FFR_{CT} et planification de procédure interventionelle

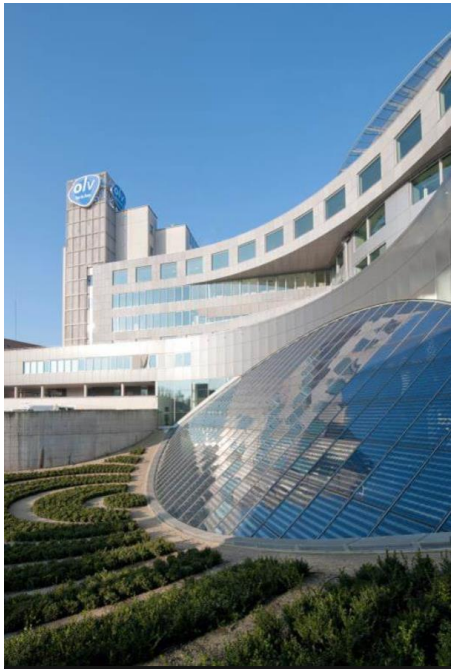
Le cath-lab du futur frappe à votre porte

Jeroen Sonck, MD
Cardiovascular Center, OLV Clinic Aalst
Belgium

DÉCLARATION DE LIENS D'INTÉRÊT AVEC LA PRÉSENTATION

Intervenant : Jeroen SONCK, Aalst

☑ Je n'ai pas de lien d'intérêt à déclarer



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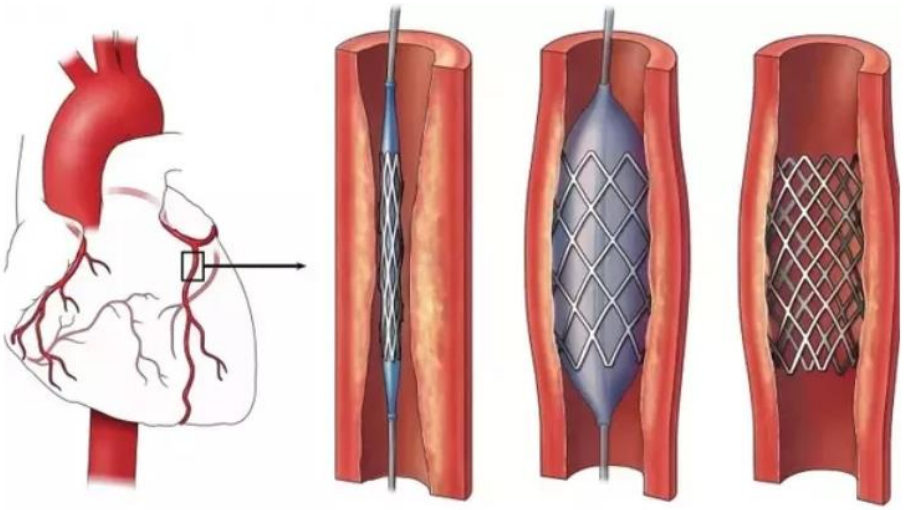

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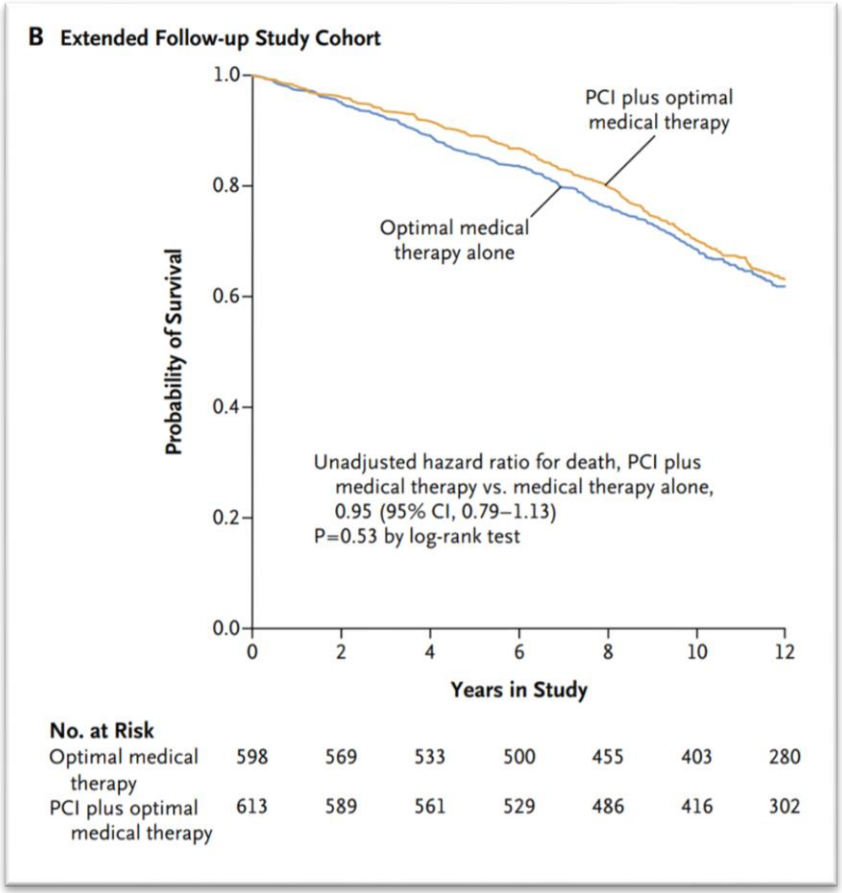
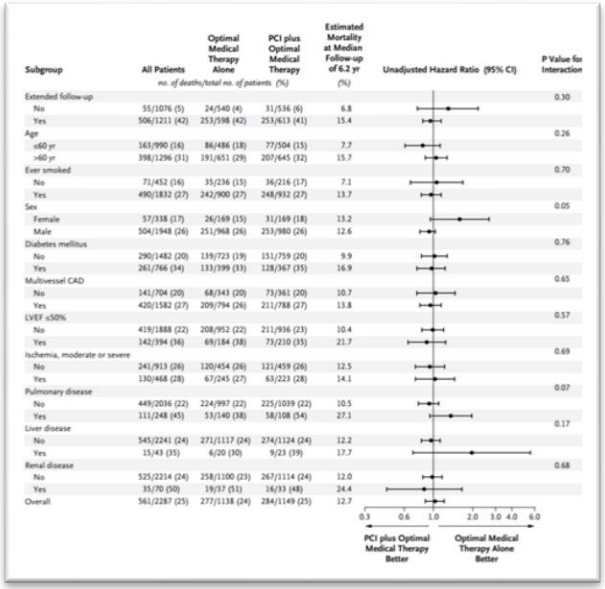
ORIGINAL ARTICLE

Effect of PCI on Long-Term Survival in Patients with Stable Ischemic Heart Disease

Steven P. Sedlis, M.D., Pamela M. Hartigan, Ph.D., Koon K. Teo, M.B., B.Ch., Ph.D., David J. Maron, M.D., John A. Spertus, M.D., M.P.H., G.B. John Mancini, M.D., William Kostuk, M.D., Bernard R. Chaitman, M.D., Daniel Berman, M.D., Jeffrey D. Lorin, M.D., Marcin Dada, M.D., William S. Weintraub, M.D., and William E. Boden, M.D., for the COURAGE Trial Investigators*





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FAME

Defer PCI for lesions with FFR>0.8

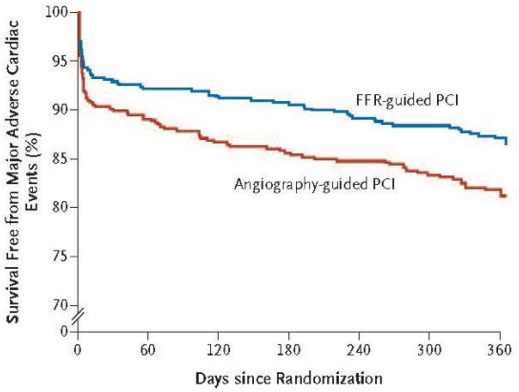
The NEW ENGLAND JOURNAL of MEDICINE
ESTABLISHED IN 1812 JANUARY 15, 2009 VOL. 360 NO. 3

Fractional Flow Reserve versus Angiography for Guiding Percutaneous Coronary Intervention

CONCLUSIONS

Routine measurement of FFR in patients with multivessel coronary artery disease who are undergoing PCI with drug-eluting stents significantly reduces the rate of the composite end point of death, nonfatal myocardial infarction, and repeat revascularization at 1 year. (ClinicalTrials.gov number, NCT00267774.)

Tonino et al. NEJM 2009, 360: 213



FAME-2

Perform PCI for lesions with FFR≤0.8

The NEW ENGLAND JOURNAL of MEDICINE

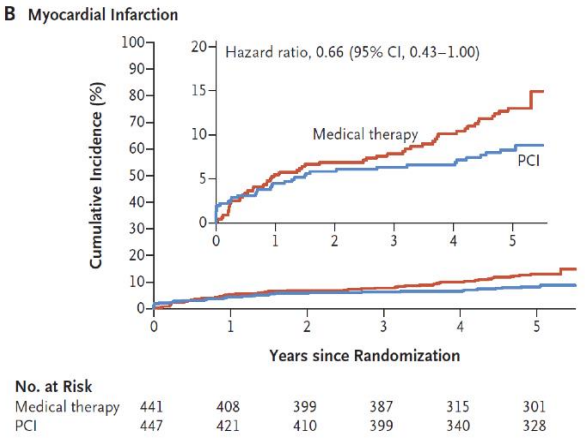
ORIGINAL ARTICLE

Five-Year Outcomes with PCI Guided by Fractional Flow Reserve

CONCLUSIONS

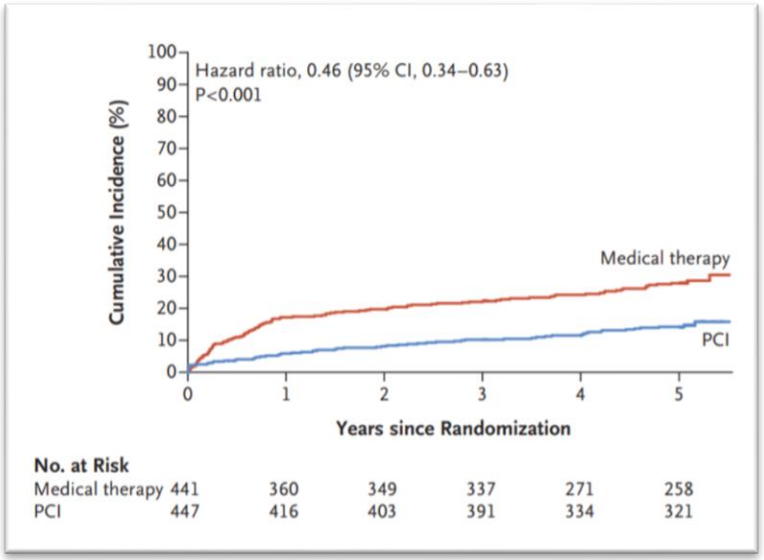
In patients with stable coronary artery disease, an initial FFR-guided PCI strategy was associated with a significantly lower rate of the primary composite end point of death, myocardial infarction, or urgent revascularization at 5 years than medical therapy alone. Patients without hemodynamically significant stenoses had a favorable long-term outcome with medical therapy alone. (Funded by St. Jude Medical and others; FAME 2 ClinicalTrials.gov number, NCT01132495.)

Xaplanteris et al. NEJM 2018

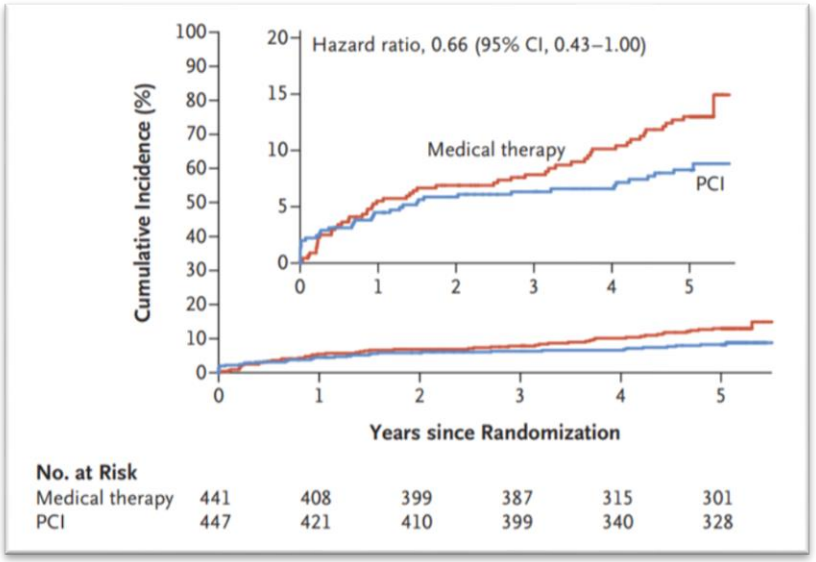


Patient selection using ***physiology*** at the ***vessel level*** is associated with improved clinical outcomes.

