



# HOT TOPICS IN CARDIOLOGIA 2023

13 e 14 Novembre 2023

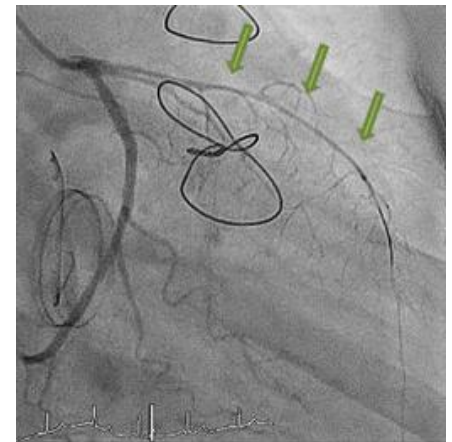
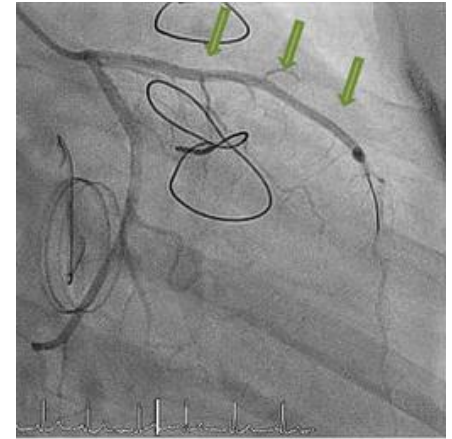
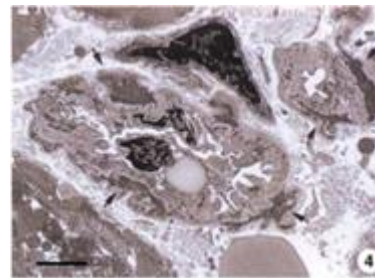
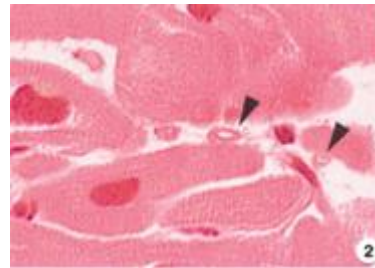
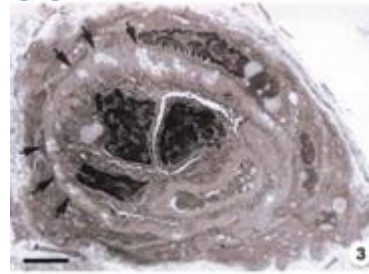
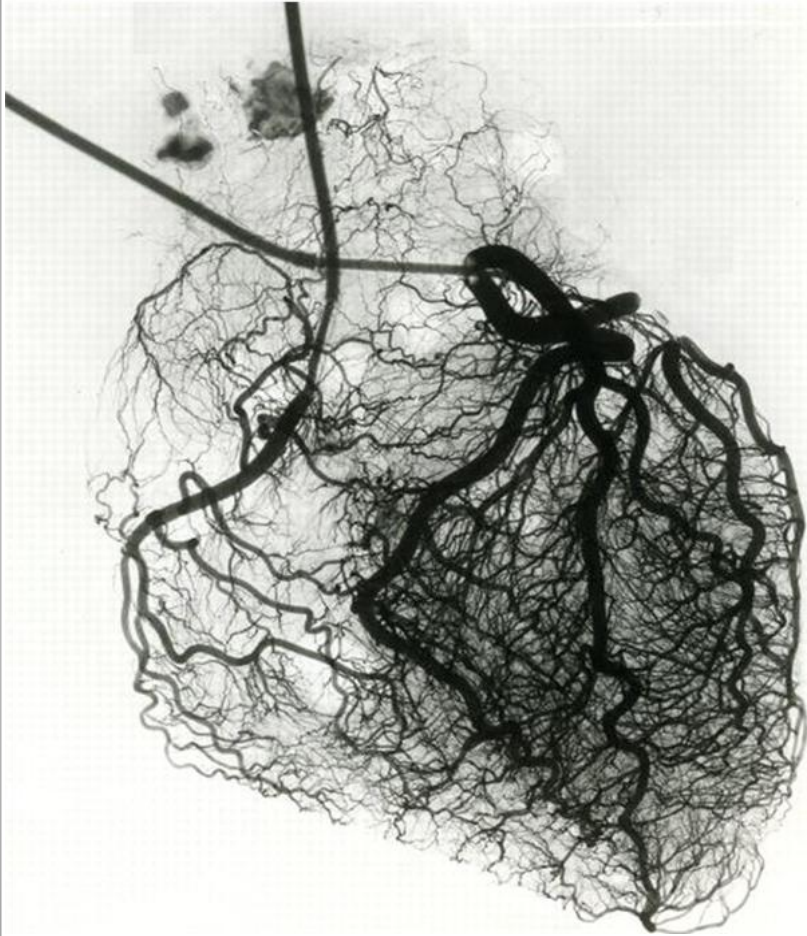
Villa Doria D'Angri - Via F. Petrarca 80,  
Napoli

