



PHYSIO DAY

JOURNÉES DE PHYSIOLOGIE
EN CARDIOLOGIE INTERVENTIONNELLE

La FFR comme guide post-PCI?

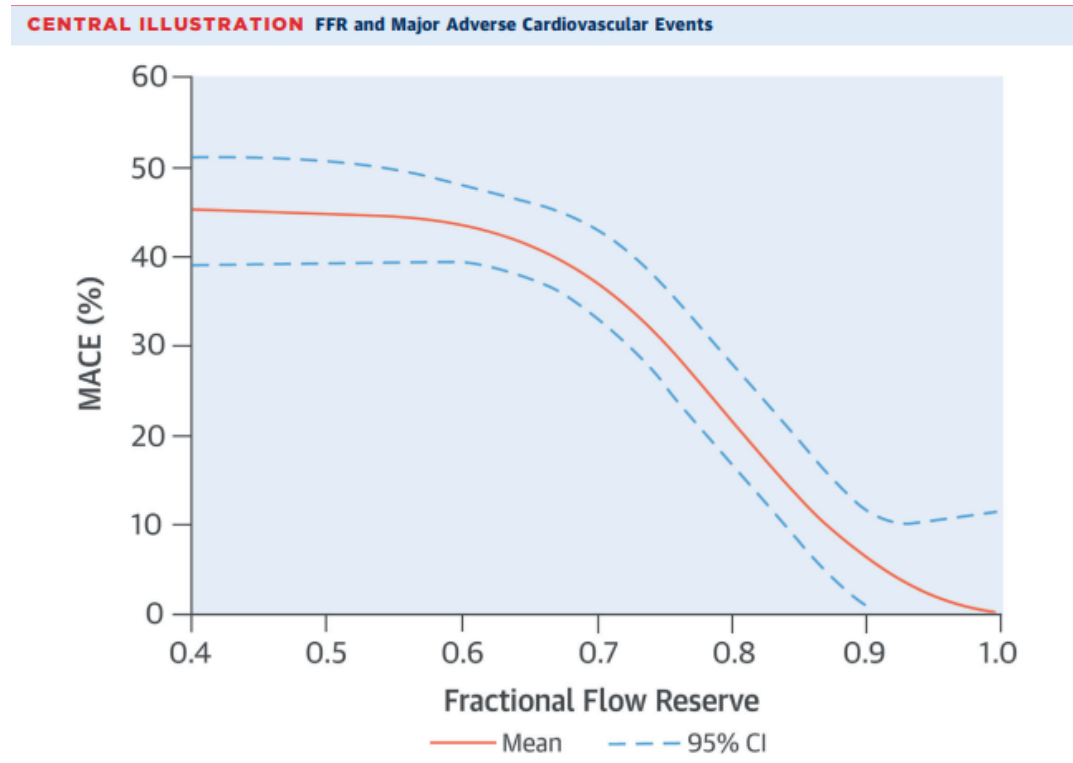
Benoit GUILLON

CHRU J.MINJOZ- Besançon

5 & 6 AVRIL 2024

HÔTEL SHERATON · NICE

Introduction: FFR as a continuum of risk



Barbato E et al J Am Coll Cardiol 2016

(As pre-PCI) Low post-PCI FFR is associated with MACE

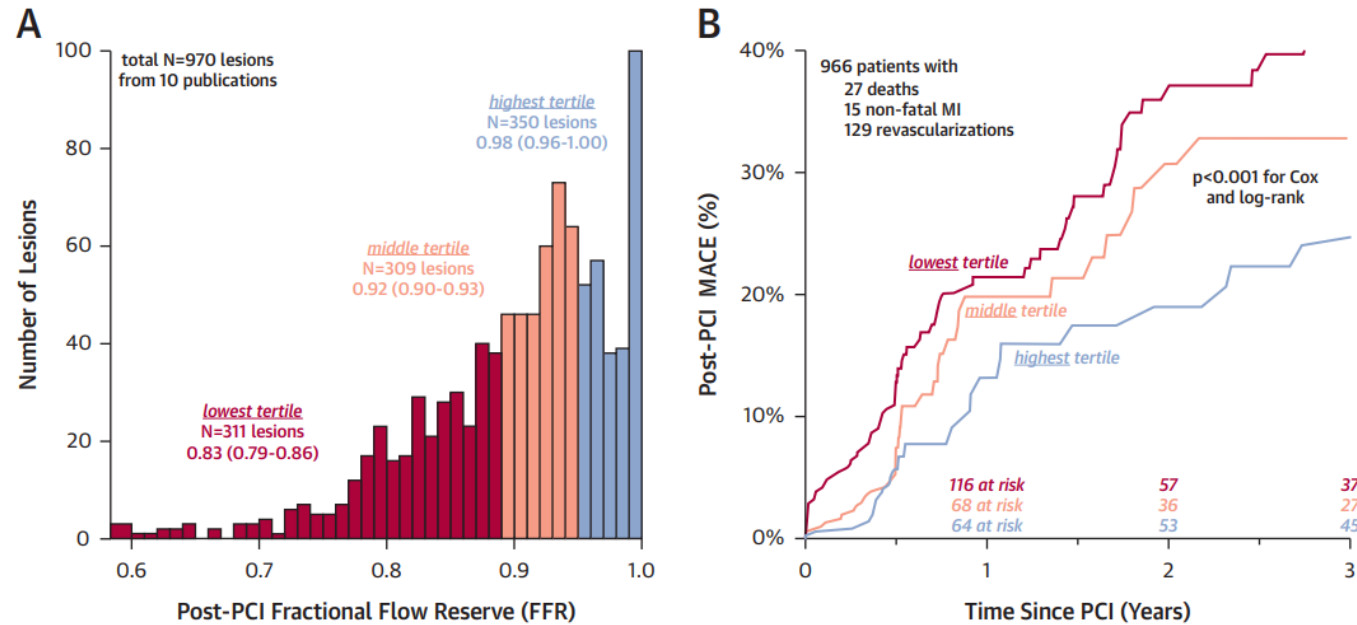
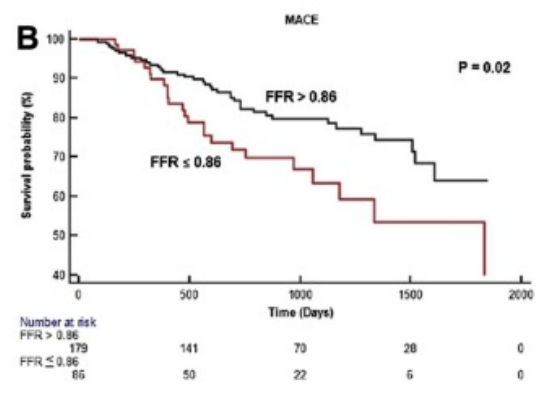
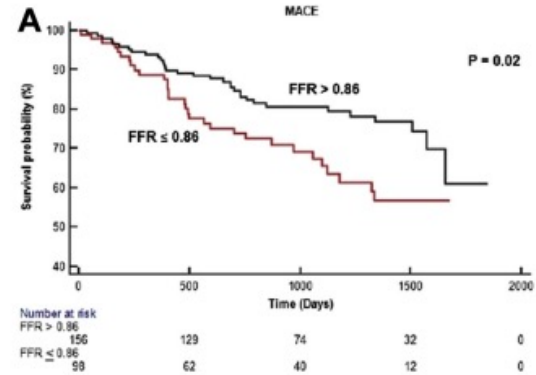


