FFR, New Resting Indices, Post PCI Measurements, Tips and Tricks for Getting Accurate, Reproducible Information

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Disclosure #1:

Morton J. Kern, MD

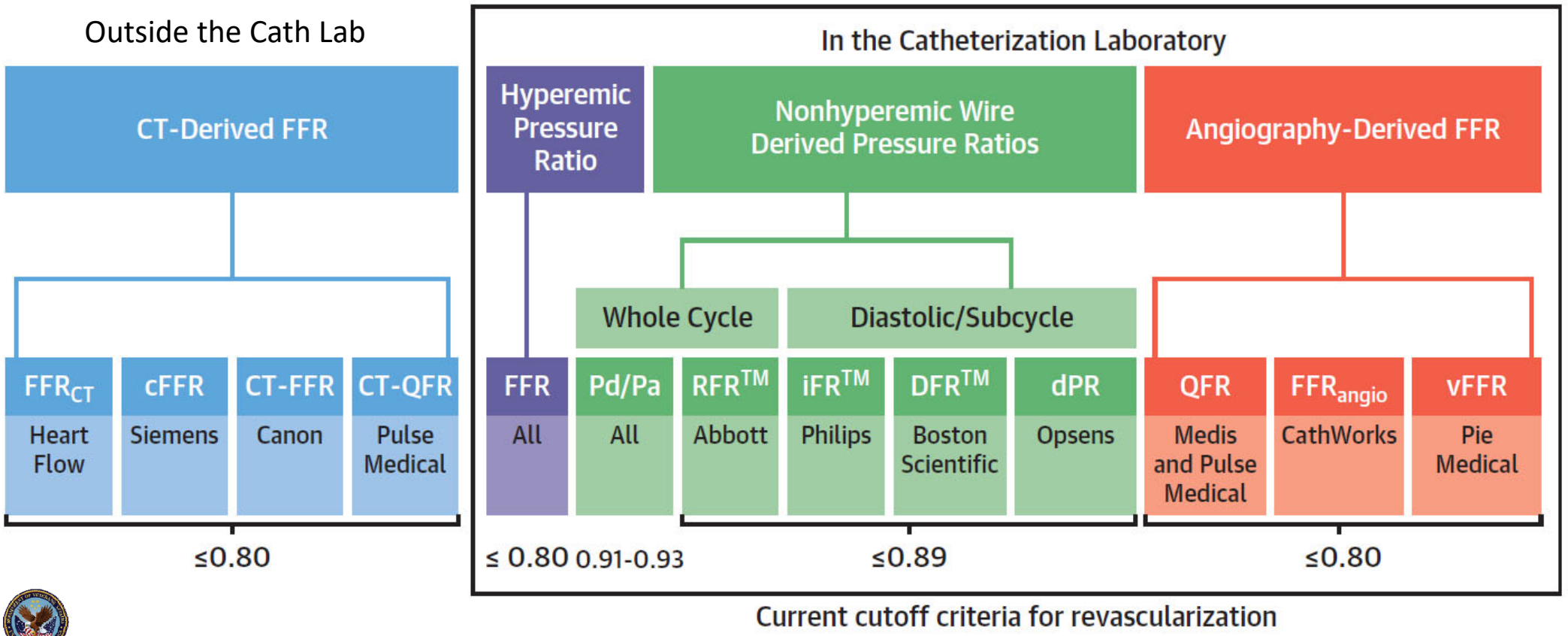
Within the past 12 months, the presenter or their spouse/partner have had a financial interest/arrangement or affiliation with the organization listed below.

Company Name	Relationship
Abbott Medical Inc.	Speakers' Bureau
Boston Sci Inc	Speakers' Bureau
Philips Volcano	Speakers' Bureau
Acist Medical Inc.	Speakers' Bureau
Opsens	Speakers' Bureau

Best Uses of FFR/NHPR for Clinical Decisions

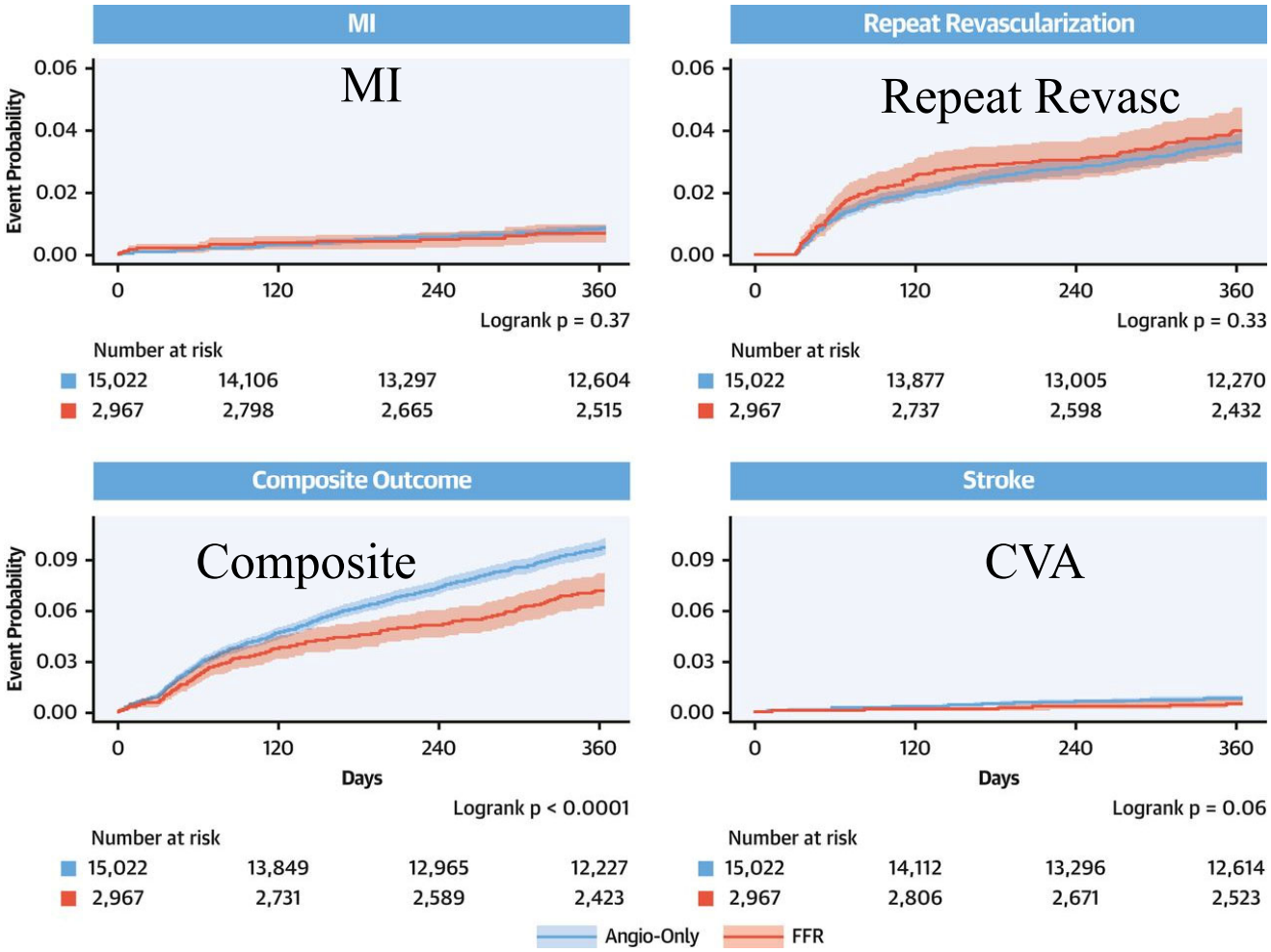
- **Assessment of Ischemia**
  - SIHD
  - ACS – Non Culprit
- **PCI**
  - Pre, during, post
- **CABG**
  - Pre, post
- **Aortic Stenosis, probably**
- **Microvascular Disease?**