**La diagnosi invasiva di  
malattia microvascolare vs malattia  
epicardica: FFR, iFR-RFR e iMR**

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CD SICI-GISE

# *Macro and Mircovascular Heart Disease*



# *Ischemic Heart Disease*

*>50% stenosis  
in any major epicardial vessel*

*<50% stenosis  
in any major epicardial vessel*

*Chronic  
coronary syndrome*

**Obstructive CAD**

**INOCA**

*Acute  
coronary syndrome*

**STEMI NSTEMI  
UA**

**MINOCA**

**PRESENTATION**

# #Fullphysiology Approach

## Epicardial disease assessment

- NHPR ( $\leq 0.89$ )  $\rightarrow$  iFR, Pd/Pa, RFR
- cFFR ( $\leq 0.85$ )
- FFR ( $\leq 0.80$ )  $\rightarrow$  perform pullback

## Microvascular disease assessment

- IMR ( $\geq 25$ )
- CFR ( $< 2.0-2.5$ )

## Vasomotor testing

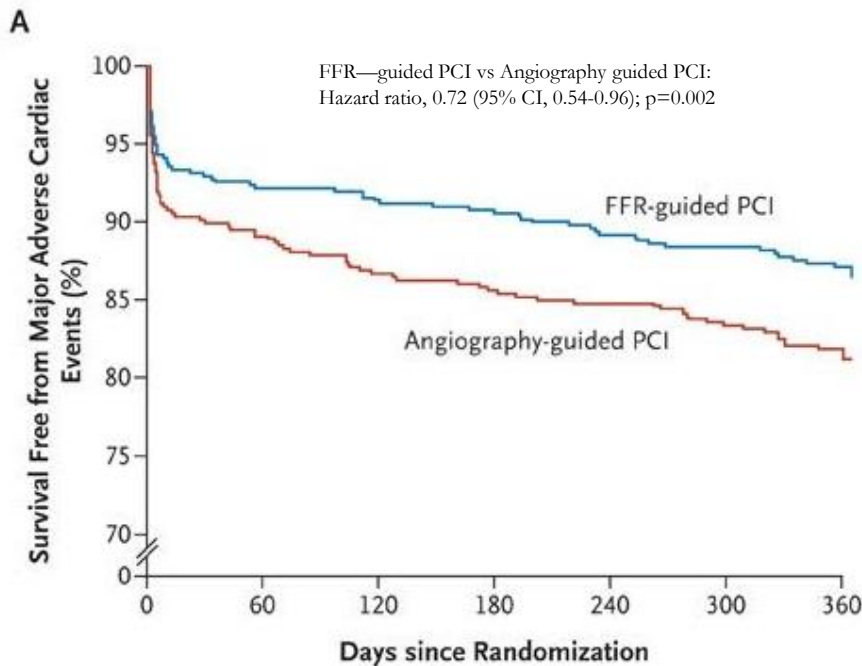
- Ach

## Post PCI Full Physiology assessment if applicable

- NHPR/cFFR/IMR/CFR/FFR  $\rightarrow$  perform pullback

# FFR and NHPR Measurements in CCS

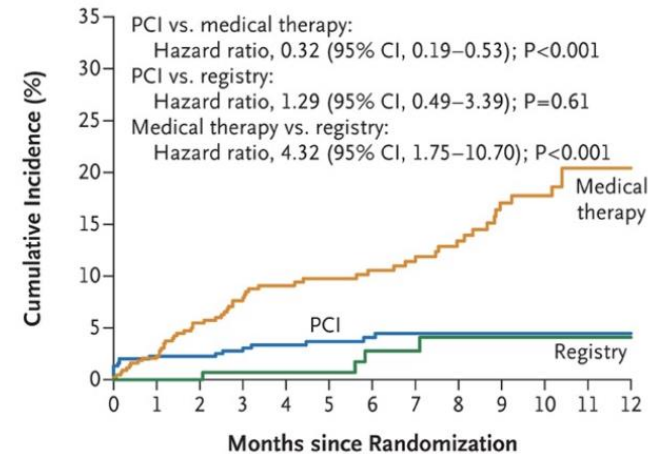
## FAME I



Pijls N et al JACC 2010

## FAME II

### A Primary End Point

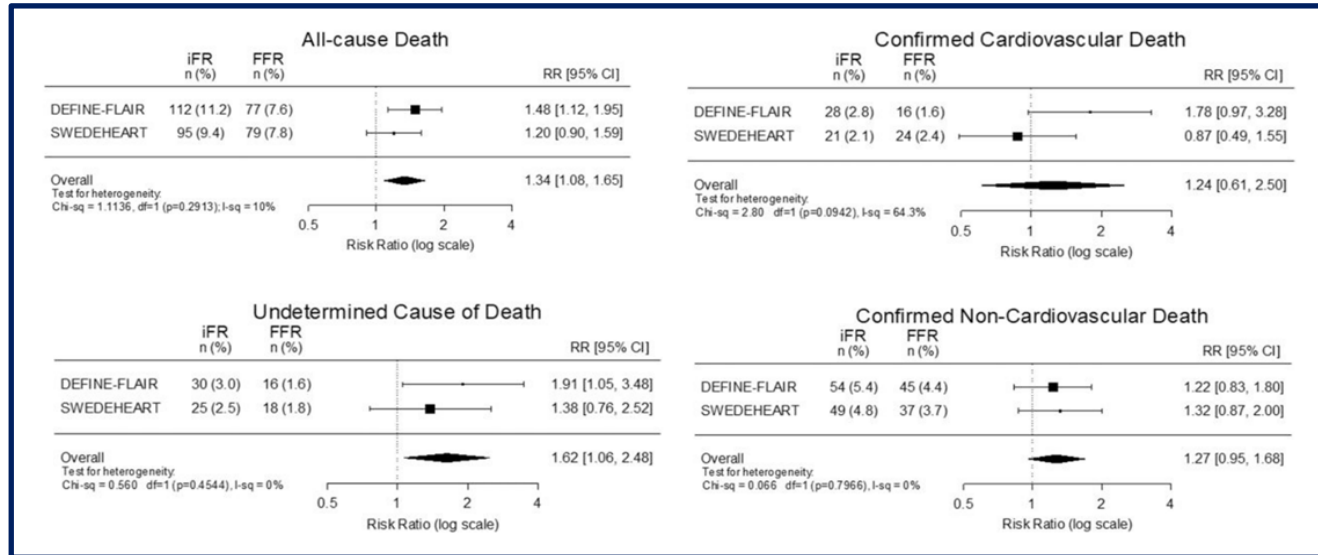


#### No. at Risk

Medical therapy	441	414	370	322	283	253	220	192	162	127	100	70	37
PCI	447	414	388	351	308	277	243	212	175	155	117	92	53
Registry	166	156	145	133	117	106	93	74	64	52	41	25	13

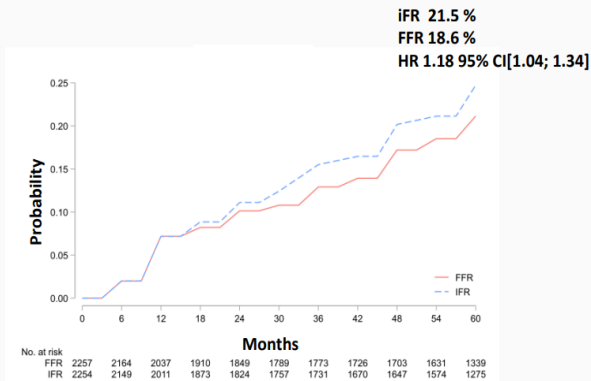
De Bruyne, Barbato E et al NEJM 2014

# FFR and NHPR Measurements in CCS



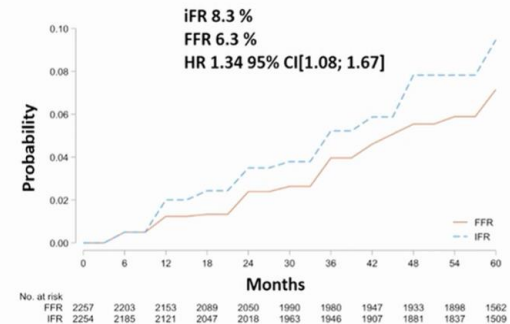
Berry et al. EHJ 2023

## MACE



Eftekhari A et al. Eur Heart J. 2023, in press

## All-cause mortality



Eftekhari A et al. f

# FFR Measurements in Non Culprit Lesions

First Author/Study	Year	Study Design	AMI Type	N (STEMI/NSTEMI)	Time From Index PCI to FFR	Findings
