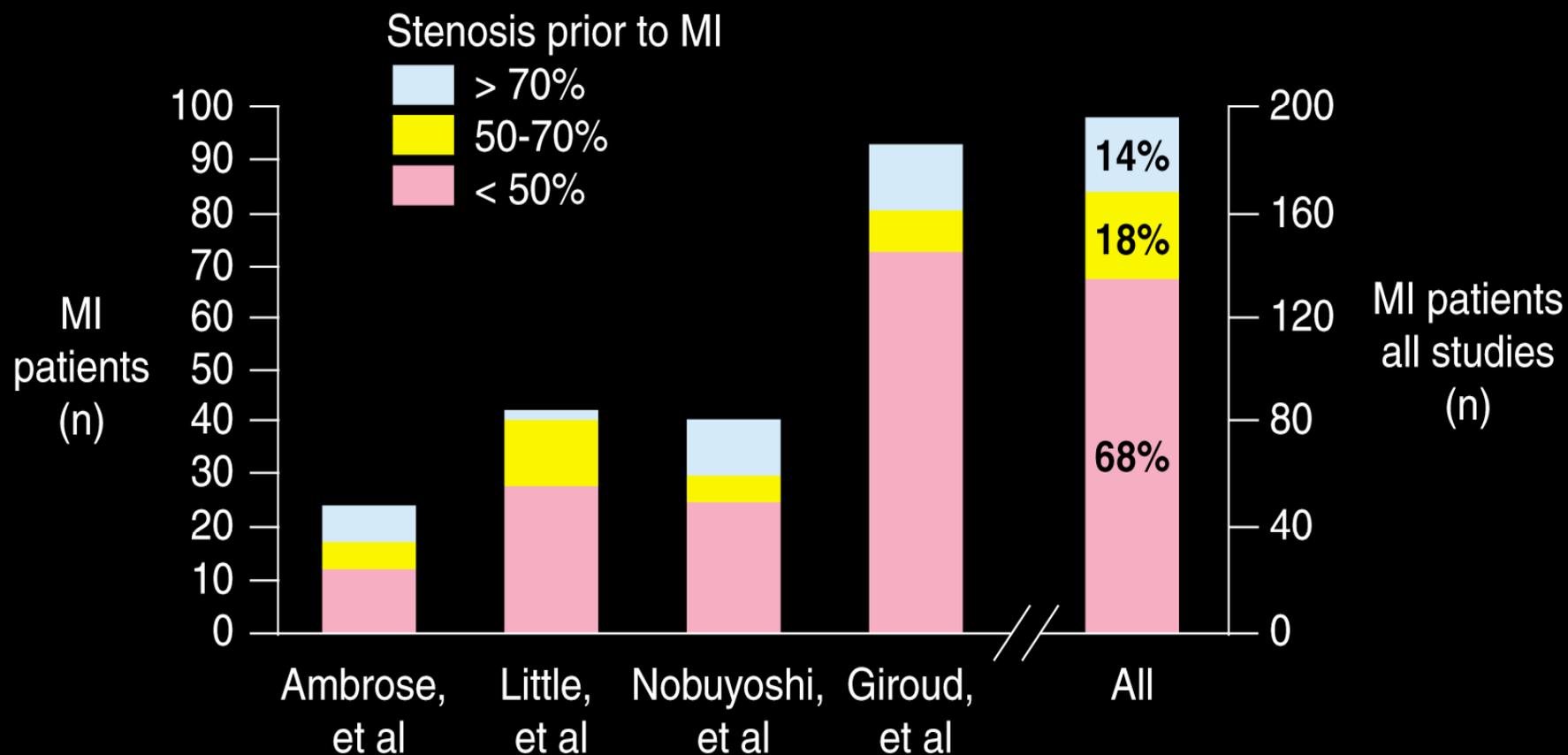


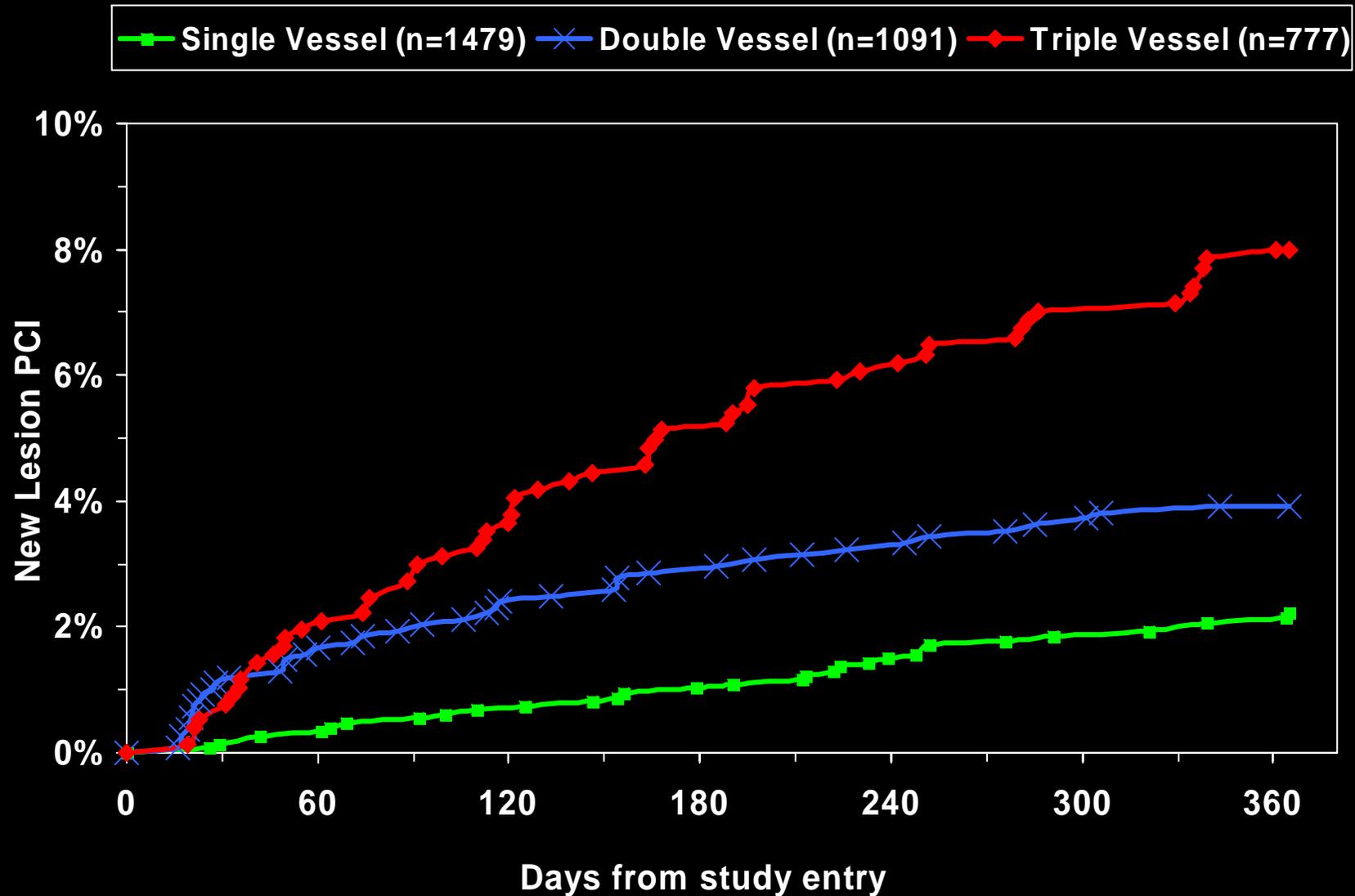
Intravascular imaging and vulnerable plaque detection

Ron Waksman MD, FACC, FSCAI
Professor of Medicine (Cardiology), Georgetown
University Associate Chief of Cardiology
Washington Hospital Center
Washington DC

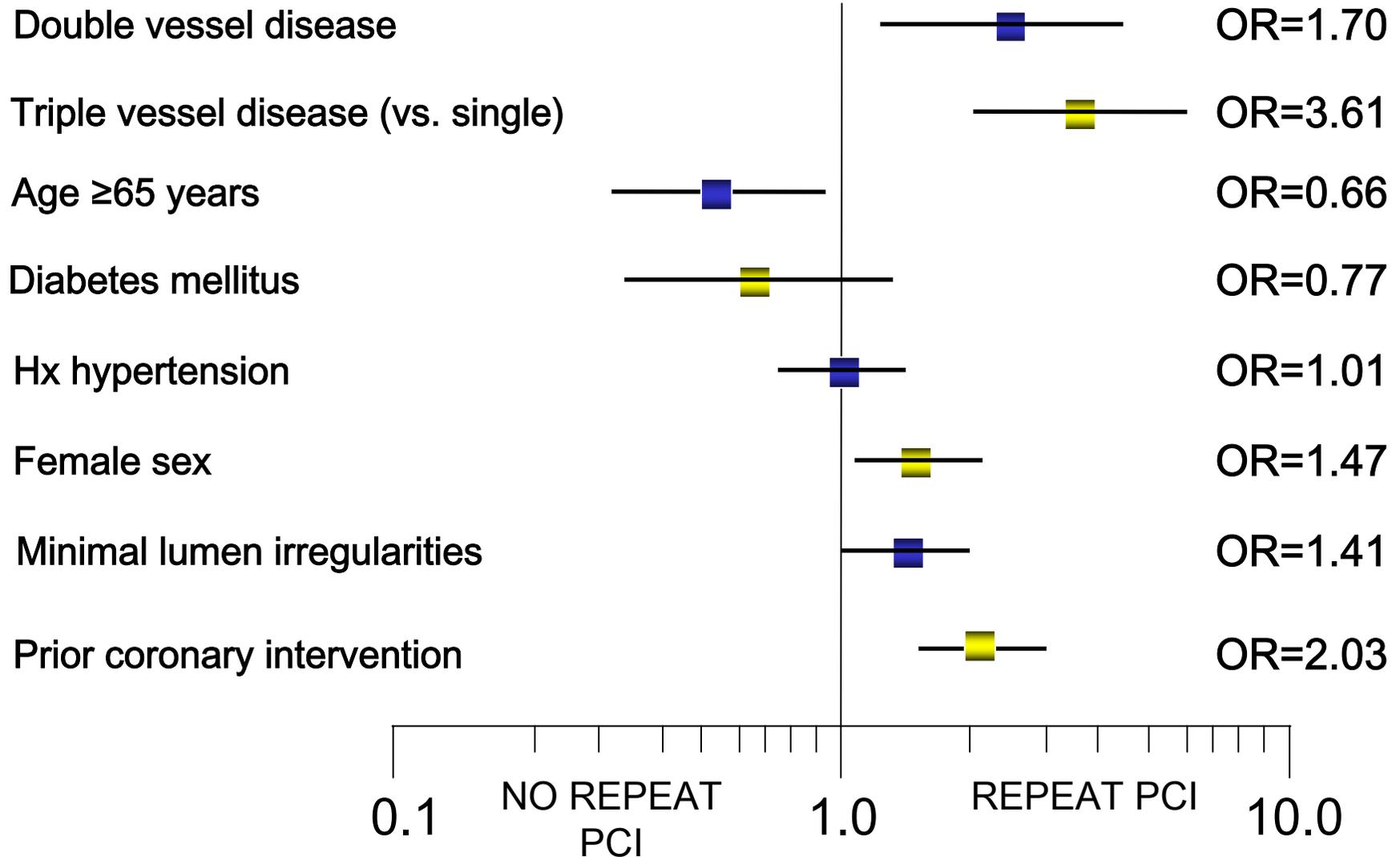
Clinical studies summary: Angiography in infarct-related artery

