Angiography-Based Physiology Assessment

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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

Affiliation/Financial Relationship	Company
Grant/ Research Support:	**Abbott, Medtronic, Edwards**
Consulting Fees/Honoraria:	**CathWorks, HeartFlow**
Major Stock Shareholder/Equity Interest:	
Royalty Income:	
Ownership/Founder:	
Salary:	**NIH R61 HL139929-01A1 (PI)**
Intellectual Property Rights:	

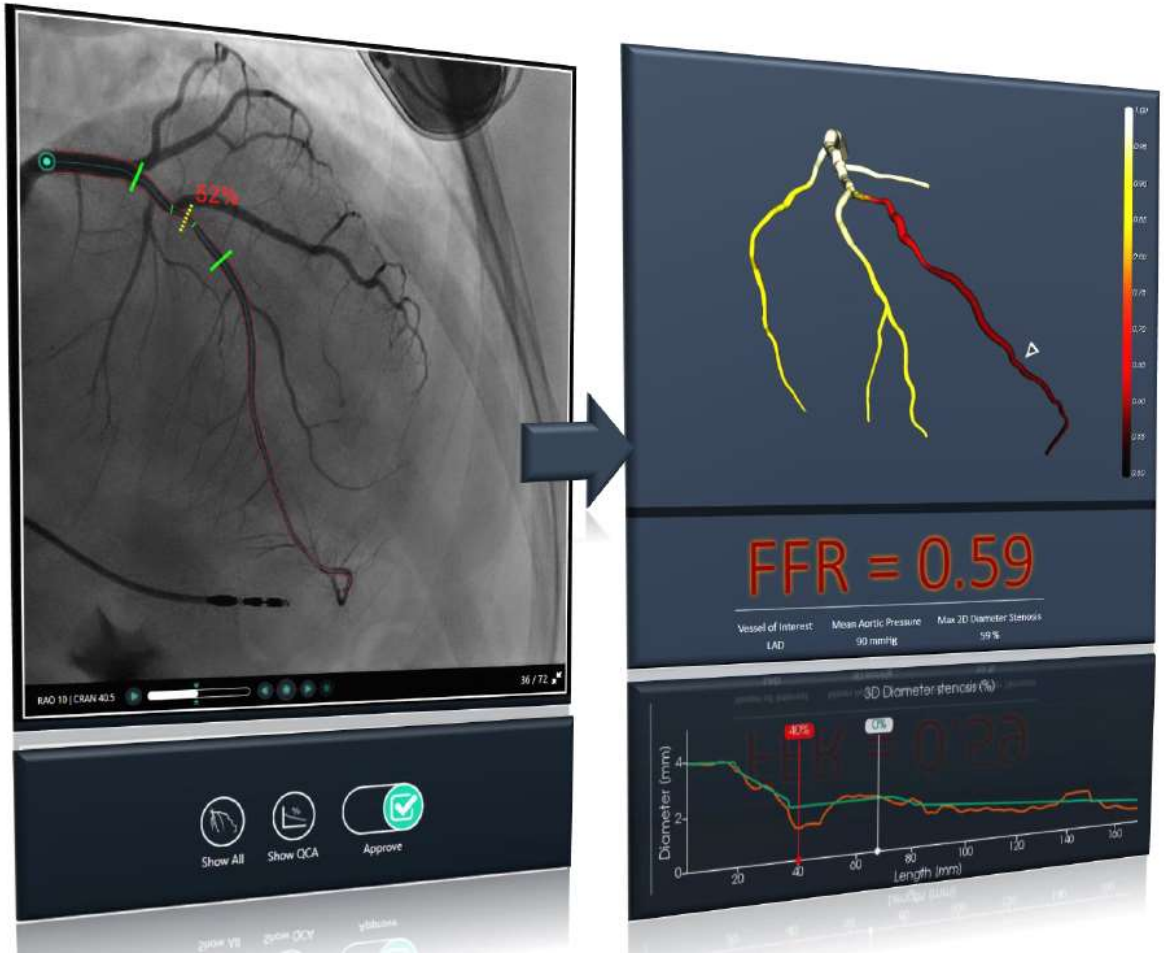
Why Don't We Perform Wire-Based Coronary Physiology?

- It takes time…
- Wire handling characteristics…
- Pressure drift is frustrating…
- Side effects of adenosine…
- It is expensive…
- There is a small risk…

Coronary Pressure Wire

Angiography-Derived FFR

Measurement of FFR without the need of a pressure wire or adenosine



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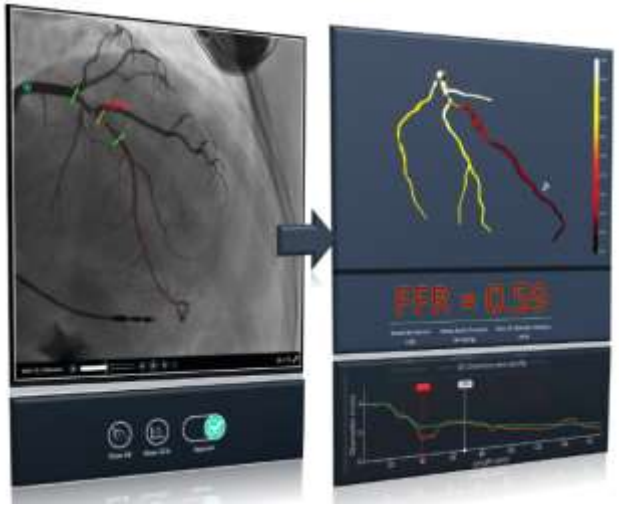
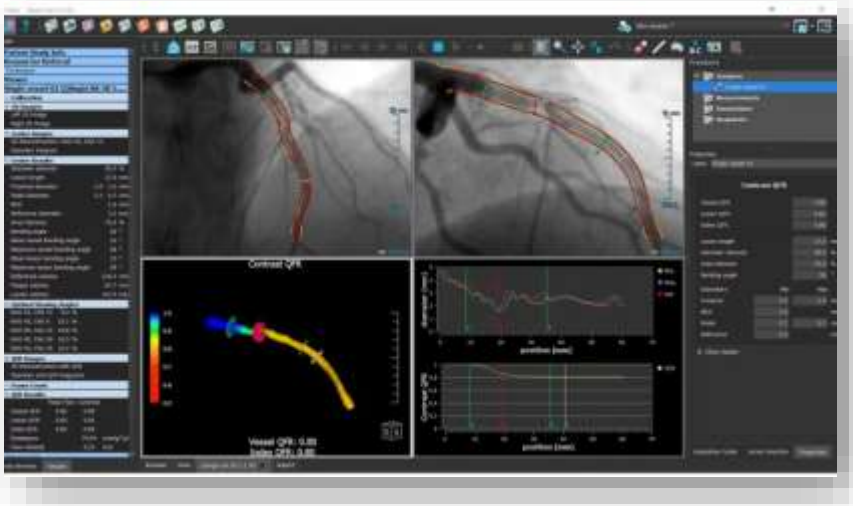
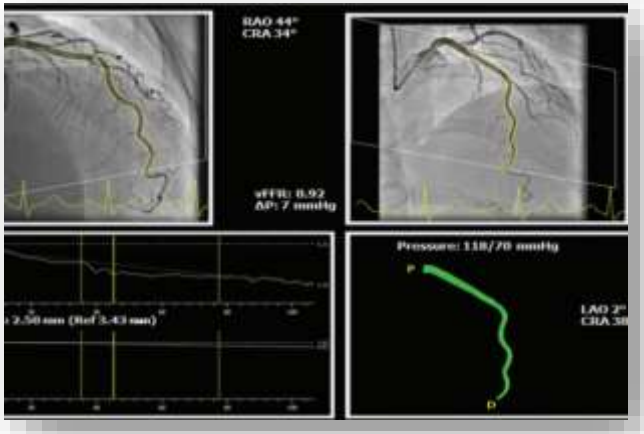


