

Nonhyperemic pressure indices: pros and cons

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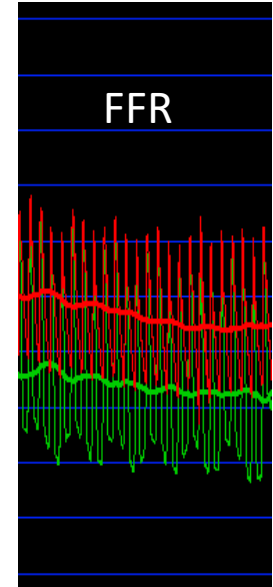
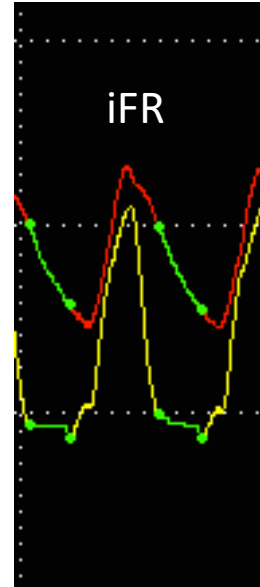
I have the following potential conflicts of interest to report in the field of this presentation:

Speaker at educational events and/or consultancies: Abbott, Boston Scientific, Philips Healthcare

Advantages of non-hyperemic indices

Evidence gathered with iFR :

- Non-inferior to FFR
- Faster than FFR.
- No patient discomfort related to hyperemic agents.
- Less PCI performed than with FFR.
- More cost-effective.
- Less crosstalk between serial stenoses.
- Co-registration with angiography.



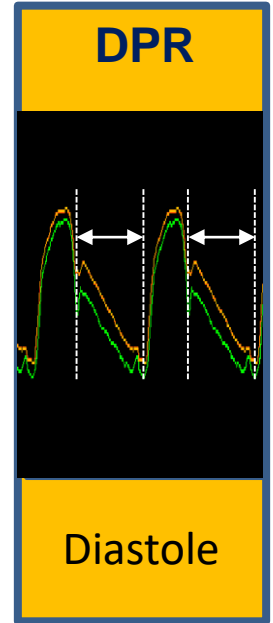
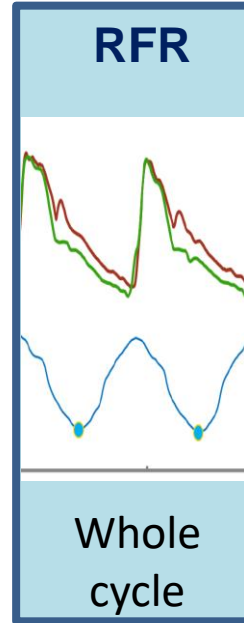
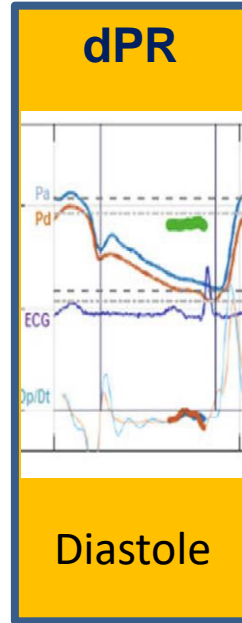
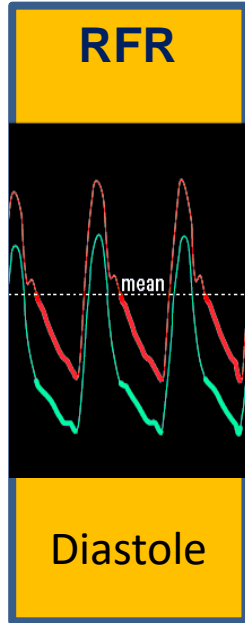
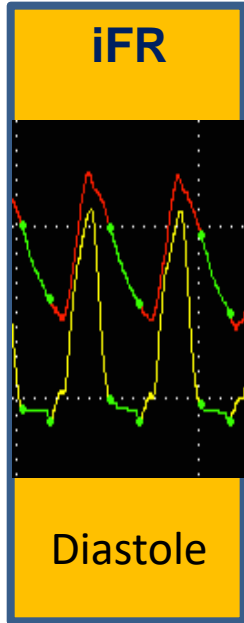
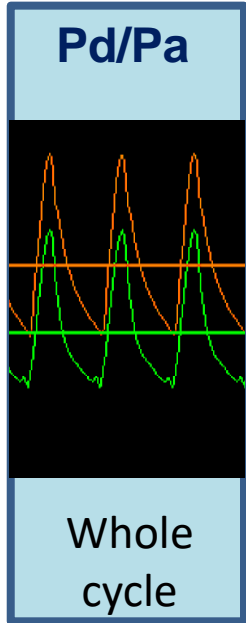
A lexicon of non-hyperemic indices

- Pd/Pa: Whole-cycle translesional ratio (mean pressures)
- iFR TM: Instantaneous wave-free ratio
- DFR TM: Diastolic hyperemia-free ratio
- dPR: Diastolic pressure ratio
- RFR TM: Resting whole-cycle ratio
- DPR: Diastolic pressure ratio

Non-hyperemic indices: are all the same?

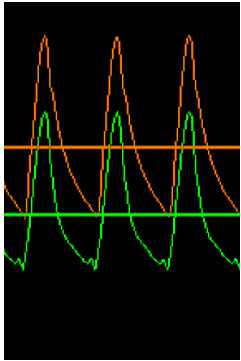
- Same data sampling within the cardiac cycle?
- Same data spread?
- Same agreement with iFR?
- Same ability to detect ischaemia?
- Same analysis software for practical use?
- Same long-term patient outcomes when used for decision making?
- Same value in predicting PCI results?

Sampling interval in NHPI: all the same?



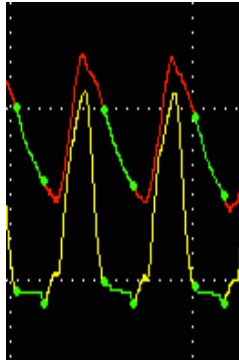
Sampling interval in NHPI: all the same?