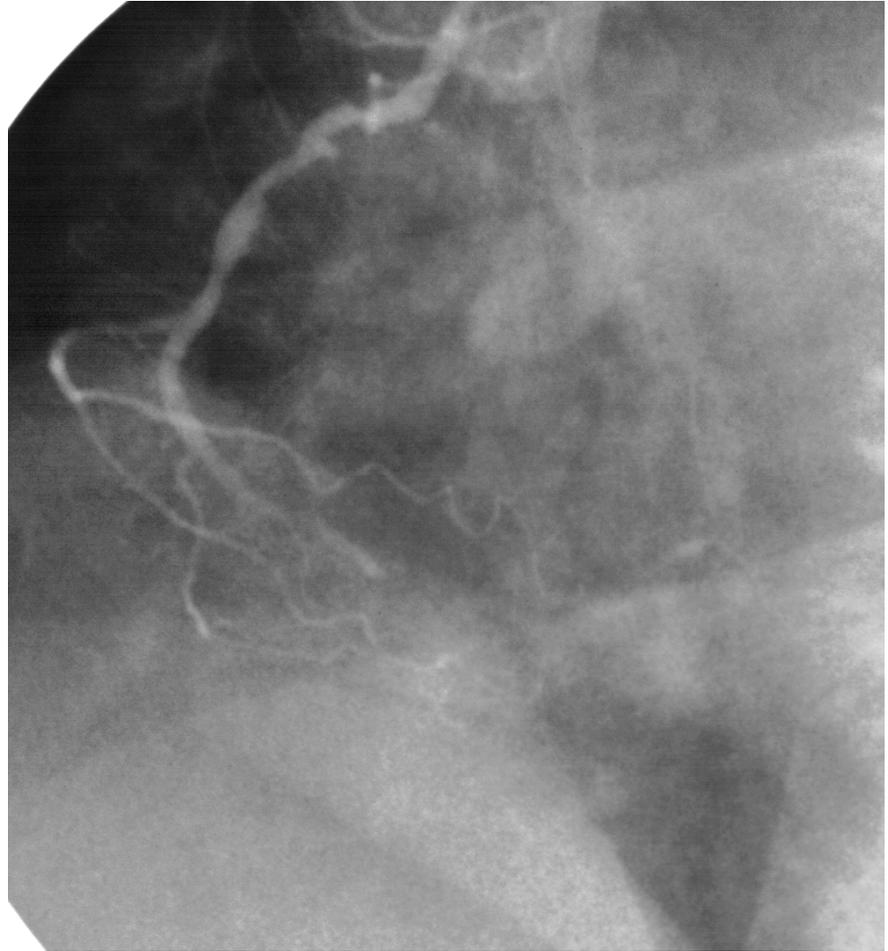
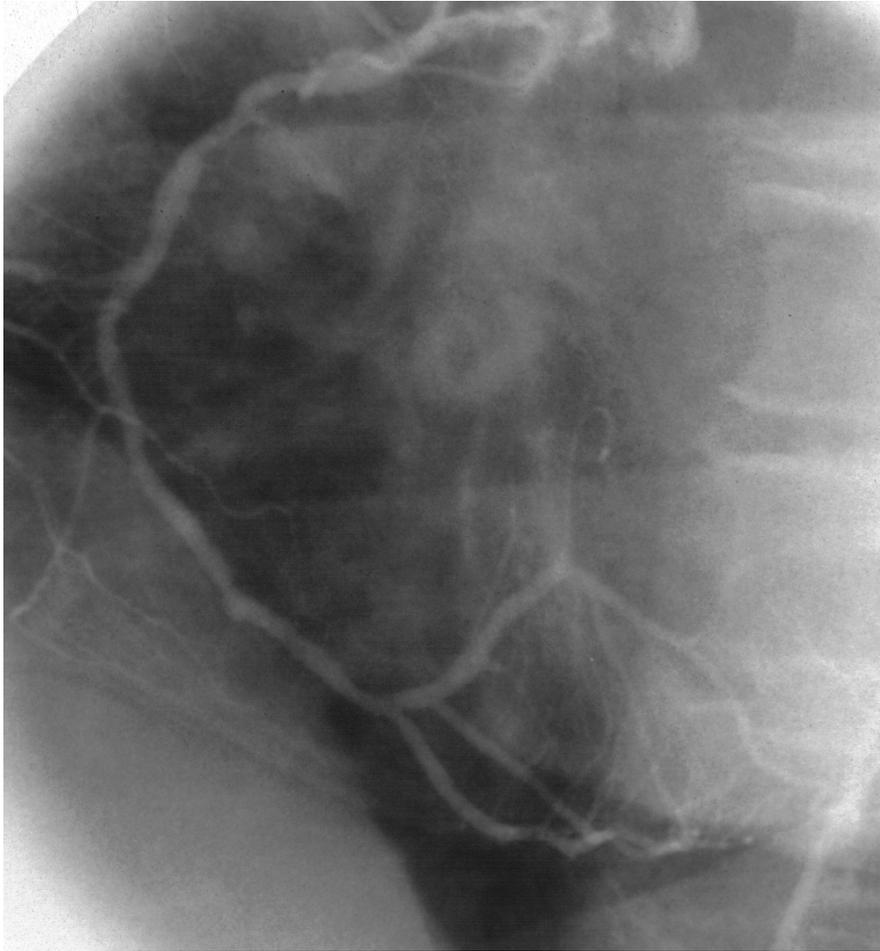


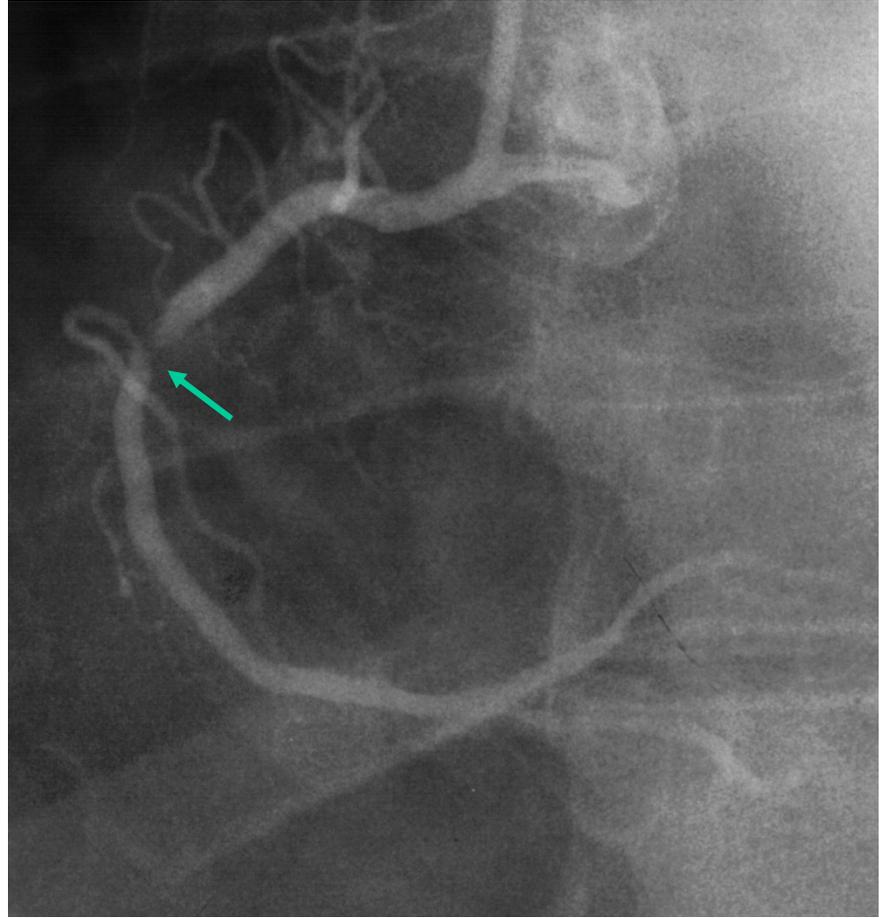
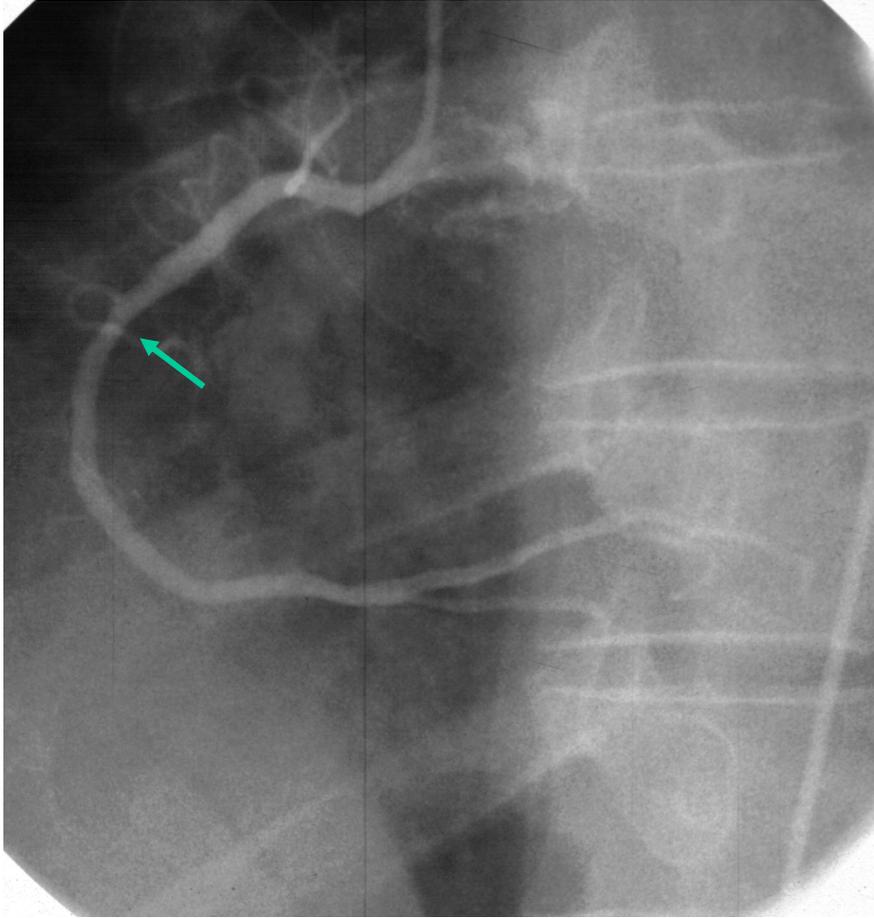
Need for intervention in original non-culprit lesion correlates to underlying extent of coronary artery disease



