GLOBAL SCIENTIFIC ACTIVITIES

EUROPEAN SOCIETY OF CARDIOLOGY®

ESC भारत में IN INDIA

Cardiological Society of India Congress
12th February 2016
Chennai, India

Intervention:
How and to which extent is technology helping us?

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UNIVERSITÀ DEGLI STUDI DI FERRARA
- EX LABORE FRUCTUS -

Introduction

- I will limit my talk to how technology can improve PCI results

- I will refer to the new knowledge reported at the last ESC congress

The technologies

- **FFR** (Fractional Flow Reserve)
- **NIRS** (Near Infrared Spectoscopy)
- **BVS** (Bioresorbable Vascular Scaffold)

Is FFR useful to identify patients in need of stenting?

DEFER: first study showing that oculostenotic reflex is not enough to identify ischemic lesions

Is FFR useful to identify patients in need of stenting?

FAME I and II. 2 landmark studies showing that:

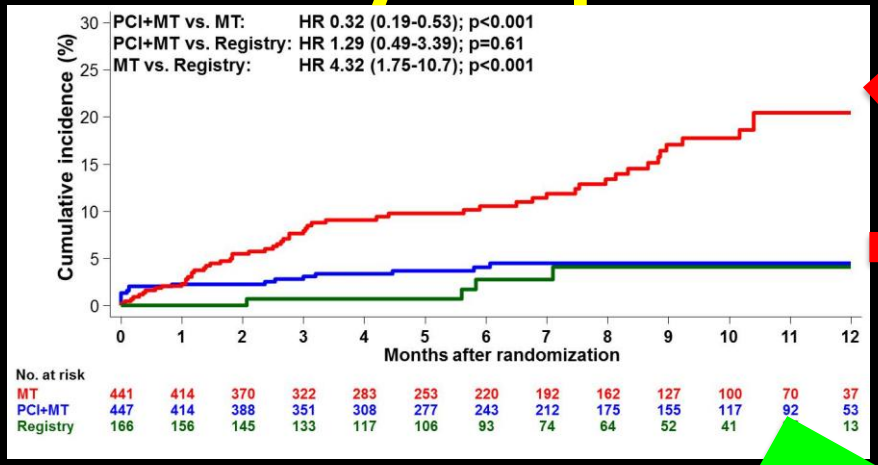
- Outcome after FFR-guided PCI is superior as compared to Angio-guided PCI
- Positive FFR benefit from PCI as compared to OMT

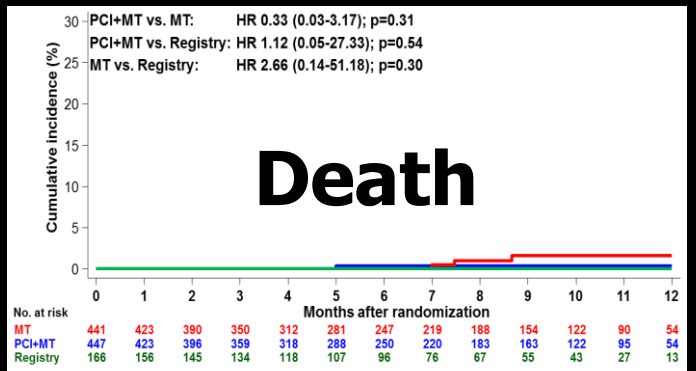
But…FAME I

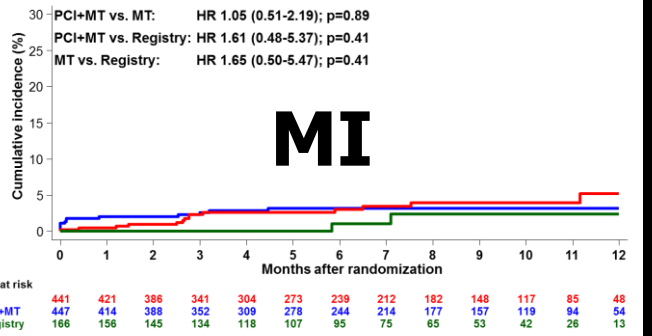
Events at 1 year, No (%)	ANGIO-group N=496	FFR-group N=509	P-value
MACE	**113 (23)**	**76 (15)**	0.02
Death	**15 (3)**	**9 (2)**	0.19
Myocardial infarction	**43 (9)**	**29 (6)**	0.07
CABG or repeat PCI	**47 (10)**	**33 (7)**	0.08

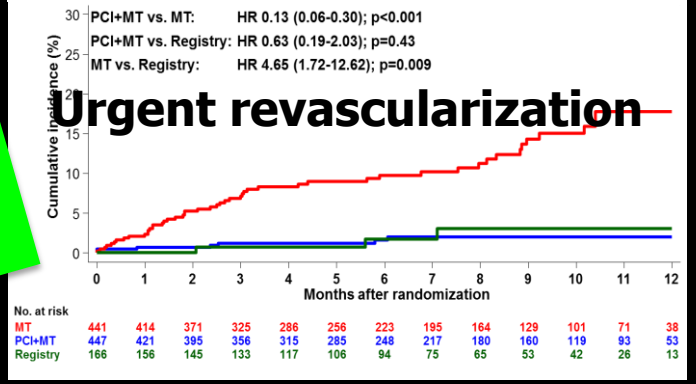
But…FAME II

Primary Endpoint

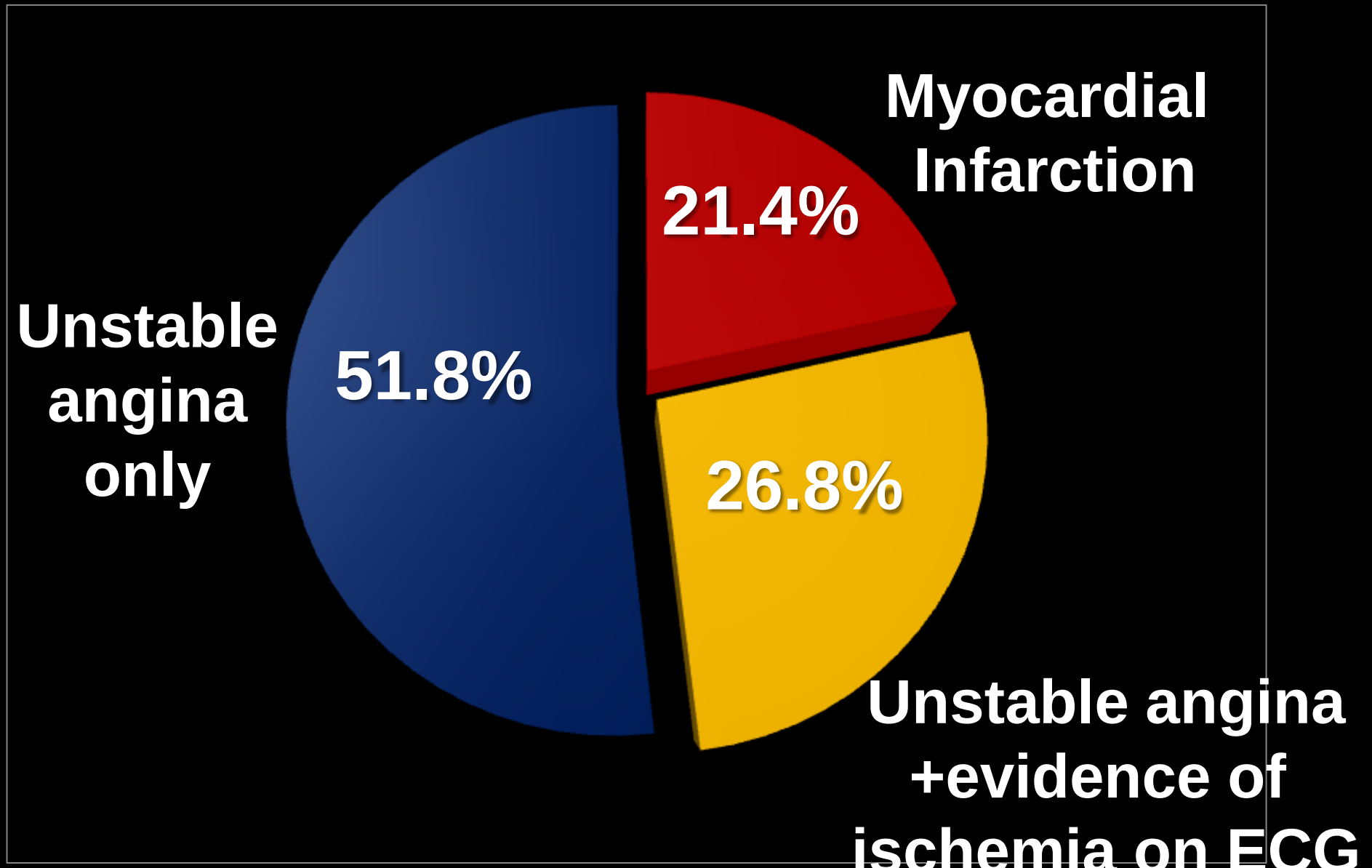








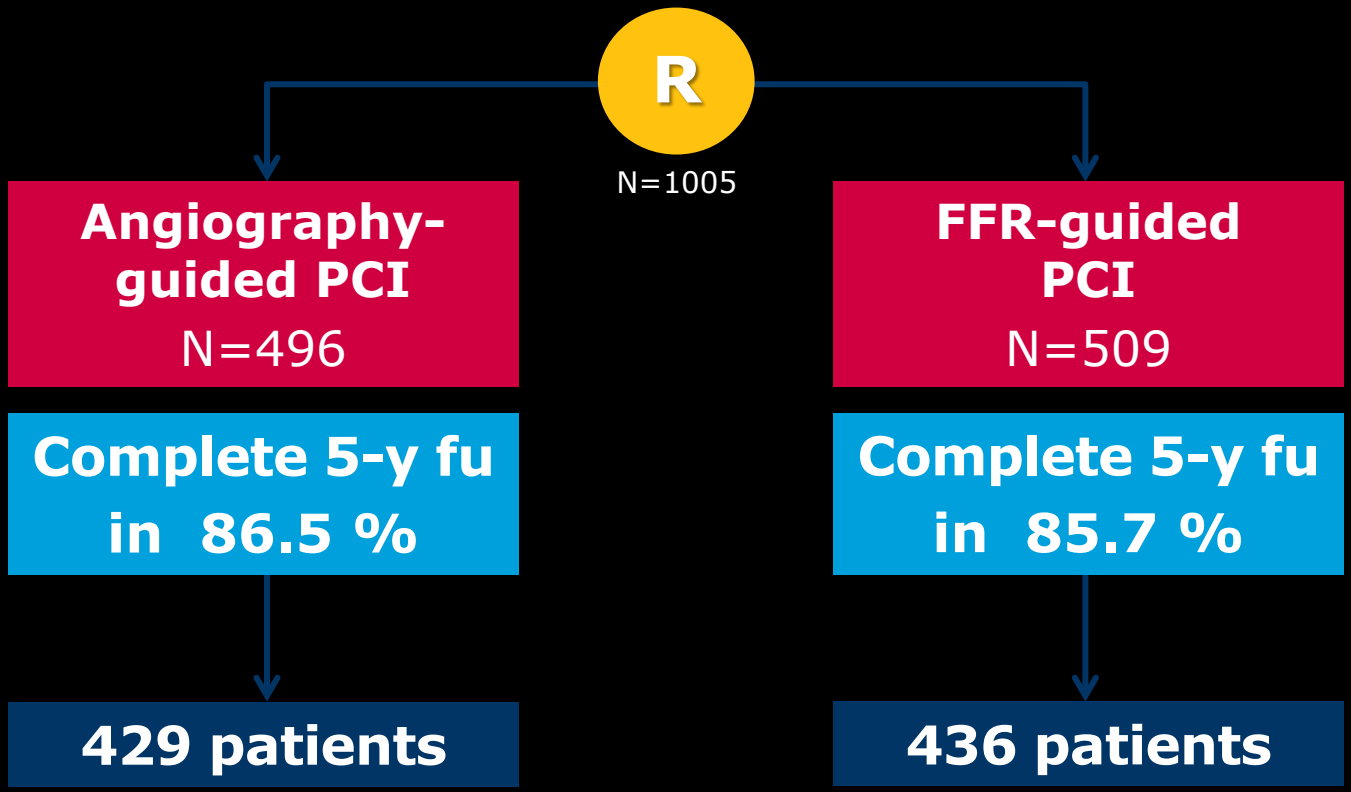
Urgent revascularization in FAME II



Fractional Flow Reserve What's new?

- FAME 5 years results
- PLATFORM

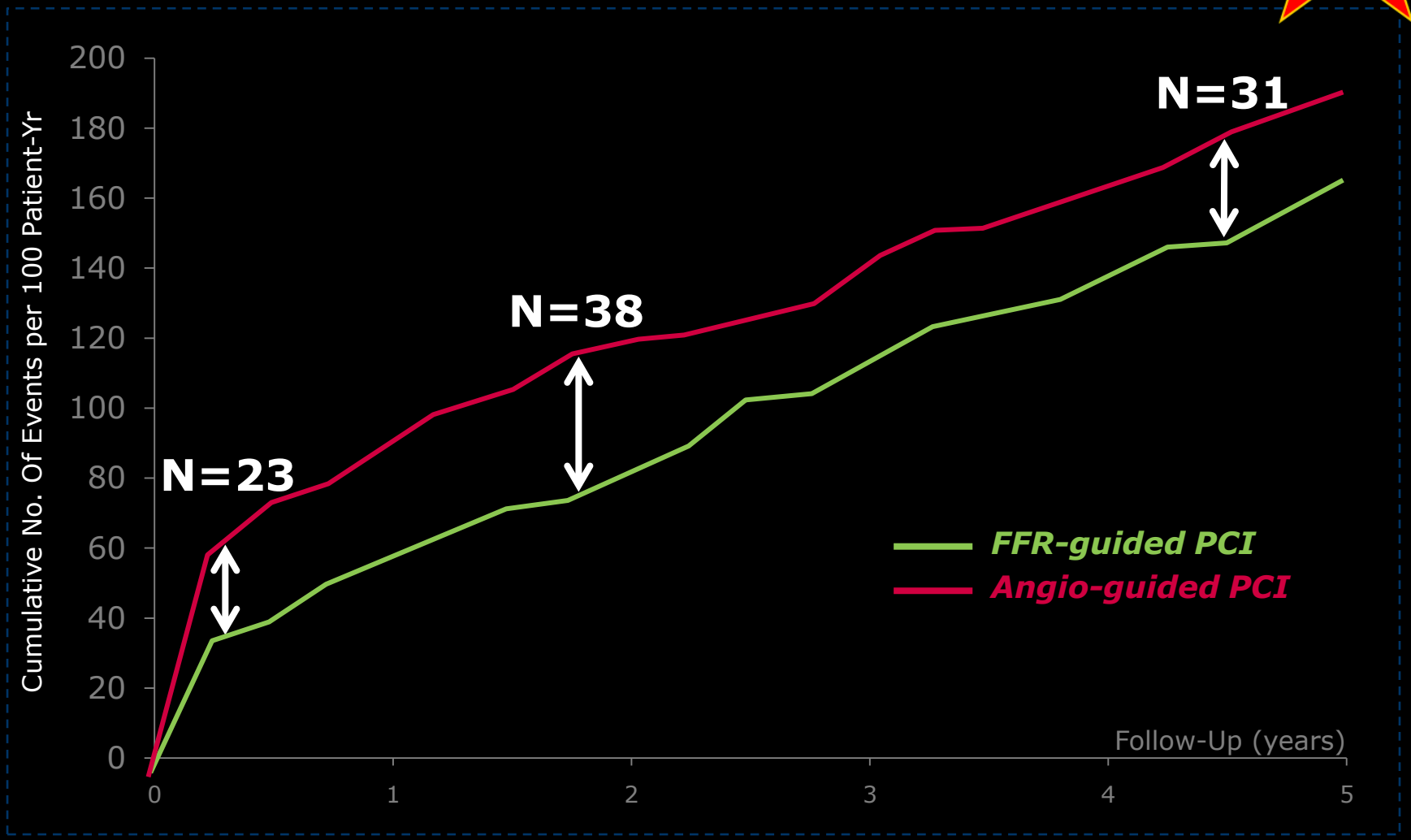
FAME: 5 YEAR FOLLOW-UP



The Lancet online

N.H.J. PIJLS (Eindhoven, NL), FP 1949

FAME STUDY:
CUMULATIVE EVENTS DURING 5-YEAR FOLLOW-UP



The Lancet online

N.H.J. PIJLS (Eindhoven, NL), FP 1949

5 years results of FAME shows that FFR benefit is consistent through years

FAME: 5 years results

Absolute Reduction of All-cause Mortality:

- **at 1 year: 1.2 %**
- **at 2 years: 1.2 %**
- **at 5 years: 1.3 %**

Relative Reduction of Cardiac Mortality:

- **at 1 year: 30 %**
- **at 2 years: 25 %**
- **at 5 years: 27 %**

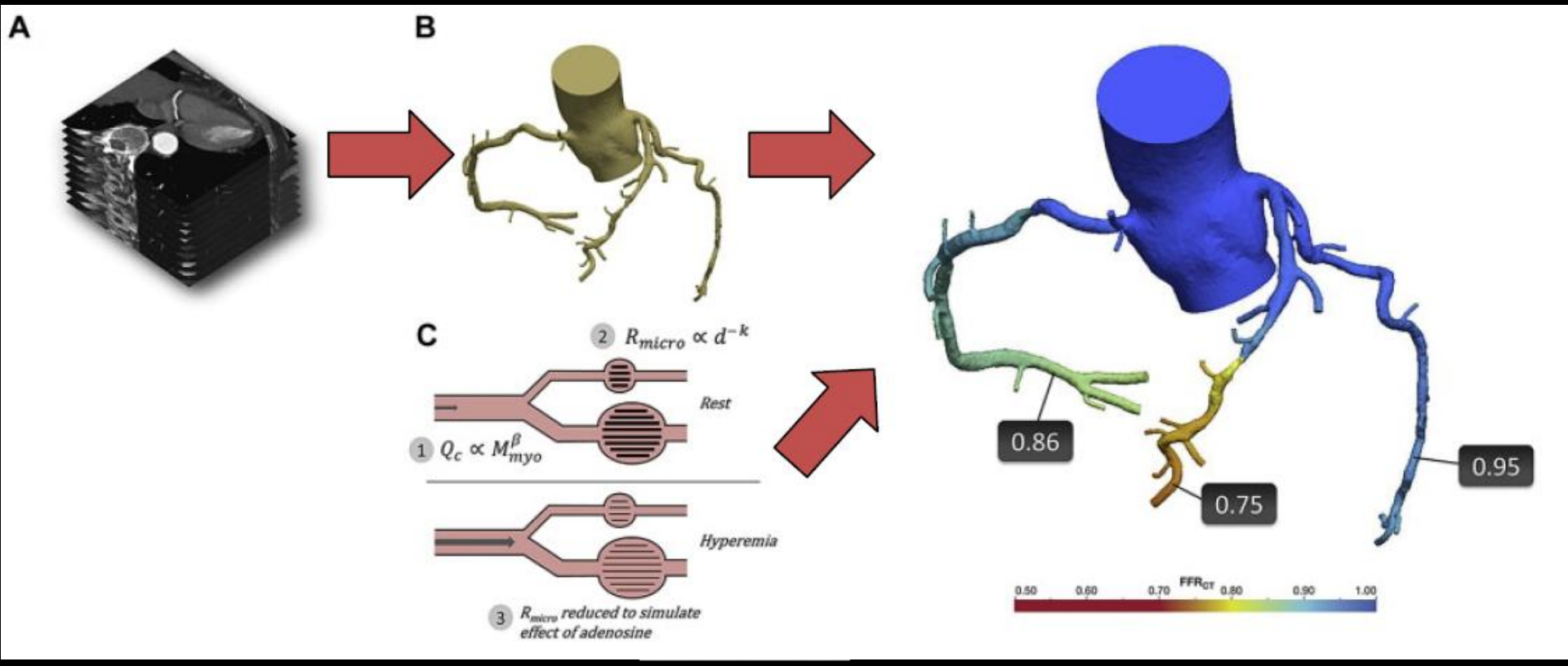
Although important the "FAME" story still has limitations…

- Not powered for 5-y follow-up
- Lost to follow-up: 14 % of patients
- Unknown whether events between 2 and 5 years were related to index stenoses
- First-generation DES

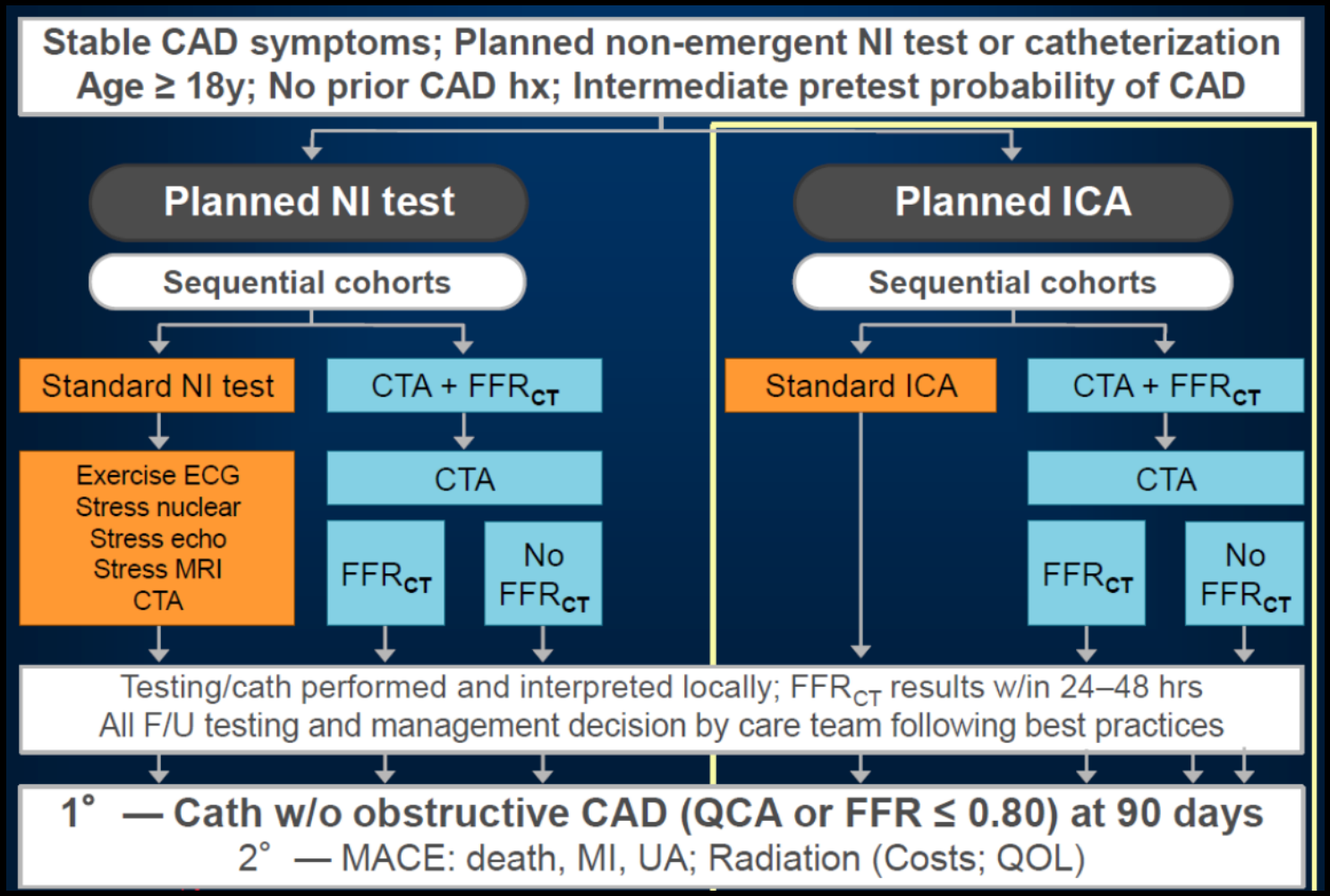
And what about non-invasive FFR for screening in stable CAD patients?

Coronary Computed Tomography Angiography derived FFR

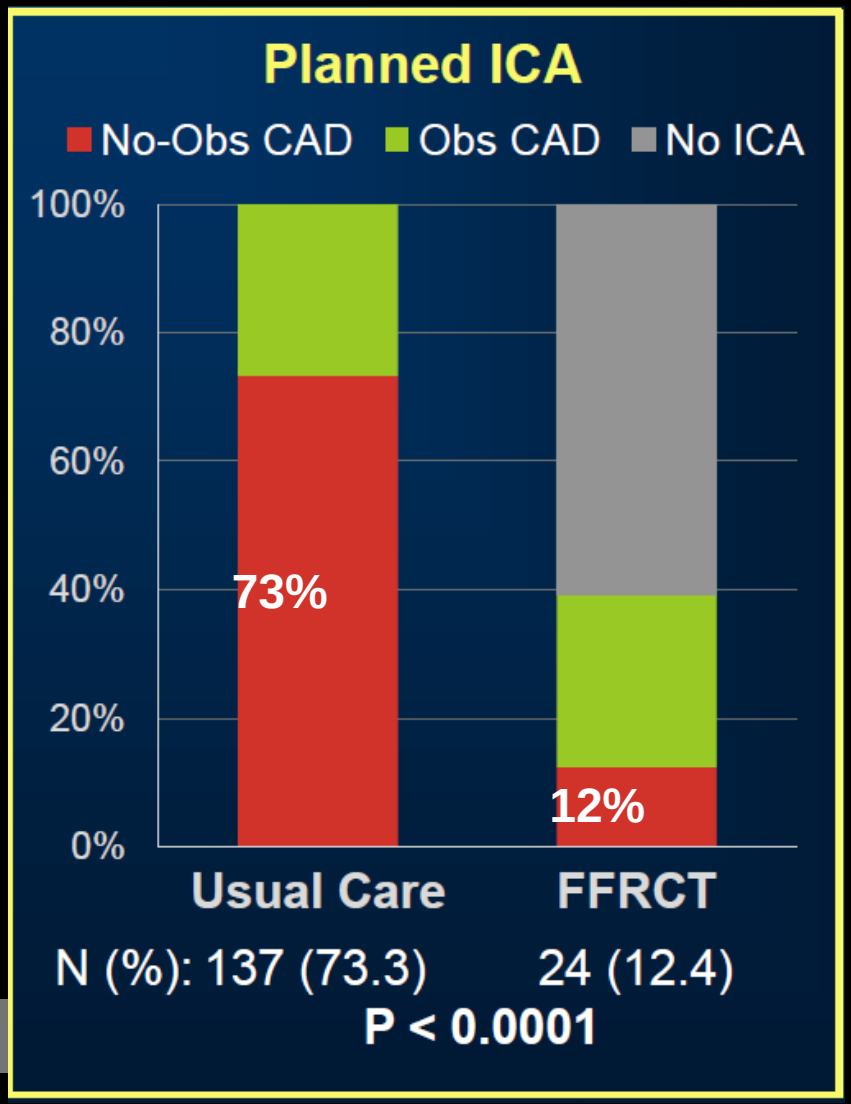
- Software-based technology
- Uses routine CCTA images from any devices



PLATFORM study design



PLATFORM results



- 73% of patients without obstructive CAD at coronary angiography in the usual care group versus 12% in the FFR group
- No events in the 61% of patients in which angiography was cancelled

Non-invasive FFR was safe

	Planned NI Test N=204			Planned ICA N=380		
	Usual care strategy N=100	FFR_{CT} strategy N=104	P value	Usual care strategy N=187	FFR_{CT} strategy N=193	P value
SAFETY: MACE — no. (%)	0	0		0	2 (1.0)	NA
SAFETY: RADIATION EXPOSURE	(enrolment to 90 days)					
Mean ± SD, mSv	5.8 ± 7.1	8.8 ± 9.9	0.0002	9.4 ± 4.9	9.9 ± 8.7	0.20

Does FFR solve all problems?

