FFR/IFR Should Not be the Gold Standard for Intervention Decisions

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**Disclosure Statement of Financial Interest**

Within the past 12 months, I or my spouse/partner have had a financial interest/arrangement or affiliation with the organization(s) listed below.

<table>
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<tr>
<th>Affiliation/Financial Relationship</th>
<th>Company</th>
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<tr>
<td>Grant/Research Support</td>
<td>Boston, Abbott, Medtronic, Edwards</td>
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<td>Consulting Fees/Honoraria</td>
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<td>President (unpaid)</td>
<td>NBPAS</td>
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Does this lesion “need” a stent?

Is it “significant.?”
Total number of non structural patients treated = 695

PCI = 525

Diagnostic only = 170

FFR/iFR = 277 (40%)

IVUS = 273 (39%)

Both FFR/iFR and IVUS = 87 (12%)

Either FFR/iFR or IVUS = 463 (67%)
78 yo with angina, especially during intercourse.
Medical therapy = Norvasc, asa
• FFR = 0.87
IVUS performed
MLA = 1.8
Despite patient’s symptoms, angiographic and IVUS lesion, I as barred from stenting by my colleagues....

“With FFR of 0.87, you will be sent to quality committee jail, Paul!”

Treatment: add nitro and beta blockers but no stent, just increased medical therapy

Follow-up:
Successful outcome.

Patient no longer has angina because he has headaches and no viagra from nitro and can no longer achieve erections on beta blocker, so... no more sex...no more angina
82 yo RCA stented several months earlier….still has angina….a “bounce back.”

Medical therapy includes nitrates, beta blockers and calcium blockers.

RCA looks great, LAD lesion had been left alone.
FFR = 0.85

In light of continued angina and “bounce back” IVUS was performed
MLA on IVUS = 2.9
What should we do?

To stent or not to stent, that is the question!
Symptoms resolved
RXi™ Rapid Exchange FFR System

The RXi system, with the ultra-thin ACIST Navvus™ Rapid Exchange FFR MicroCatheter, gives you the freedom to quickly and easily assess FFR using your wire of choice.
Catheter-based FFR: Navvus MicroCatheter

- Delivered over a standard 0.014” guidewire
- Marker band located 2.5mm from tip
- Fiber-optic sensor 2.5mm from marker band (5mm from tip)
- Profile comparable to 0.022” diameter at lesion site

![Diagram of the Navvus MicroCatheter showing femoral markers, working length, and transducer location.](image-url)
Primary Results of the Assessment of Catheter-based Interrogation and Standard Techniques for Fractional Flow Reserve Measurement Study

The ACIST-FFR Study

William F. Fearon, MD, Jeffrey W. Chambers, MD, Arnold H. Seto, MD, Ian J. Sarembock, MD, Ganesh Raveendran, MD, Charlotte Sakarovitch, PhD, Lingyao Yang, MS, Manisha Desai, PhD, Allen Jeremias, MD, and Matthew J. Price, MD for the ACIST-FFR Study Investigators
Study Design

• **Design**: Prospective, open-label, observational study
• **Primary endpoint**: Difference in agreement between microcatheter and PW FFR by Bland-Altman
• **Core laboratory assessed** FFR and QCA (CRF, NY, NY)
• **Independent analyses** performed by Stanford University

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**Enrollment**
- Stable angina or ischemia
- Indicated for FFR
- RVD ≥ 2.25 mm

**Resting Pd/Pa**
- PW Alone
- Deliver Navvus over PW
- Measure with both systems

**Navvus FFR**
- Check PW FFR
- Navvus drift check
- Navvus removed

**Pressure Wire FFR**
- With PW Alone
- PW Drift Check
Primary Endpoint: Microcatheter vs. Pressure Wire FFR, Core Lab Values, by Bland Altman Analysis

N=169

Bias: -0.022
(95%CI: -0.029, -0.015)

Upper 95% LOA: 0.071

Lower 95% LOA: -0.12
Sensitivity Analysis: Microcatheter vs. Pressure Wire FFR, Site Report Values

Mean FFR

FFR Difference (Microcatheter-PW)

Bias: -0.025
(95%CI: -0.034,-0.016)

