

# Physiology-guided Optimal PCI - Learning from DEFINE Trials -

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*New York City, NY*

# 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.

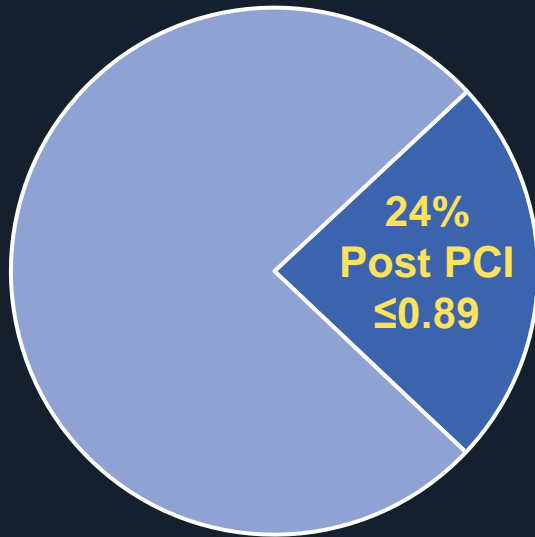
## Affiliation/Financial Relationship

- Consulting Fees/Honoraria
- Consulting Fees/Honoraria

## Company

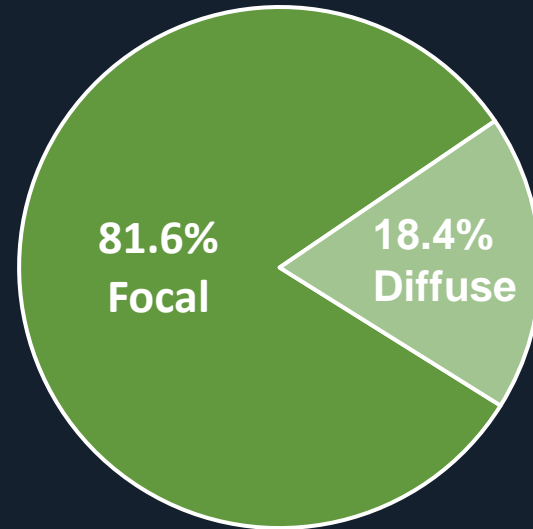
- TERUMO Corporation
- Boston Scientific Corporation

467 Patients with Angiographically Successful PCI and qualified iFR pullbacks



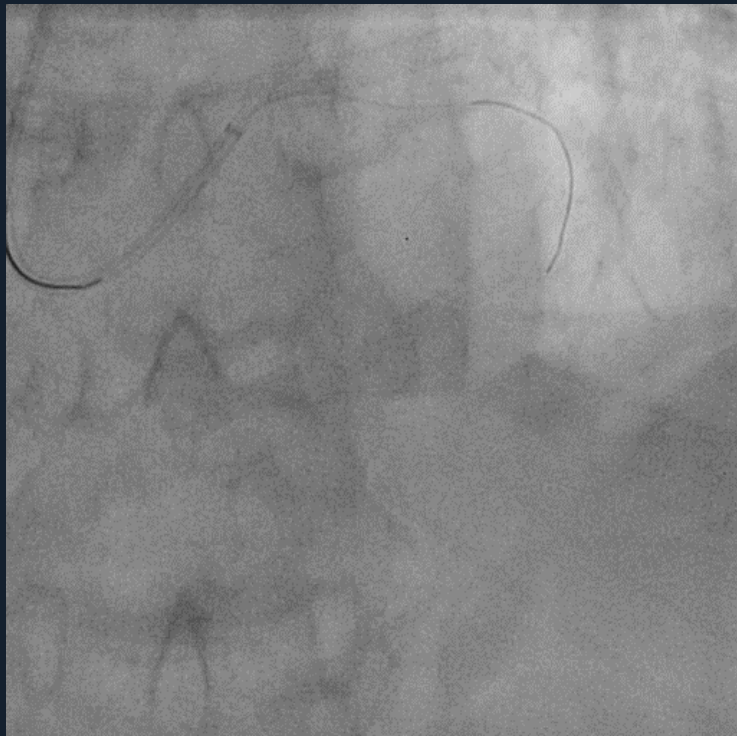
■ Post iFR ≤ 0.89   ■ Post iFR > 0.89

24% Residual Ischemia  
(112 patients with Post PCI iFR ≤ 0.89)

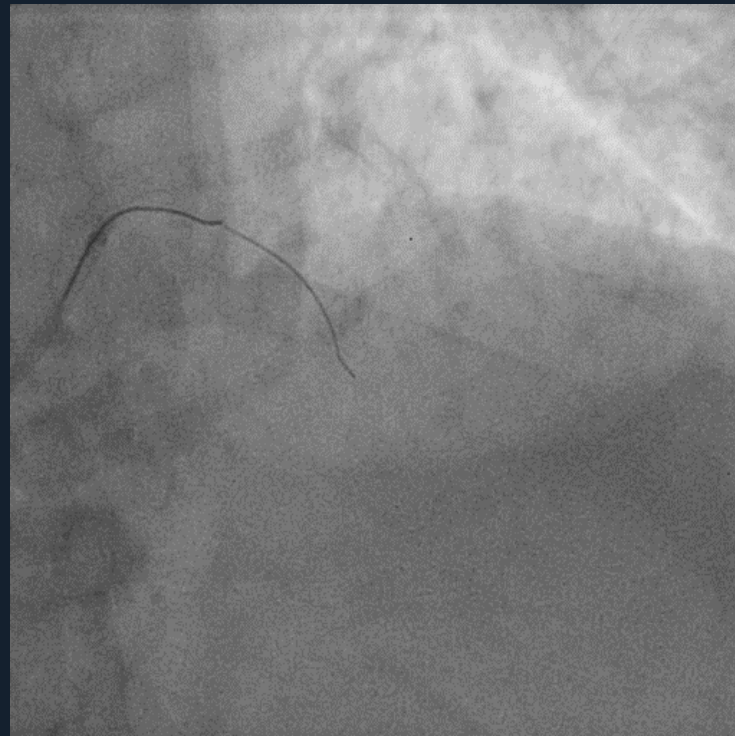


Focal defined as step-up of  $\geq 0.03$  units in  $\leq 15$  mm segment  
Diffuse defined as  $> 15$  mm segment

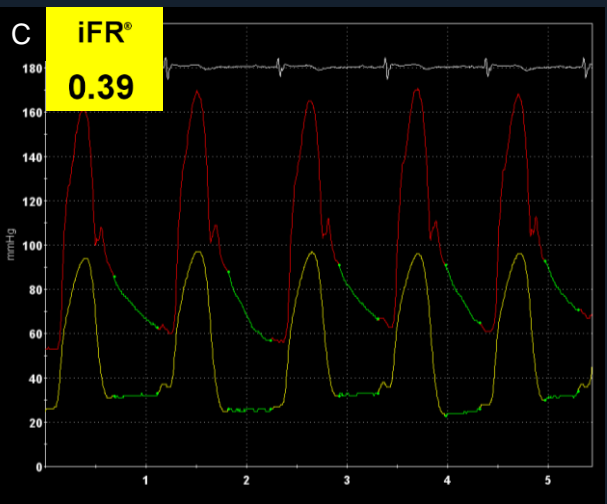
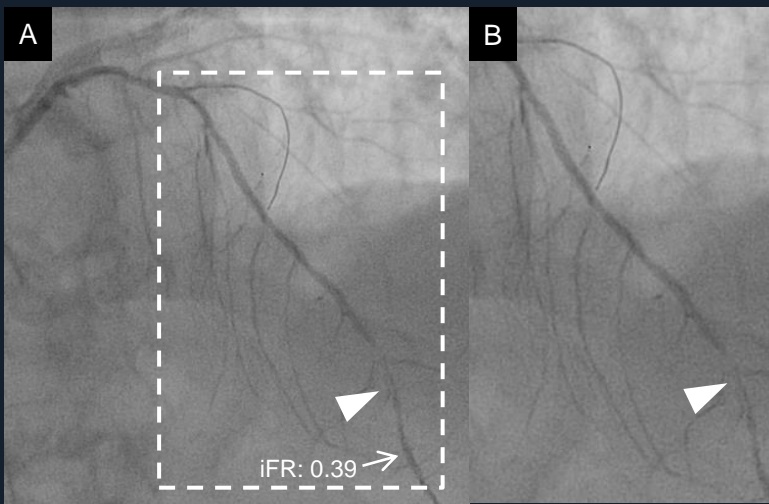
## Pre Angiogram



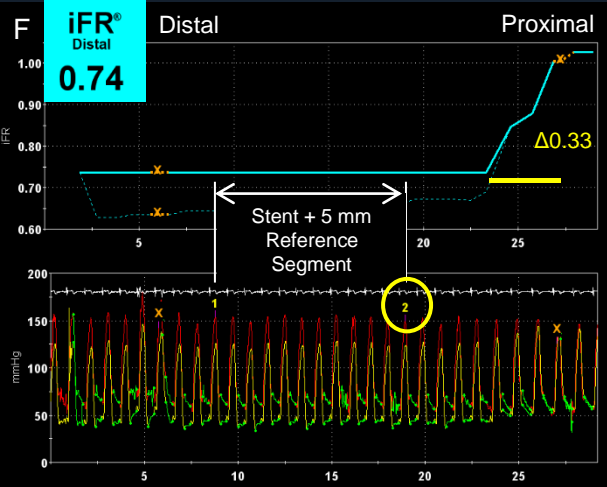
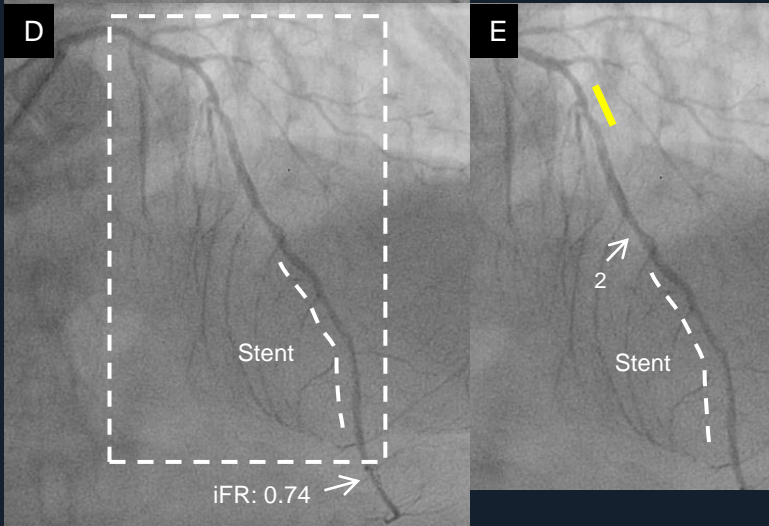
## Final Angiogram