Currently Available Physiological Assessment



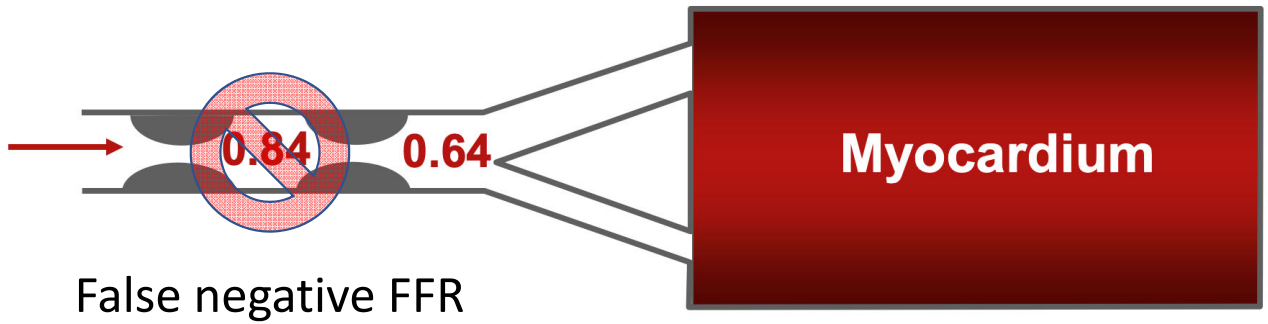
Kogame N et al. J Am Coll Cardiol Intv 2020;13:1617-1638

FFR-Guided Revascularization With Secondary Clinical Endpoints

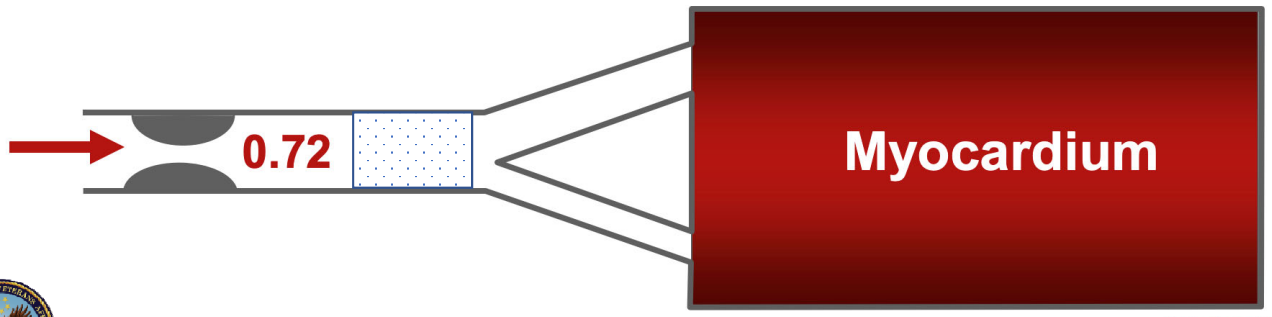


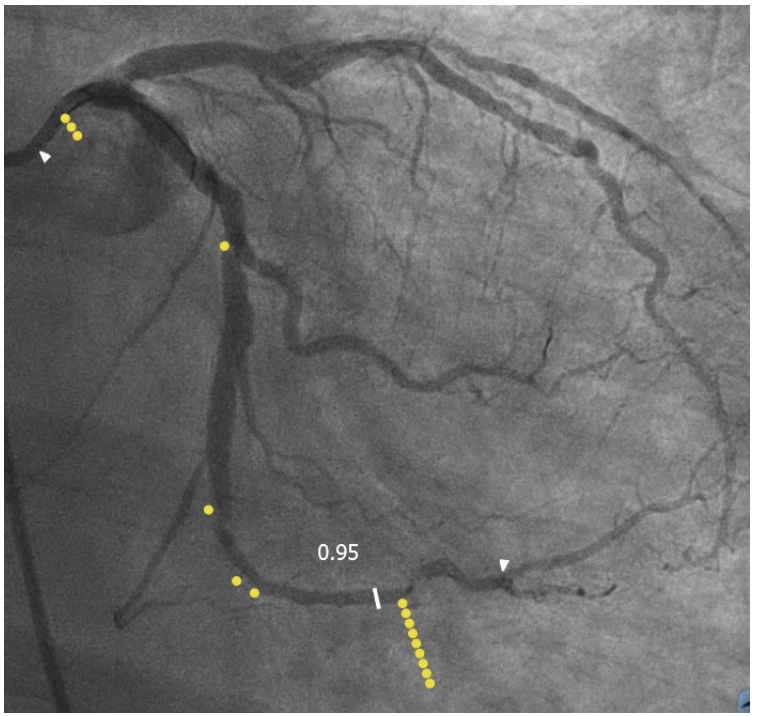
Rushi V. Parikh et al.
JACC 2020;75:409-419

FFR/NHPR for Diffuse disease or tandem lesions (e.g. iFR pullback)