Upper 95% LOA: 0.109

Lower 95% LOA: -0.16

N=221
Randomised Comparison of Simultaneous Data from two Different Pressure Wires:

the COMET trial

Nick Curzen
University Hospital Southampton, UK

Rod Stables
Liverpool Heart & Chest Hospital, UK

on behalf of the COMET Investigators
Silicone Coating

Spring Coil

Stainless Steel Core

Laser-cut Hypotube

Optimized Slot Pattern Transition

Fiber optic sensor

Diameter: 0.14”
Method

- Ethical approval granted for written informed consent in cases in whom FFR is clinically indicated
- Elective & NSTACS
- Web based randomisation after diagnostic angiography
- 2 centres (Southampton & Liverpool)
- Patients randomised to one of 3 paired wire options:
  - BS - BS  n of Patients = 37  n of Paired Readings = 90
  - SJ - SJ  n of Patients = 34  n of Paired Readings = 90
  - BS - SJ  n of Patients = 35  n of Paired Readings = 108
  (BS/SJ sub-randomised for wire to be passed first)

- For each vessel, 4 simultaneous pressure recordings were taken with the wires at exactly the same position...

1. Equalisation at the guide catheter tip
2. Baseline Pd/Pa at the target measurement site in the distal vessel
3. FFR at the target measurement site (steady state maximum hyperaemia using iv adenosine)
4. Final Pd/Pa at the guide catheter tip (for estimation of “drift”)
   BS Drift estimation in 142 vessels;  SJ Drift estimation in 137 vessels
**Primary Outcome**

Observed absolute $\Delta$

(irrespective of sign - Median and IQR)

- BS-SJ  Median = 0.01  IQR (0.01 – 0.0225)
- SJ-SJ  Median = 0.015 IQR (0.01 – 0.03)

($p = 0.61$  Mann-Whitney test)
Fractional Flow Reserve–Guided Revascularization

Practical Implications of a Diagnostic Gray Zone and Measurement Variability on Clinical Decisions

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Mauro Echavarria-Pinto, MD,† Javier Escaned, MD, PhD,†
Darrel P. Francis, MB, BCHIR, MA, MD,* Justin E. Davies, MBBS, PhD*

London, United Kingdom; and Madrid, Spain

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BACKGROUND:

Current appropriateness guidelines recommend the utilization of FFR to guide coronary revascularization based on a fixed cut-off of 0.8. This rigid approach does not take into account the intrinsic biological variability of a single FFR result and the clinical judgment of experienced interventional cardiologists.

METHODS:

FFR reproducibility data from the landmark Deferral Versus Performance of PTCA in Patients Without Documented Ischemia (DEFER) trial was analyzed (two repeated FFR measurements in the same lesion, 10 min apart)
RESULTS:

Outside the [0.75 to 0.85] FFR range, measurement certainty of a single FFR result is >95%. However, closer to its cut-off, certainty falls to less than 80% within 0.77 to 0.83, reaching a nadir of 50% around 0.8. In clinical practice, that means that each time a single FFR value falls between 0.75 and 0.85, there is a chance that the FFR-derived revascularization recommendation will change if the measurement is repeated 10 min later, with this chance increasing the closer the FFR result is to 0.8.
Figure 1. Biological Variability of FFR Test-retest reproducibility of 2 repeated measurements of fractional flow reserve (FFR) taken 10 min apart is shown as a scatter plot (A, gray dashed envelope demarcates 99% of the data points from 0.5 to 1 and dotted line...
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Ricardo Petracco, Sayan Sen, Sukhjinder Nijjer, Mauro Echavarria-Pinto, Javier Escaned, Darrel P. Francis, Justin E. Davies

JACC: Cardiovascular Interventions, Volume 6, Issue 3, 2013, 222–225

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DEFINE-FLAIR and iFR SwedeHeart in clinically meaningful patient distribution
In our view, therefore, it would be rational for clinicians to make revascularization decisions based on broadened clinical judgment when FFR values fall in this 0.75 to 0.85 biological variability zone, particularly between 0.77 and 0.83. Within this range, it would be particularly relevant to use all available information (including other perfusion imaging modalities, considering anatomical features and risk-benefit profile) to deliver safe and suitable care for individual patients.
Like Guidelines and AUC, FFR cut offs are simply suggestions. Let's not empower them with more importance than they deserve.

The “Gold Standard” should still be clinical judgement!
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