FIGURE 4 FFR Measurements Made Immediately After PCI

(A) Histogram. Lesion-level histogram of post-PCI FFR values from the patient-level analysis colored by tertiles (red, salmon, periwinkle). (B) Survival curves. Kaplan-Meier event curves for tertiles of post-PCI FFR values (colors match histogram). Both continuous Cox regression and tertile-based log-rank tests demonstrated a significant ($p < 0.001$), inverse relationship between post-PCI FFR and subsequent clinical events. Abbreviations as in Figures 1 and 2.

FFR Post-PCI: which cut-off?

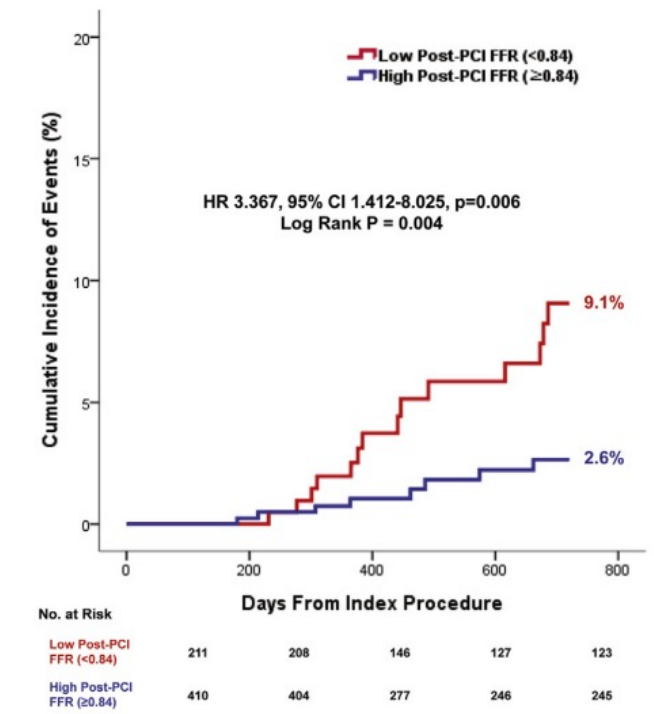
FIGURE 6 Freedom From MACE in Various Subgroups of Patients



(A) Kaplan-Meier curve showing significantly higher survival free of MACE in the patients with diffuse disease achieving final FFR >0.86 compared to the final FFR ≤0.86 group. **(B)** Kaplan-Meier curve showing significantly higher survival free of MACE in the patients with multivessel disease achieving final FFR >0.86 compared to the final FFR ≤0.86 group. Abbreviations as in Figure 4.

