

PHYSIO DAY

JOURNÉES DE PHYSIOLOGIE
EN CARDIOLOGIE INTERVENTIONNELLE

FFR dérivée du CT

Etat des lieux

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HÔTEL SHERATON · NICE



Statement of financial interest

Speaker's name : Frédéric Bouisset

I have the following potential conflicts of interest to report:

Consultant: Abbott, Amgen, B-Braun, Medtronic, Boston Scientific

1

From anatomy to physiology

How to Calculate FFR from CT?

2

Clinical data

Diagnostic performance and clinical outcomes

3

The big picture

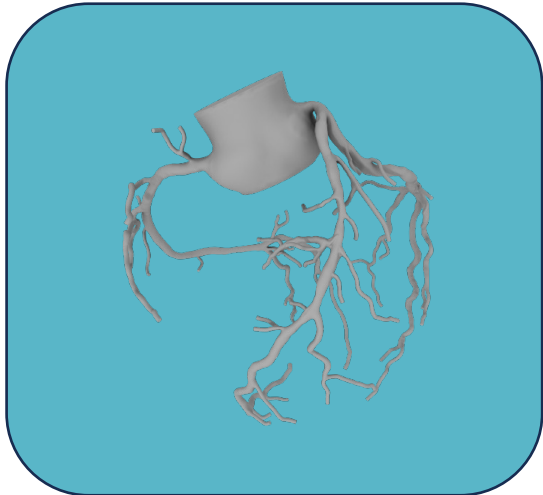
How is FFR Derived from CT Used in the Context of CT-Guided PCI?



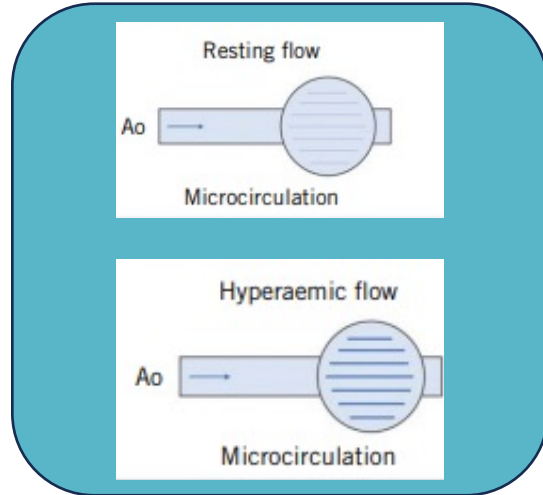
1

From anatomy to physiology

The principle



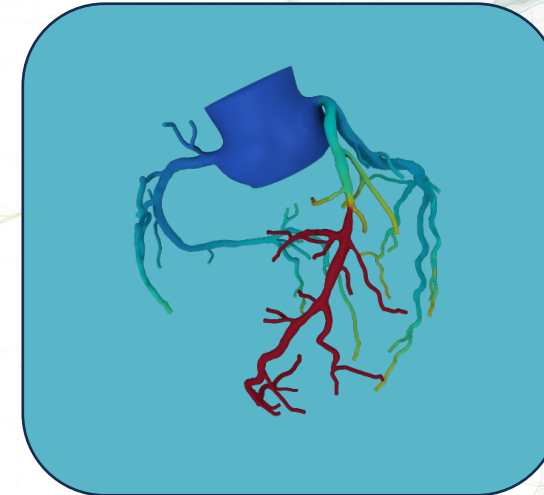
Building a 3D geometry



Setting the boundaries conditions

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

Solving the governing equations

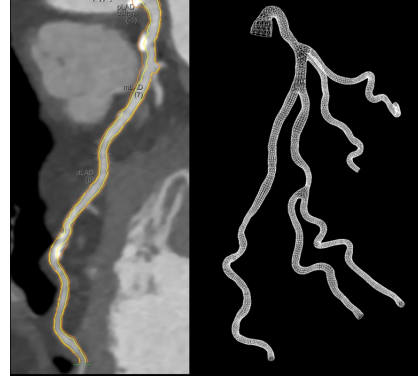


Getting the prediction

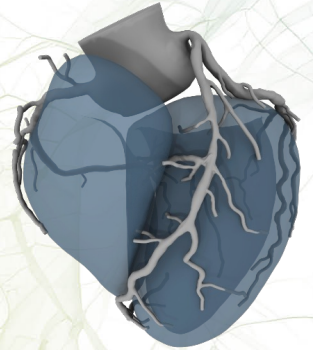
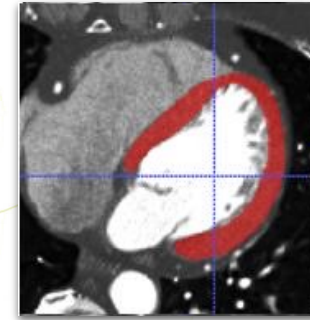
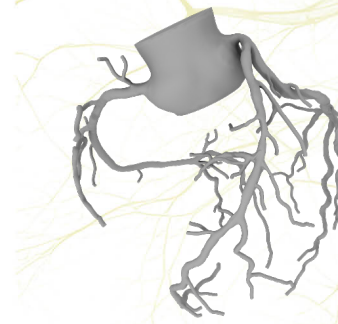




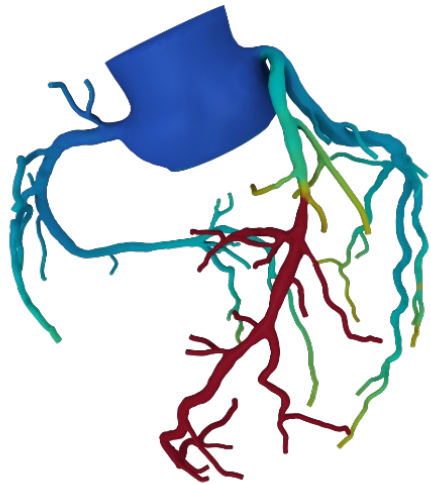
The FFR_{CT} Analysis Process



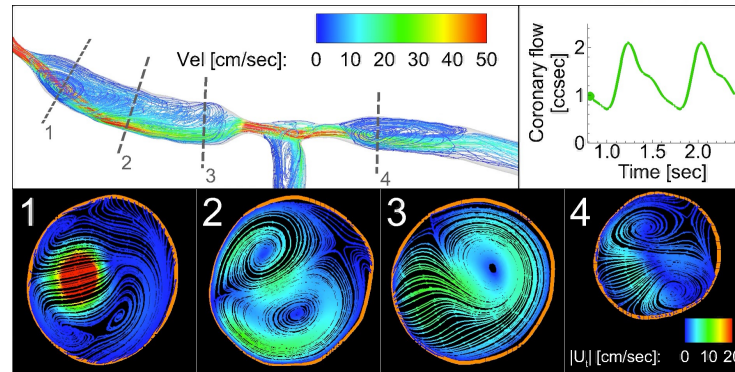
Anatomic model



Physiologic model



FFR_{CT}



Functional assessment with CFD



The players in the game

	Heartflow FFRCT	Toshiba CT-FFR	Siemens cFFR	United imaging uCT-FFR	Escope eFFR
Model generation	Semi auto + manual adjustments	Semi auto + manual adjustments	Semi auto + manual adjustments	Fully auto + manual adjustments	Fully auto
Operator	Processed by a technician at HeartFlow laboratory	Feasible by radiographer or physician at point of care	Any radiographer or physician at point of care	Any radiographer or physician at point of care	Barely radiographer or physician is needed
Computational requirements	Parallel supercomputer required for computing the fluid analysis model	Standard desktop computer	Standard desktop computer	Standard desktop computer	Standard desktop computer
Time	1-4 h	30 min	12~30 min (Average time per case)	Less than 15 min, based on the image quality and the severity of calcification	Less than 5 minutes

