

Theoretical construct: Why bioresorbable scaffold may change the landscape of coronary intervention?

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Erasmus MC, Rotterdam, NL**

**3:12-24 p.m., April 29, 2015
Coronary theater, Level 1**

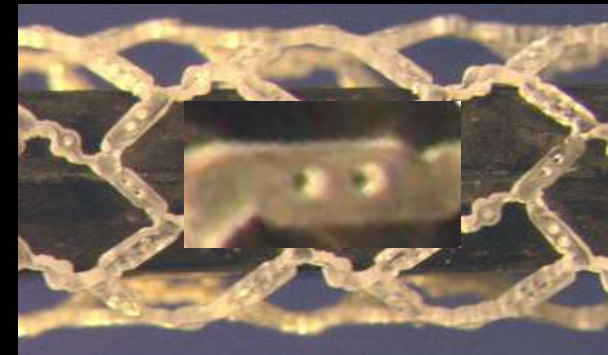
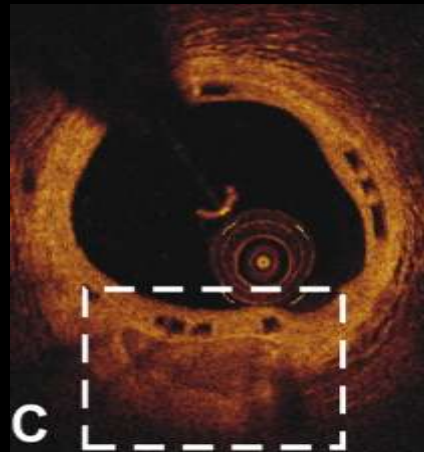
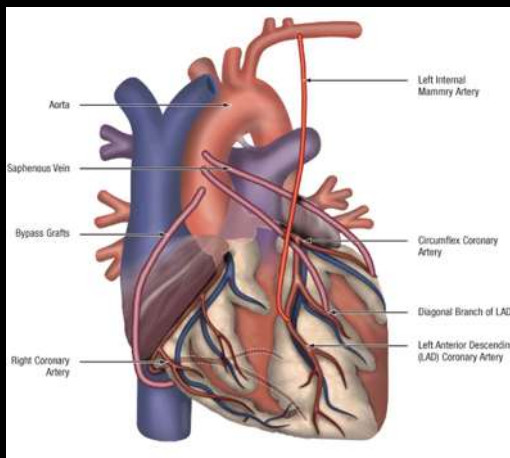
Why BRS may change the landscape of coronary intervention ?

