

Genova, 14 aprile 2023



CUORE
E NON SOLO
INTERVENTIONAL
CARDIOLOGY

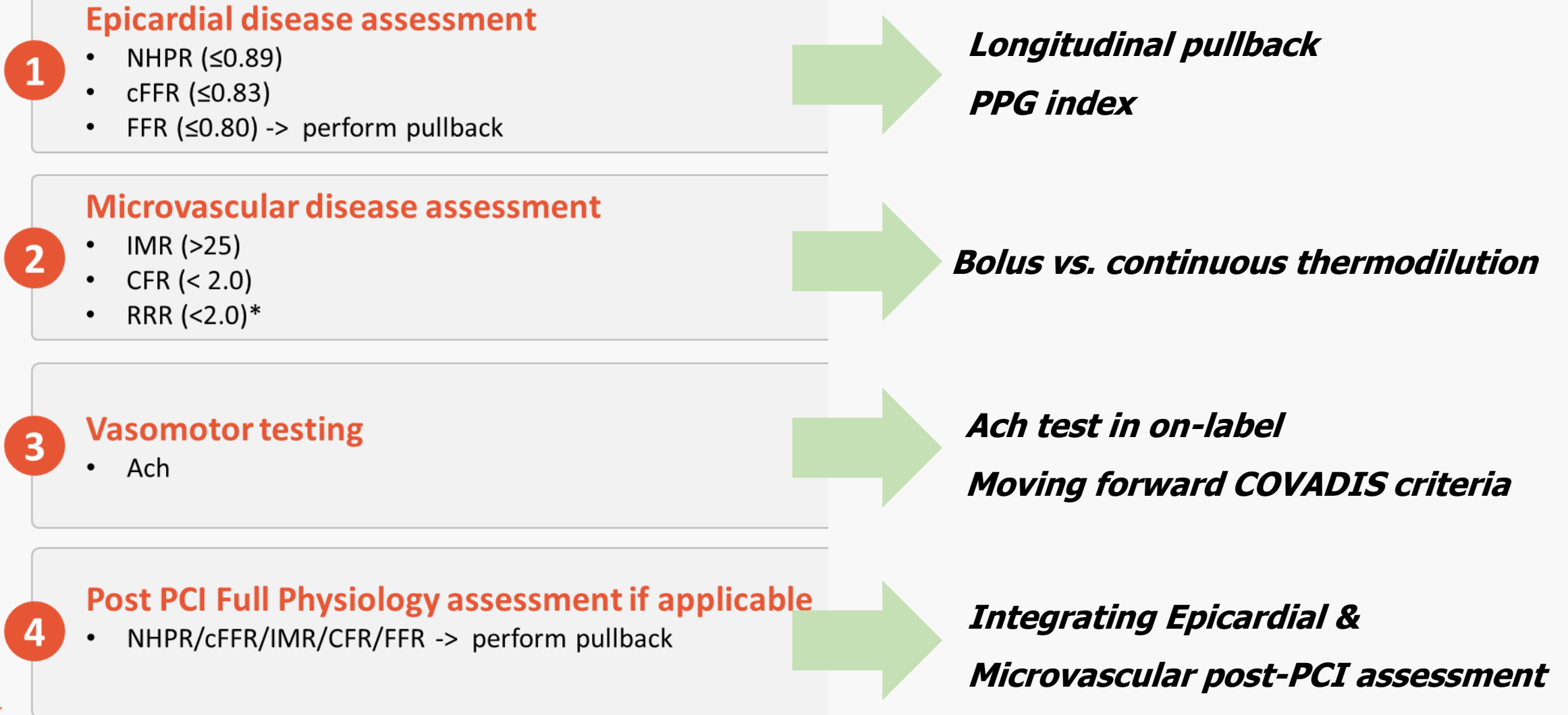
14/15.04.23
GENOVA

***Valutazione funzionale della
malattia epicardica e del
microcircolo: quali novità?***

Gianluca Campo

AOU Ferrara

#FullPhysiology: coming soon



#FullPhysiology: coming soon

1 Epicardial disease assessment

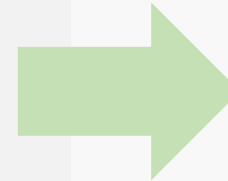
- NHPR (≤ 0.89)
- cFFR (≤ 0.83)
- FFR (≤ 0.80) -> perform pullback



***Longitudinal pullback
PPG index***

2 Microvascular disease assessment

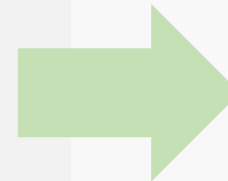
- IMR (> 25)
- CFR (< 2.0)
- RRR (< 2.0)*



Bolus vs. continuous thermodilution

3 Vasomotor testing

- Ach



***Ach test in on-label
Moving forward COVADIS criteria***

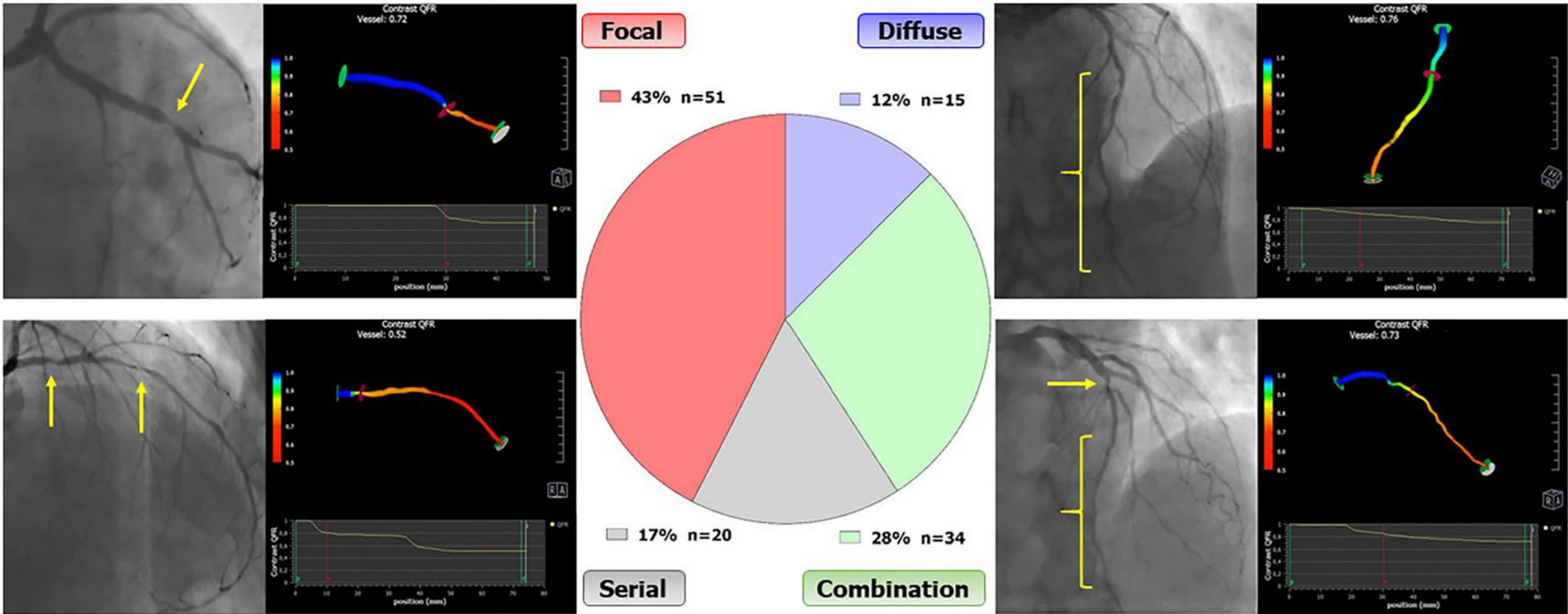
4 Post PCI Full Physiology assessment if applicable