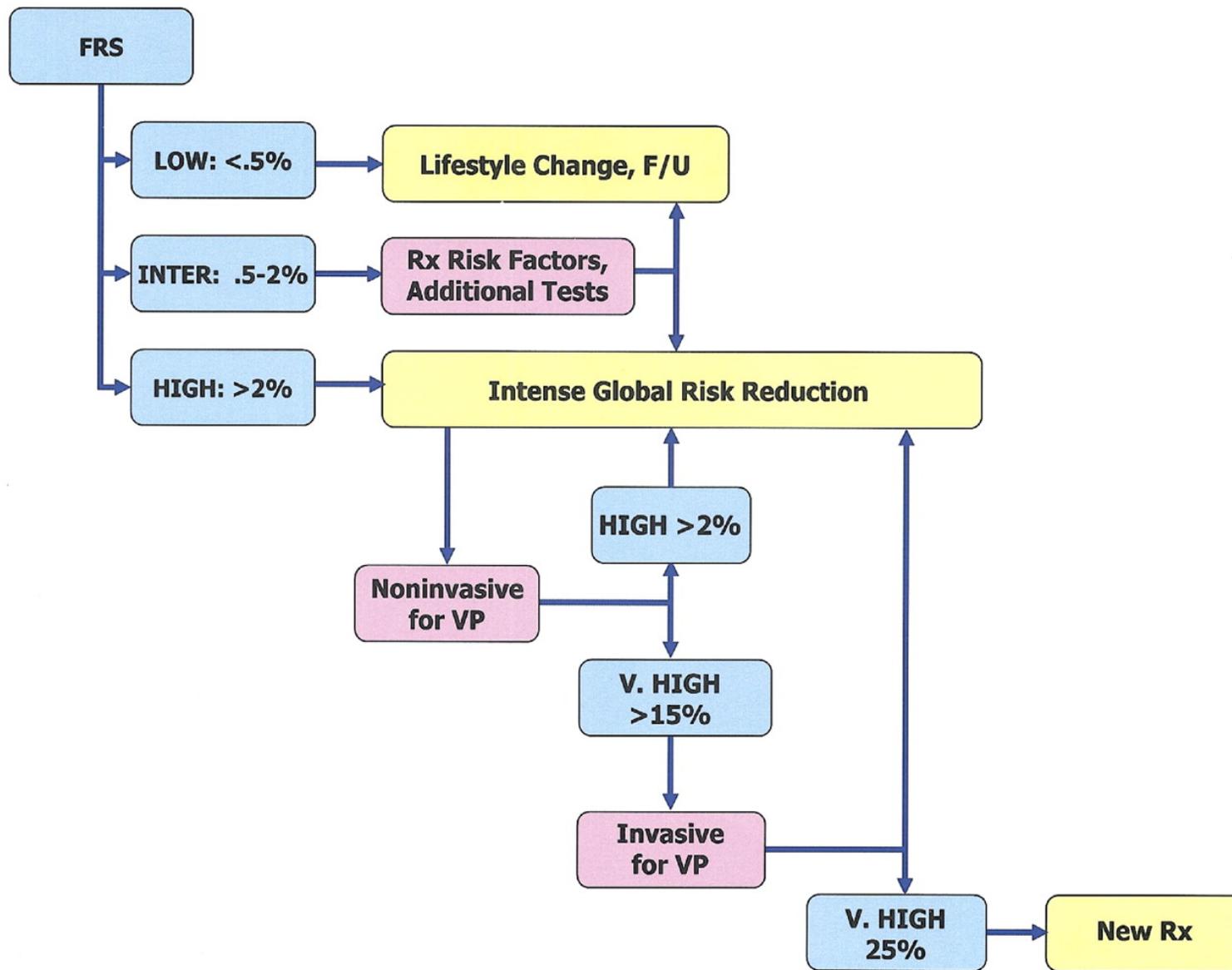
New lesion PCI in subgroups







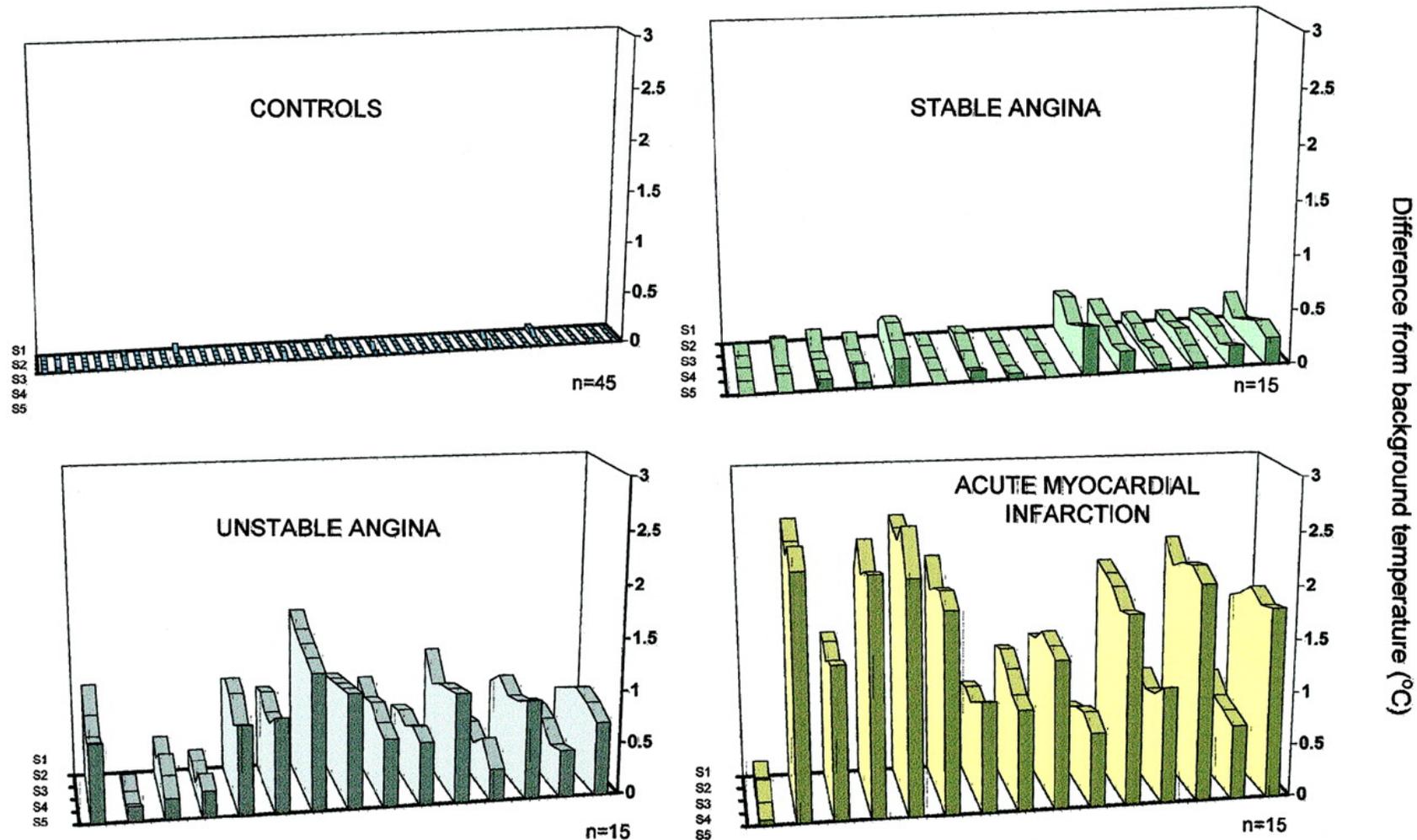
Proposed algorithm for the detection of plaques likely to result in acute coronary syndromes



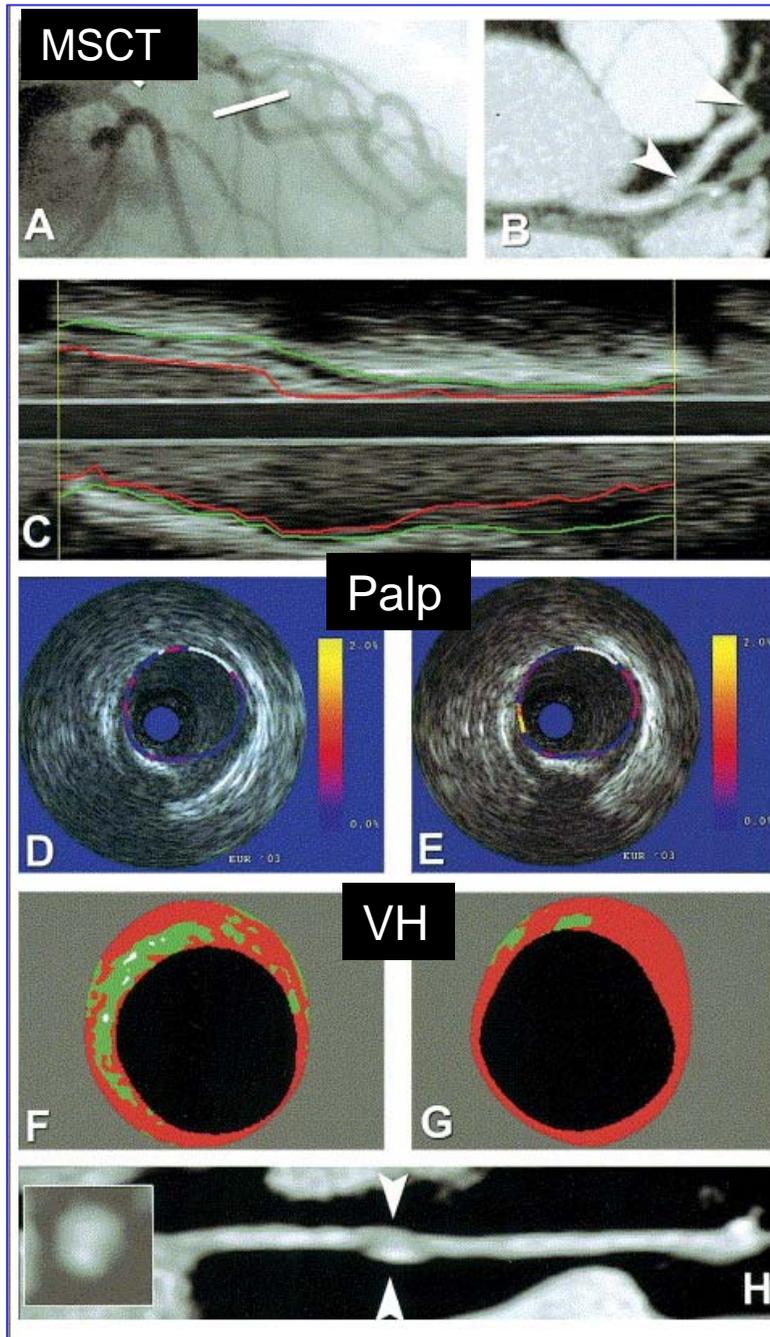
Invasive approaches to vulnerable plaque diagnosis

- Intravascular thermography
- IVUS based: Palpography and virtual histology
- Near infrared spectroscopy
- Optical coherence tomography-*optical analog of ultrasound imaging measuring the back-scattered light (optical echoes) returning from an arterial sample as a function of delay.*