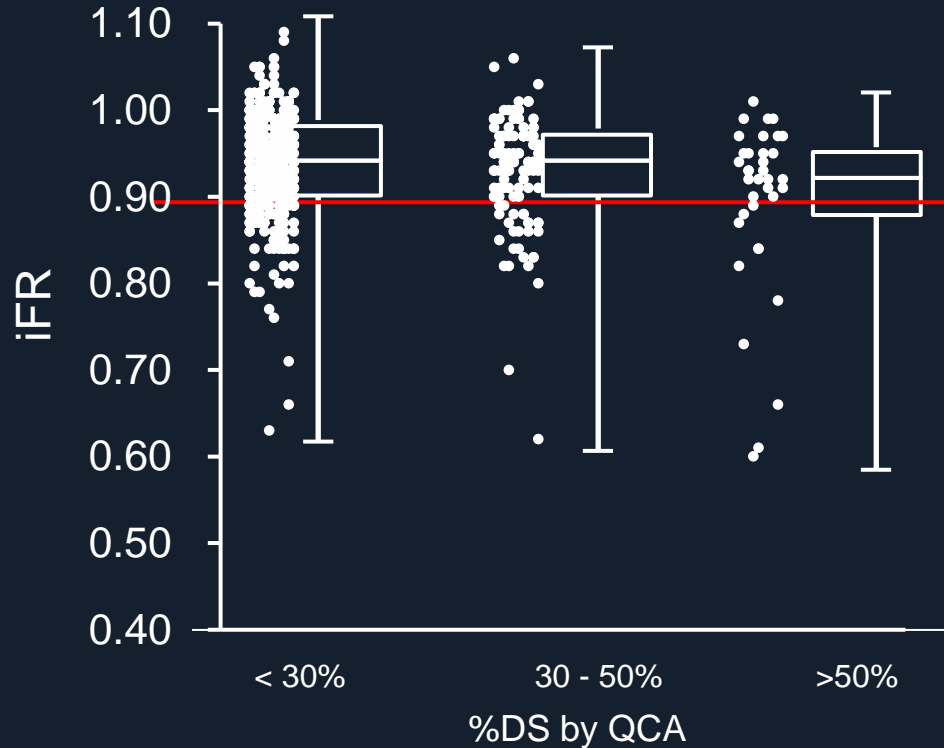
Pre-PCI



Post-PCI

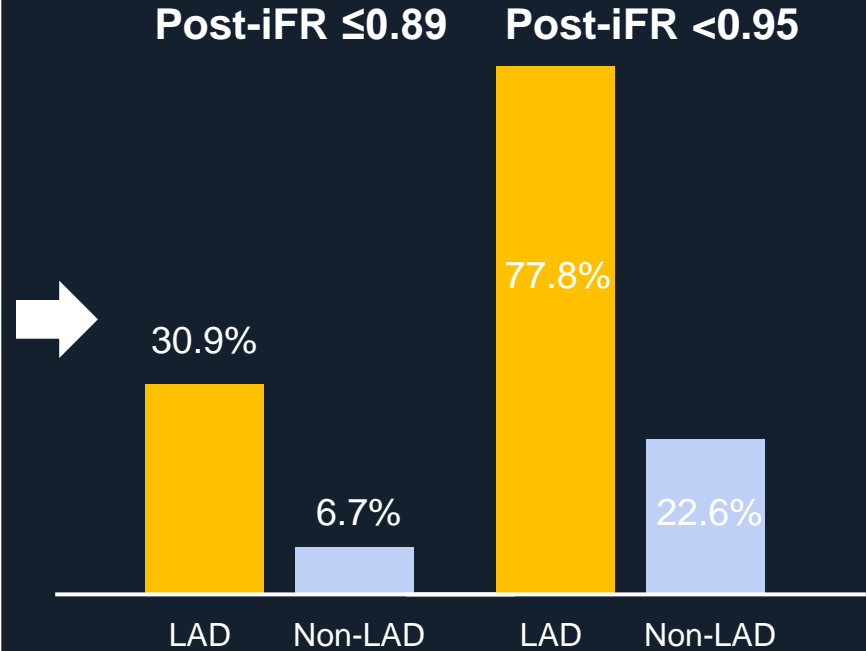
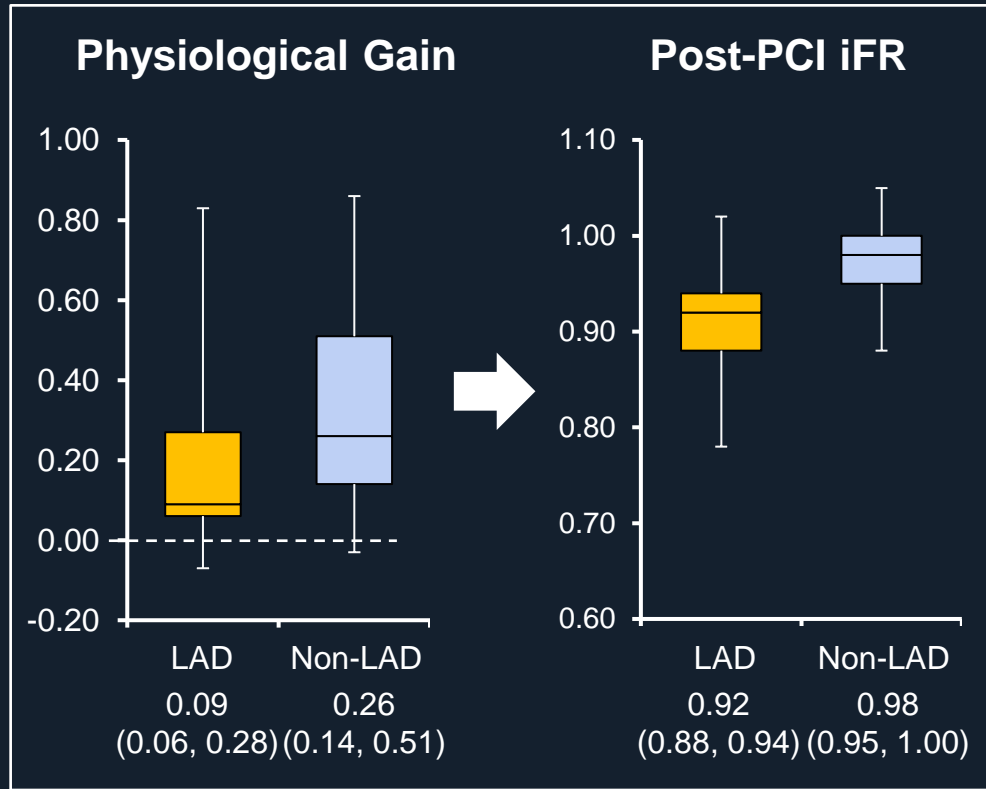


# Functional/Angiographic Mismatch After 'Successful' PCI

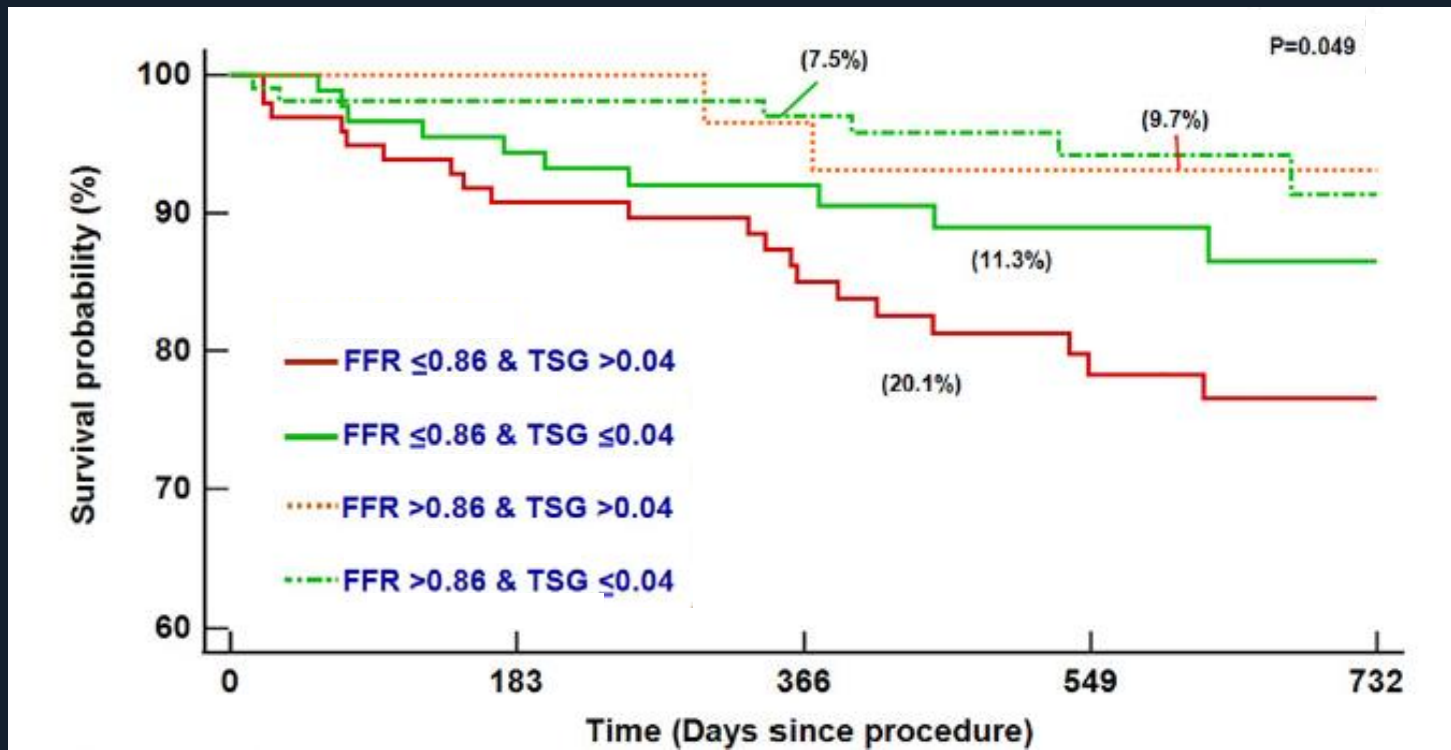


**Post PCI coronary angiography has poor correlation with coronary physiology assessment**

# Comparison of Physiological Assessment in the LAD vs. Non-LAD Vessels

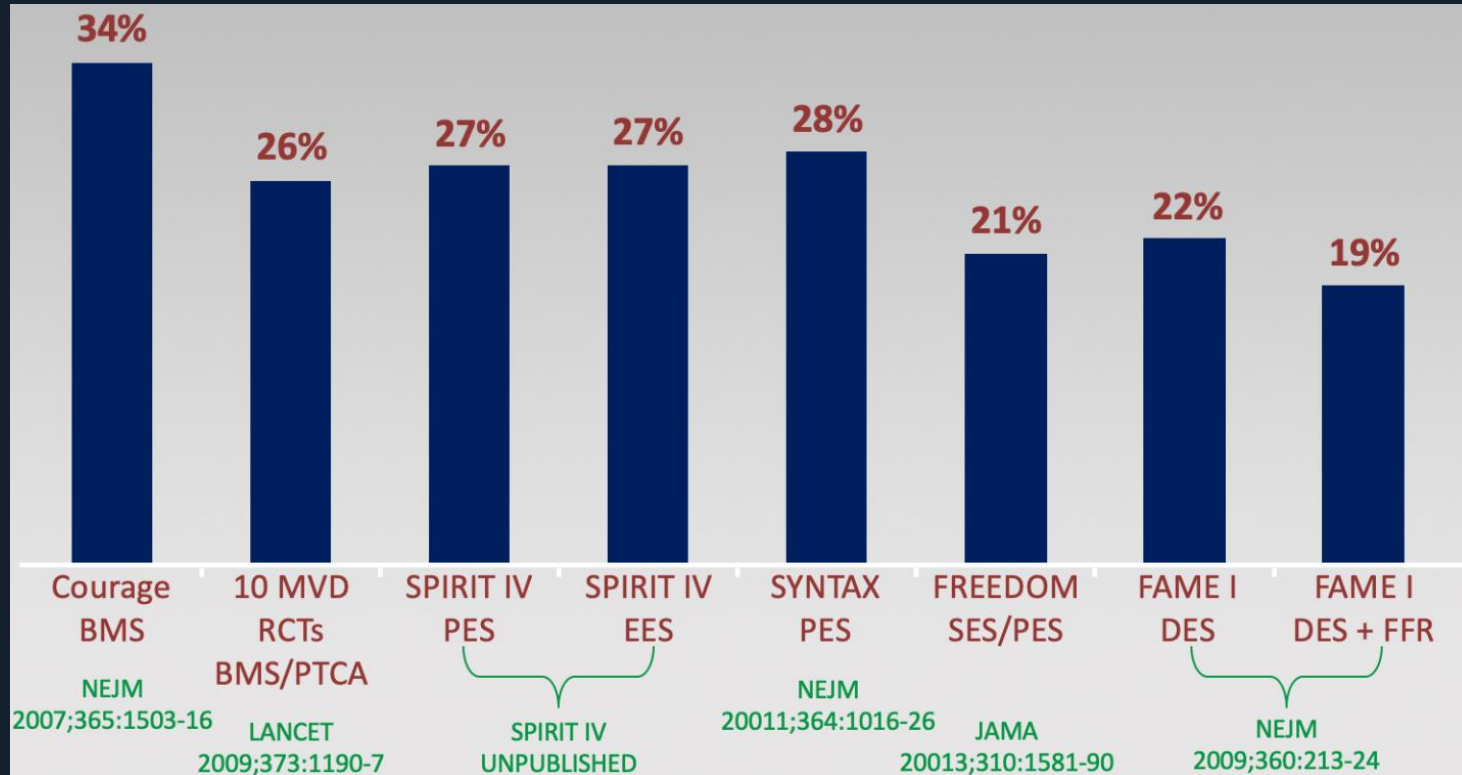


# Combined Effect of Post-PCI FFR and Trans-Stent FFR Gradient (TSG)





# Recurrent Angina at 1 Year After PCI



# DEFINE GPS



## Trial Design

- Prospective
- Randomized
- ~80 global sites

## Number of Patients

- 2,200 - 3,200

Guideline Directed PCI  
(excluding STEMI)

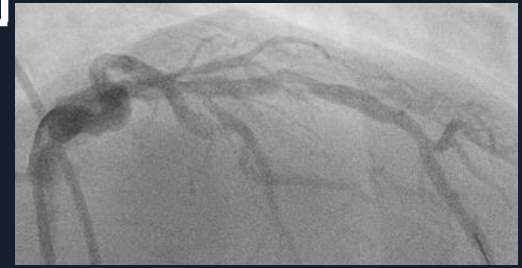
Randomize

iFR Co-Registration  
Guided PCI (GPS)

Standard of Care  
PCI

## Inclusion

- NSTEMI-ACS with  $DS \geq 50\%$
- Angiographic visual estimation  $DS \geq 80\%$
- Angiographic visual estimation  $DS \geq 50\%$  to  $< 80\%$  and an abnormal non-invasive stress test
- Angiographic visual estimation  $DS \geq 50\%$  to  $< 80\%$  and spot iFR  $\leq 0.89$  or FFR  $\leq 0.80$  for borderline iFR



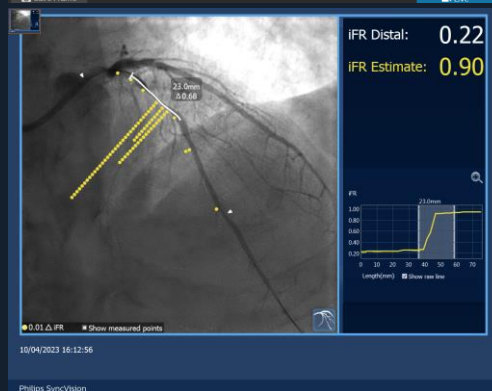
Blinded Assessments  
@ 30d, 6Mo, 1Y, 2Y

1° End Point: MACE @ 2Y

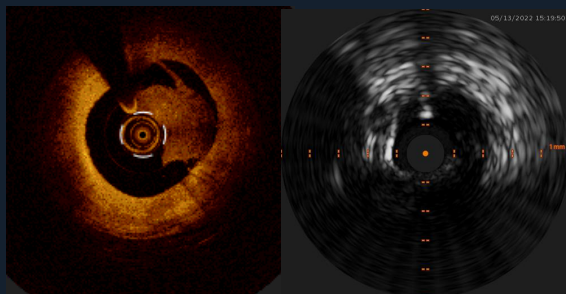
2° End Points @ 1Y & 2Y:  
QoL, Cost-Effectiveness, etc.