- NHPR/cFFR/IMR/CFR/FFR -> perform pullback

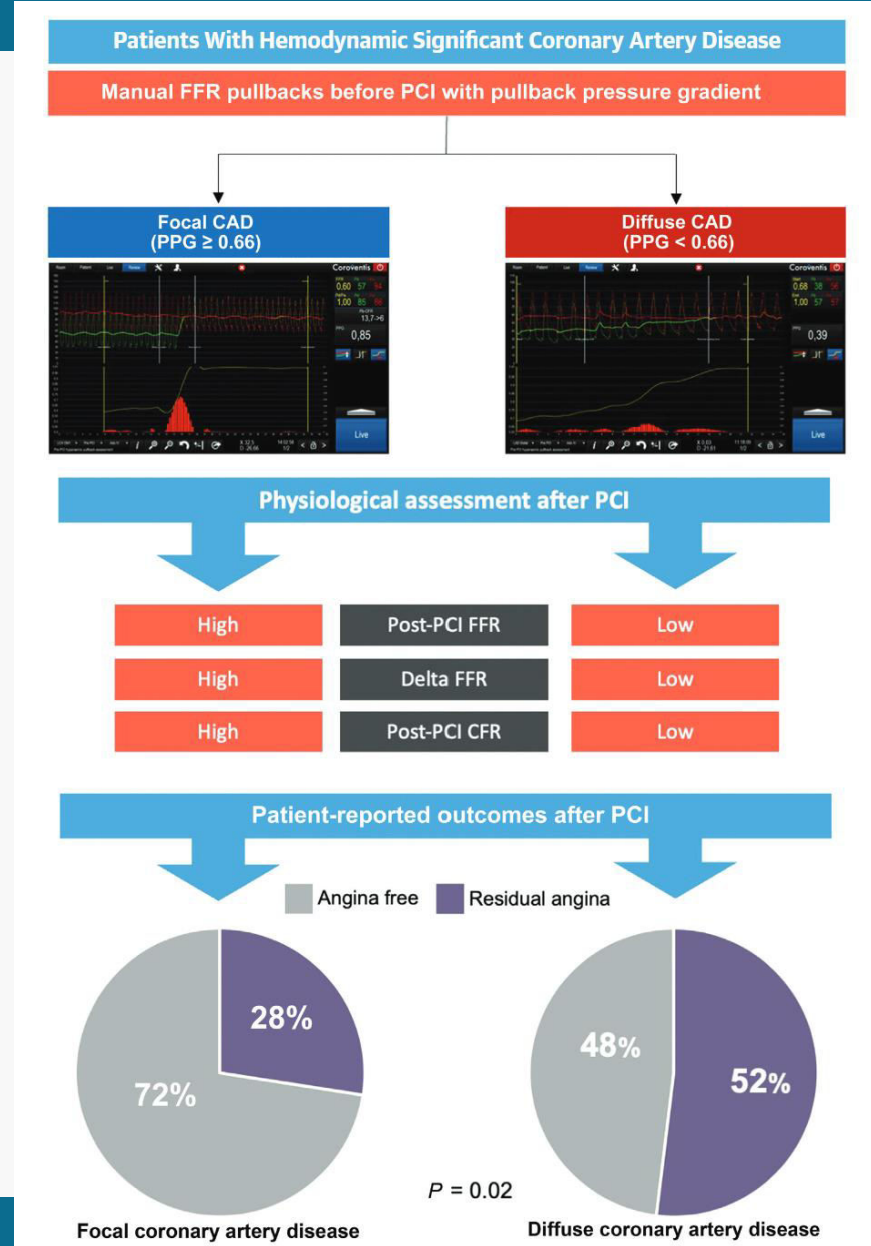
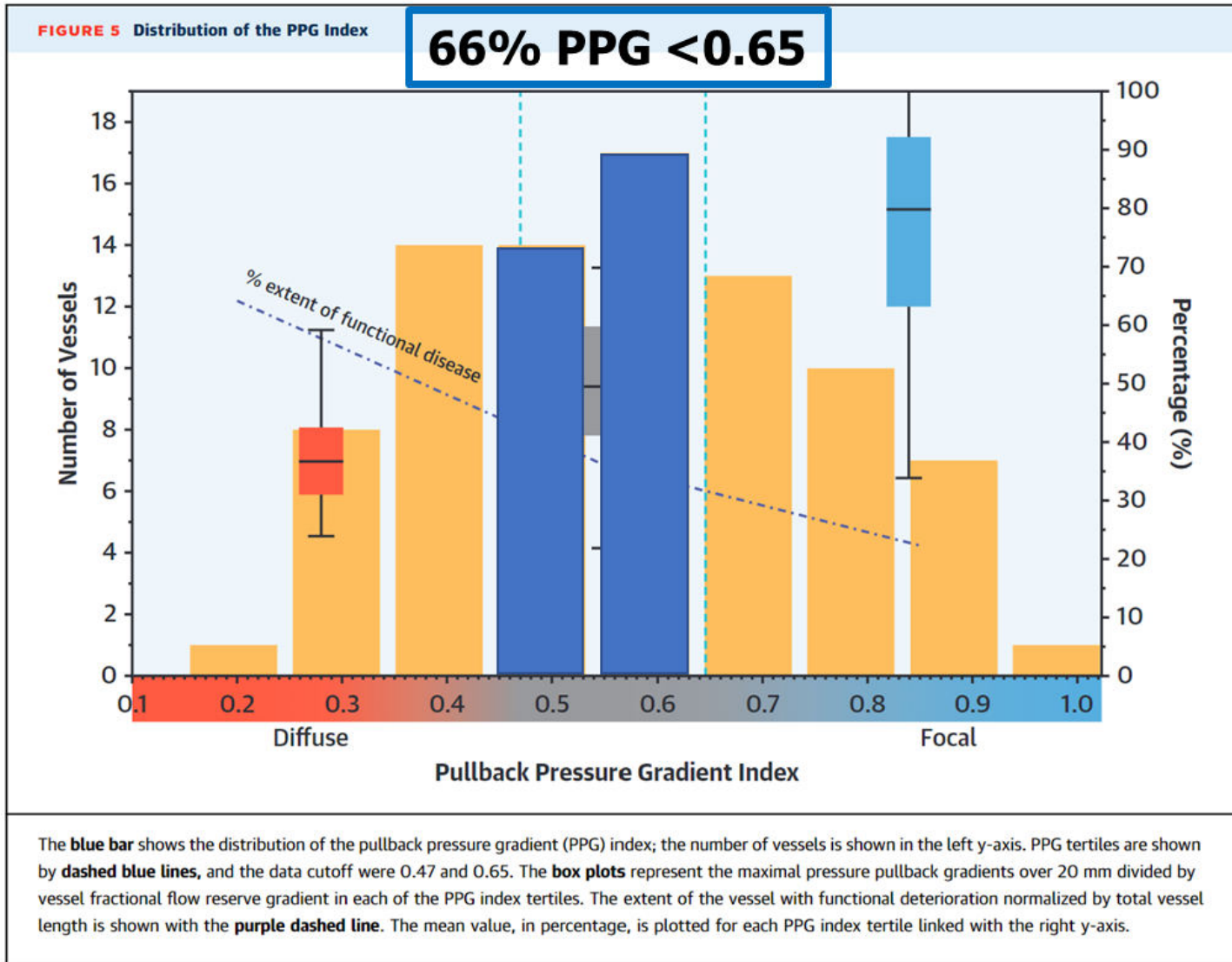