FFR_{angio}
CathWorks



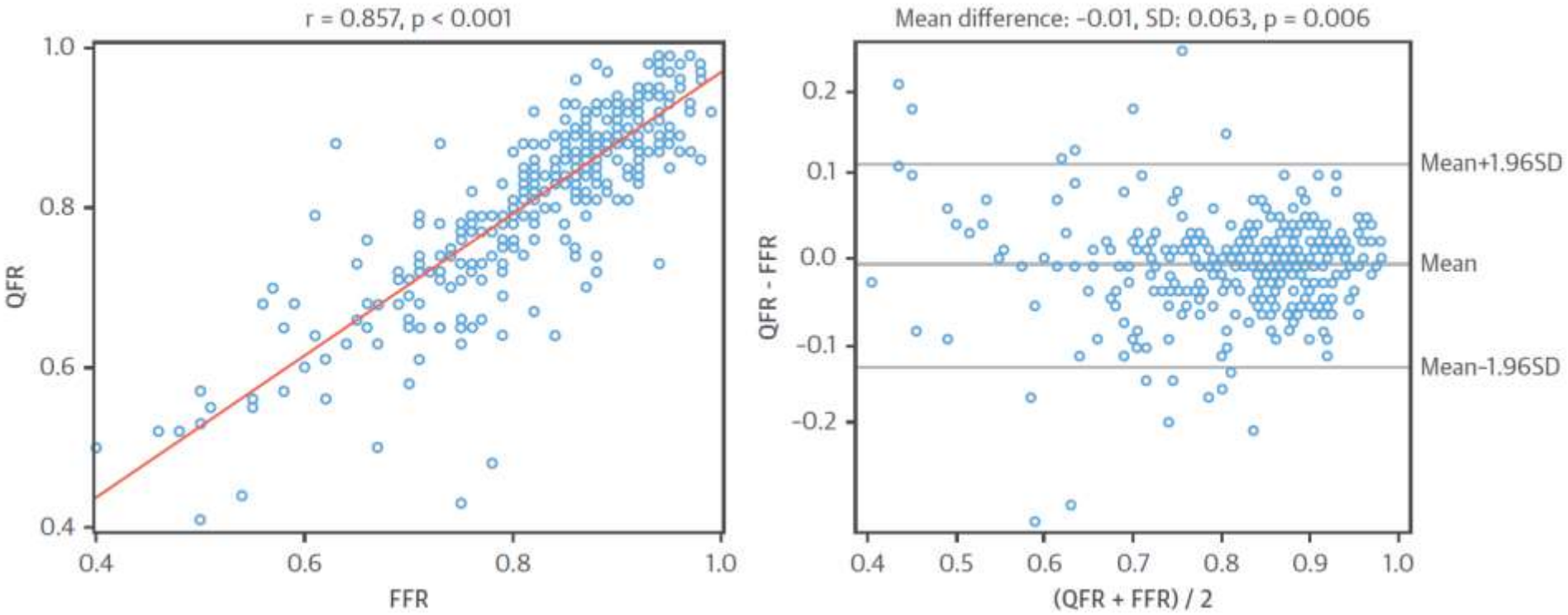
QFR
Medis Medical



vFFR
Pie Medical

Quantitative Flow Ratio

Quantitative Flow Ratio (QFR) compared with invasive FFR in 328 lesions

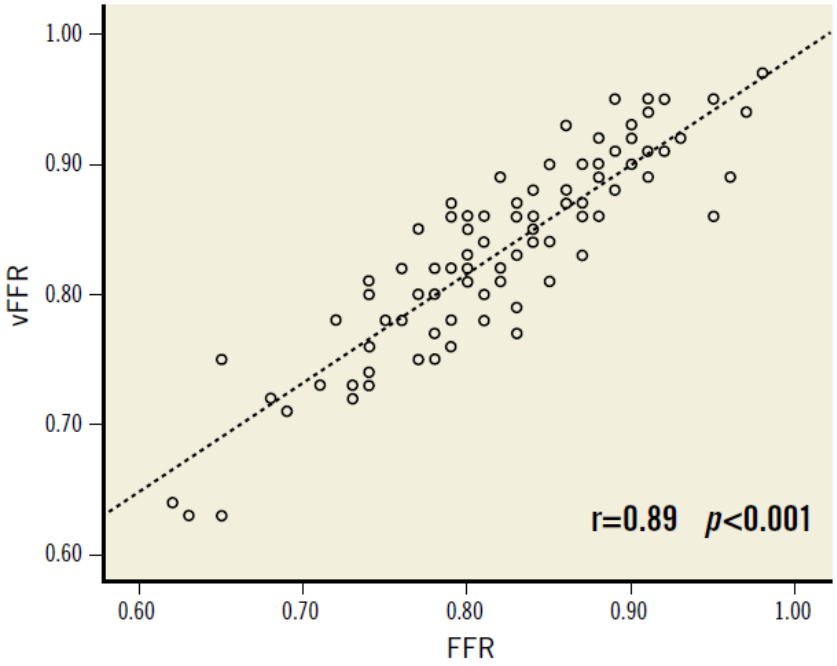


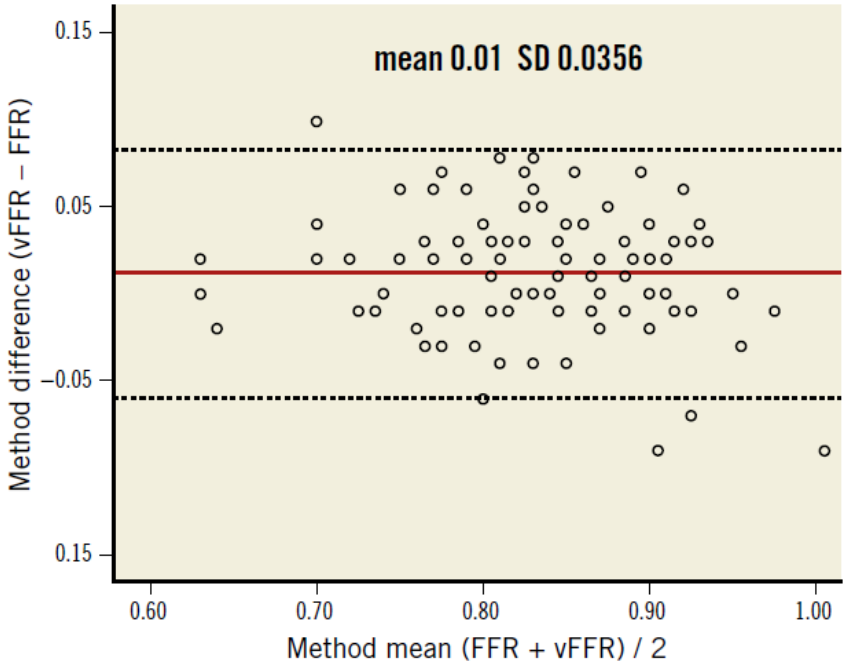
Sensitivity, specificity and accuracy of QFR was 95%, 92% and 93%

Xu, et al. J Am Coll Cardiol 2017;70:3077-87.