- Actually patients with negative FFR might still have AMI

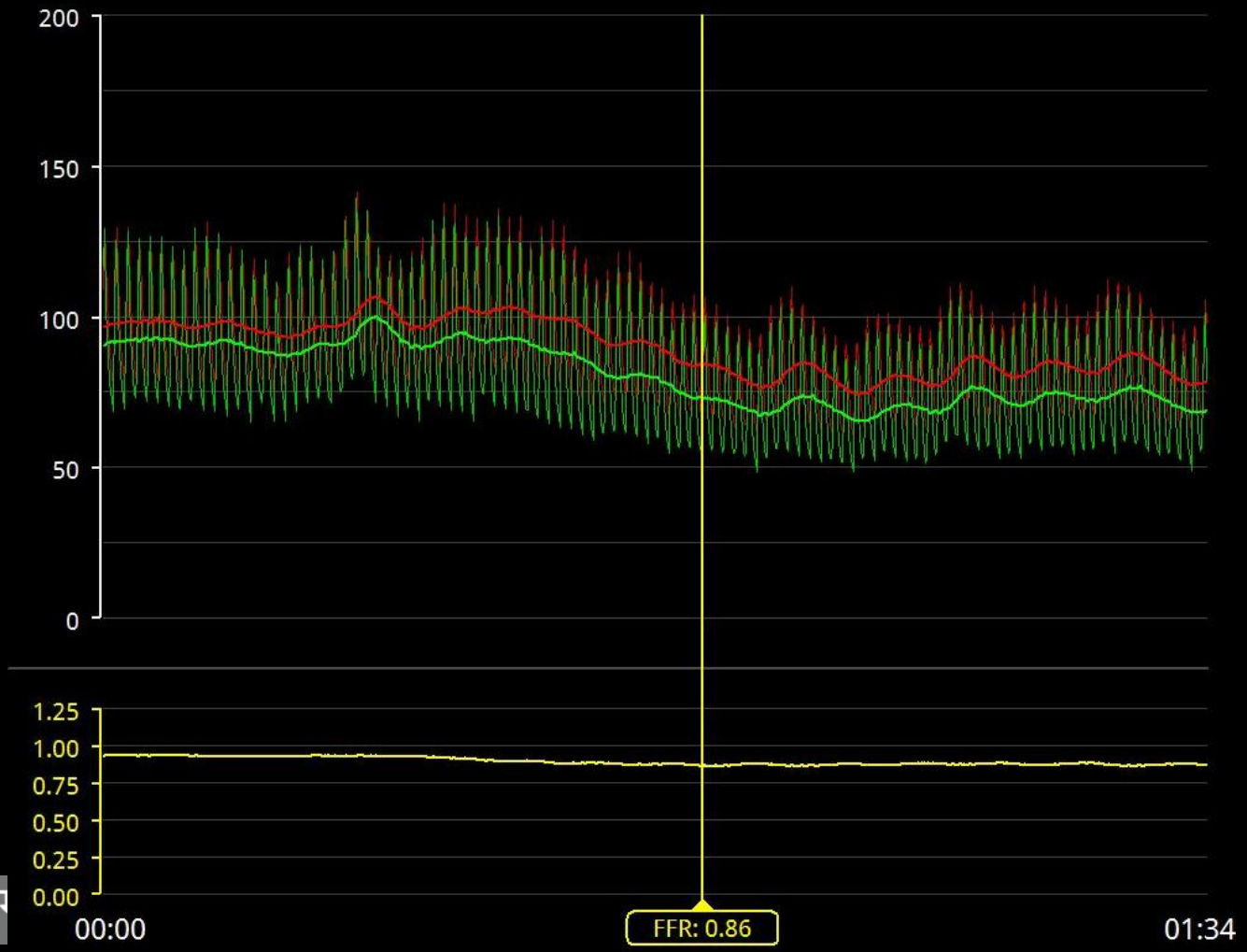
Here is an example of 2 days ago…

65 year-old woman

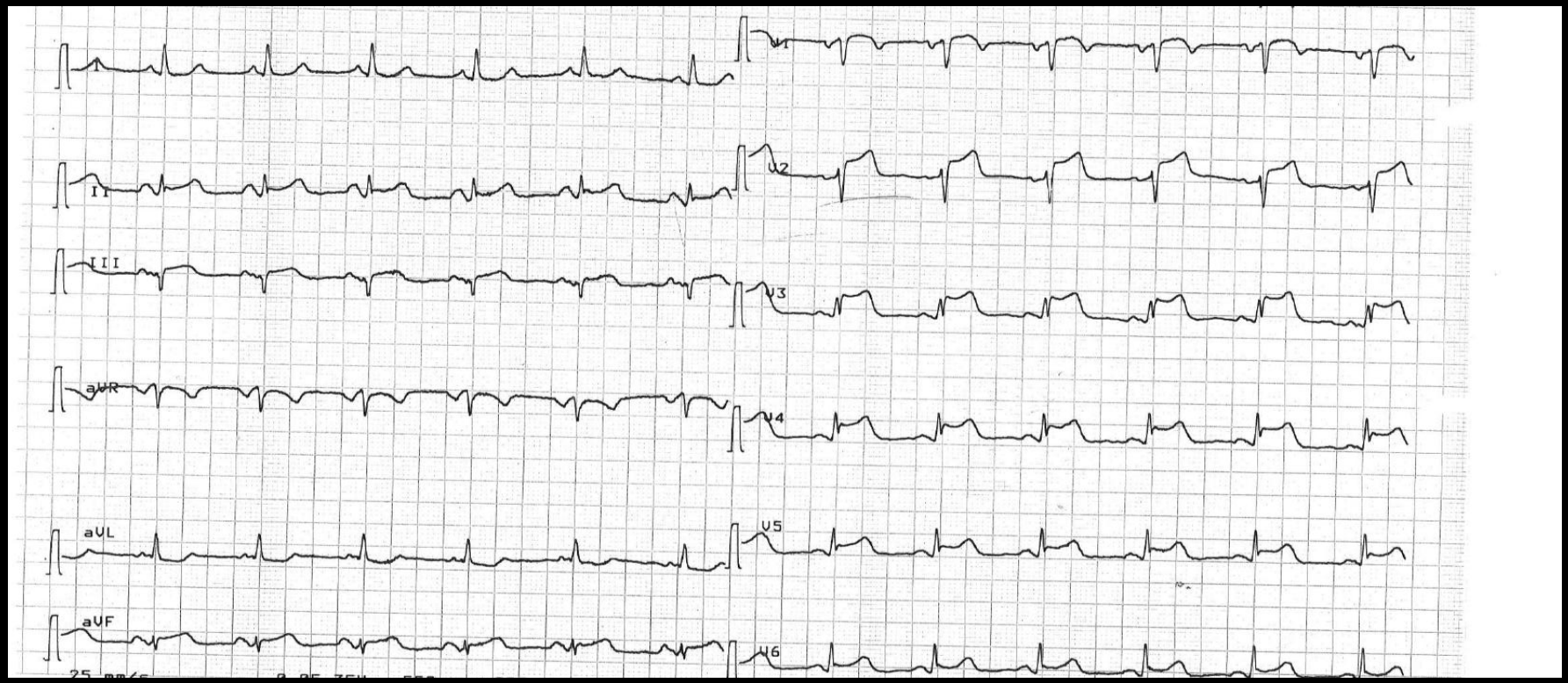
- Hypertension
- Smoker
- Hospitalized for recurring typical chest pain
- During hospitalization:
  - No ischemia at EKG
  - Negative Troponin

Coronary Angio

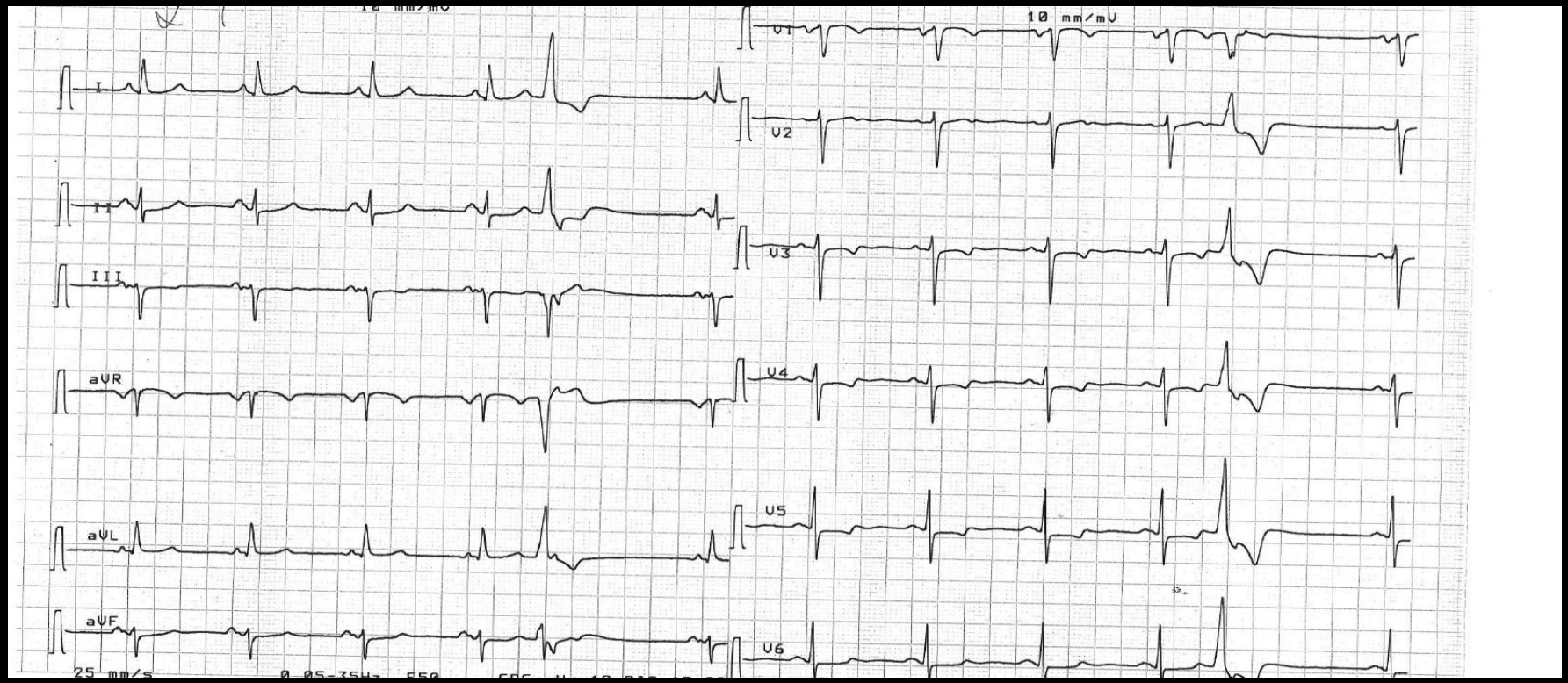
FFR evaluation



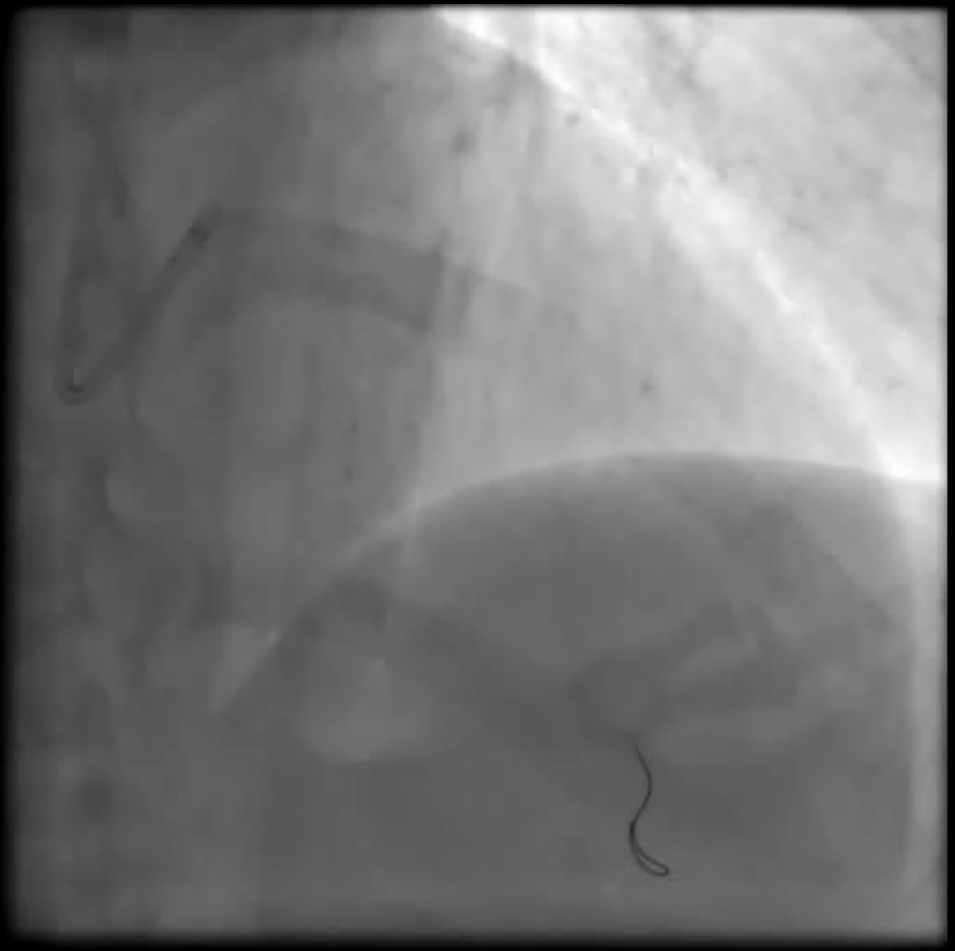
In the afternoon new episode of chest pain