Pd/Pa



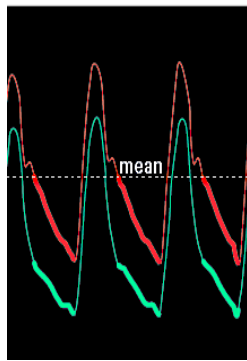
Whole-cycle average Pd/Pa

iFR



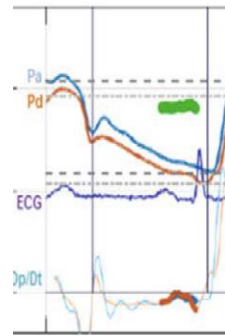
Average Pd/Pa during WFP

DFR



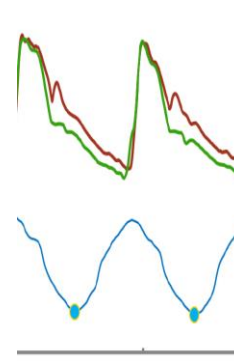
Average Pd/Pa during WFP

dPR



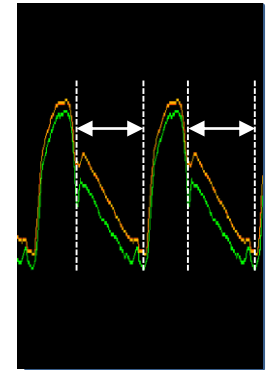
Average Pd/Pa over flat dP/dt period

RFR



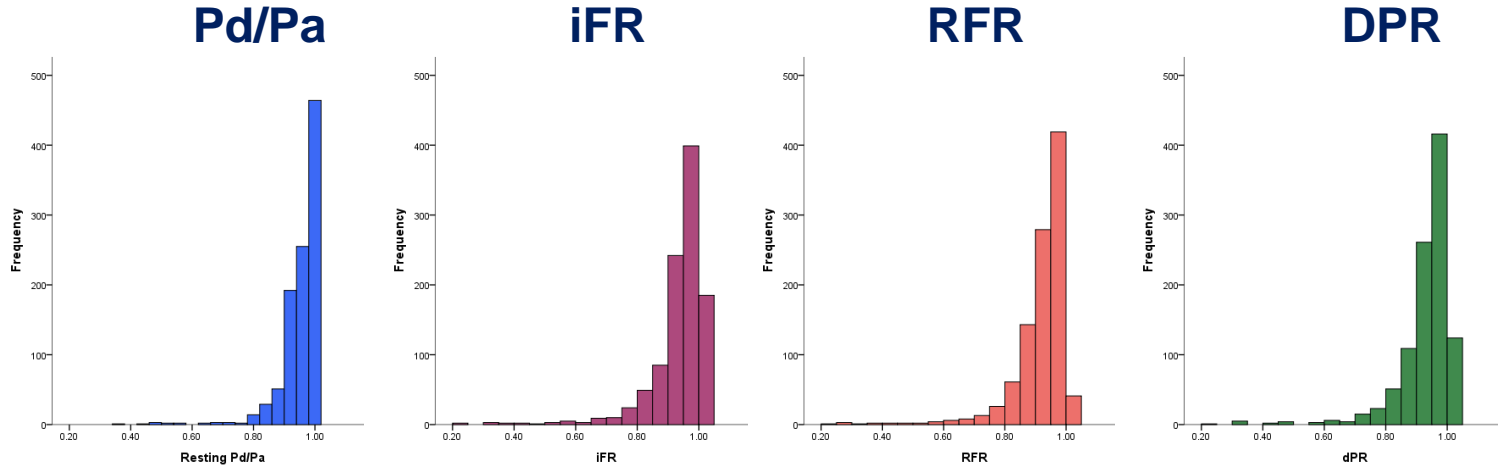
Lowest Pd/Pa over entire cycle

DPR

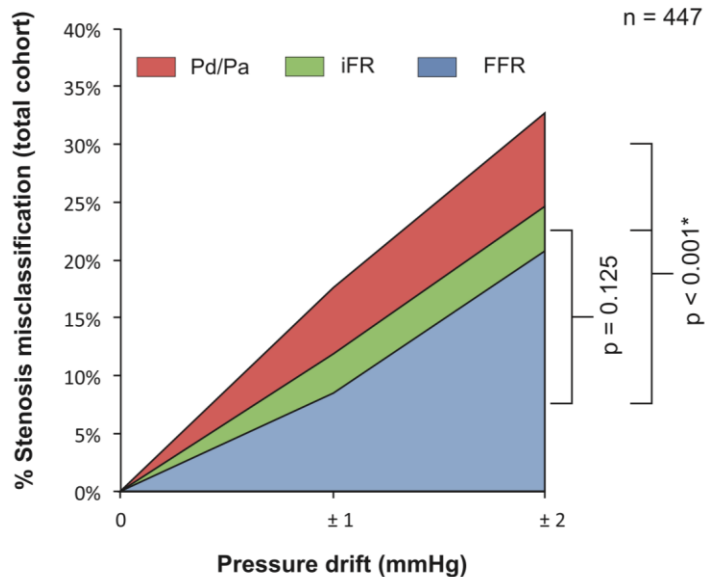
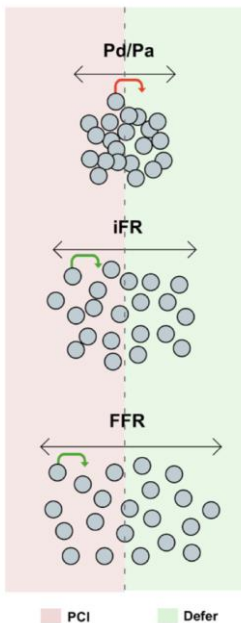


Average Pd/Pa over entire diastole

NHPI and data spread: all the same?



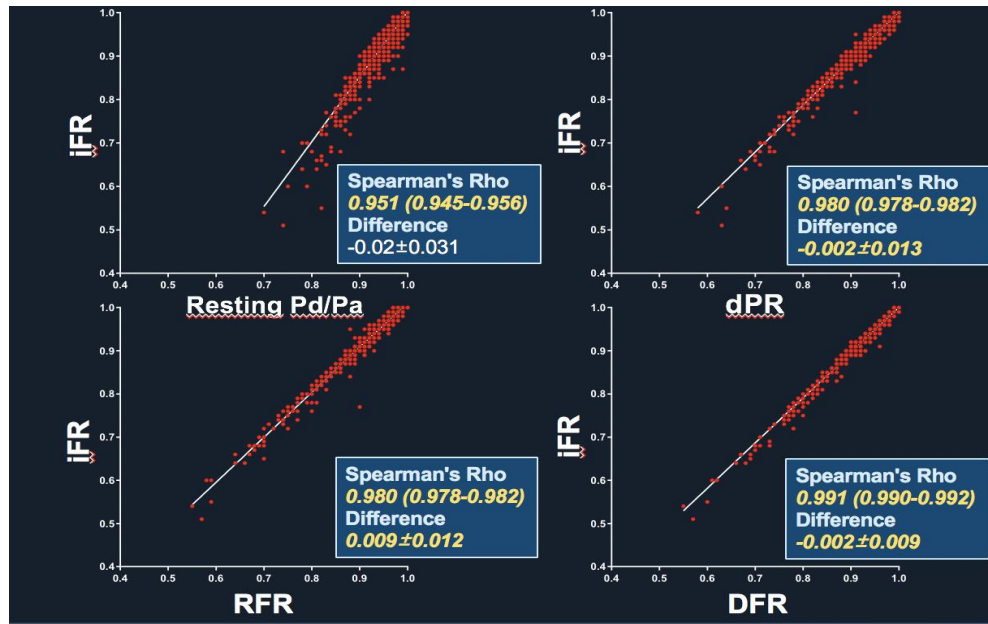
NHPI and data spread: all the same?