Ntalianis et al <sup>151</sup>	2010	Observational registry	STEMI and NSTEMI	75/26	35 ± 4 days	Mean value of FFR did not change between acute and follow-up. FFR declined from >0.80 to <0.75 at follow-up in 2 patients.
WAVE study <sup>152</sup>	2017	Observational registry	STEMI	50/0	5-8 days	The iFR and FFR values of nonculprit lesions did not change significantly between the index and staged procedure.
Choi et al <sup>153</sup>	2018	Observational registry	STEMI and NSTEMI	34/66	Not available	Changes in FFR and iFR for the nonculprit stenosis of AMI patients were not significantly different from those in stable coronary disease patients.
Van der Hoeven et al <sup>41</sup>	2019	Cohort analysis of randomized clinical trial	STEMI	73/0	1 month	FFR of nonculprit lesions decreased at 1 month follow-up, but iFR was unchanged.
DANAMI-3-PRIMULTI <sup>43</sup>	2015	Randomized	STEMI	314 <sup>a</sup> /0	2 days (IQR: 2-4 days)	FFR-guided complete revascularization significantly reduces repeat revascularization.
COMPARE-ACUTE <sup>44</sup>	2017	Randomized	STEMI	295 <sup>b</sup> /0	83% during index procedure, 17% during same admission.	FFR-guided complete revascularization significantly reduces repeat revascularization.
FLOWER-MI <sup>46</sup>	2021	Randomized	STEMI	586 <sup>b</sup> /0	2.6 ± 1.4 days	FFR-guided complete revascularization was not better than angiography-guided strategy.
FRAME-AMI <sup>48</sup>	2022	Randomized	STEMI and NSTEMI	265/297	60% at index PCI and 40% at staged PCI during same hospitalization Median length of hospital stay, 3.0 days (IQR: 2.0-4.0 days)	FFR-guided noninfarct-related artery lesions revascularization was superior to angiography-guided revascularization regarding the risk of death, myocardial infarction, or repeat revascularization.