Argawal et al JACC CVI 2014

A Post-PCI FFR



Joo Myung Lee et al JACC CVI 2018

Impact of Δ FFR/ relative increase on symptoms and TVF

B Percent FFR increase

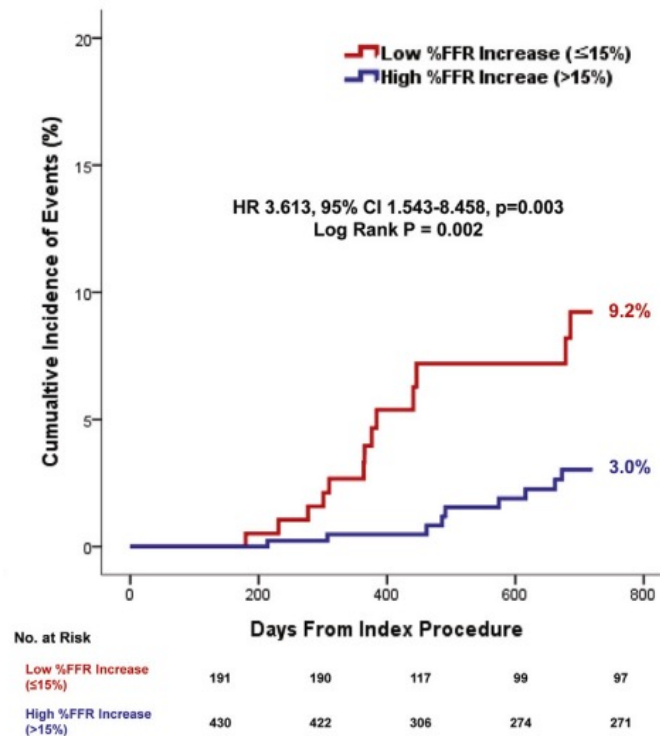


Table 2. Outcomes per Fractional Flow Reserve (Δ FFR) Tertile^a

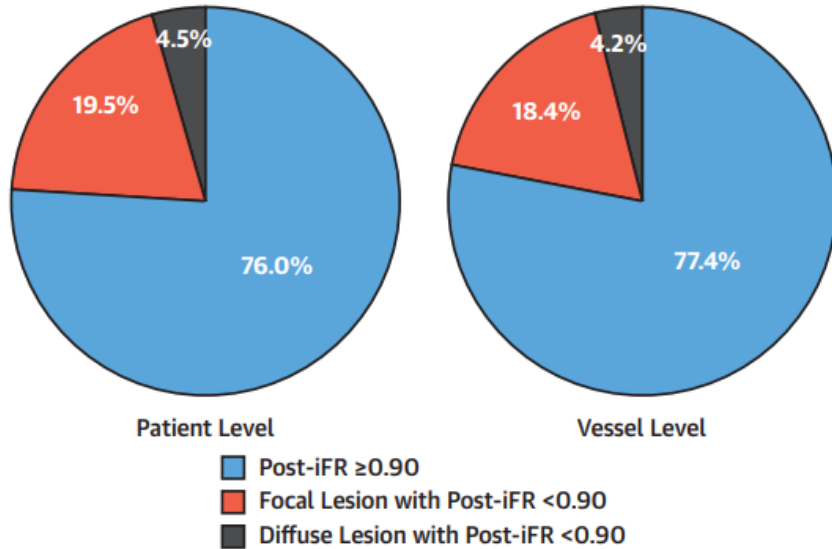
End Point	No. (%)			P Value	
	Lowest Tertile	Middle Tertile	Highest Tertile	Unadjusted	Adjusted ^b
Lesions, No.	277	282	278	NA	NA
Vessel-oriented clinical events	25 (9.0)	20 (7.1)	13 (4.7)	.13	.01
Death ^c	4 (1.4)	5 (1.8)	4 (1.4)	.94	.69
Myocardial infarction	5 (1.8)	6 (2.1)	4 (1.4)	.83	.32
Target vessel revascularization	20 (7.2)	14 (5.0)	7 (2.5)	.04	.002

Fournier et al, JAMA Cardiol 2019

Joo Myung Lee et al JACC CVI 2018

Impaired FFR/iFR post-PCI: a current case

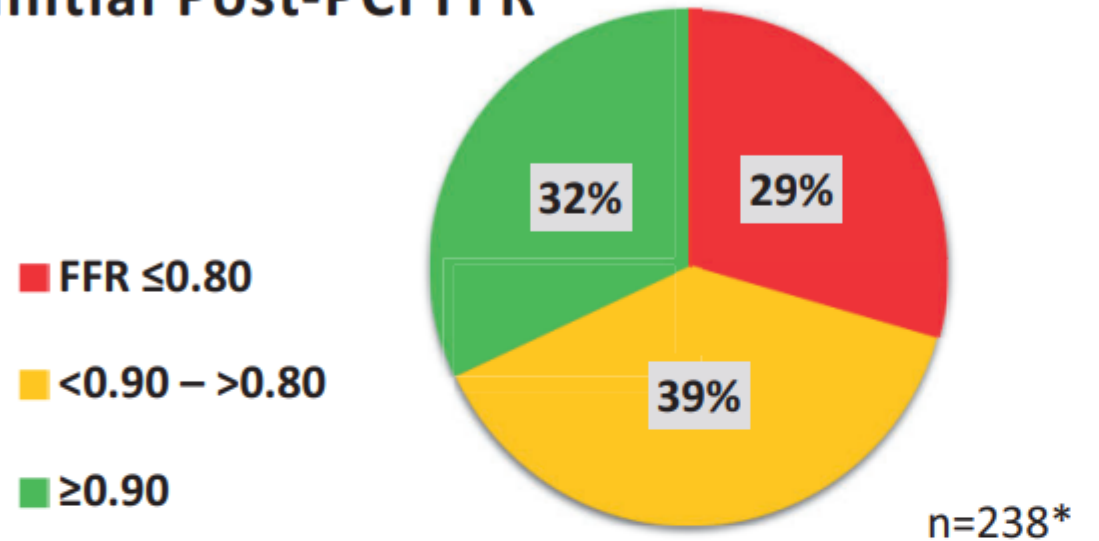
CENTRAL ILLUSTRATION Post-Percutaneous Coronary Intervention Coronary Physiology



Jeremias, A. et al. J Am Coll Cardiol Interv. 2019;12(20):1991-2001.

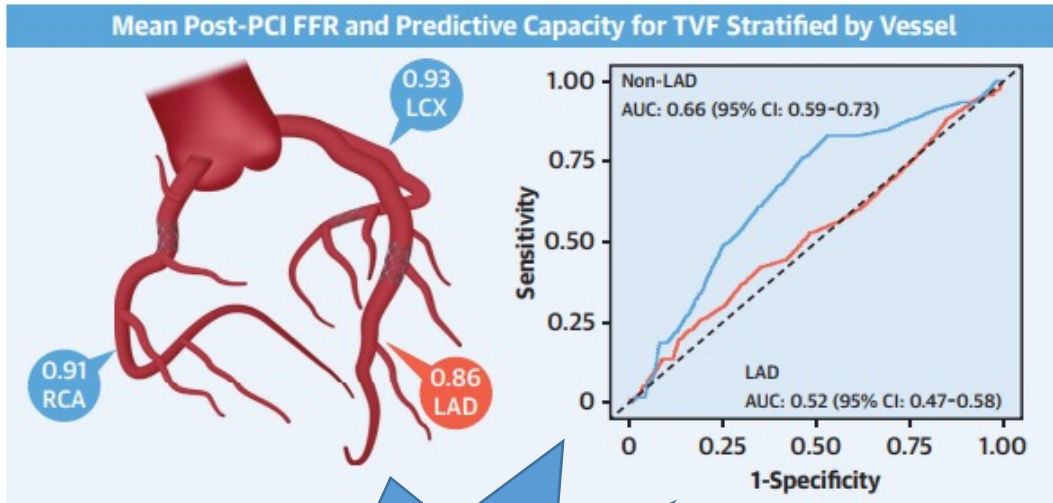
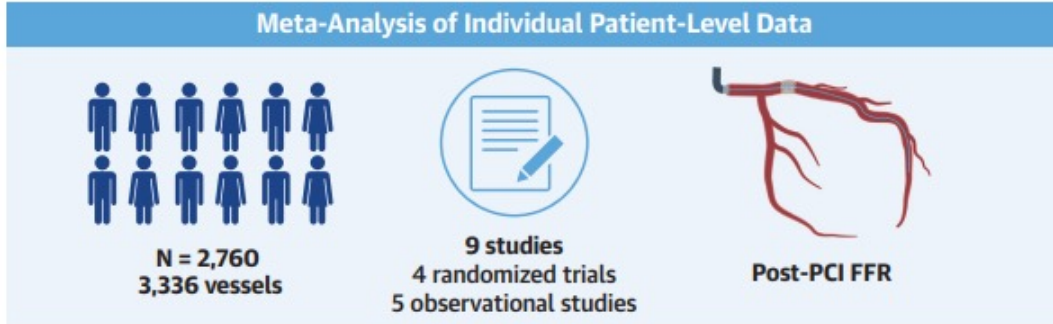
Jeremias et al, JACC CVI, 2019 DEFINE PCI