MACE



Myocardial infarction



Xaplanteris P et al. NEJM 2018

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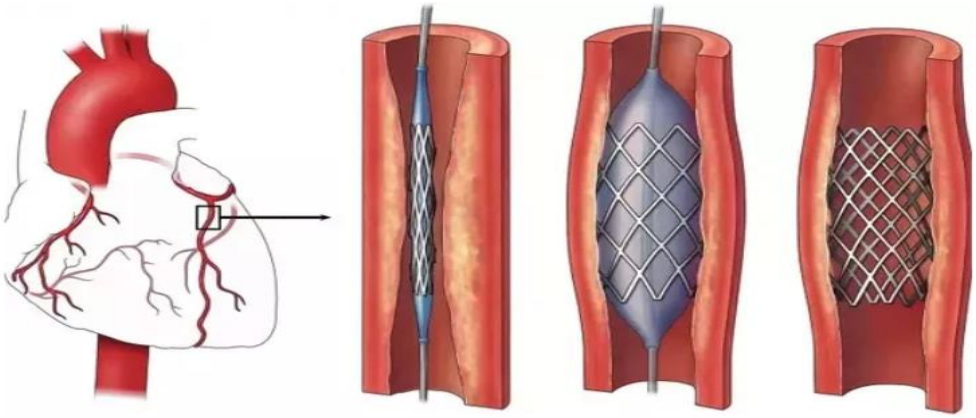
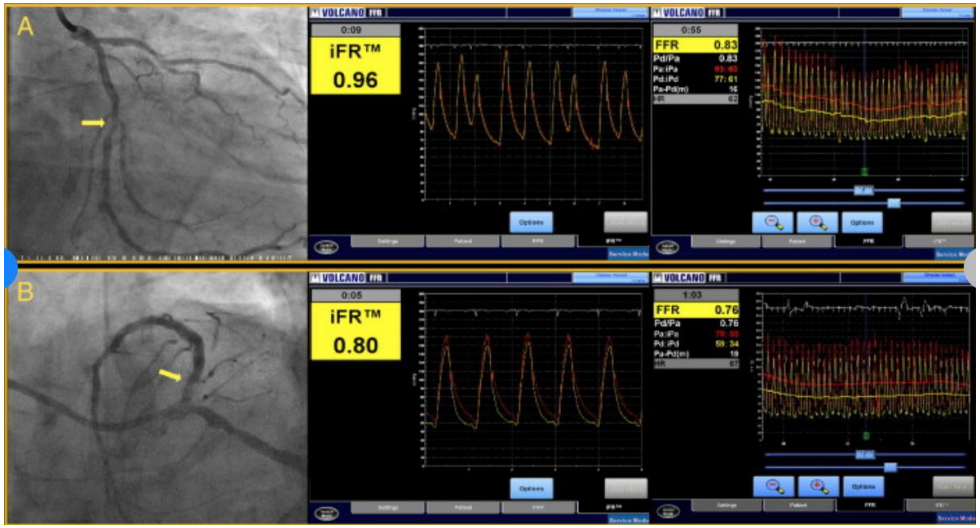
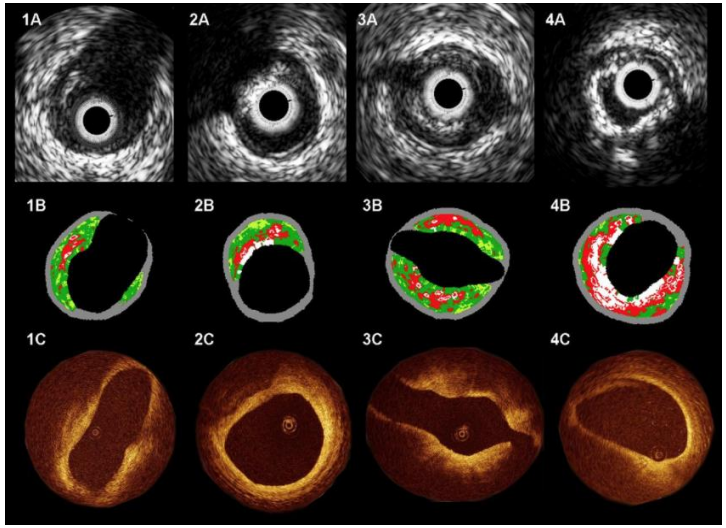
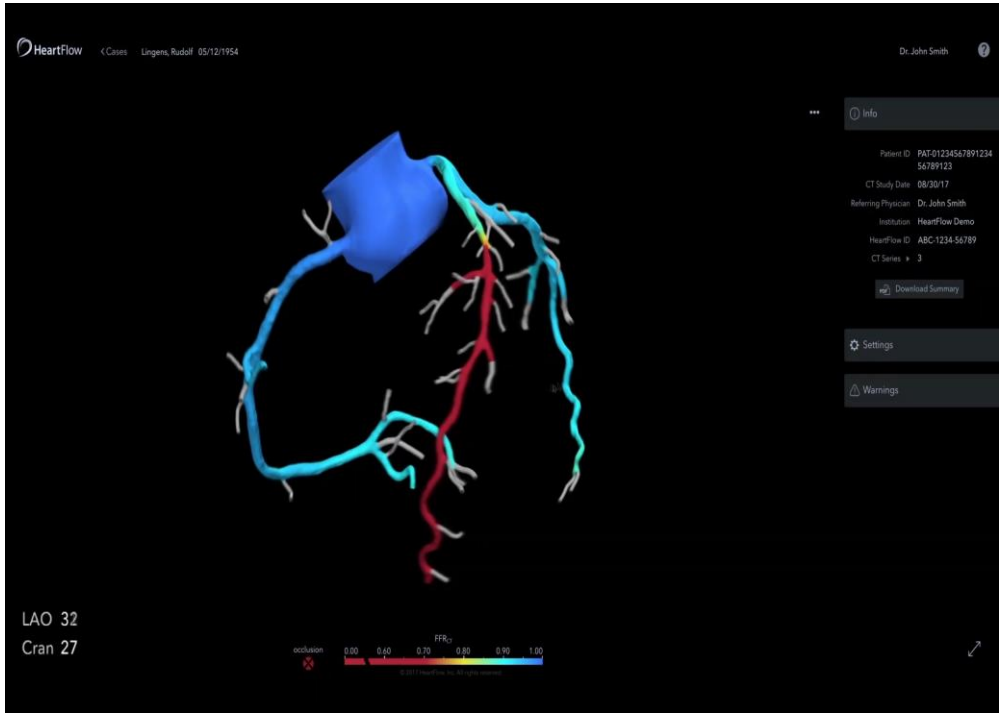




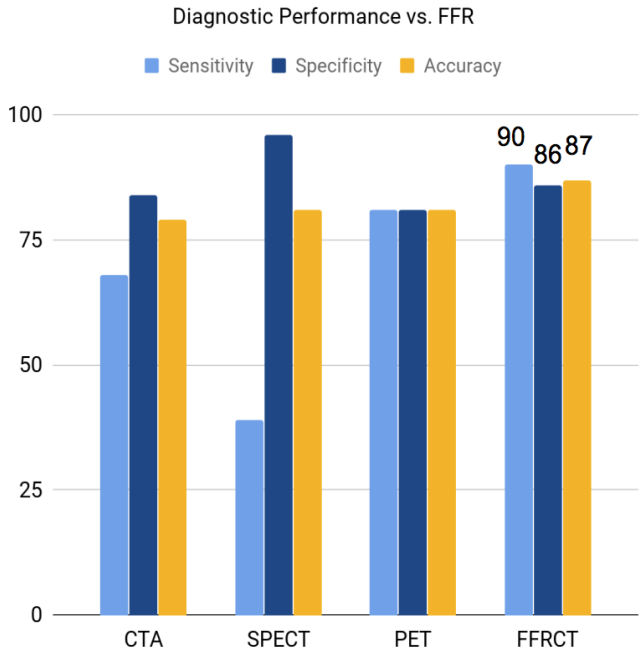


The incremental value of CT-derived FFR on top of CCTA

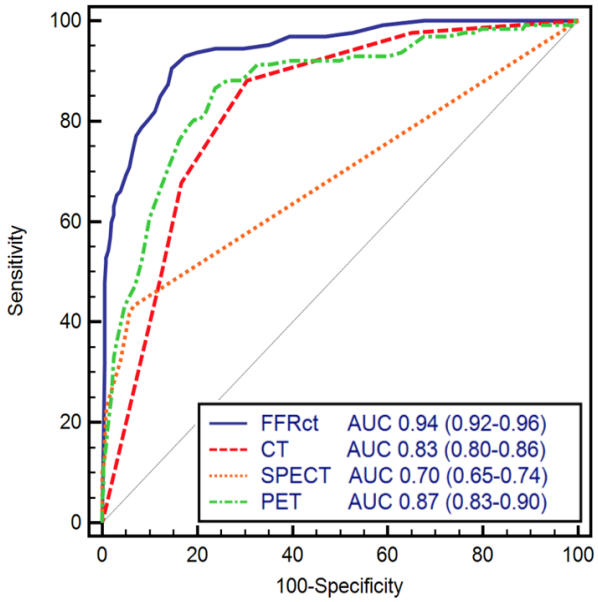


- 1/ Optimize patient selection for the lab
  - Vessel and lesion-specific physiology
  - Pre-lab MVD classification
- 2/ Plaque assessment ∞ IVUS/OCT
- 3/ Plan the percutaneous approach

Diagnostic performance of FFR_{CT}: PACIFIC trial



Presented Euro PCR 2018, Driessen RS et al.



Highest discrimination of ischaemia causing lesions for FFR_{CT} compared to:

- CT stenosis: Δ AUC 0.11, $p < 0.001$
- SPECT: Δ AUC 0.24, $p < 0.001$
- PET: Δ AUC 0.07, $p < 0.001$

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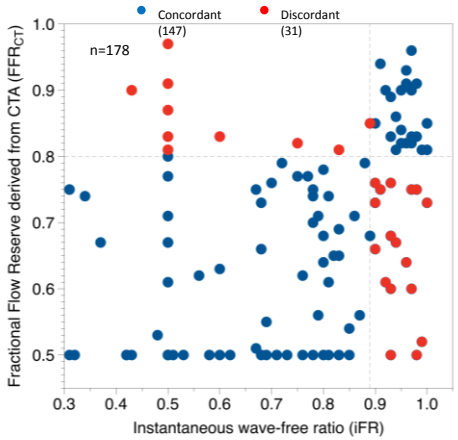
SYNTAX II sub-study: Performance of FFR_{CT} in patients with multivessel disease

Mean FFR_{CT} 0.67 (IQR 0.5 -0.81)



Sensitivity 95% (95% CI: 89% to 98%); **specificity 61%** (95% CI: 48% to 73%); **positive predictive value 81%** (95% CI: 76% to 86%) and **negative predictive value 87%** (95% CI: 74% to 94%).

Collet, Sonck and Serruys, JACC 2018

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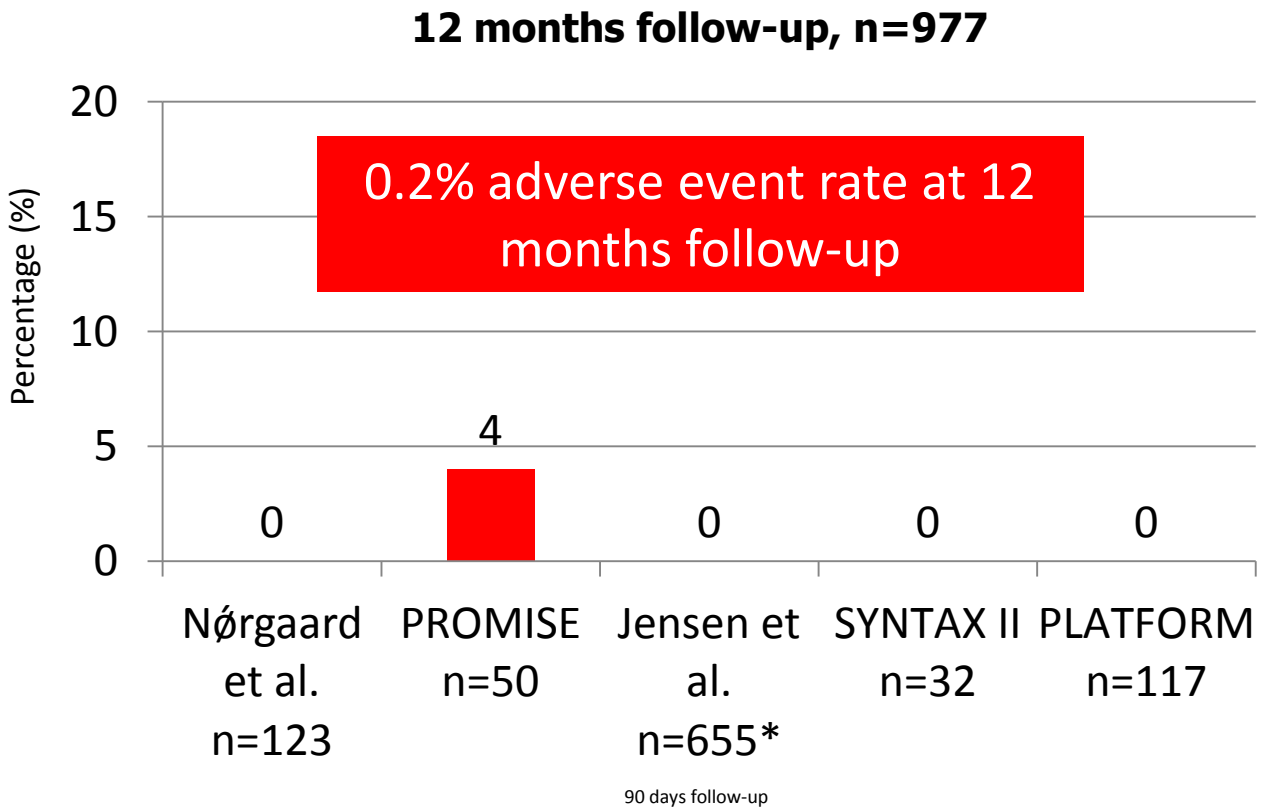
Major Adverse Cardiac Events in patients with deferred lesions based on FFR_{CT}