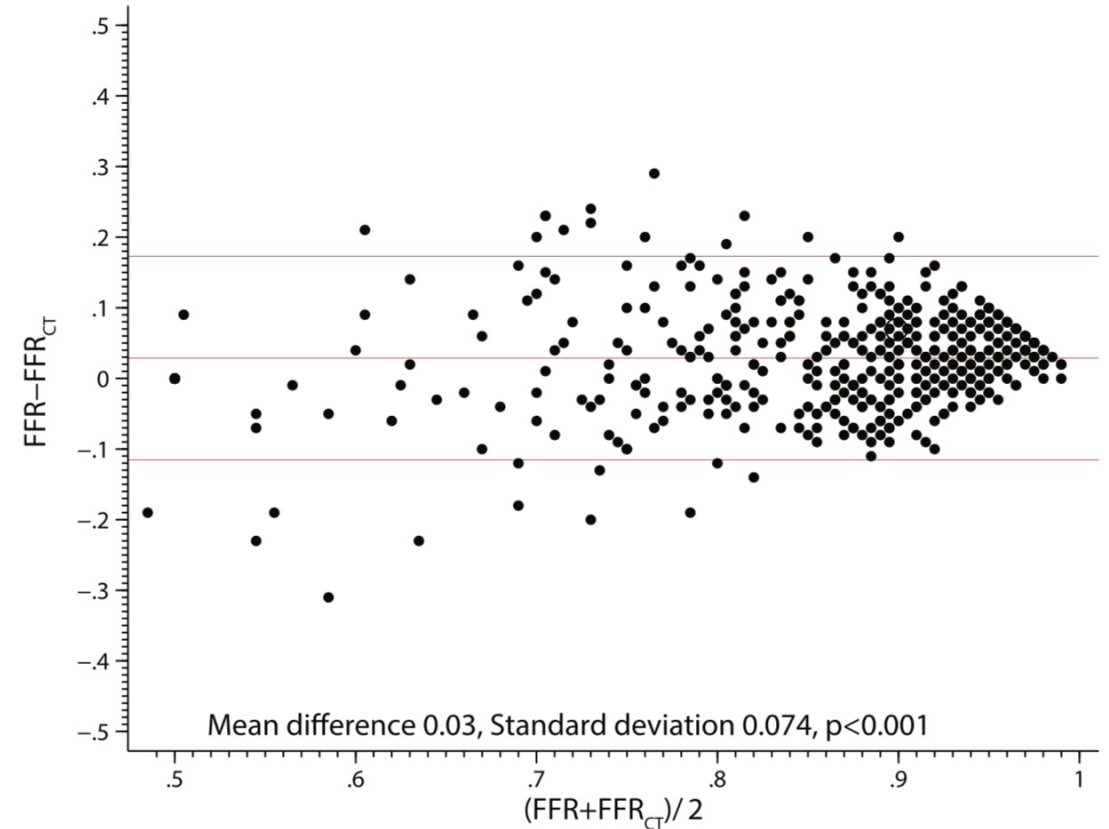
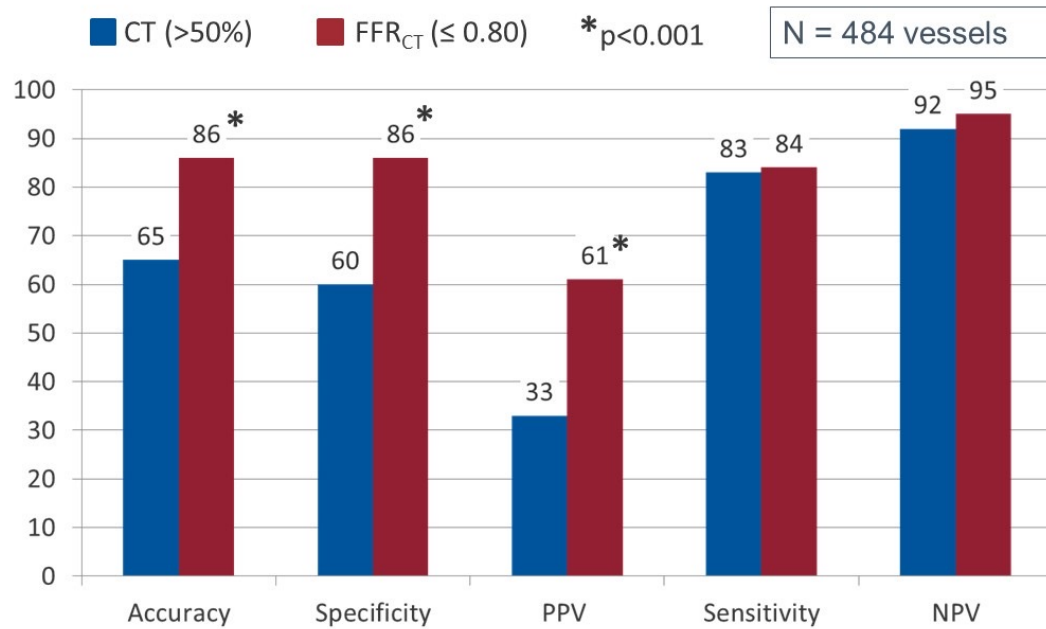