Initial Post-PCI FFR

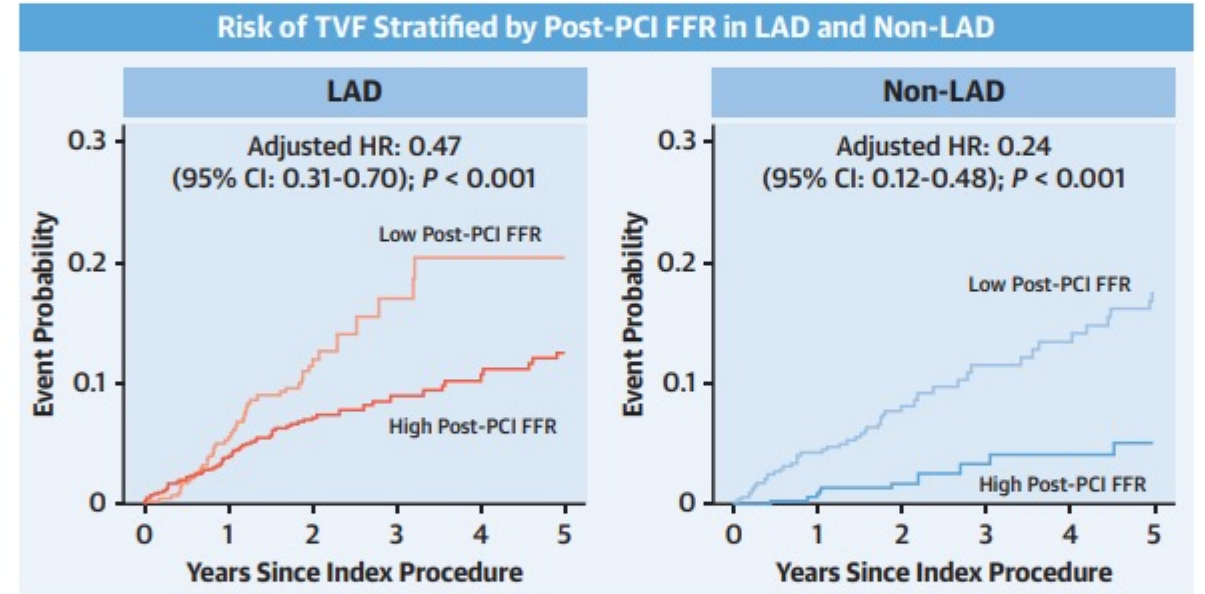


Collison et al, Eur Heart J, 2019-TARGET FFR

Post-PCI FFR stratified by coronary artery



Post PCI FFR has poor (LAD) to moderate (non LAD) value to predict TVF



Post-PCI FFR :

- 0,83 LAD
- 0,93 non LAD

is associated with adverse outcomes

Why is FFR lower in LAD artery?

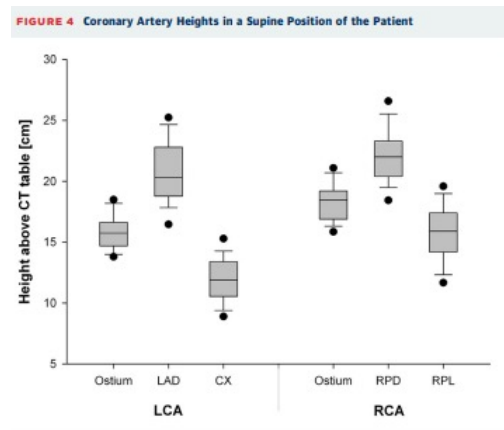
1) Highest myocardial mass and flow

Fournier S et al Eurointervention 2021

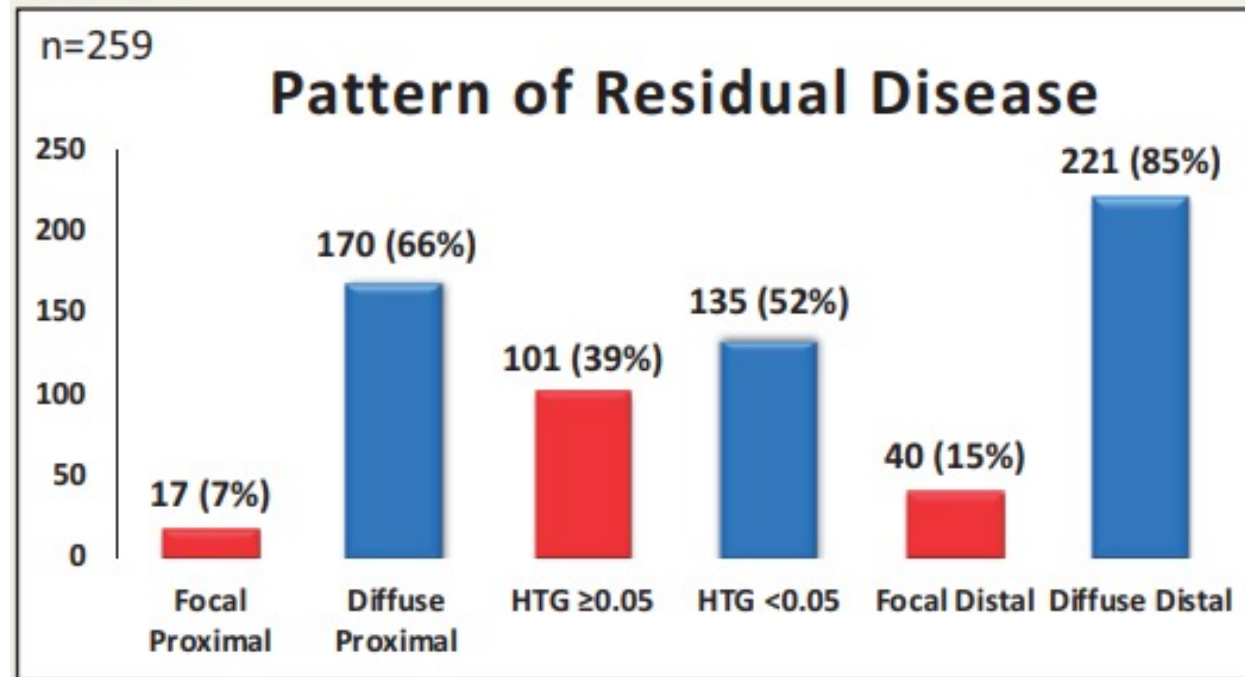
2) Hydrostatic effect

Tobias Härle JACC CVI 2017

Invasive measurements		Controls N=25		
		LAD	Cx	RCA
FFR	Mean±	0.92±0	0.96±0	0.96±0
	SD	.02	.04	.03
	Median (5-95)	0.93 (0.88-0.94)	0.97 (0.88-1.00)	0.96 (0.92-0.99)
Q (mL/min)	Mean±	293±10	204±10	197±63
	SD	2	4	
	Median (5-95)	297 (149-528)	208 (87-374)	207 (78-275)