Jensen et al. EHJCI. 2017
Lu, M. e.a. TCT 2015
PLATFORM. JACC 2016
Collet et al. JACC 2018
Norgaard et al. JACC Imag. 2017

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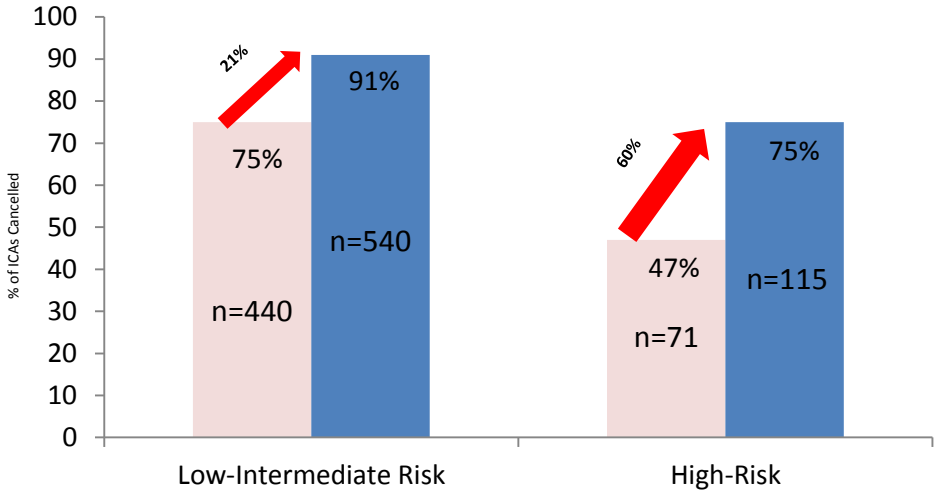
Combined cCTA and FFR_{CT}: ICA cancellations in high-risk patients



- **A frontline cCTA and FFR_{CT} testing strategy cancelled 75% of ICAs in the high-risk group**
- **The incremental impact of FFR_{CT} was greater in high-risk as compared with the low-intermediate risk group**
  - 60% in high-risk versus 21% in low-intermediate risk

Jensen et al, European Heart Journal – Cardiovascular Imaging 2017

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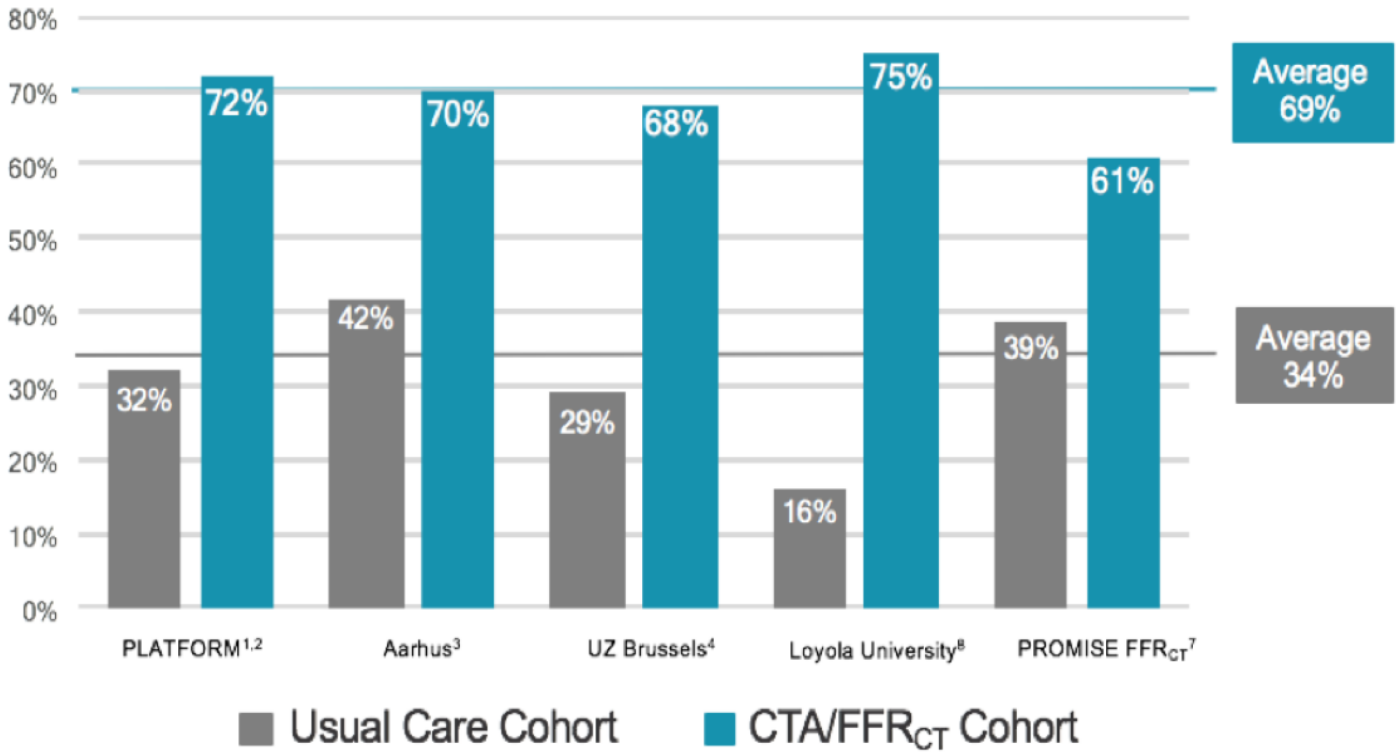
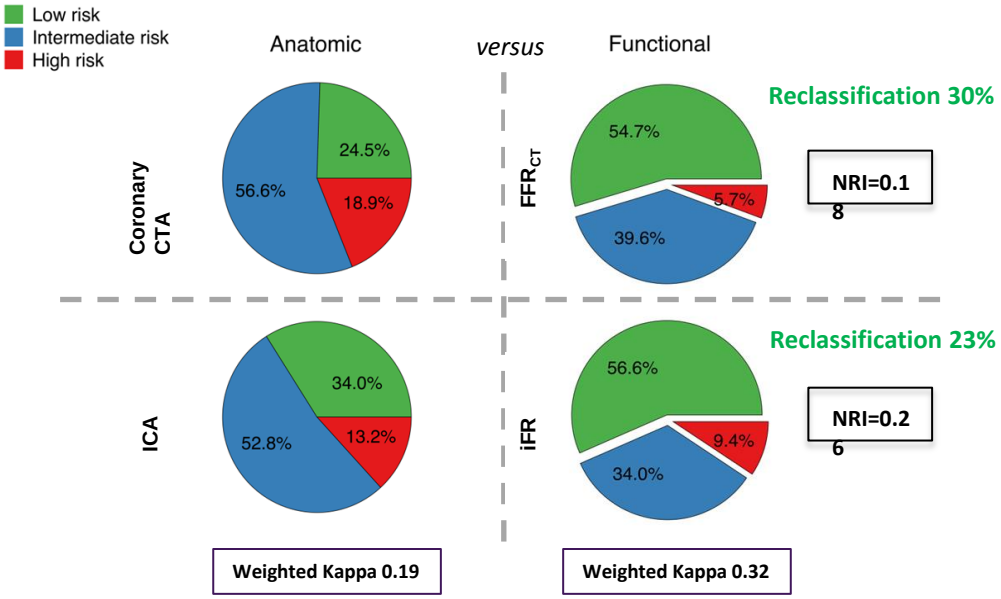
Ratio of cath/PCI: Cath-lab efficiency