Vessel Fractional Flow Reserve

vFFR compared with invasive FFR in 100 patients



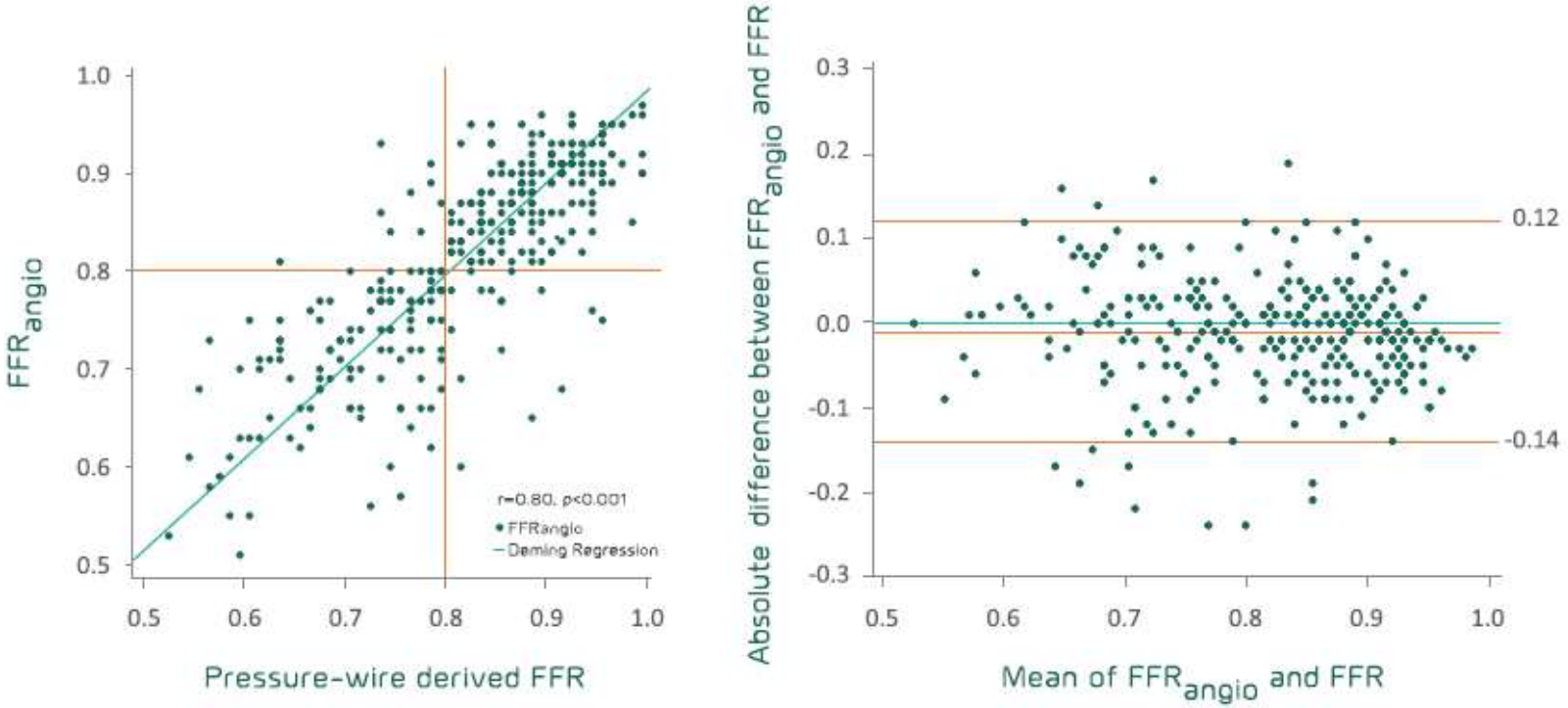


The AUC of vFFR was 0.93

Masdjedi, et al. EuroIntervention 2020;16:591-99.

FAST FFR Trial

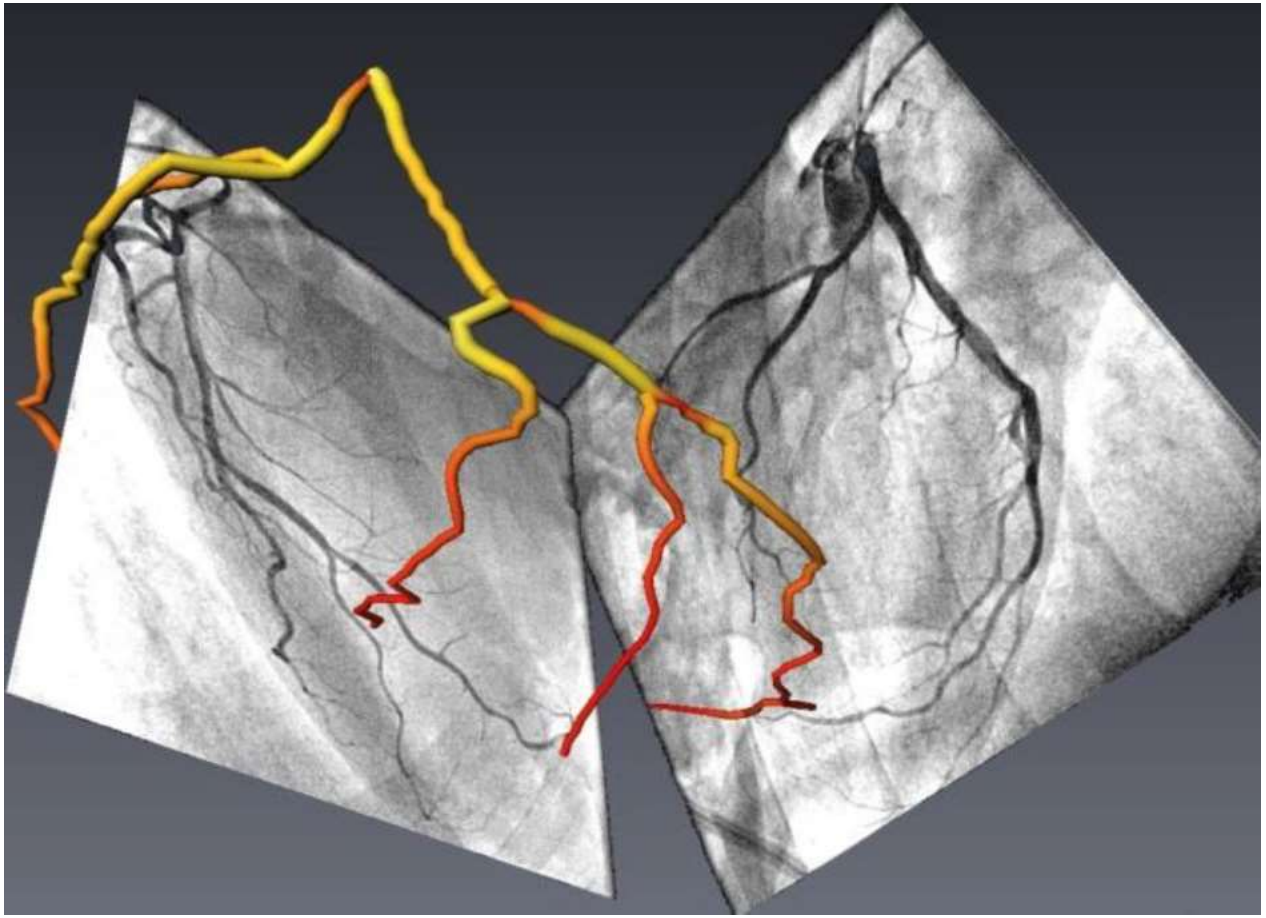
FFR_{angio} compared with invasive FFR in 319 vessels



Sensitivity, specificity and accuracy of FFRangio was 94%, 91% and 92%

Circulation 2019;139:477-84.