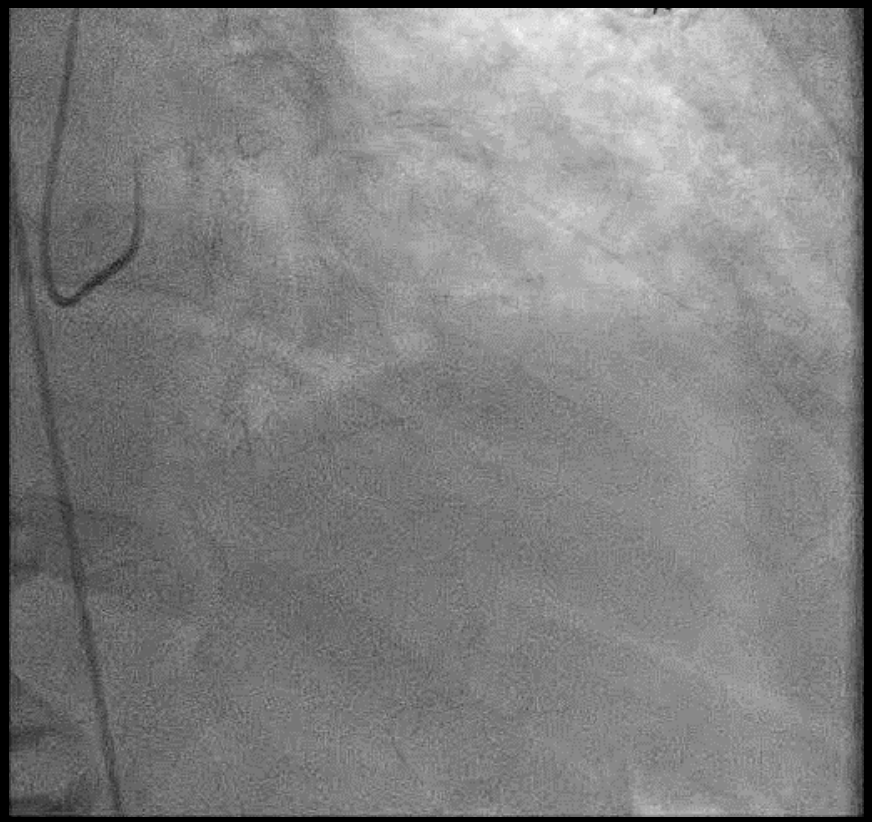
False negative FFR

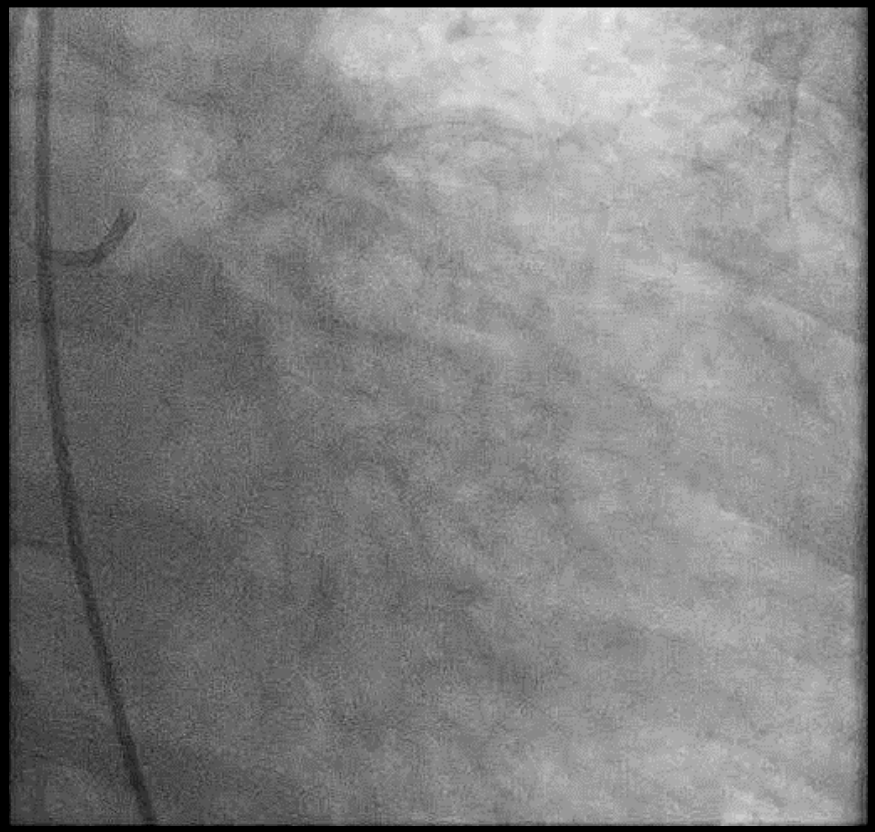




iFR pullback

81 yo M w angina and SOB. Prior LAD and CFX stents 4yr ago
Negative prior ETT 1 yr. CFX 2 lesions. **LAD+LM?**