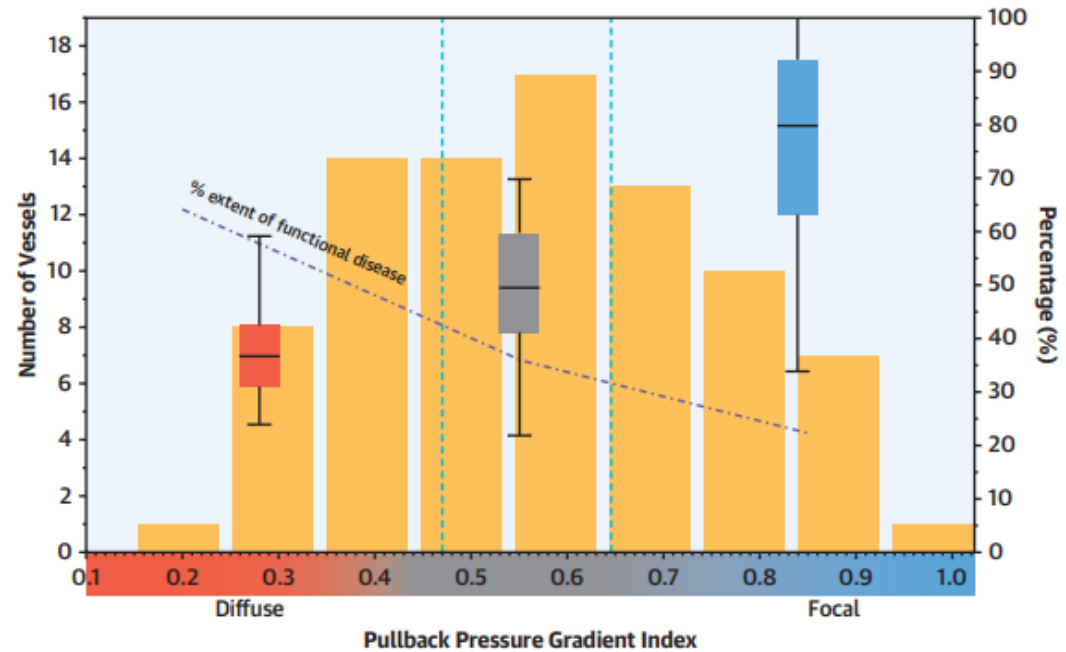
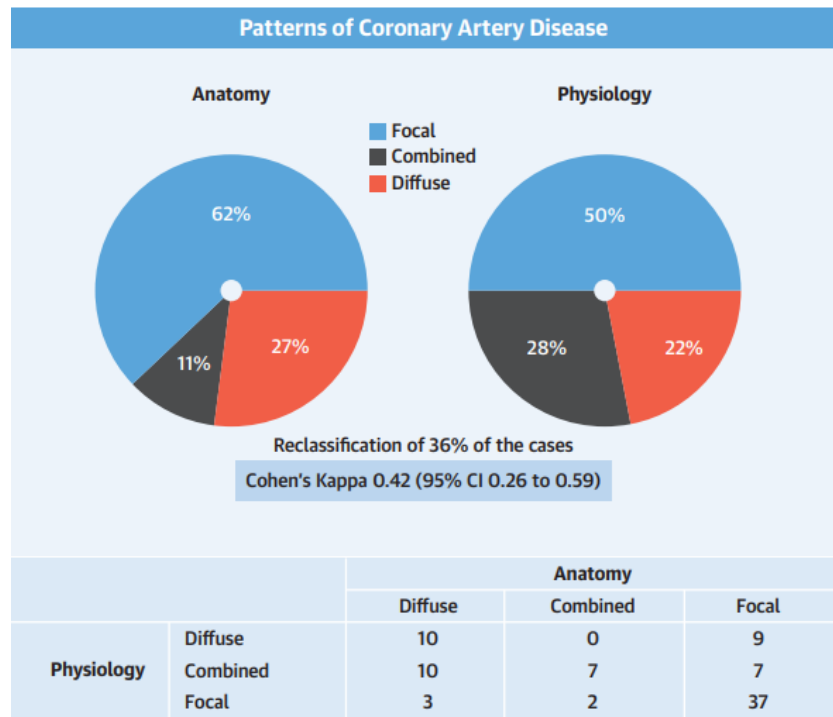


Causes of sub-optimal FFR post-PCI



Collison et al, Eur Heart J, 2019

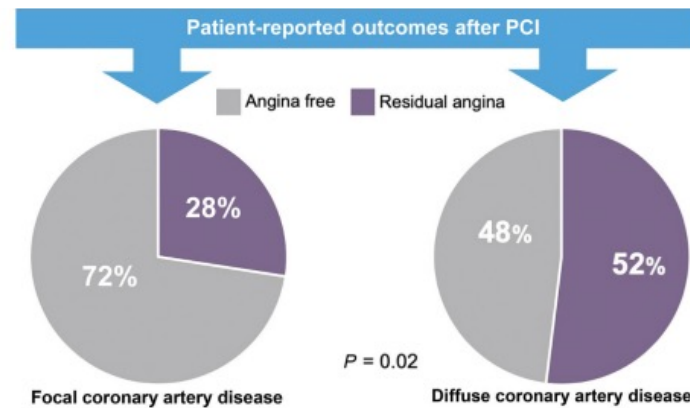
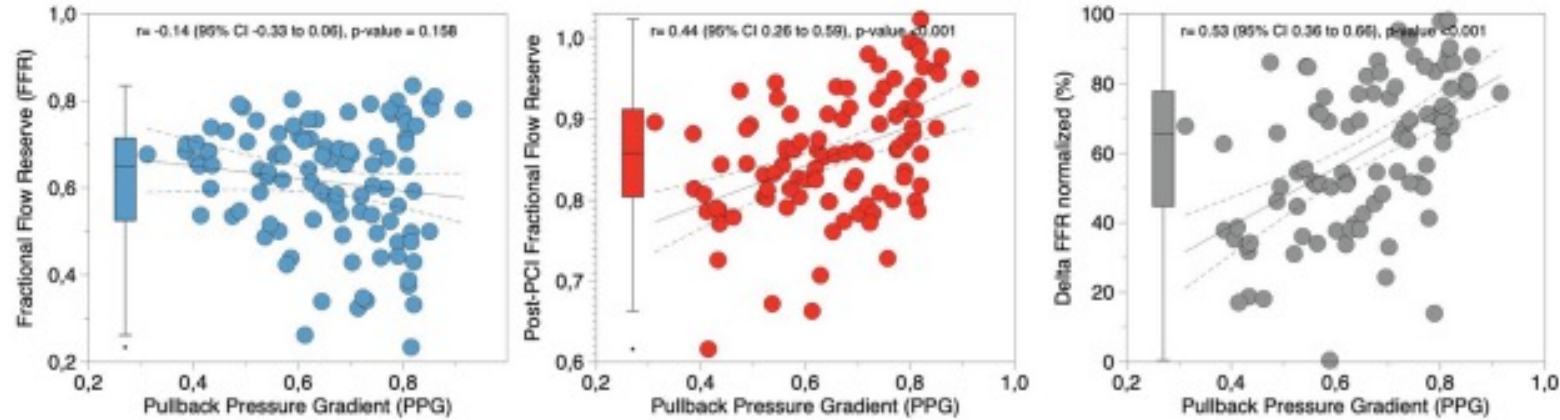
Impact of atherosclerosis distribution on FFR pre ... and post-PCI=> PPG index(1)