Trifecta in coronary revascularization

**Endoluminal bypass
(vs. conventional bypass)**

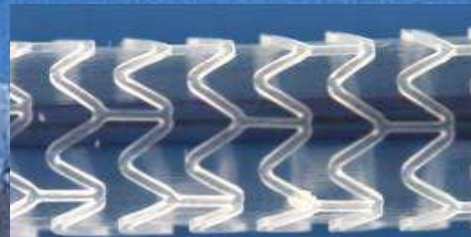
**Preventive PCI
By sealing plaques**

**Bioresorbable
reservoir for specific
indications
(e.g. STEMI)**



By 2020, only a minority of patients will receive a permanent metallic implant

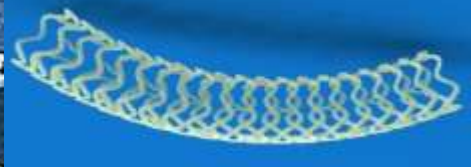
Bioresorbable scaffold



PLLA



Magnesium

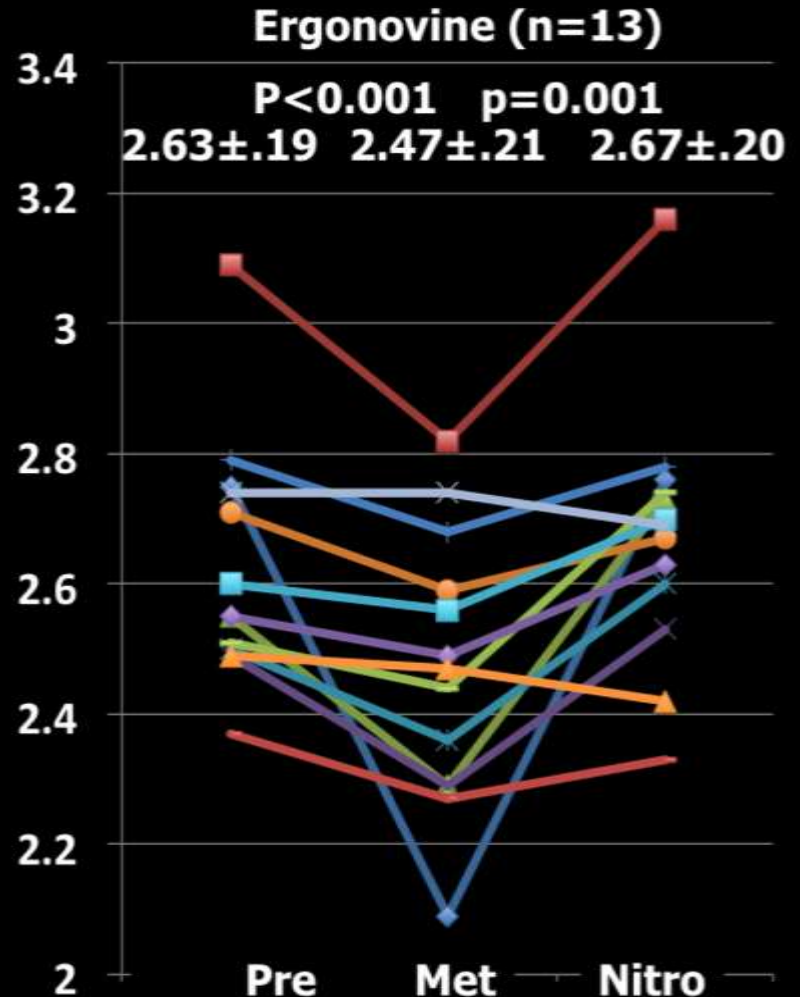


Tyrosine polycarbonate

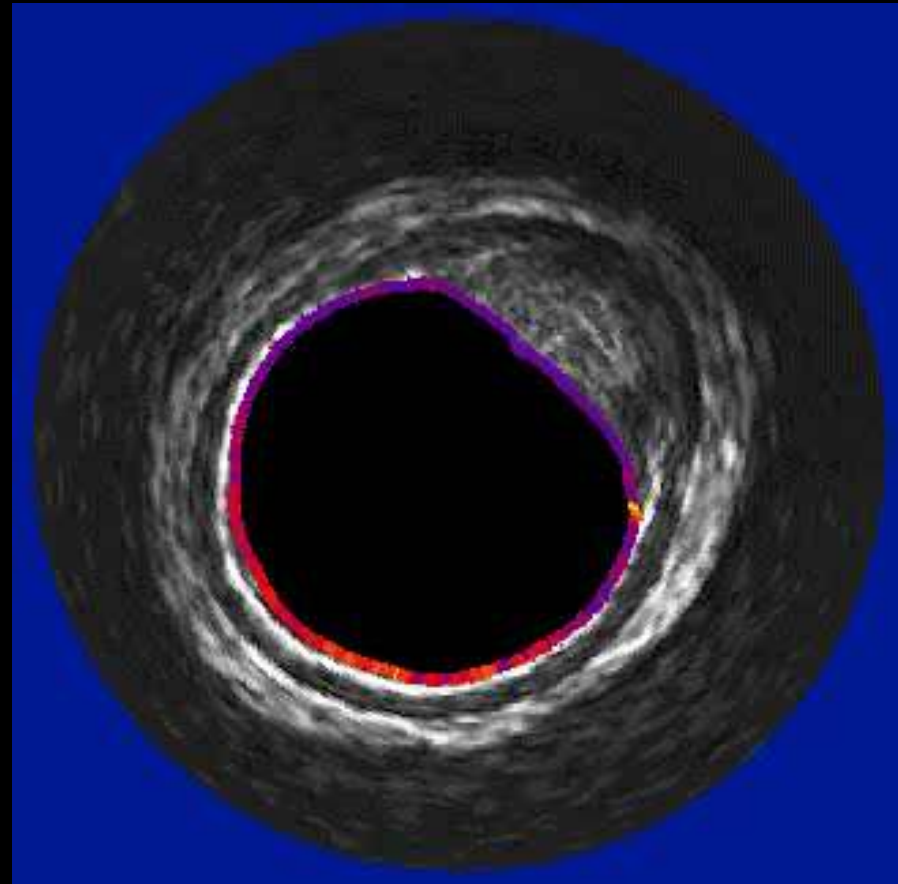
WHY?

- **Disappearance of mechanical integrity and return of vasomotion (6 to 12 months)**
- Return of cyclic strain and mechanotransduction
- Normalization of endothelial shear stress
- Potential for non-invasive imaging
- Restoration of contractile phenotype of smooth muscle cells (SMC) with normalized gene expression of endothelium and SMC
- Shielding and recapping of plaque
- Late lumen enlargement and remodelling
- Plaque media regression