# Procedure Guidance in GPS Arm

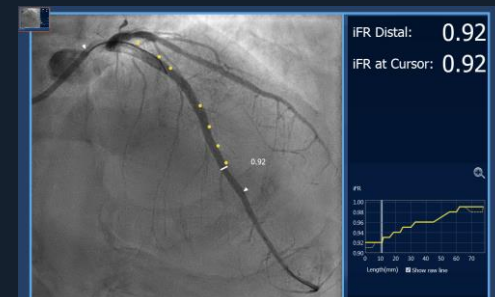
Pre



PCI

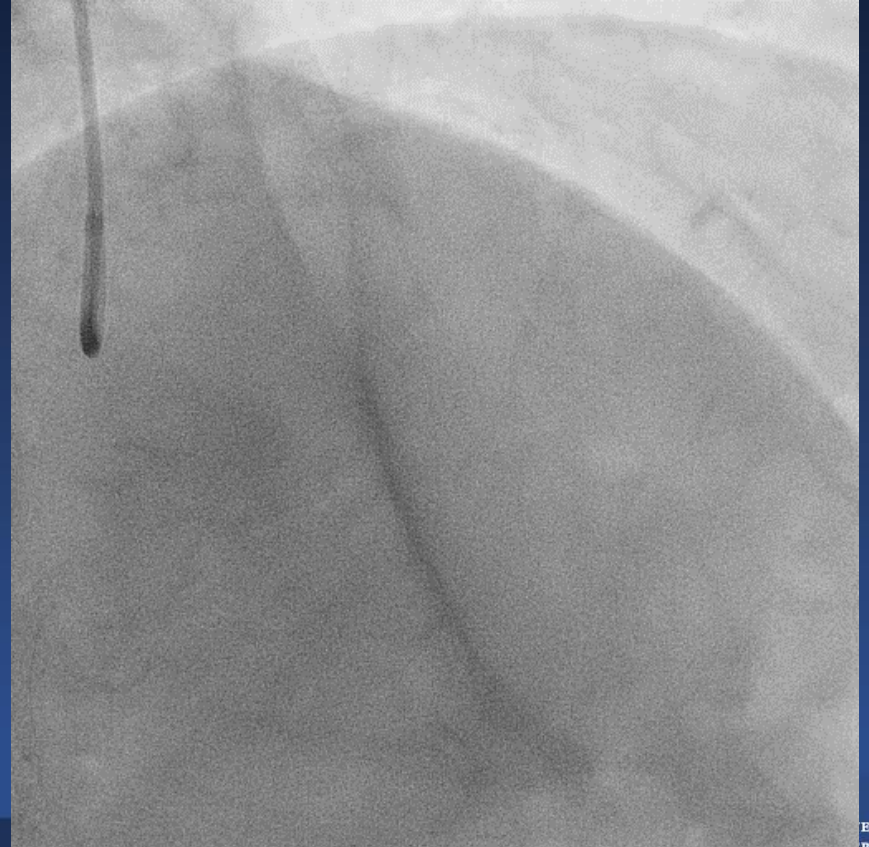


Post-stent or Final

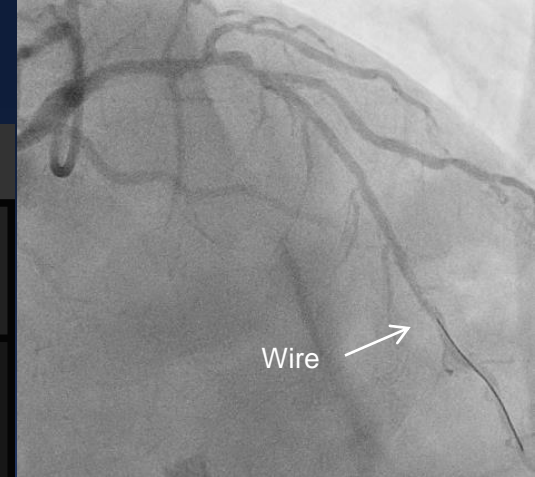


**Goal of PCI**  
**≤ 5 residual iFR units (IU)**  
**AND**  
**≤ 2 IUs within 15mm stent segment**

# Case



# Pre-PCI Spot iFR



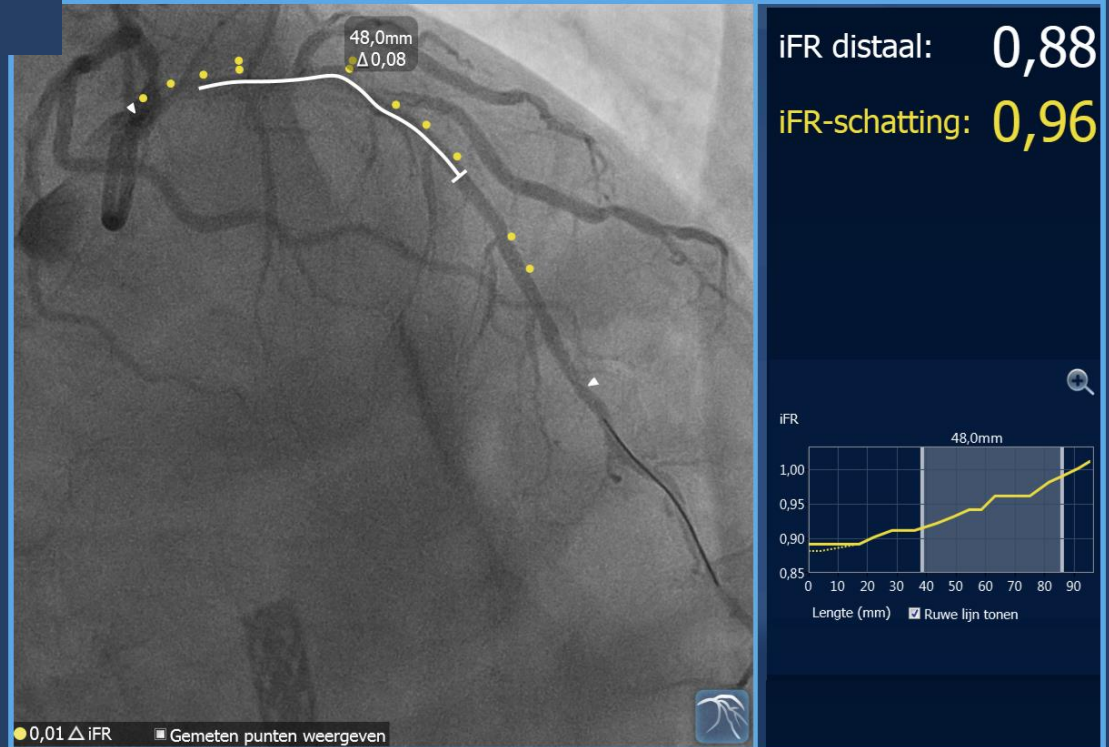


- Distal spot-iFR: 0.87
- Distal iFR during pullback: 0.88

### Planned number of IUs

- Lesion segment: 8 IUs
- Distal segment: 2 IUs
- Proximal segment: 2 IUs

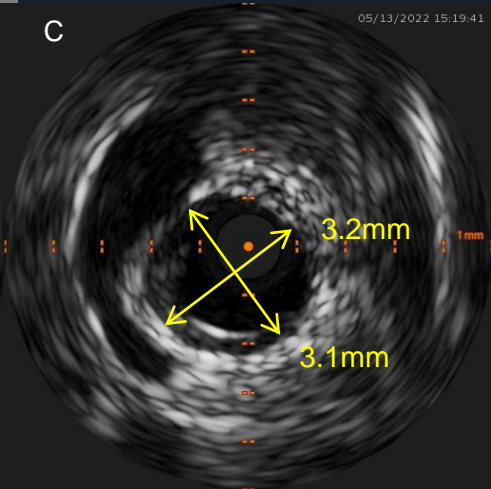
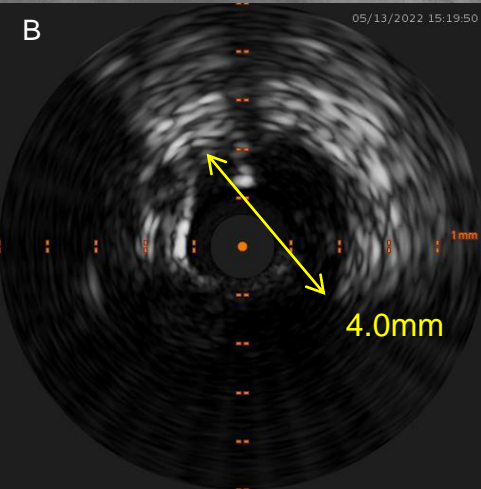
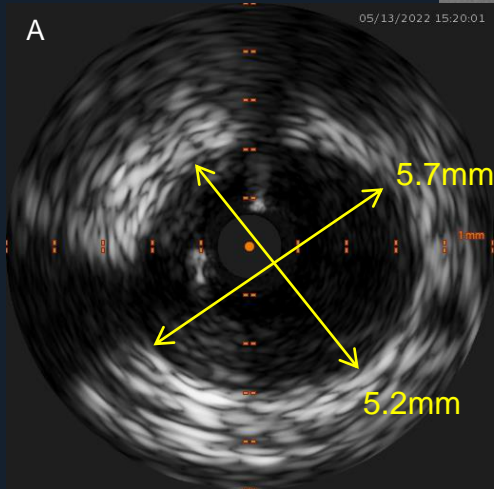
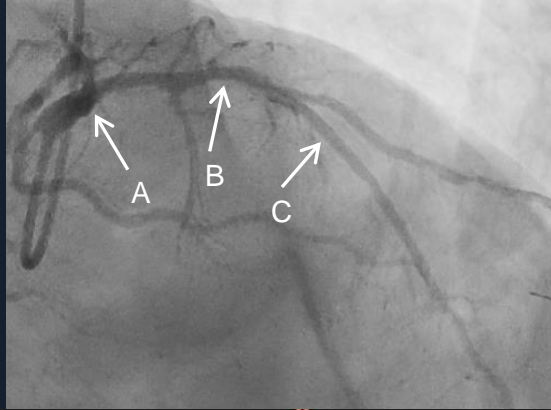
# Planning