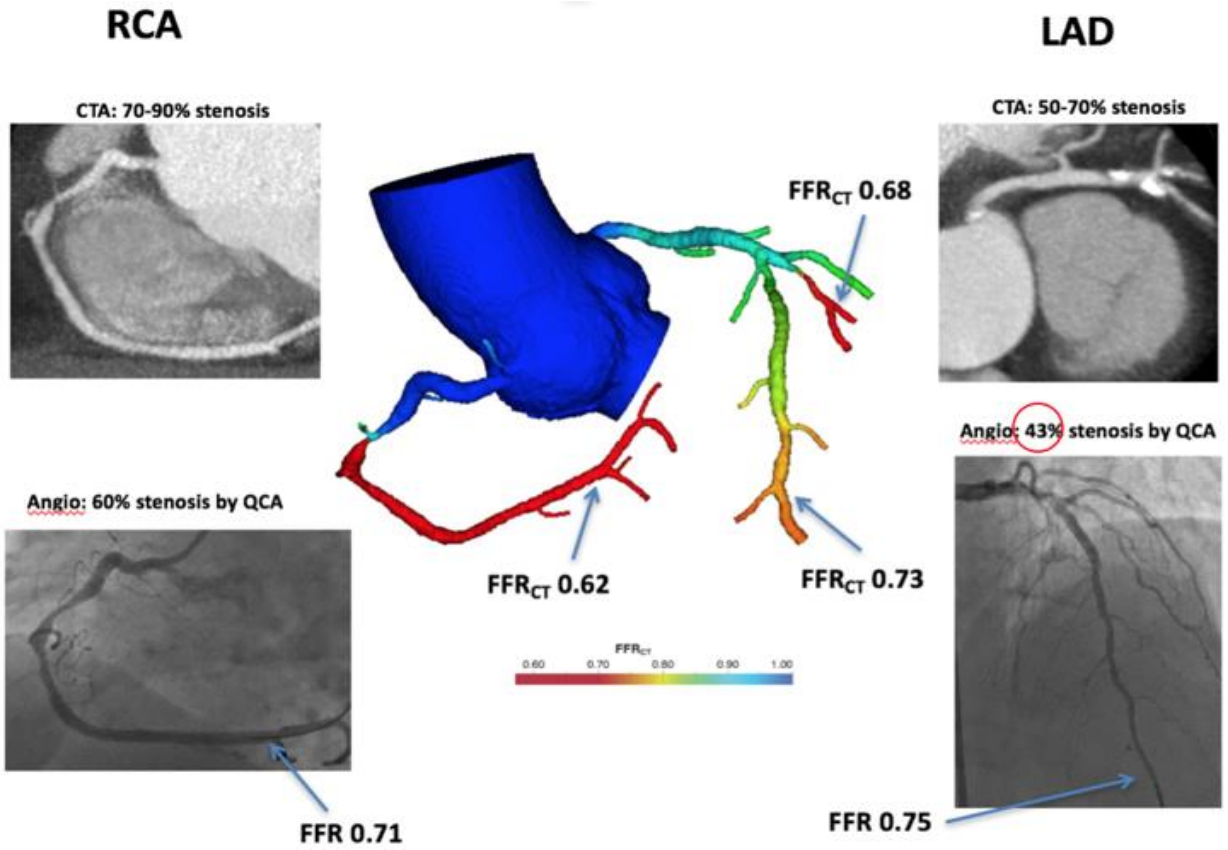


Reclassification of the SYNTAX-score tertiles



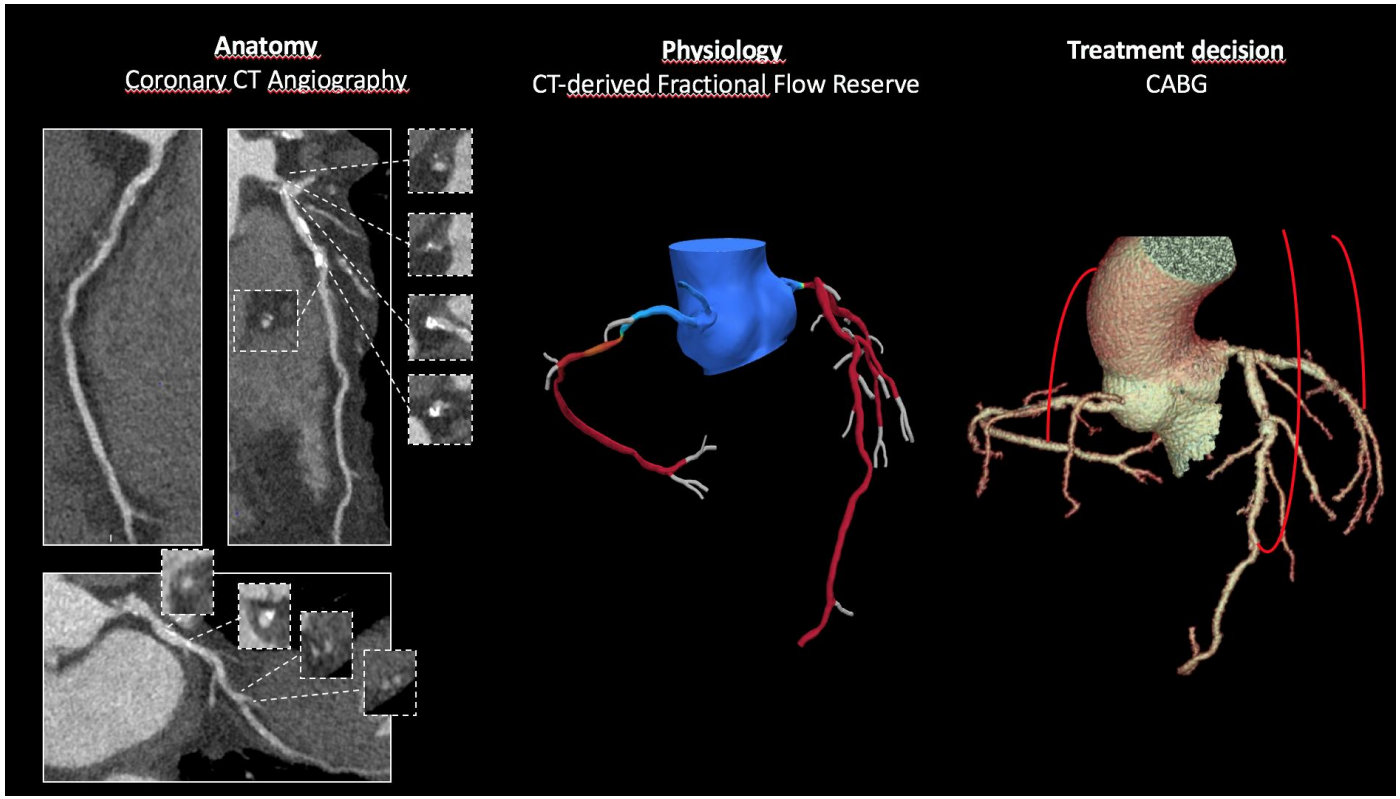
Collet, Sonck, Serruys et al. JACC 2018

MVD classification before we enter the lab



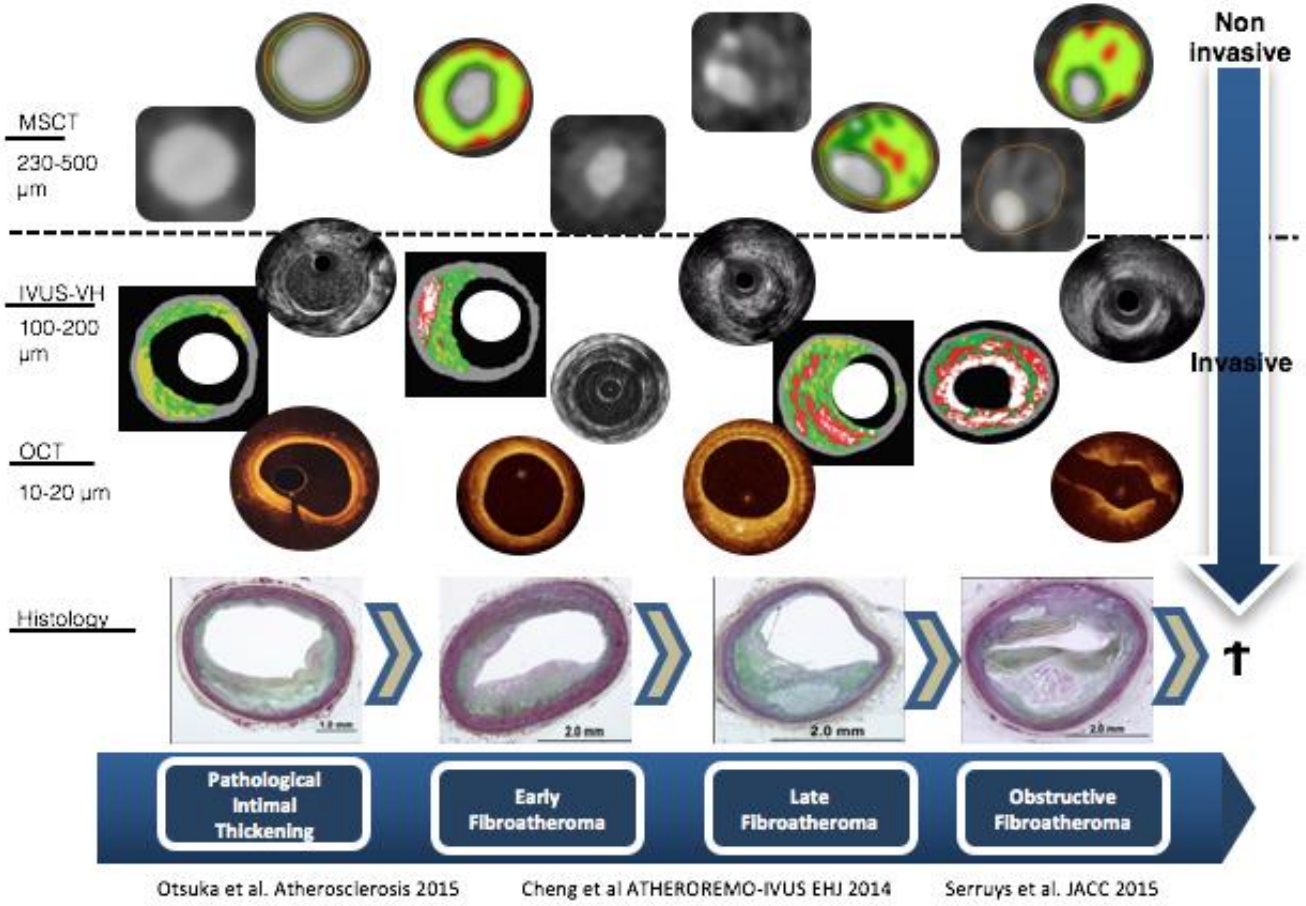
Ongoing trial: CABG Revolution

CABG without ICA



In patients with left main or three-vessel coronary artery disease, a heart team treatment decision-making based on coronary CTA showed an almost perfect agreement with the decision derived from conventional coronary angiography suggesting the potential feasibility of a treatment decision-making and planning based solely on this non-invasive imaging modality.

Coronary Imaging: from vessel to plaque



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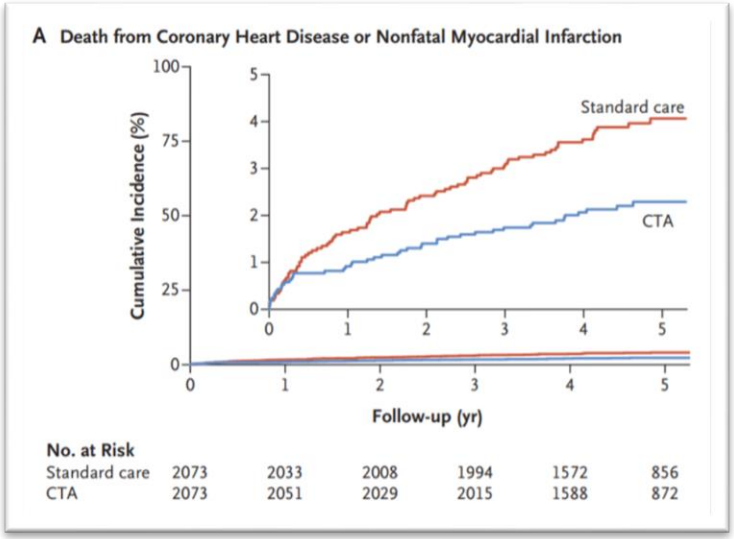
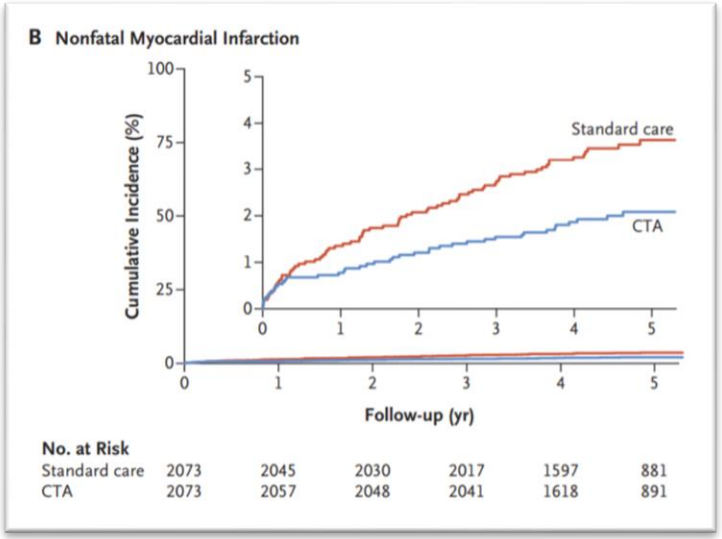
ORIGINAL ARTICLE

Coronary CT Angiography and 5-Year Risk of Myocardial Infarction

The SCOT-HEART Investigators*





Newby et al. NEJM 2018

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High Risk Plaques and Clinical Outcomes

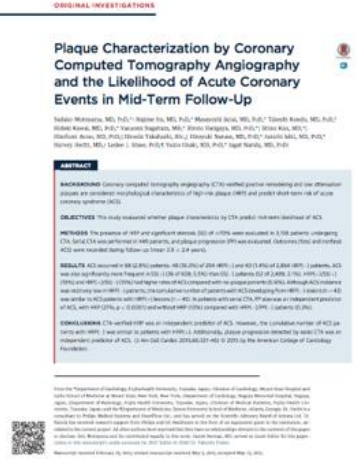
Low attenuation plaque. Positive remodeling. Spotty calcification


Computed Tomographic Angiography Characteristics of Atherosclerotic Plaques Subsequently Resulting in Acute Coronary Sy

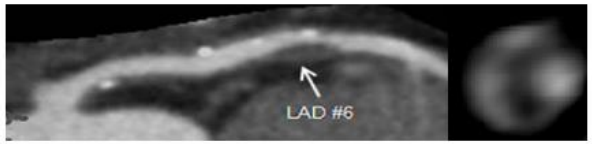
2009


Napkin-Ring Sign on Coronary CT Angiography for the Prediction of Acute Coronary Syndrome

2013


Plaque Characterization by Coronary Computed Tomography Angiography and the Likelihood of Acute Coronary Events in Mid-Term Follow-Up

2015



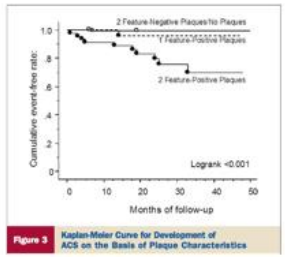
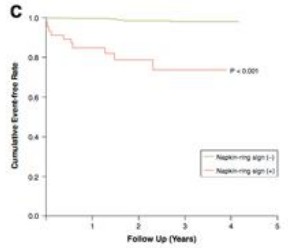
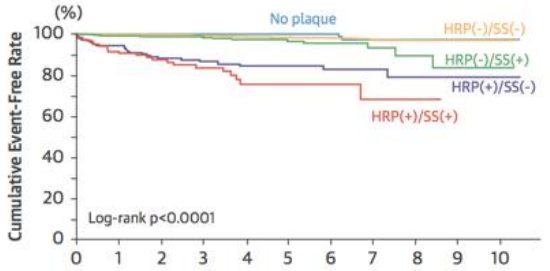
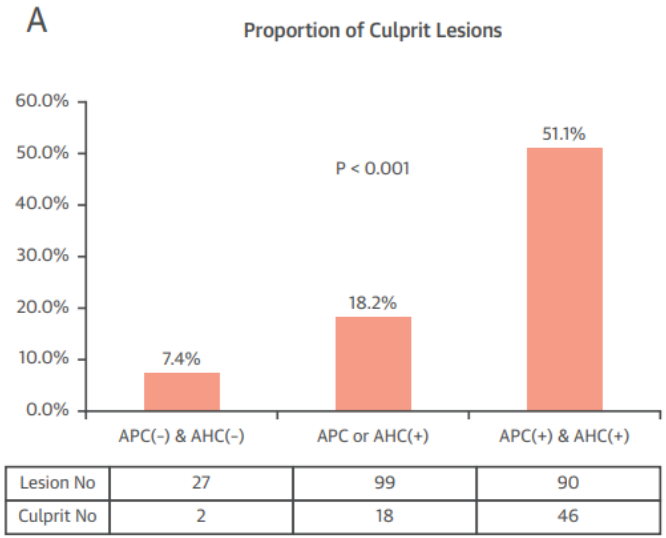


Figure 3 Kaplan-Meier Curve for Development of ACS on the Basis of Plaque Characteristics

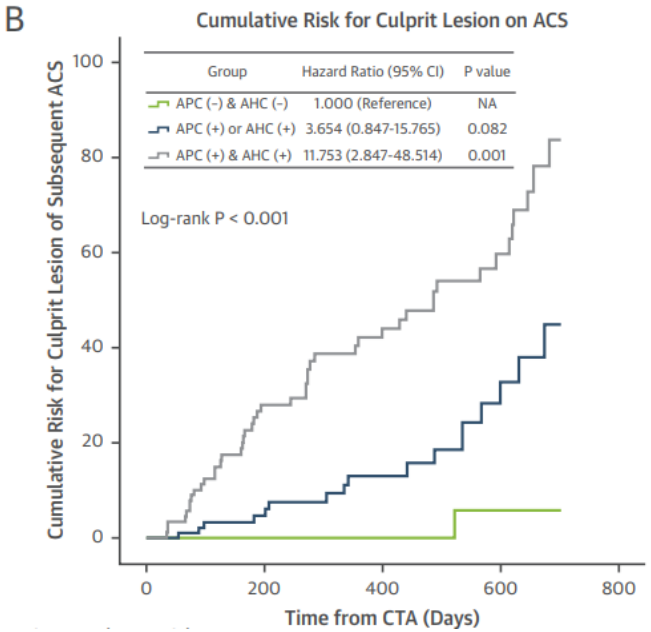




Identification of High Risk Plaques



Lesion No	27	99	90
Culprit No	2	18	46



Adverse Hemodynamic characteristics (AHC) defined as lesions that have **low FFR_{CT}** (<0.80), high **ΔFFR_{CT} (>0.06), high WSS** (≥154.7 dyn/cm2), or **high axial plaque stress** (≥ 1,606.6 dyn/cm2).