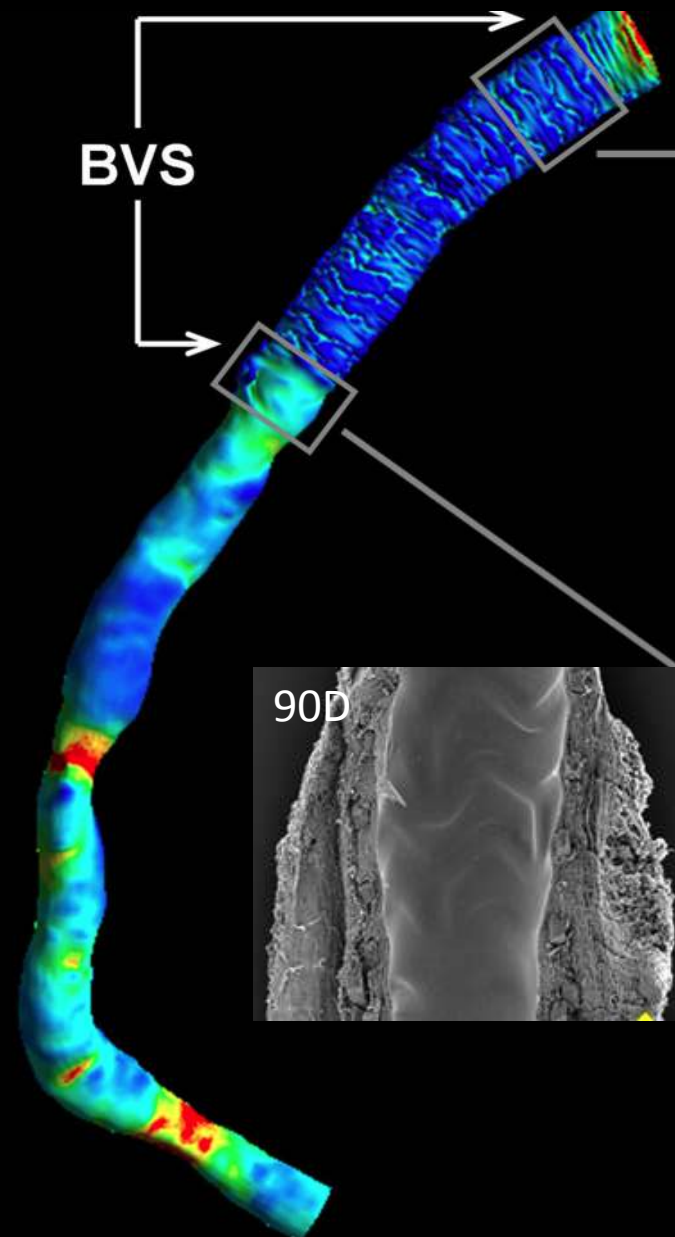
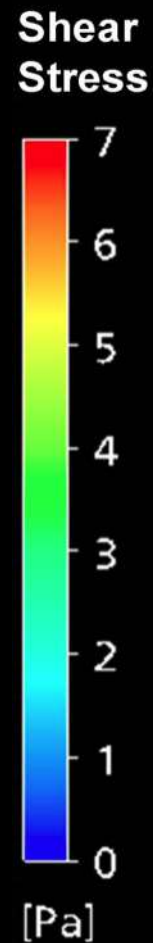
Restoration of vasomotion at 12 MONTHS



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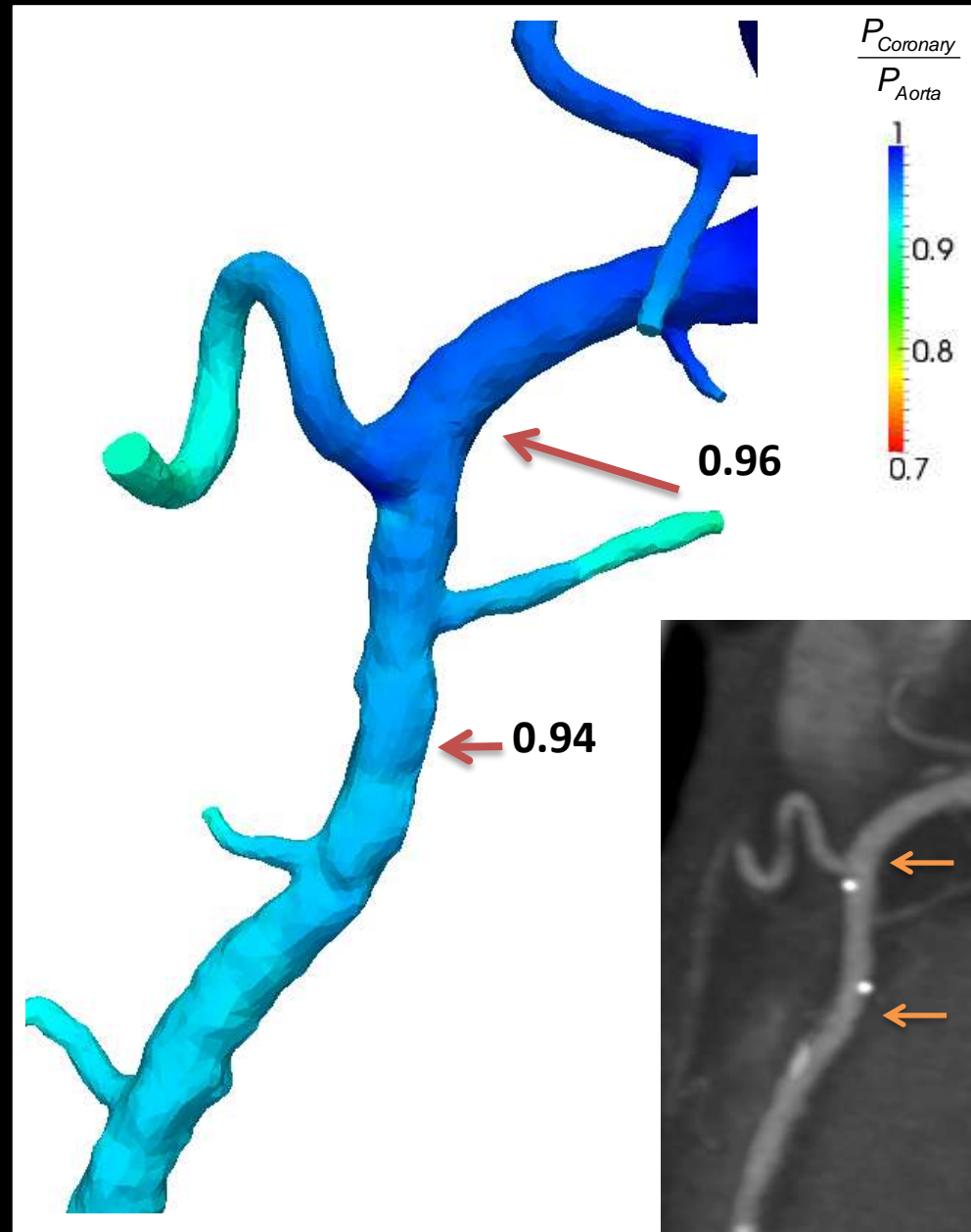