Individual temperature wall differences by *in-vivo* thermography



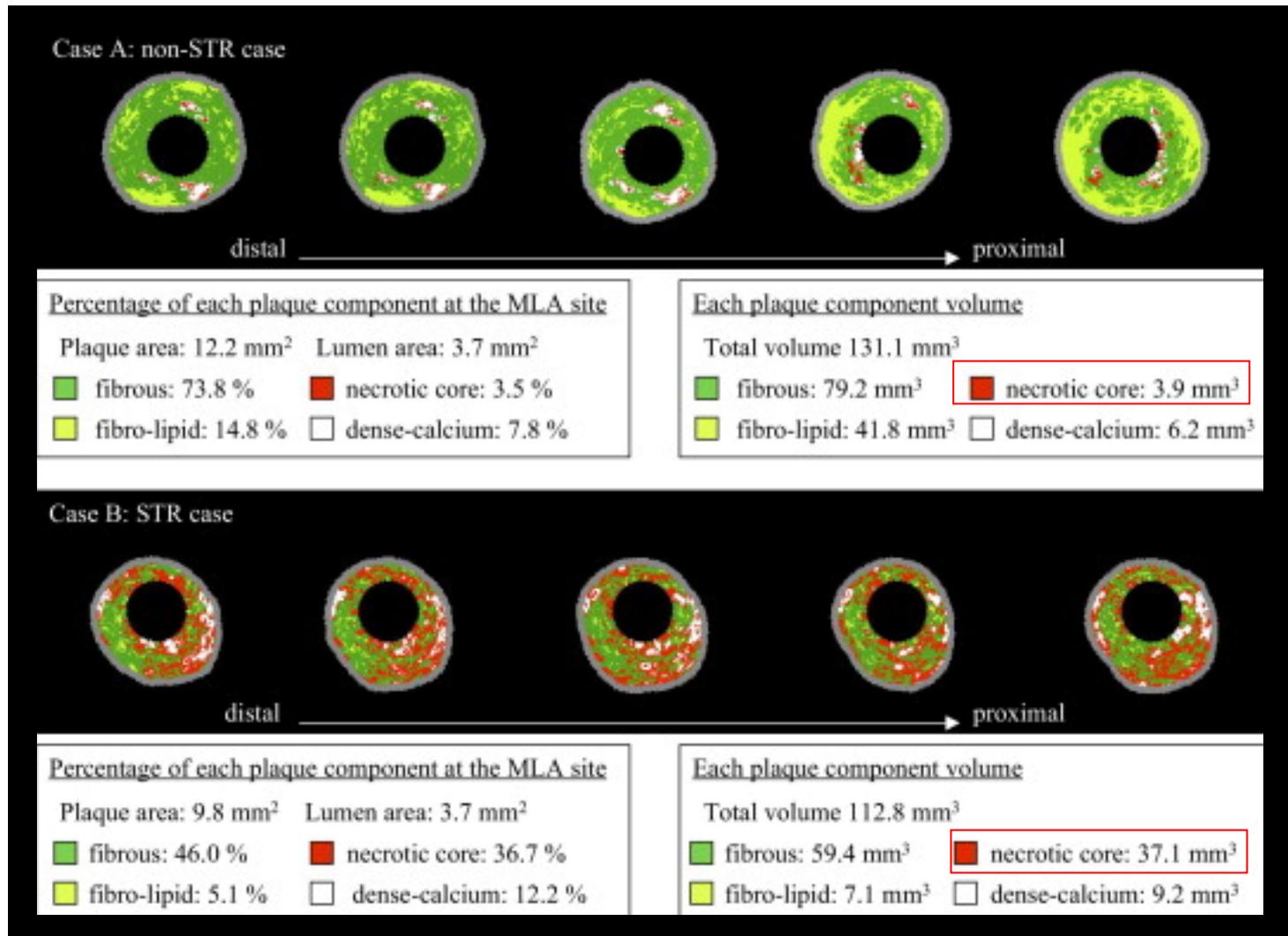
IBIS study



High strain spots on palpography

- pre- 4.8 ± 4.5
- post- 3.6 ± 4.4
- Significant decrease in STEMI patients

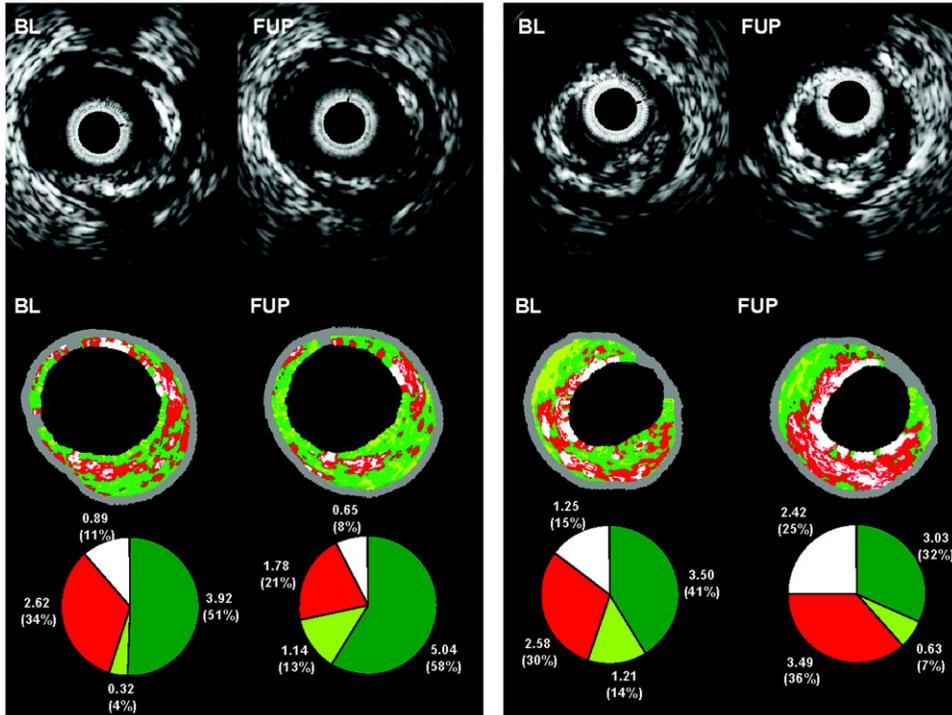
Use of VH to predict distal embolization after PCI for STEMI



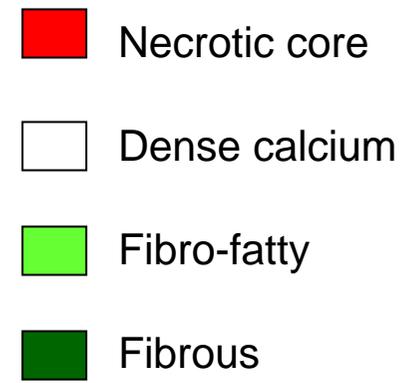
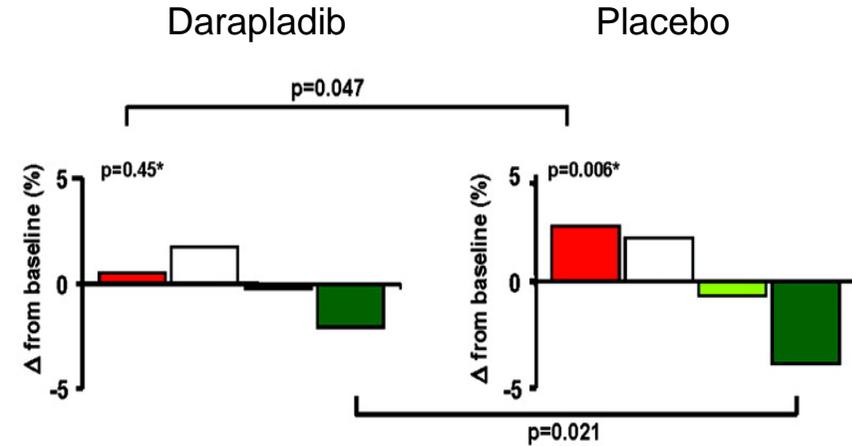
IBIS 2. Darapladib reduces necrotic core area in patients with an acute coronary syndrome: Representative examples