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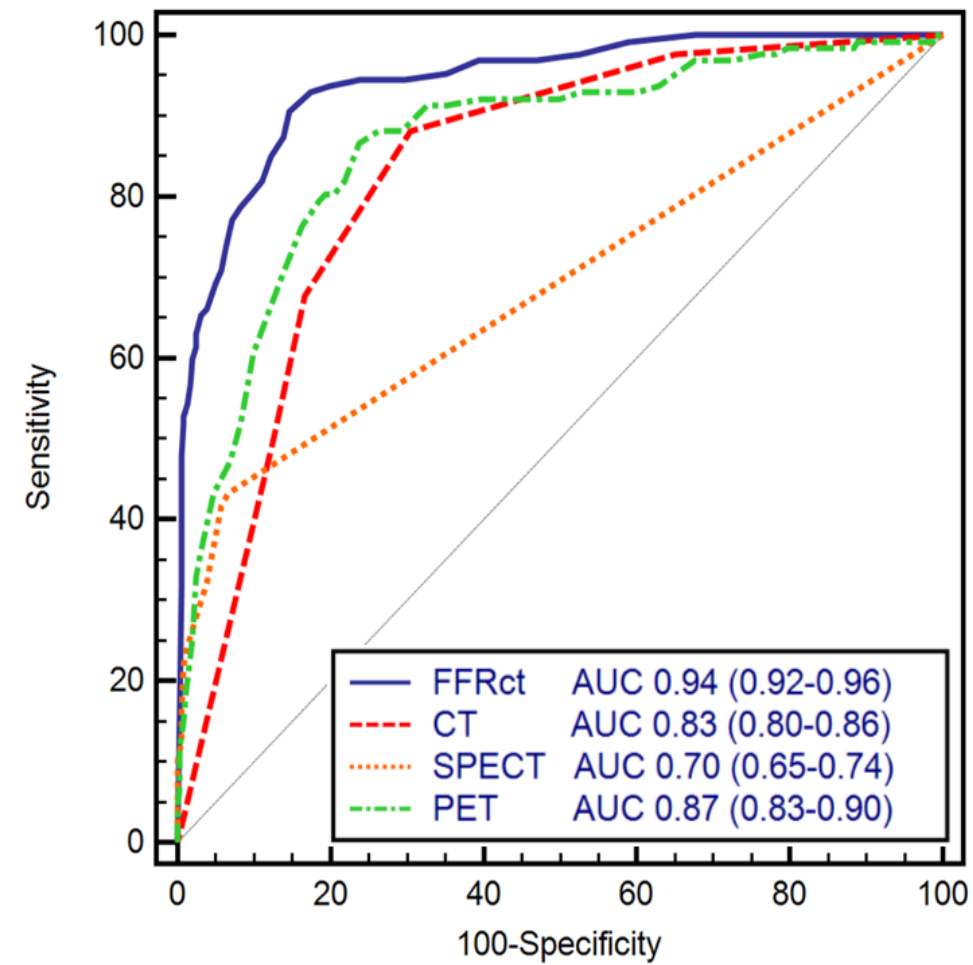
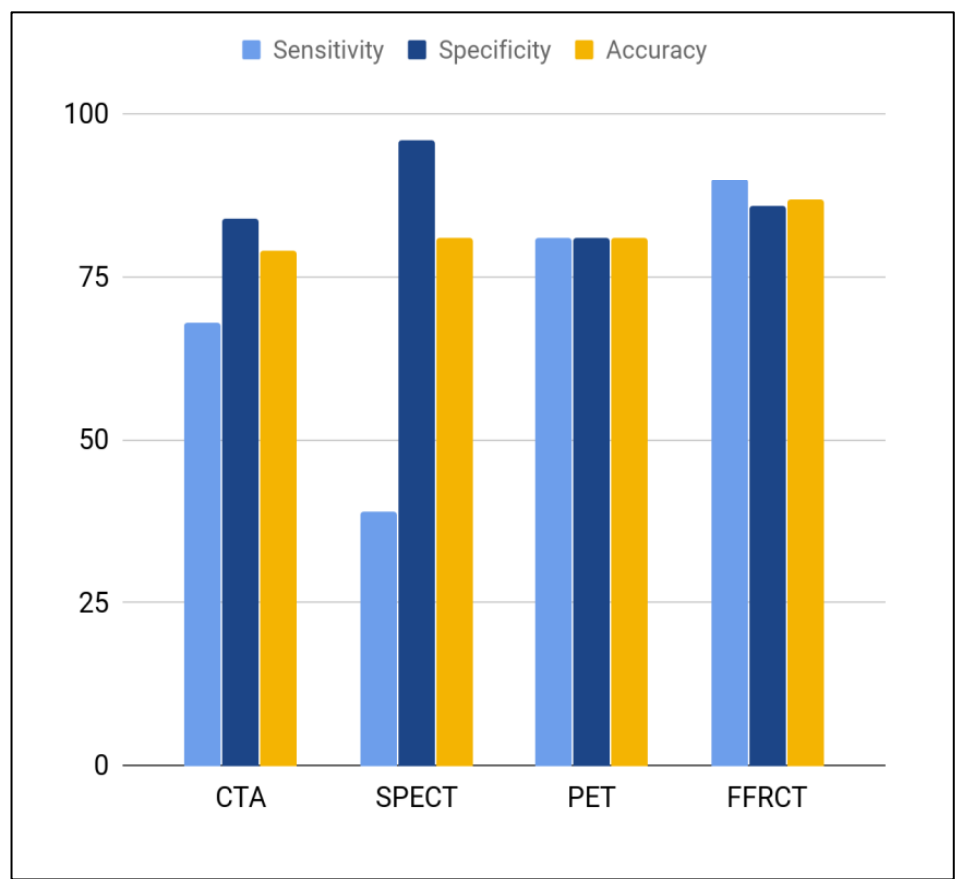
FFR derived from CT in clinical practice