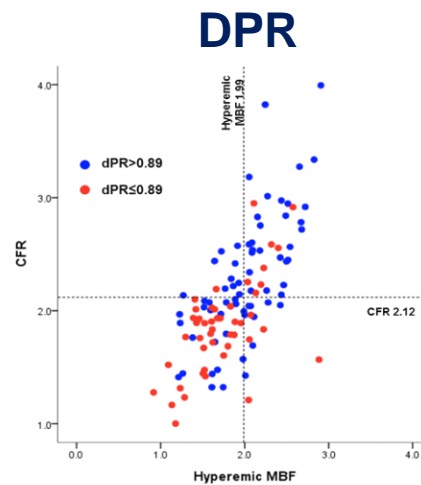
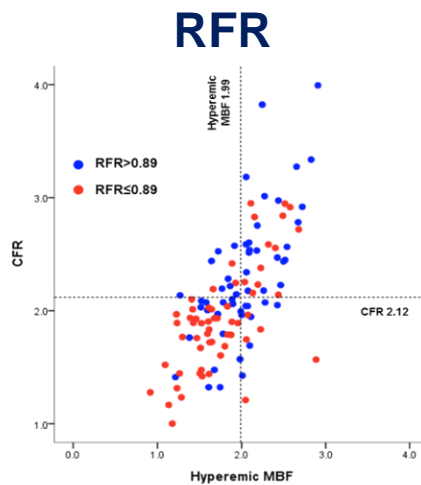
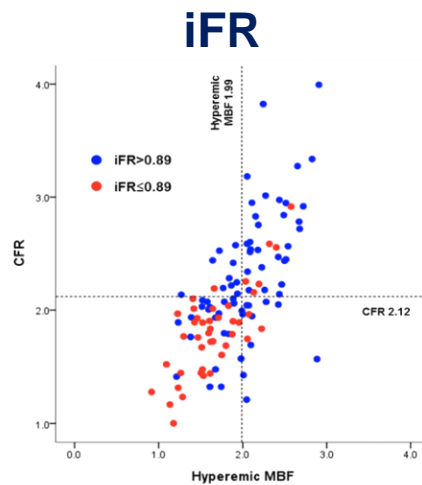
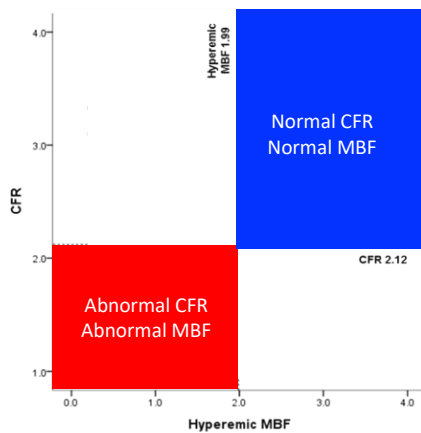
FFR and iFR are more resilient than whole-cycle Pd/Pa to stenosis misclassification caused by pressure drift

NHPI and iFR: same agreement?

Retrospective analysis of data from IRIS-FFR Registry

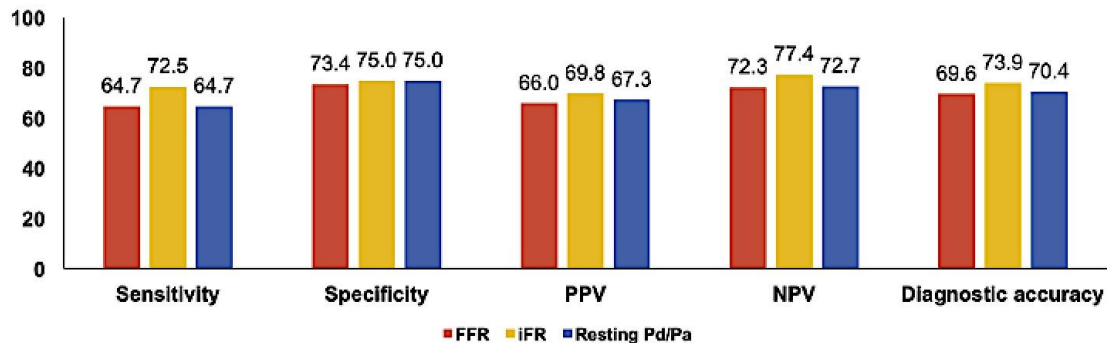


NHPI and ischemia: all the same?

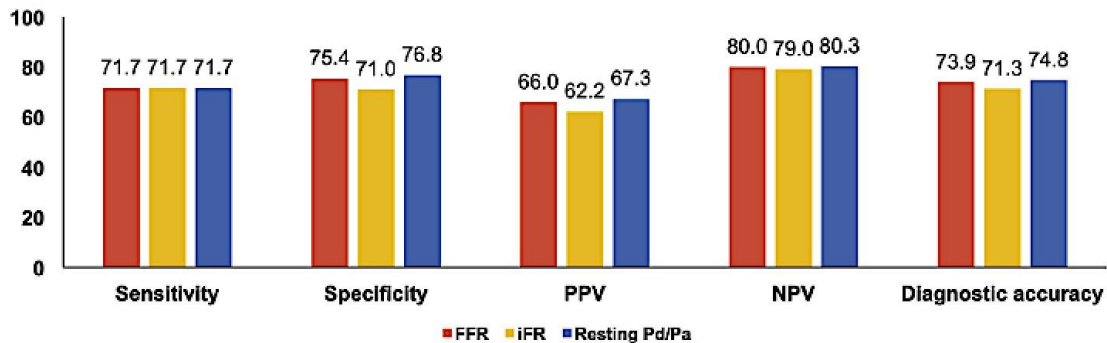


NHPI and ischemia: all the same?