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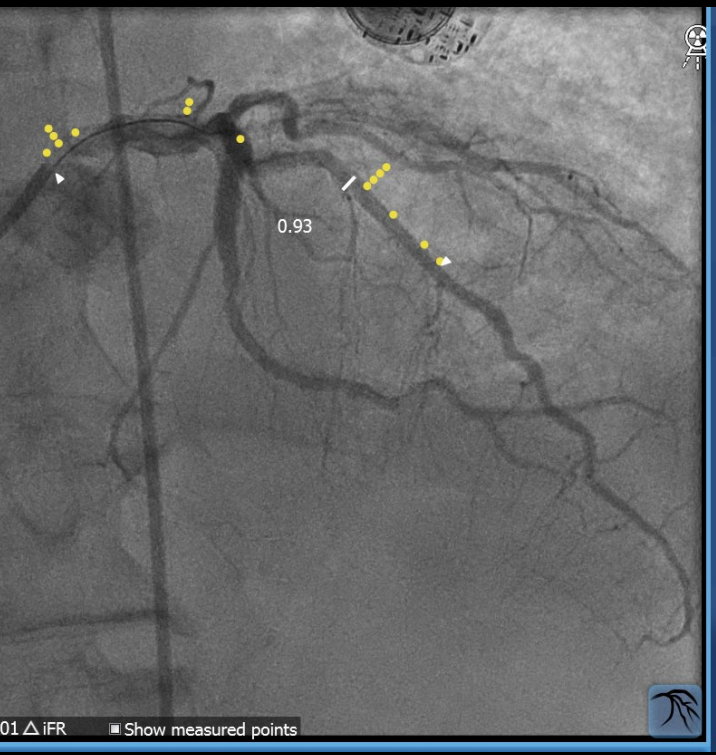
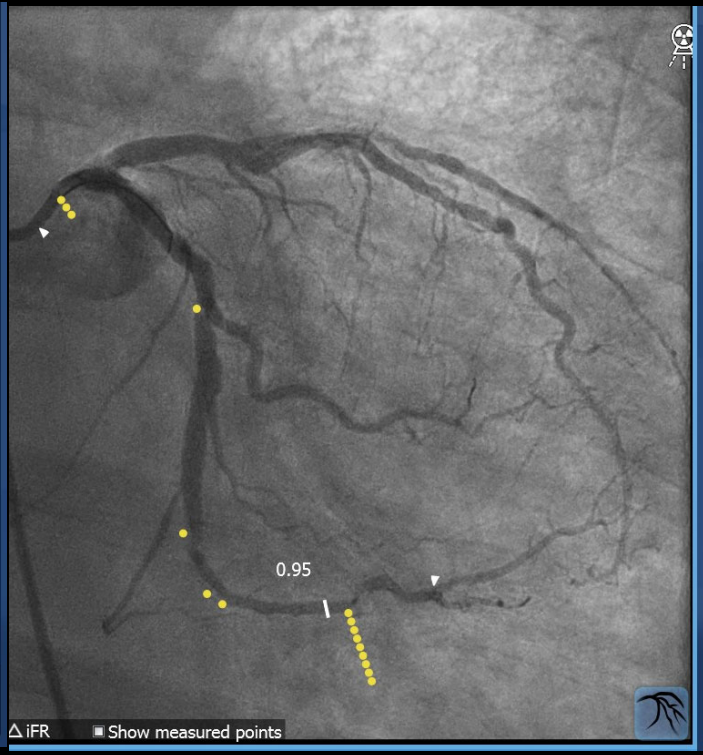
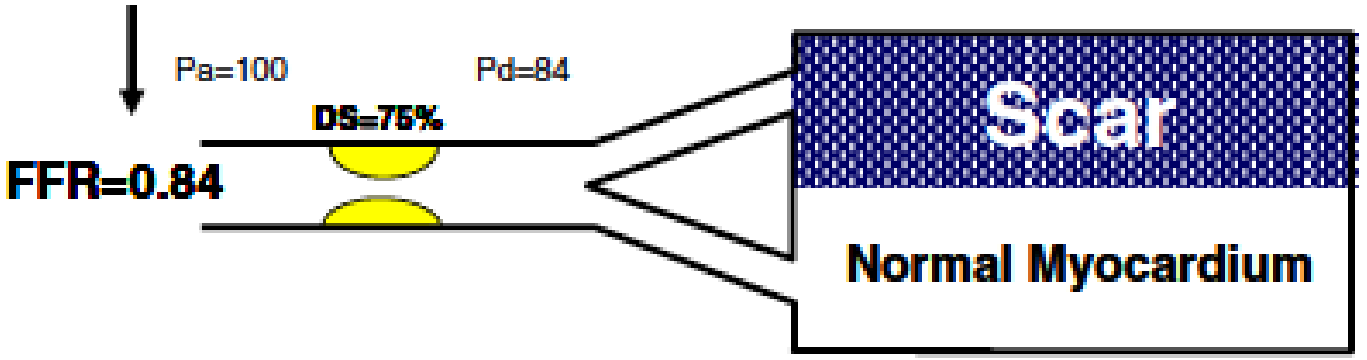
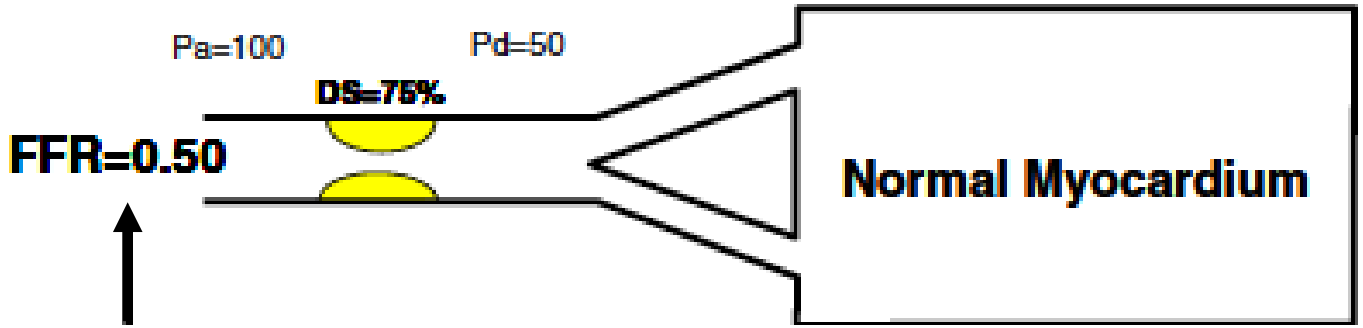




FFR not reliable in ACS because of dynamic nature of bed and lesion



Key: As flow recovers, FFR falls



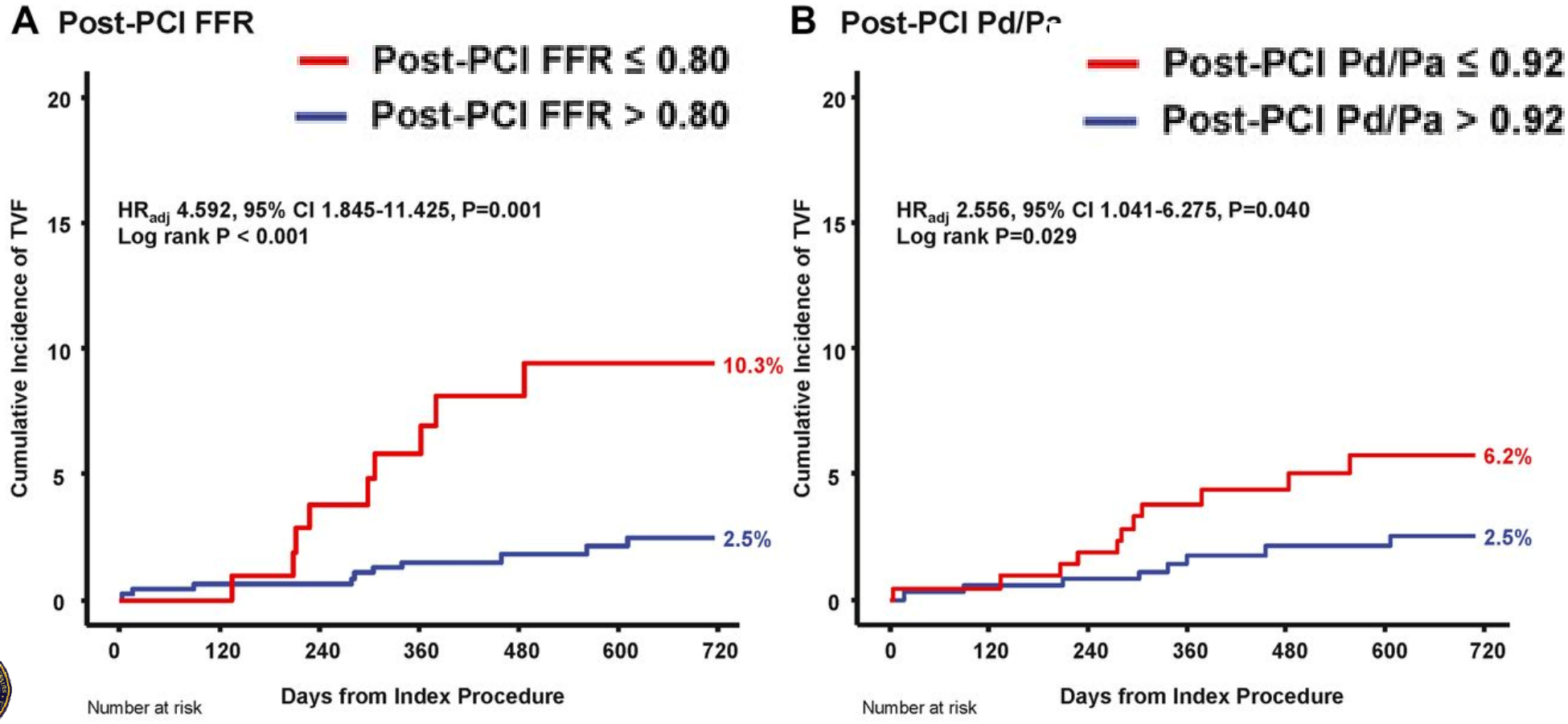
When Can We Use FFR in ACS?