FFR_{CT} Diagnostic Performance

NXT Per-Vessel Diagnostic Performance vs. CT

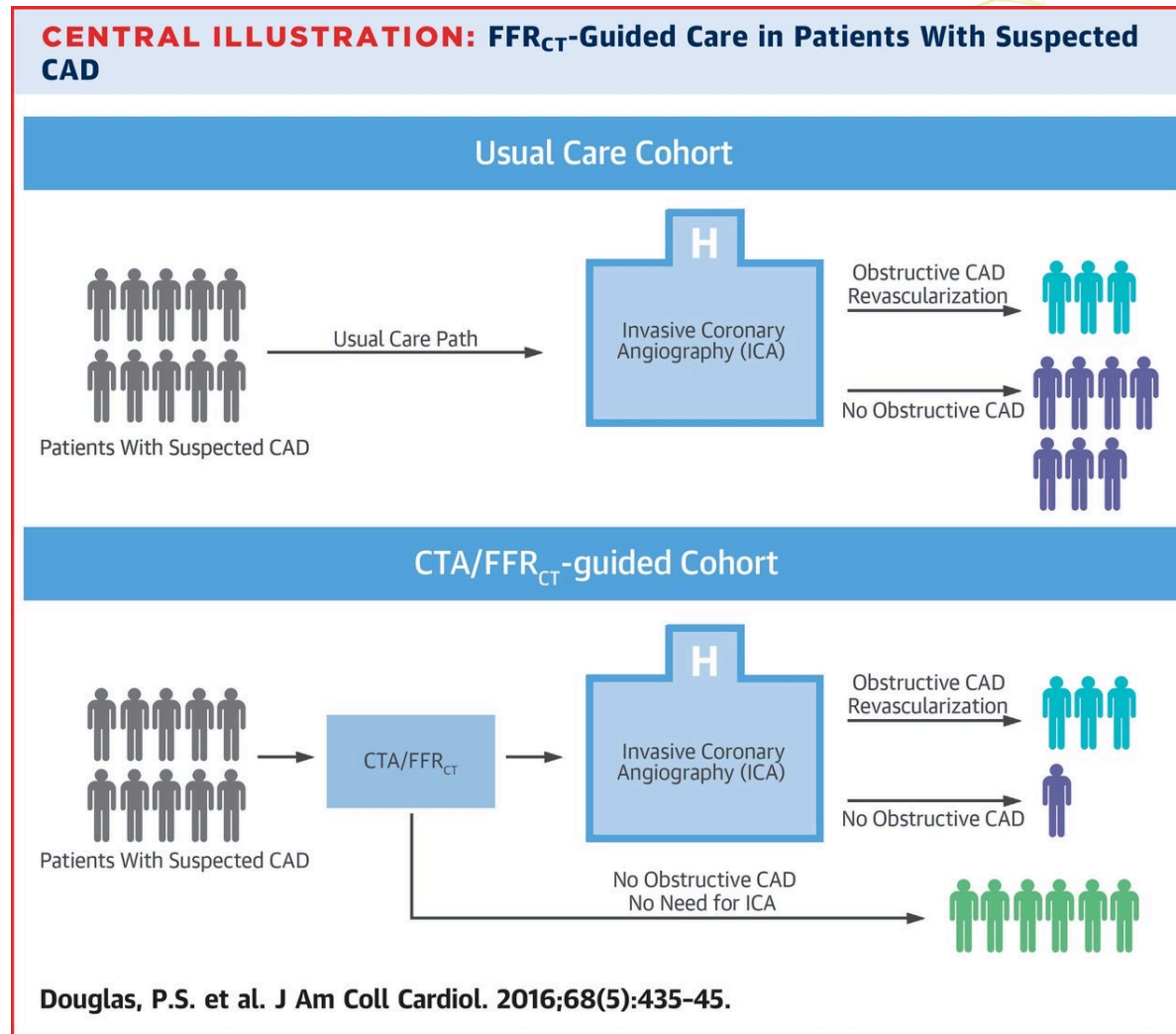


Head-to-head comparison of non-invasive cardiac tests



Driessen RS et al. JACC 2018

PHYSIODAY PLATFORM: FFR_{CT} guided strategy vs usual care



At 11 sites, 584 patients

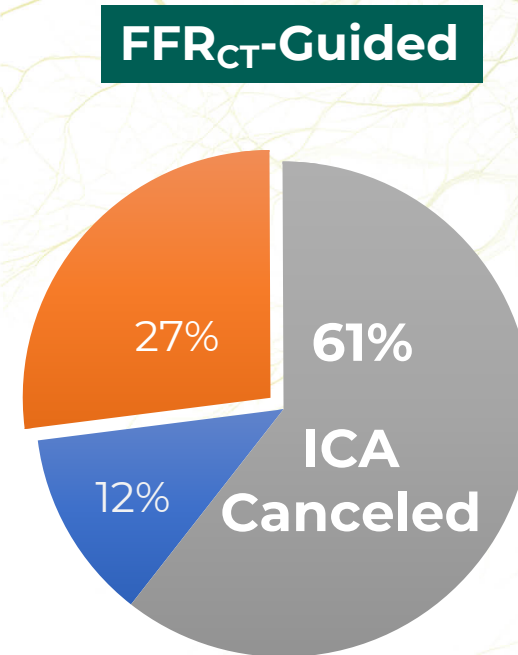
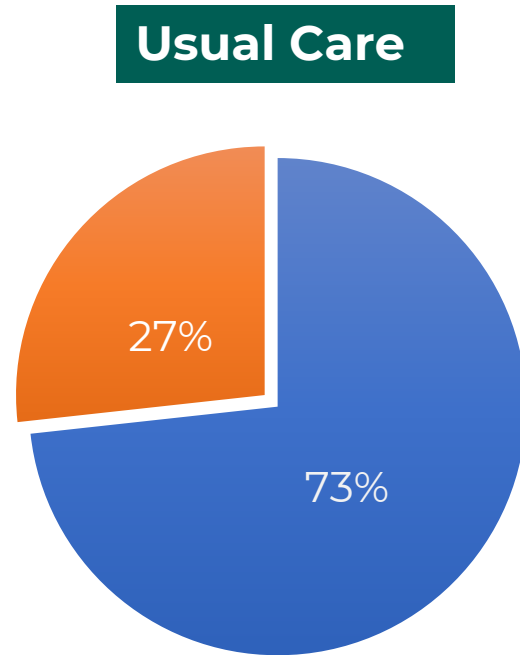
New onset chest pain

Primary endpoint:
percentage of patients
with planned ICA in
whom no significant
obstructive CAD