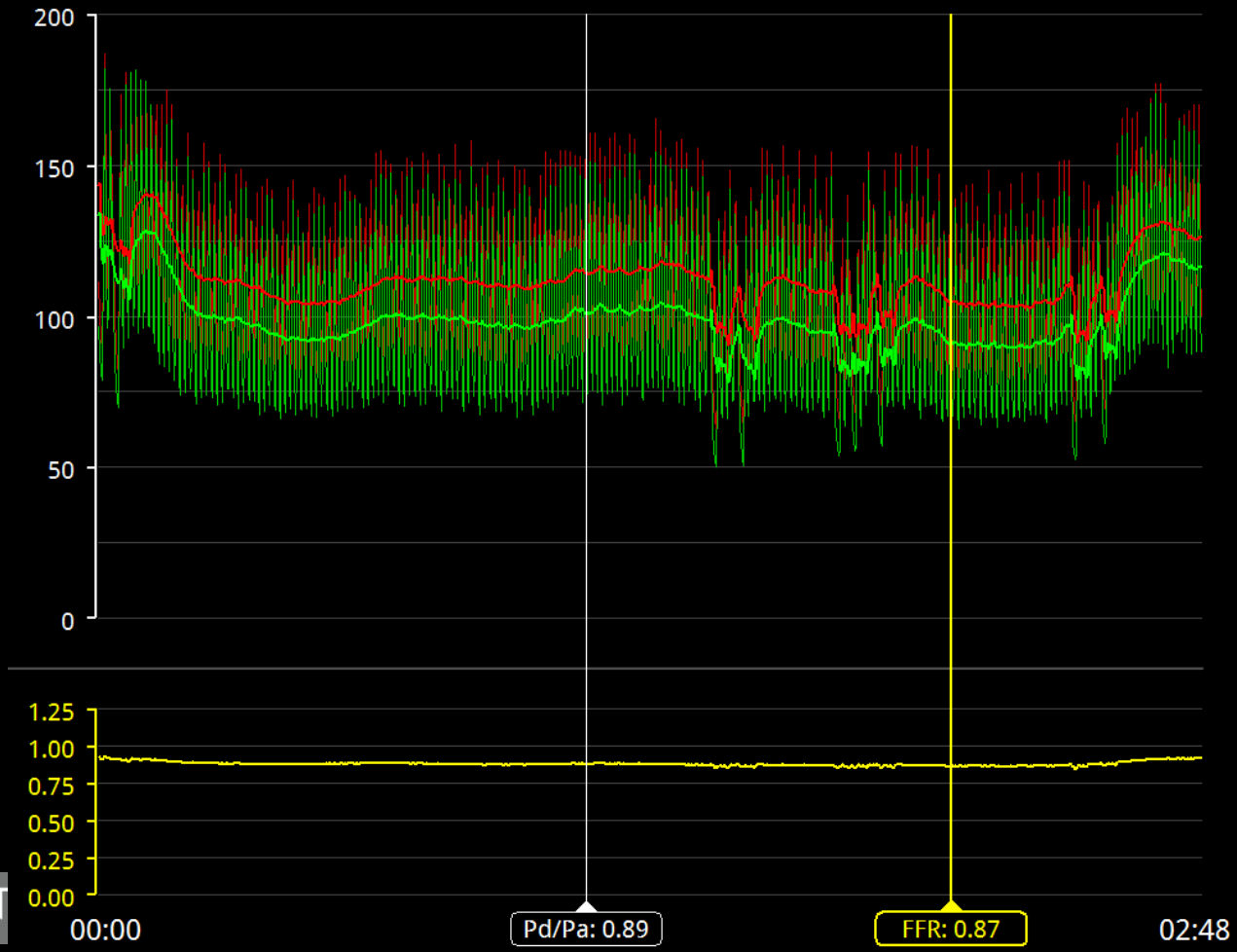
EKG after chest pain resolution



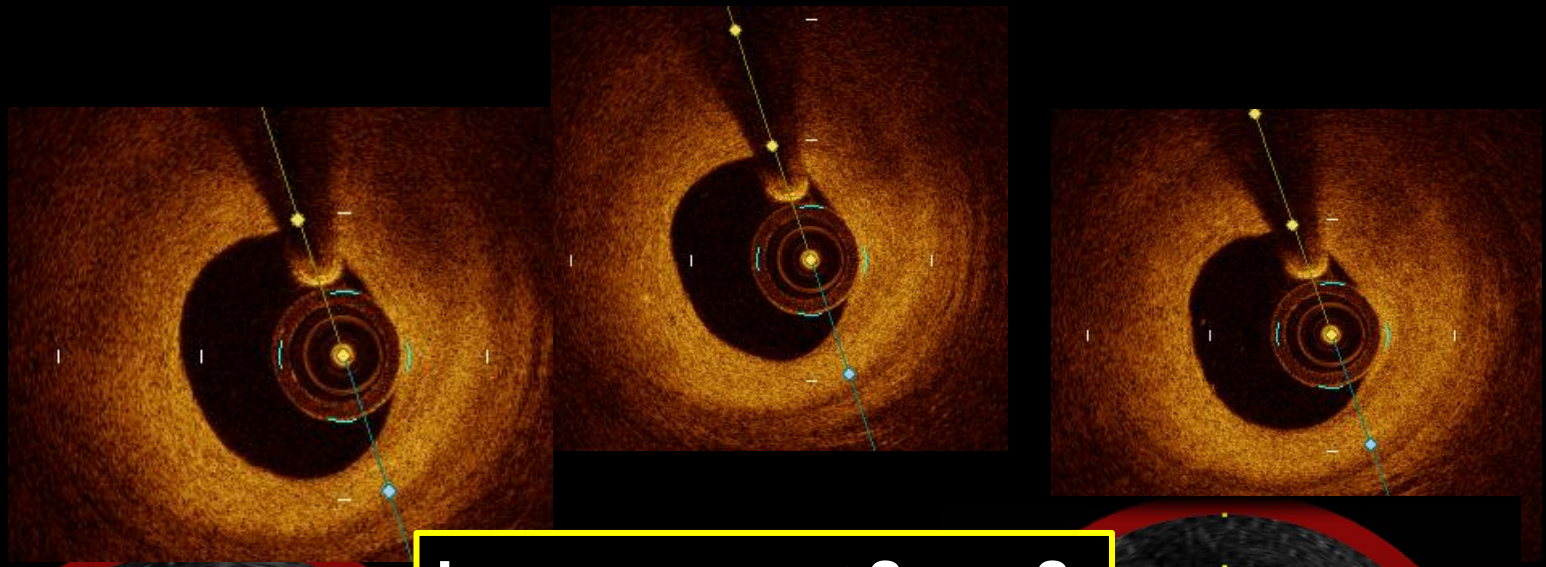
Coronary Angio



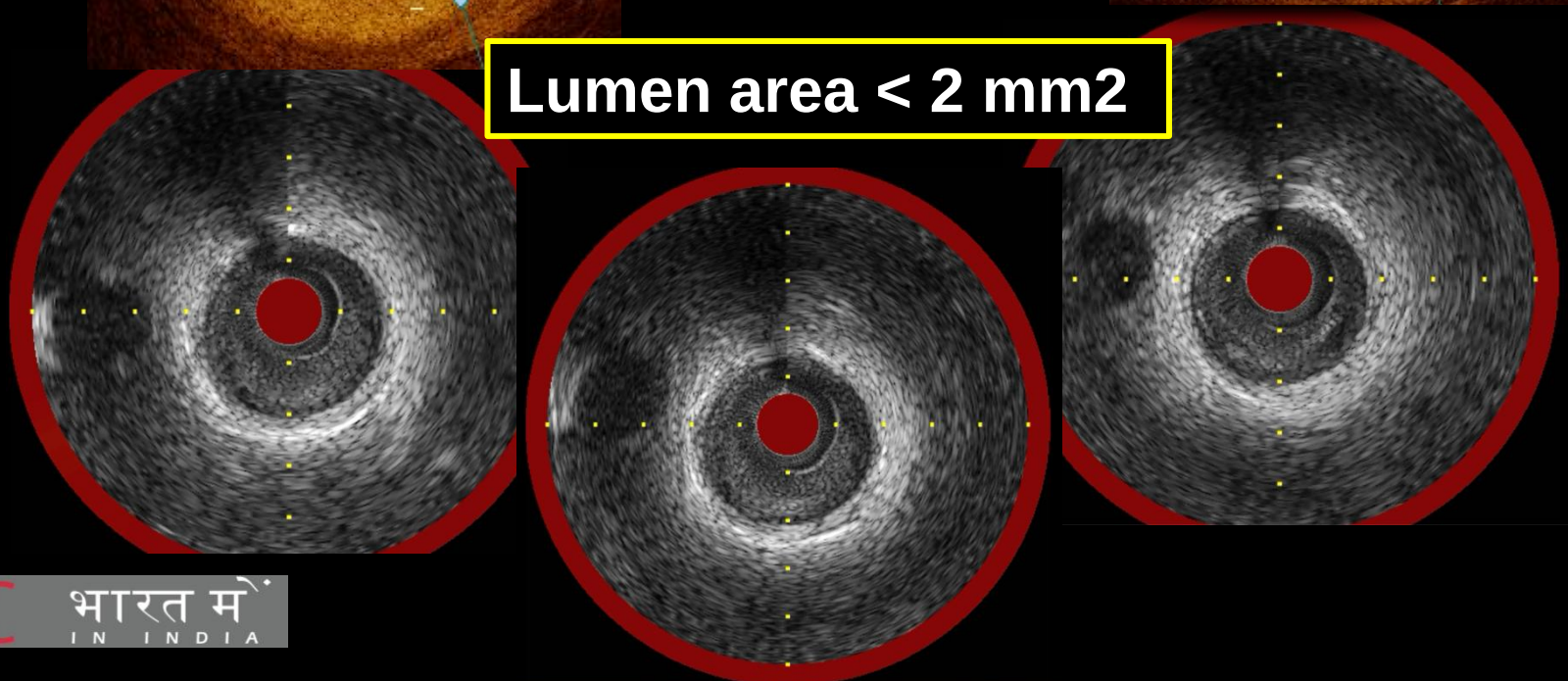
FFR evaluation



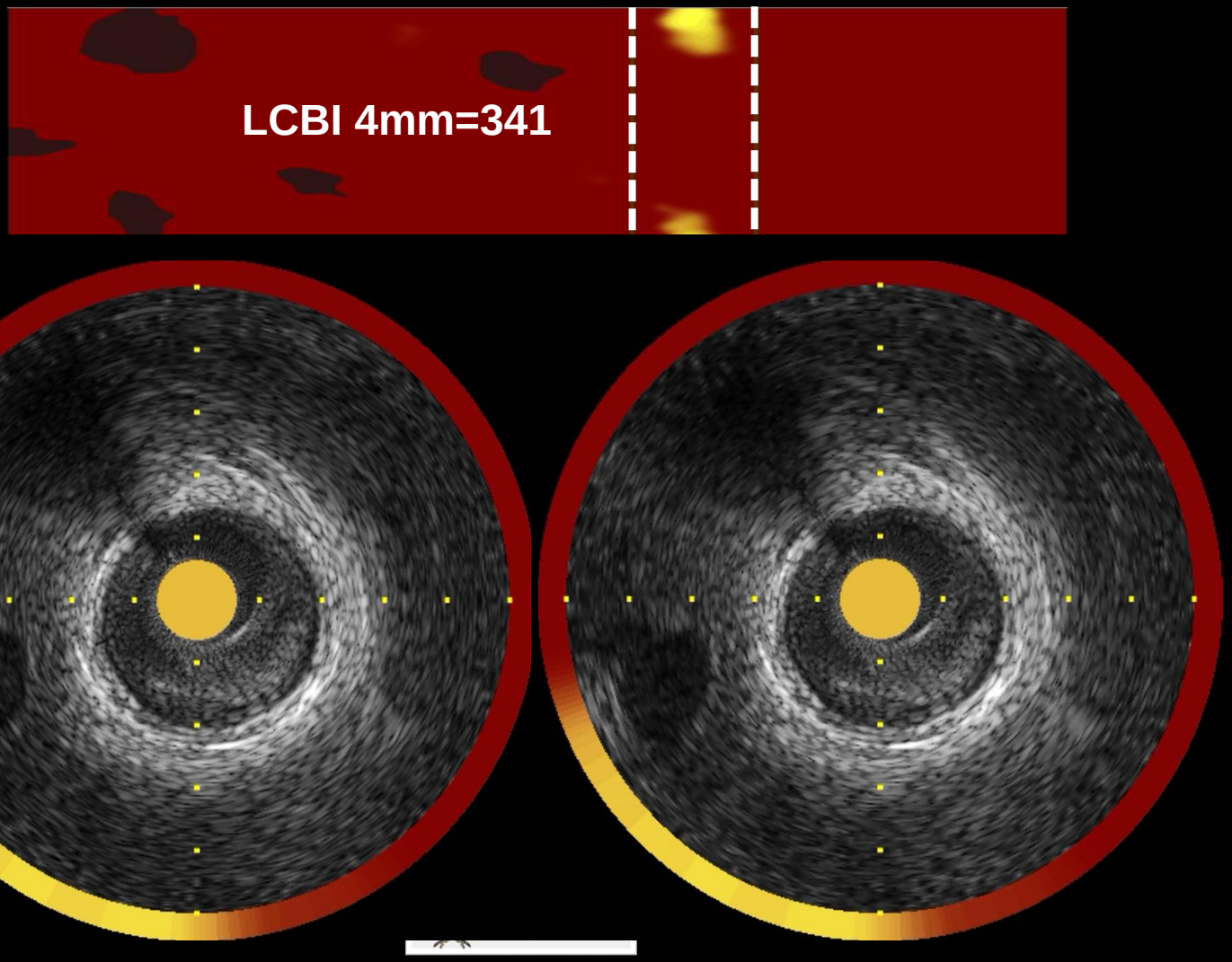
Multimodality imaging



Lumen area < 2 mm2

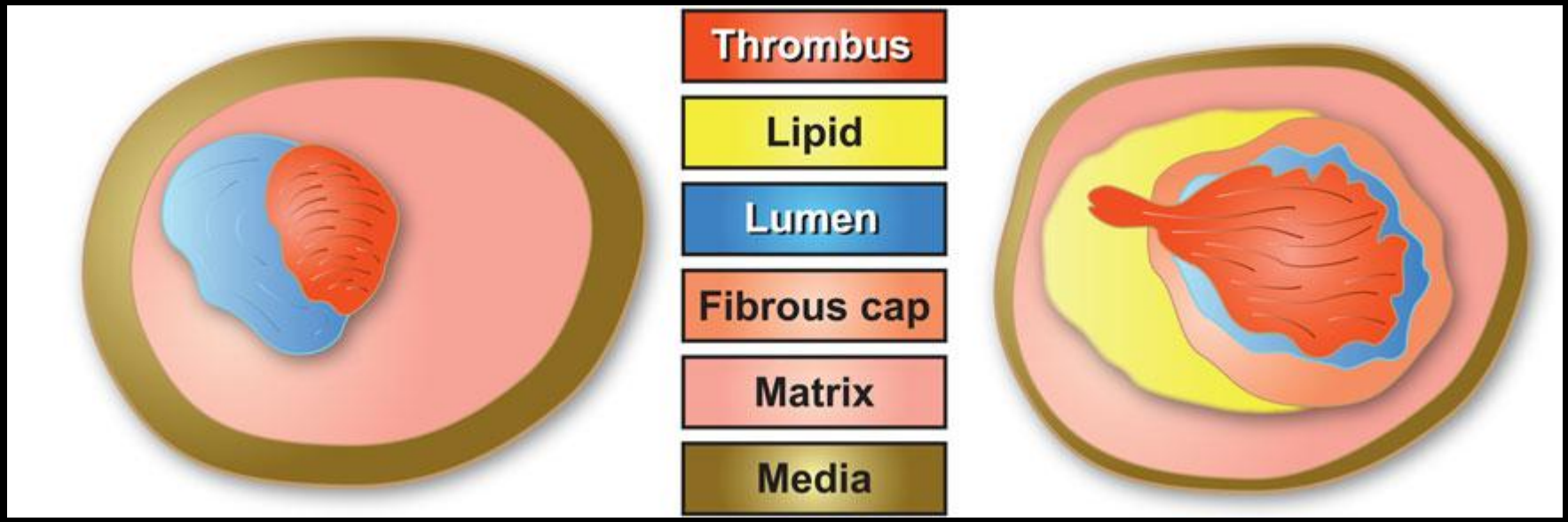


NIRS detected lipid component of culprit plaque



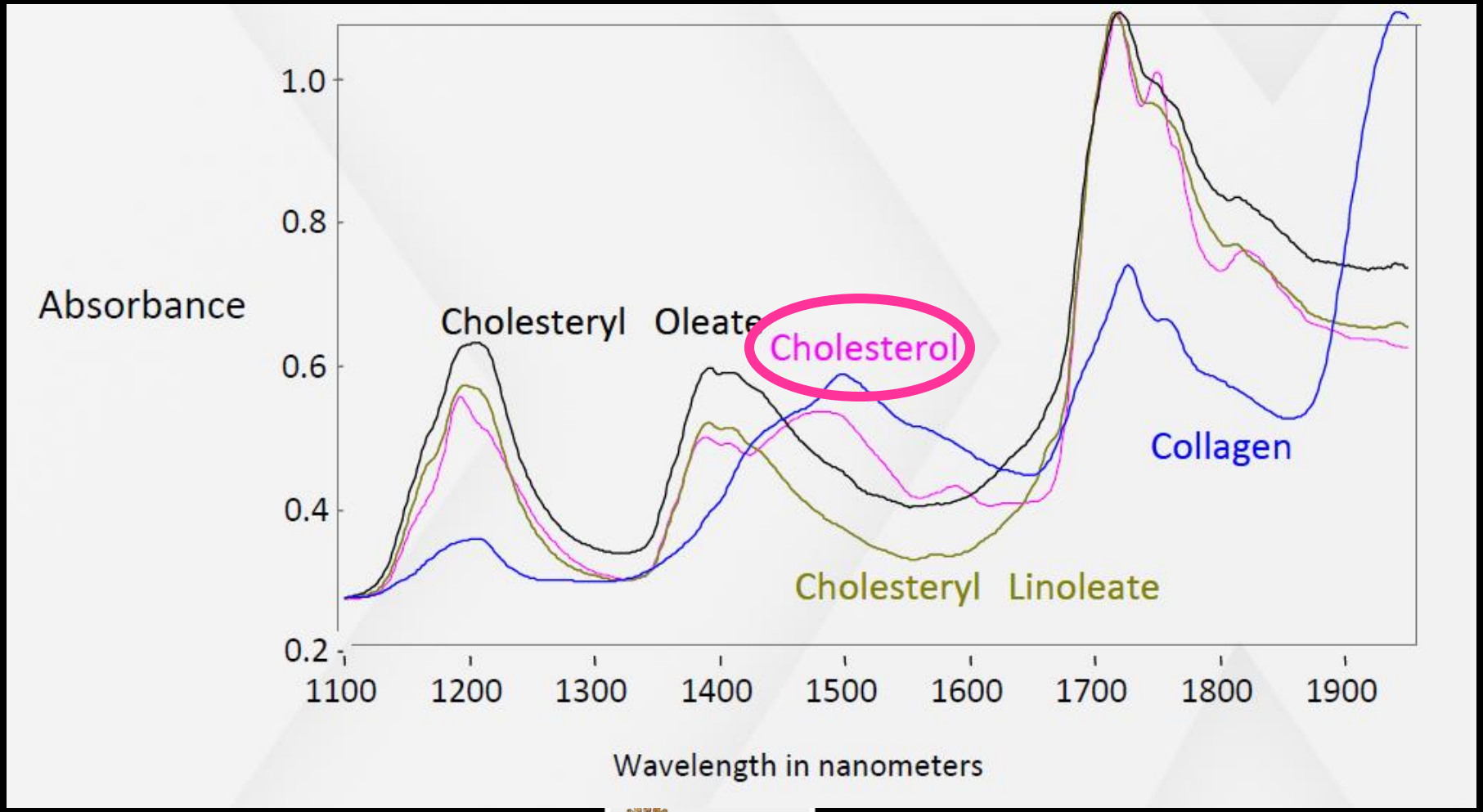
This is leading us to the second technology: NIRS

The vulnerable/eroded plaque theories are based on increased endothelial apoptosis and lipid core