# ACS and CCS Guidelines

## Multivessel disease in haemodynamically stable STEMI patients undergoing PPCI

Complete revascularization is recommended either during the index PCI procedure or within 45 days. <sup>508–511,531</sup>	<b>I</b>	<b>A</b>
It is recommended that PCI of the non-IRA is based on angiographic severity. <sup>511,524</sup>	<b>I</b>	<b>B</b>
Invasive epicardial functional assessment of non-culprit segments of the IRA is not recommended during the index procedure.	<b>III</b>	<b>C</b>

## Multivessel disease in haemodynamically stable NSTEMI-ACS patients undergoing PCI

In patients presenting with NSTEMI-ACS and MVD, complete revascularization should be considered, preferably during the index procedure. <sup>513,514</sup>	<b>IIa</b>	<b>C</b>
Functional invasive evaluation of non-IRA severity during the index procedure may be considered. <sup>518,527,528,532</sup>	<b>IIb</b>	<b>B</b>

## Recommendations on functional testing and intravascular imaging for lesion assessment

Recommendations	Class <sup>a</sup>	Level <sup>b</sup>
When evidence of ischaemia is not available, FFR or iwFR are recommended to assess the haemodynamic relevance of intermediate-grade stenosis. <sup>15,17,18,39</sup>	<b>I</b>	<b>A</b>
FFR-guided PCI should be considered in patients with multivessel disease undergoing PCI. <sup>29,31</sup>	<b>IIa</b>	<b>B</b>
IVUS should be considered to assess the severity of unprotected left main lesions. <sup>35–37</sup>	<b>IIa</b>	<b>B</b>

© ESC 2018

F.-J. Neumann, M. Sousa-Uva, A. Ahlsson, *et al.* 2018 ESC/EACTS Guidelines on myocardial revascularization. *Eur Heart J* (2019) 40, 87–165

R. A. Byrne, X. Rossello, J.J. Coughlan, E. Barbato, C. Berry, *et al.* 2023 ESC Guidelines for the management of acute coronary syndromes. *Eur Heart J* 2023 00, 1–107



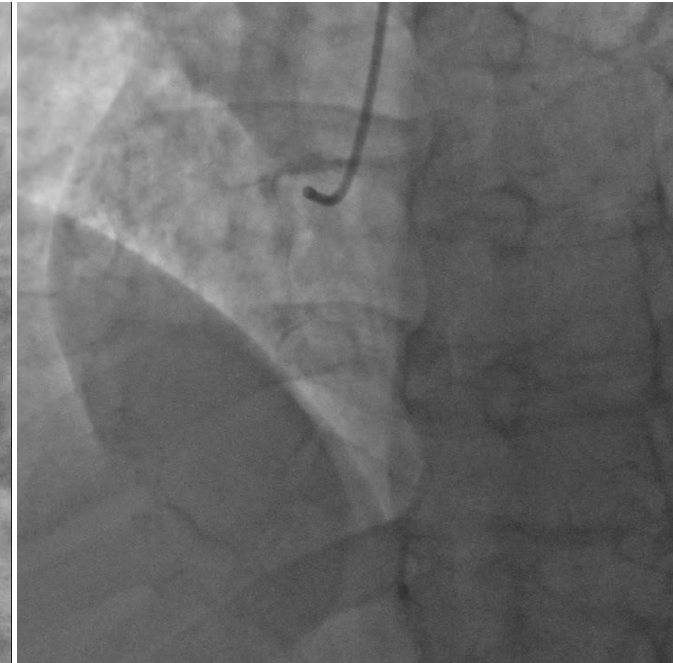
# Acute Coronary setting



## STEMI with MVD

Index iFR: 0.96  
Staged iFR: 0.97

Index FFR: 0.92  
Staged FFR: 0.91



Index iFR: 0.92  
Staged iFR: 0.93

Index FFR: 0.83  
Staged FFR: 0.83

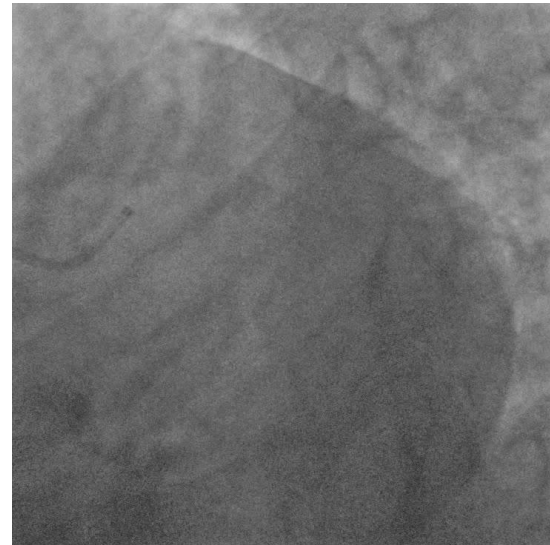
## Clinical Case

- 78 y/o male
- Hypertensive heart disease
- Exertional dyspnoea/ angina
- hsTnI negative
- FFR: IVA 0.85; Cx 0.87; CDx 0.95

**Table 1** Classification of coronary microvascular dysfunction

**Coronary  
microvascular  
dysfunction (CMD)**

Type 1	Primary CMD in the absence of underlying myocardial disease or obstructive epicardial CAD
Type 2	CMD in the presence of myocardial disease (eg, hypertrophic cardiomyopathy, <u>hypertensive heart disease</u> )
Type 3	CMD in the presence of obstructive CAD (either stable CAD or acute coronary syndrome)
Type 4	Iatrogenic CMD secondary to myocardial revascularisation
Type 5	CMD following cardiac transplantation



Herrmann J, Kaski JC, Lerman A. Coronary microvascular dysfunction in the clinical setting: from mystery to reality. Eur Heart J 2012;33:2771–82