13/05/2022 13:41:18

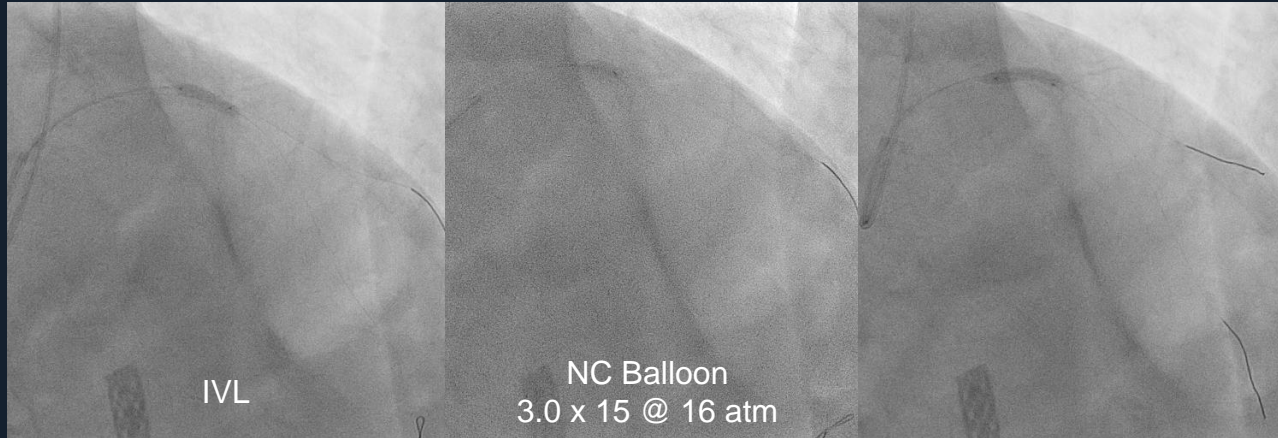
Philips SyncVision

# Pre IVUS

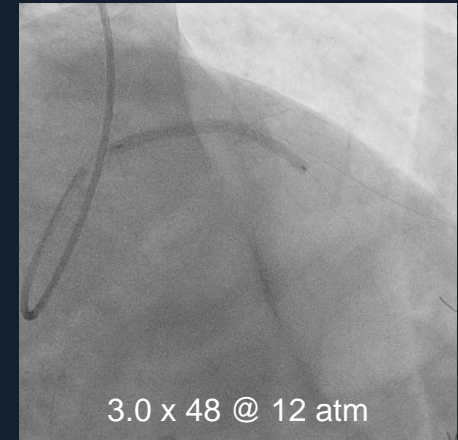


# PCI

IVL / POBA

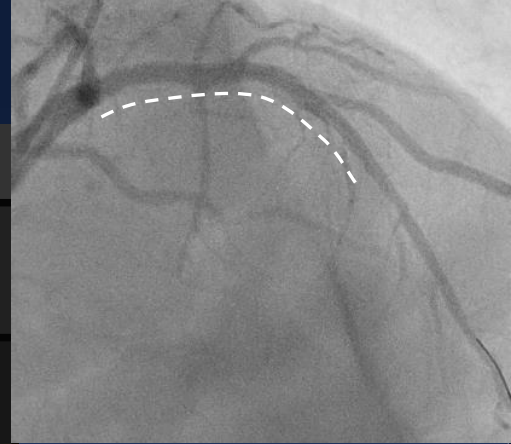


Stent





# Post-stent Spot iFR



PHILIPS

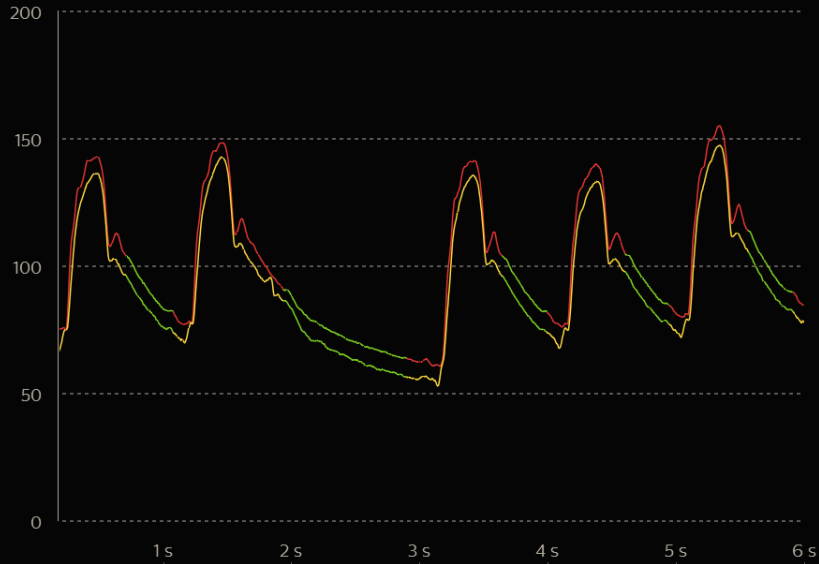
iFR Spot 6: LAD post pci

05/13/2022 15:52:25

iFR SPOT

0.91

mmHg



Pa

Pd

Nulst. Pa

Normals.

Pd/Pa

15:52:25 iFR Spot 0.91

15:50:31 FFR 1.00

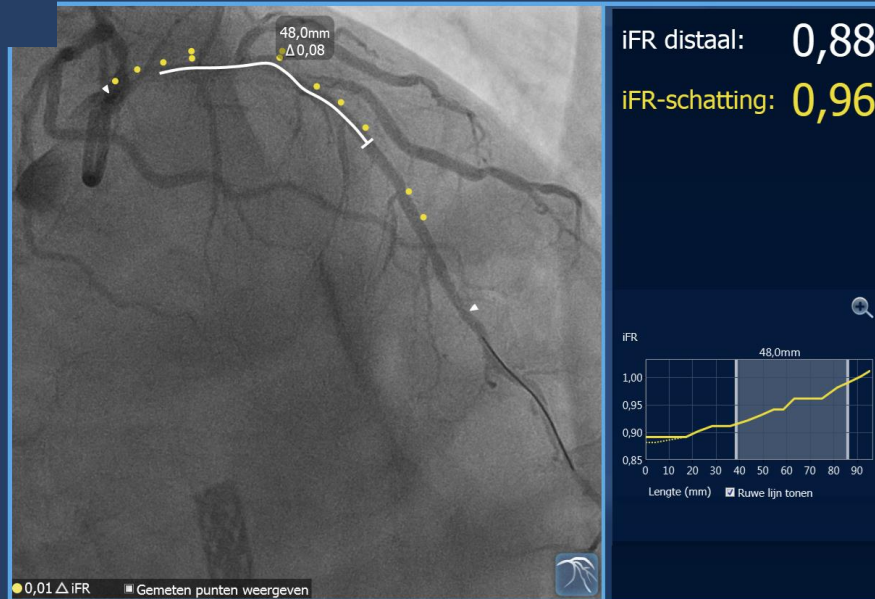
14:57:09 iFR PB 0.88

14:52:46 FFR 0.99

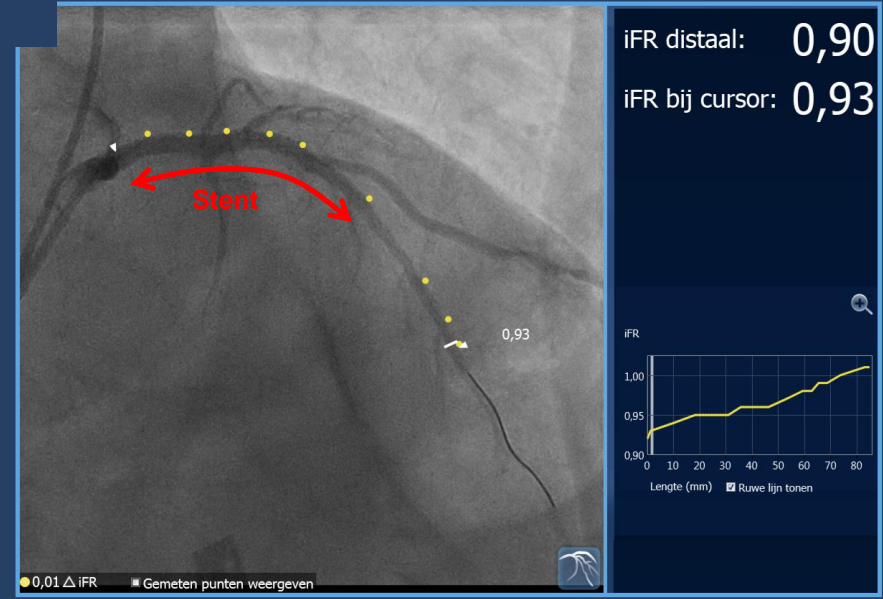
14:52:09 iFR Spot 0.87

# Post-stent Co-registration

## Pre-PCI



## Post-stent



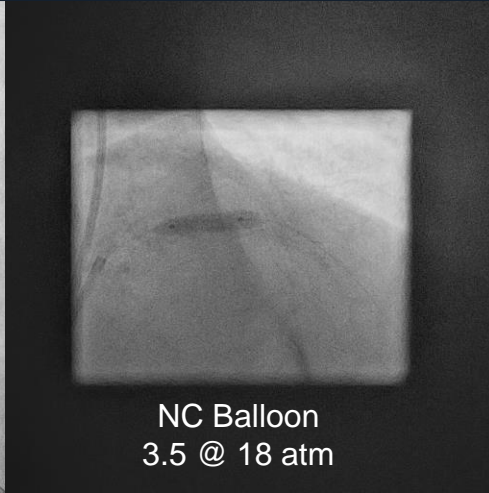
- Distal spot-iFR: 0.91
- Distal iFR during pullback: 0.90

### Residual IUs (Total: 9 IUs)

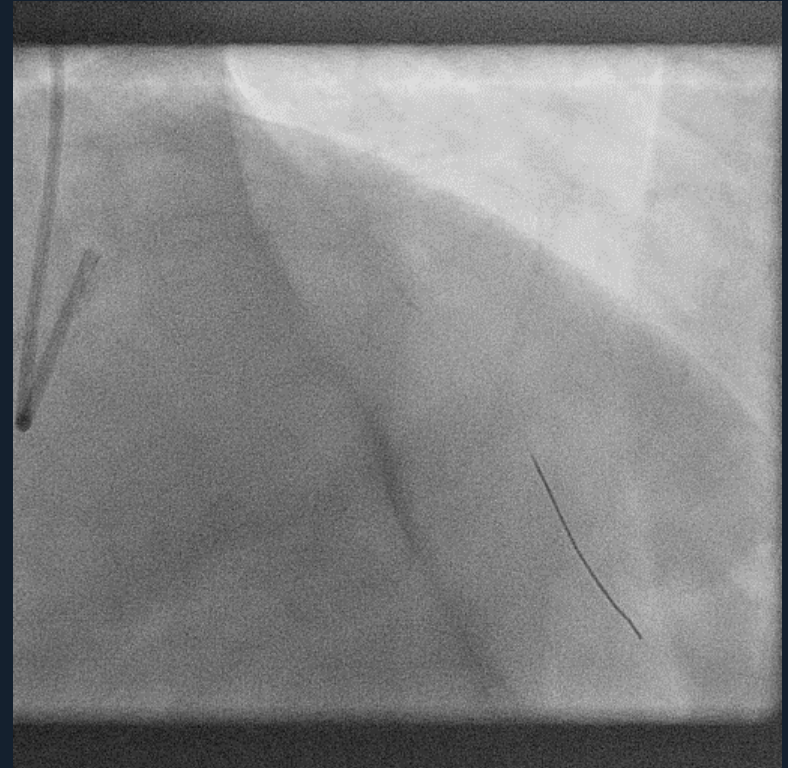
- Stent segment: 6 IU
- Distal segment: 3 IU
- Proximal segment: 0 IU

# PCI

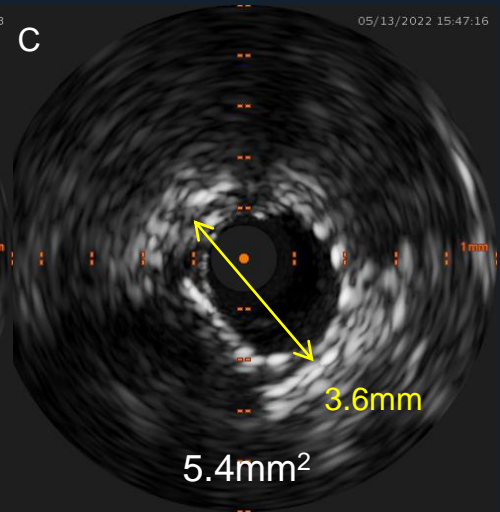
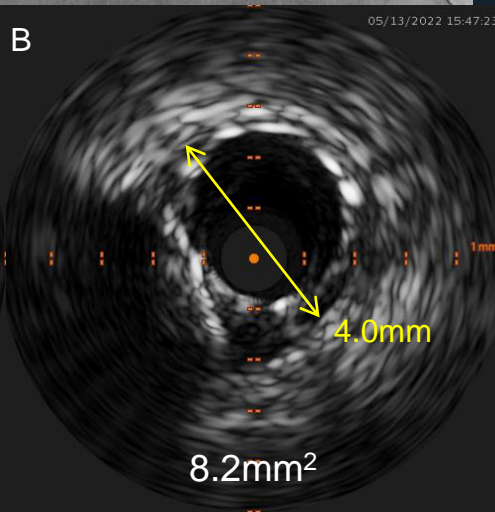
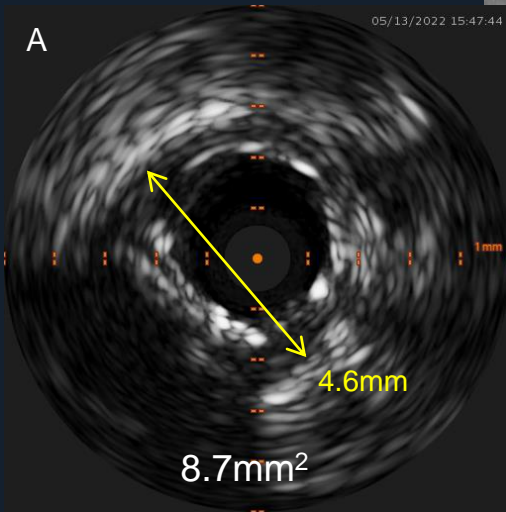
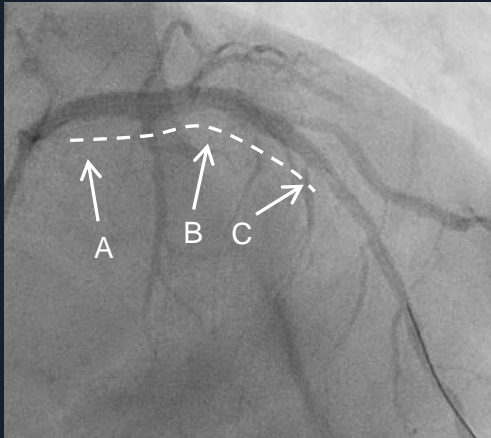
Post Dilation