PET-derived CFR <2.0 as a reference standard



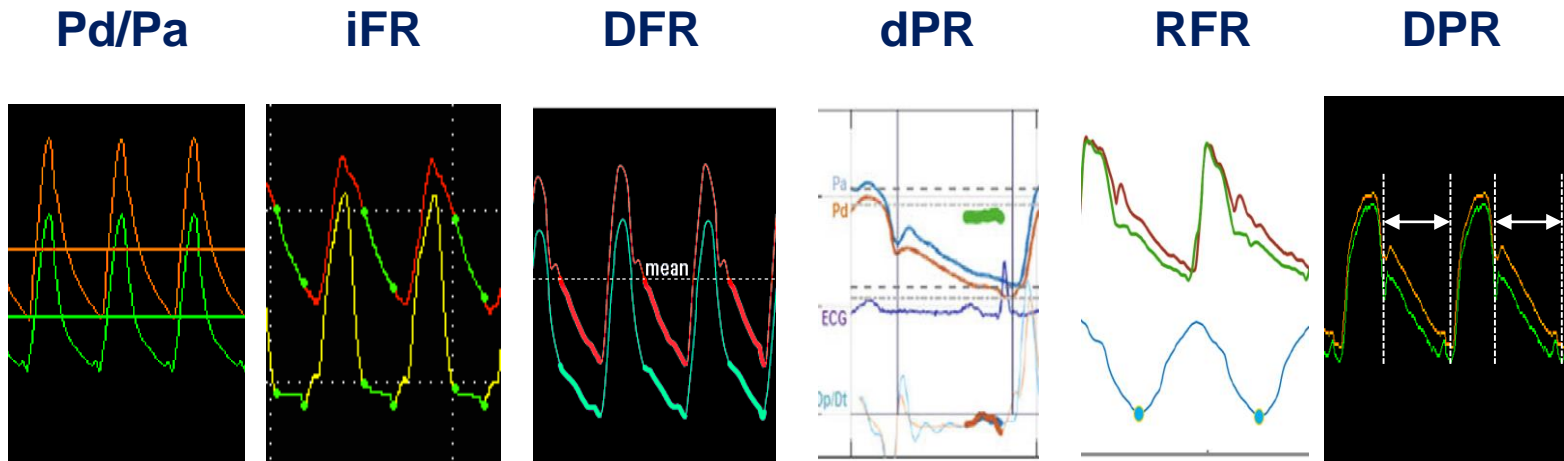
PET-derived relative flow reserve <0.75 as a reference standard



Non-hyperemic indices: are all the same

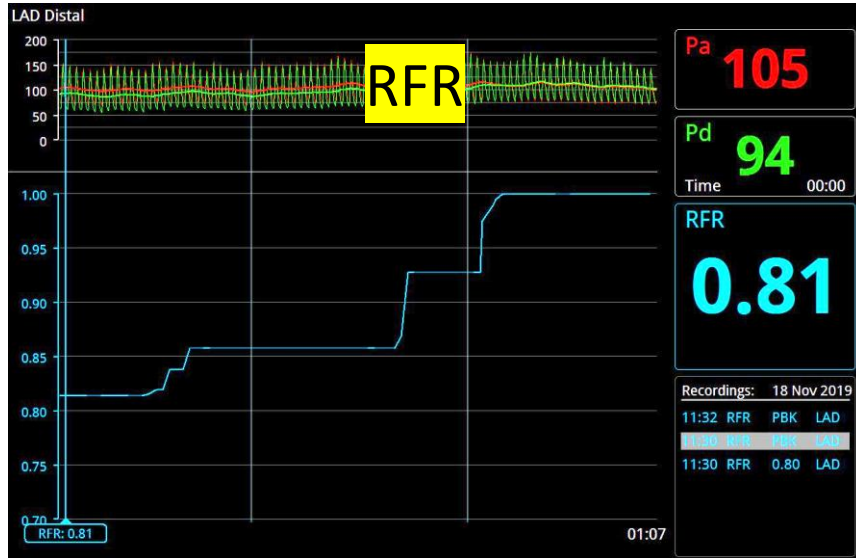
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Analysis software in NHPI: all the same?

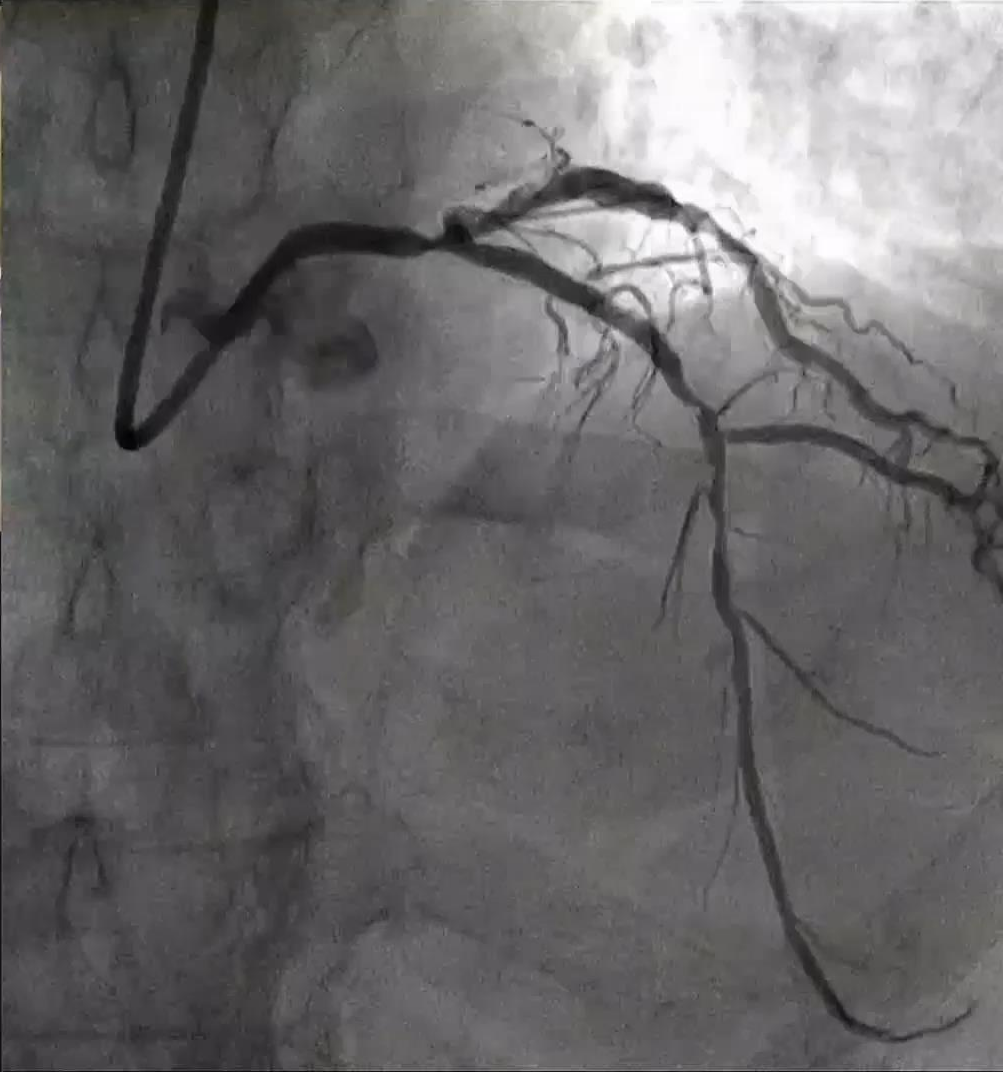


Pullback analysis	-	+	-	-	+	+
Virtual PCI	-	+	-	-	-	-
Co-registration	-	+	-	-	-	-

Analysis software in NHPI: all the same?