TABLE 1 Indications for FFR-Based Decision Making

Vessel	SIHD	NSTE-ACS	STEMI
Clear culprit	Yes	No	No
Nonculprit	Yes	Yes	Yes

Fearon WF, *JACC*. 2016 Sep 13;68(11):1192-4.

Outcomes and Post-PCI Physiologic Indices

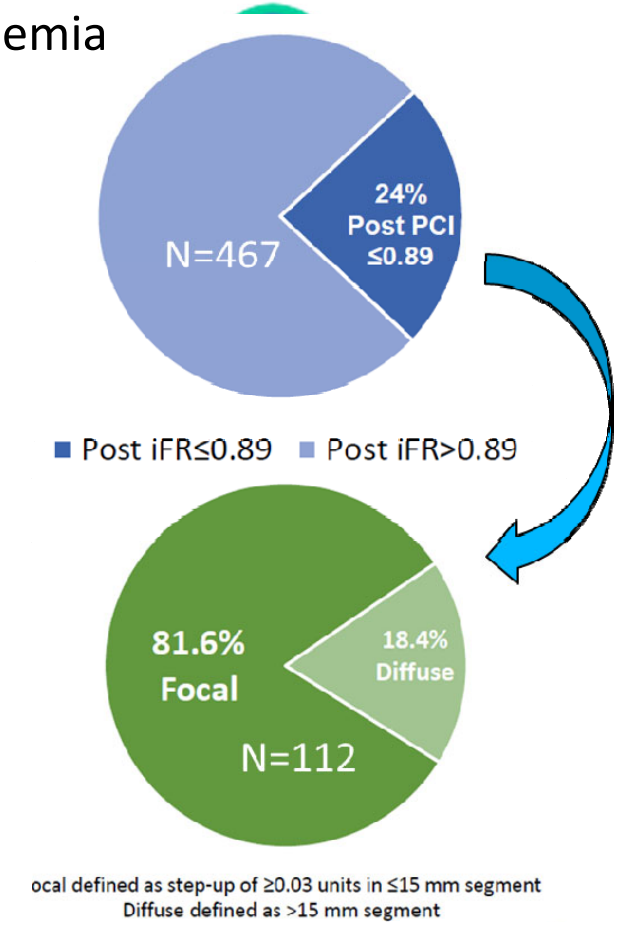


Doosup Shin et al. J Am Coll Cardiol Intv 2020;13:1920-1933

1-Year Outcomes of Patients with Residual Physiologic Ischemia After Percutaneous Coronary Intervention: The DEFINE PCI Trial

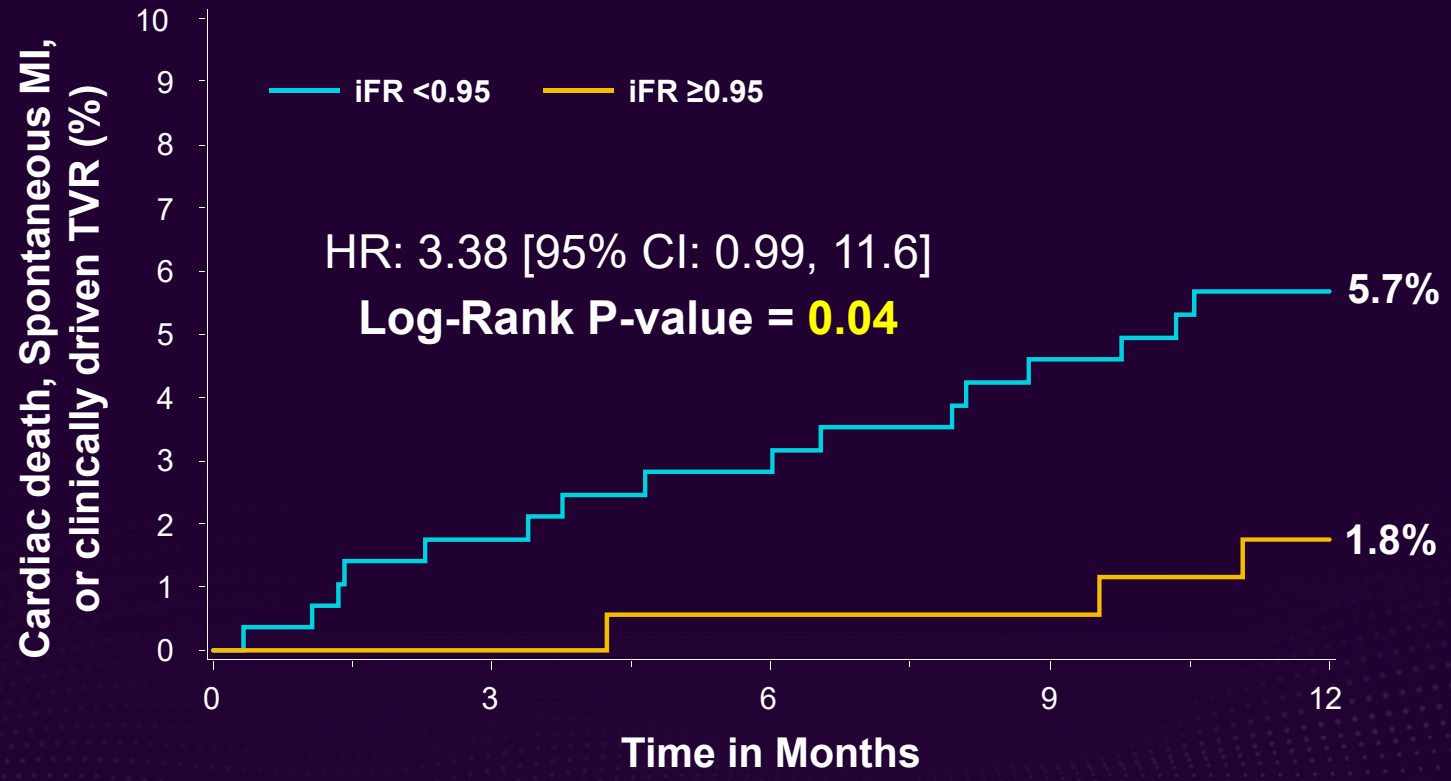
Manesh Patel, Allen Jeremias, Justin Davies, Akiko Maehara, Mitsuaki Matsumura, Arnold Seto, Habib Samady, Andrew Sharp, Joel Schneider, Kare Tang, Ziad Ali, Suneel Talwar, and Gregg W. Stone on behalf of the DEFINE PCI Investigators