***Integrating Epicardial &
Microvascular post-PCI assessment***

Why longitudinal pullback



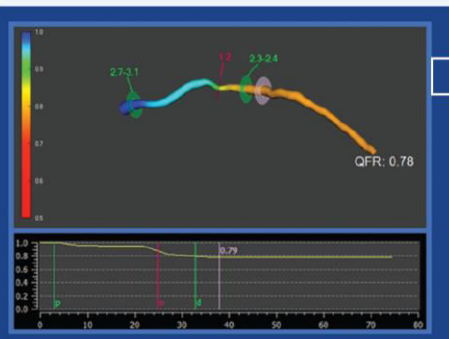
Longitudinal pullback vs. PPG





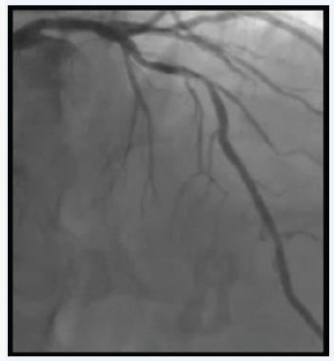
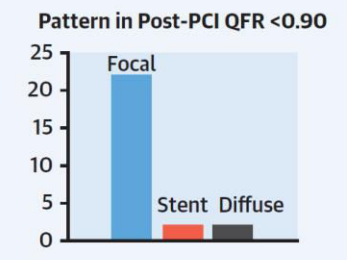
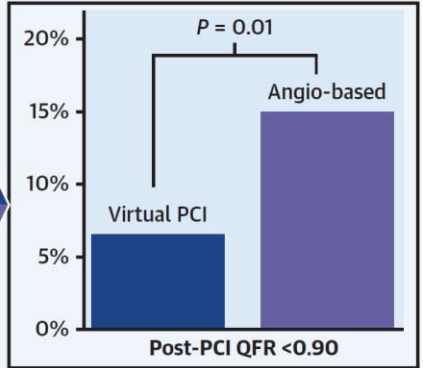
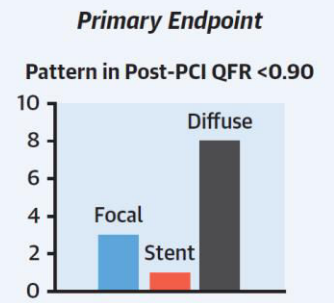
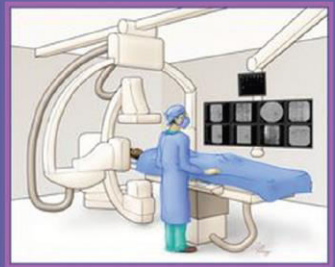
AQVA

→ Randomization → Procedure



Quantitative flow ratio-BASED VIRTUAL PCI

ANGIOGRAPHY-BASED PCI



Two angiographic projections >25° apart



LEAVE FOCAL LESION

Vessel QFR 0.55

OPTION 1

ΔQFR 0.16 ΔQFR 0.24 ΔQFR 0.05

RESIDUAL QFR 0.76

OPTION 2

ΔQFR 0.16 ΔQFR 0.24 ΔQFR 0.05

RESIDUAL QFR 1.00

OPTION 3

ΔQFR 0.16 ΔQFR 0.24 ΔQFR 0.05

RESIDUAL QFR 0.95

LEAVE DIFFUSE DISEASE

Vessel QFR 0.64

OPTION 1

ΔQFR 0.08 ΔQFR 0.28 0.64

RESIDUAL QFR 0.72

OPTION 2

ΔQFR 0.08 ΔQFR 0.28 0.64

RESIDUAL QFR 1.00

OPTION 3

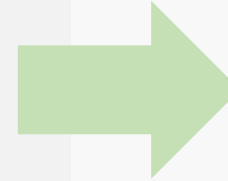
ΔQFR 0.08 ΔQFR 0.28 0.64

RESIDUAL QFR 0.92

#FullPhysiology: coming soon

1 Epicardial disease assessment

- NHPR (≤ 0.89)
- cFFR (≤ 0.83)
- FFR (≤ 0.80) -> perform pullback

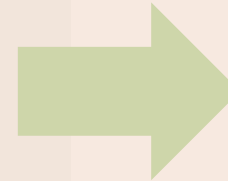


Longitudinal pullback

PPG index

2 Microvascular disease assessment

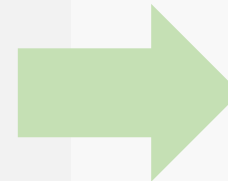
- IMR (> 25)
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Bolus vs. continuous thermodilution

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Ach test in on-label

Moving forward COVADIS criteria

4 Post PCI Full Physiology assessment if applicable

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Integrating Epicardial &

Microvascular post-PCI assessment

Microvascular Dysfunction

CFR < 2

IMR > 25

"Structural Microvascular Dysfunction"



CFR < 2

IMR < 25

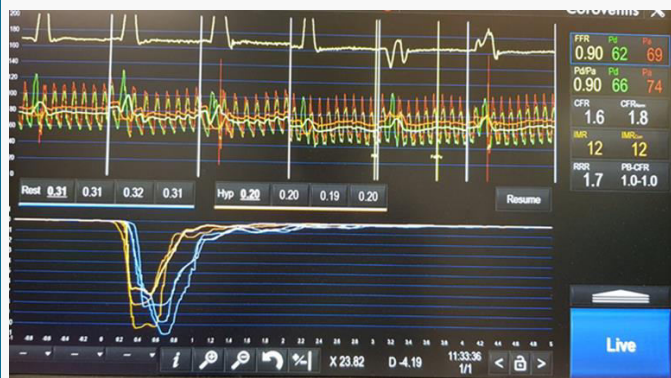
"Functional Microvascular Dysfunction"