Lee et al. EMERALD trial. JACC Imaging 2018

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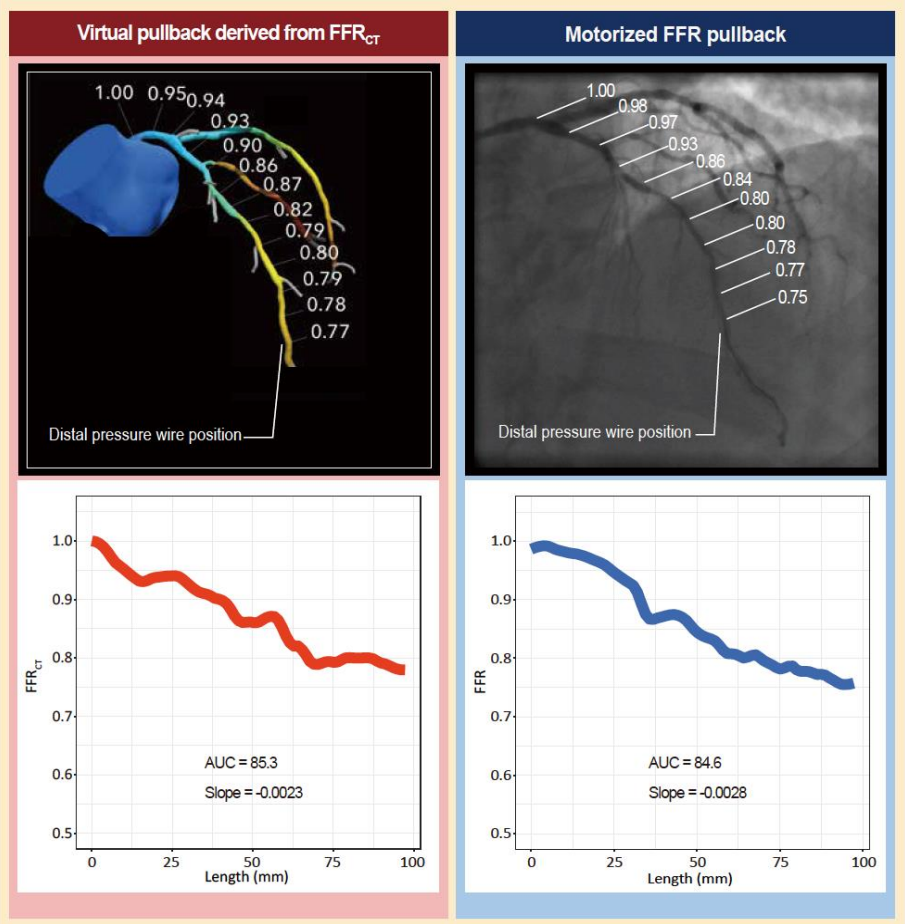
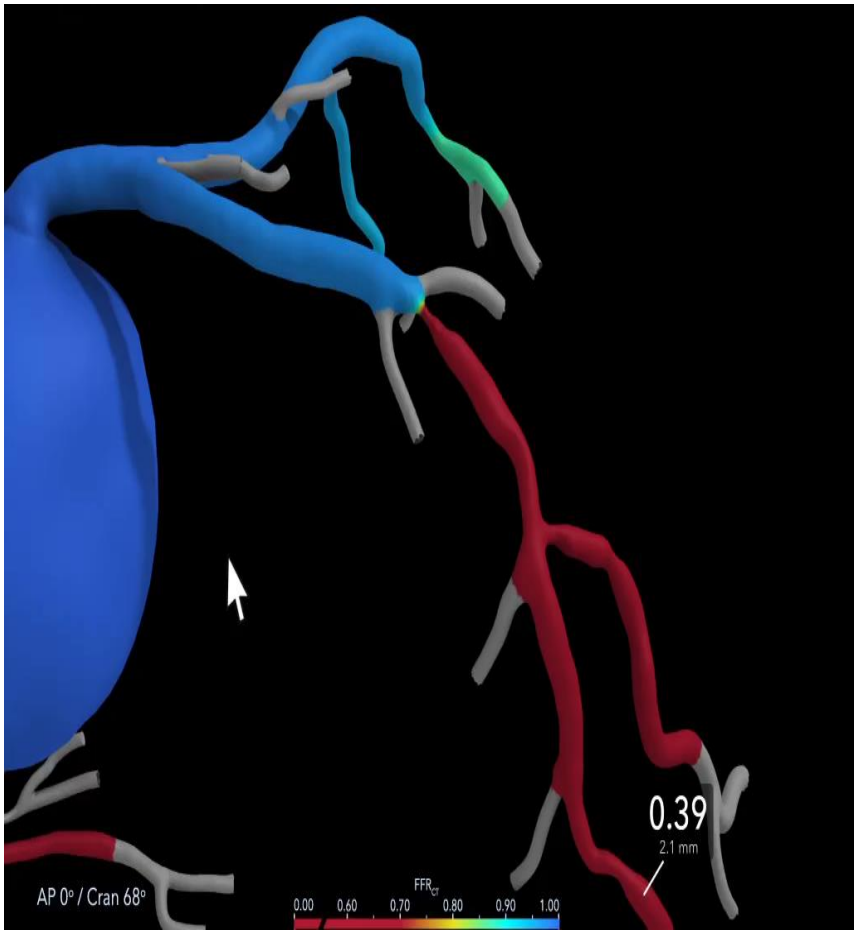
Treatment planning based on FFR_{CT}





Collet et al. Circulation 2018. Sonck et al. Circ Interv submitted.

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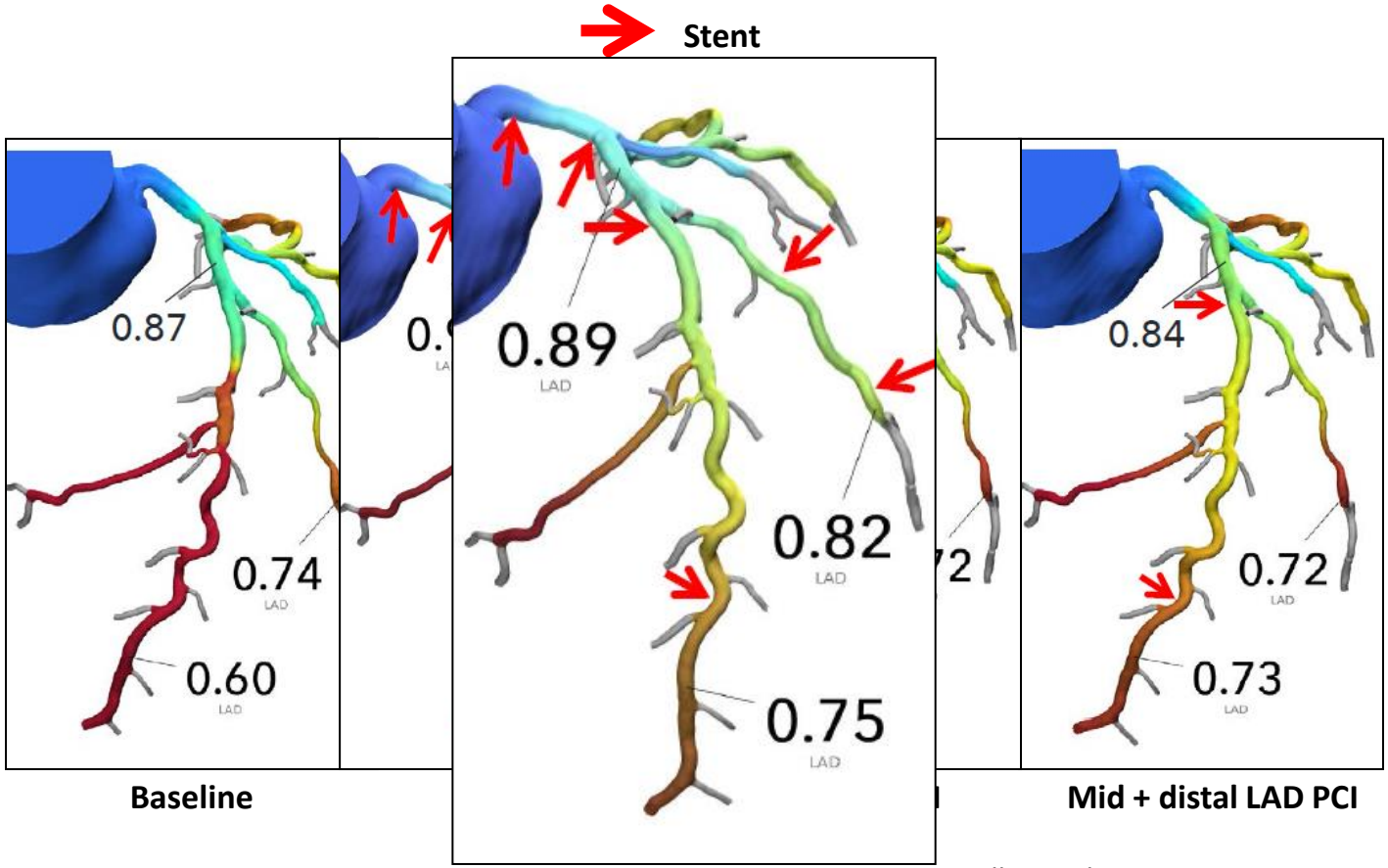
HeartFlow Interactive Revascularization Planner



Collet et al. Nature Reviews 2018.

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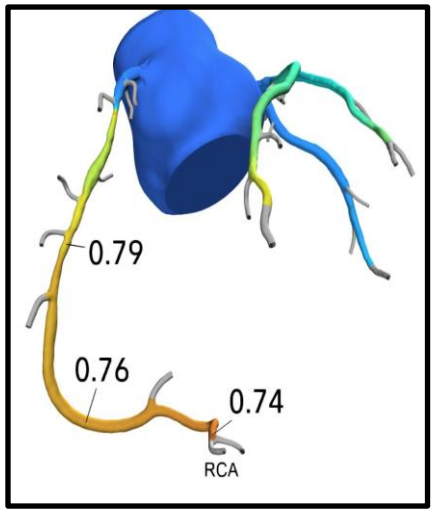
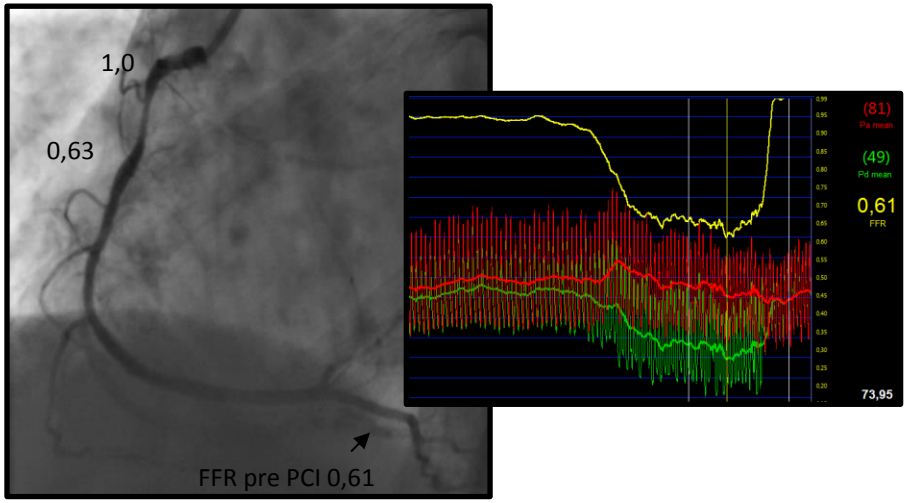
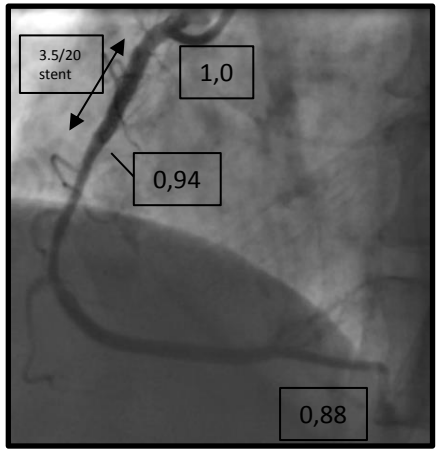
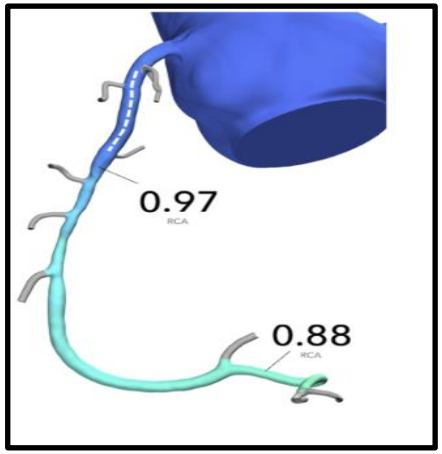
PRECISE PCI PLAN