Initial findings – 24% have residual ischemia



TCT 2020

Cardiac Death, Spontaneous MI, or Clinically Driven TVR



Number at risk:

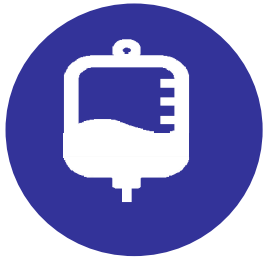
iFR <0.95	285	279	275	264	252
iFR ≥0.95	182	179	175	166	162

Clinical Challenges for Physiology in Specific Subgroups

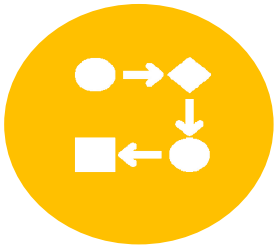
Patient Subgroup	FFR	NHPR	Key Points
Stable IHD, Low Risk	✔	✔	*Defer, Define-Flair, SwedeHeart*
STEMI / NSTEMI	✔	✘	FFR valid in non-culprit ACS vessel if <0.8
SVG Assessment	✔	✘	Physiology accurate, but biology of vein graft deterioration is critical role beyond “ischemia”
Ostial lesion, Left Main	✔	✔	IV hyperemia and caution for left main assessment and proximal LCX or LAD disease
Bypass Graft Failure	✔	✘	Early rate of bypass graft closure in non-physiologically significant vessels
Serial Lesions	?	✔	iFR pullback looks promising
Aortic Stenosis & TAVR	✔	?	With increasing coronary blood flow after successful AVR, decrease in FFR

Reproducibility and reliability?	Solutions
Drift	
Adenosine	
Poor pressure wire handling	
Tandem Lesions	
Microvascular Disease and FFR	
Recrossing stents at end of procedure	