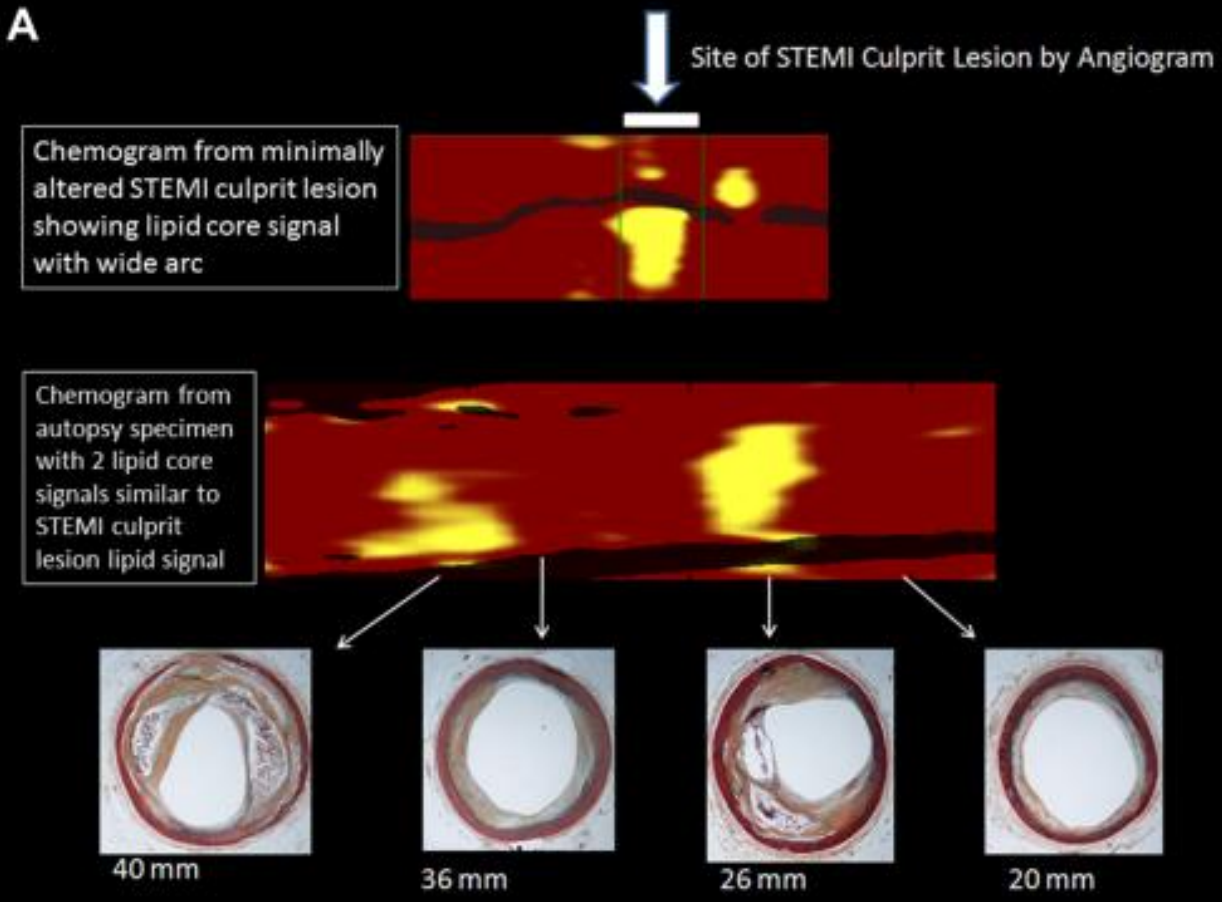


Libby P, EHJ 2015

NIRS identifies chemical composition of the plaque

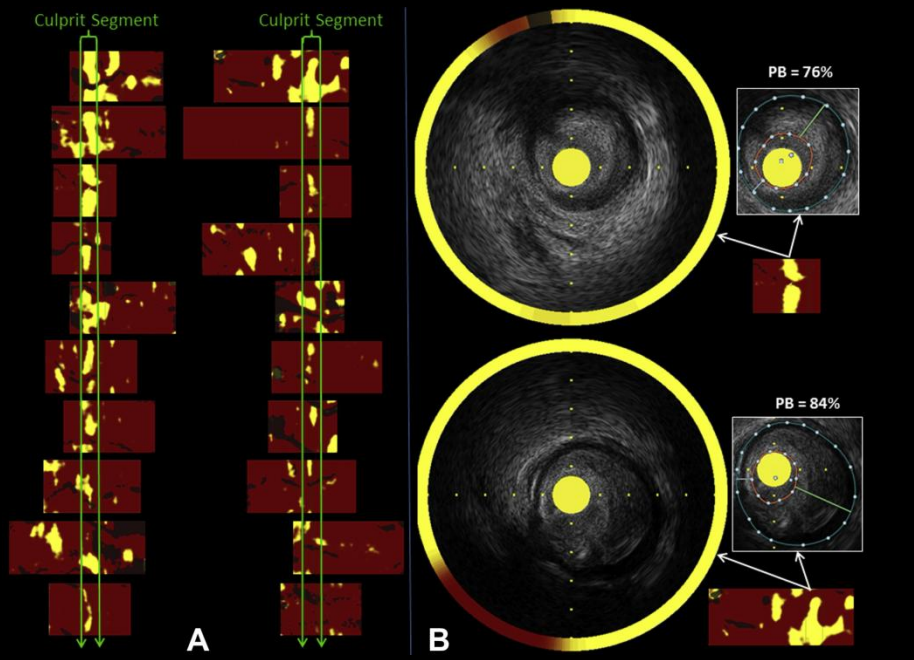


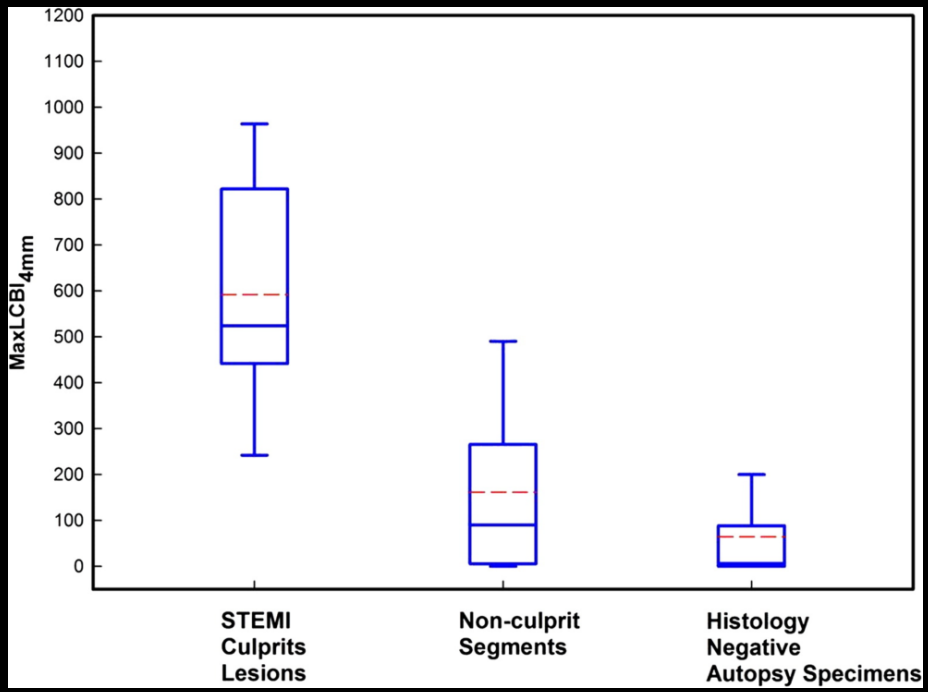
For lipids, NIRS correlates with autopsy



J Am Coll Cardiol Intv. 2013;6(8):838-846.

STEMI patients show high lipid core burden index (LCBI)





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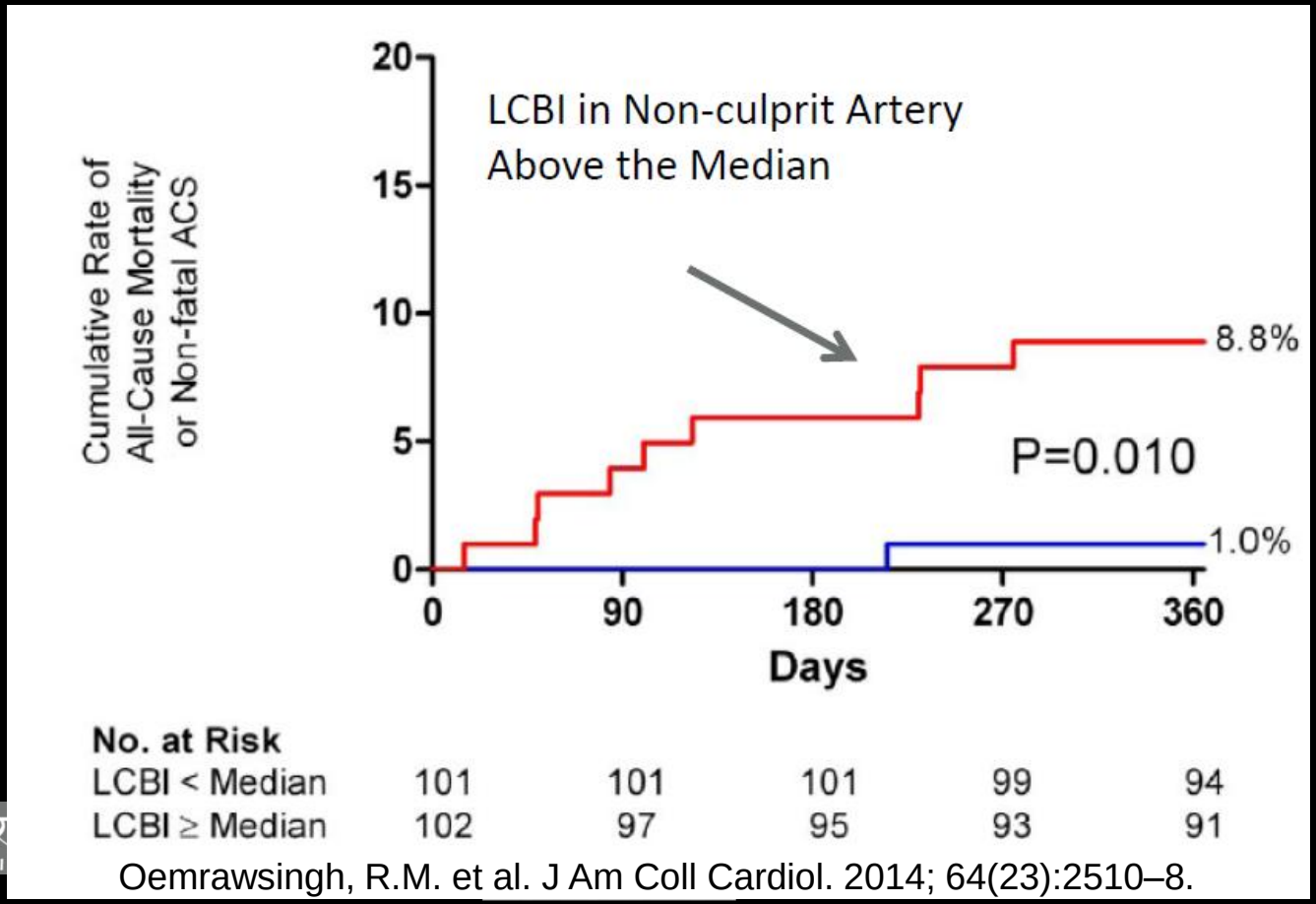
J Am Coll Cardiol Intv. 2013;6(8):838-846.

LCBI prospectively identifies patients at risk in non-culprit arteries

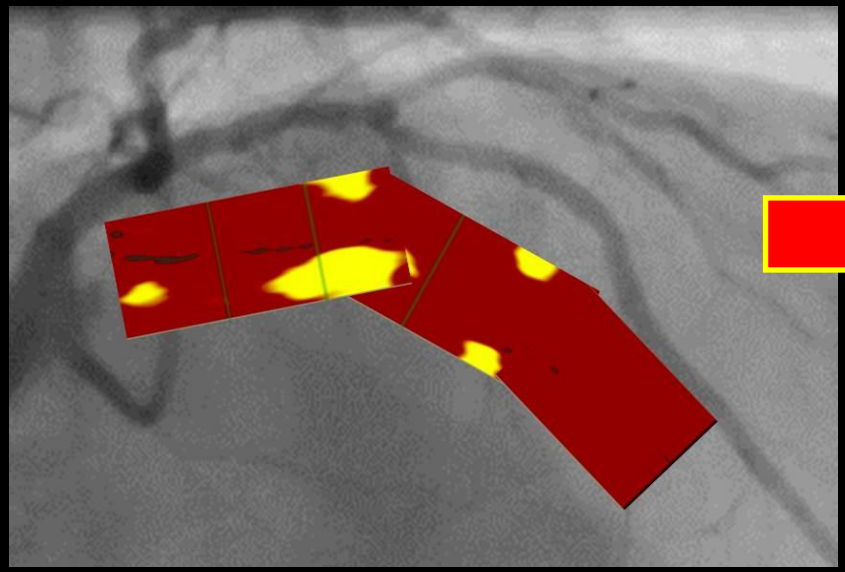


Oemrawsingh, R.M. et al. J Am Coll Cardiol. 2014; 64(23):2510–8.

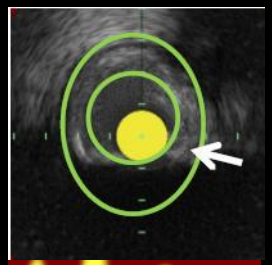
Are we ready for routine use of NIRS alone or in combination with other tools?