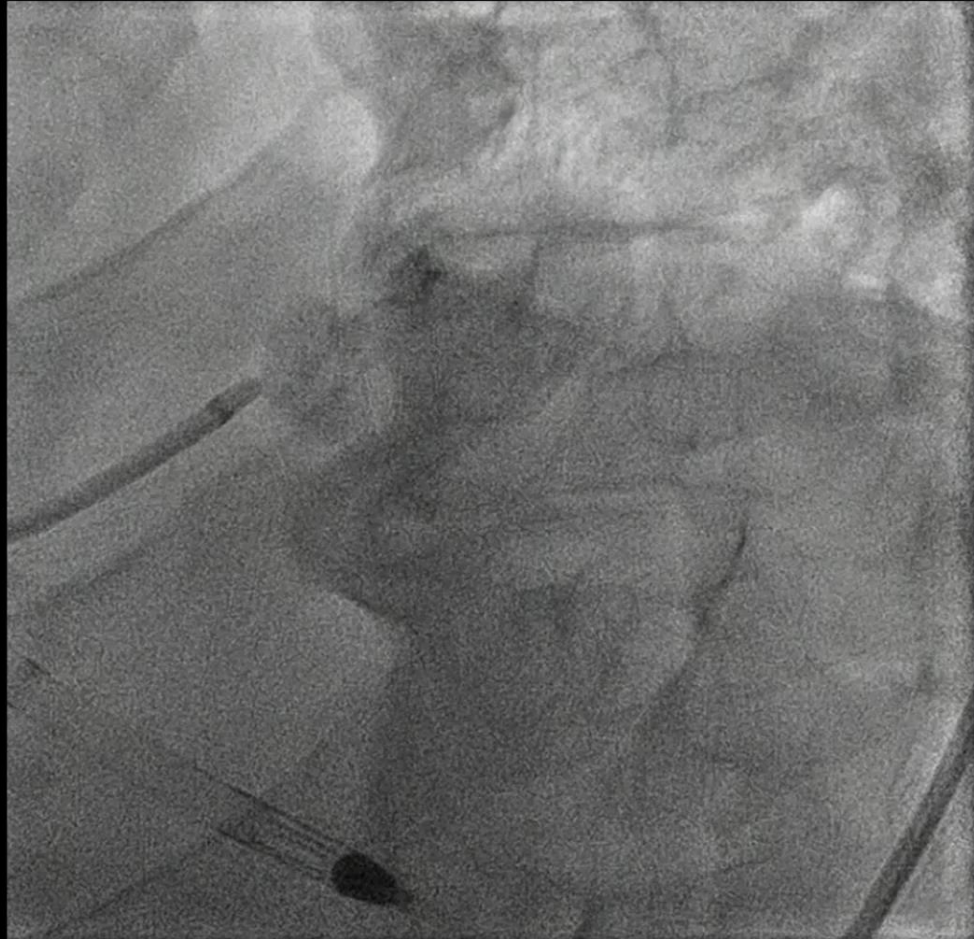
Only RFR and iFR have dedicated software analysis for longitudinal vessel interrogation circumventing fluctuations cause by Venturi effect.

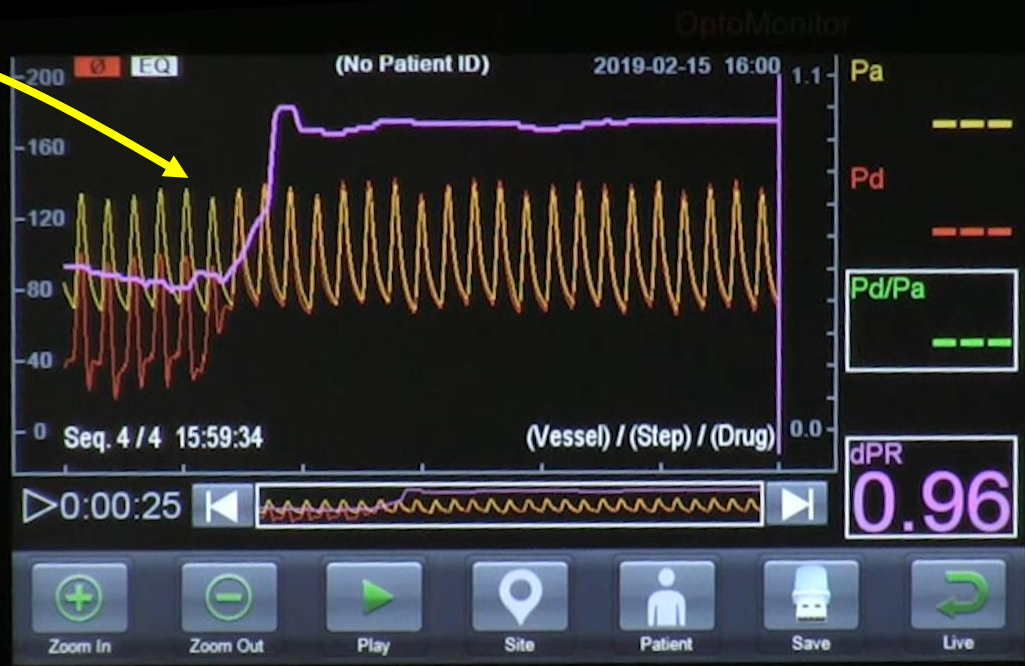
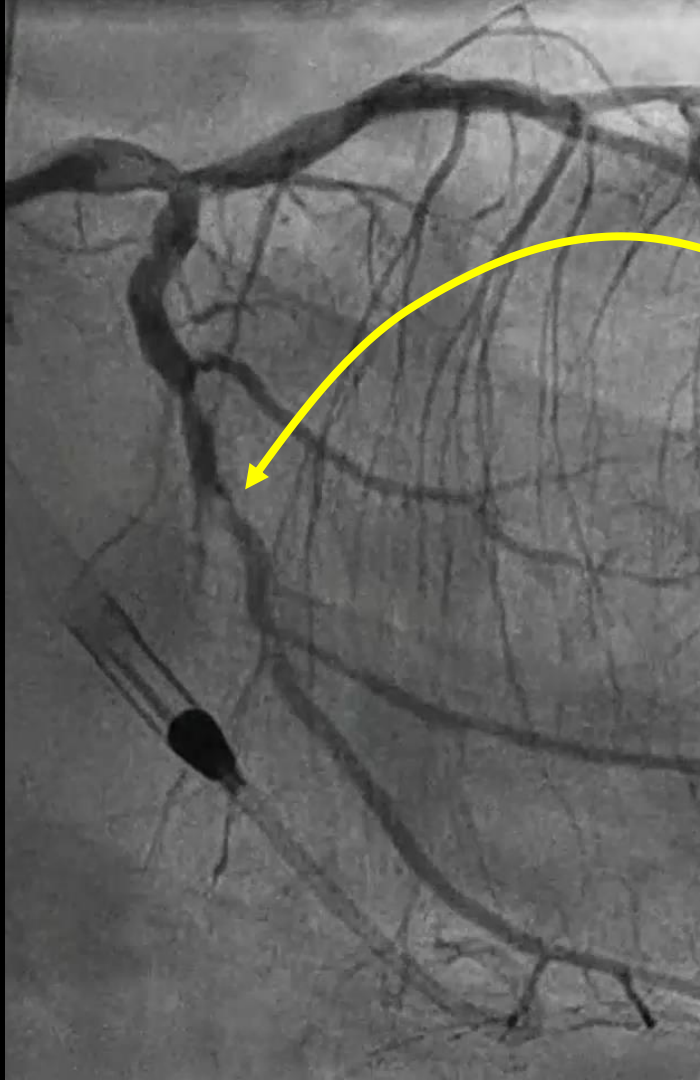