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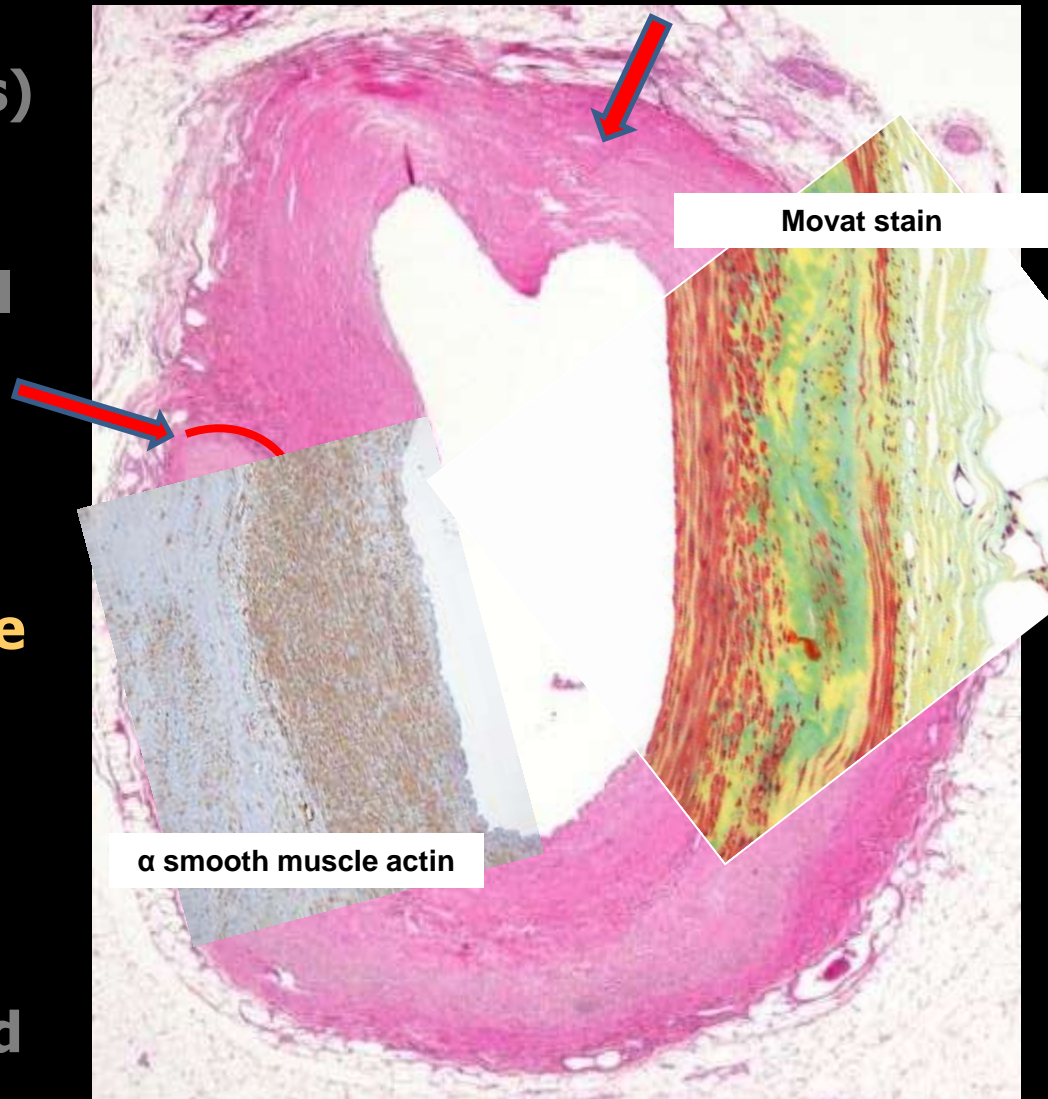