Case 1 Precise PCI Plan Study









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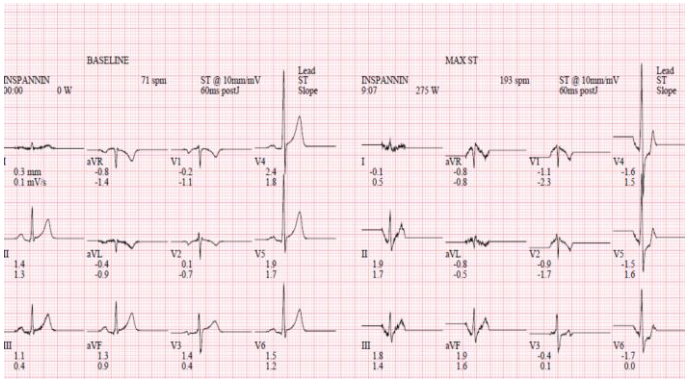
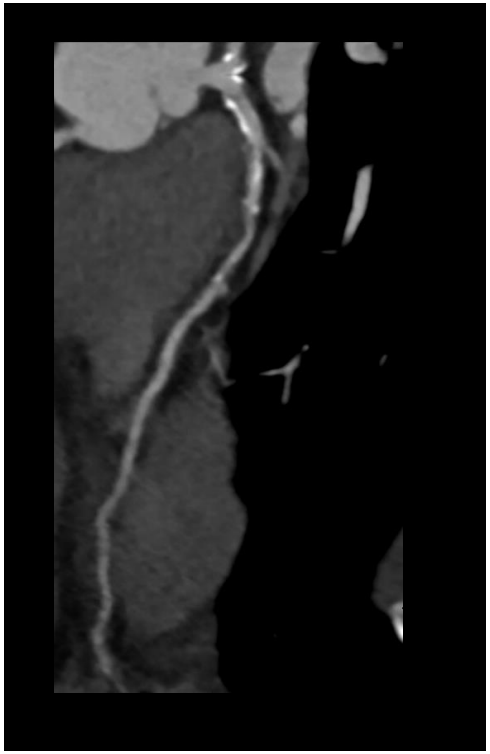
PRECISE PCI PLAN

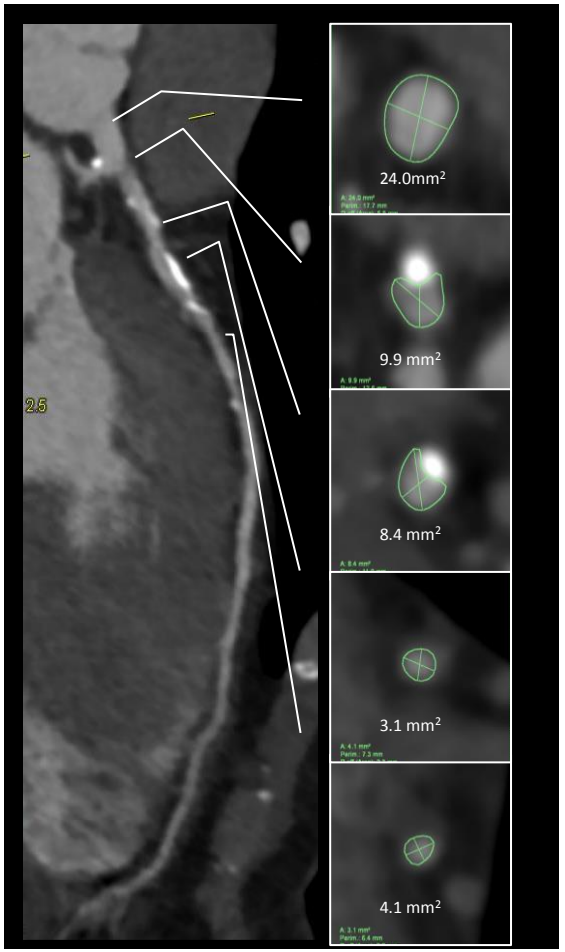
Case 2 Precise PCI Plan Study

- 40 year old sportive male
- Asymptomatic





Multiplanar reconstruction (MPR)



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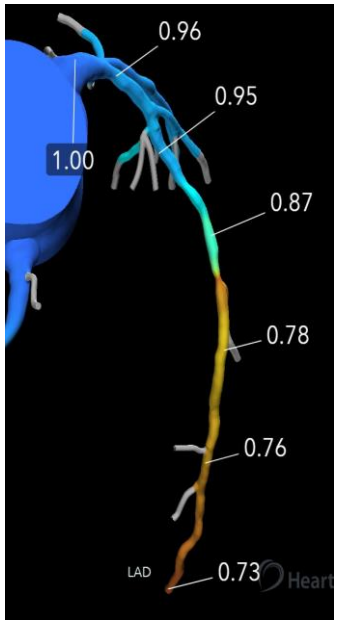
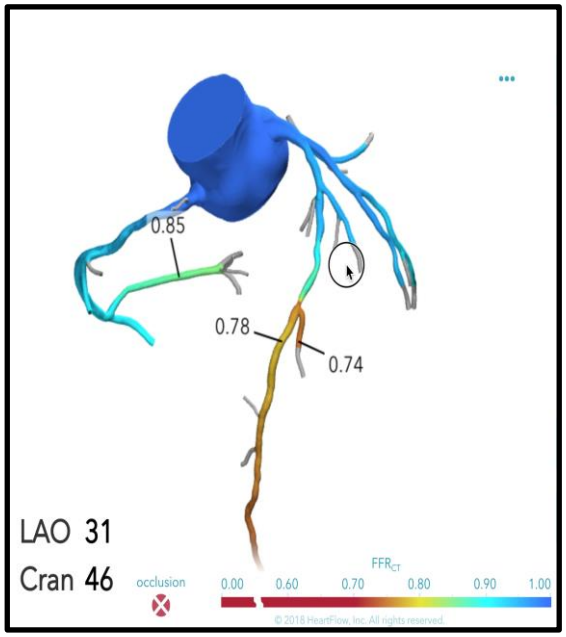
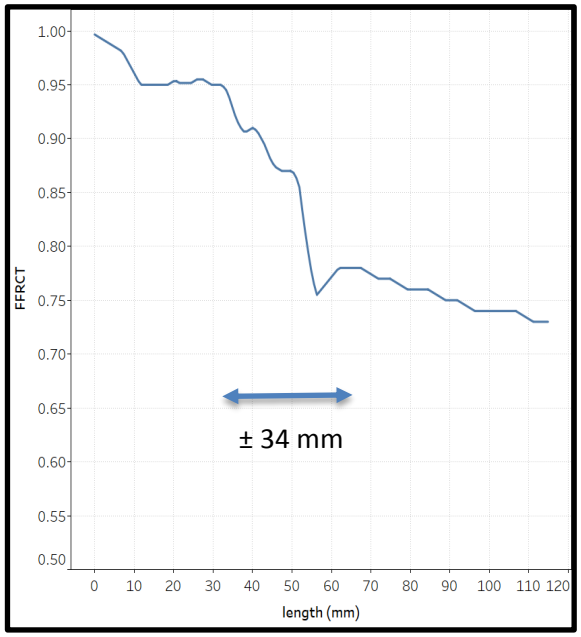
PRECISE PCI PLAN

Case 2 Precise PCI Plan Study







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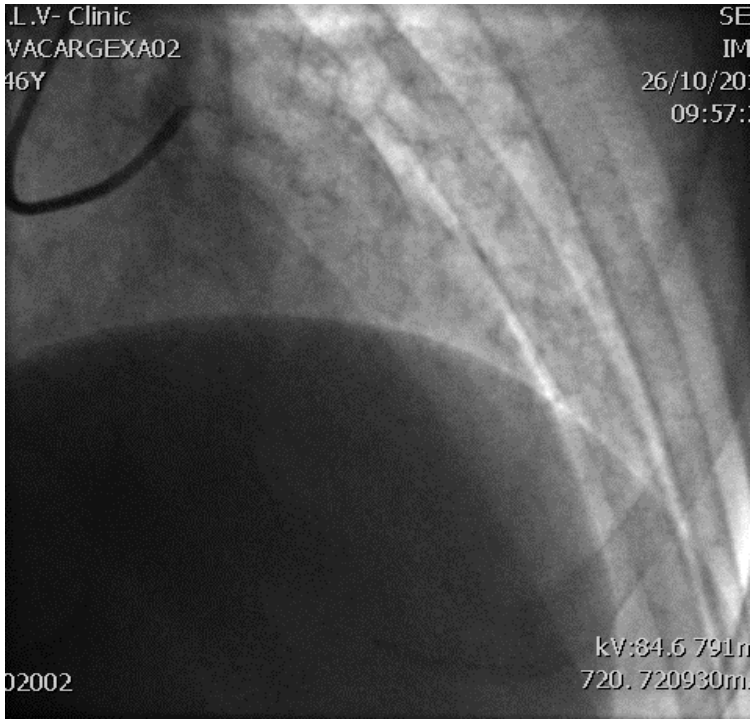
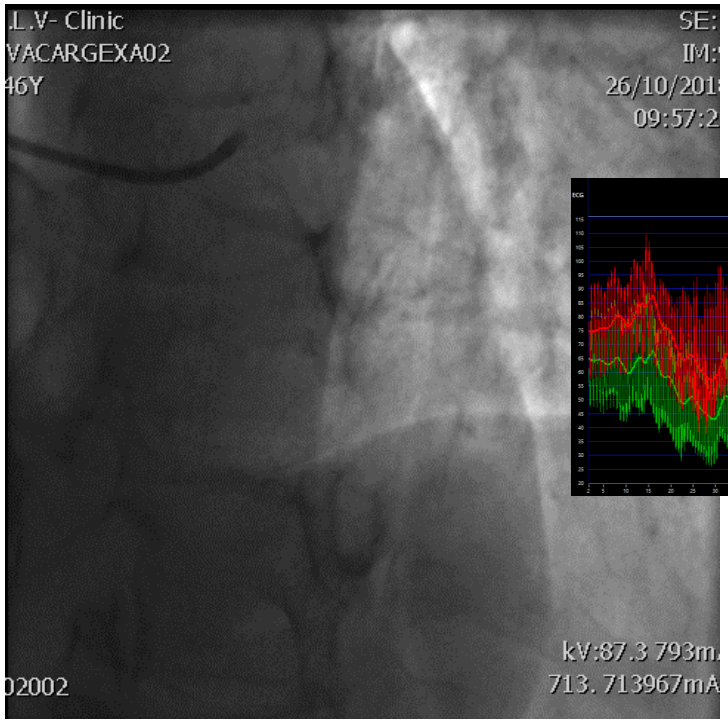
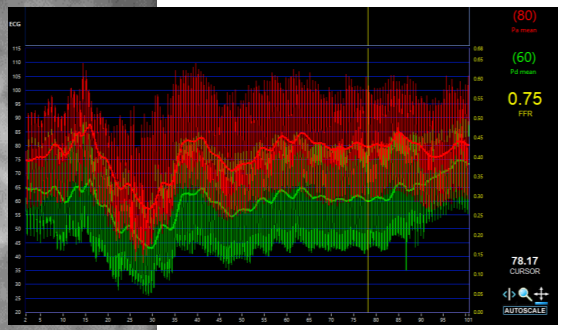
PRECISE PCI PLAN