= Revascularization

↓ ICA without CAD

PLATFORM: Cancellation of invasive procedure

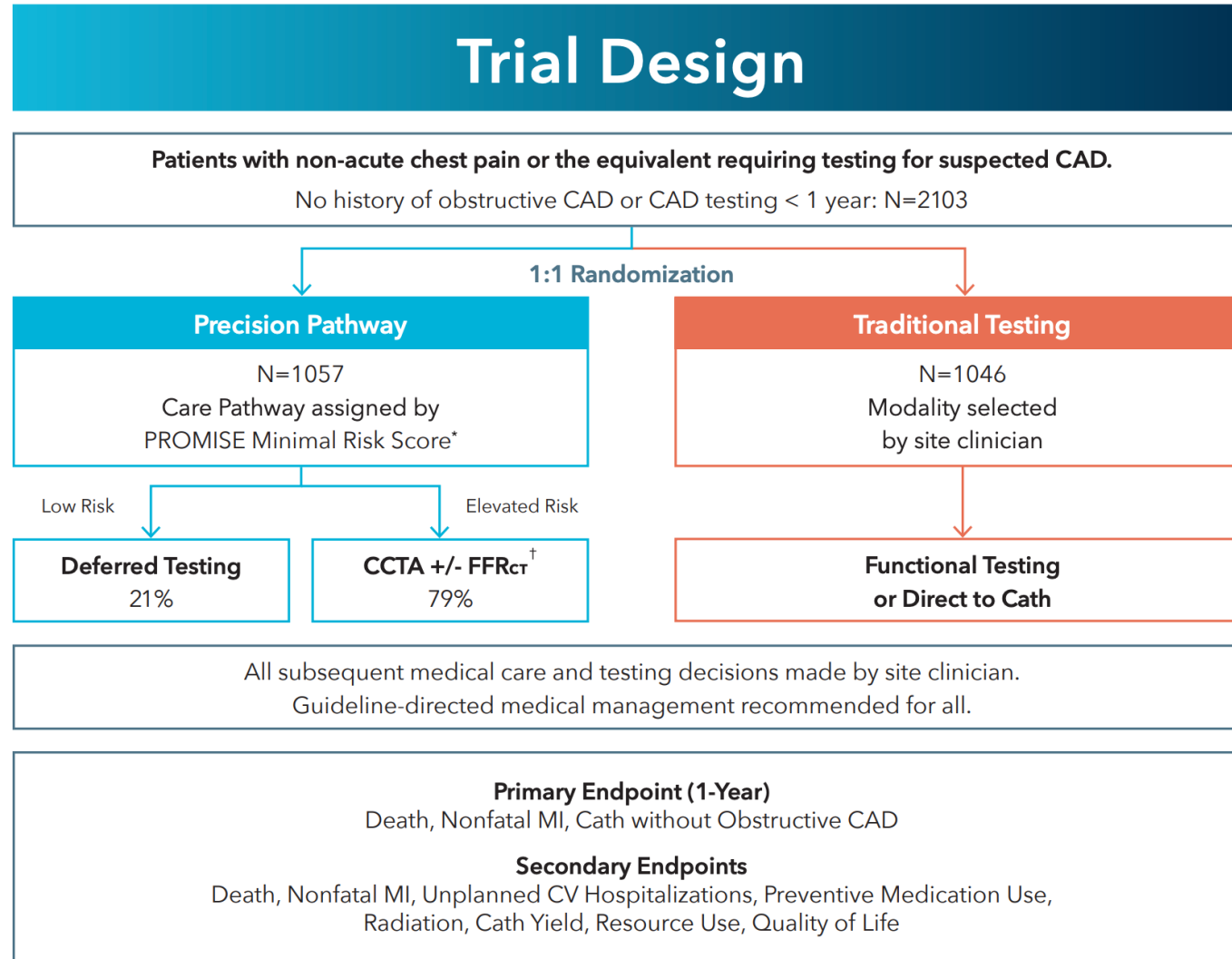


■ Obstructive CAD

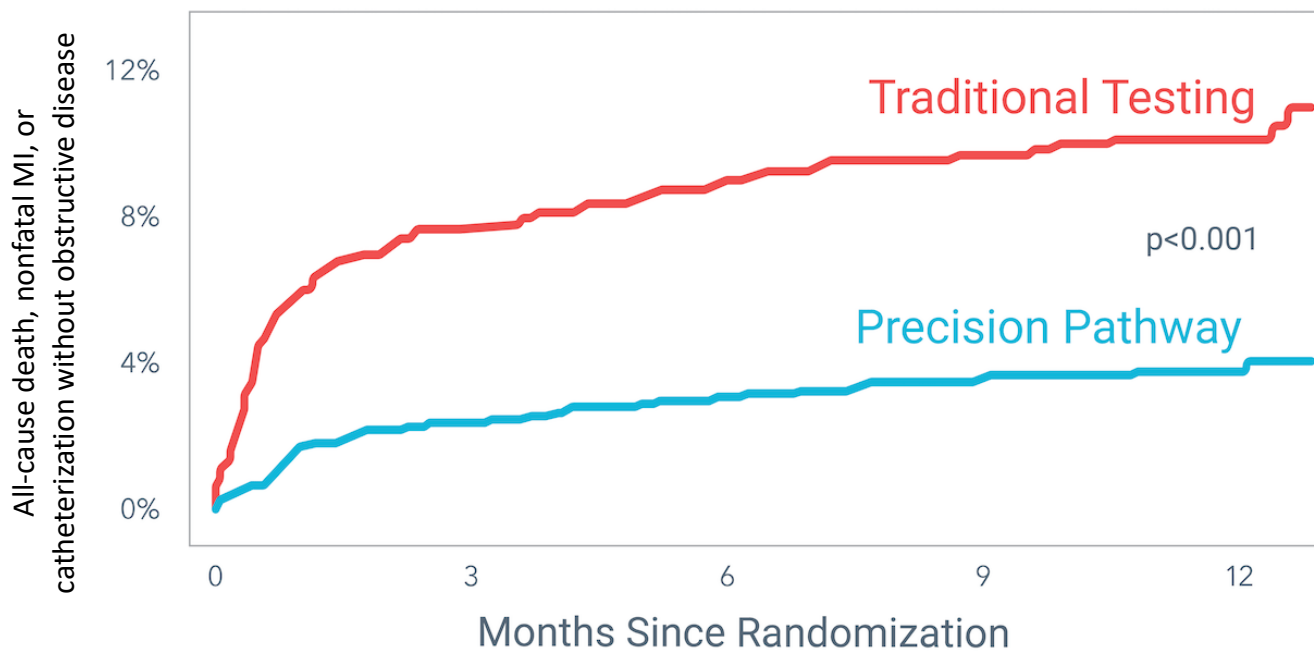
■ Non-obstructive CAD

84% Reduction in invasive catheterization without obstructive CAD.

Douglas et al. PLATFORM Trial. EHJ 2015.



Precision Pathway vs Traditional Testing



Number at risk	0	3	6	9	12
Precision Pathway	1057	997	971	945	431
Traditional Testing	1046	922	898	869	421

Traditional Testing

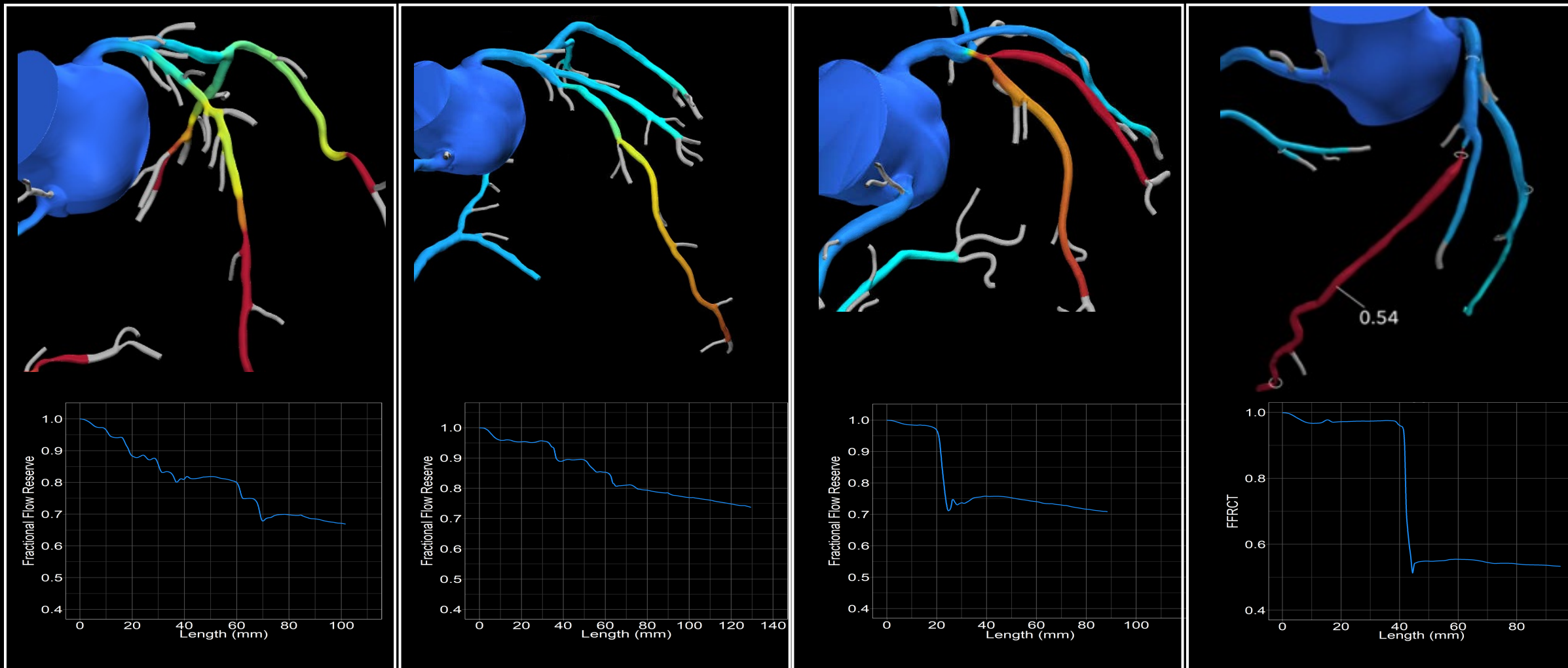
Functional testing (stress nuclear and stress echo) and **Invasive Coronary Angiography (ICA)**.

Precision Pathway

Risk scoring to defer testing for low-risk patients.³

CCTA with selective FFR_{CT}⁴ for elevated risk patients.