JACC intervention 2014

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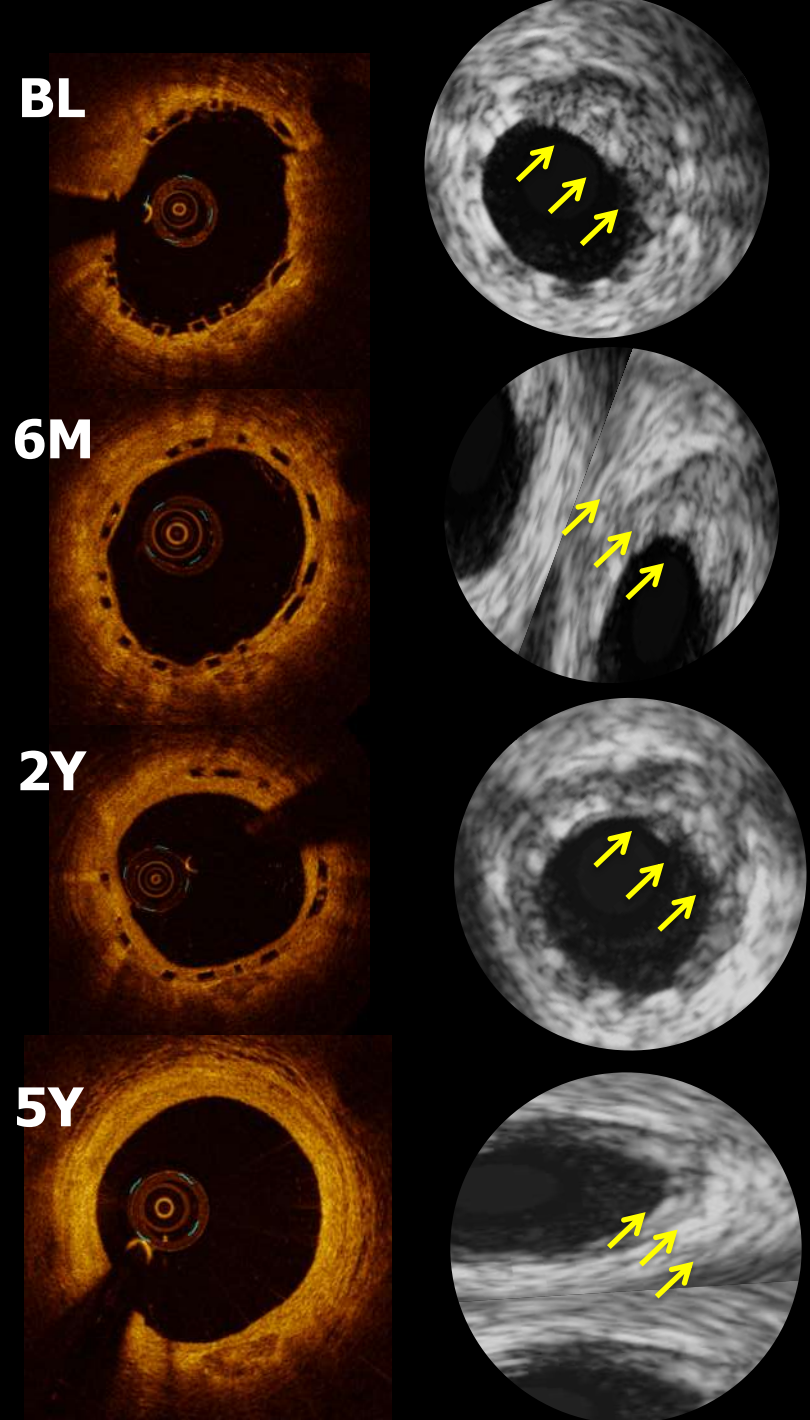


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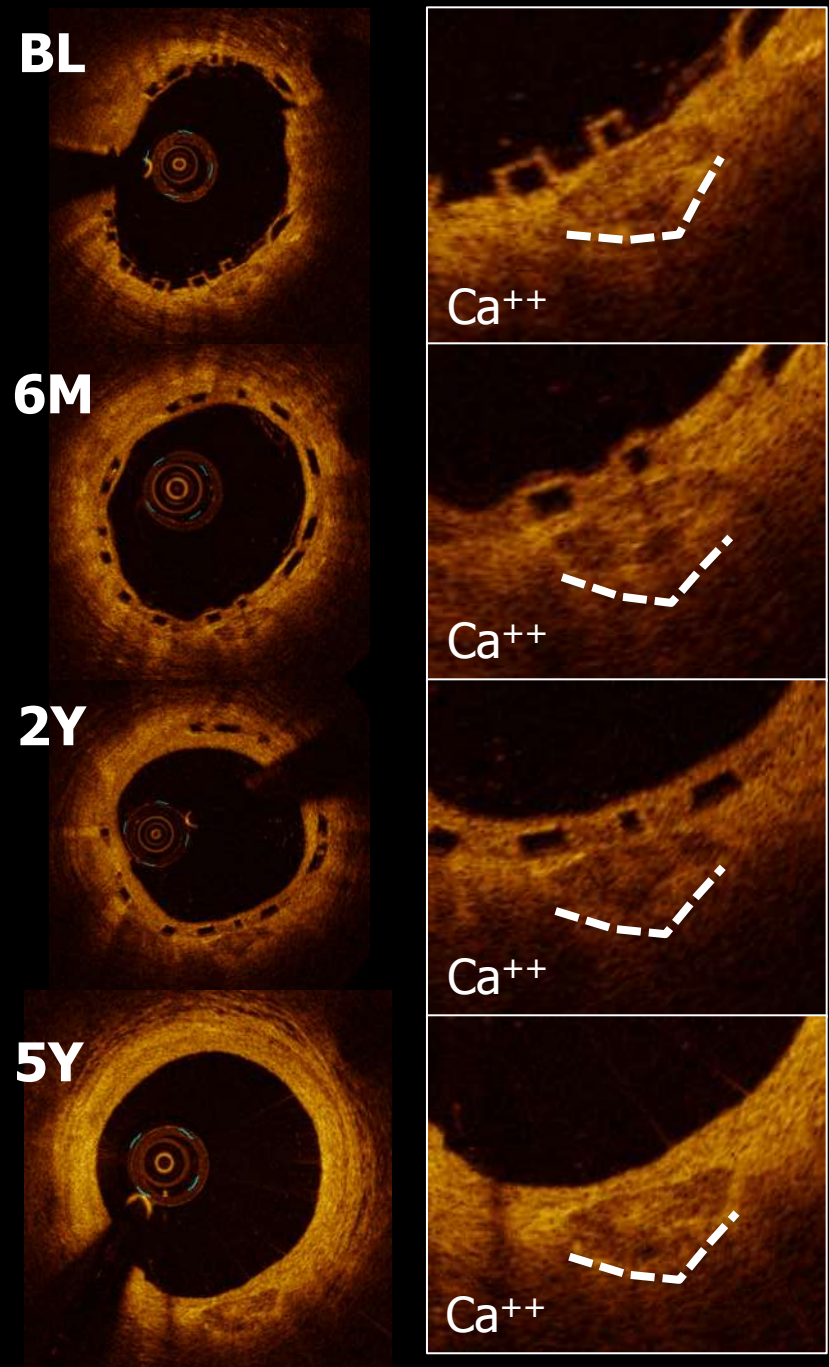