Not yet, the future is in the use of multimodality imaging

IVUS/NIRS shows lipid rich plaque in non-stenotic plaque



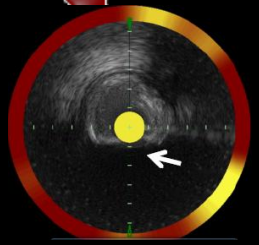
*Preliminary algorithm



Large plaque burden by IVUS

High lipid score by NIRS

Thin cap by NIRS*



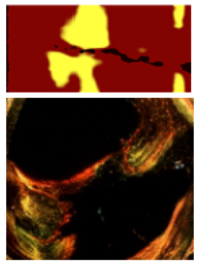
Superficial attenuated plaque with yellow spot

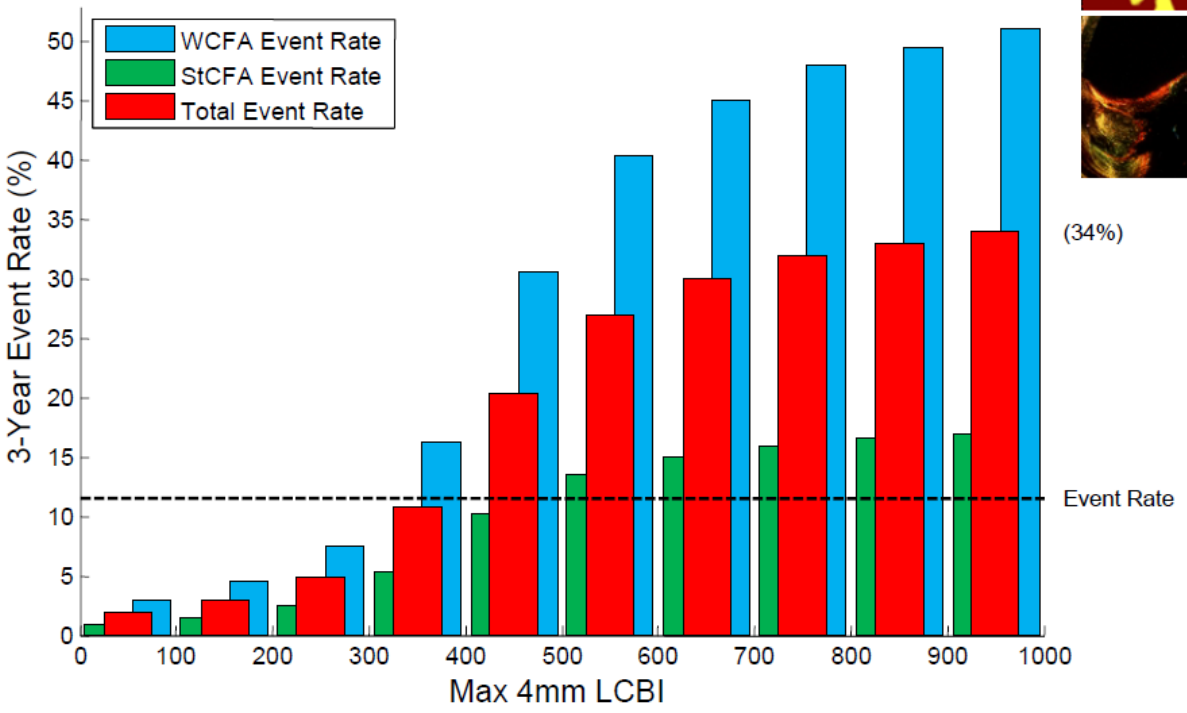
Vulnerable plaque index

Multimodal evaluation to identify very high risk patients

An Optimistic Outcome of LRP Study

- Accounting for presence of Weak/Strong Cap Fibroatheromas,
  - **Estimate only. NOT THE STUDY RESULTS**
  - **Courtesy of Dr. Jim Muller, Infraredx, Inc., March, 2015**



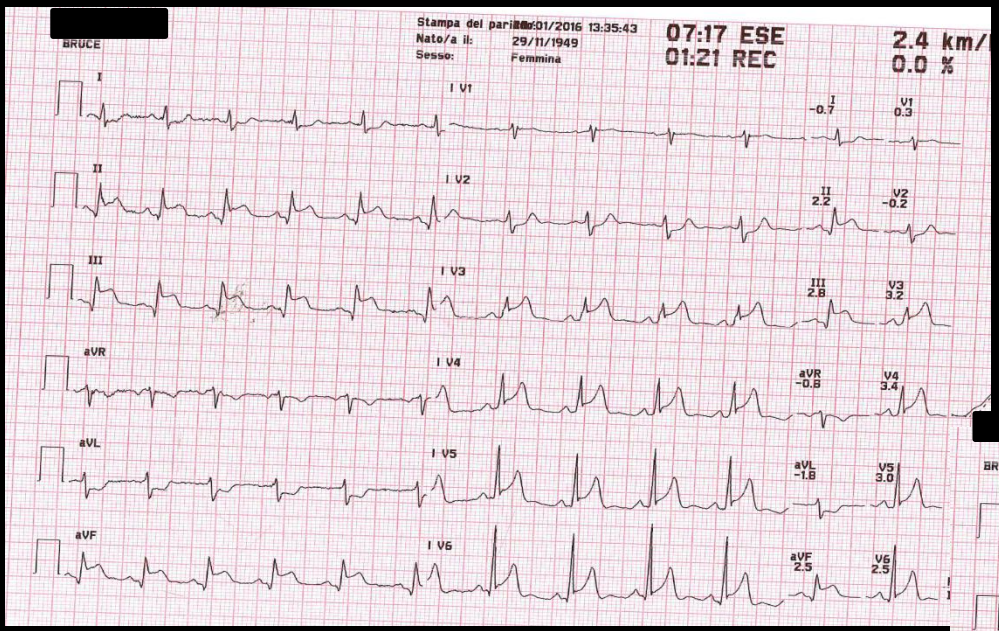


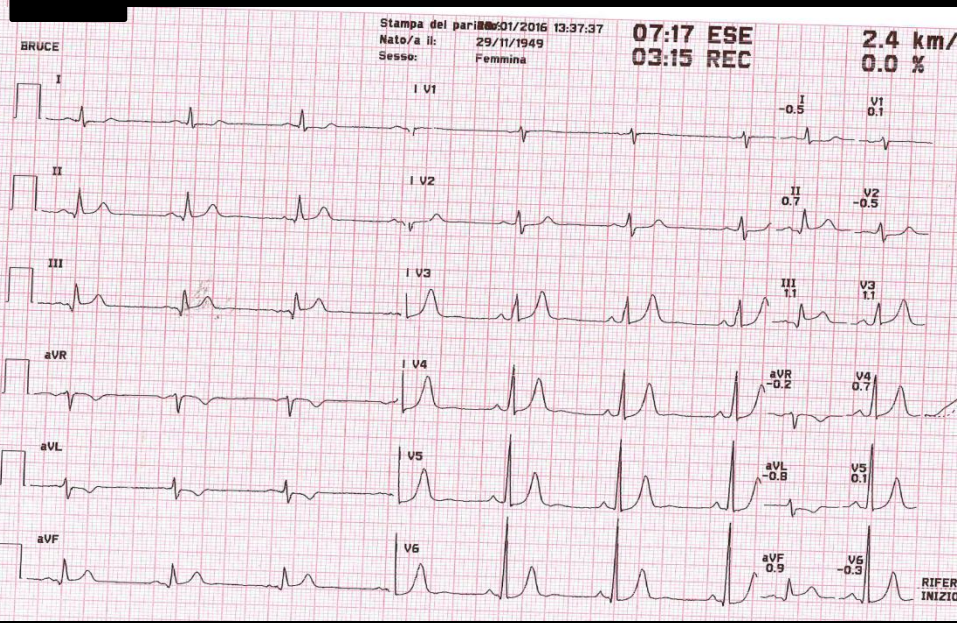
Once identified is it possible to treat these plaques?

67 year-old woman

- Previous smoker
- Dyslipidemia
- No previous cardiac history
- Stress test for chest pain

During recovery after stress test





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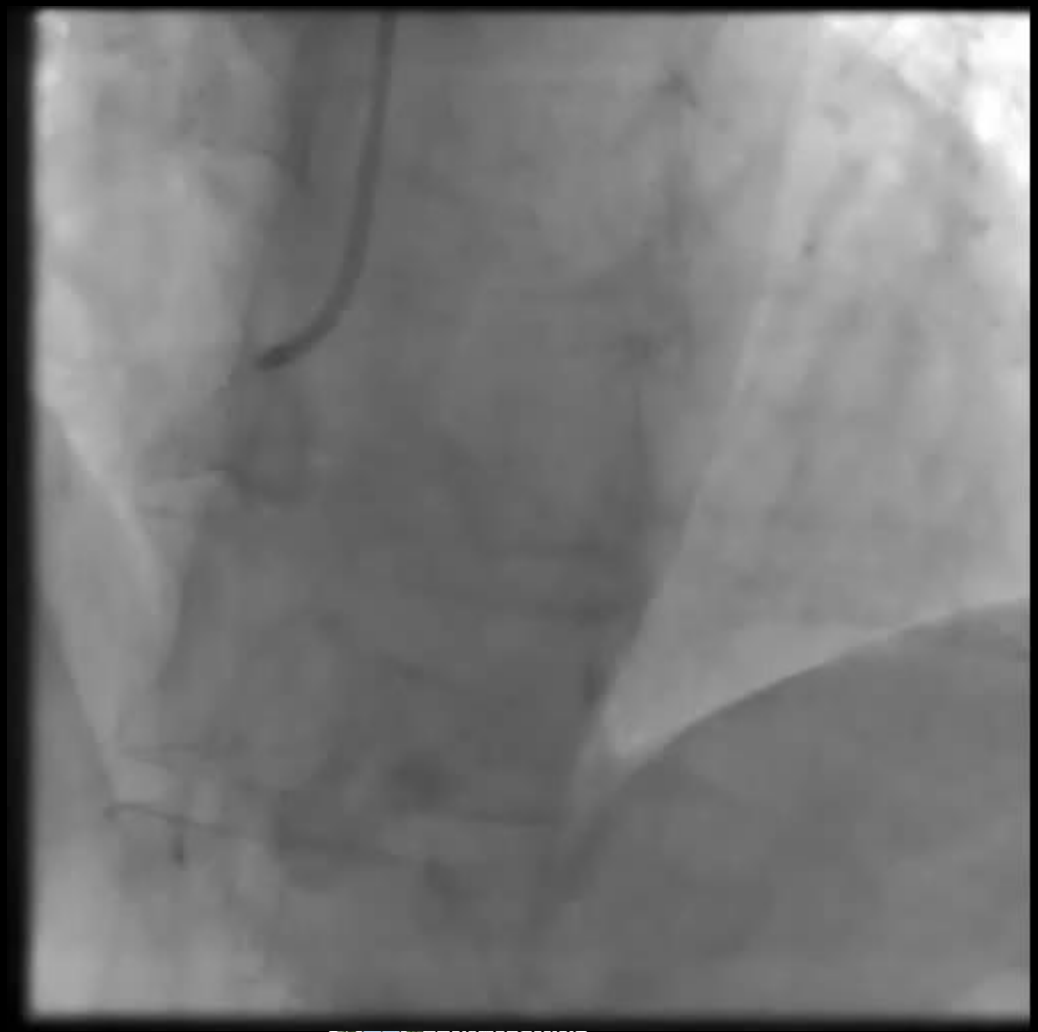
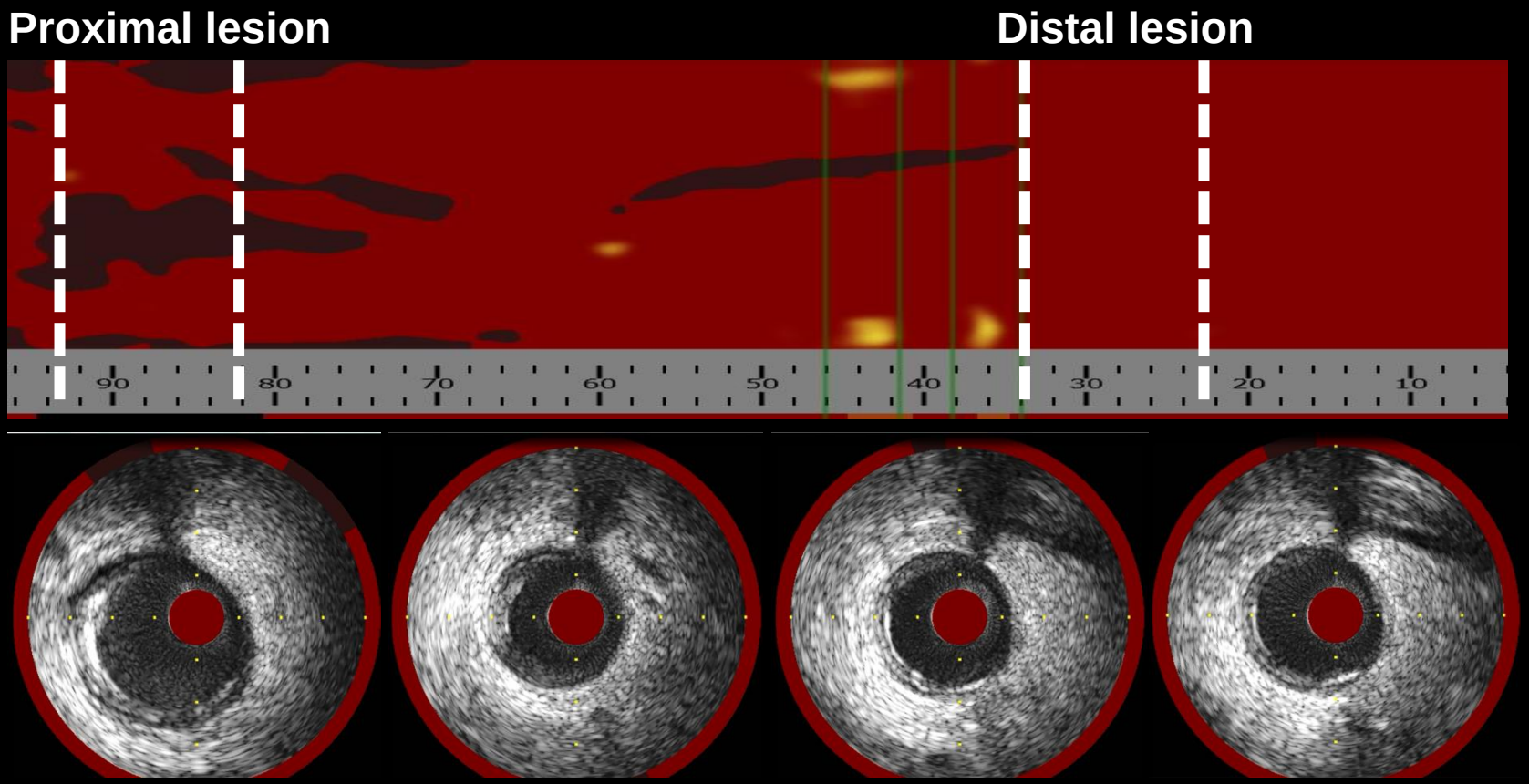
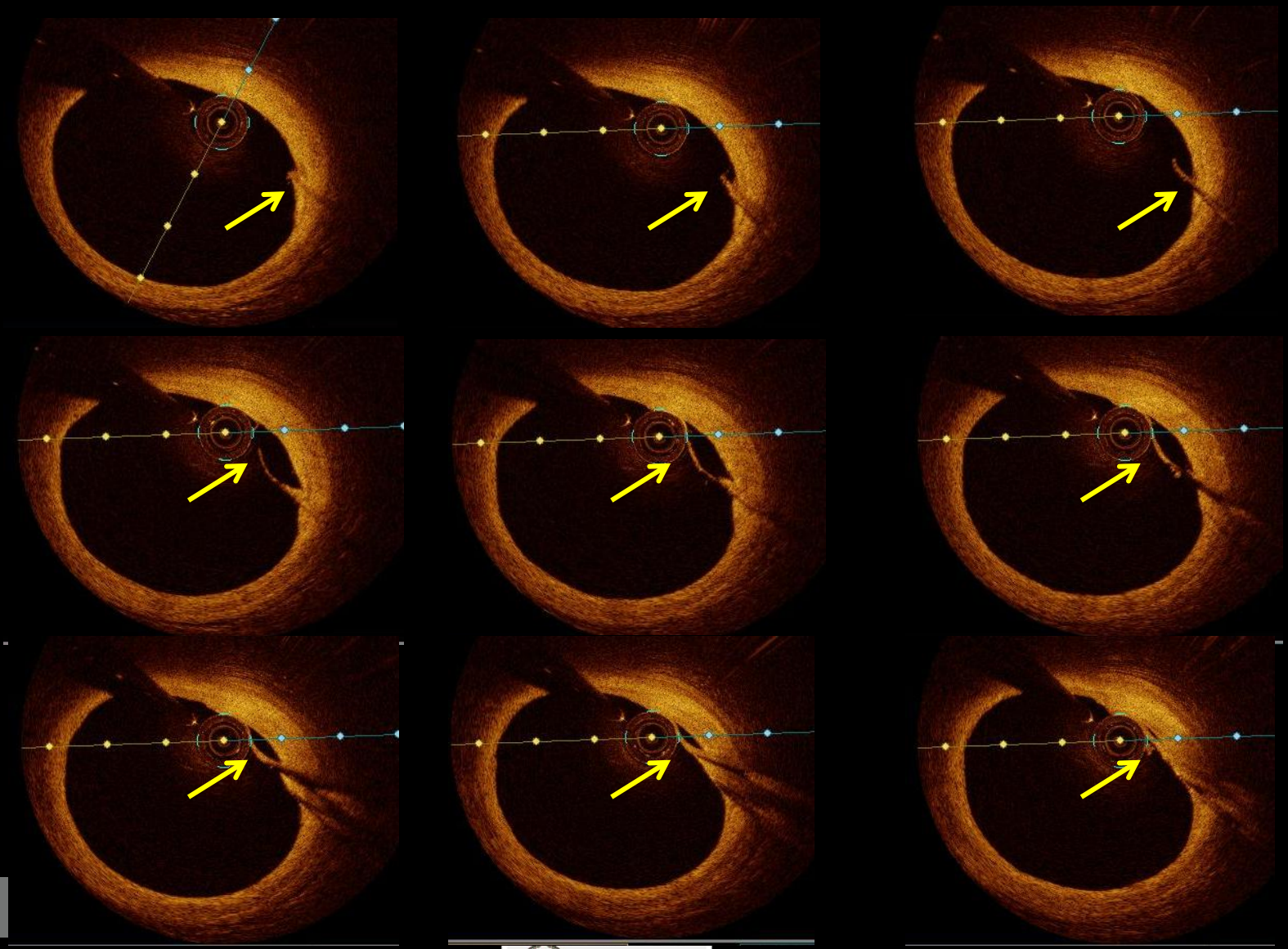
Coronary Angio