Post Dilation Angio



# Final IVUS



# Final Spot iFR

PHILIPS

iFR Spot 10: LAD Post Stent Balloon 05/13/2022 16:10:43

mmHg

Time	Pa (mmHg)	Pd (mmHg)	FFR
16:10:43	~140	~135	0.96
16:09:17	~140	~135	1.00
16:09:04	~140	~135	1.00
16:05:04	~140	~135	0.99
16:03:11	~140	~135	0.95

IFR SPOT **0.96**

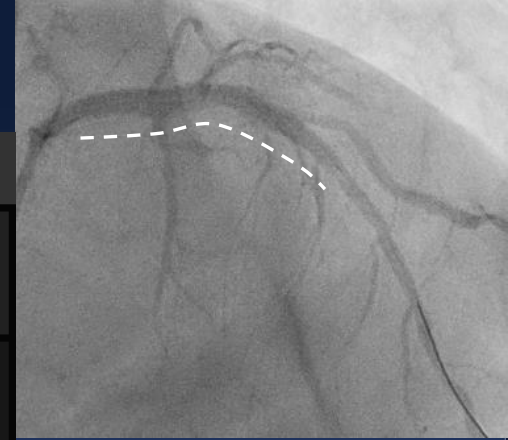
Pa Pd

↓ Nulst. Pa ↗ Normalis.

Pd/Pa

16:10:43	IFR Spot	0.96
16:09:17	FFR	1.00
16:09:04	FFR	1.00
16:05:04	FFR	0.99
16:03:11	IFR PB	0.95

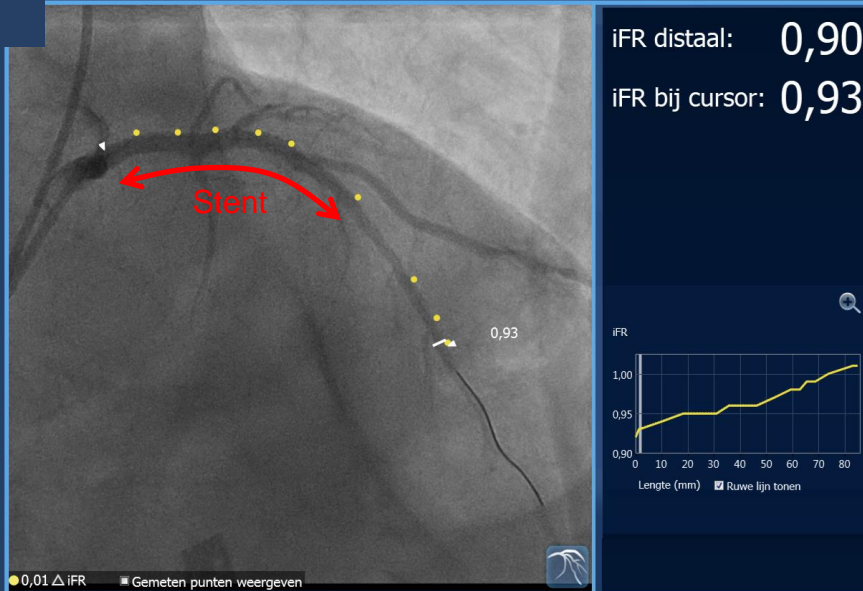
Frame opslaan Live



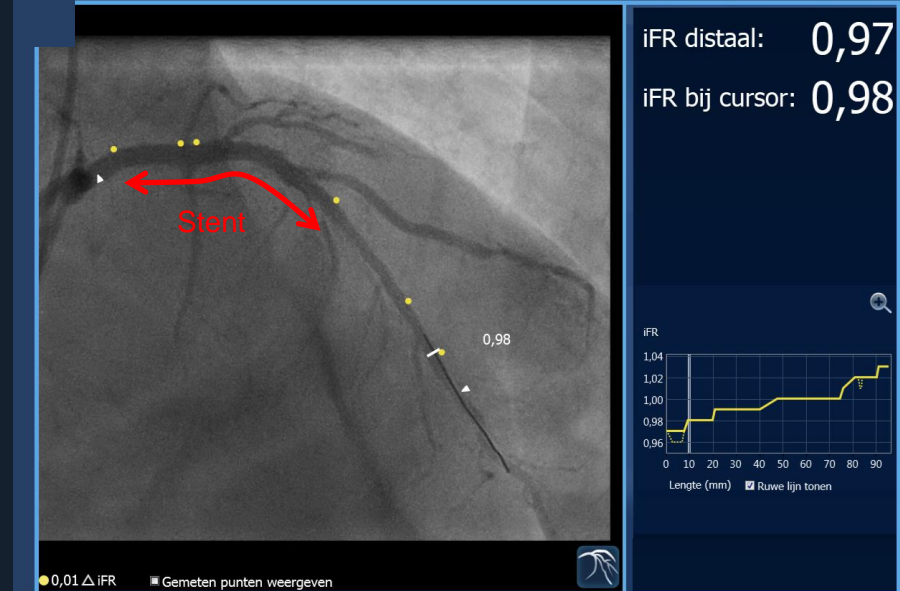


# Final Co-registration

## Post-stent



## Final

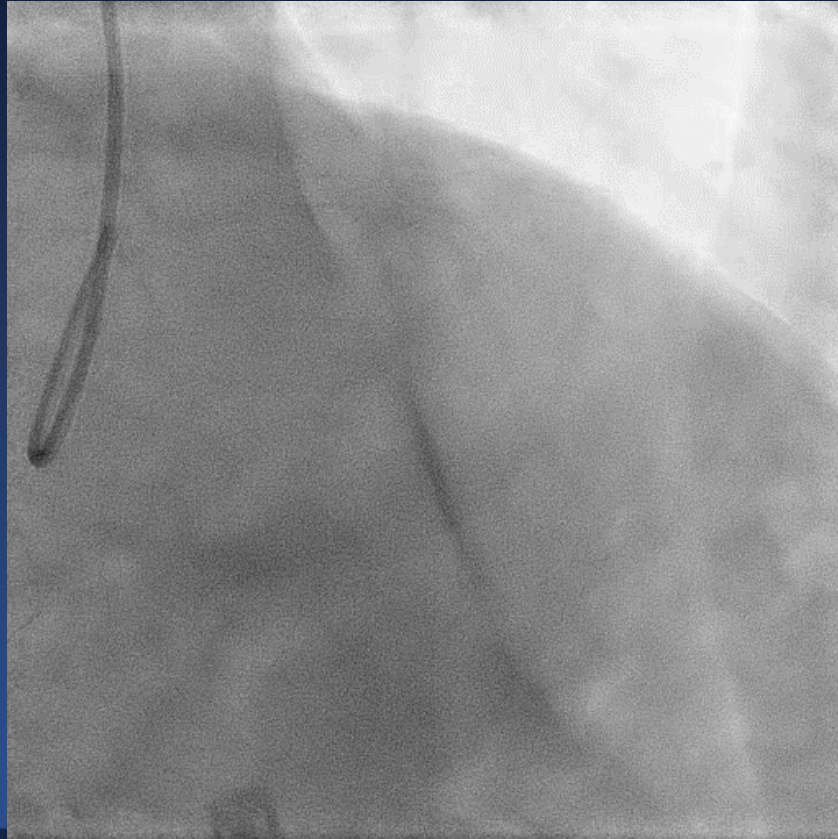


- Distal spot-iFR: 0.96
- Distal iFR during pullback: 0.97

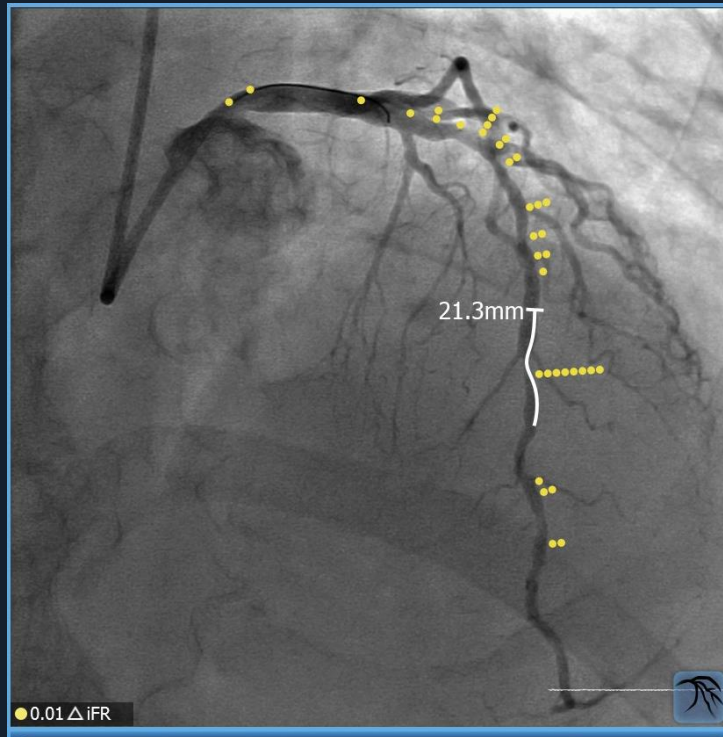
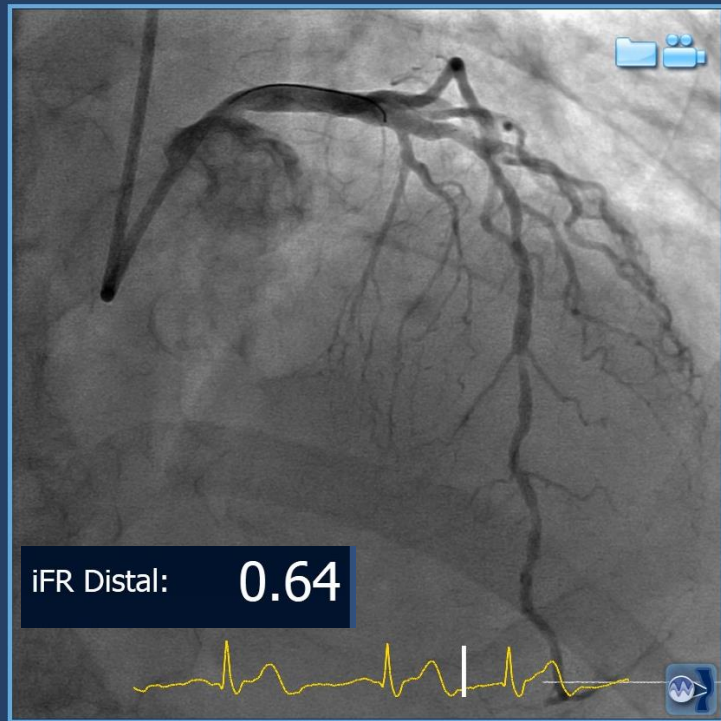
### Residual IUs (Total: 6 IUs)