Neomedialia?

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- **Late lumen enlargement and remodeling**
- **Plaque media regression**
- Shielding and recapping of plaque

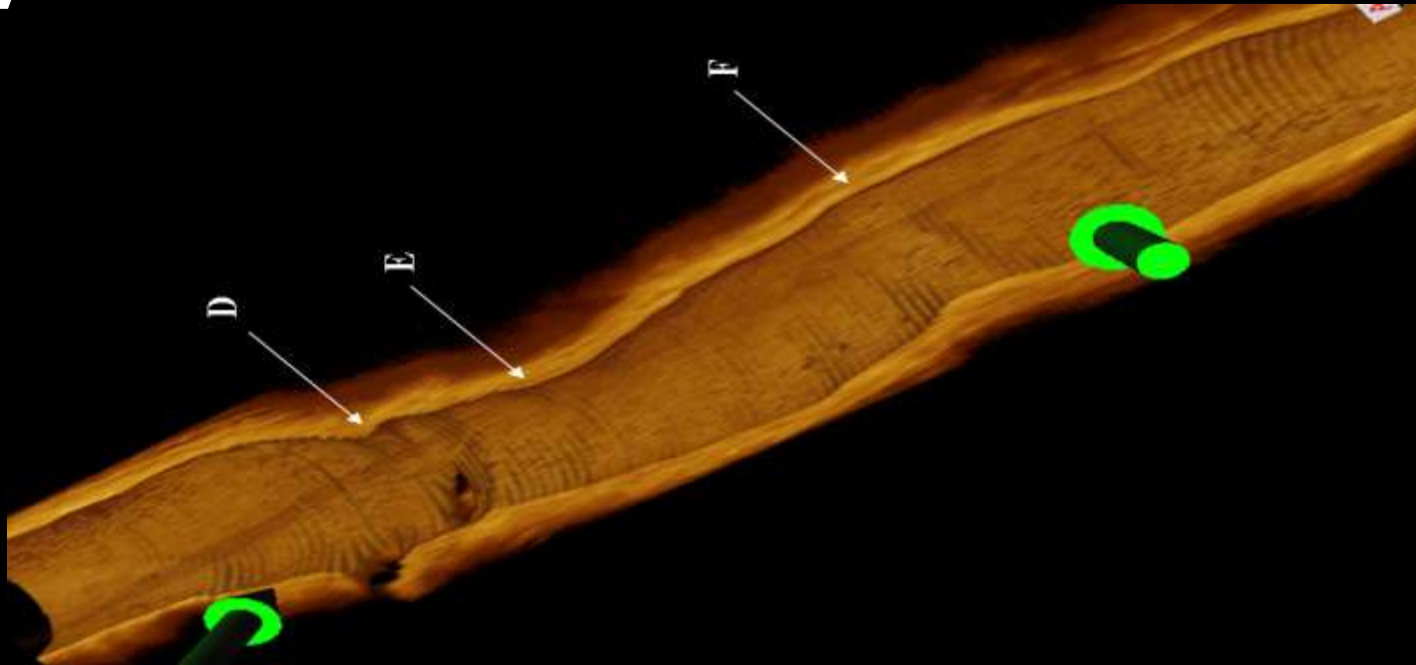


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- Late lumen enlargement and remodelling
- Plaque media regression
- **Shielding and recapping of plaque**
- **“Golden tube”?**



"Golden tube"

**Vessel with strong homogeneous light reflectivity on OCT
= refurbished endoluminal lining, capping underlying
plaques with late lumen enlargement, vasomotion and
cyclic strain**