FFR_{CT} functional CAD endotypes

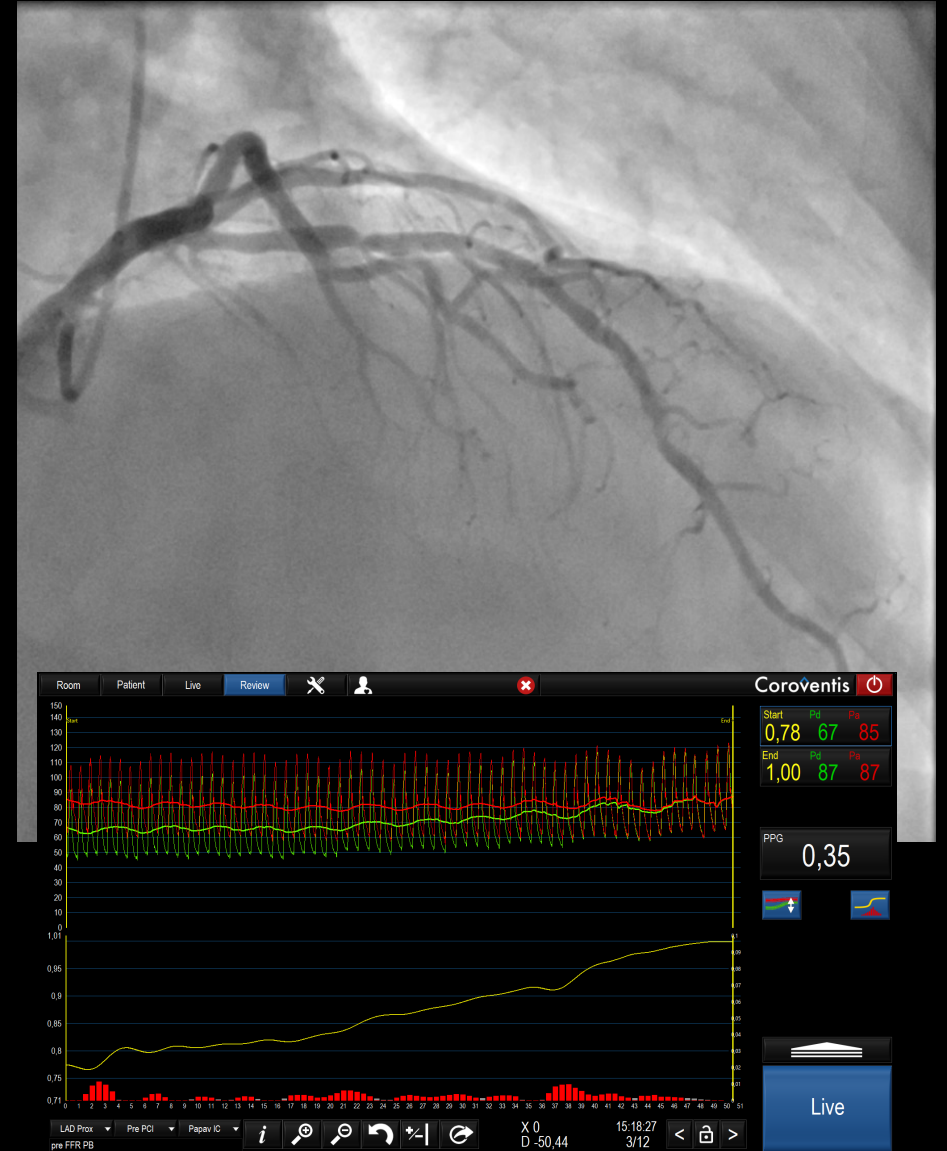
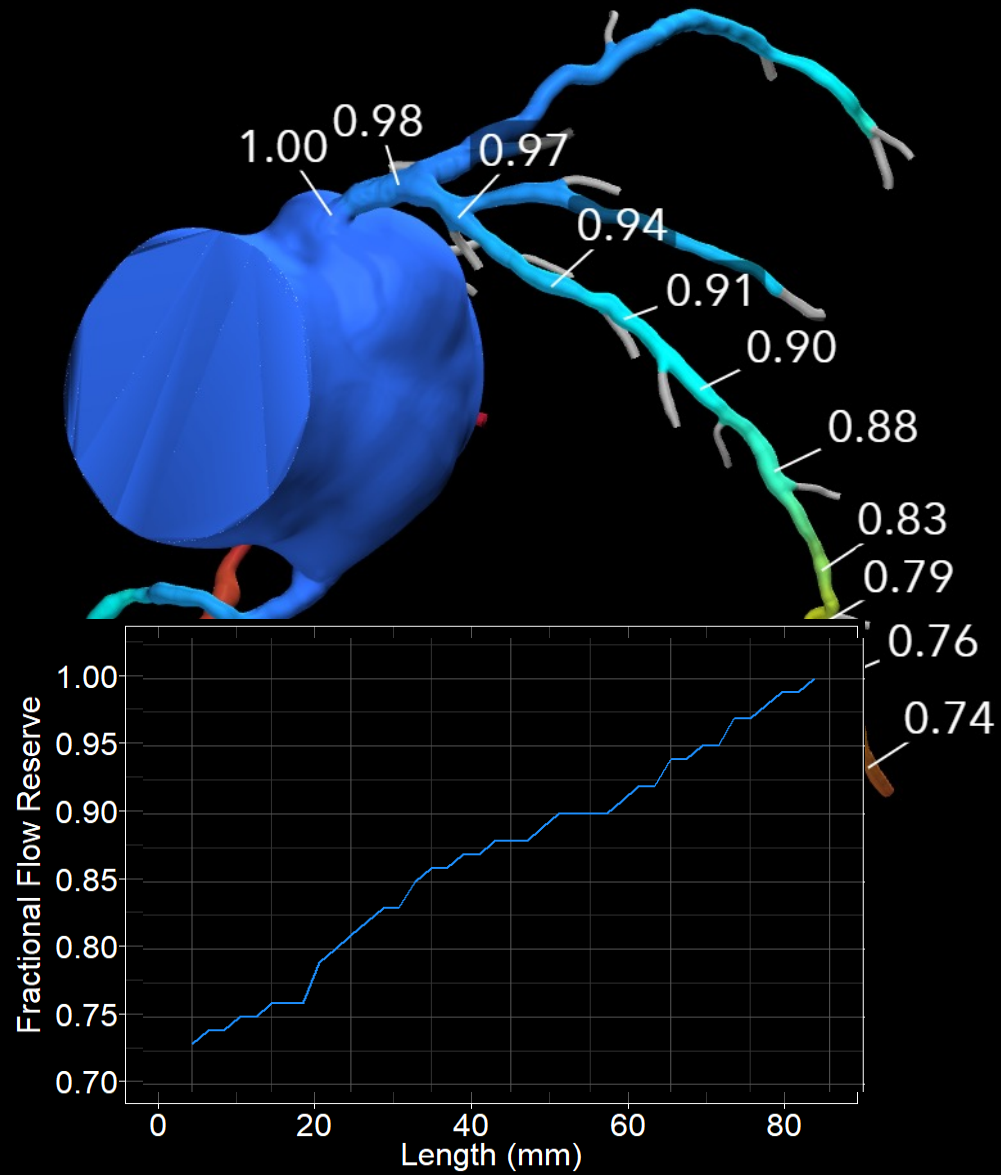