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Pressure mapping with DPR



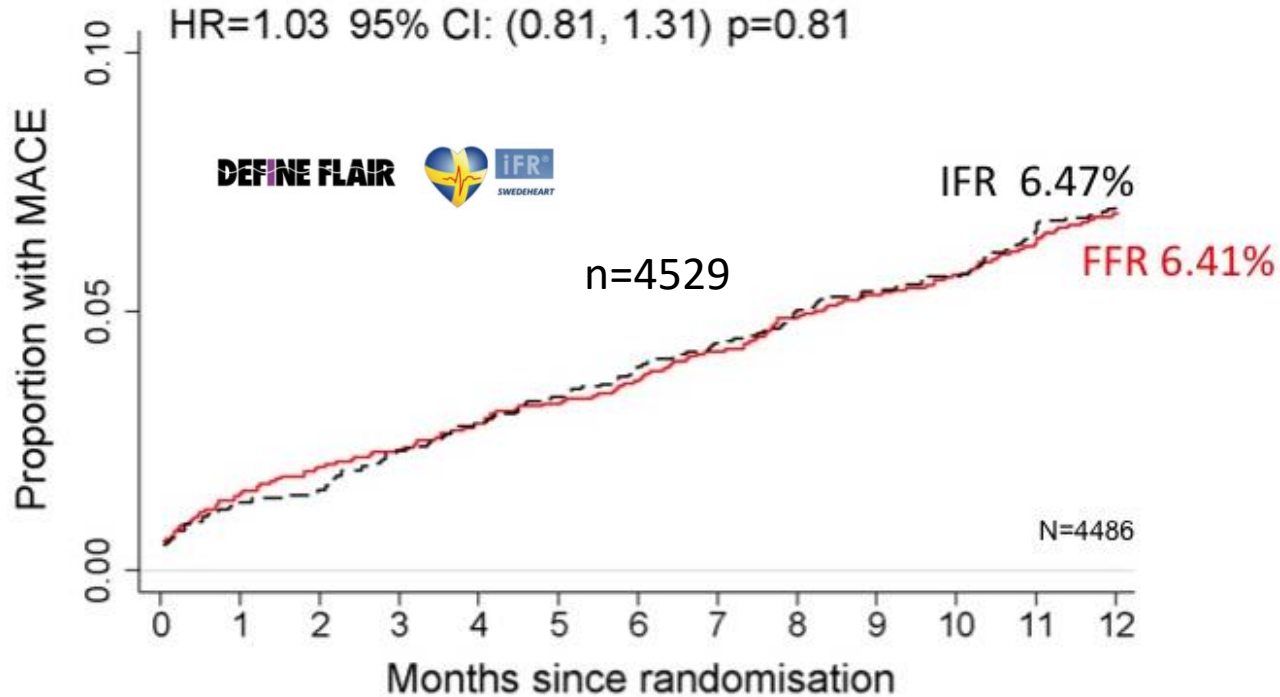


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Long-term outcome evidence for NHPI

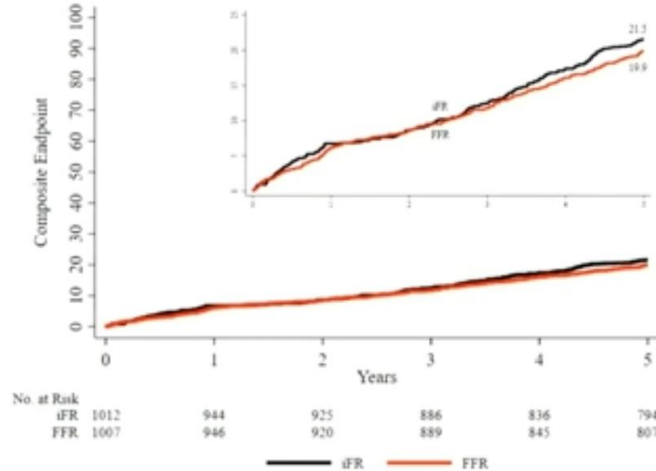
- Currently, prospective evidence only available for FFR and iFR.
- Retrospective studies supporting similar value of some NHPI than FFR and iFR
- Facilitated by limited impact of close-to-cutoff NHPI values on long-term outcomes.

NHPI and clinical outcomes: all the same?



NHPI and clinical outcomes: all the same?