Darapladib group

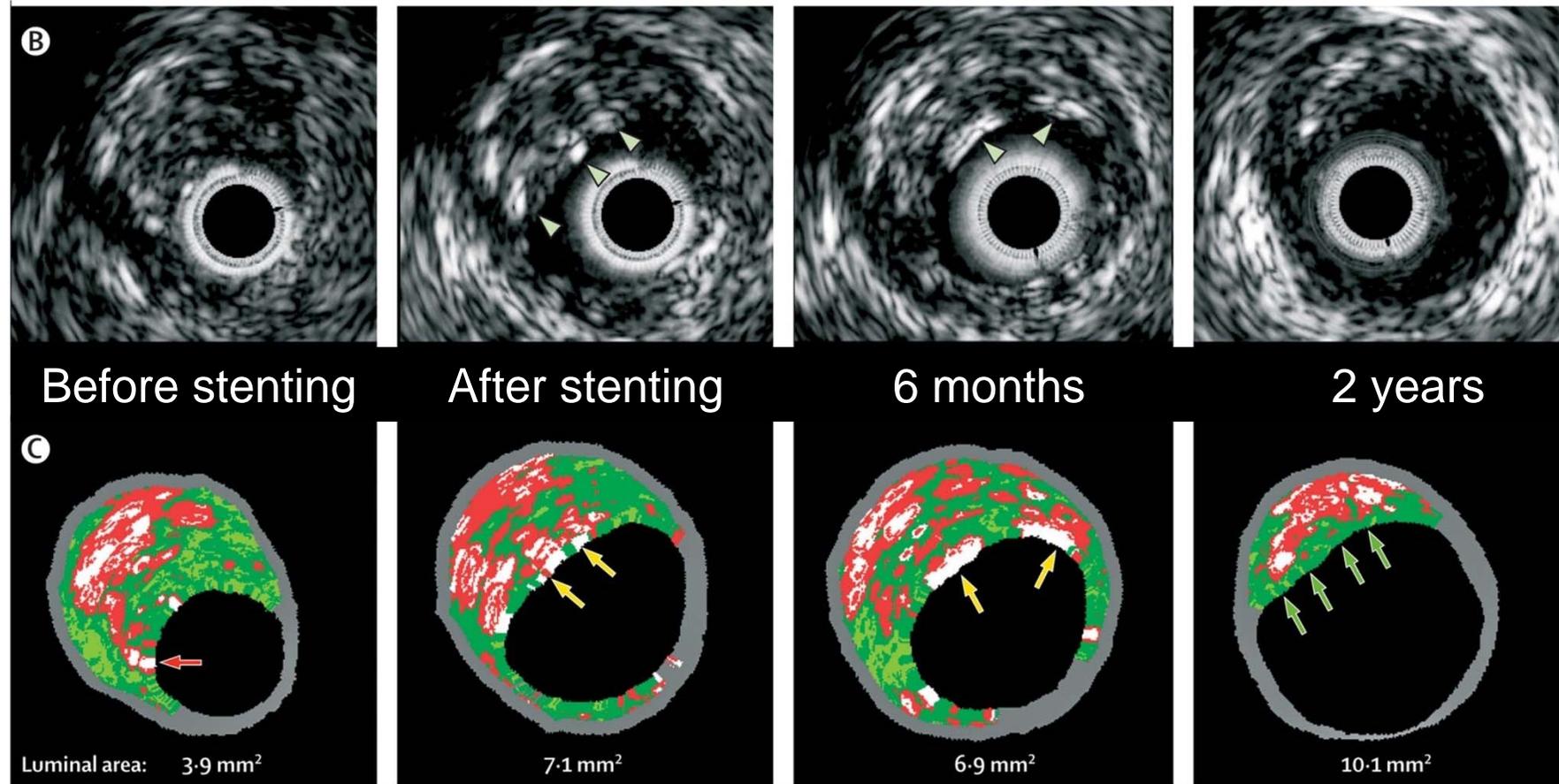
Placebo group



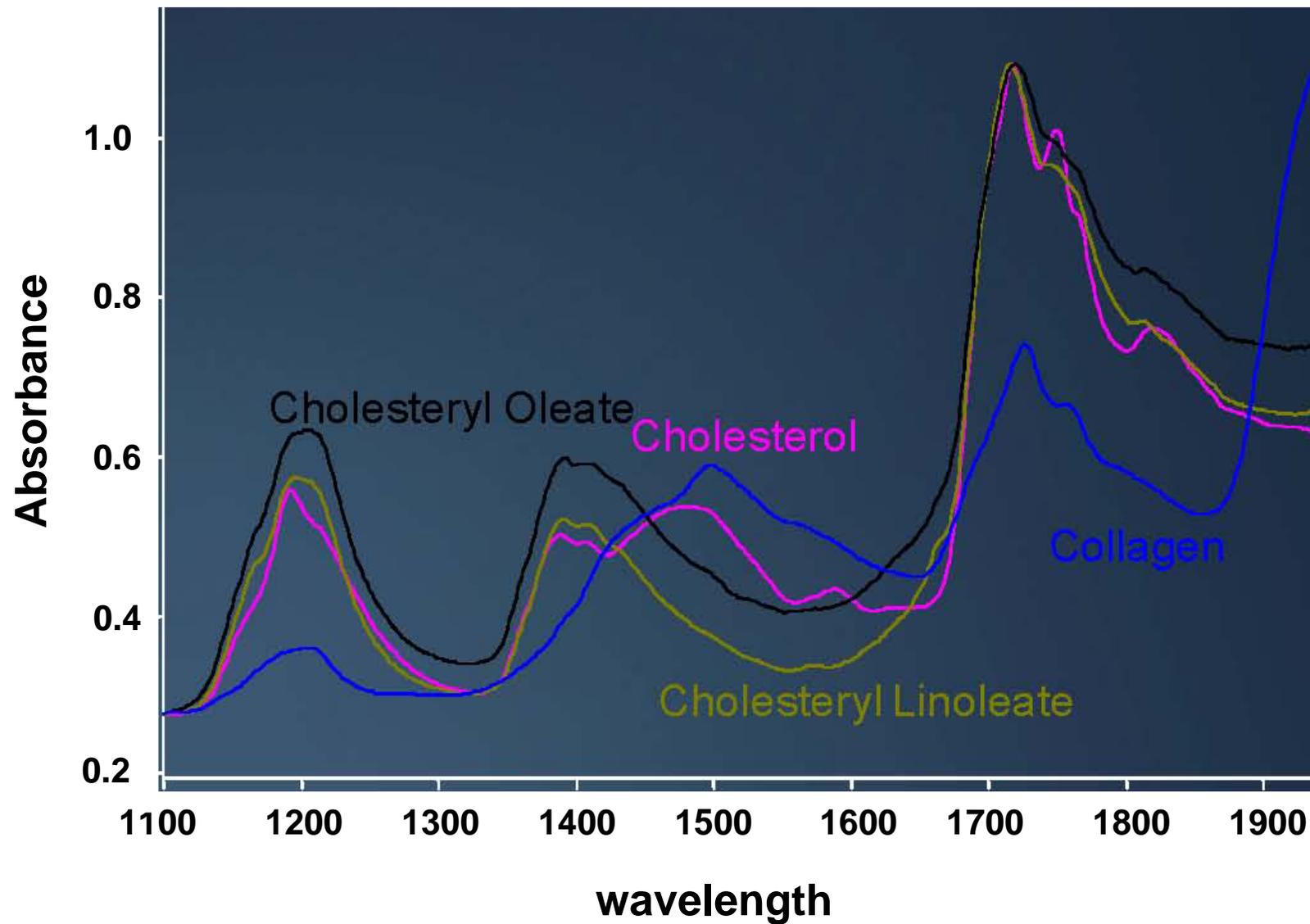
Change in individual plaque components



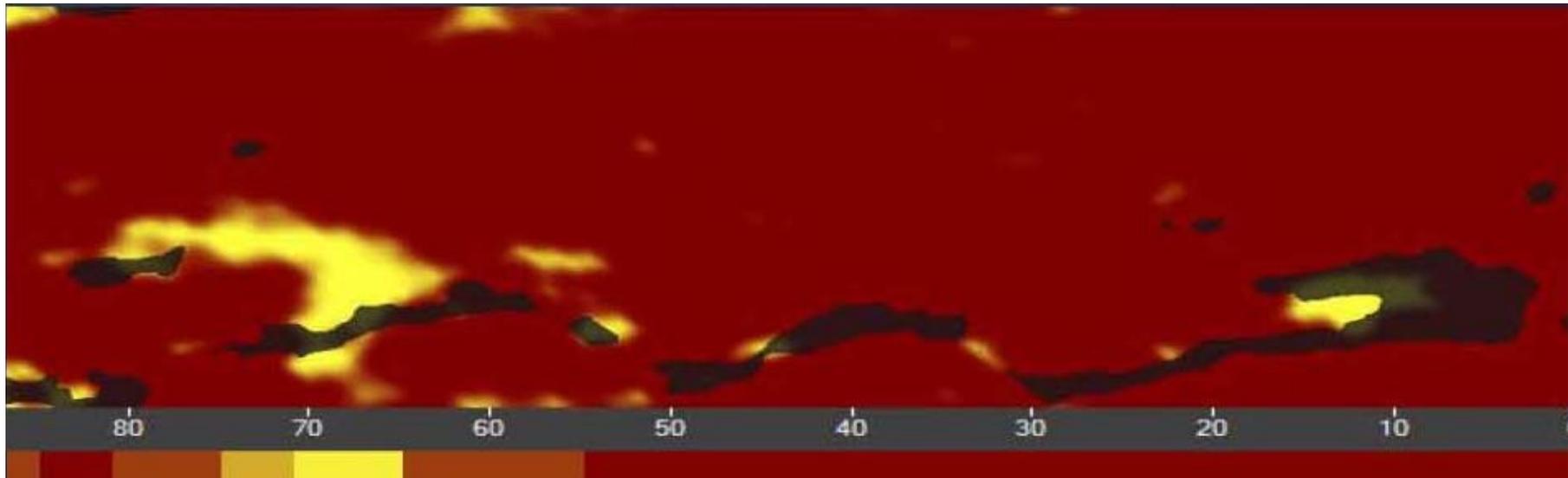
Serial assessment of bioabsorbable stent with IVUS and VH

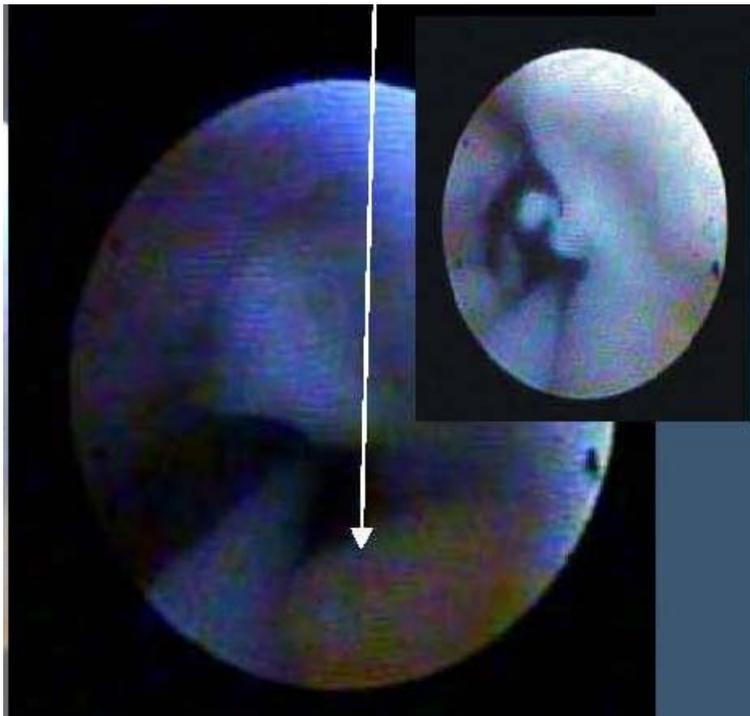
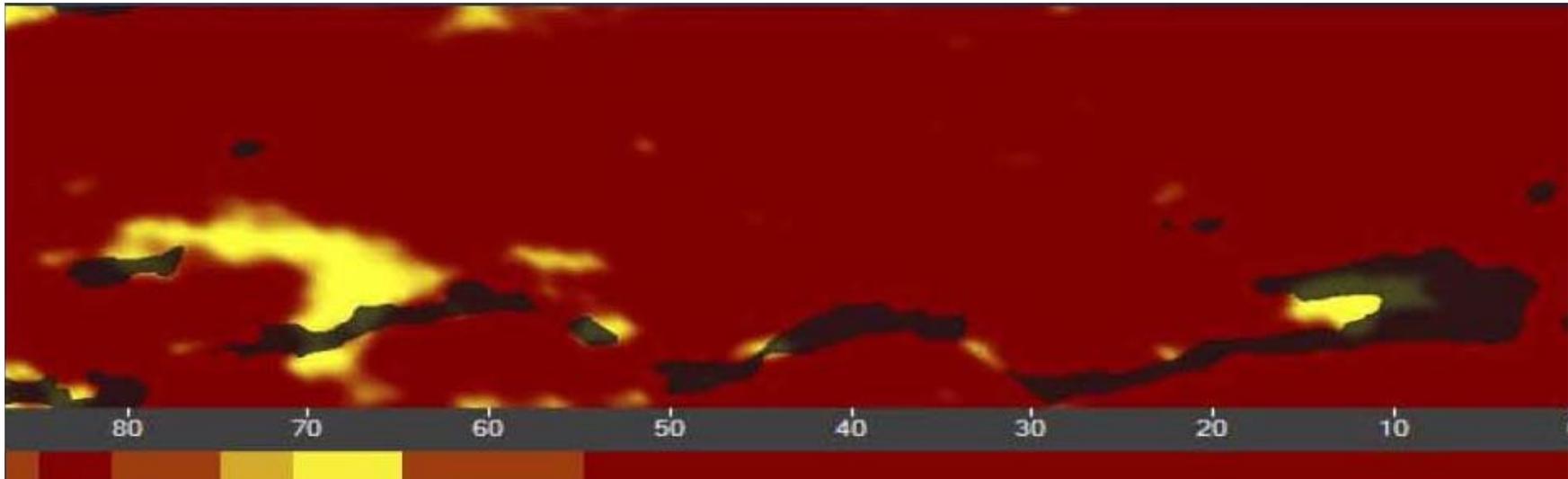