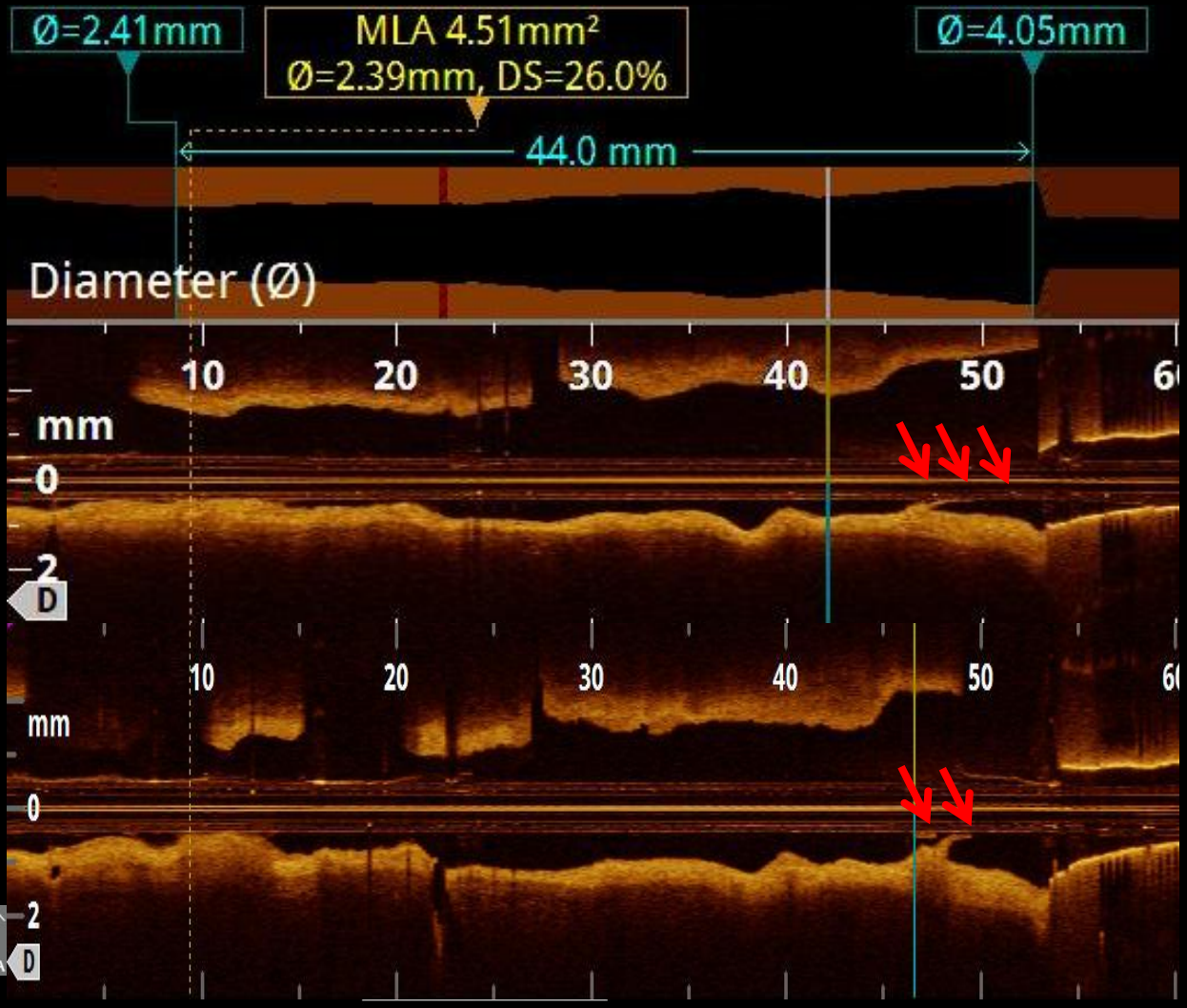
RCA NIRS chemogram and NIRS-IVUS images



OCT images



OCT longitudinal view



OCT 3D images

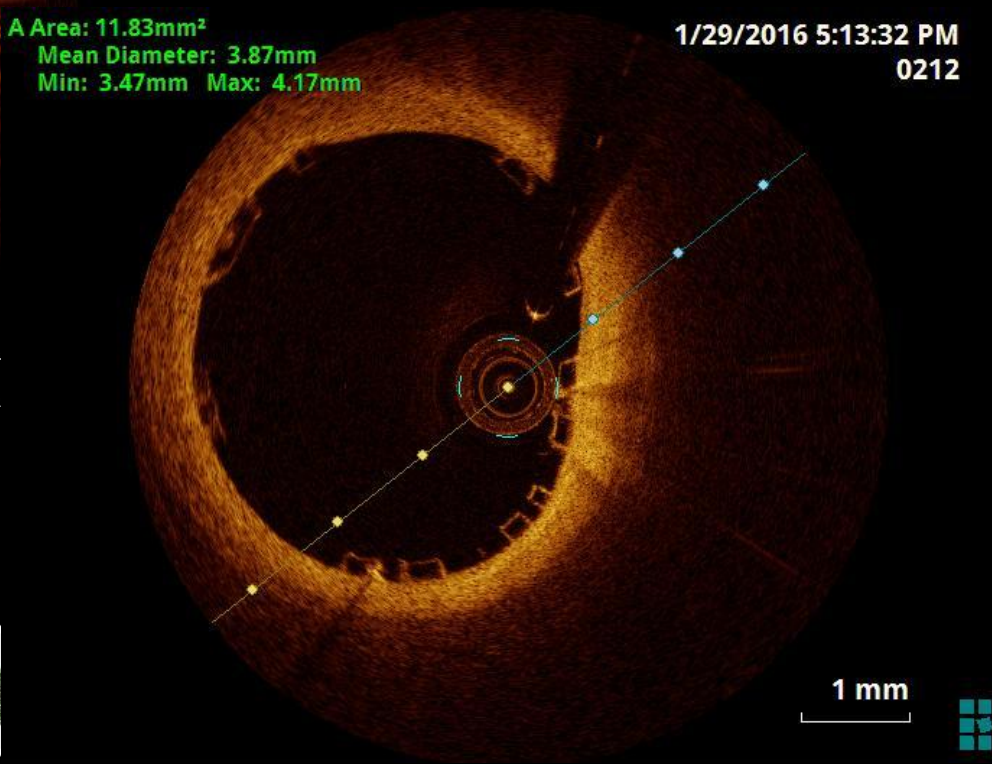
OCT 3D images

OCT 3D images

OCT 3D images

OCT 3D images

BVS implantation



Coronary Angio

Bioresorbable Scaffold could be an attractive option

BVS rationale

- Plaque media regression
- Late lumen enlargement and remodelling
- Shielding and recapping of plaque
- Restoration of coronary vasomotion endothelial function
- No chronic source of inflammation
- Future possibility for CABG

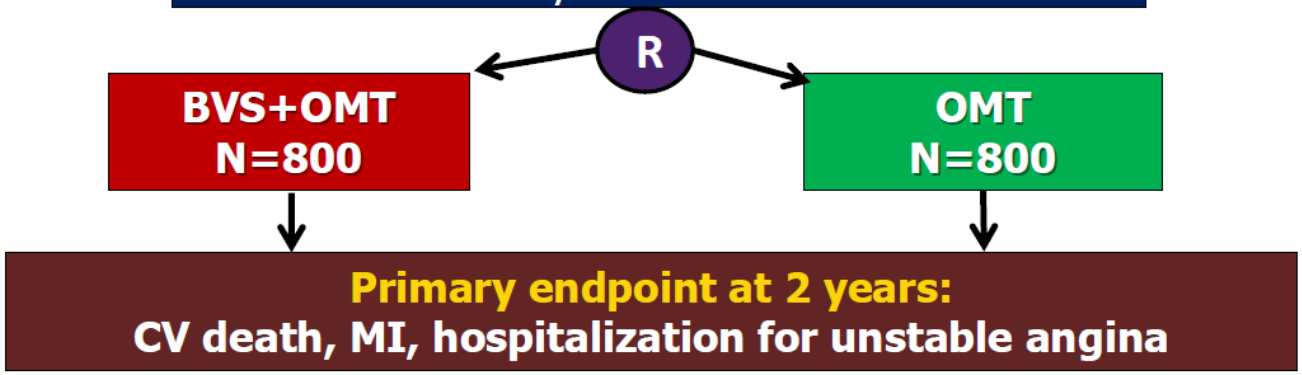
This is the rationale for «preventive» Interventional Cardiology

The PREVENTive Implantation of Bioresorbable Vascular Scaffold on Stenosis Functionally Insignificant with signs of Vulnerability

PREVENT Trial (n=1600)

Any Significant Epicardial Coronary Stenosis (DS>50%) (ACS and non-ACS) with FFR >0.80 and with Two of the following

1. MLA <4.0 mm^2
2. Plaque Burden at MLA site >70%
3. Lipid-Rich Plaque on NIRS ($_{max}LCBI_{4mm}$>500)
4. TCFA defined by OCT or VH-IVUS



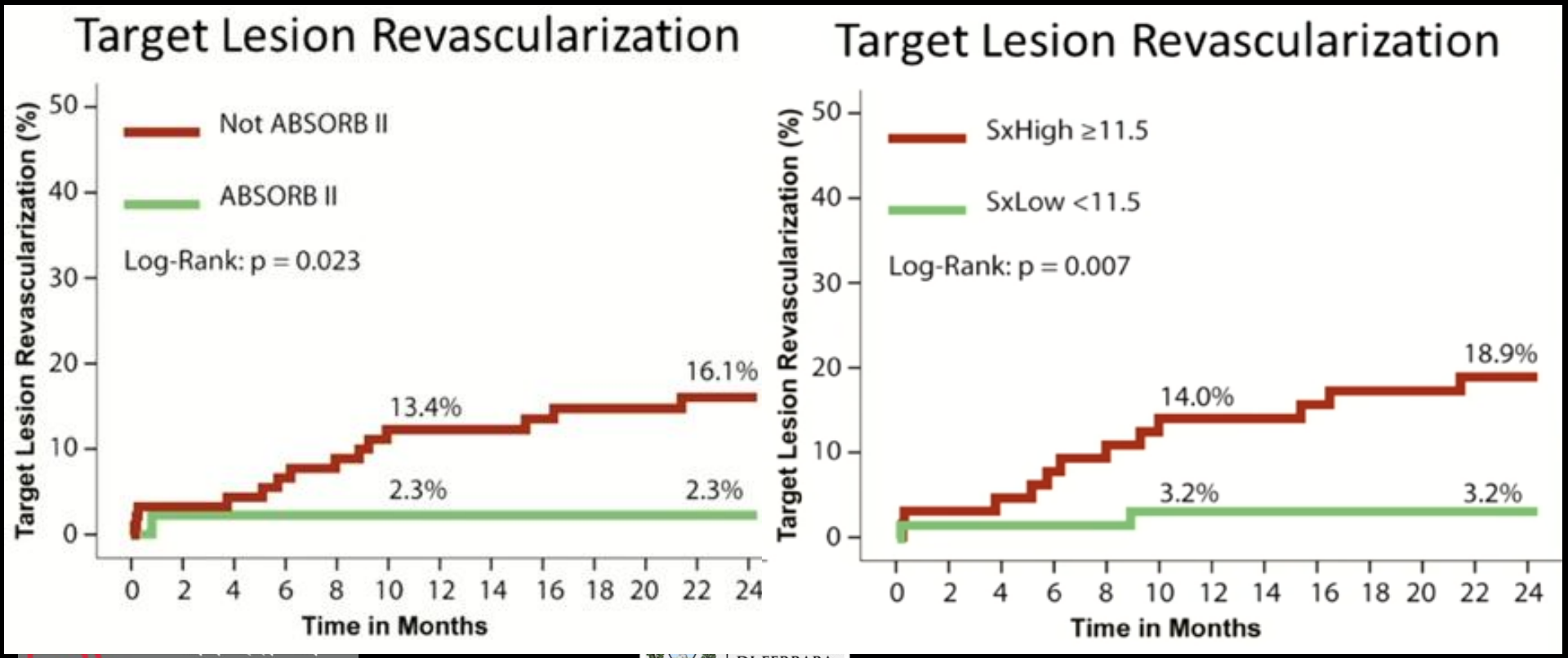
TCFA

- OCT definition: fibrous cap thickness<65 µm and arc>90°
- VH-IVUS definition: ≥10% confluent NC with >30° abutting to the lumen in 3 consecutive slices
PI: SJ Park

However, even BVS are not concern-free!

The problem of overlapping in complex lesions

First reports show more events with BVS in complex lesions!



Kraak, ESC 2015

But…patients were enrolled from August 2012 to August 2013, before optimization of BVS implantation technique

5 MUST for proper BVS implantation

1. **P**repare the Lesion
2. **P**roperly Size the Vessel
3. **P**ay Attention to Expansion Limits
4. **P**ost-Dilate with a Non-Compliant Balloon (AVOID UNDEREXPANSION)
5. **P**rescribe adequate length of dual antiplatelet regimen (DA**P**T)

Are more recent data regarding BVS in complex lesions different from first reports?