- Stent segment: 4 IU
- Distal segment: 2 IU
- Proximal segment: 0 IU

# Final Angiogram



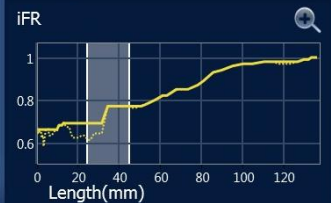
# iFR Pullback Example 1



iFR Distal: **0.64**

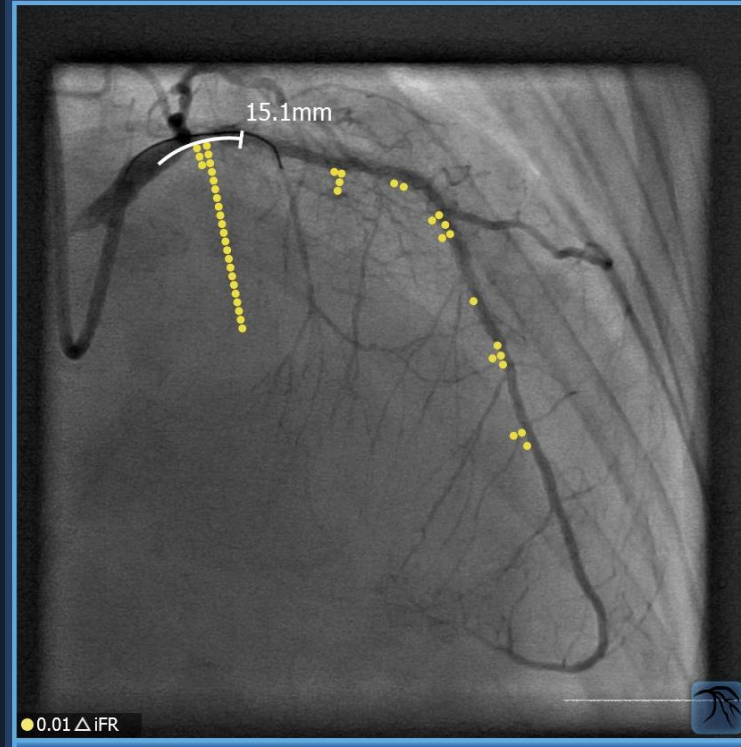
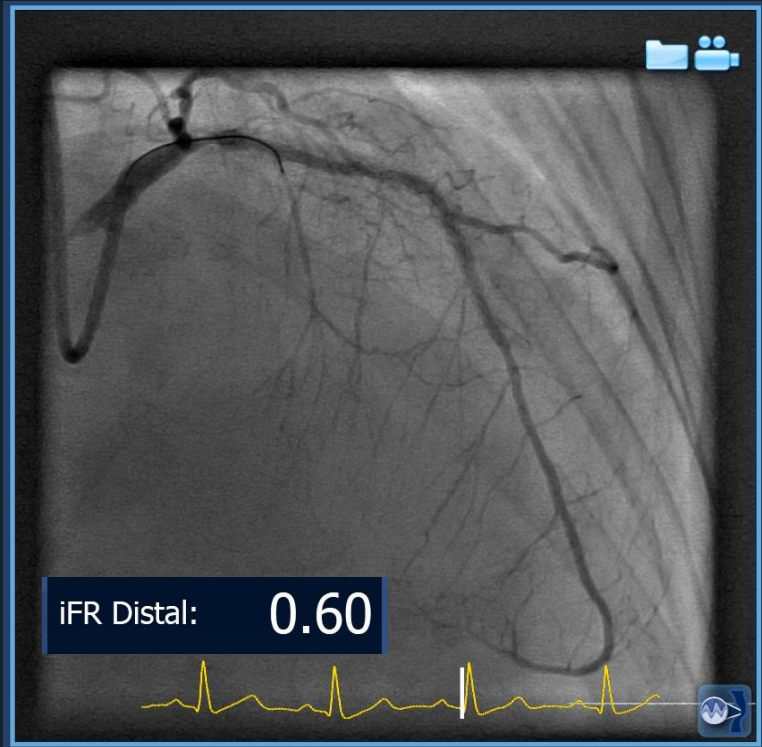
iFR drop  
in selection : **0.08**

Length: **21.3mm**





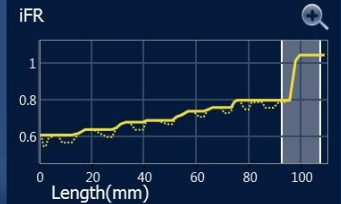
# iFR Pullback Example 2



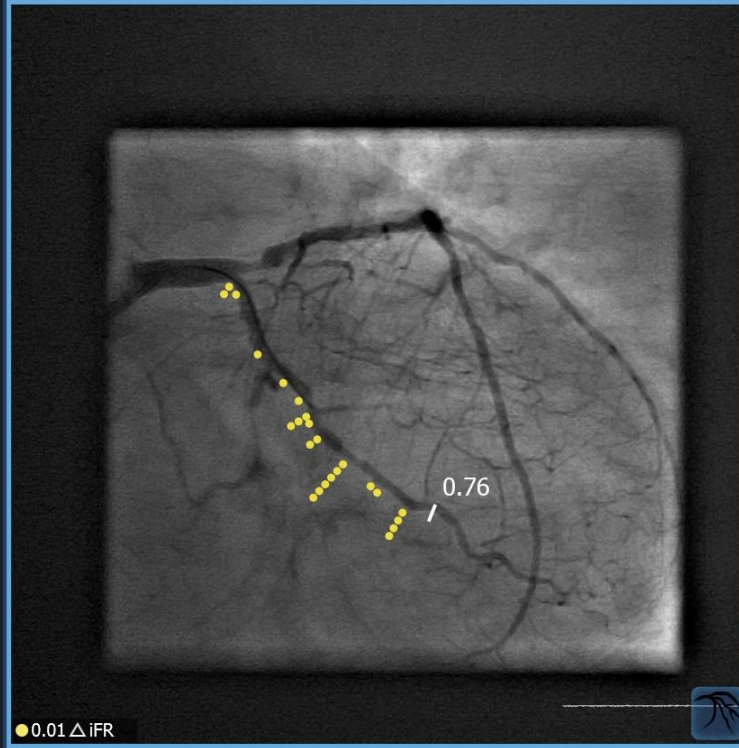
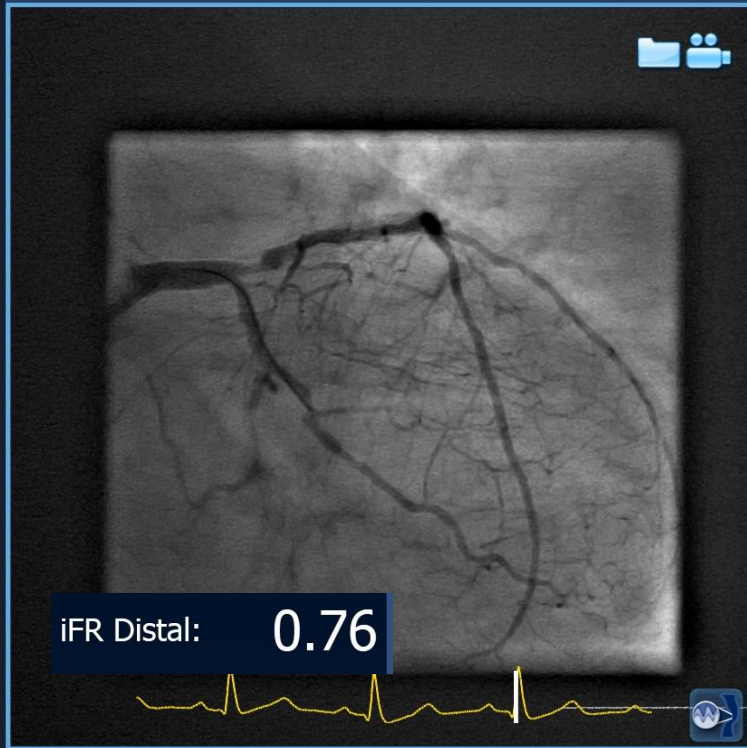
iFR Distal: 0.60