# #Fullphysiology Approach

## Epicardial disease assessment

- NHPR ( $\leq 0.89$ )  $\rightarrow$  iFR, Pd/Pa, RFR
- cFFR ( $\leq 0.85$ )
- FFR ( $\leq 0.80$ )  $\rightarrow$  perform pullback

## Microvascular disease assessment

- IMR ( $\geq 25$ )
- CFR ( $< 2.0$ )

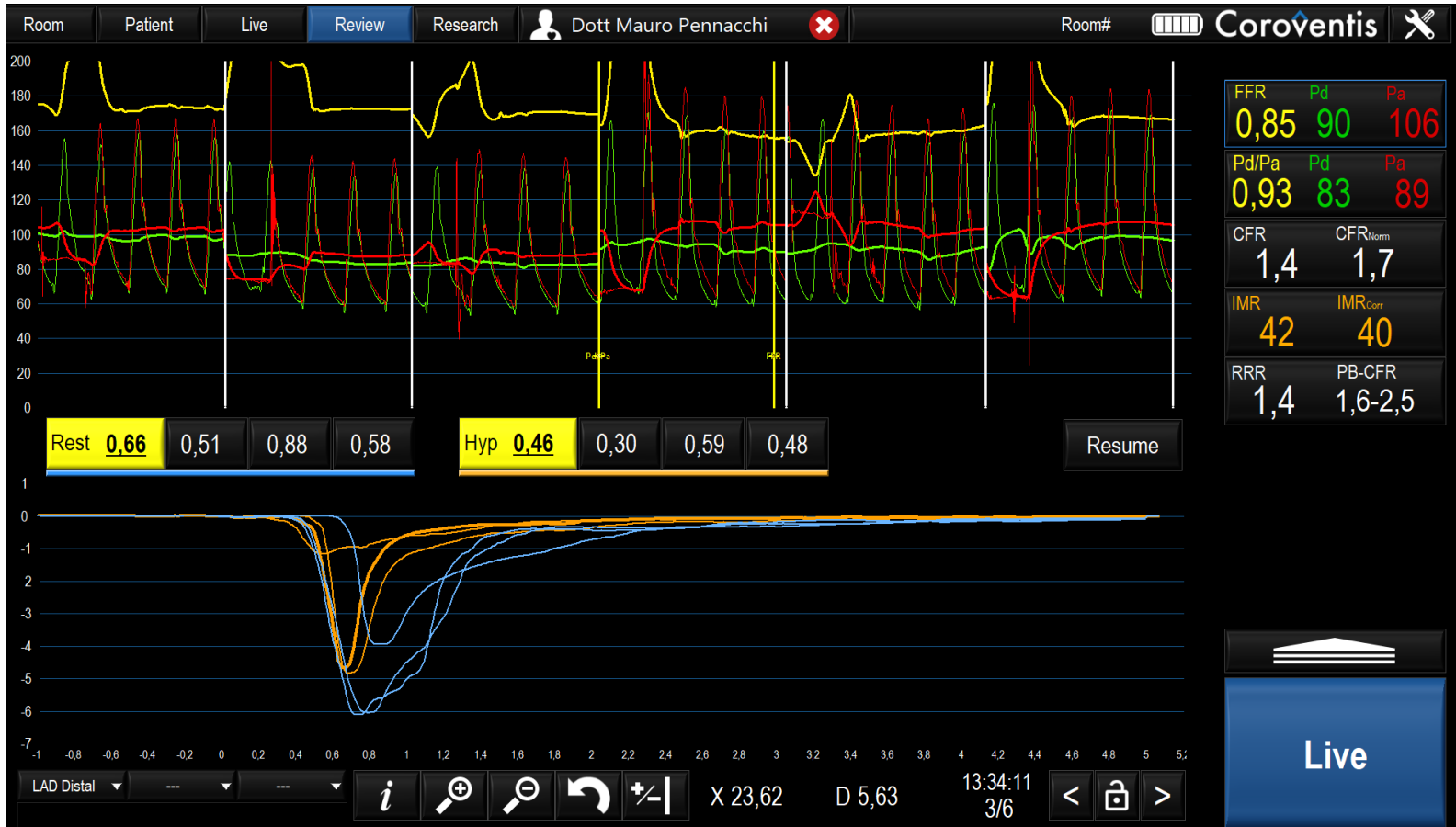
## Vasomotor testing

- Ach

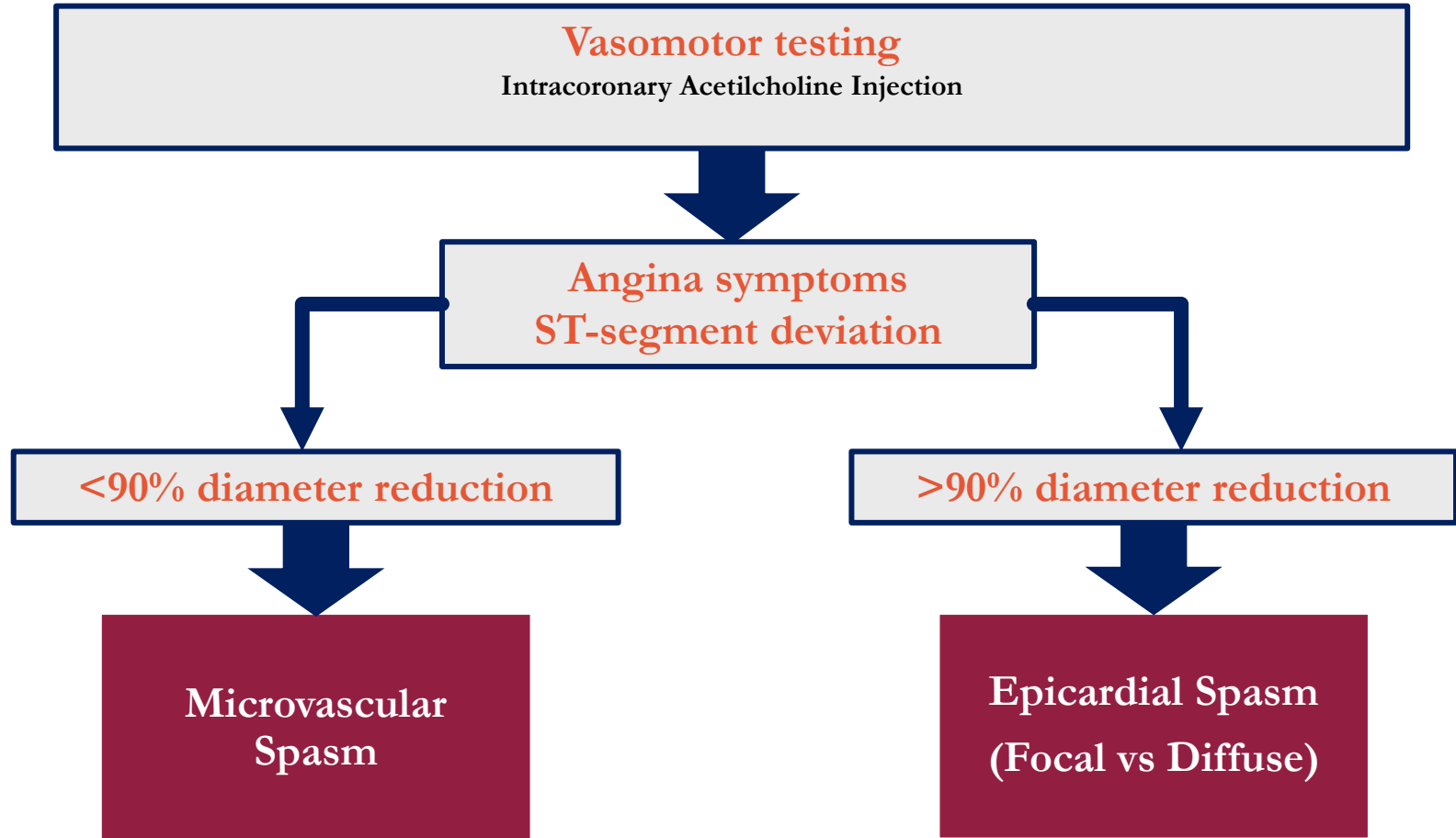