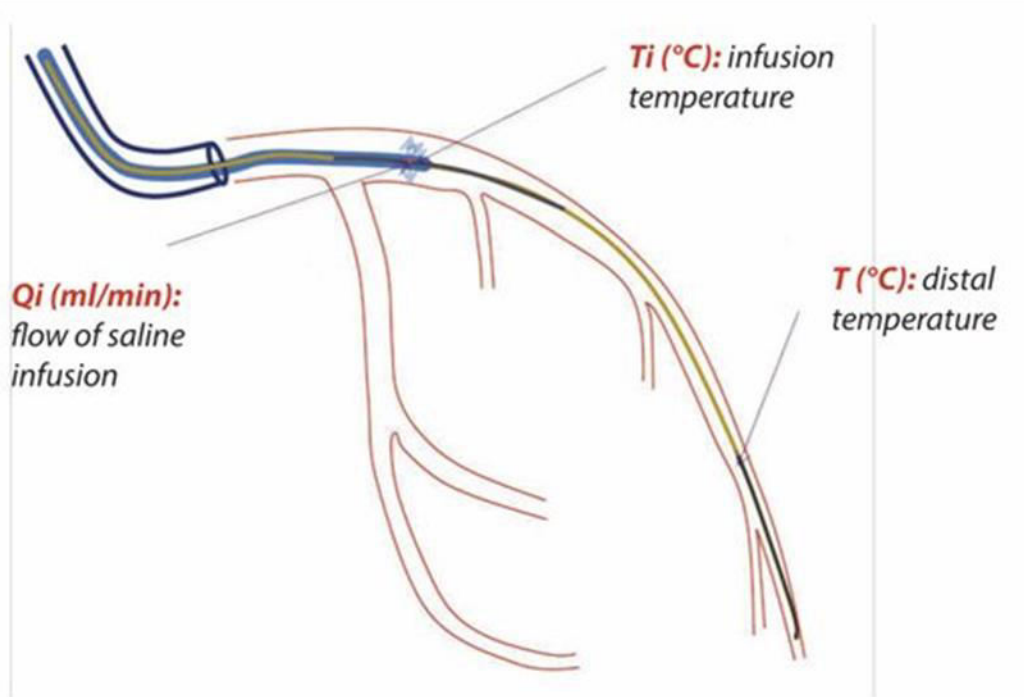
CFR > 2

IMR < 25

"Compensated/Initial Structural Microvascular Dysfunction"



Bolus vs. Continuous Thermodilution



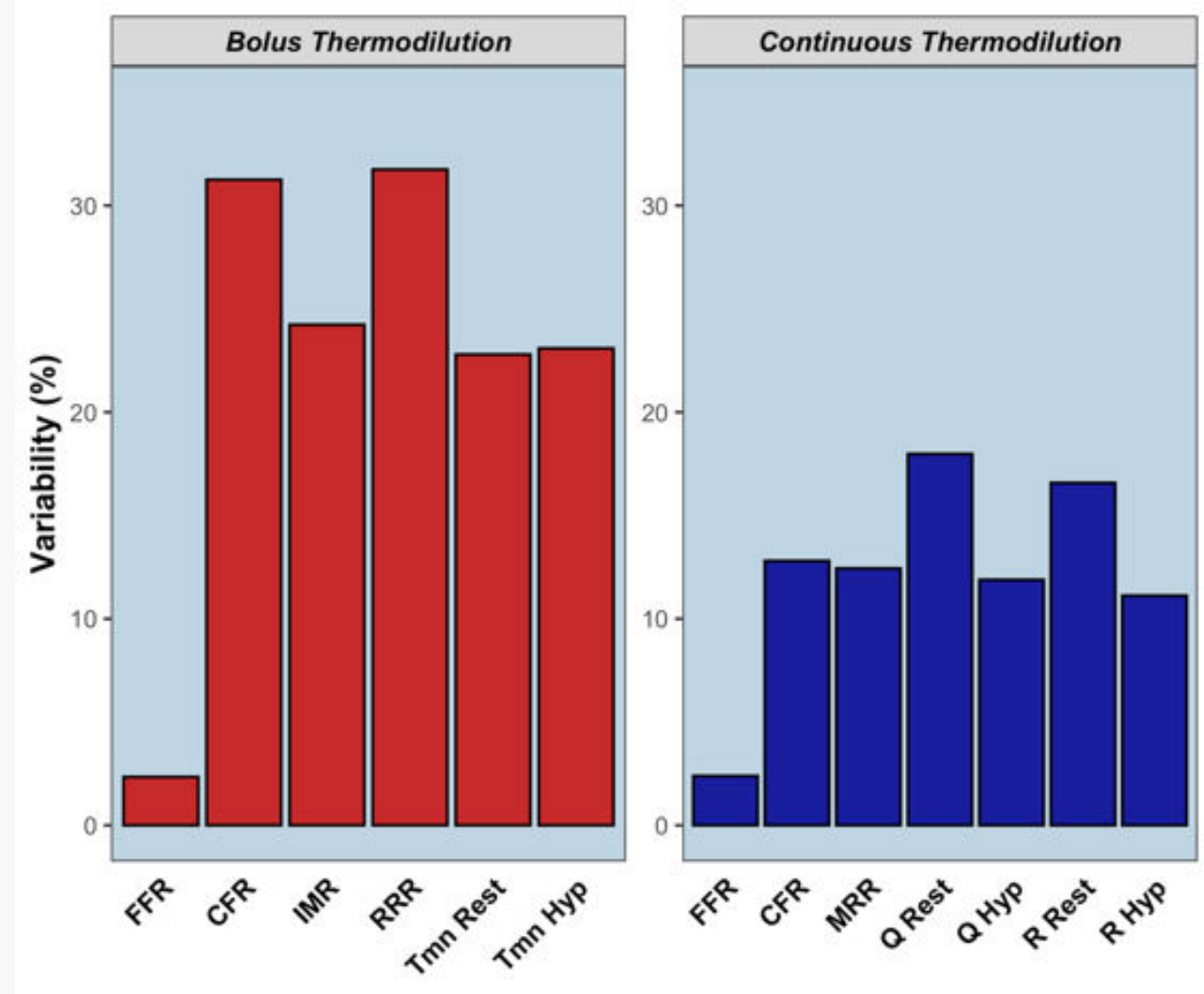
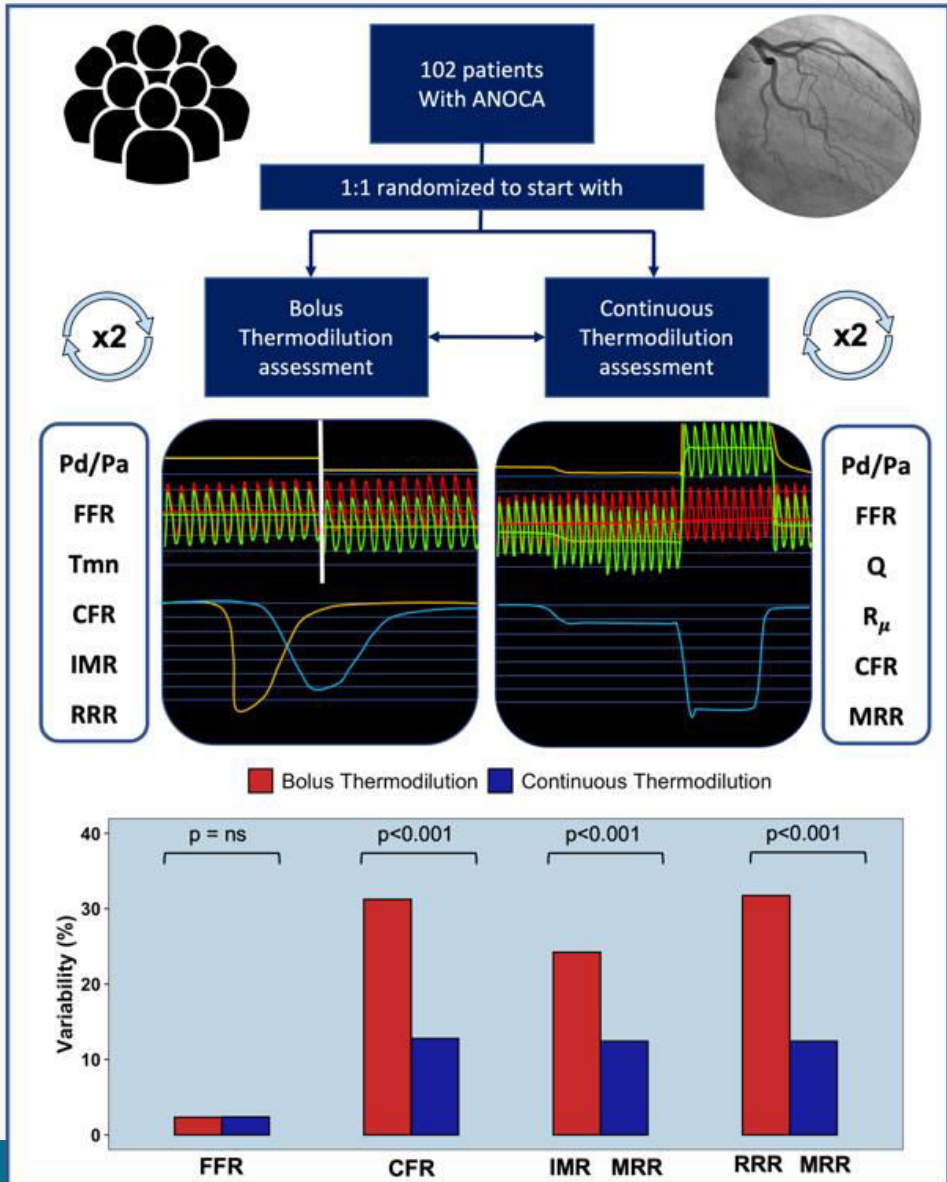
The technique is based on continuous thermodilution, achieving stable hyperemia by intracoronary infusion of saline at room temperature, at a rate of 20 mL/min with a dedicated monorail catheter (RayFlow, Hexacath, Paris, France).