Case 2 Precise PCI Plan Study







FFR - One distal value

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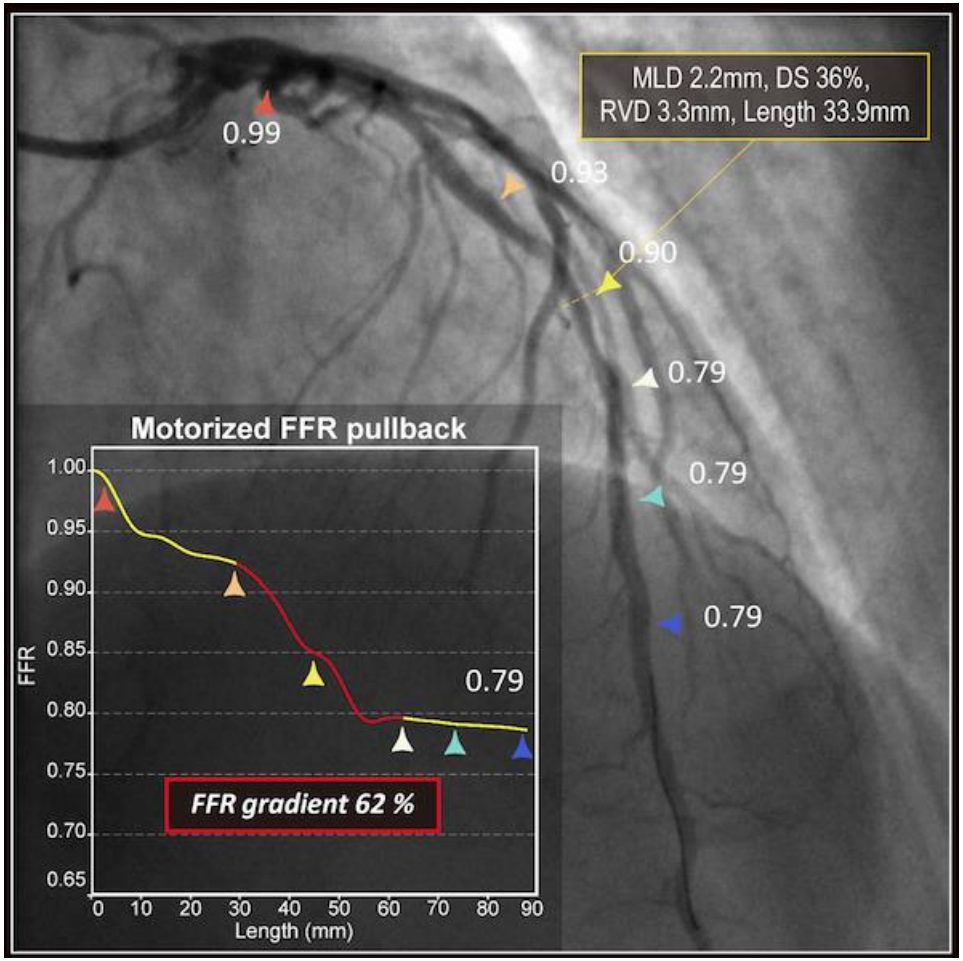
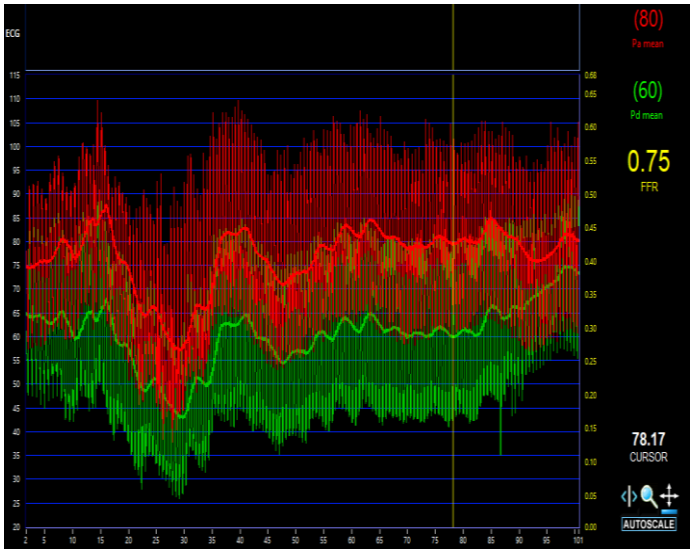
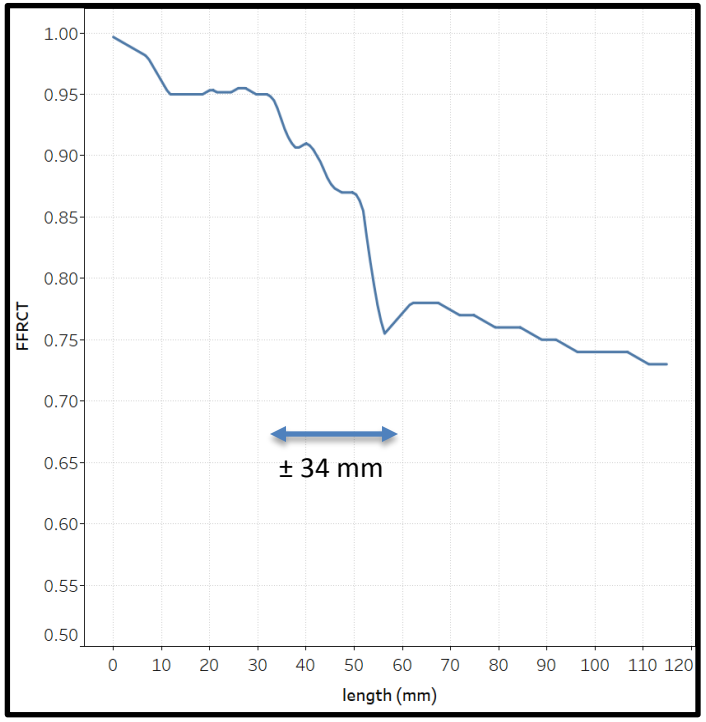
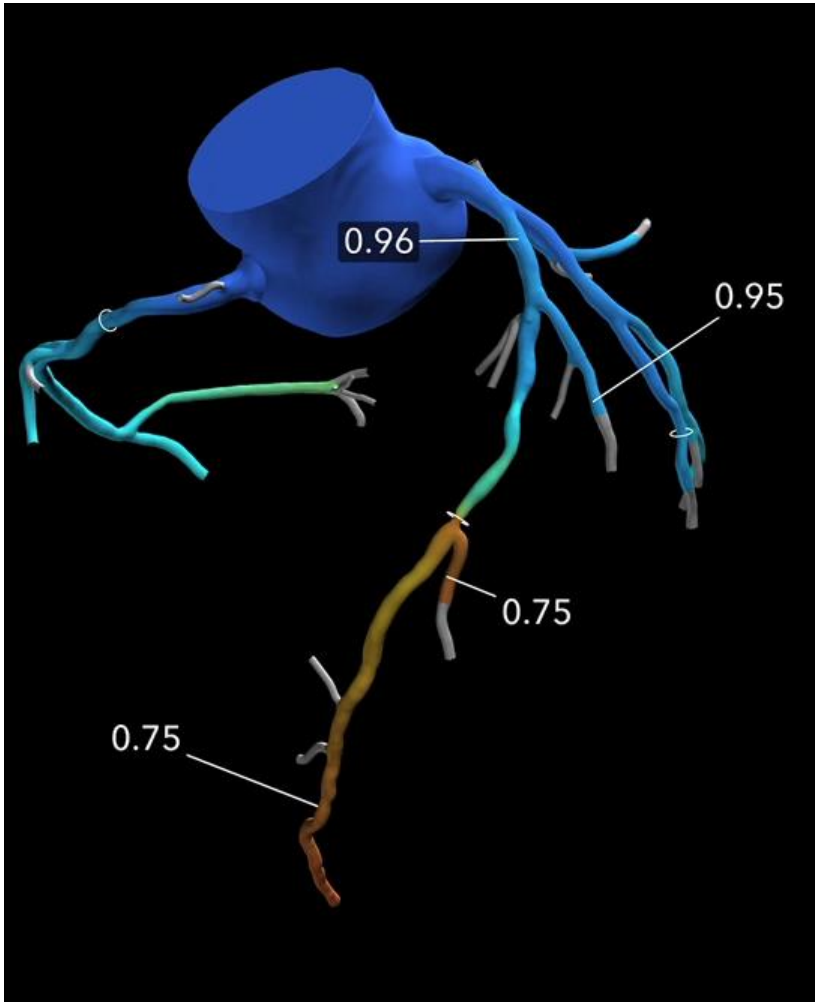
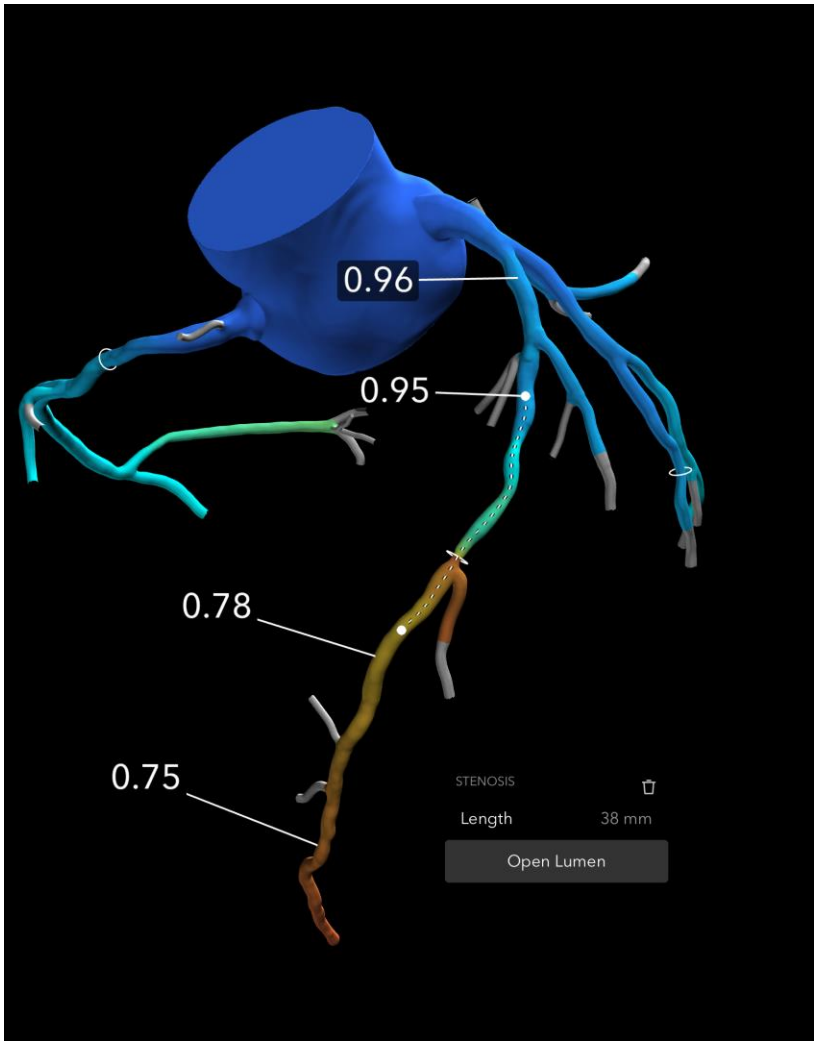
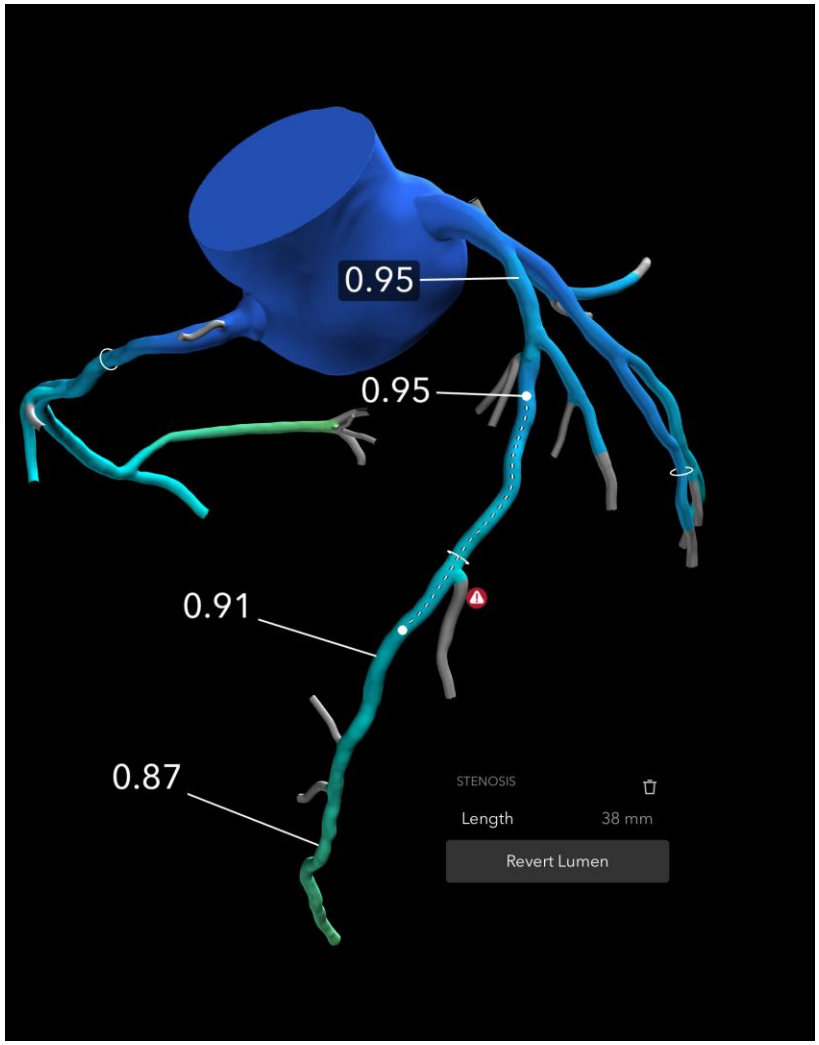