Use of NIR spectroscopy to distinguish cholesterol from collagen



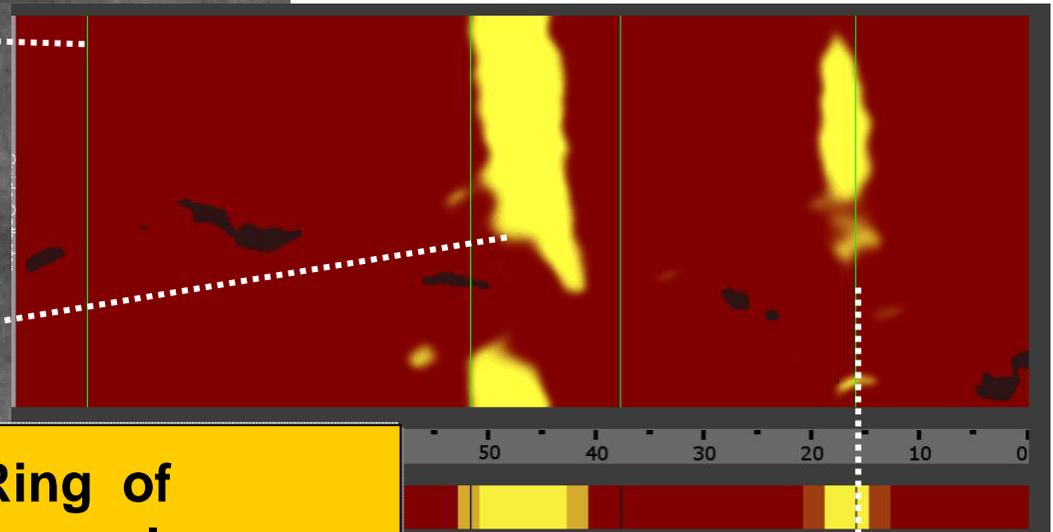
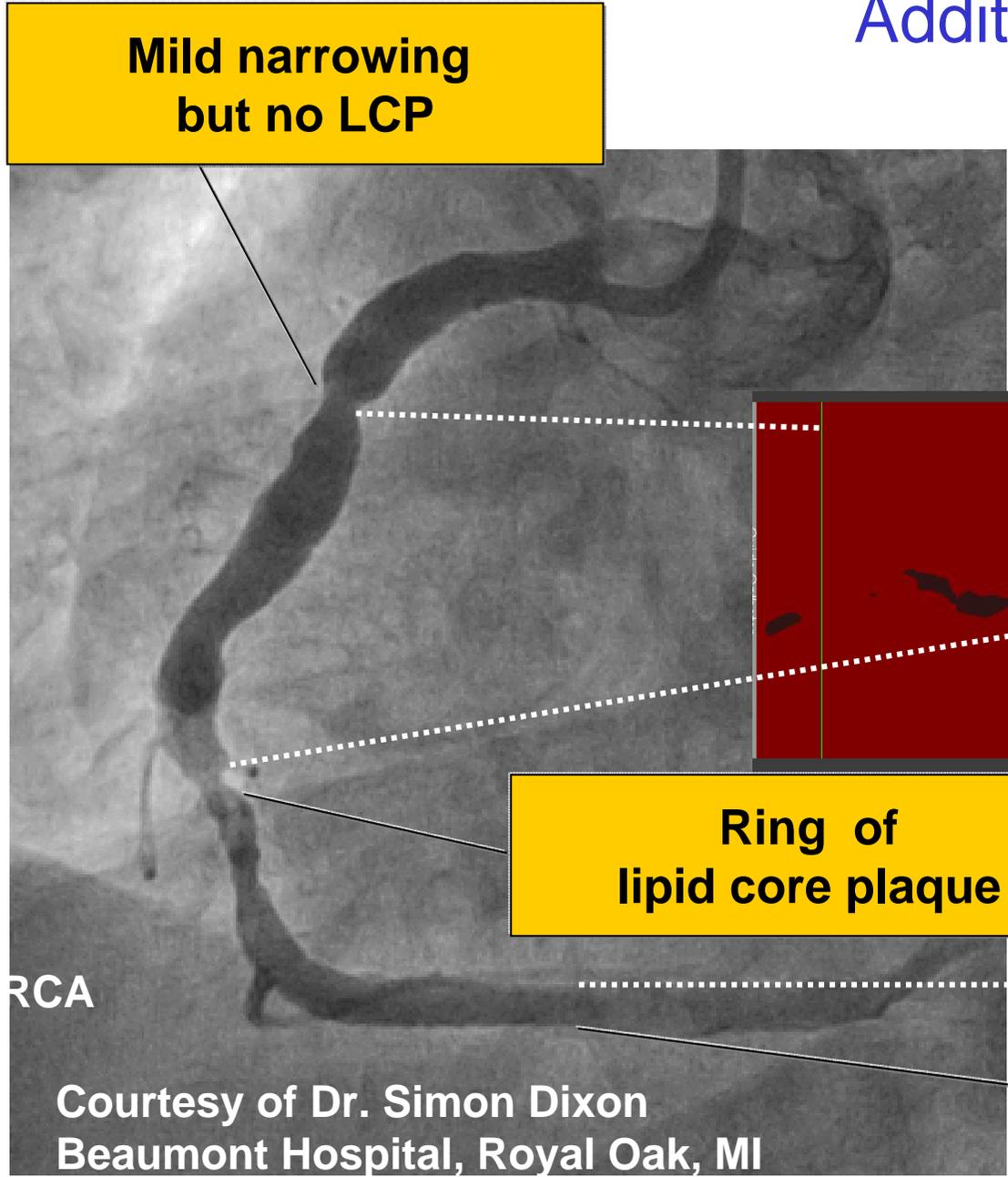
Chemogram of a RCA in a DM/HC pig that died of sudden cardiac death 3 months later.





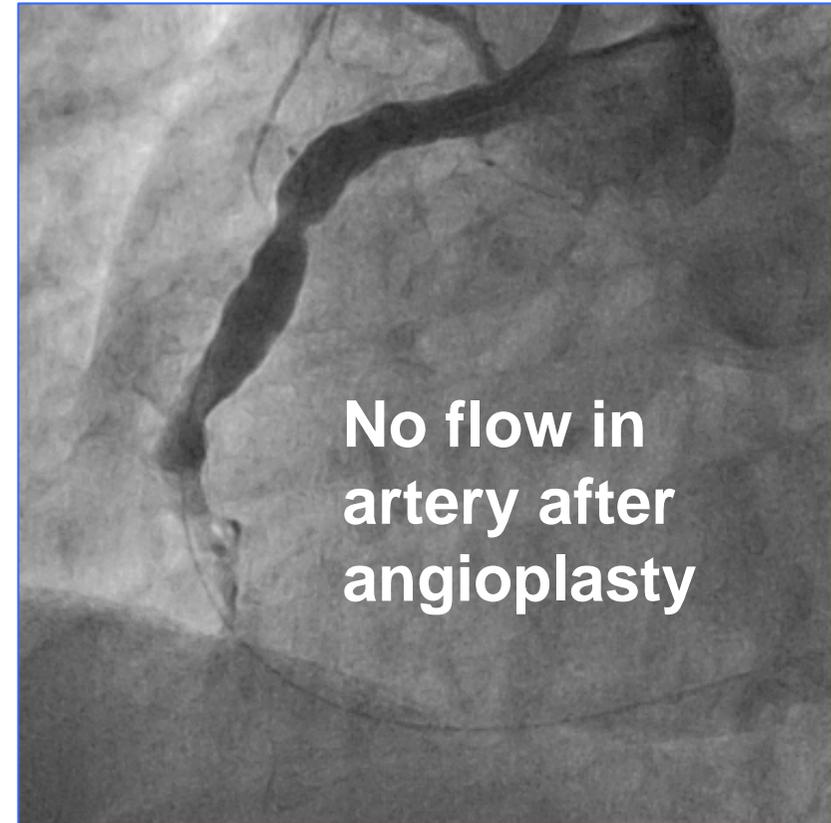
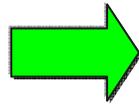
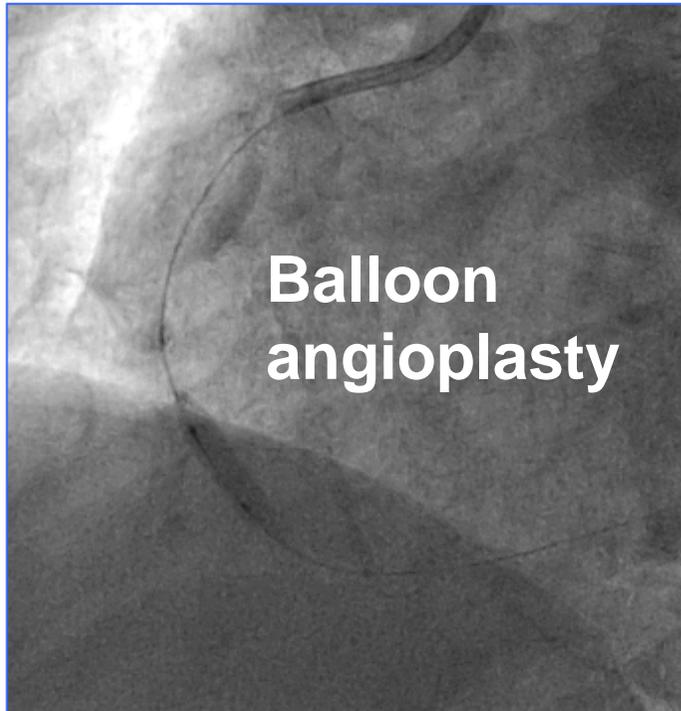
Acute sudden
cardiac death in a
DM/HC pig.

Additional information from intra-coronary NIR Spectroscopy

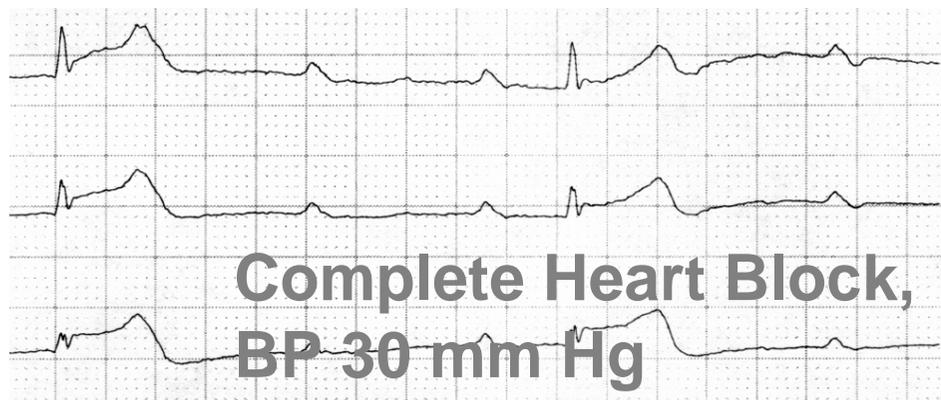


No stenosis, however,
a lipid core plaque

Dilation of the lipid core plaque

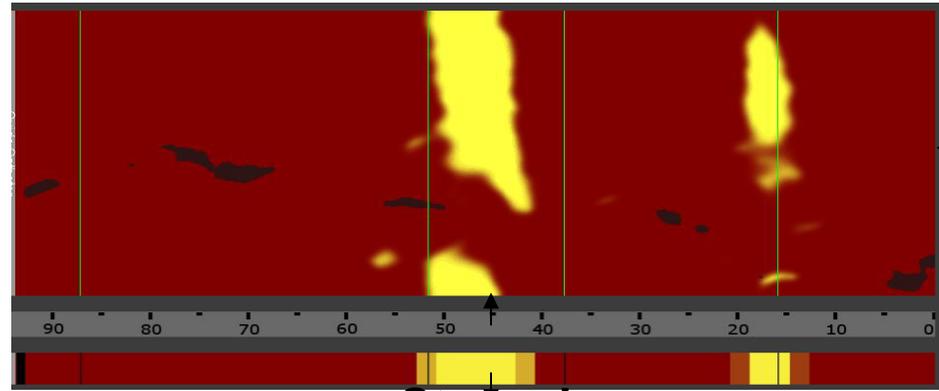


**Plaque contents
passed downstream**



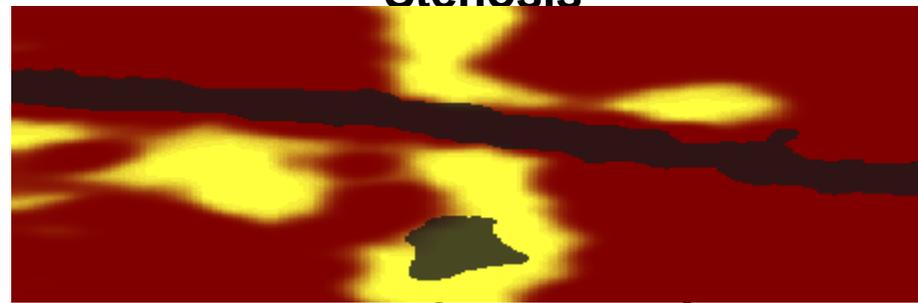
Courtesy of Dr. Simon Dixon
Beaumont Hospital, Royal Oak, MI