The intracoronary infusion of saline at 20 ml/min induces hemolysis, adenosine release and then hyperemia

In addition to hyperaemic flow, continuous thermodilution can quantify absolute resting coronary blood flow (10 ml/min intracoronary infusion of saline)

Therefore, it can be used to calculate coronary flow reserve and microvascular resistance reserve

Bolus vs. Continuous Thermodilution



Bolus vs. Continuous Thermodilution



102
With

1:1 random

Bolus
Thermodilution
assessment

x2

Pd/Pa

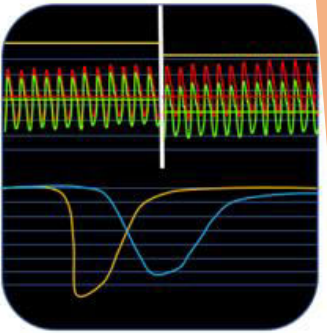
FFR

Tmn

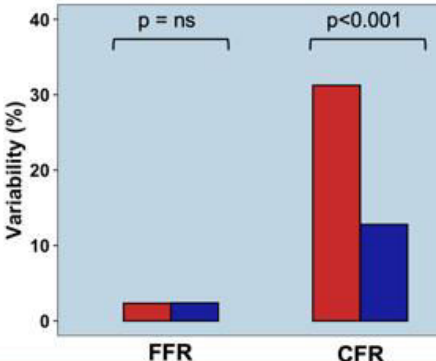
CFR

IMR

RRR



■ Bolus Thermodilution ■ Continuous Thermodilution



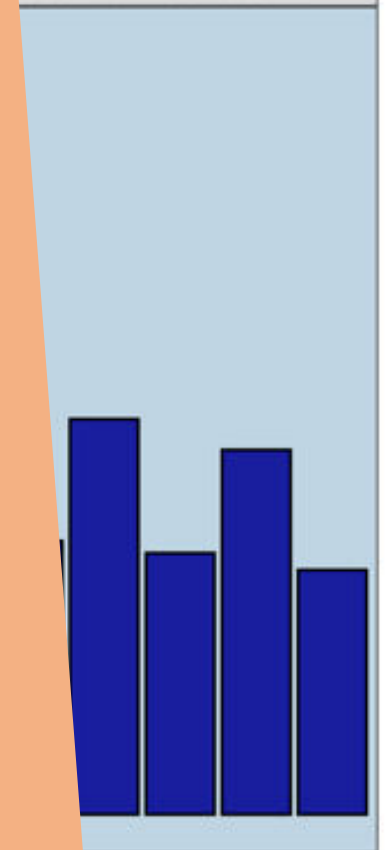
PRO

- Highly reproducible
- Operator independent
- No adenosine administration
- Correlation with CFR and PET-derived flow measurement

CONTRA

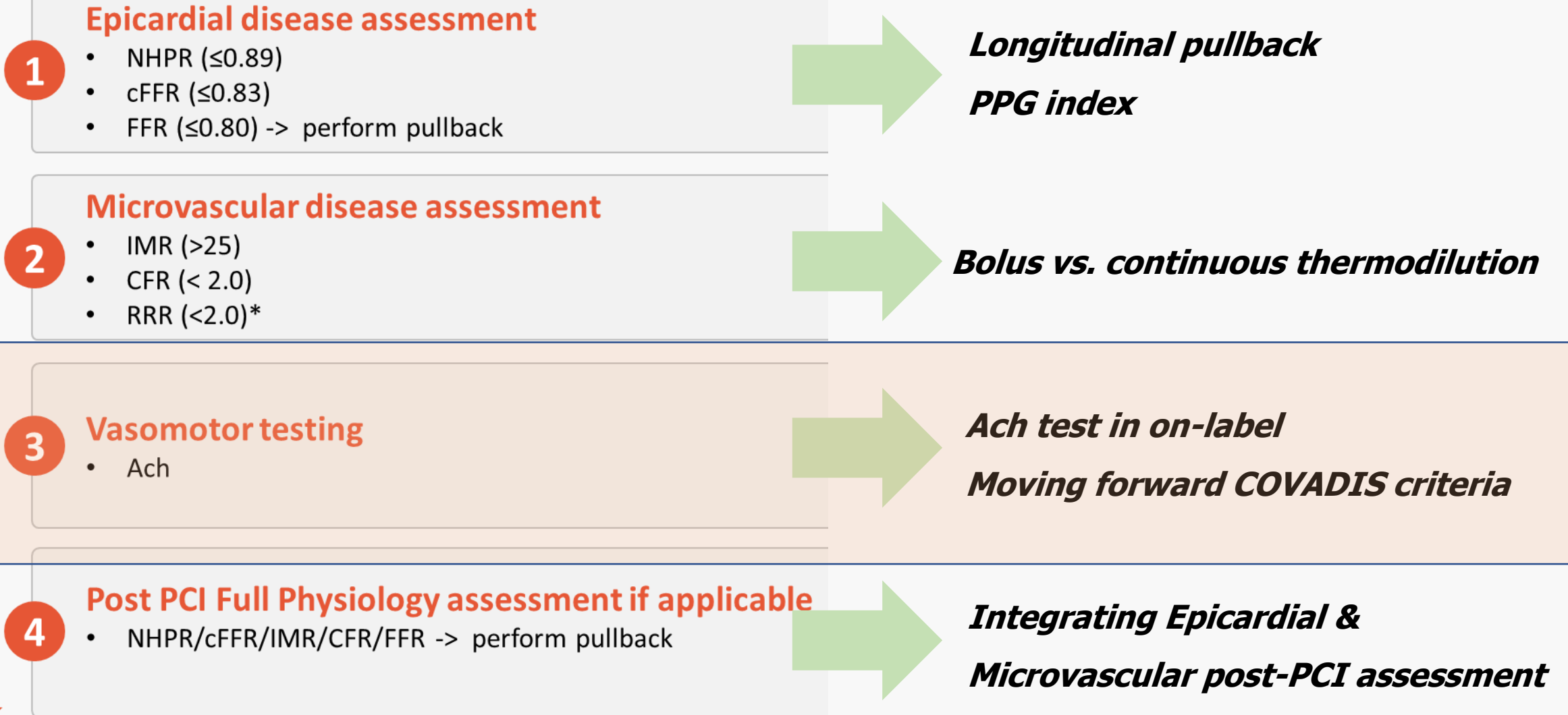
- Concerns about safety
- Increased complexity
- Time consuming
- Need dedicated tool (expensive and limited availability)
- Lack of normal values
- No prognostic data