Pullback Pressure Gradient index as a tool to assess distribution of lesion

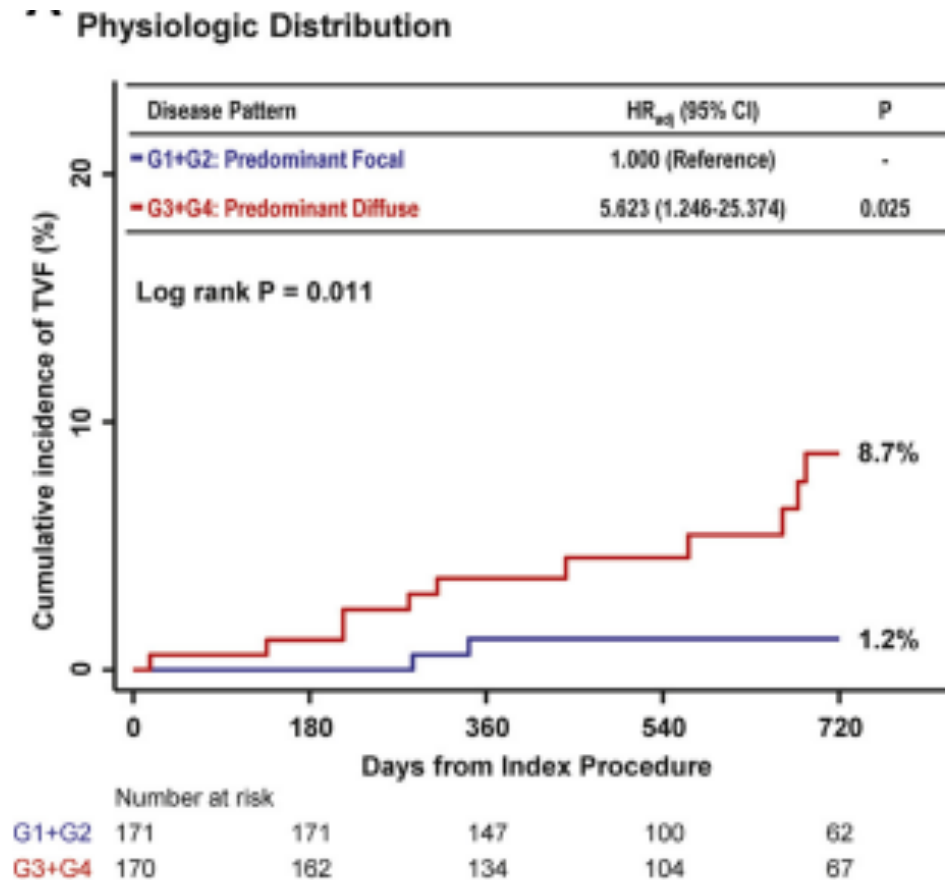
Impact of atherosclerosis distribution on FFR pre ... and post-PCI(2)

FIGURE 2 Distribution of the PPG and its Correlation With Pre-PCI FFR, Post-PCI FFR, and Delta FFR



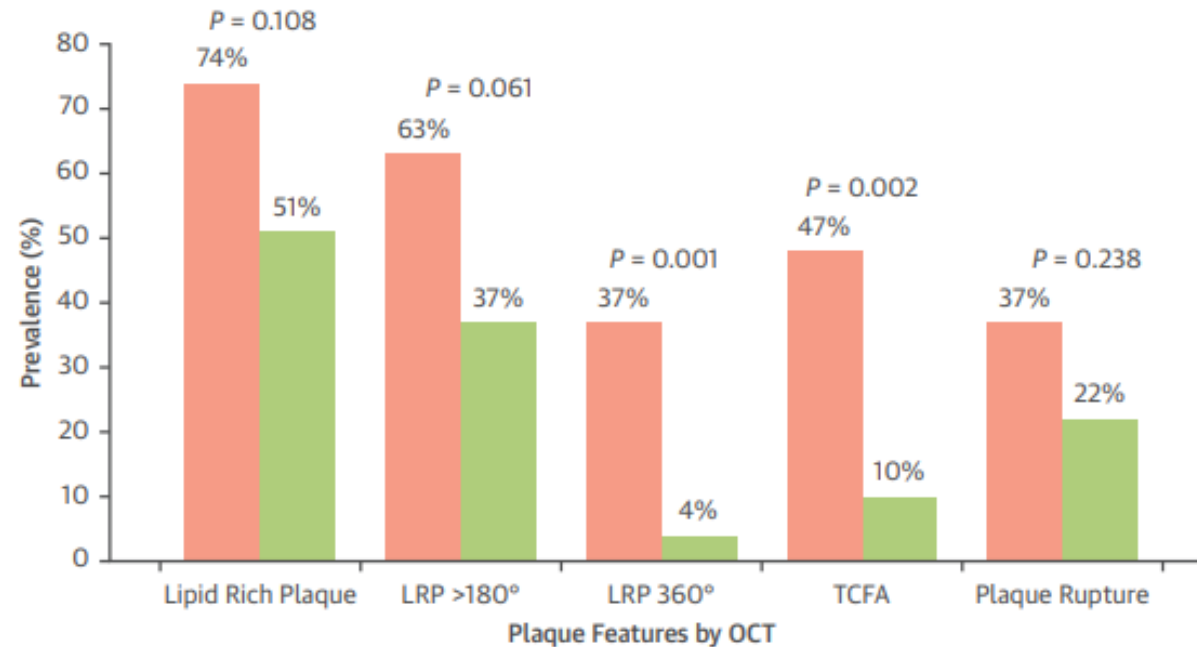
Collet C, et al JACC 2019

Impact of atherosclerosis distribution on FFR pre ... and post-PCI(3)