Diffuse

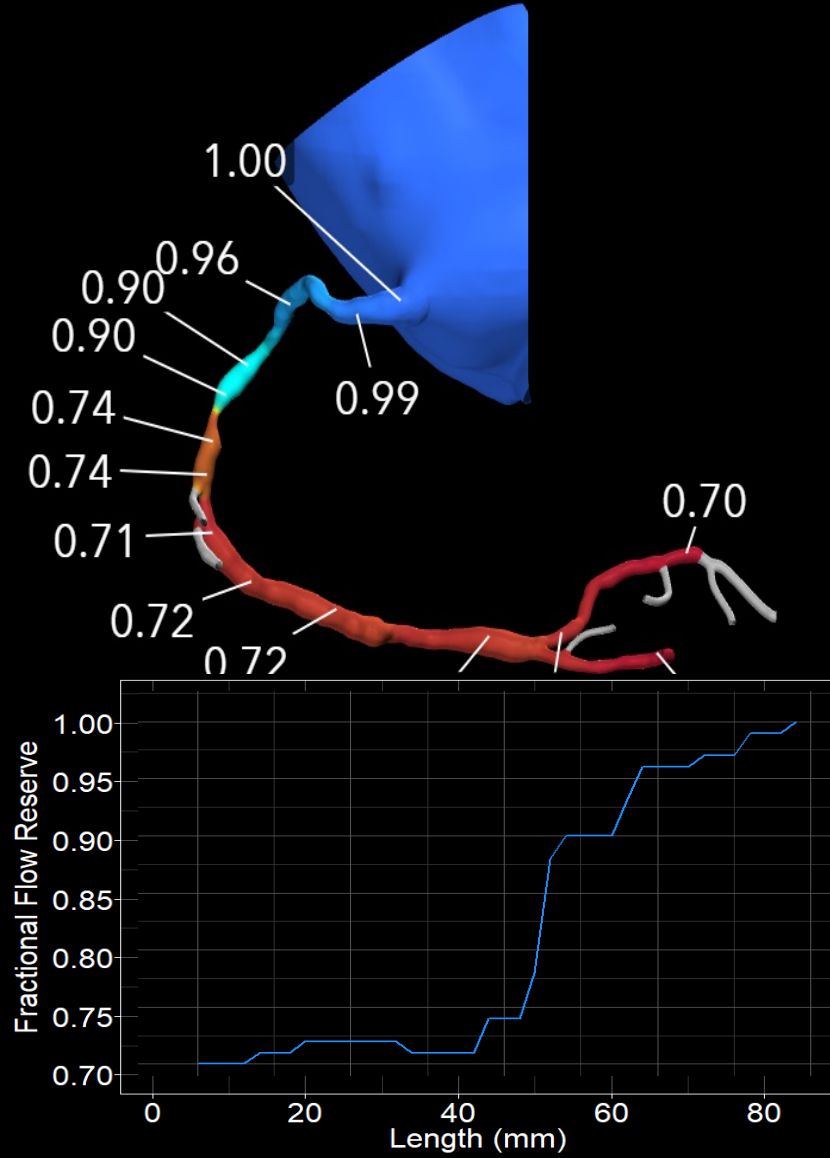
PPG

Focal

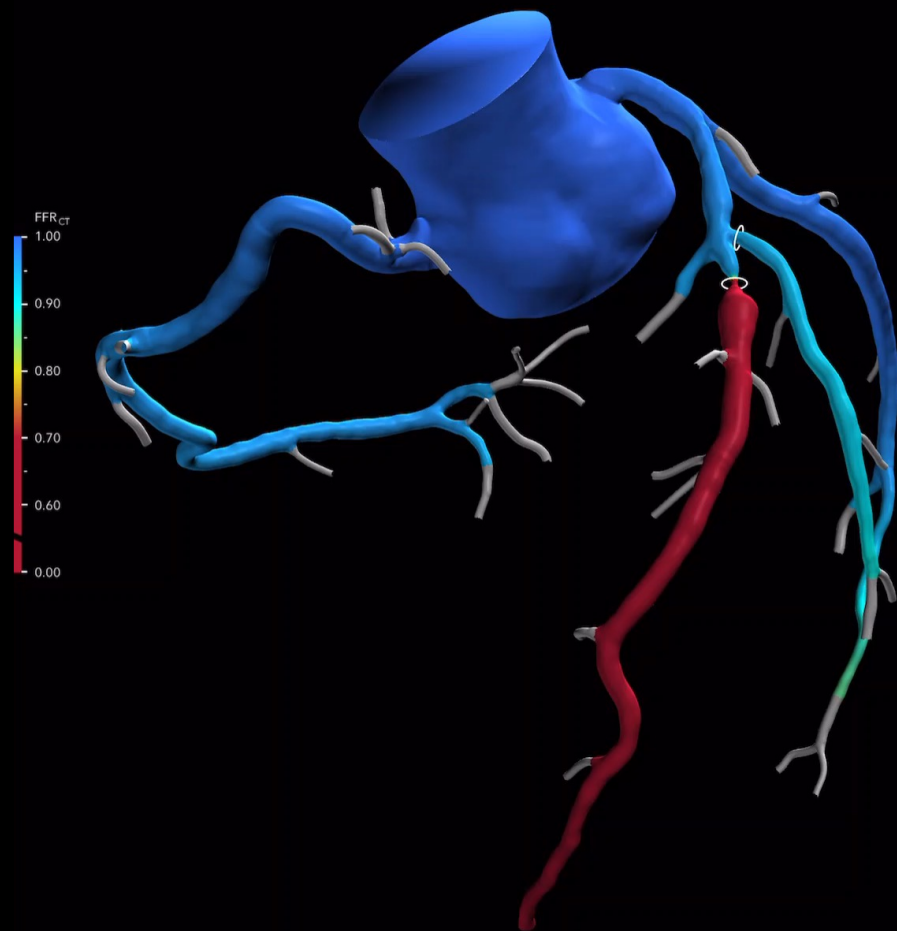
Diffuse CAD



Focal CAD



FFR_{CT} Planner



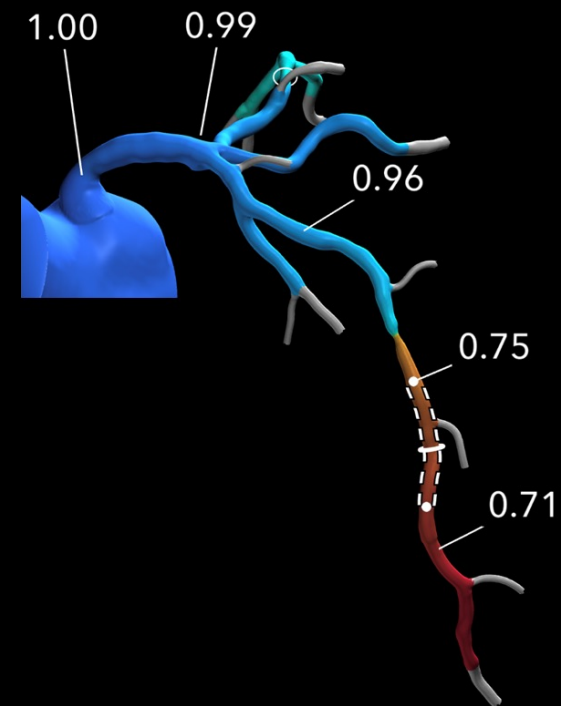
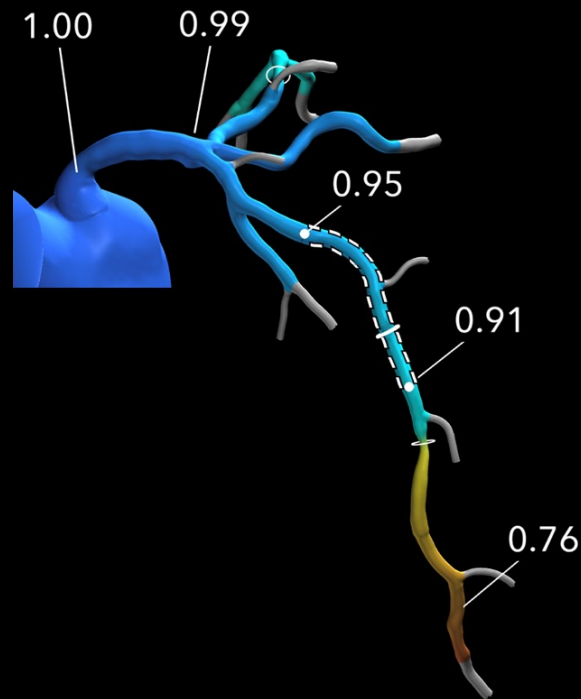
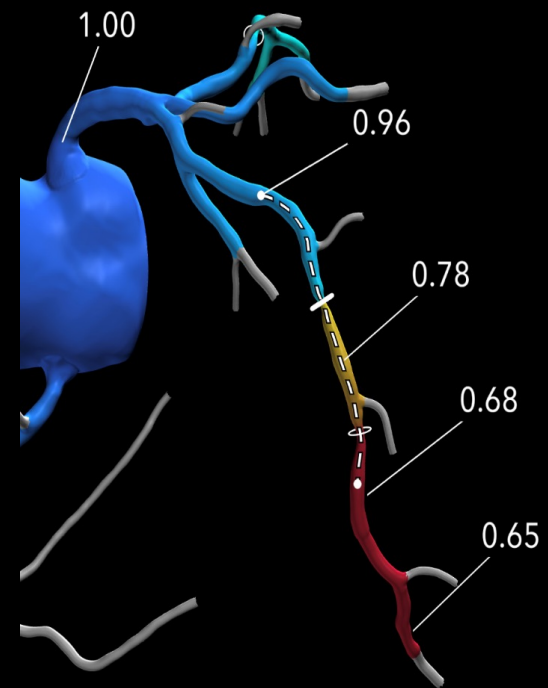
FFR_{CT} Planner