## Post PCI Full Physiology assessment if applicable

- NHPR/cFFR/IMR/CFR/FFR  $\rightarrow$  perform pullback

# Clinical Case



# #Fullphysiology Approach



# Ischemic Heart Disease - INOCA

## No Obstructive Epicardial Arteries

FFR >0.80 or NHPR >0.89

FFR >0.80 or NHPR >0.89

IMR ( $\geq 25$ )  
CFR ( $< 2.0$ )

Microvascular  
Angina (MVA)

MVA and VSA

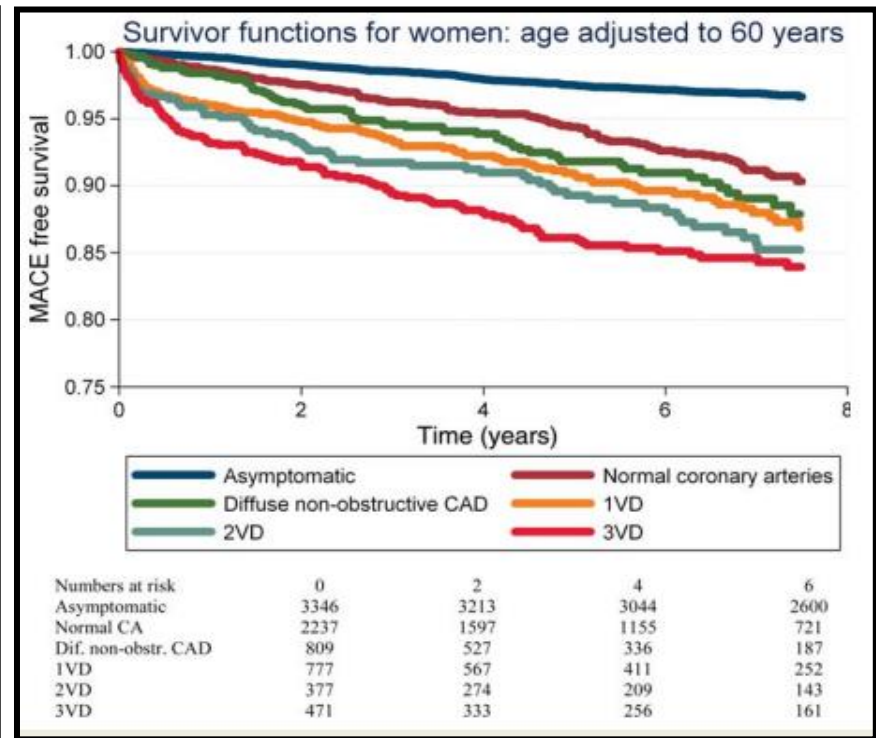
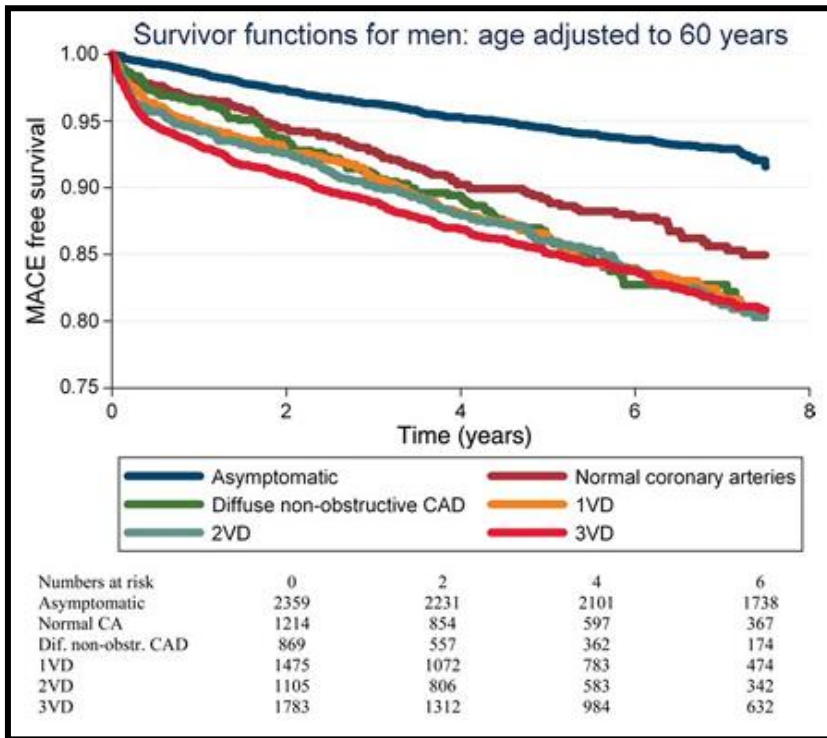
IMR ( $< 25$ )  
CFR ( $\geq 2.0$ )