Continuous Thermodilution



Rest Q Hyp R Rest R Hyp

#FullPhysiology: coming soon



Intracoronary Ach is on-label



AGENZIA ITALIANA DEL FARMACO
DETERMINA 28 luglio 2022

Inserimento del medicinale Acetilcolina cloruro nell'elenco dei medicinali erogabili a totale carico del Servizio sanitario nazionale, ai sensi della legge 23 dicembre 1996, n. 648, come test farmacologico per la valutazione della funzione vascolare coronarica limitatamente all'uso durante le procedure di cateterismo/coronarografia (Allegato 6). (Determina)

Articoli

- 1
- 2
- 3

Determina:
Art. 1

Nell'elenco dei medicinali erogabili a totale carico del Servizio sanitario nazionale, ai sensi della legge 23 dicembre 1996, n. 648, nella specifica sezione relativa ai medicinali che possono essere impiegati per una o più indicazioni diverse da quelle autorizzate, nella lista costituente l'allegato 6 relativa all'uso consolidato - sulla base dei dati della letteratura scientifica - di radiofarmaci e diagnostici, è inserito il farmaco Acetilcolina cloruro per la seguente indicazione terapeutica: test farmacologico per la valutazione della funzione vascolare coronarica limitatamente all'uso durante le procedure di cateterismo/coronarografia.

ai sensi della legge 23 dicembre 1996, n. 648, come test farmacologico per la valutazione della funzione (22A04477) (GU Serie Generale n.182 del 05-08-2022)

- 1 vial of Miovisin 20mg/2ml diluted in 100 ml of NaCl 0.9%
- 1 ml of this solution (200 mcg/ml) diluted with 19 ml of 0.9% NaCl = 20 ml of 10 mcg/ml Ach (Master solution)
- Take from the Master solution:
 - 2 ml + 18 ml of 0.9% NaCl % (20 mcg)
 - 5ml + 15 ml of 0.9% NaCl % (50 mcg)
 - 10 ml + 10 ml of 0.9% NaCl % (100 mcg)
 - 20 ml (200 mcg)
- infuse manually in the LCA incremental doses of Ach (20-50-100-200 mg) in 2 minutes
(rarely we infuse incremental doses of Ach 20-50-80 mg in the RCA)

Epicardial Spasm

Epicardial spasm Angina symptoms during ACh bolus (e.g. 100 µg acetylcholine over 20 seconds) AND:

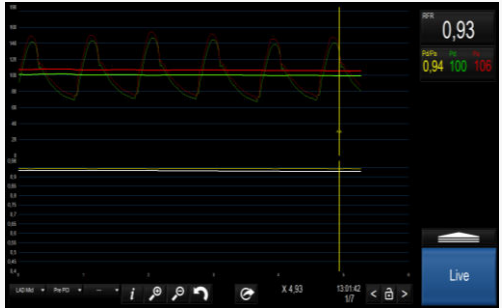
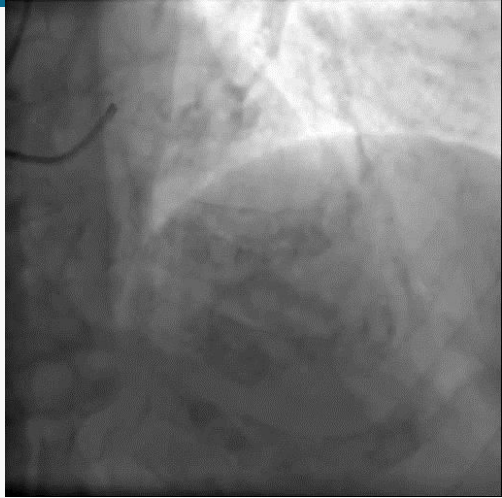
- ST-segment deviation on ECG
- >90% epicardial coronary constriction during ACh reduction[34]

Microvascular Spasm

Microvascular spasm Angina symptoms with ACh infusion AND:

- ST-segment deviation on ECG
- No significant epicardial coronary spasm (<90% diameter reduction)