UNDERDOGS study

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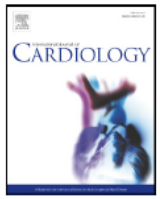
journal homepage: www.elsevier.com/locate/ijcard



Bioresorbable Scaffold vs. Second Generation Drug Eluting Stent in Long Coronary Lesions requiring Overlap: A Propensity-Matched Comparison (the UNDERDOGS study)

Simone Biscaglia [a,*,1], Fabrizio Ugo [b,1], Alfonso Ielasi [c,1], Gioel Gabrio Secco [d,1], Alessandro Durante [e,1], Fabrizio D'Ascenzo [f,1], Enrico Cerrato [g,1], Mohammed Balghith [h,1], Giampaolo Pasquetto [i,1], Carlo Penzo [j,1], Massimo Fineschi [k,1], Francesco Bonechi [l,1], Christian Templin [m,1], Mila Menozzi [n,1], Matteo Aquilina [o,1], Andrea Rognoni [p,1], Piera Capasso [q,1], Carlo Di Mario [r,1], Salvatore Brugaletta [s,1], Gianluca Campo [t,1]

- 16 international centers involved
- Primary Endpoint: DOCE (device oriented endpoint) at 12 months

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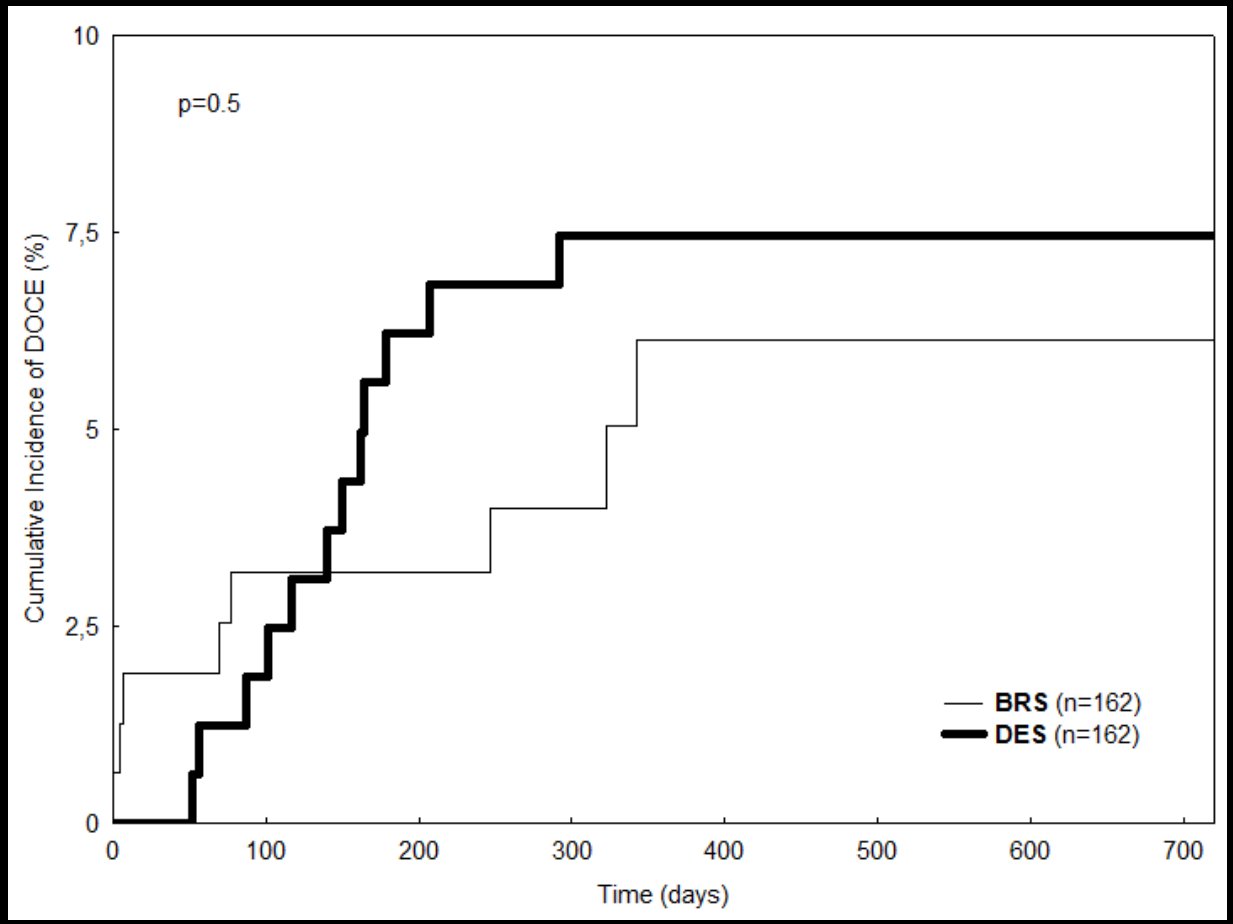
Kaplan-Meier DOCE



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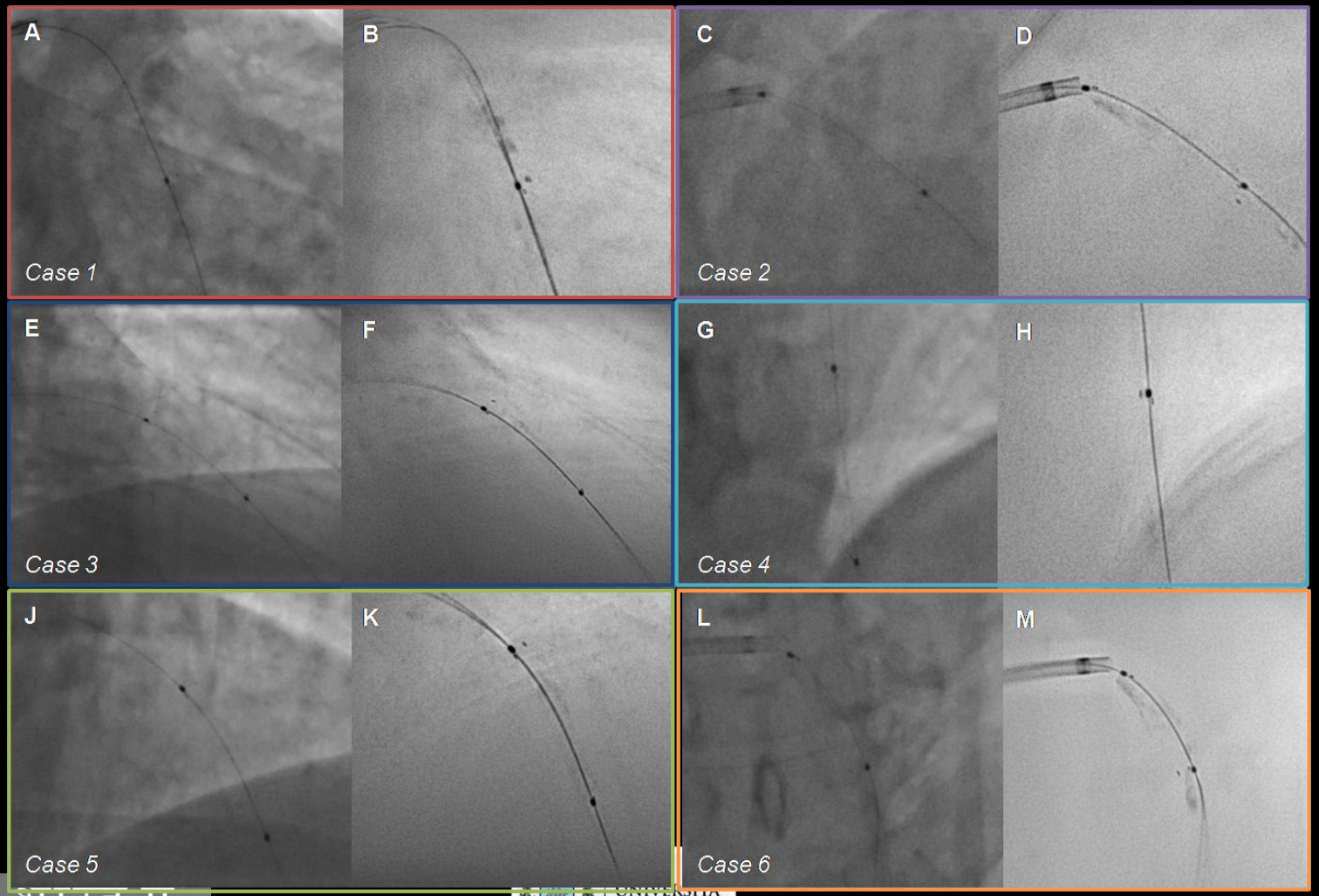
Biscaglia, IJC 2016

Clinical events

	BVS group (n=162)	DES group (n=162)	p
DOCE	**9 (5.6)**	**12 (7.4)**	**0.50**
All cause death	3 (1.9)	4 (2.5)	0.70
CV death	2 (1.2)	4 (2.5)	0.41
TVMI	5 (3.1)	6 (3.7)	0.76
TLR	7 (4.3)	9 (5.6)	0.61
TVR	9 (5.6)	9 (5.6)	1
ST	2 (1.2)	3 (1.9)	0.65

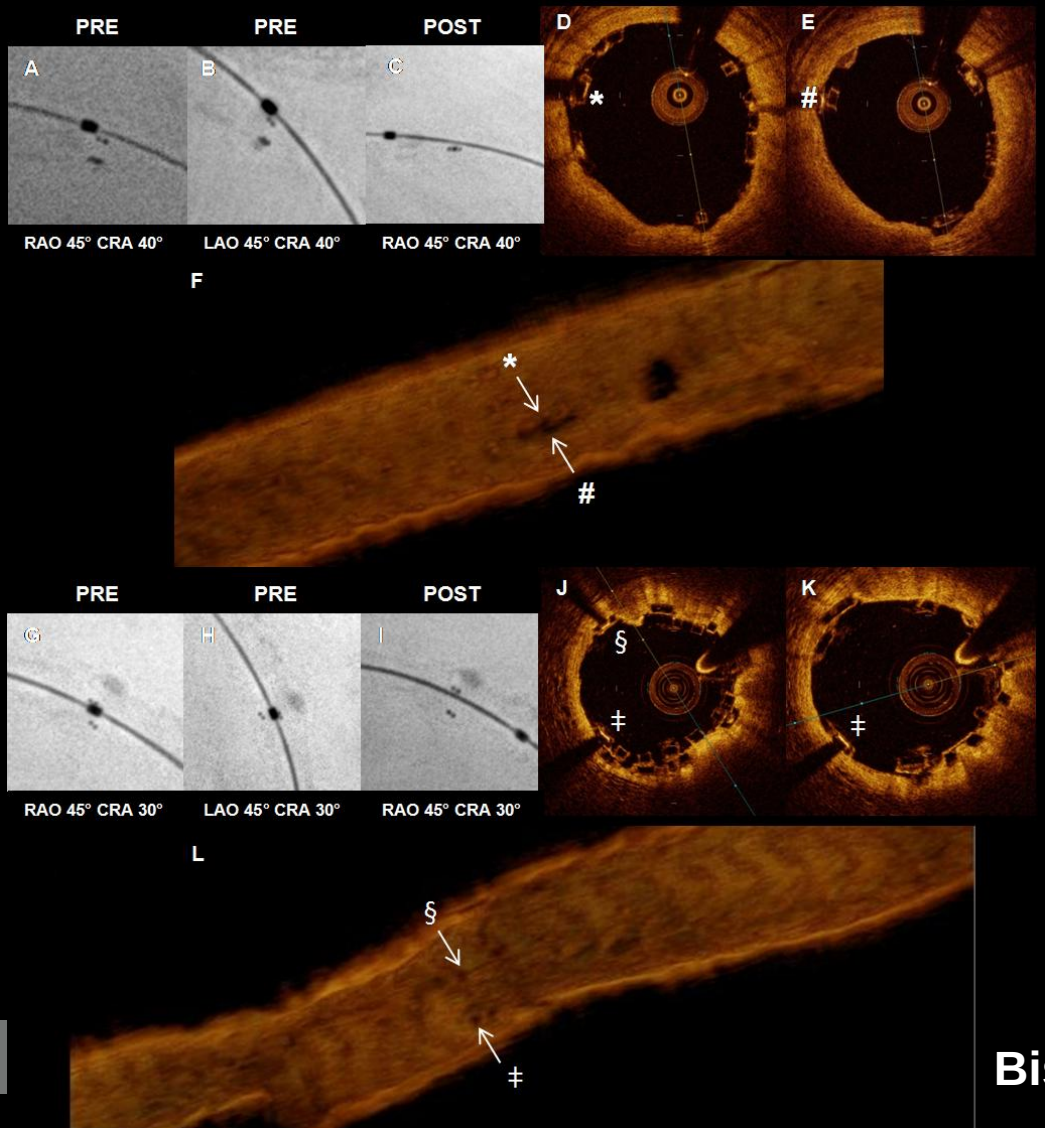
Biscaglia, IJC 2016

How is it possible to optimize implantation?



Biscaglia, IJCVI 2015

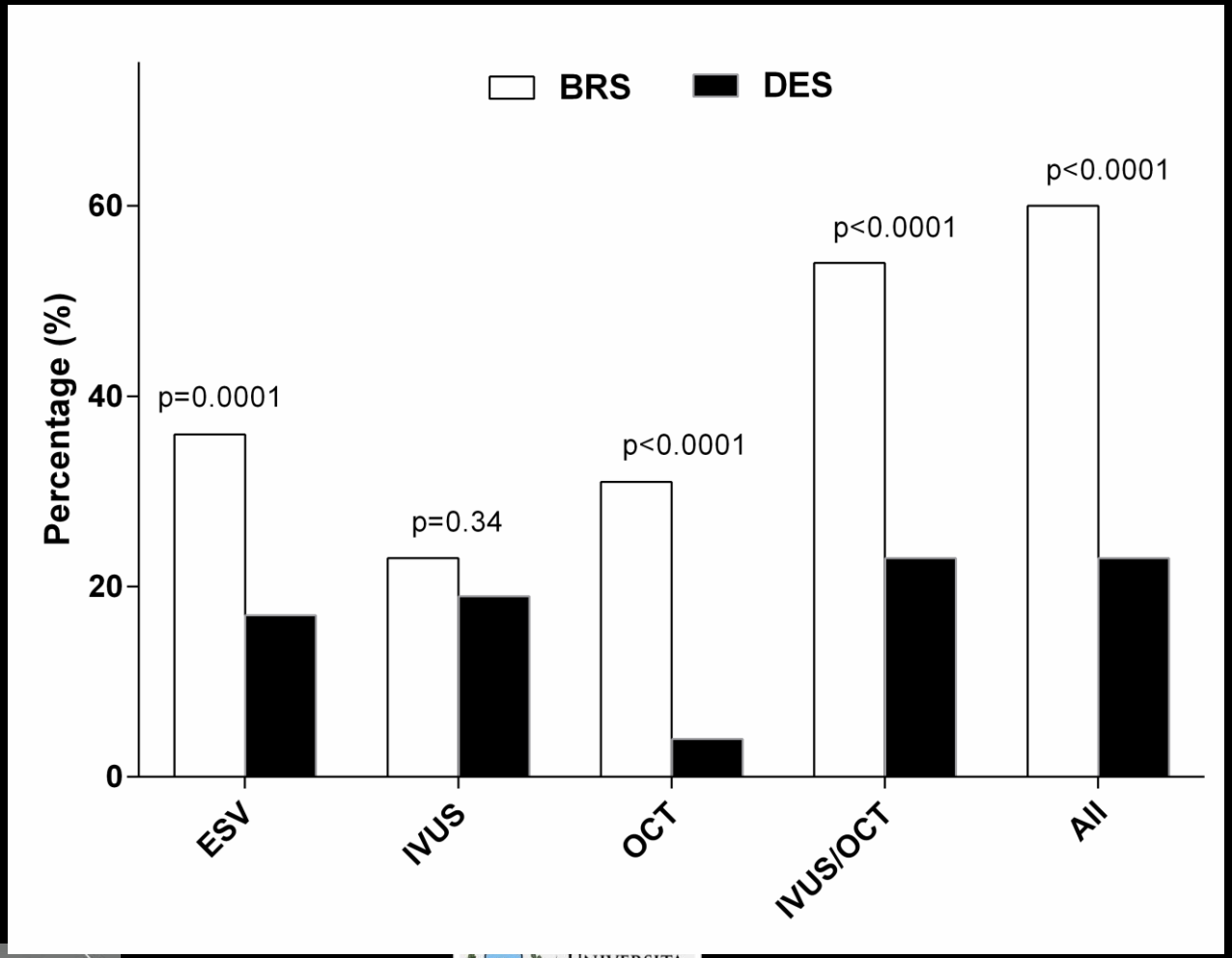
Careful implantation = minimal overlap



ESC भारत में IN INDIA

Biscaglia, IJCVI 2015

A careful implantation is crucial!



Biscaglia, IJC 2016

- **Complex lesions can be treated with BVS only with a careful implantation technique**

- **Adequately powered studies are needed to confirm preliminary data**

In conclusion…

- We are moving from the angiographic evaluation of coronary stenoses to a multimodal evaluation of coronary plaques (FFR, OCT, IVUS/NIRS…)
- Disappearing scaffold is a very attractive technology, but at present its safety is validated only in simple patients with simple lesions
- **We need more time for research!**