Chemogram of RCA with ring LCP at stenosis in 62 yo male



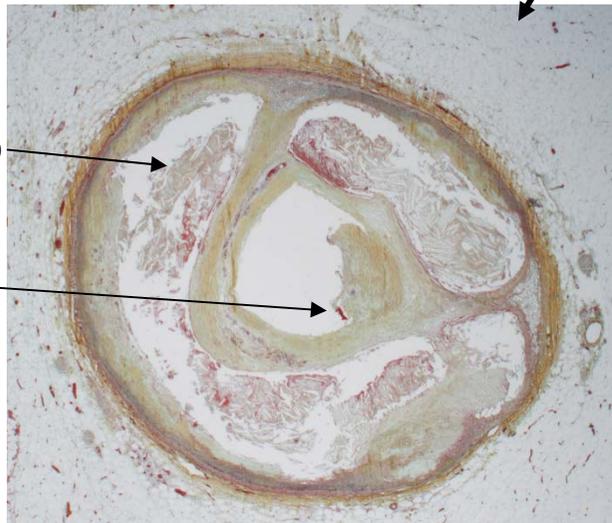
Distal embolization following dilation leading to MI and CPR

Similar chemogram with ring LCP from autopsy specimen of 48 yo male

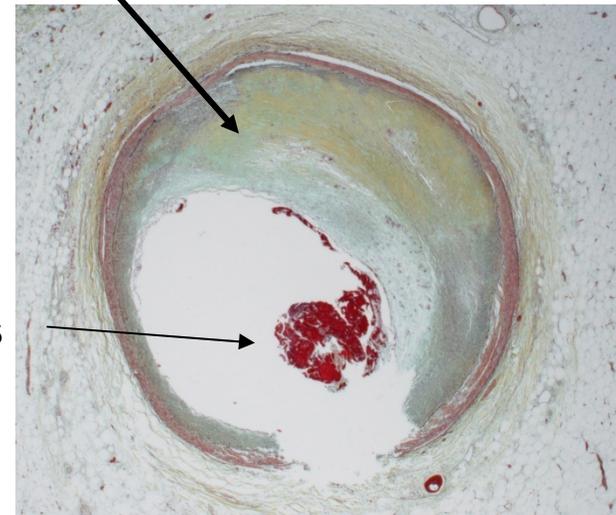


Sudden coronary death

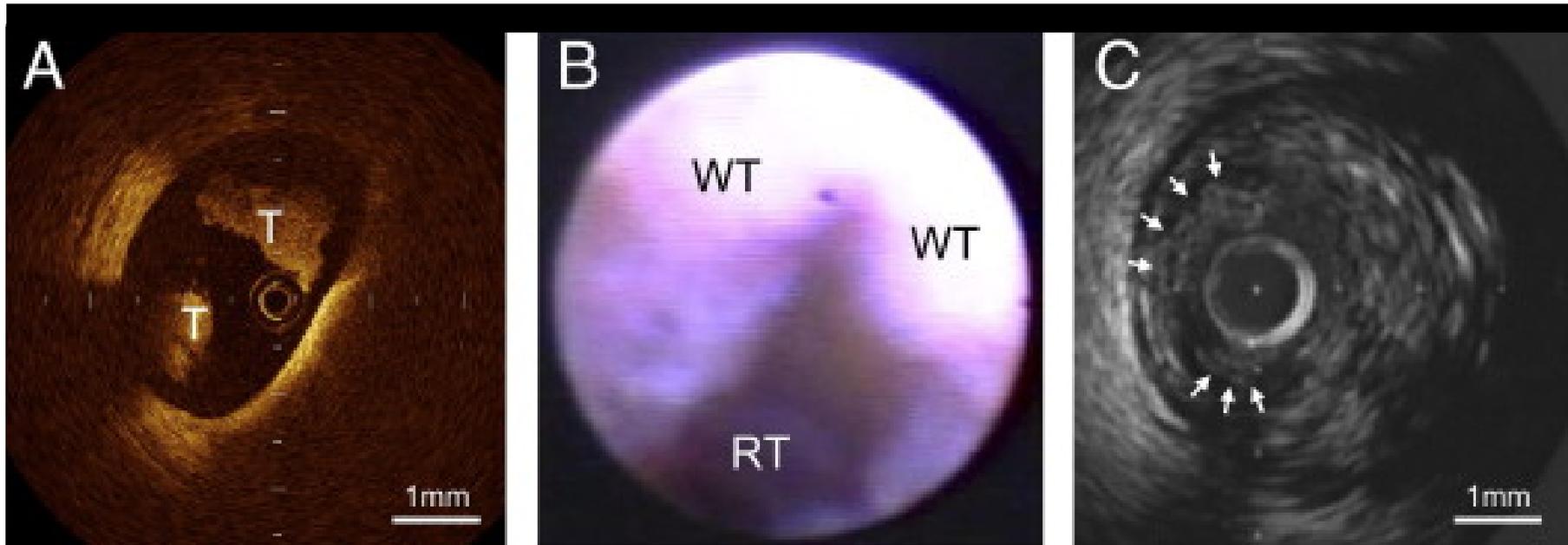
Massive LCP and remnant of fatal thrombus



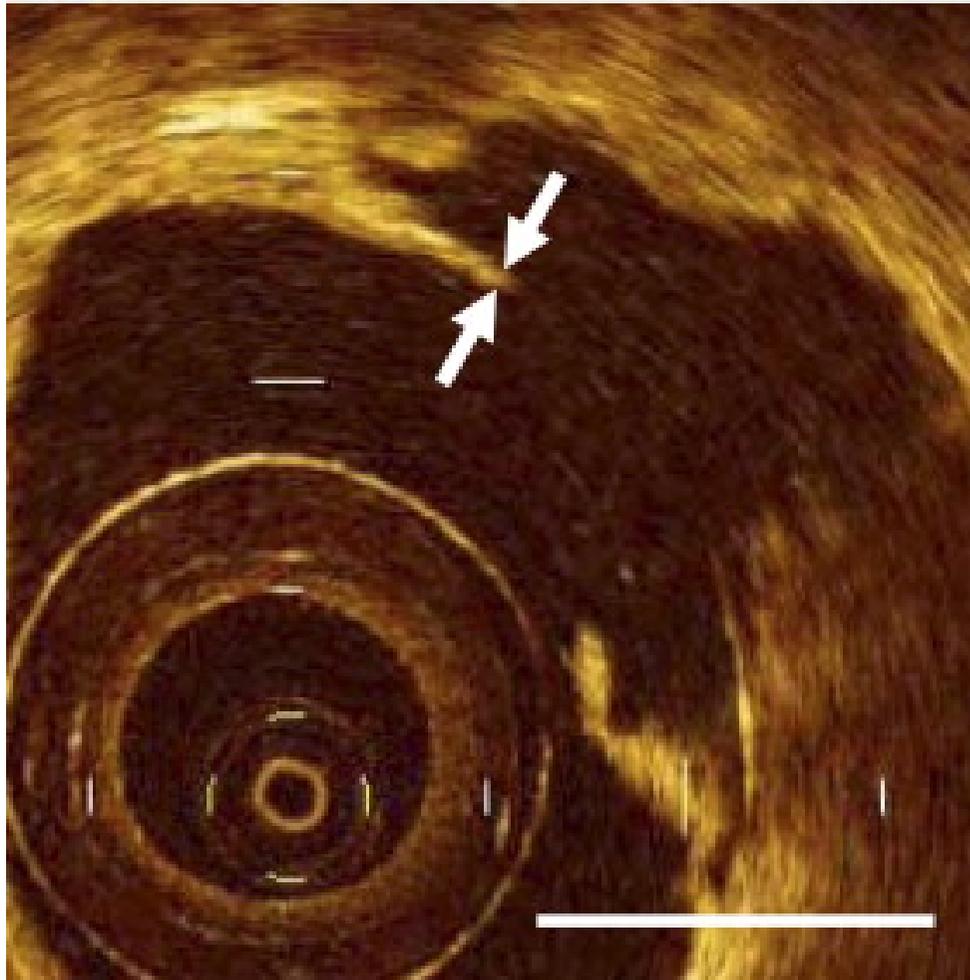
Thrombus remnant



Assessment of AMI culprit lesion morphology with OCT, angioscopy, IVUS

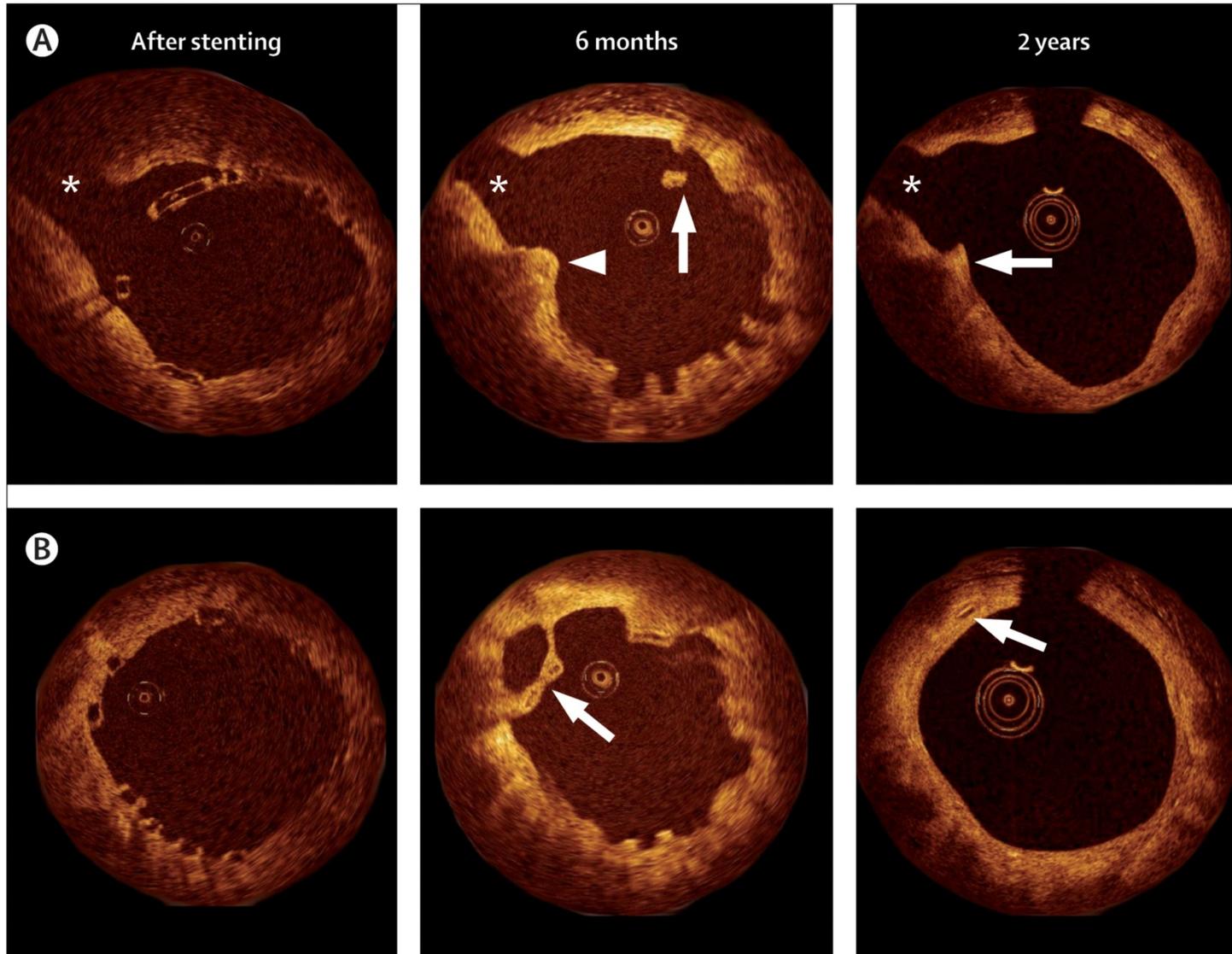


Assessment of AMI culprit lesion morphology with OCT, IVUS, angiography

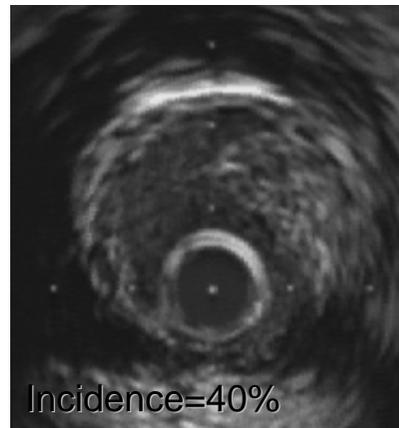
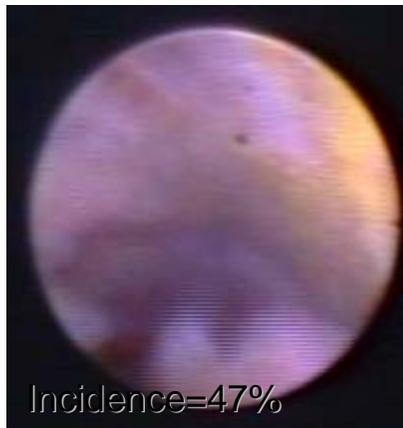


