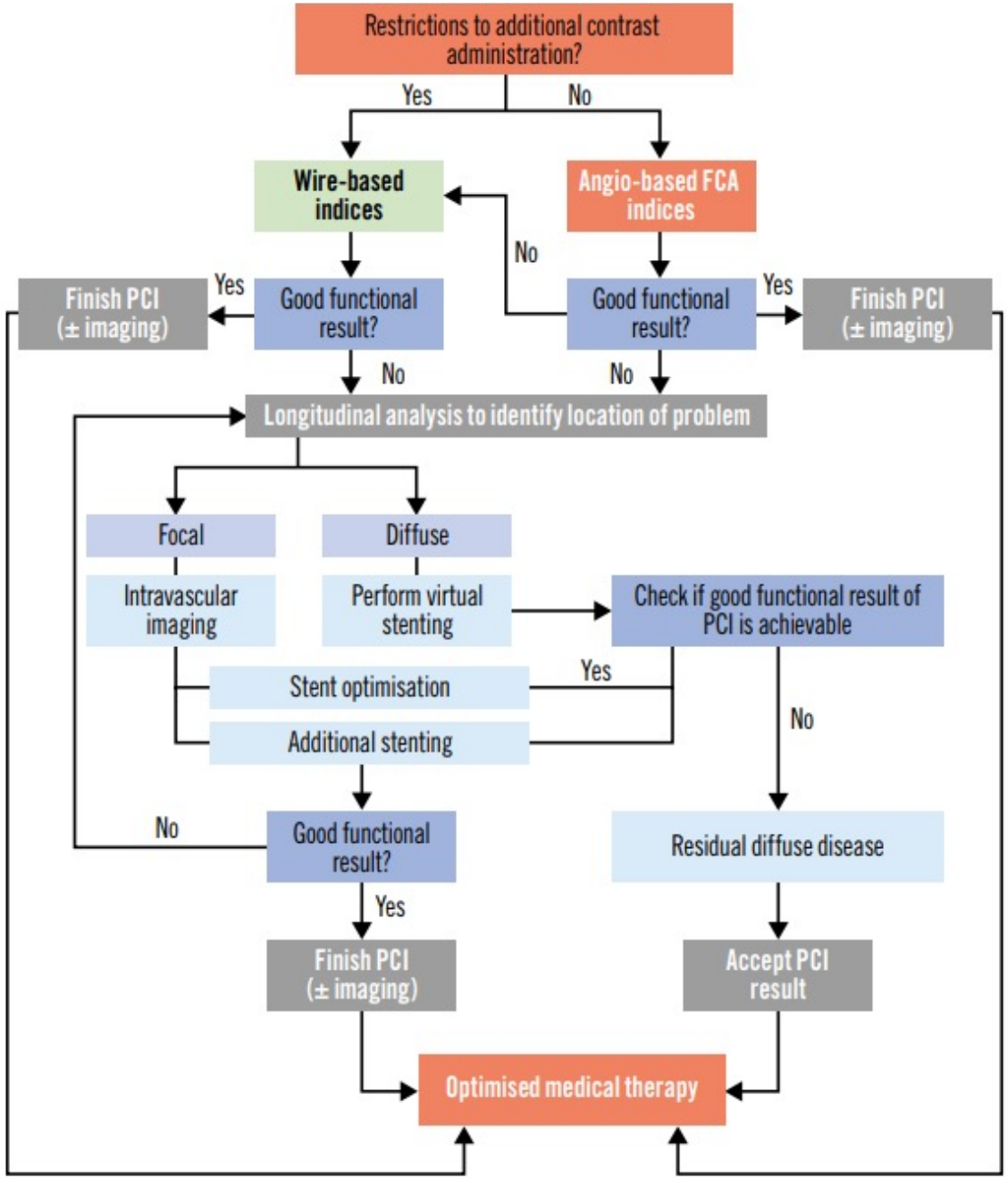


Conclusion: Pre-PCI assesment



Faria et al, EuroIntervention 2023

Conclusion: Post-PCI assesment



Faria et al, EuroIntervention 2023