Baseline

Strategy 1

Strategy 2

Strategy 3



DES 40 mm

DES 28 mm

DES 18 mm

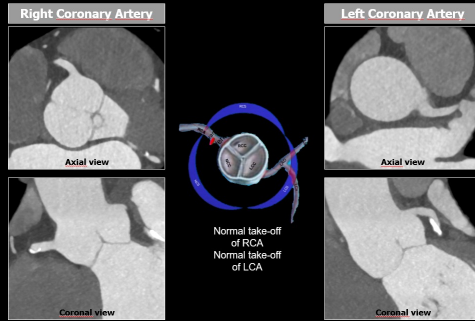


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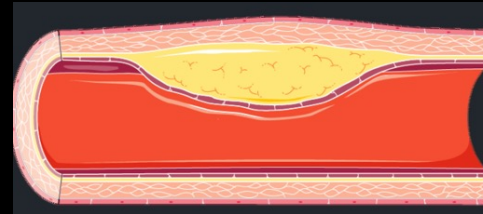
The big picture



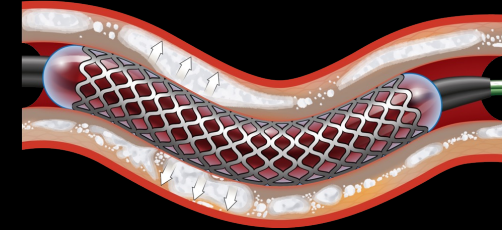
FFR derived CT from is a piece of the puzzle



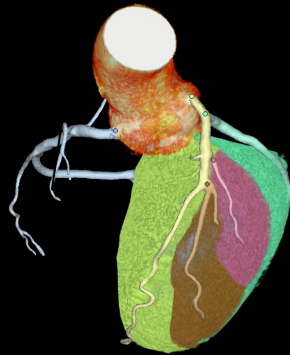
Position des ostias coronaires



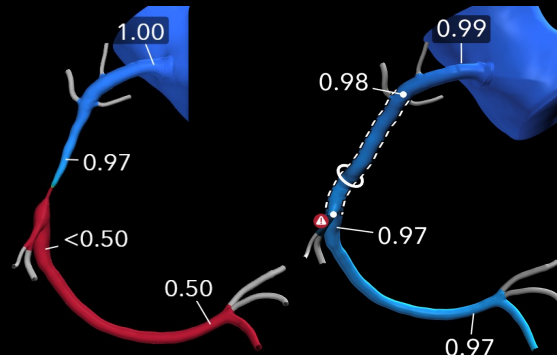
Choix des « landing zones »



Choix de la préparation



Masse myocardique à risque

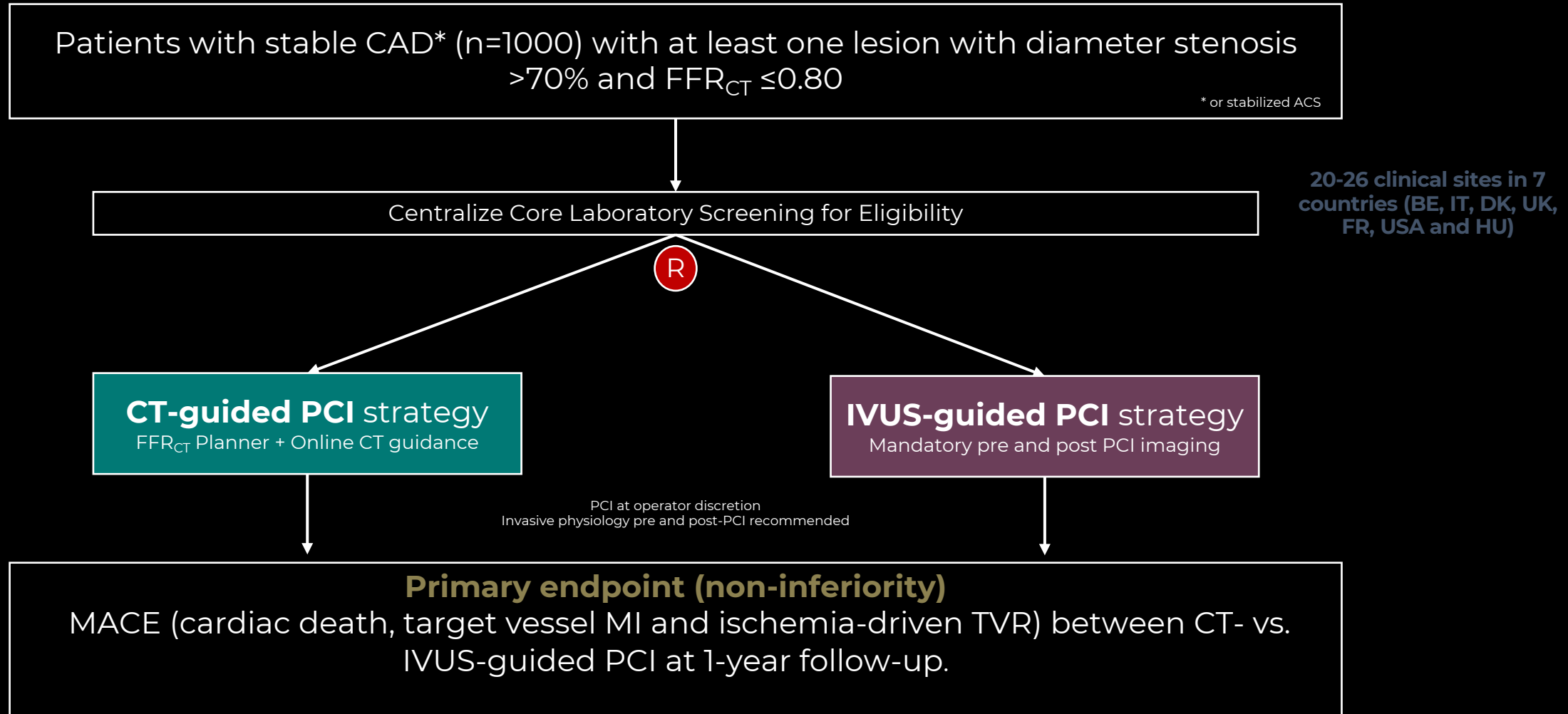


Physiologie pré/post PCI



Guidage per-procédural

The P4 trial



*Hypothesis: A CT-guided PCI strategy is **non-inferior** to IVUS guided PCI with respect to MACE*

1

FFR derived from CT necessitates a 3D coronary tree reconstruction and coronary blood flow simulation

2

FFR derived from CT demonstrates good performance as compared to invasive and non-invasive testing

3

FFR derived from CT together with anatomical data derived from CT can provide relevant information to plan and guide PCI



Thank you!





Back-up slides