iFR drop  
in selection : 0.25

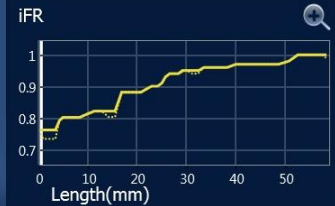
Length: 15.1mm



# iFR Pullback Example 3



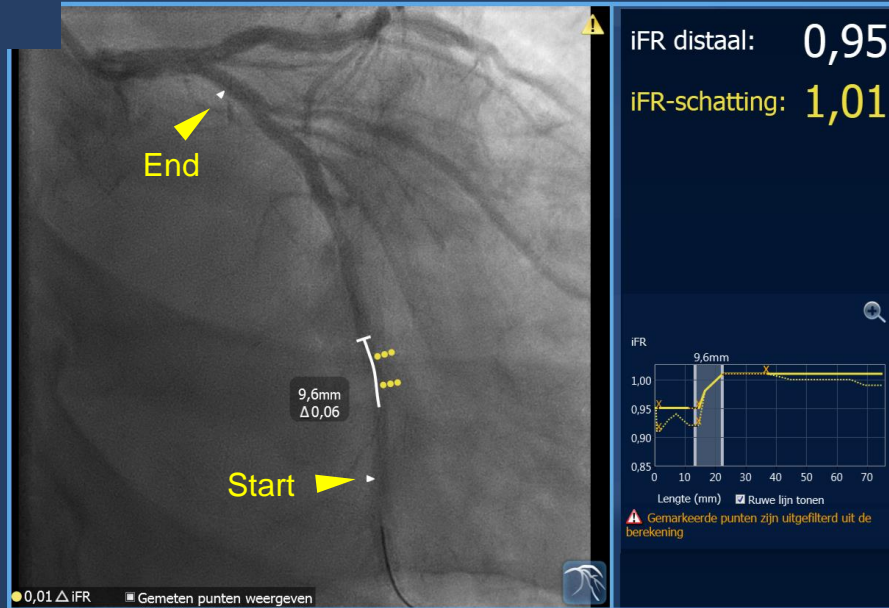
iFR Distal: 0.76  
iFR at Cursor: 0.76



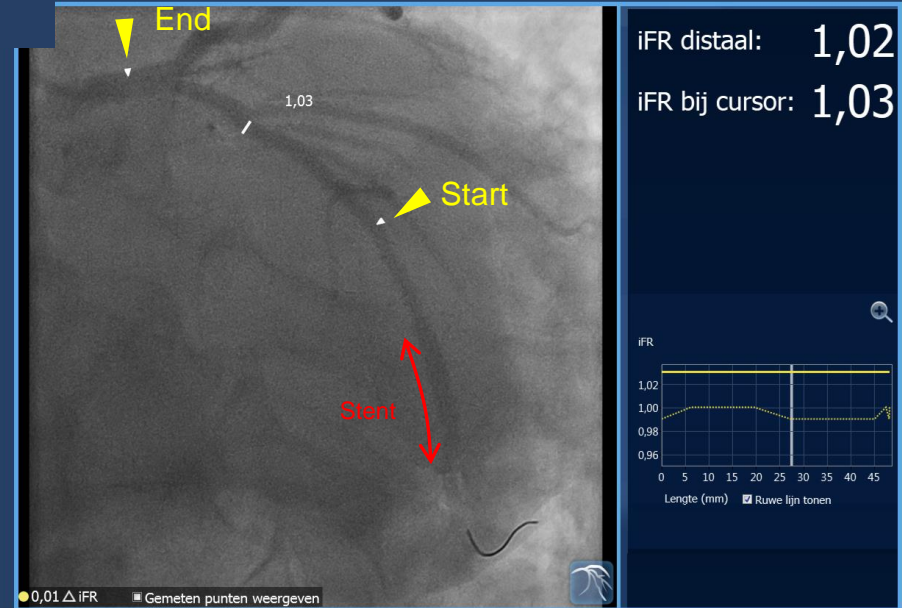
# Pay Attention to iFR pullback

# Co-registration was started too proximal

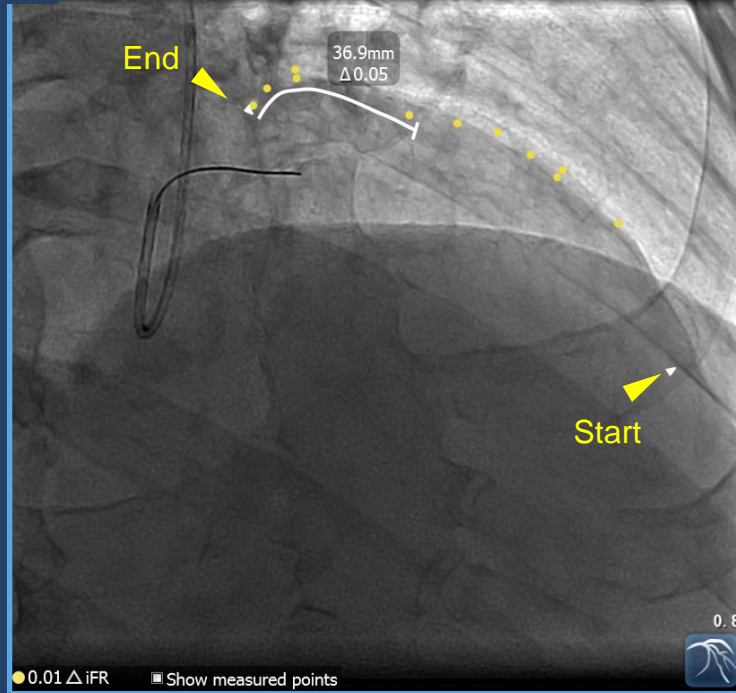
Pre



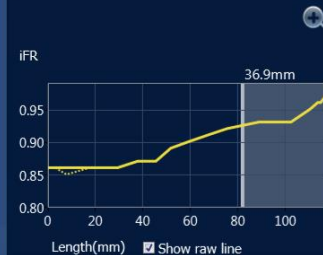
Final



# Co-registration on the non-contrast image



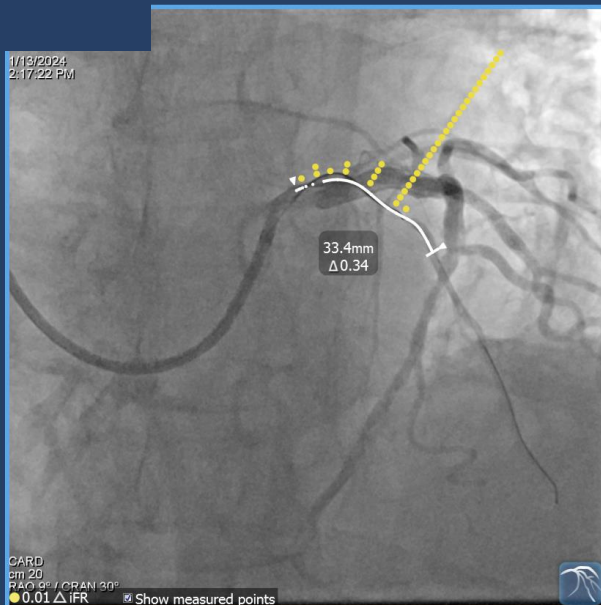
iFR Distal: 0.85  
iFR Estimate: 0.90





# Cause: Buddy wire was too close at the starting point of pullback

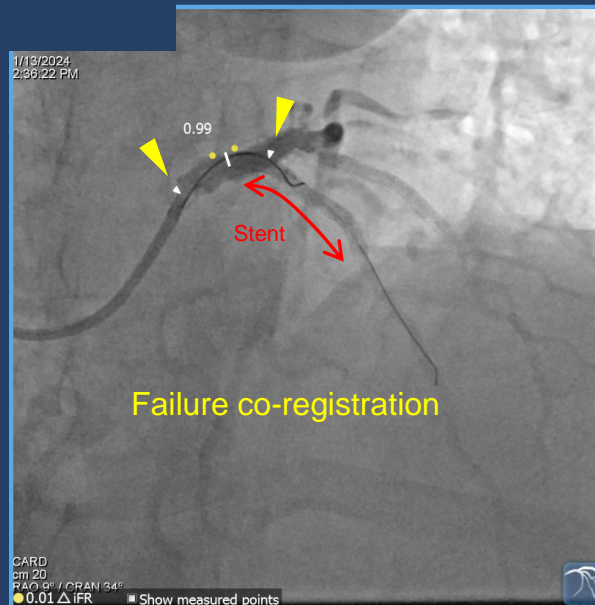
Pre



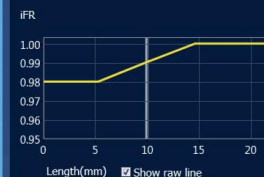
iFR Distal: 0.65  
iFR Estimate: 0.99



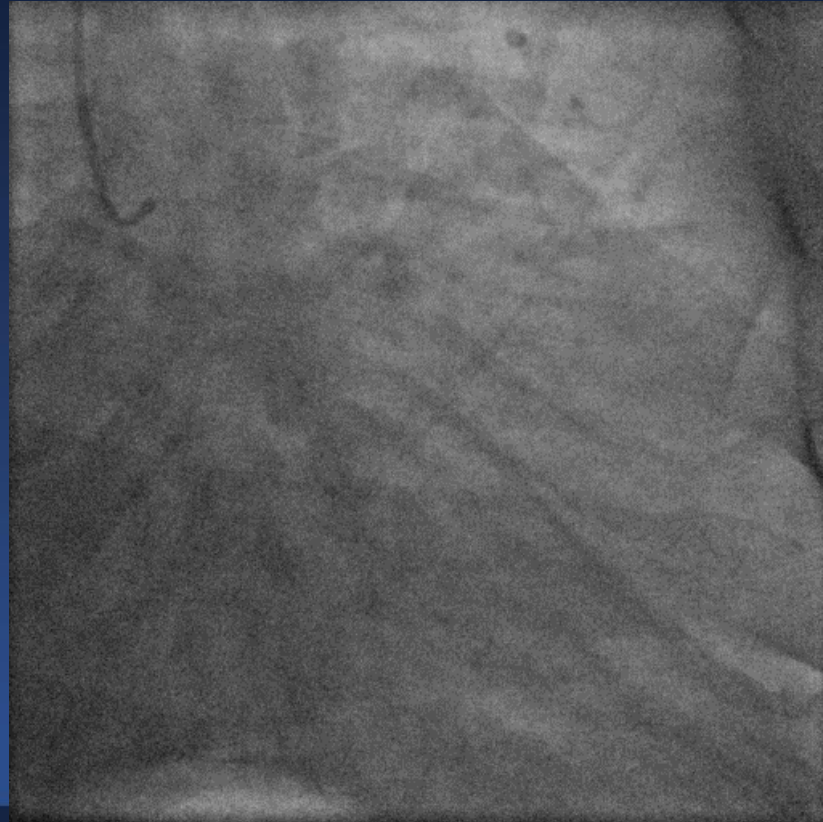
Final



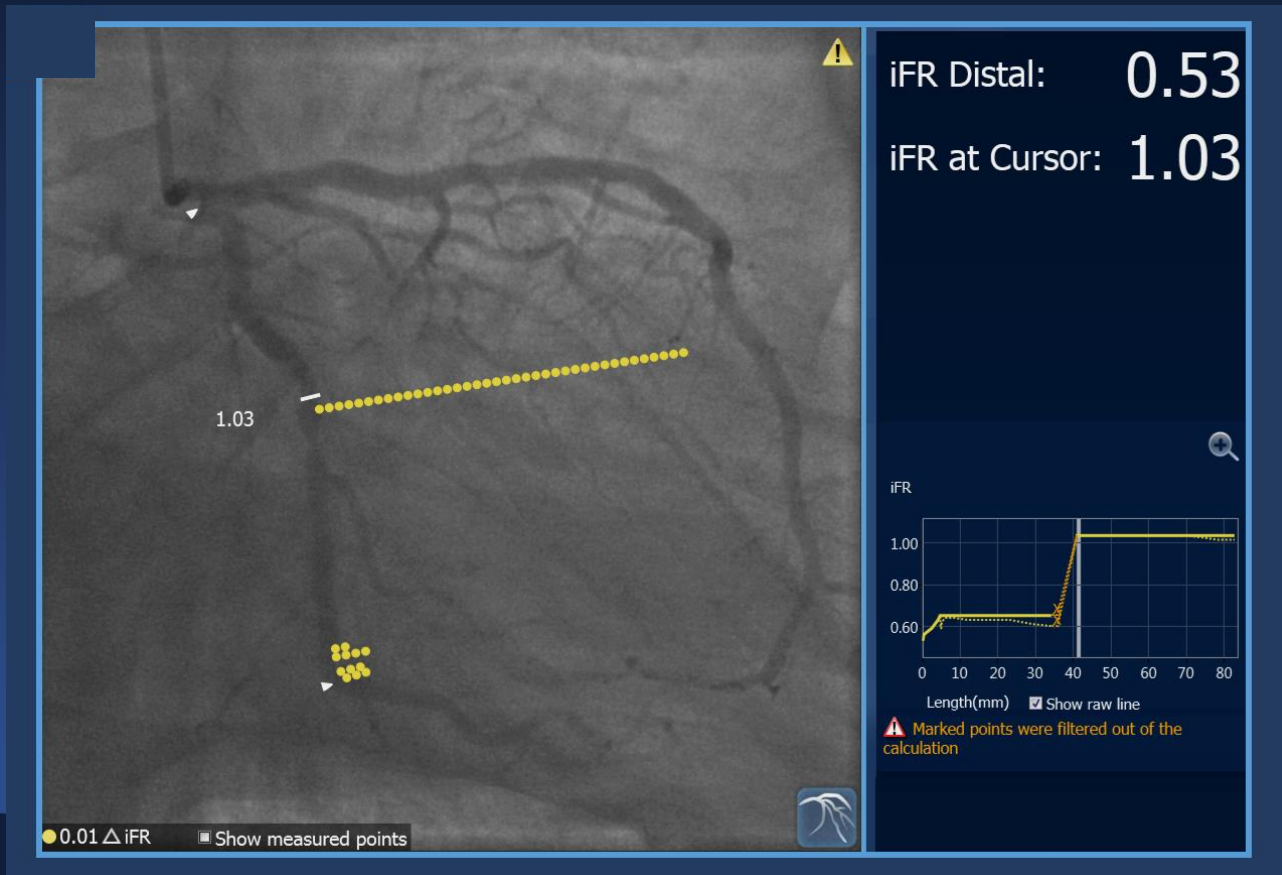
iFR Distal: 0.96  
iFR at Cursor: 0.99  
Raw Value at Cursor: 0.99