Measurement of fibrous cap thickness

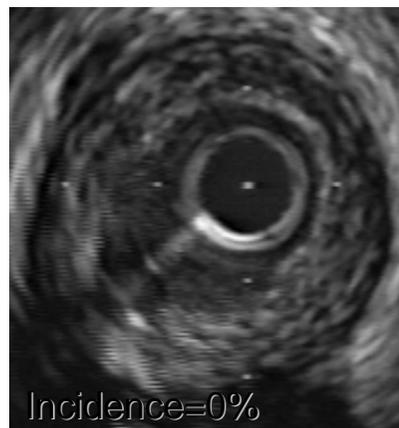
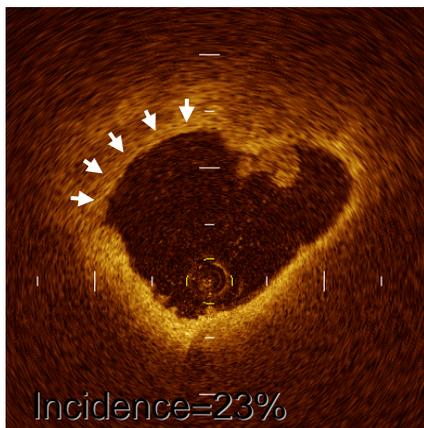
Serial assessment of stent struts with optical coherence tomography



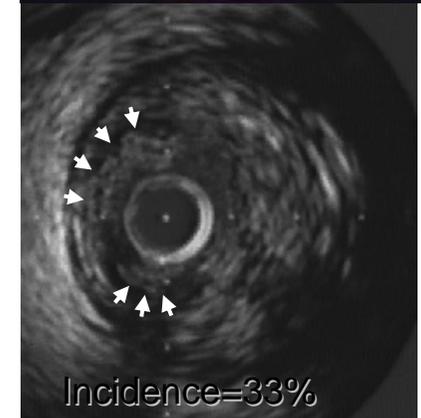
Plaque rupture



Plaque erosion

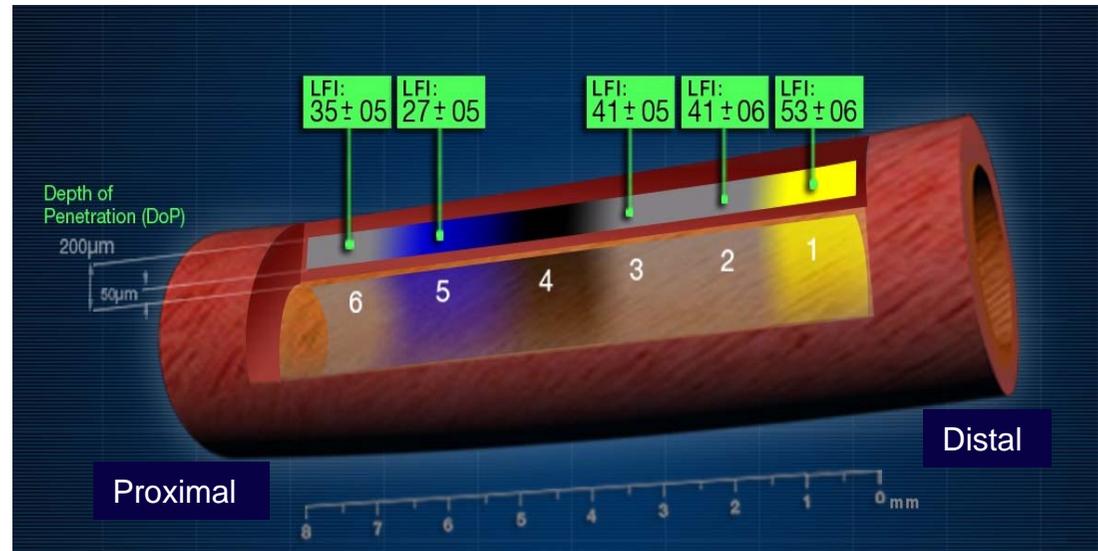
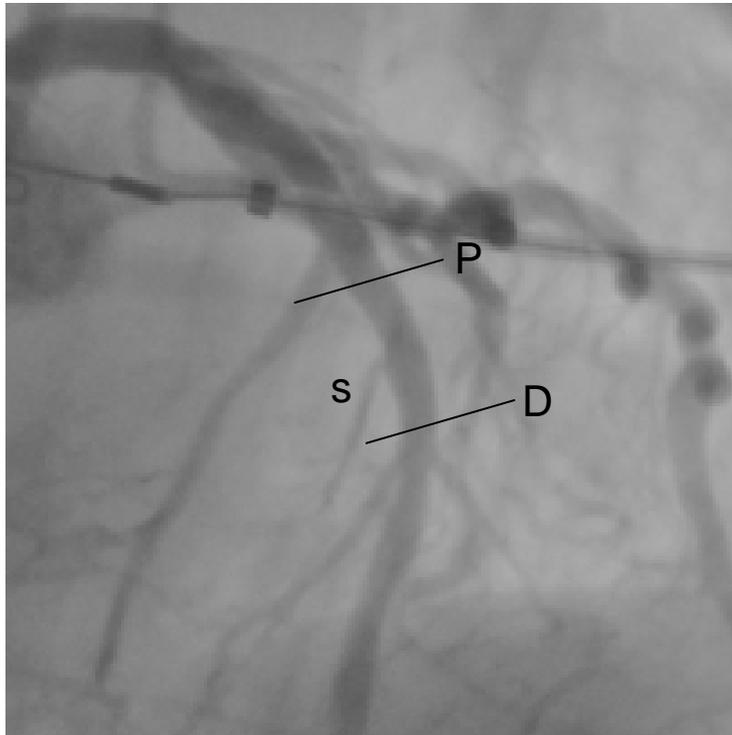


Thrombus Formation



(Kubo et al. J Am Coll Cardiol 2007;50:933-9)
(Kubo et al. J Am Coll Cardiol 2007;50:933-9)

Intravascular magnetic resonance imaging

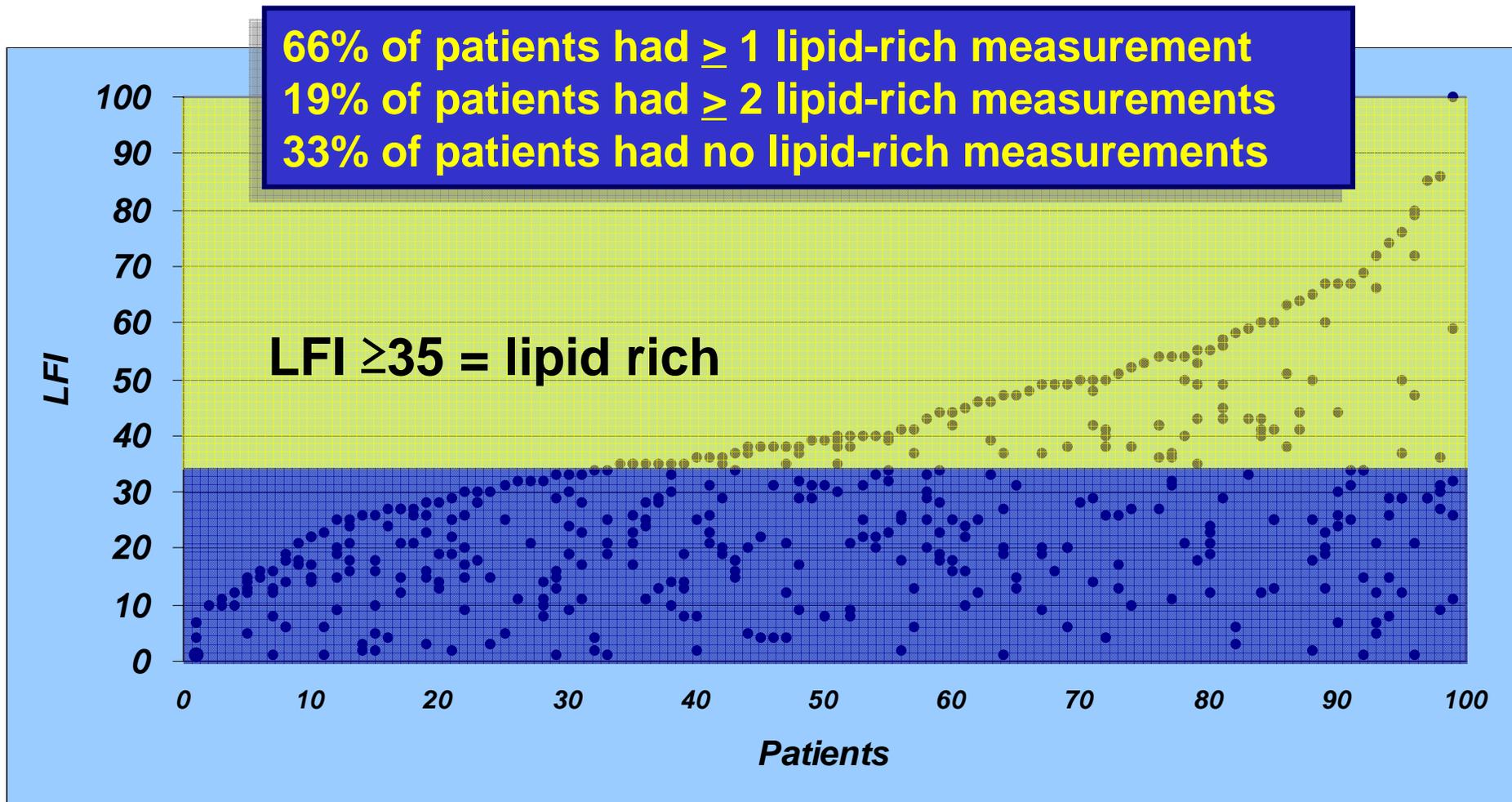


Lipid fraction index (LFI):

High Intermediate Low Void

- 48 year old female with stable angina
- Previous revascularization
- Risk factors: hypertension, hyperlipidemia and family history
- Three vessel disease
- Proximal LAD, 20% stenosis

TOPIIMAGE – LFI Results



Summary

- New non-invasive techniques are being developed which may show the presence of lesions with an increased propensity to instability.
- However, invasive approaches, may be necessary to demonstrate those specific lesions at increased risk of causing clinical instability.
- No one device demonstrates all the information needed to assess vulnerable plaques and so a combination may be necessary.