Common Pitfalls in obtaining reliable physiology



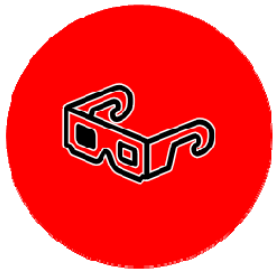
Nitrates



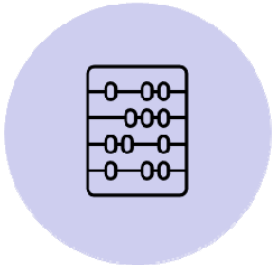
Normalize

No Touch

Watch the setup



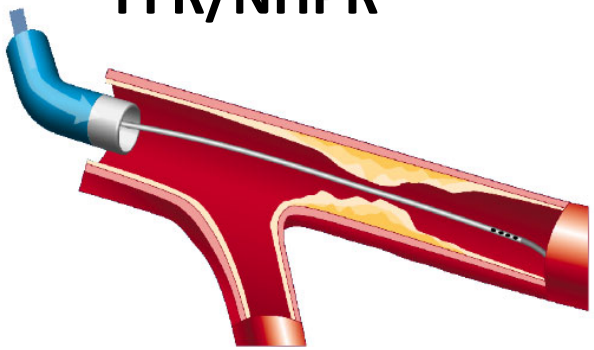
Weigh the results

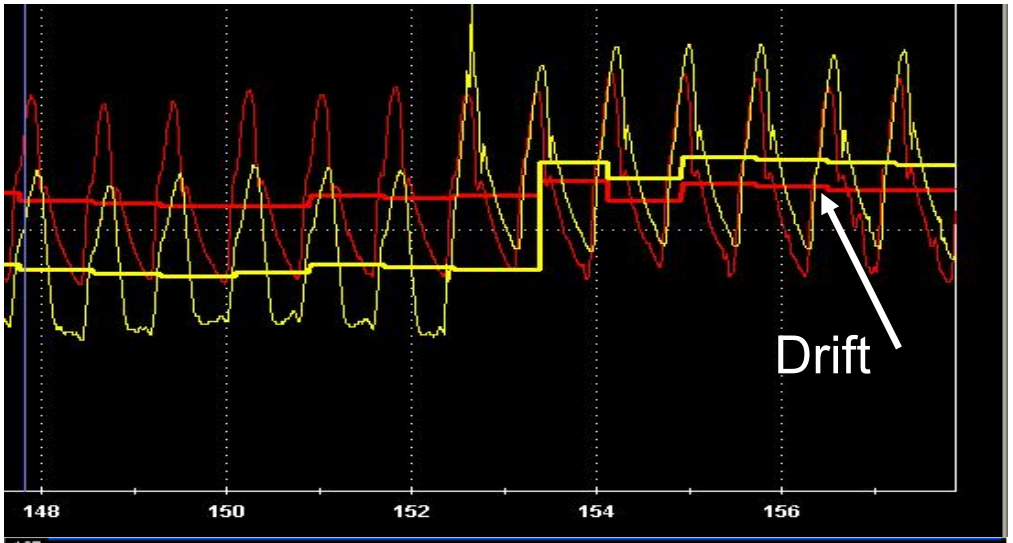


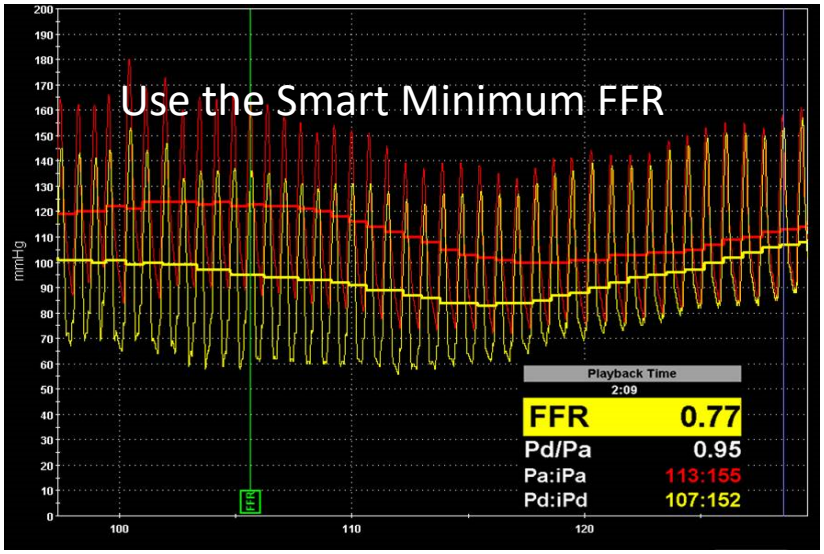
Wait for the right time

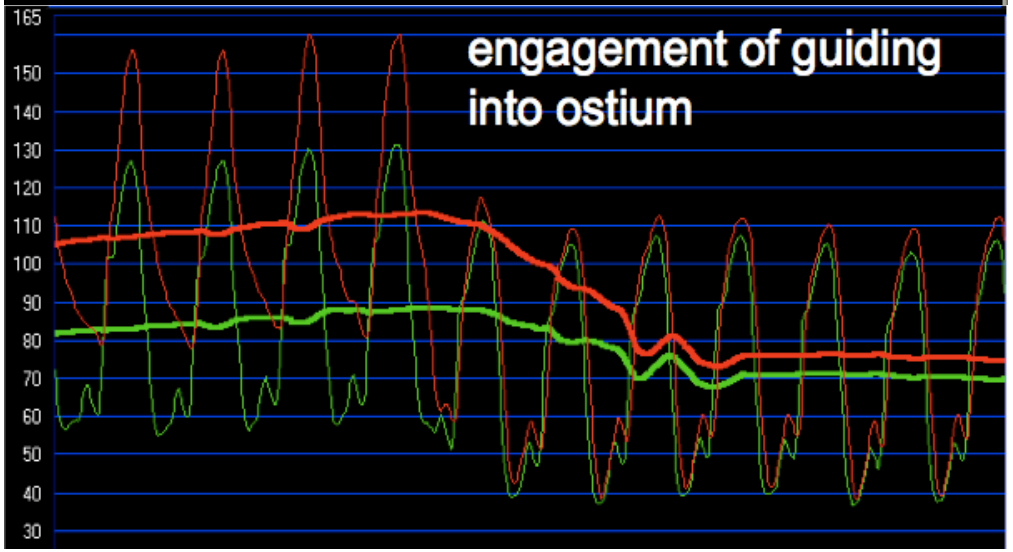
Modified From Karim Al-azizi, MD, The Heart Hospital Baylor Plano, Tx, CRT 2020 Fellows Course