Composite Endpoint at 5 years all-cause death, MI, unplanned revascularization

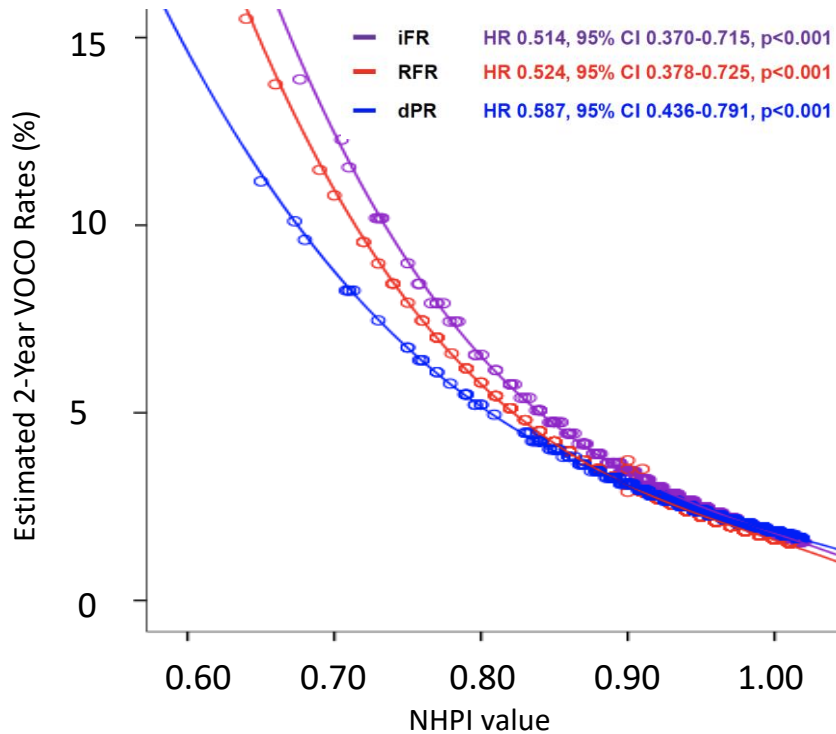


iFR 21.5%
FFR 19.9%

HR 1.09; 95% CI: 0.90, 1.33

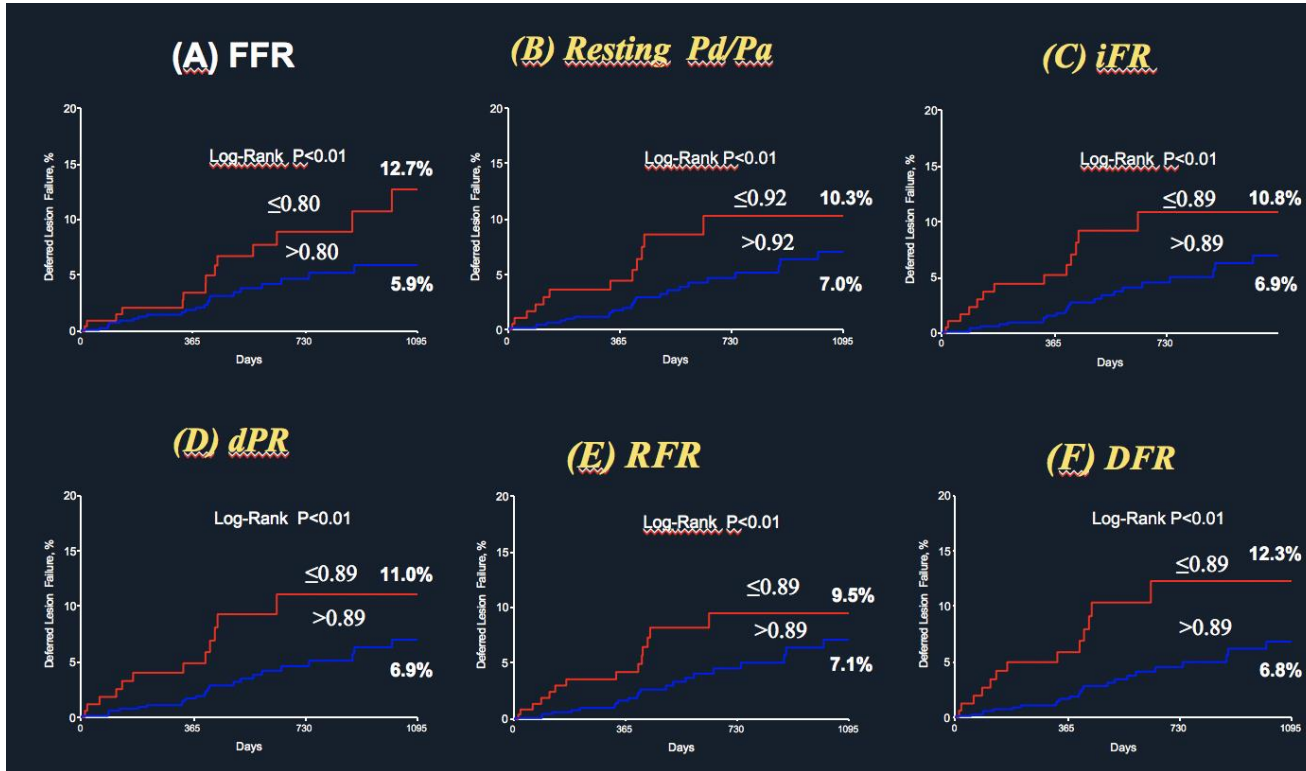
iFR no difference in composite outcome
compared with FFR at 5 years

NHPI and clinical outcomes: all the same?



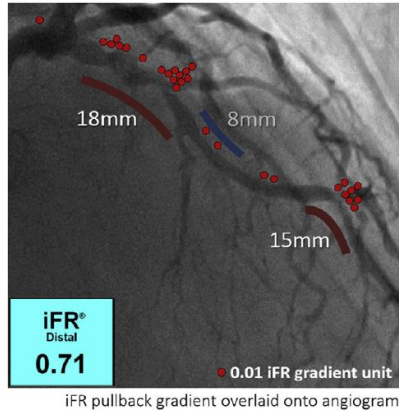
NHPI and clinical outcomes: all the same?

Retrospective prediction based on IRIS-FFR Registry



iFR GRADIENT study: predicted and actual functional PCI results measured with iFR

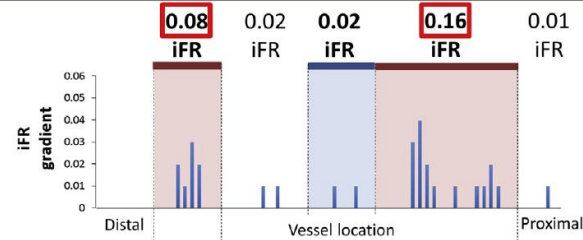
iFR pullback assessment



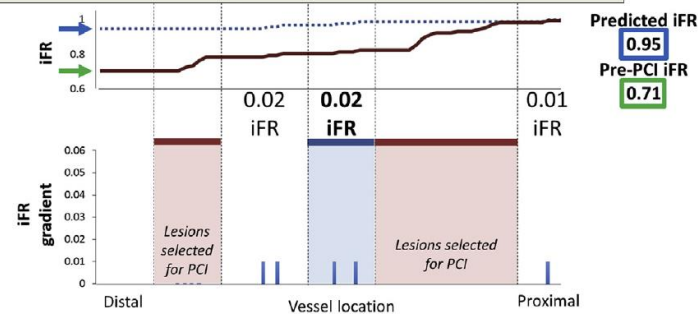
iFR pullback was performed to evaluate physiological lesion severity throughout a vessel. According to iFR gradient quantification, the operators made procedural planning using predicted iFR outcome.