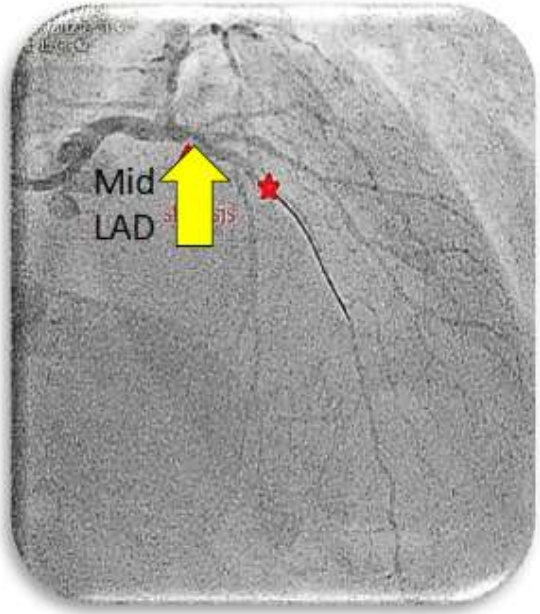
FFR_{angio}

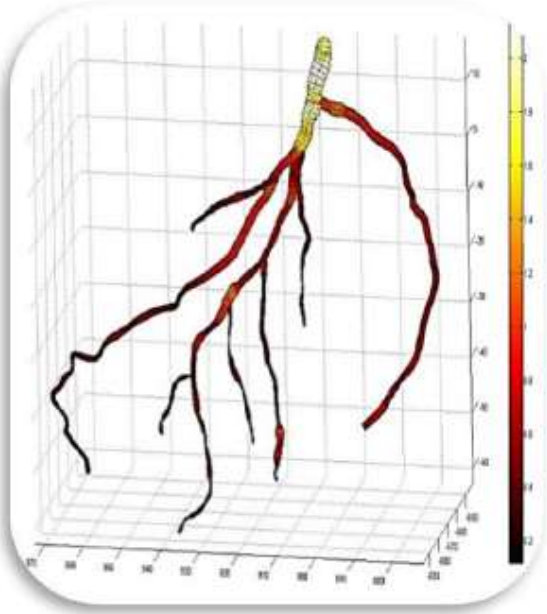


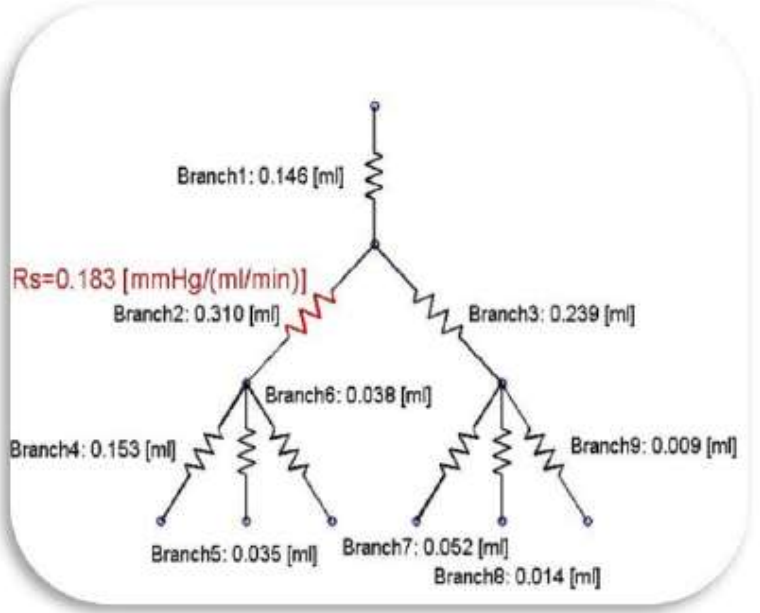
Courtesy of CathWorks

FFR_{angio}

The coronary arterial network is modeled as an electrical circuit with each segment acting as a resistor. The vessel resistance is estimated based on its length and diameter. Each vessel's contribution to flow is based on its impact on overall resistance depending on the arrangement.





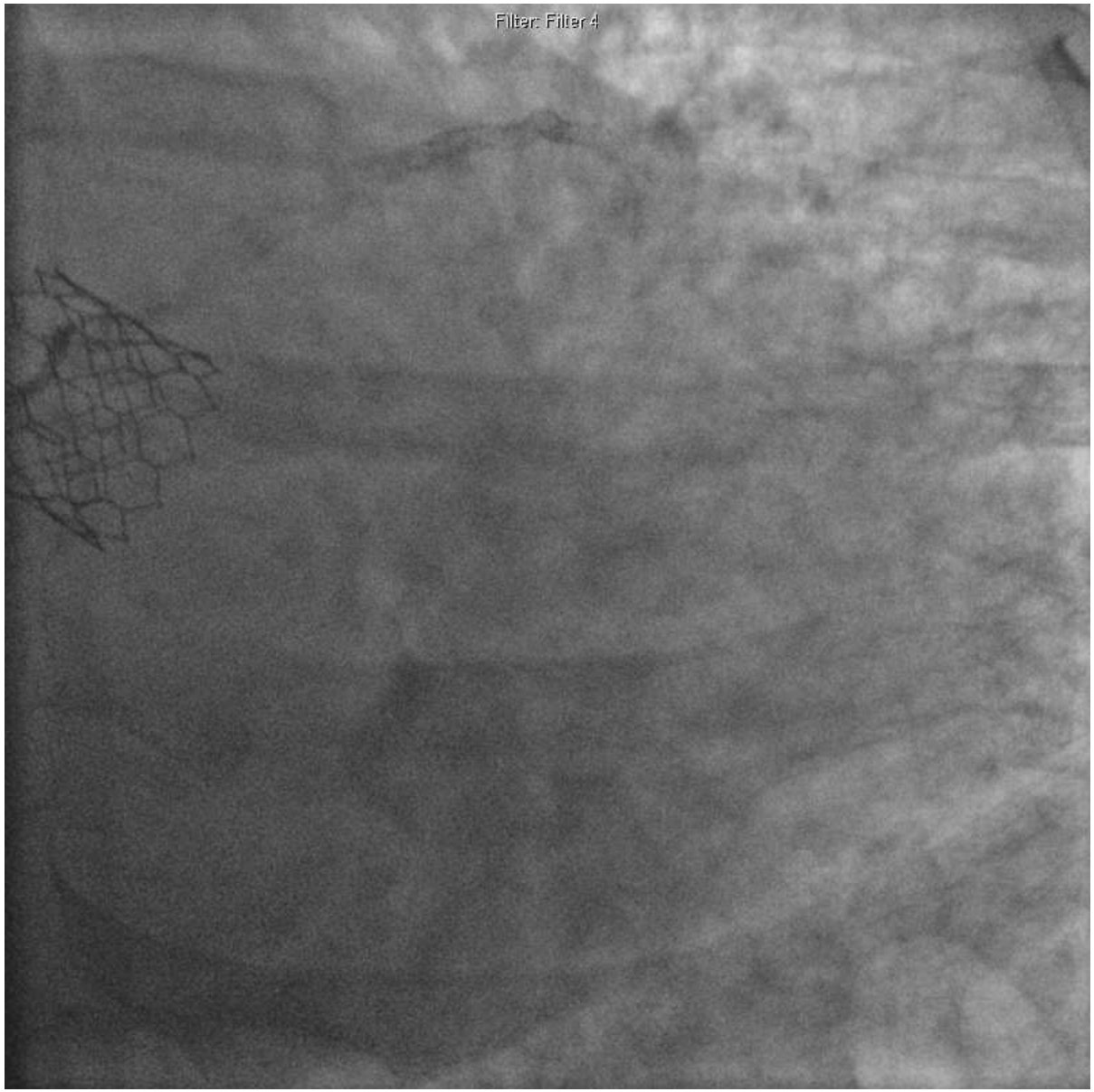


Courtesy of CathWorks

Real World Cases:

- 86 yo woman (5 feet 5 inches, 271 pounds) with history of aortic stenosis and CAD
- 18 months ago underwent TAVR and PCI of LAD. Moderate left circ/OM disease with pressure wire FFR 0.82
- Now multiple episodes of atypical chest pain
- Echo: Normal EF, mean aortic valve gradient 16, no PVL
- DSE: No stress-induced wall motion abnormalities


Filter: Filter 4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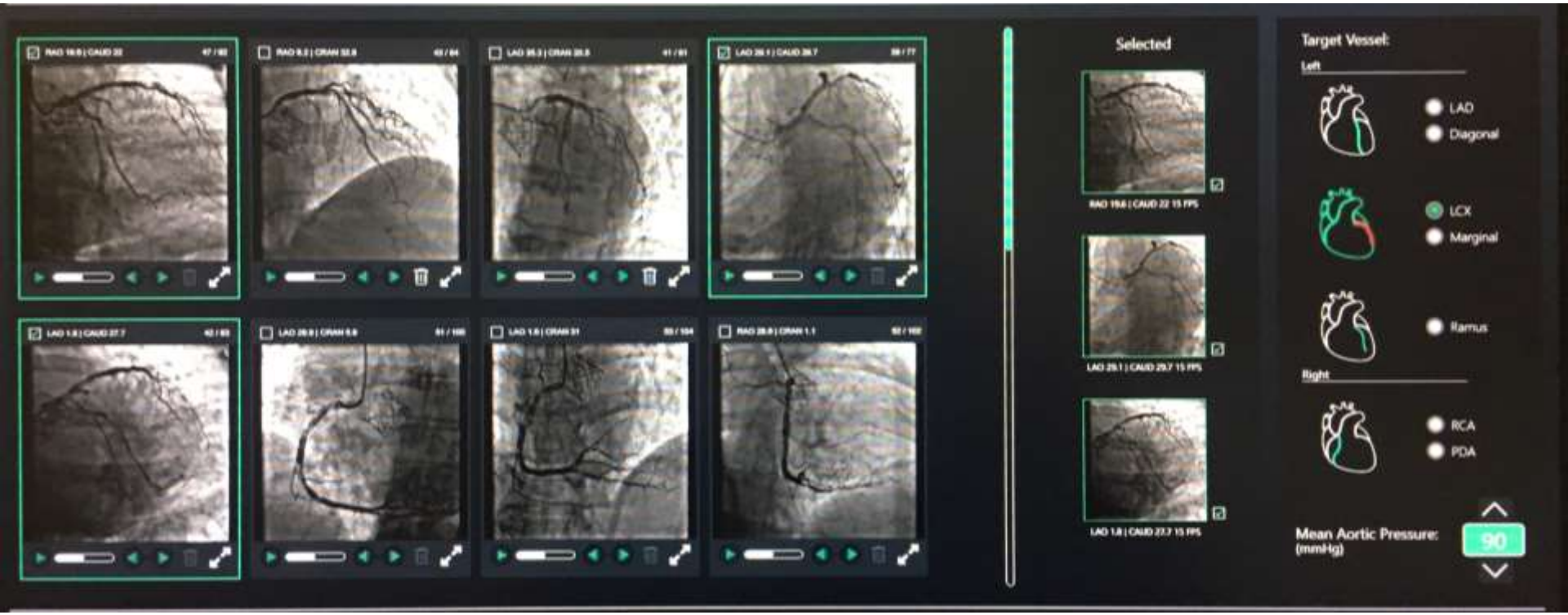
Filter: Filter 4