Commonest Errors for FFR/NHPR

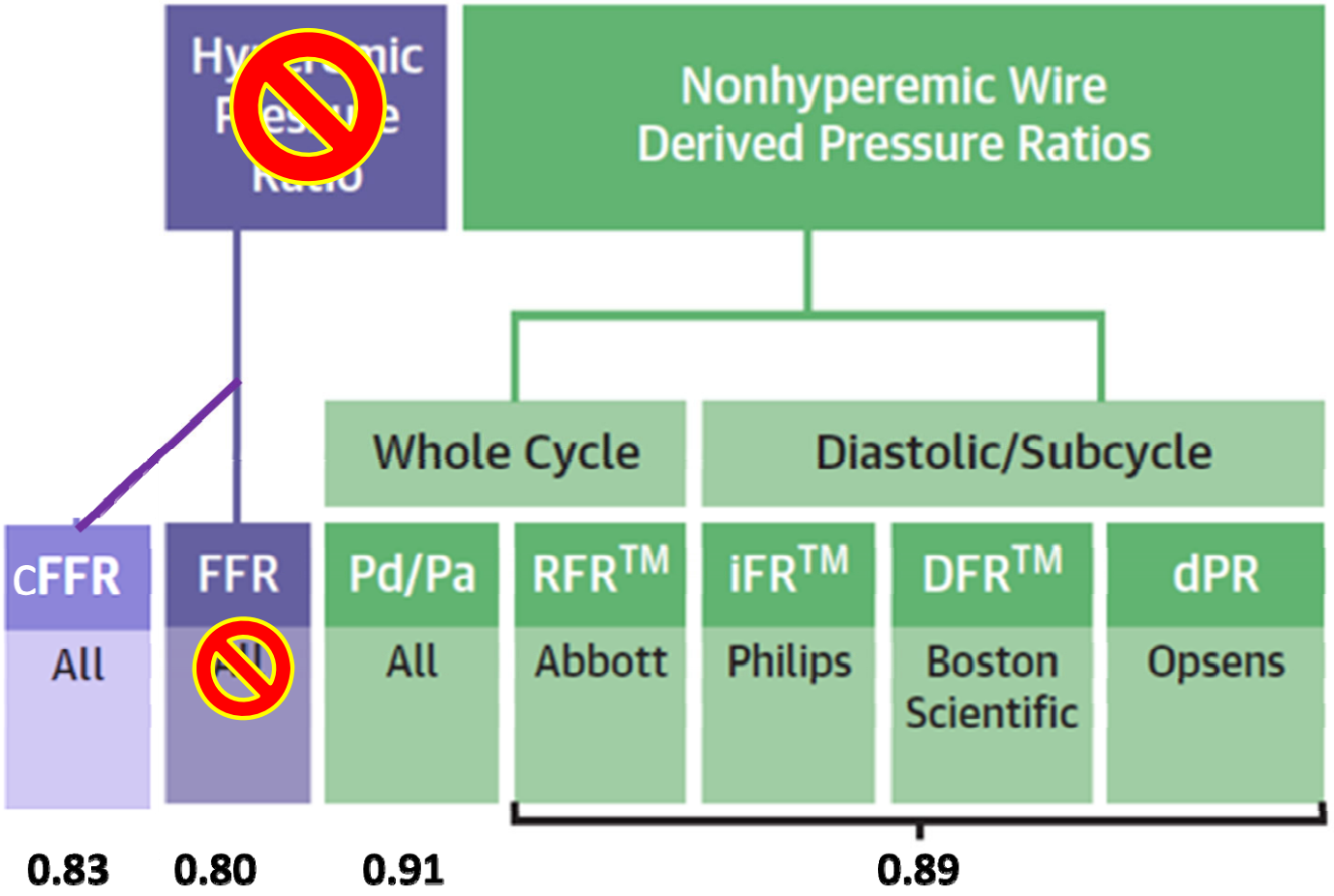








You Hate Adenosine? You have options



Using adenosine? Do it right

- Intravenous Adenosine

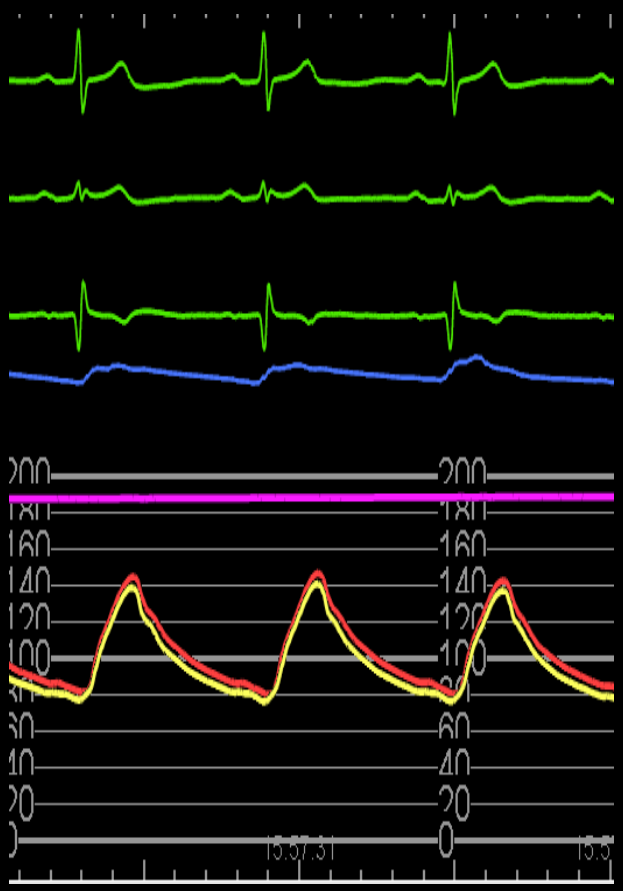
- Check infusion, IV, pump,
- 140mcg/kg, use smart minimum
- Large central vein preferred
- Avoid Valsalva during infusion

- ❑ Intracoronary Bolus
- ❑ Correct dose/dilution
- ❑ 30mcg/ml – bolus 50-100 mcg RCA, 100-200mcg LCA
- ❑ Guiding catheter not intubating the coronary artery, no flow obstruction (damping)

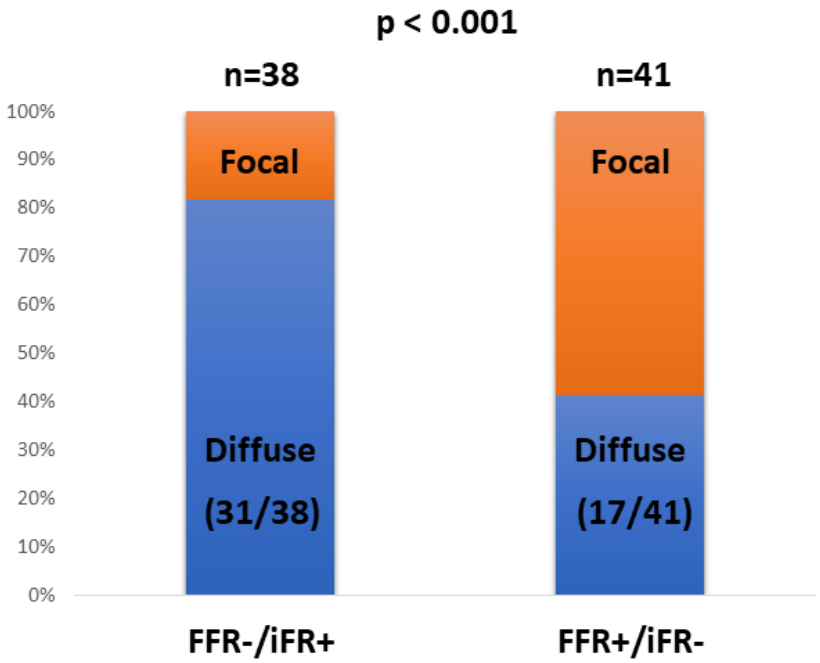
”I hate not understanding the Discordance between NHPR and FFR”

Baseline NHPR = 0.94

FFR = 0.80



Disease patterns and iFR/FFR discordance



$$\Delta P = f.Q + s.Q^2$$

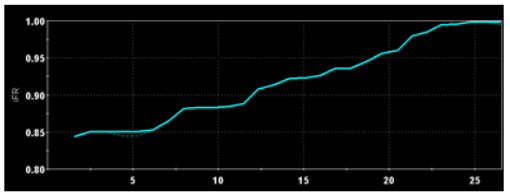
f. = friction coefficient

s. = separation coefficient

(a)

Moderate Gradient at Rest

Mild Increase at Hyperemia

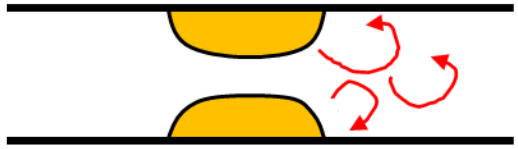


Mid LAD FFR 0.82 iFR 0.85

Diffuse

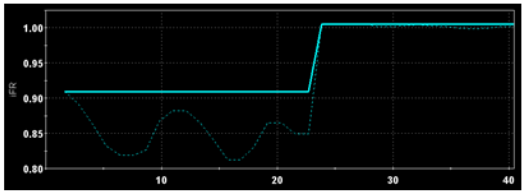
Reduced CFR

(b)



Small Gradient at Rest

Large Increase at Hyperemia



Proximal LAD FFR 0.79 iFR 0.91

Focal

Preserved CFR

Warisawa T, et al. Circ Cardiovasc Interv. 2019;12(5):e007494.

Algorithmic Approach to FFR/NHPR Decisions