Vasospastic  
Angina (VSA)

Non-Cardiac

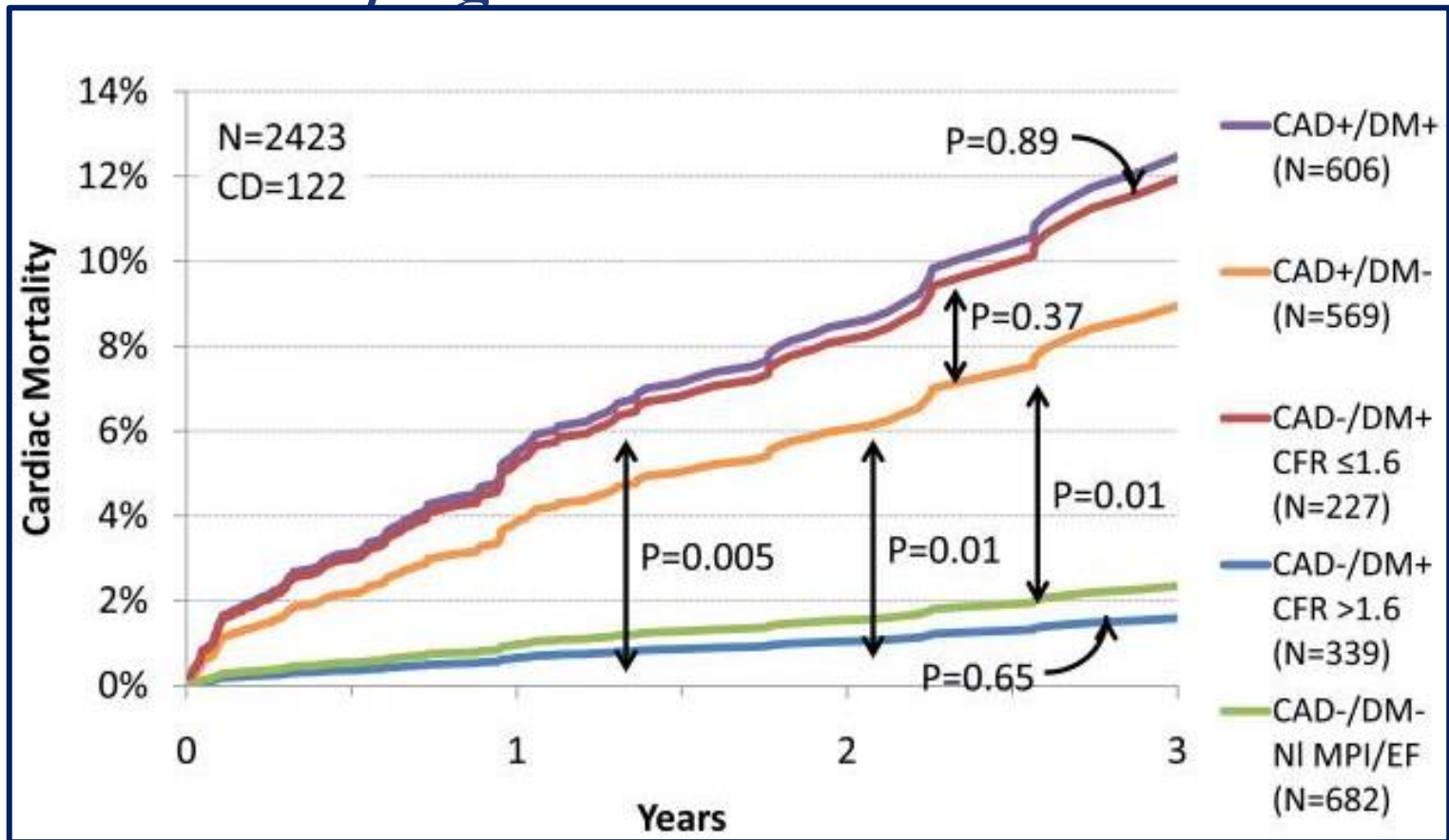
PRESENTATION

# *INOCA: What is the prognosis?*



Jespersen L, Hvelplund A, Abildstrom SZ, et al. Stable angina pectoris with no obstructive coronary artery disease is associated with increased risks of major adverse cardiovascular events. *Eur Heart J.* 2012;33:734–744

## *INOCA: What is the prognosis?*



Venkatesh L. Murthy, Masanao Naya, Courtney R. Foster et al. Association Between Coronary Vascular Dysfunction and Cardiac Mortality in Patients with and without Diabetes Mellitus. *Circulation*. 2012 October 9; 126(15): 1858–1868



# BHF CorMicA trial (Coronary Microvascula Angina)



**Angiogram**  
No obstructive CAD  
DS<50%, FFR >0.80

**CFR/IMR/Ach**  
Randomize 1:1  
Stratified Therapy n=75  
Standard Care n=76

## Vasospastic Angina

- Smoking cessation
- Calcium channel blocker
- Long-acting Nitrate
- Lifestyle changes

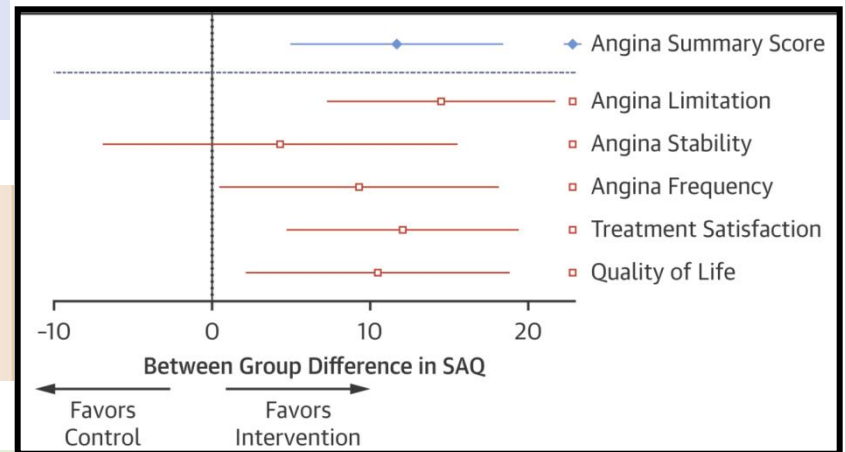
## Microvascular Angina

- Betablocker (e.g. Nebivolol)
- Lifestyle changes & weight loss (Cardiac rehab, smoking cessation)
- Consider ACEi & Statin

## Non-Cardiac Chest Pain

- Stop antianginal Rx
- Discharge from cardiology
- Consider non-cardiac investigation

## Primary endpoint: SAQ at 6 months



For the SAQSS the stratified therapy group resulted in an improvement of 11.68 U (95%[CI]: 4.99 to 18.37; p=0.001)

# CCS and VA/SCD Guidelines

## Investigations in patients with suspected coronary microvascular angina

Recommendations	Class <sup>a</sup>	Level <sup>b</sup>