Doosup shin et al JACC CVI 2021

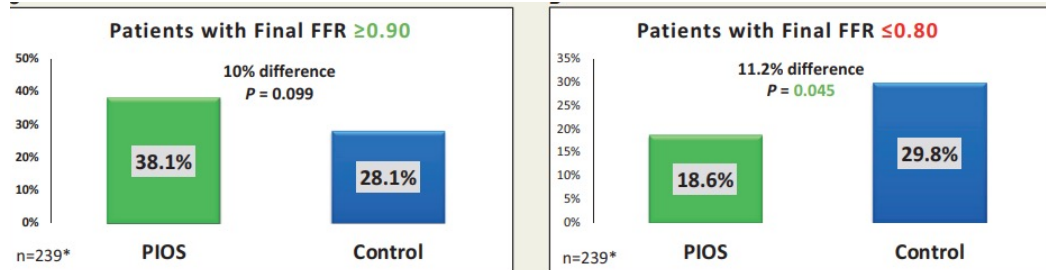
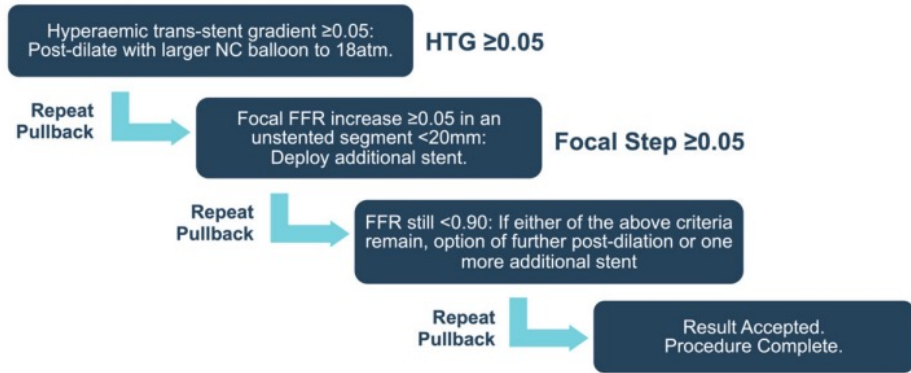
Diffuse vs Focal : atherosclerosis phenotypes



Koshiro Sakai et al JACC 2023

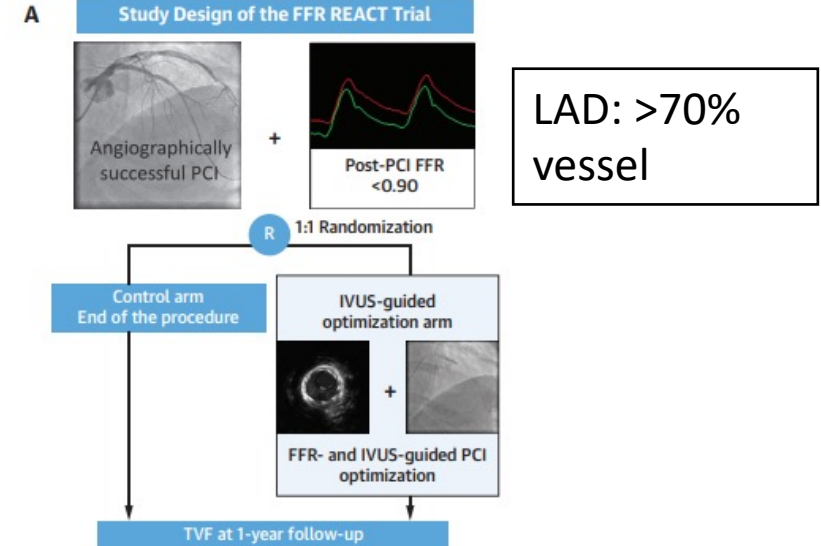
Management of sub-optimal FFR post-PCI

Physiology-guided Incremental Optimization Strategy

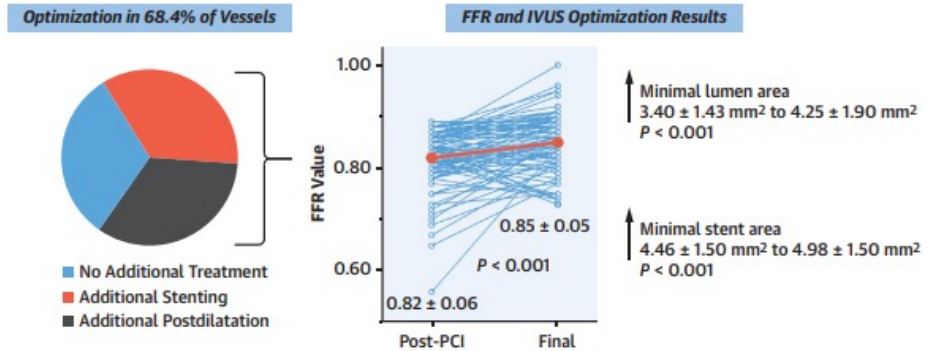


Collison et al, Eur Heart J, 2019
TARGET-FFR trial

FFR-Guided PCI Optimization Directed by High-Definition IVUS Versus Standard of Care: The FFR REACT Trial (N = 291)