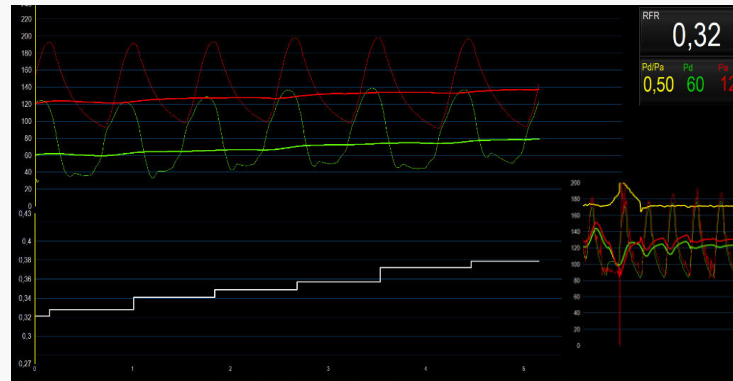
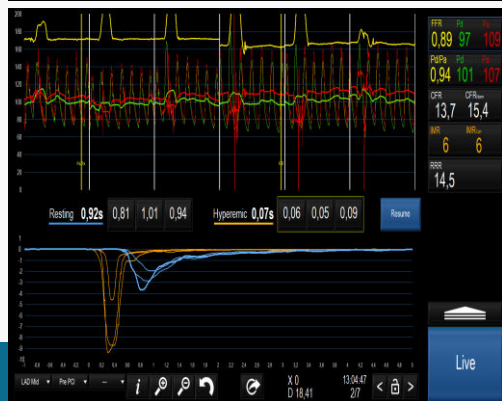
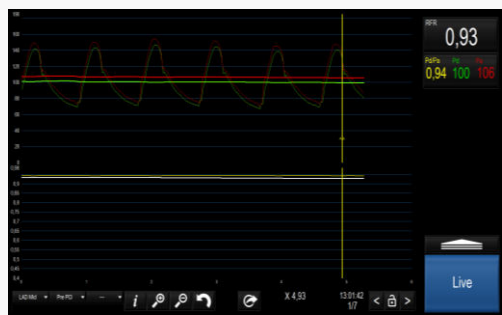
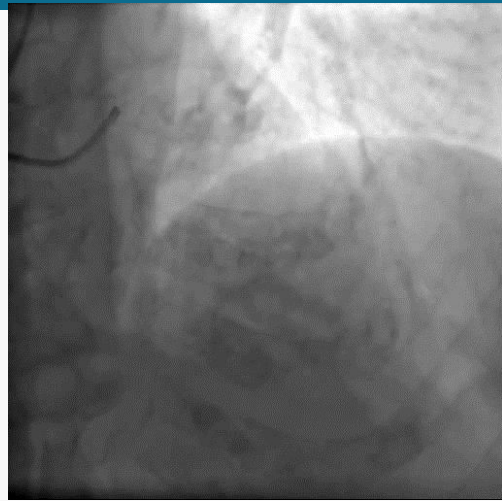
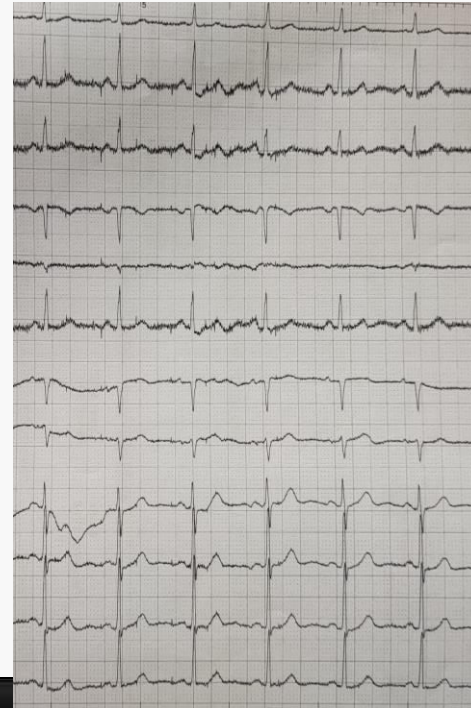
Beyond COVADIS criteria



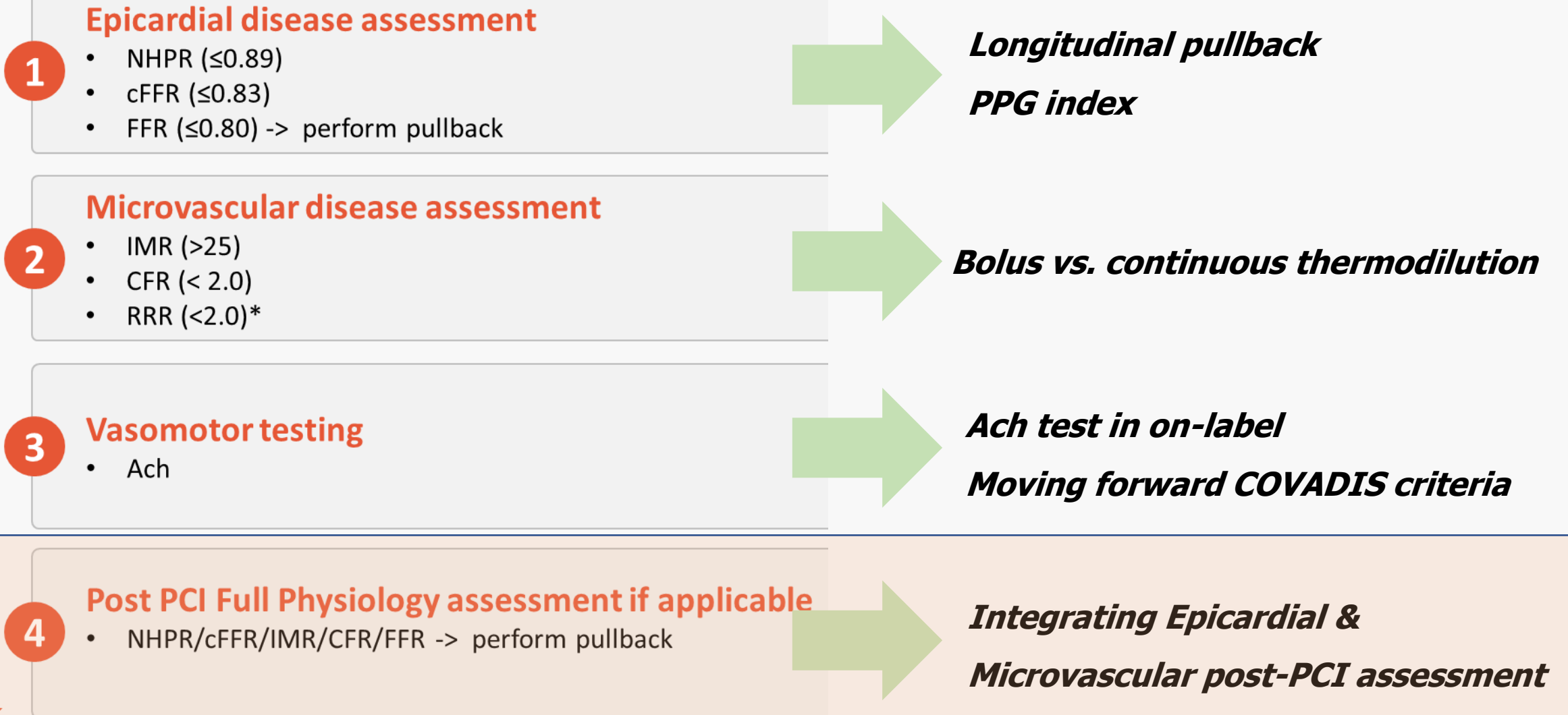
Beyond COVADIS criteria

STEP 3 – 100 μg

- ✓ RFR decrease
- ✓ Chest pain
- ✓ ECG changes
- ✓ Epicardial spasm



#FullPhysiology: coming soon





Integrating Epicardial and Microvascular Data

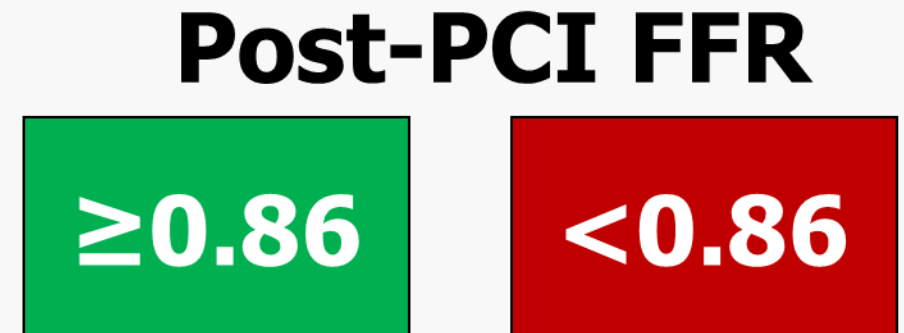
Pre-PCI

Did I select the wrong vessel (diffuse disease)?