Select Images



Mark Ostium and Lesion

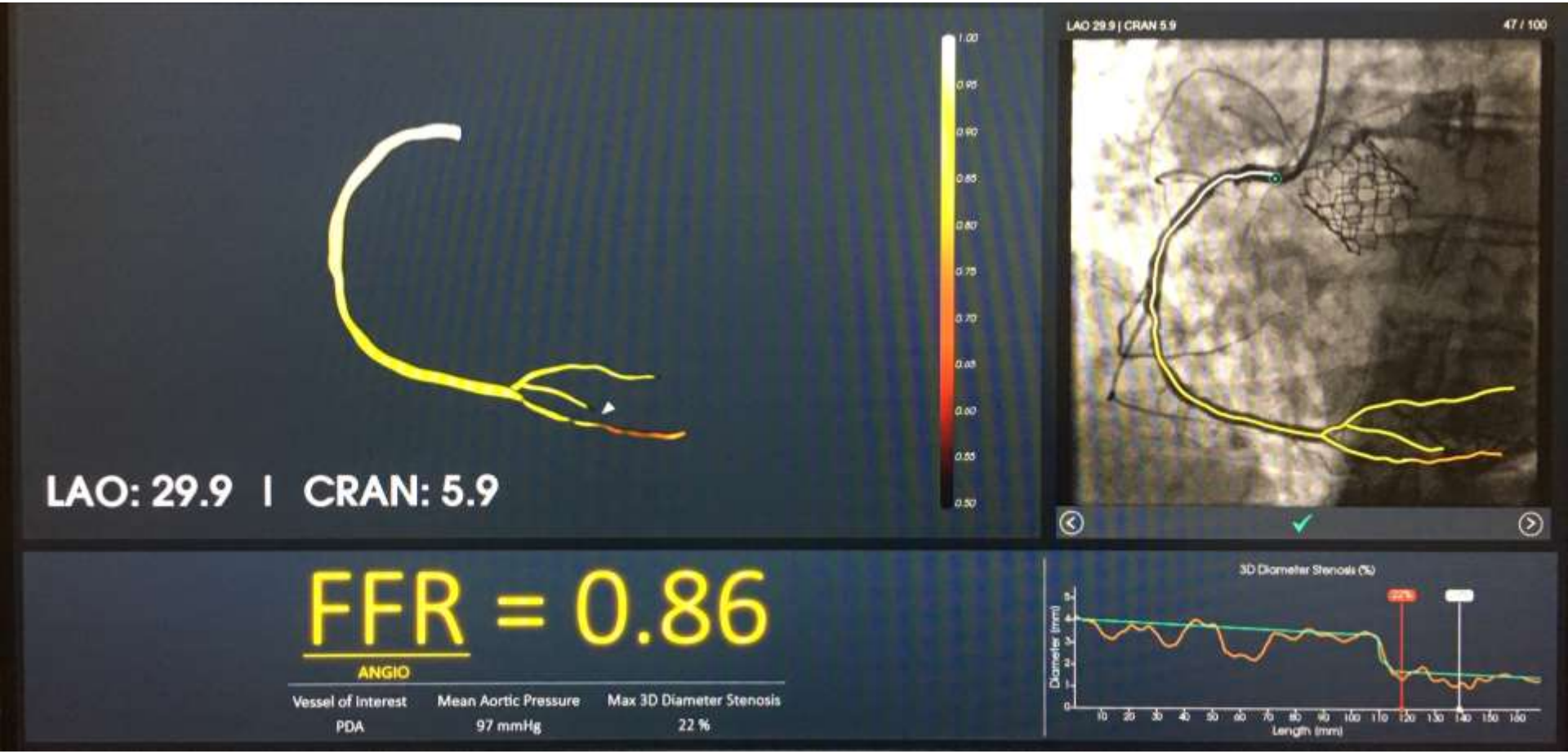
Draw Vessel Lines

Assess Vessel Contours

FFR_{angio} Left Cx/OM

Pressure wire FFR = 0.83

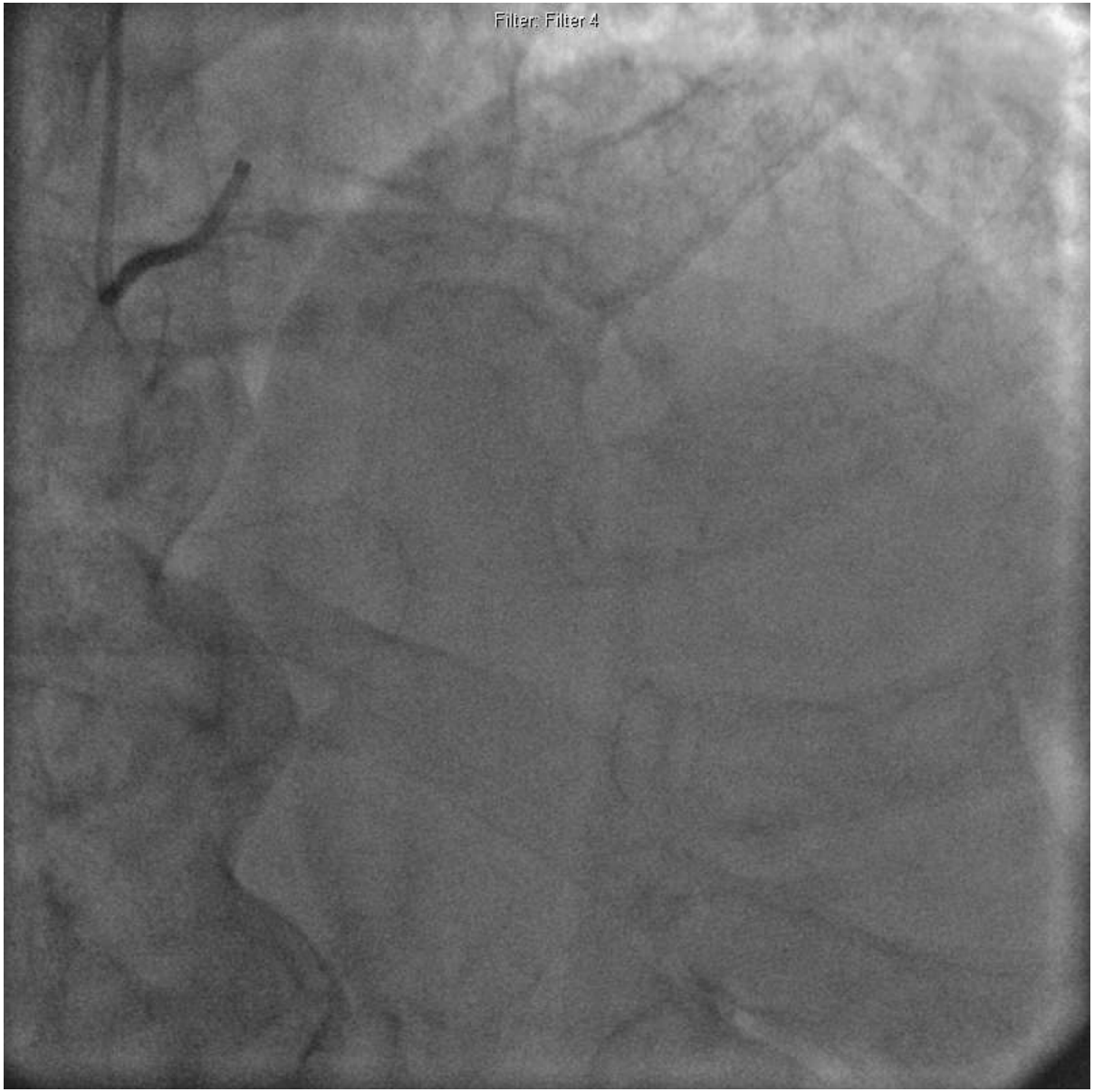
FFR_{angio} RCA/PDA



Pressure wire FFR = 0.81

Real World Cases:

- 77 yo man with hypertension and dyslipidemia
- Presents to his local physician with progressive exertional chest discomfort
- A coronary calcium scan had been performed and showed a score of 3,398 (90th percentile)
- A myocardial perfusion scan is ordered and shows no ischemia
- Because of persistent symptoms he is referred for coronary angiography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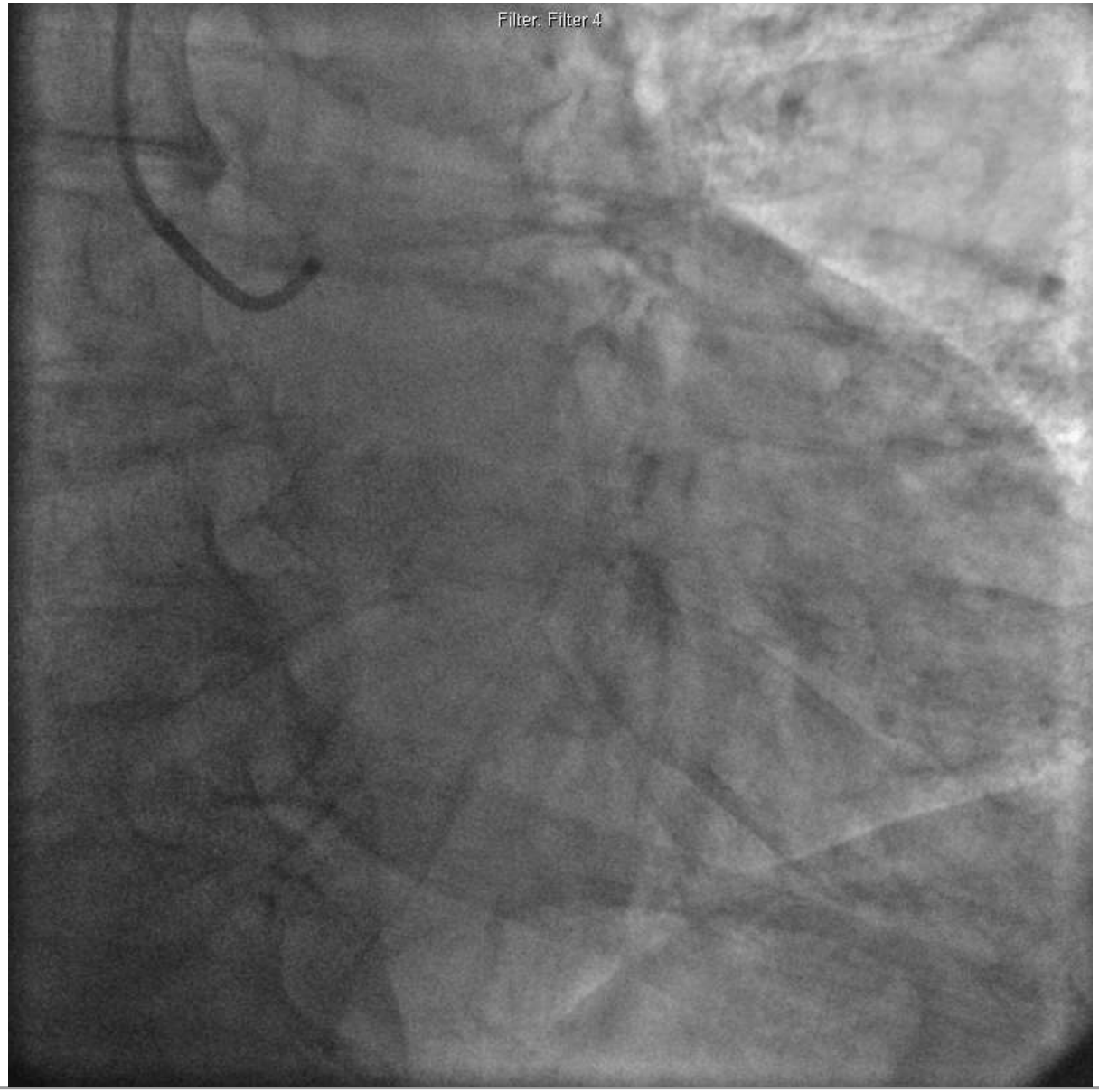
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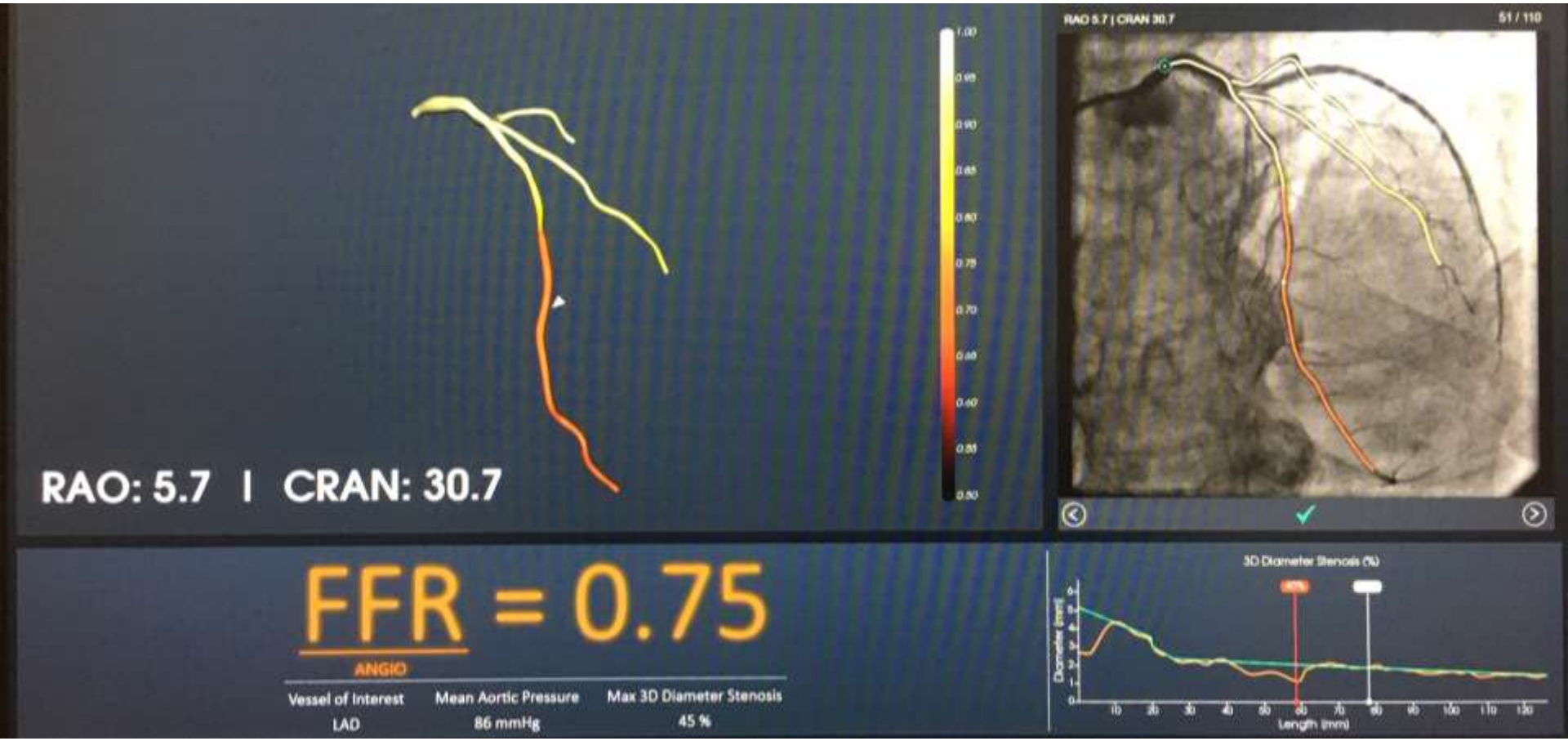
FFR_{angio} of the Left Circumflex