Will this golden tube become **the endoluminal bypass
that interventional cardiologists have been waiting for
so long?**

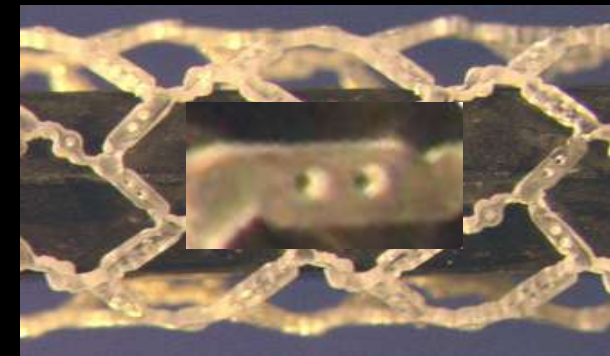
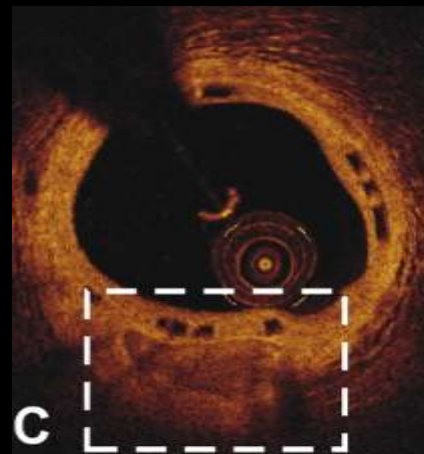
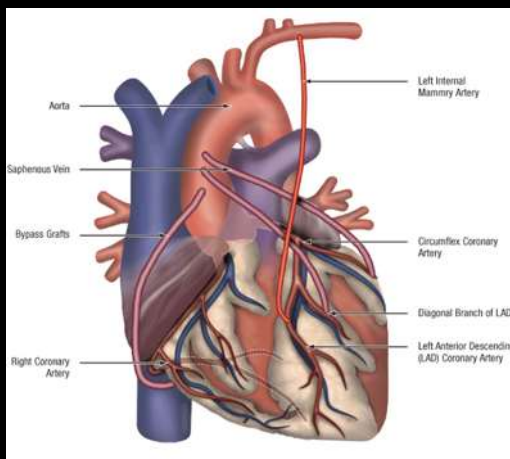
Why BRS may change the landscape of coronary intervention ?

Trifecta in coronary revascularization

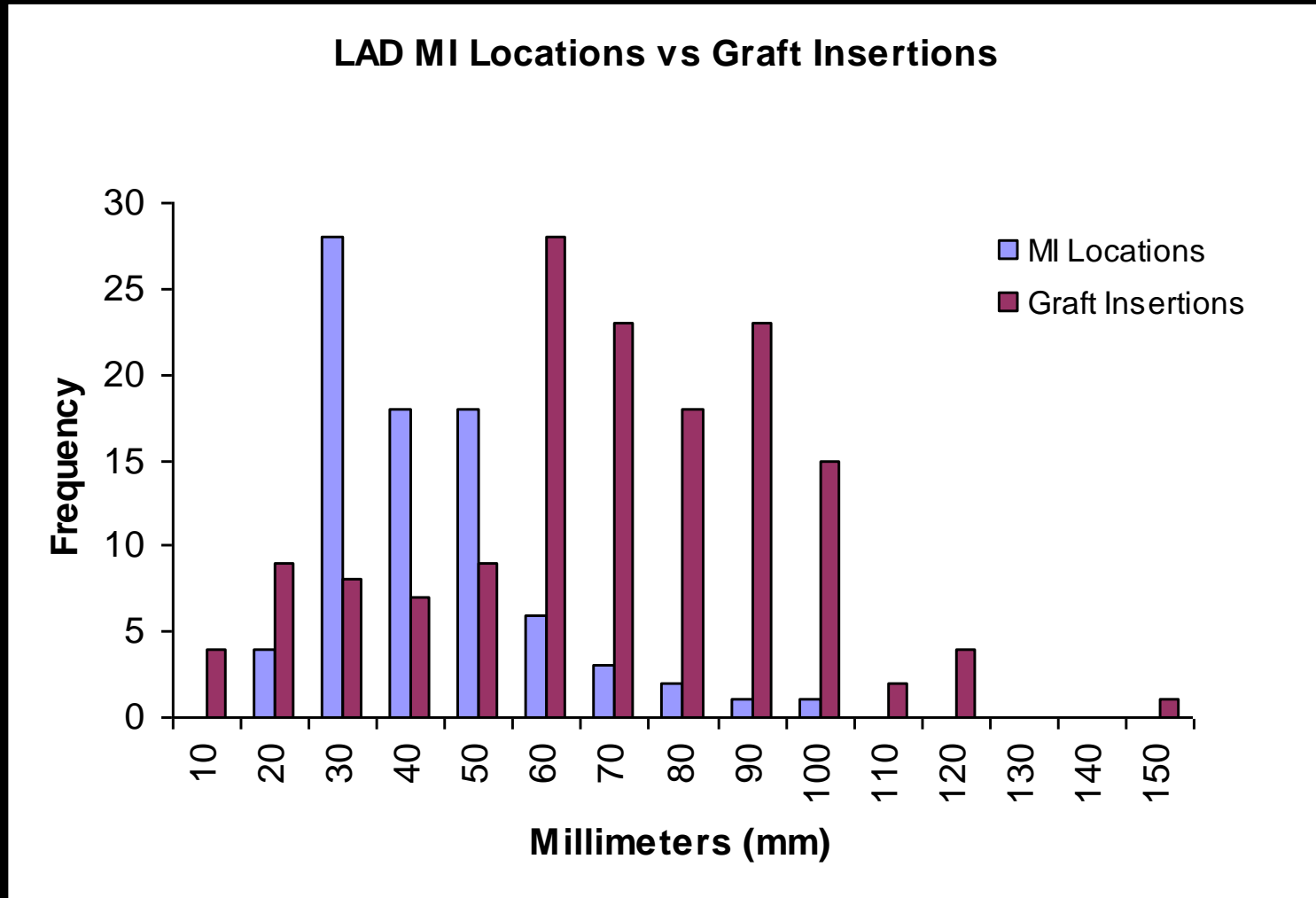
**Endoluminal bypass
(vs. conventional
bypass)**