# Case

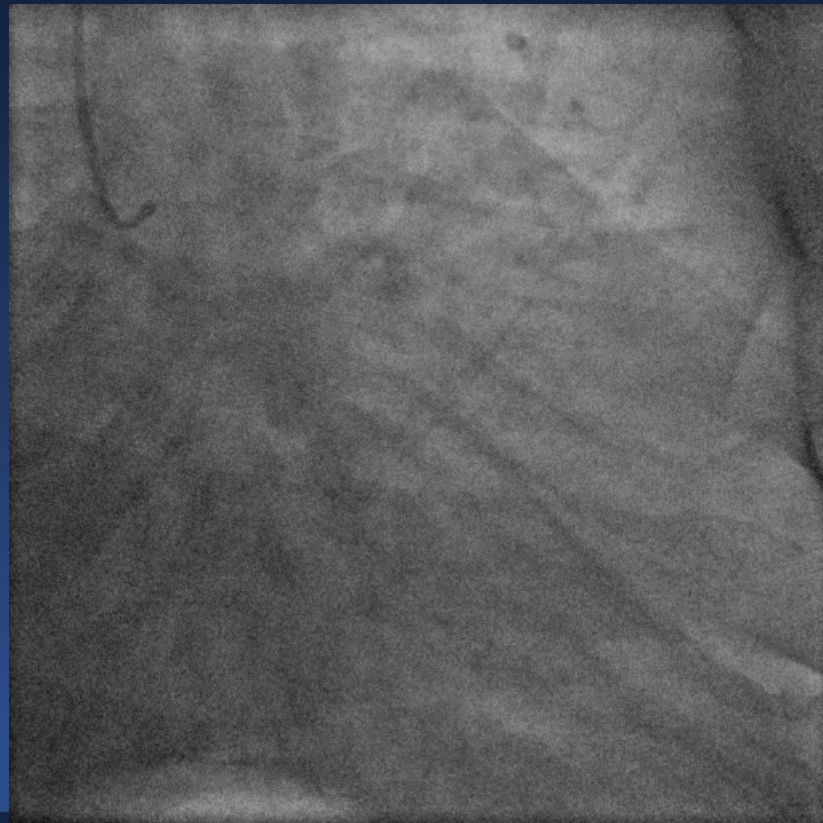


# Pre-PCI



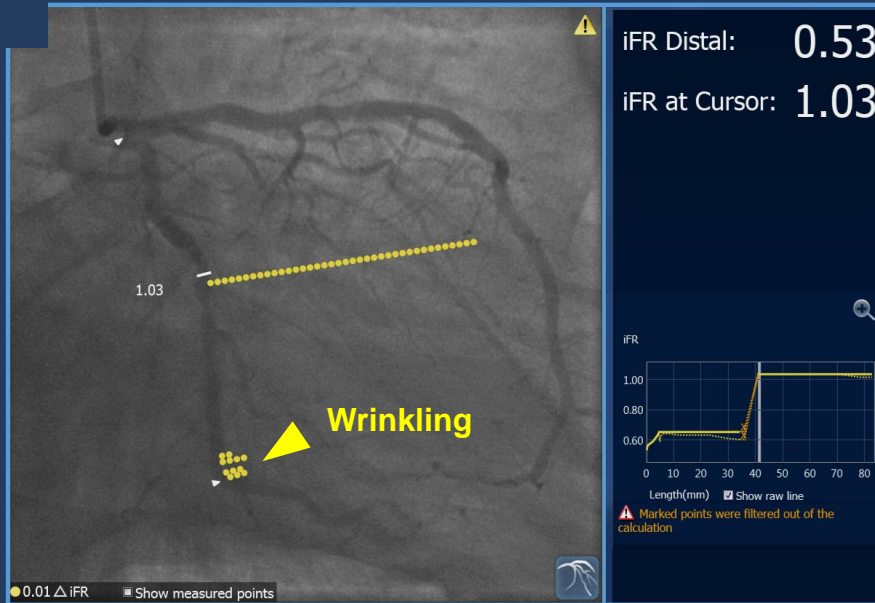


# Wrinkling or Bending

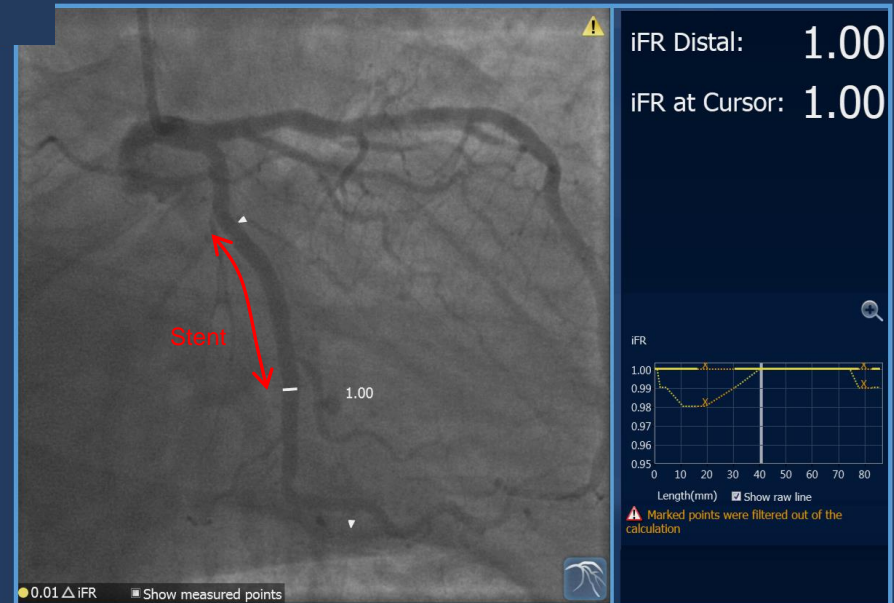


# Wrinkling or Bending

Pre



Final

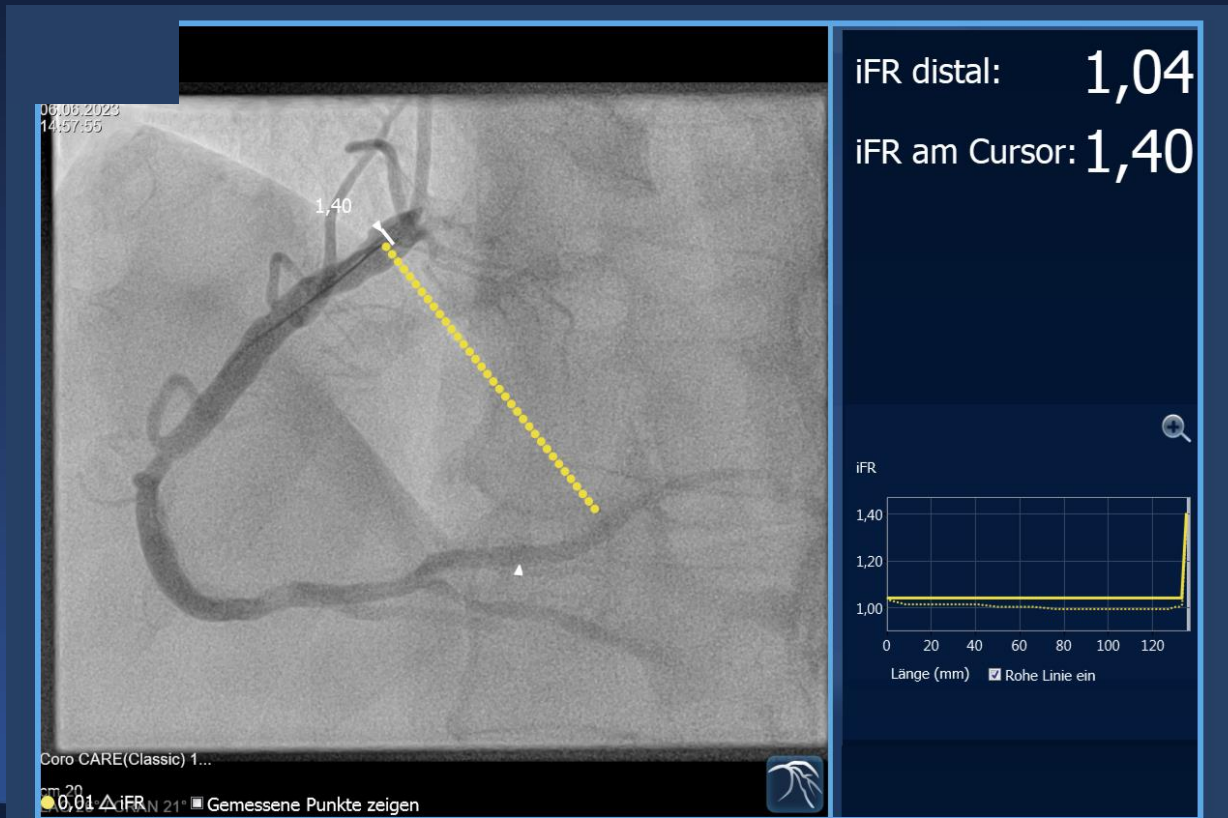


# Case

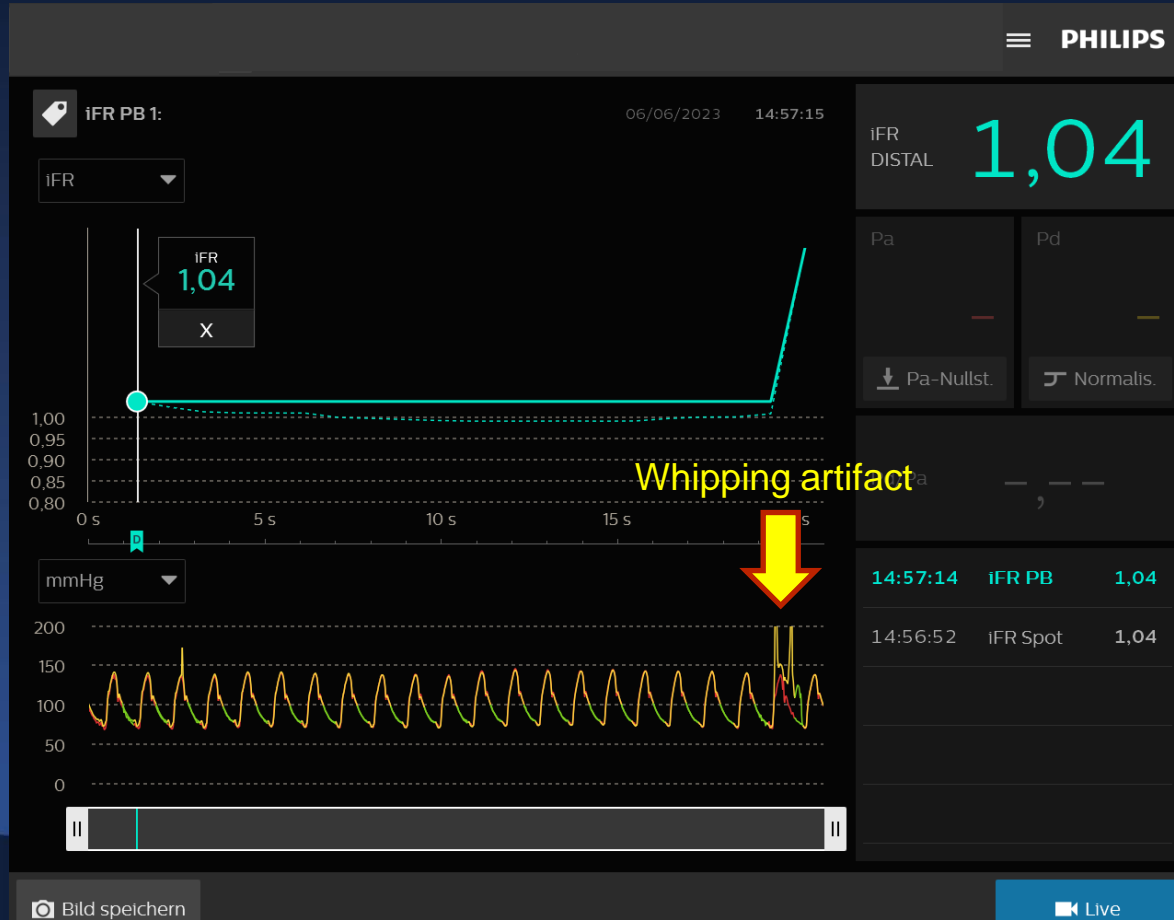
## The culprit of NSTEMI ACS



# Pre-PCI



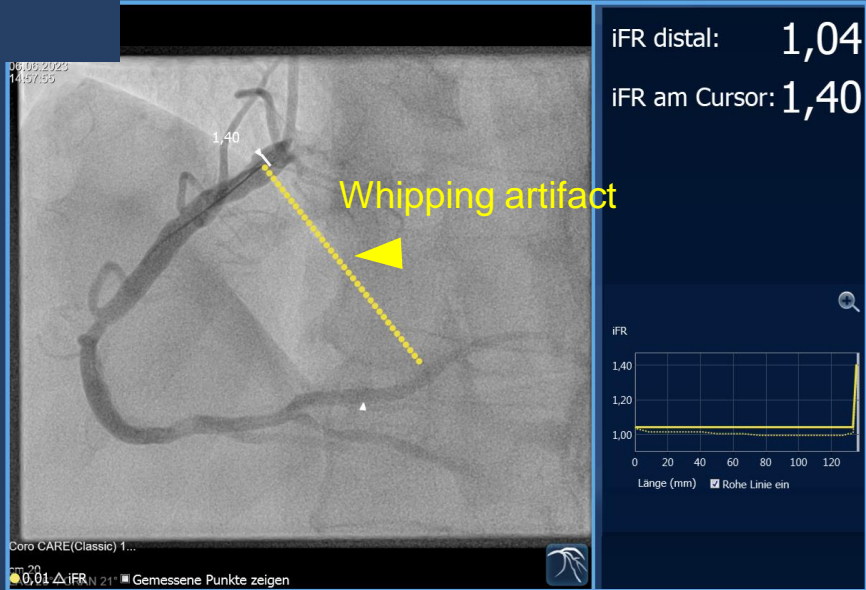
# Pre-PCI iFR Pullback



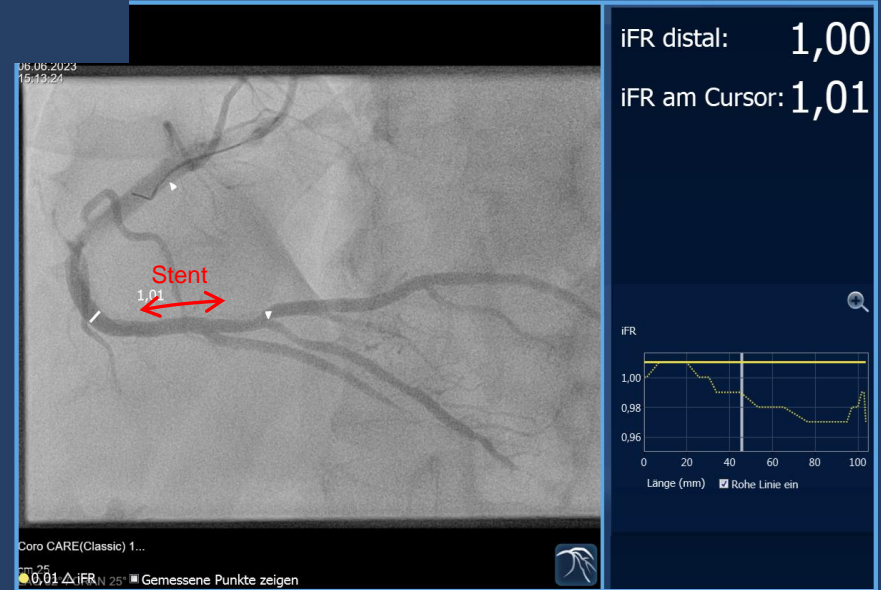


# Whipping Artifact

Pre



Final



# Take Home Message

- Pre-PCI iFR pullback can provide a full physiological map of the vessel, showing point-by-point of the functional impact of a given stenosis
- Post-PCI iFR pullback can provide useful information to eventually guide further optimization
- The crucial concept of functional optimization is to localize the residual disease burden after PCI