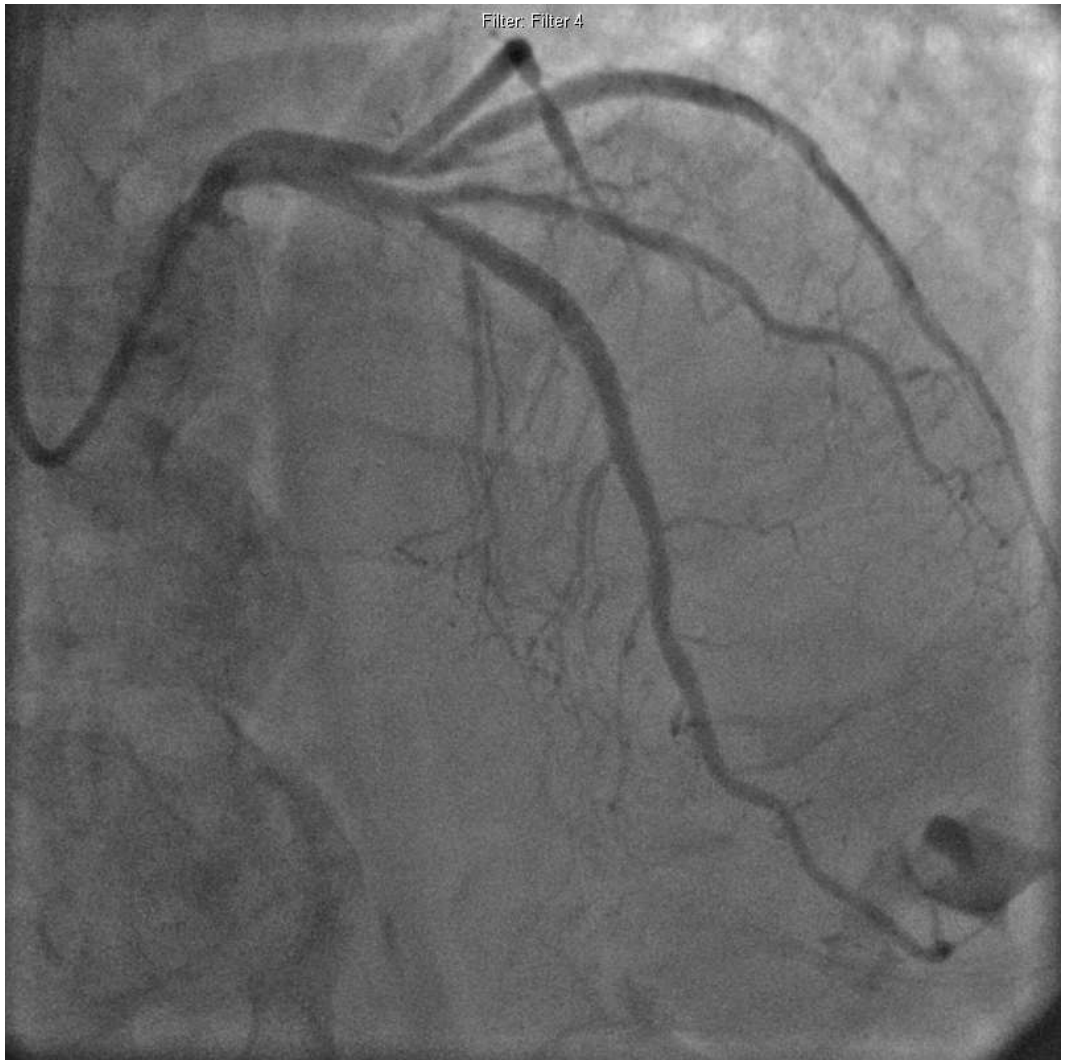
Wire-based FFR = 0.94

FFR_{angio} of the LAD



Wire-based FFR = 0.64

LAD post PCI



What's Next?

Quantitative flow ratio–guided strategy versus angiography-guided strategy for percutaneous coronary intervention: Rationale and design of the FAVOR III China trial

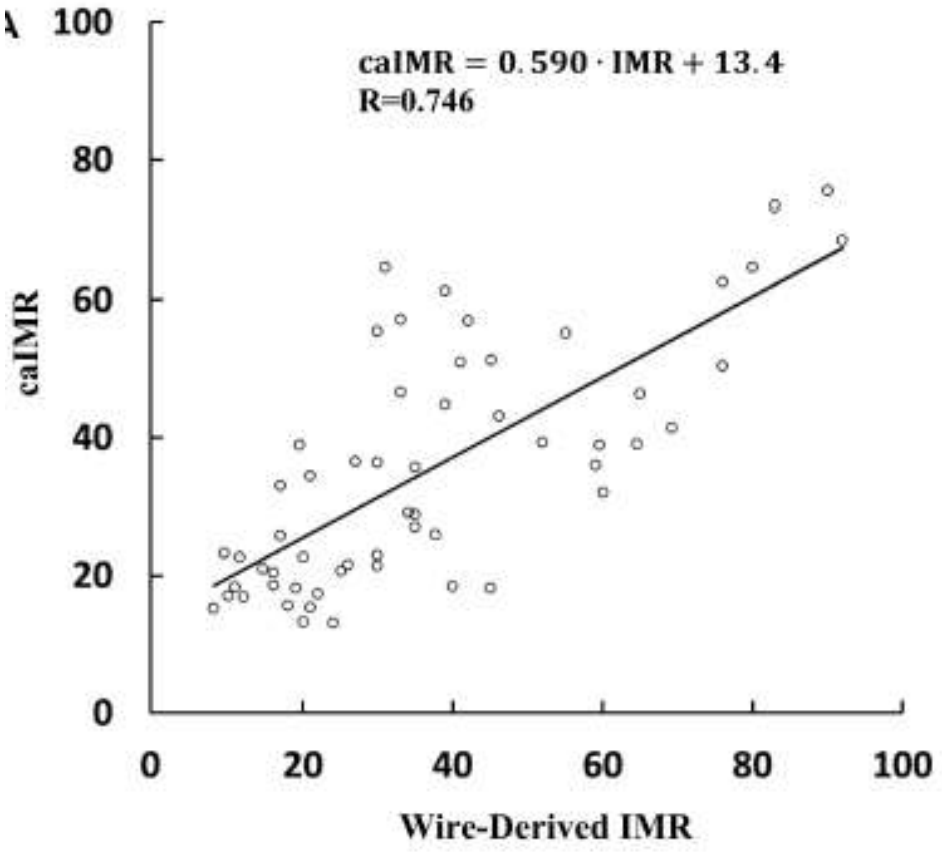
Lei Song, MD,[a,b,1] Shengxian Tu, PhD,[c,1] Zhongwei Sun, MSc,[a] Yang Wang, MSc,[d] Daixin Ding, BSc,[c] Changdong Guan, MSc,[a] Lihua Xie, MSc,[a] Javier Escaned, MD,[e] William F. Fearon, MD, PhD,[f] Ajay J. Kirtane, MD, SM,[g,h] Patrick W. Serruys, MD, PhD,[i] William Wijns, MD, PhD,[j] Stephan Windecker, MD,[k] Martin B. Leon, MD,[g,h] Gregg W. Stone, MD,[h,l] Shubin Qiao, MD,[a,b] and Bo Xu, MBBS[a,b], for the FAVOR III China Investigators

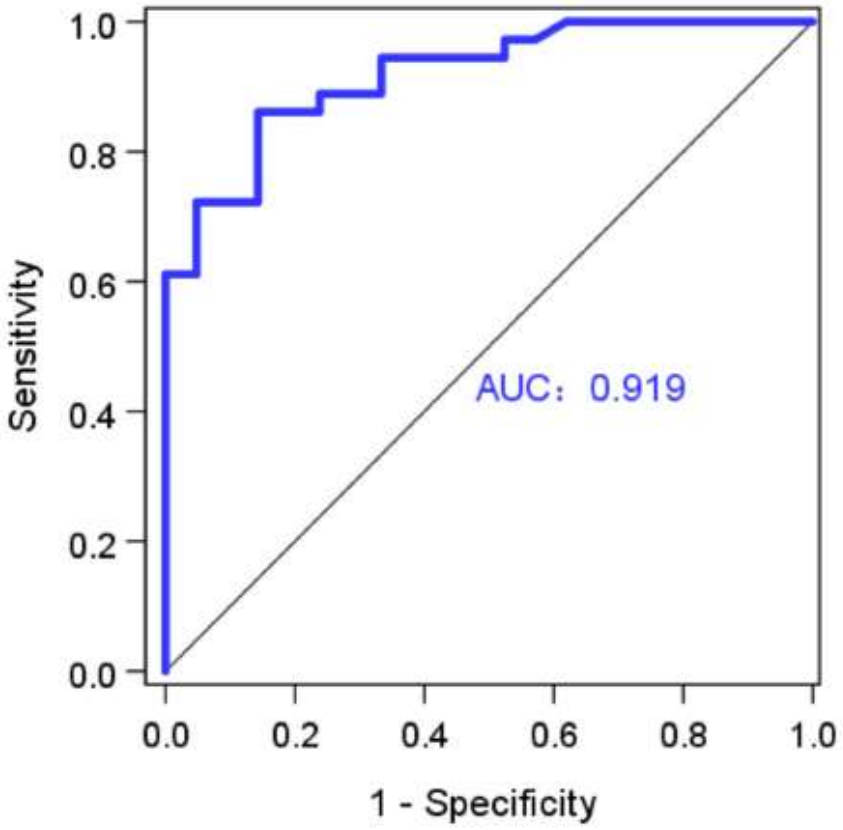
Enrolment completed in January 2020 with randomization of 3,828 subjects!

Song, et al. Am Heart J 2020;223:72-80

What's Next?

Angiography-derived Index of Microcirculatory Resistance





Ai, H et al. Frontiers in Physiology 2020;in press.