Concordance between predicted and actual post PCI NHPR values

iFR pullback gradient at each vessel location



Procedural planning using iFR outcome prediction

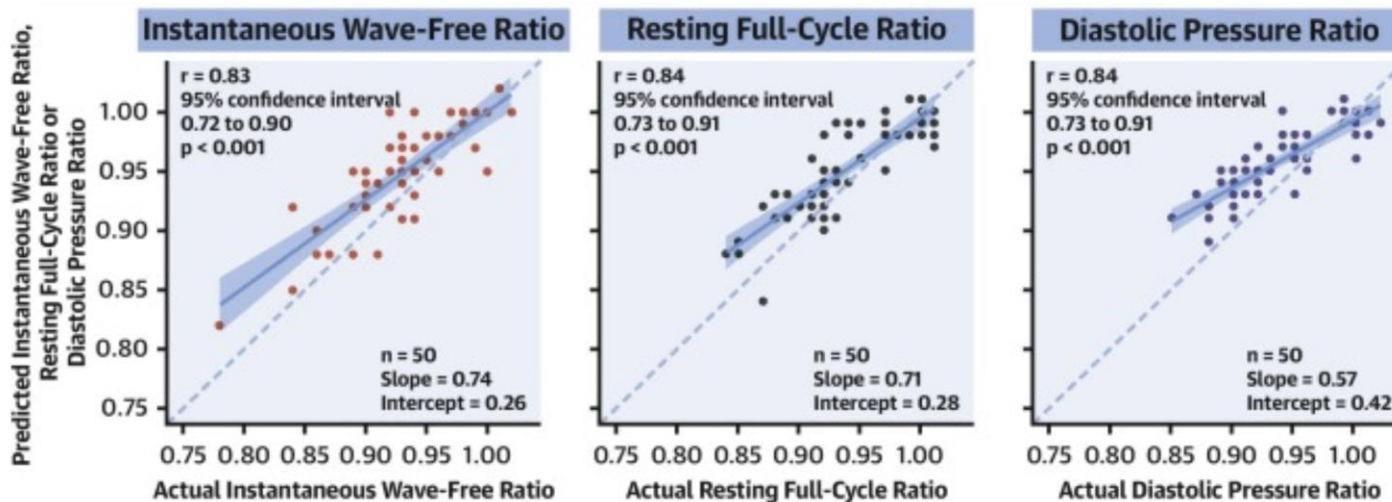


Post-PCI iFR outcome was predicted by summation of iFR gradient and distal pre-PCI iFR measured at the distal coronary artery.

$$\text{Predicted iFR} = \text{Pre-PCI iFR} + \text{iFR gradient(s)}$$

$$\mathbf{0.95} = \mathbf{0.71} + \mathbf{0.08} + \mathbf{0.16}$$

Prediction of functional PCI results based on pre-procedural NHPR measurements

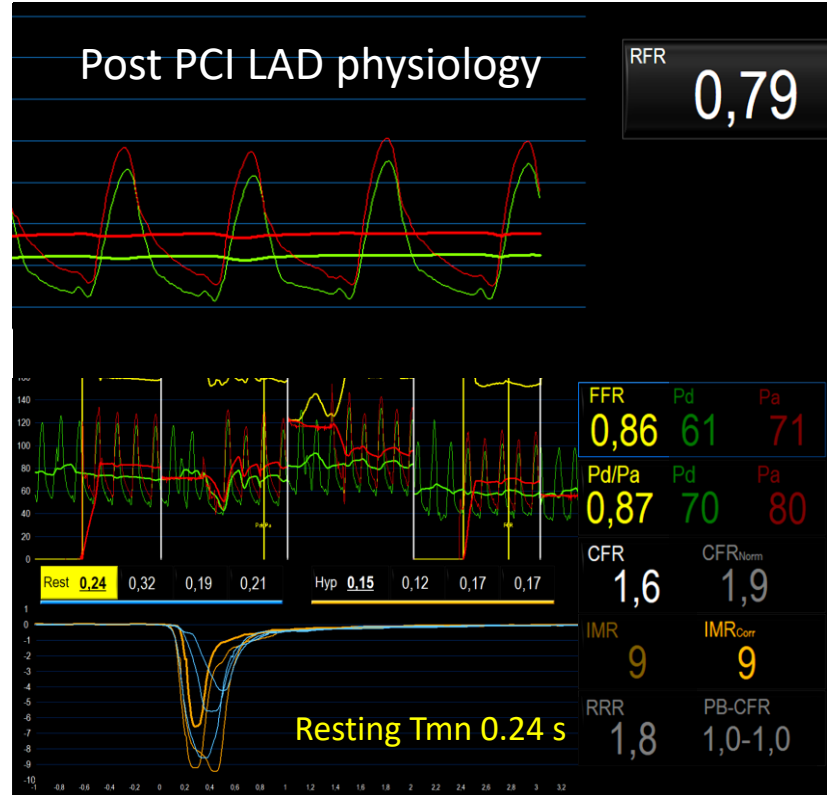


Similar good predictive value of RFR and DPR in predicting post-PCI iFR

Assessment of post-PCI results



Long complex case: LCX + LAD PCI. Rotational atherectomy LAD. NC balloon dilation. DES x2 in LAD.

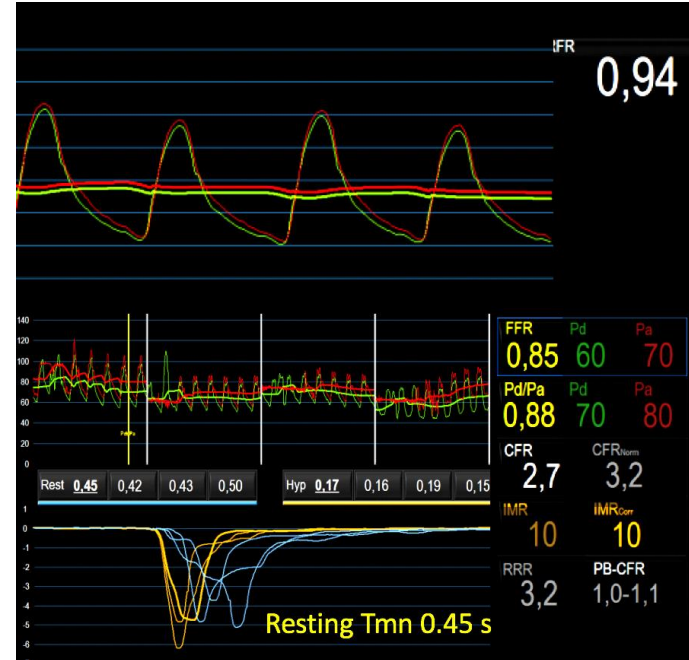


Assessment of post-PCI results

Post PCI LAD physiology



Repeat physiology 24 hours later




Long PCI / marked patient distress over the procedure may increase resting coronary flow, thus affecting post-PCI NHPR values.

Recommended updated information on this topic / Open Access

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Interventional cardiology

openheart Non-hyperaemic pressure ratios to guide percutaneous coronary intervention

Michael Michail ^{1,2} Udit Thakur,¹ Ojas Mehta,¹ John M Ramzy,¹ Andrea Comella,¹ Abdul Rahman Ildayhid,¹ James D Cameron,¹ Stephen J Nicholls,¹ Stephen P Hoole,³ Adam J Brown¹

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ABSTRACT

The use of fractional flow reserve (FFR) in guiding revascularisation improves patient outcomes and has been well-established in clinical guidelines. Despite this, the uptake of FFR has been limited, likely attributable to the perceived increase in procedural time and use of hyperaemic agents that can cause patient discomfort

Despite a robust body of evidence supporting its use, clinical uptake of FFR remains low and highly variable between healthcare systems.² Reasons for poor uptake include the perceived additional procedural cost and time, as well as the discomfort to patients

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Thank you for your attention