Guidewire-based CFR and/or microcirculatory resistance measurements should be considered in patients with persistent symptoms, but coronary arteries that are either angiographically normal or have moderate stenoses with preserved iwFR/FFR. <sup>412,413</sup>	IIa	B
Intracoronary acetylcholine with ECG monitoring may be considered during angiography, if coronary arteries are either angiographically normal or have moderate stenoses with preserved iwFR/FFR, to assess microvascular vasospasm. <sup>412,438–440</sup>	IIb	B
Transthoracic Doppler of the LAD, CMR, and PET may be considered for non-invasive assessment of CFR. <sup>430–432,441</sup>	IIb	B

## Recommendation Table 5 — Recommendations for evaluation of sudden cardiac arrest survivors

Recommendations	Class <sup>a</sup>	Level <sup>b</sup>
<b>Diagnostic evaluation</b>		
In SCA survivors, ergonovine, acetylcholine, or hyperventilation testing may be considered for the diagnosis of coronary vasospasm. <sup>240,261</sup>	IIb	B

Knuuti J, Wijns W, Saraste A, Capodanno D, Barbato E, Funck-Brentano C, *et al.* 2019 ESC Guidelines for the diagnosis and management of chronic coronary syndromes. *Eur Heart J* 2020;**41**:407–477

K. Zeppenfeld, J. Tfelt-Hansen, M. de Riva, *et al.* 2022 ESC Guidelines for the management of patients with ventricular arrhythmias and the prevention of sudden cardiac death. *European Heart Journal* (2022) 00, 1–130

# *Conclusion*

- A full physiology approach should be implemented in order to identify the underlying etiology
- Identifying the precise underlying etiology can guide therapy and in future will improve patients' quality of life and prognosis