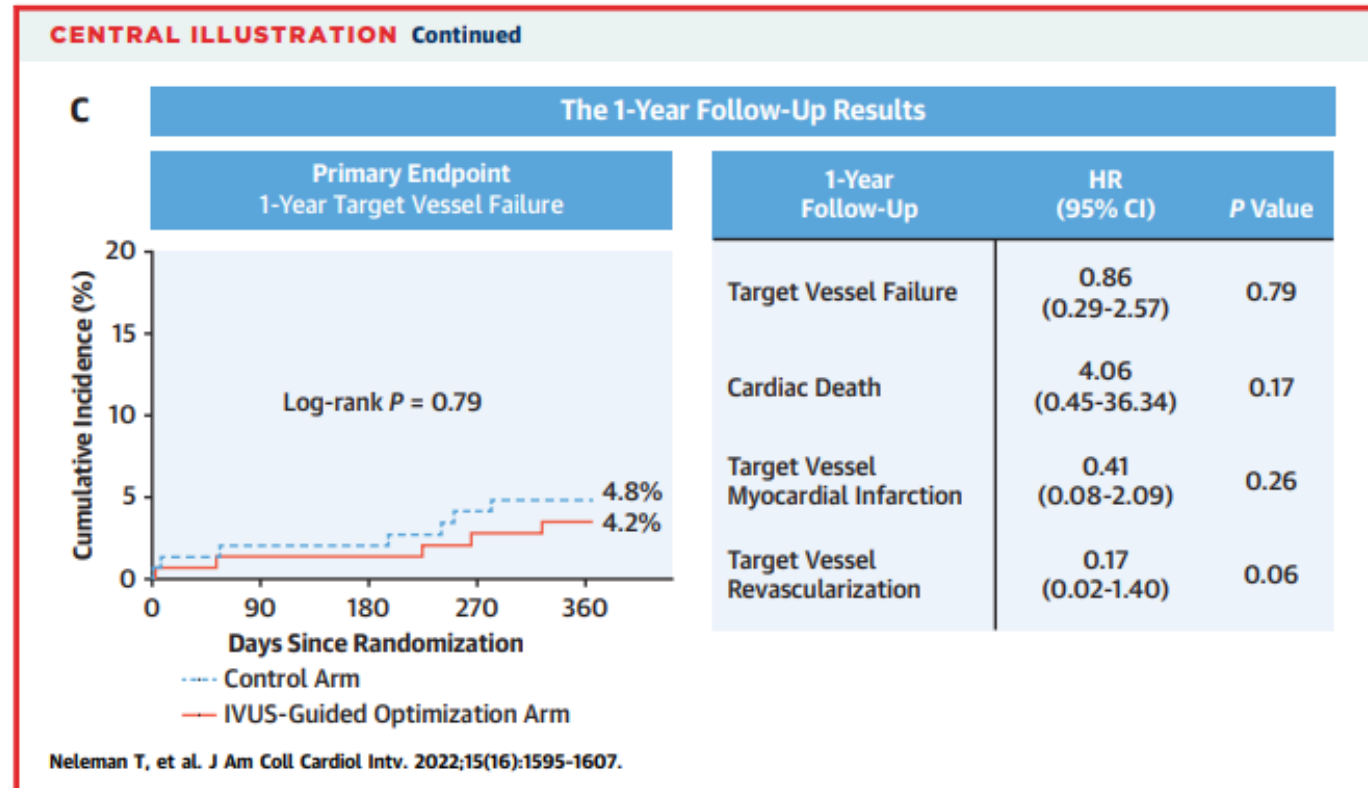


Results of Additional Treatment in the IVUS-Guided Optimization Arm



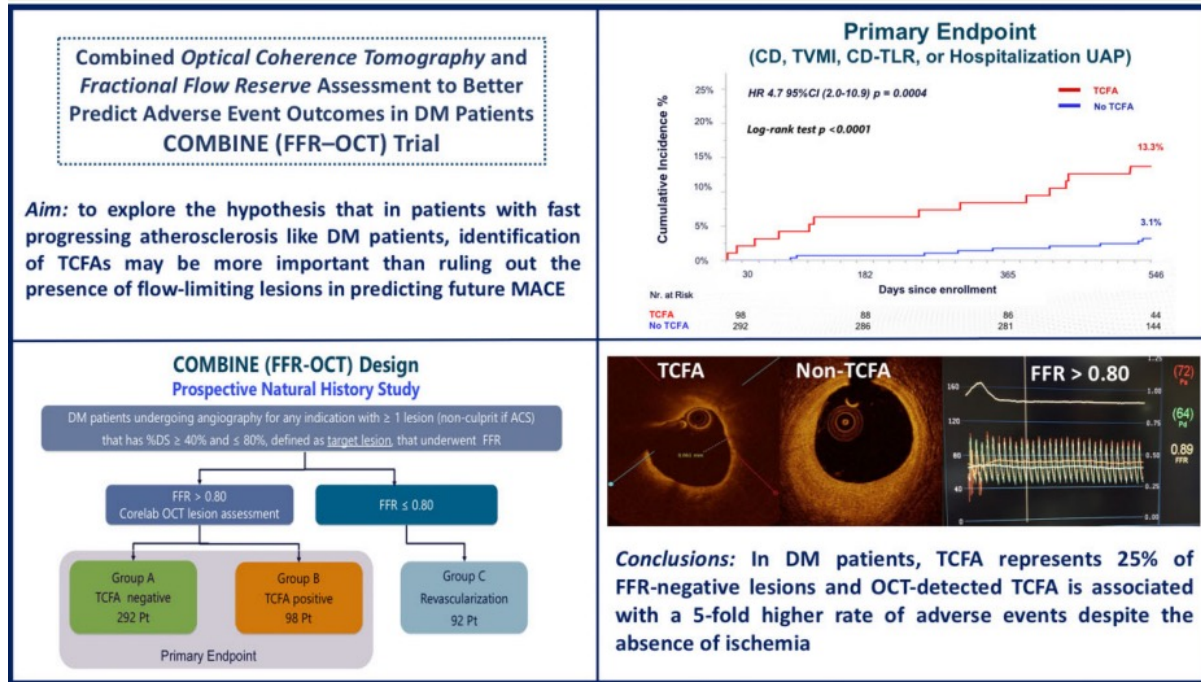
Neleman T et al J Am Cardiol Intv 2022
FFR REACT Trial

Management of sub-optimal FFR post-PCI(2)



Neleman T et al J Am Cardiol Intv 2022
FFR REACT Trial

Coronary imaging improves physiology outcomes and may guide FFR- PCI.



Trial Designs

Preventive PCI or medical therapy alone for vulnerable atherosclerotic coronary plaque
Rationale and design of the randomized, controlled PREVENT trial

Jung-Min Ahn MD^a #, Do-Yoon Kang MD^a #, Pil Hyung Lee MD^a, Young-Keun Ahn MD^b,

Conclusion

Inoptimal post-PCI FFR is frequent (2/3)



As pre-PCI, post PCI is associated with adverse outcomes with a poor to predictive effect on TVF

FFR post-PCI is a surrogate criteria which can be explained by:

- Angiographic mis-identification
- Inoptimal stenting



PPG index
Post-dilation
Additional stenting

Intra-vascular imaging improves FFR post-PCI



Intra-vascular imaging guided improves clinical outcomes