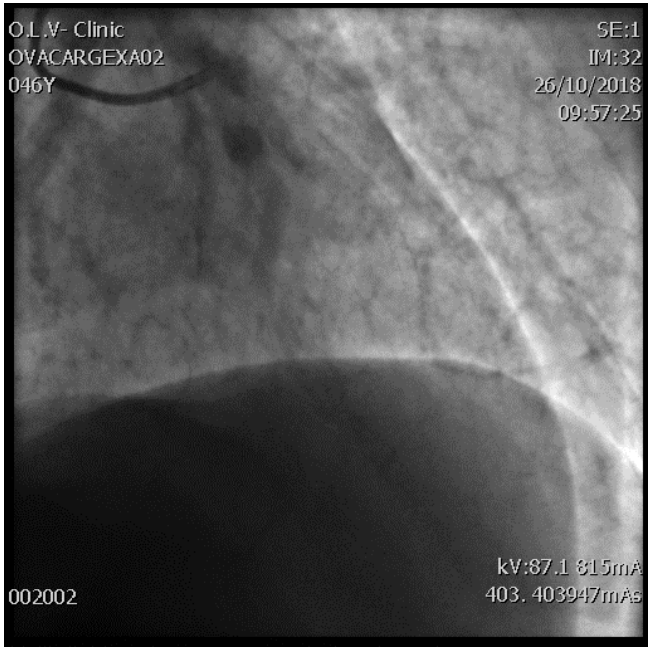


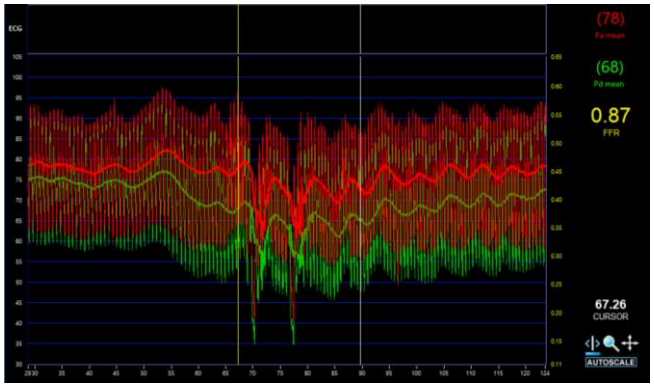


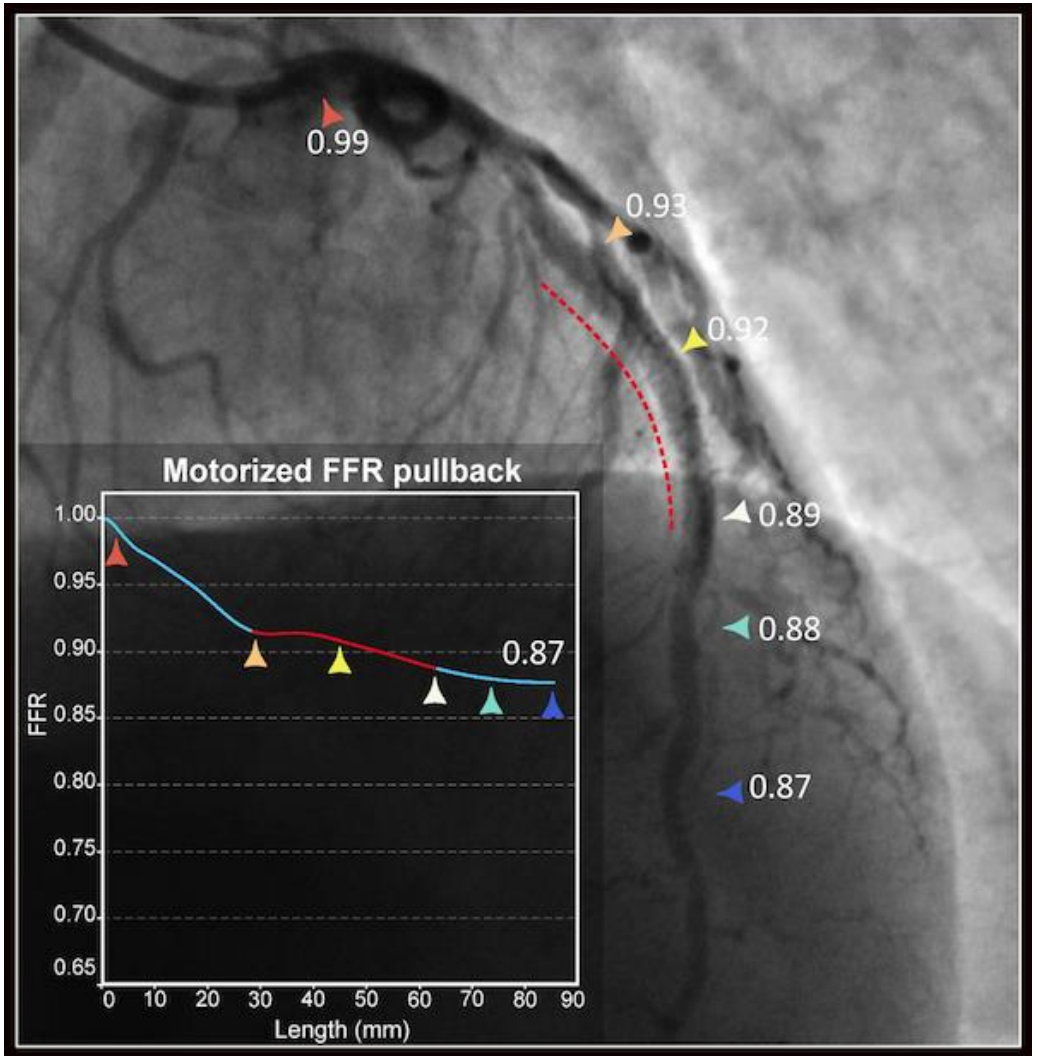

0.96
0.95
0.75
0.75


0.96
0.95
0.78
0.75
STENOSIS
Length
38 mm
Open Lumen

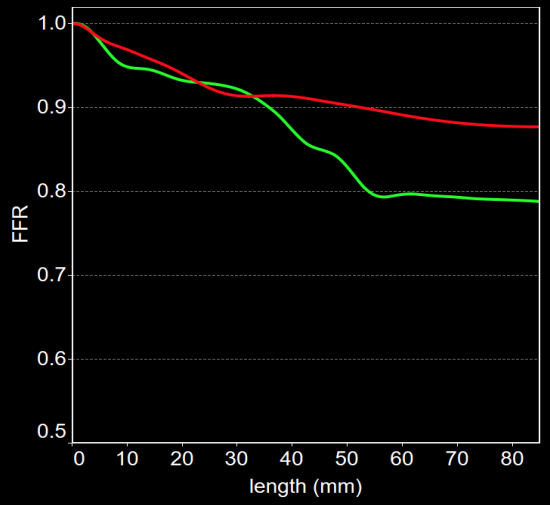

0.95
0.95
0.91
0.87
STENOSIS
Length
38 mm
Revert Lumen


O.L.V- Clinic
OVACARGEXA02
046Y
SE:1
IM:32
26/10/2018
09:57:25
kV:87.1 315mA
403. 403947mAs
002002


(78)
(68)
0.87
FFR
67.26
CURSOR
AUTOSCALE


0.99
0.93
0.92
0.89
0.88
0.87
Motorized FFR pullback
1.00
0.95
0.90
0.85
0.80
0.75
0.70
0.65
FFR
0.87
0 10 20 30 40 50 60 70 80 90
Length (mm)

Invasive vs. non-invasive treatment planning

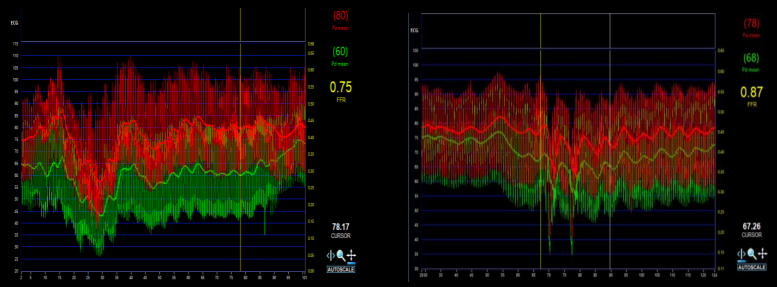


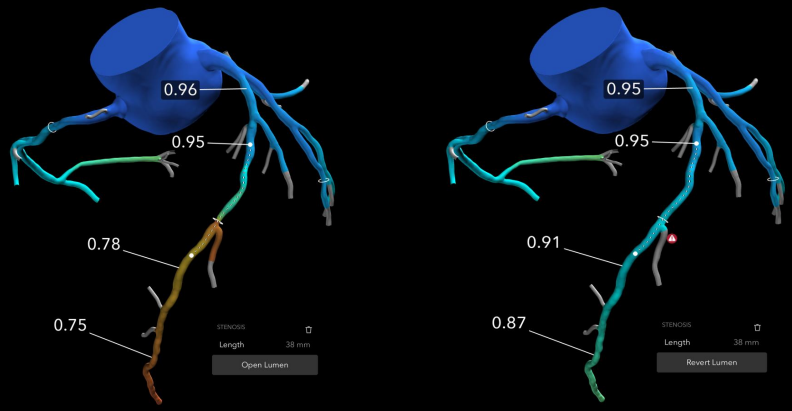
FFR post 0.87

FFR pre 0.79

FFR_{CT} post 0.87

FFR_{CT} pre 0.79





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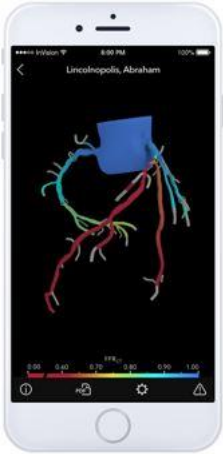
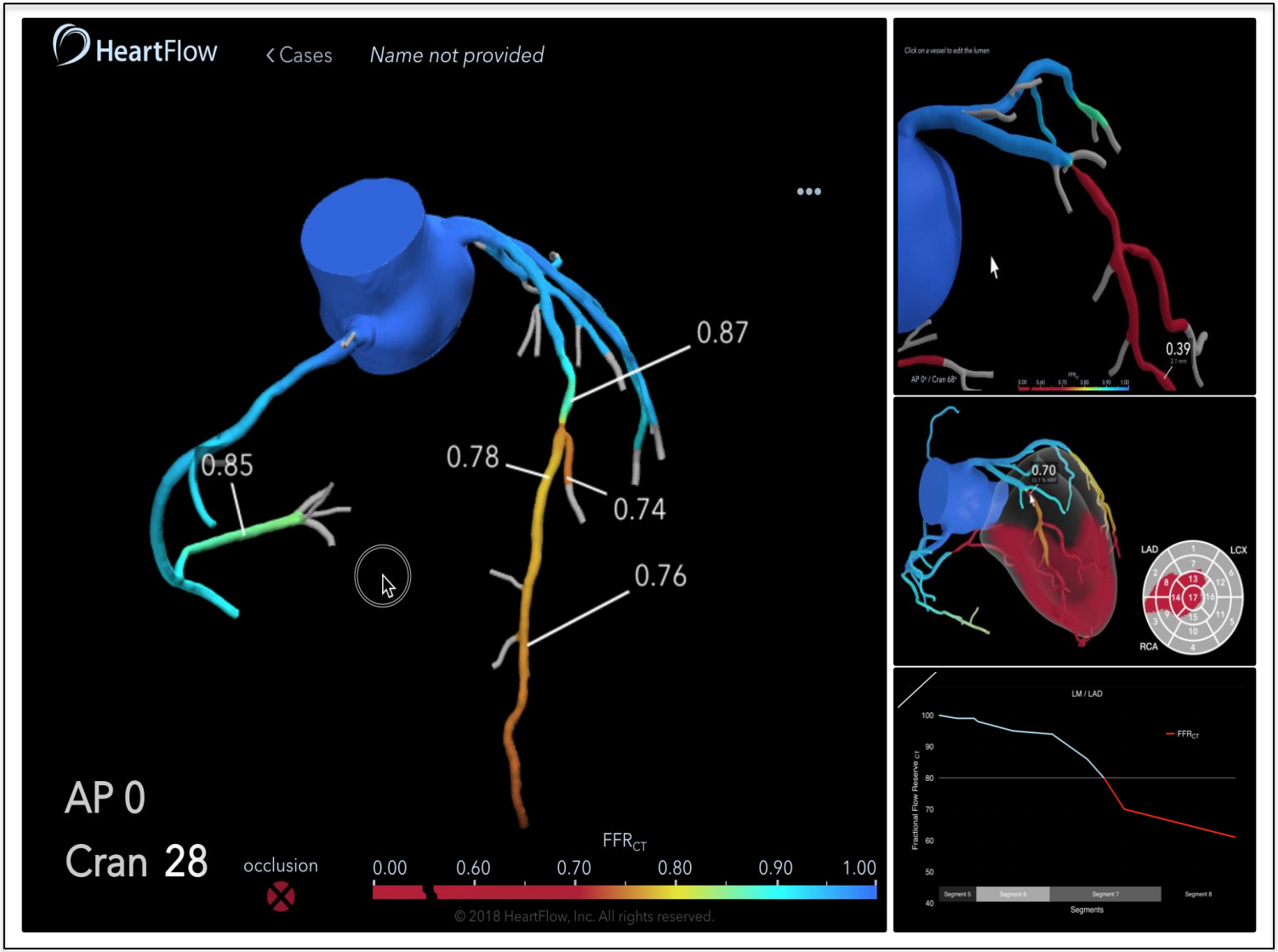
The future of FFR_{CT}: Mobile, On-Demand, Integrated & Interactive




HeartFlow
Cases
Name not provided
0.87
0.85
0.78
0.74
0.76
AP 0
Cran 28
occlusion
FFRCT
0.00
0.60
0.70
0.80
0.90
1.00
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Click on a vessel to edit the lumen
0.39
0.70
LAD
LCX
RCA
LM / LAD
FFRCT
Fractional Flow Reserve CT
100
90
80
70
60
50
40
Segment 5
Segment 6
Segment 7
Segment 8
Segments

Conclusion: FFR_{CT} in the lab of tomorrow

- FFR_{CT} enhances the non-invasive assessment of myocardial ischemia.
- Refine risk stratification with coronary physiology parameters on top of anatomy and known adverse plaque characteristics.
- May allow for decision-making between CABG and PCI and treatment planning in the non-invasive setting.
- Guide which lesions require an invasive assessment in the lab.
- Select the optimal revascularization strategy.
- Improve cathlab efficiency