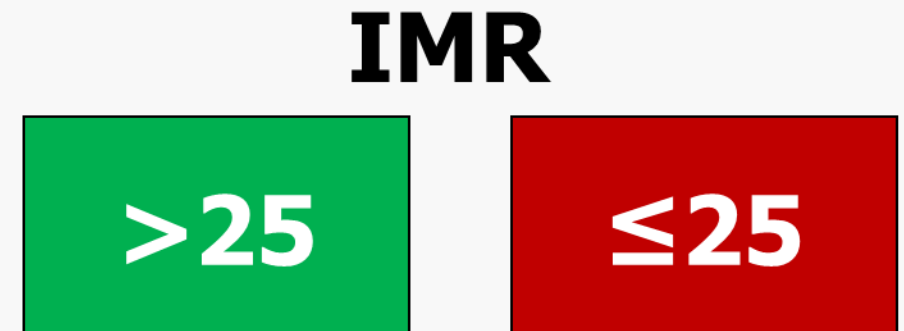


Post-PCI

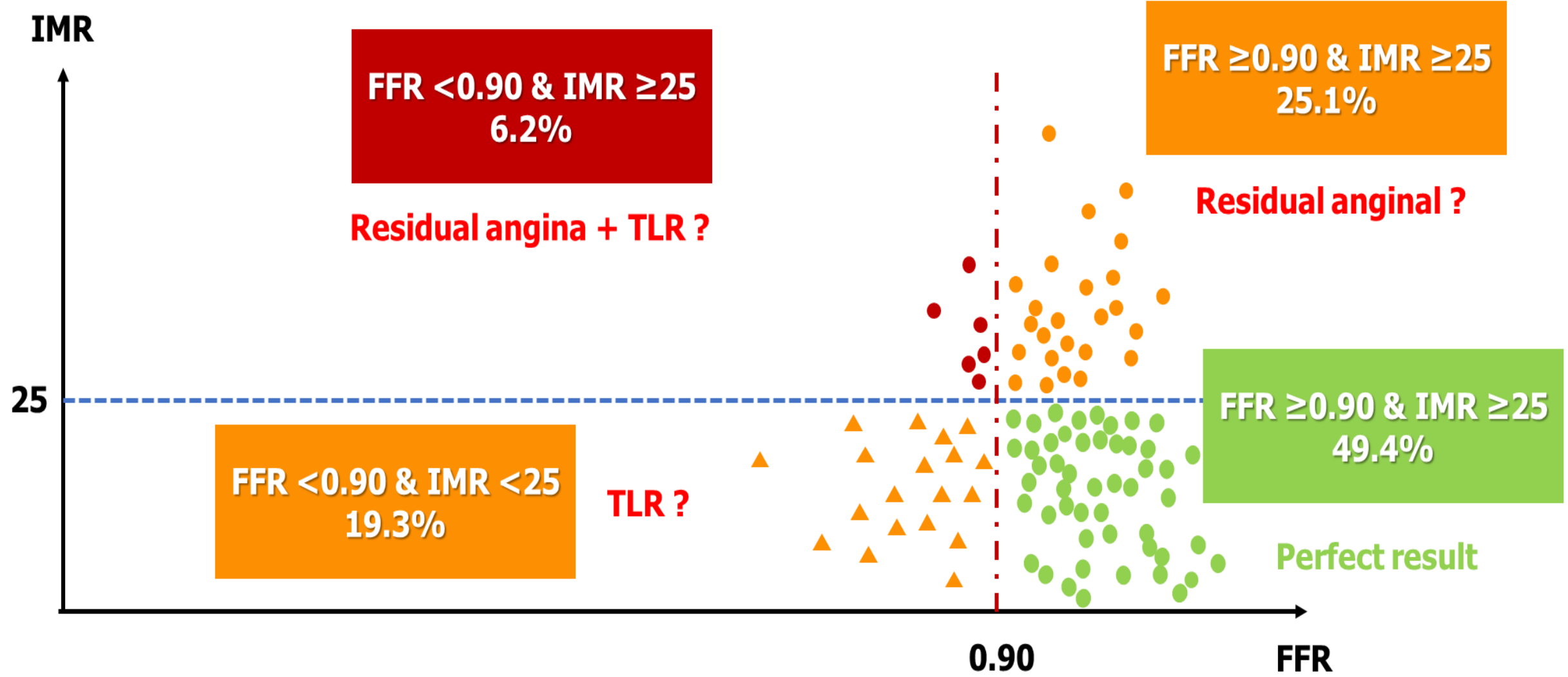
Did I miss a/the focal lesion?



Did I target the only the epicardial resistance when the problem is also in the microvascular resistance?



Integrating Epicardial and Microvascular Data





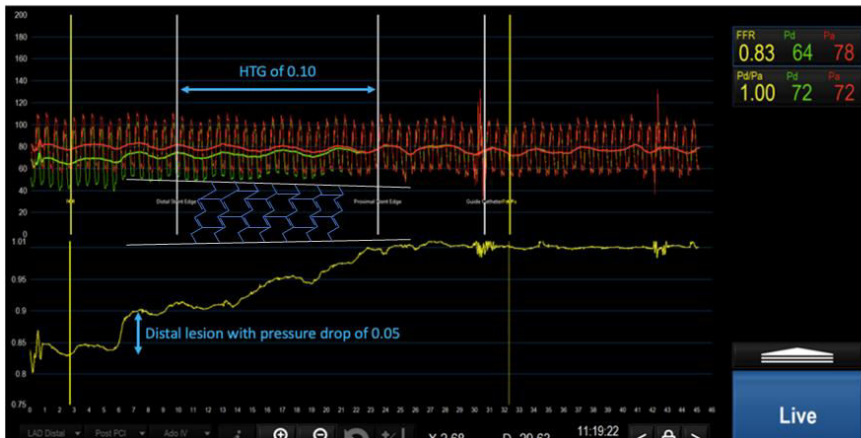
CONCLUSIONS

- **Strong data supports the prognostic implication of coronary physiology in terms of quality of life and outcome**
- **The integration of longitudinal FFR pullback and microvascular assessment may strongly improve PCI success and patient's outcome**

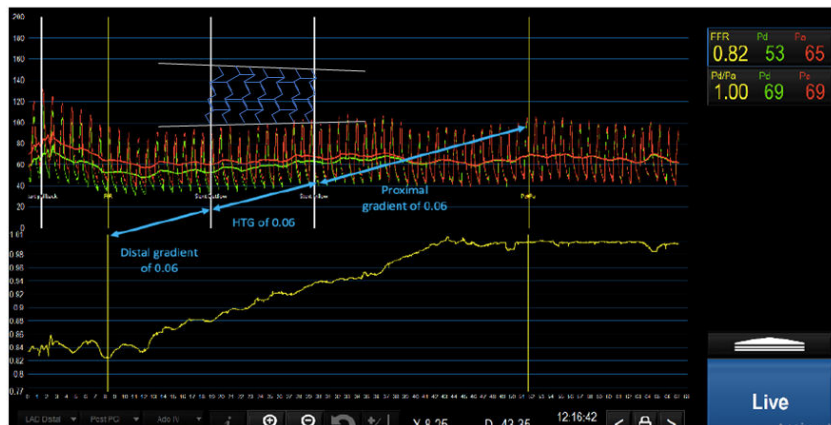
Integrating Epicardial and Microvascular Data

"Epicardial Data"

Instant+focal distal



Diffuse



"Microvascular data"

Angina post-PCI occurs in 20–30% of patients at 1 year