**Preventive PCI
By sealing plaques**

**Bioresorbable
reservoir for specific
indications
(e.g. STEMI)**

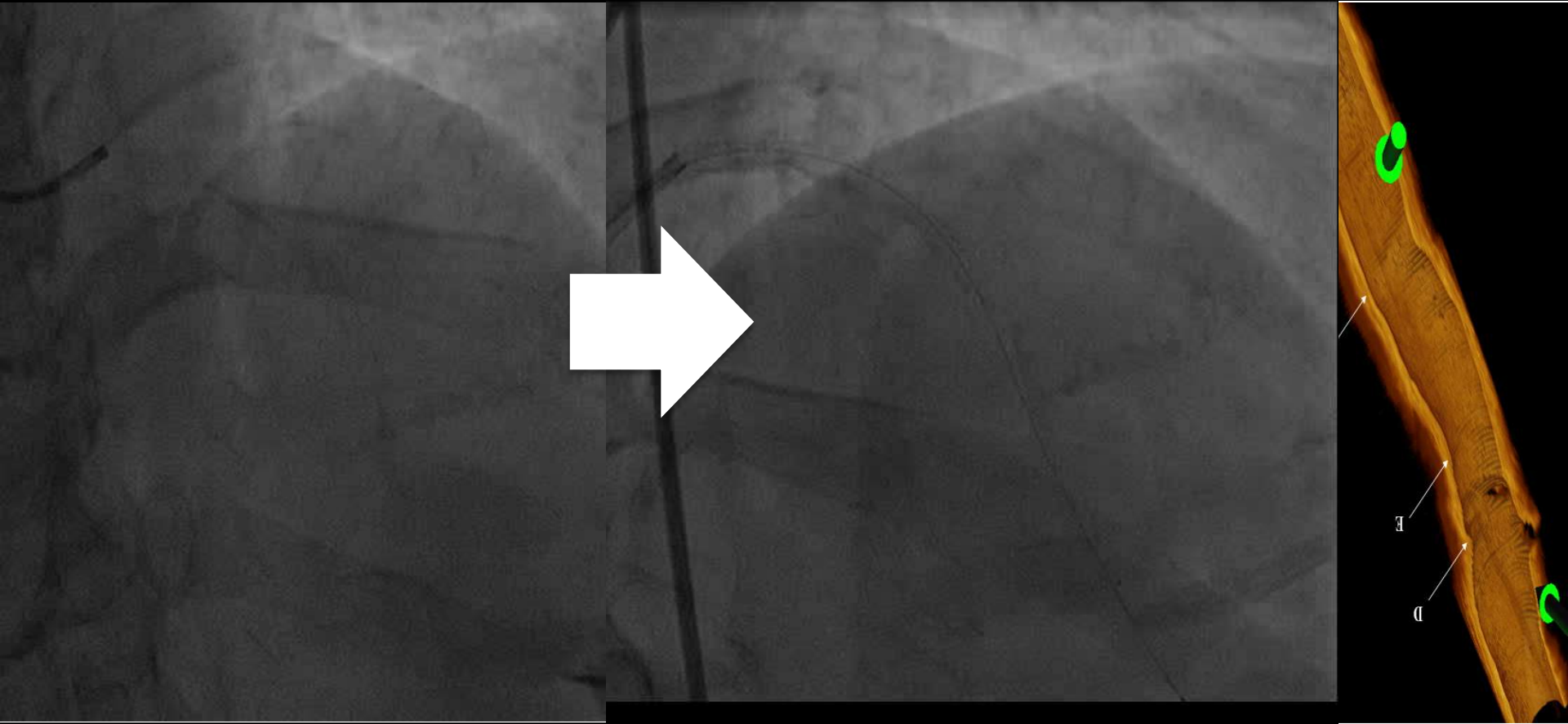


Distribution of Acute Thrombosis Relative to Bypass Graft Anastomoses



Endoluminal bypass by the bioresorbable scaffolds

Courtesy of Dr. Colombo



130mm of endoluminal bypass

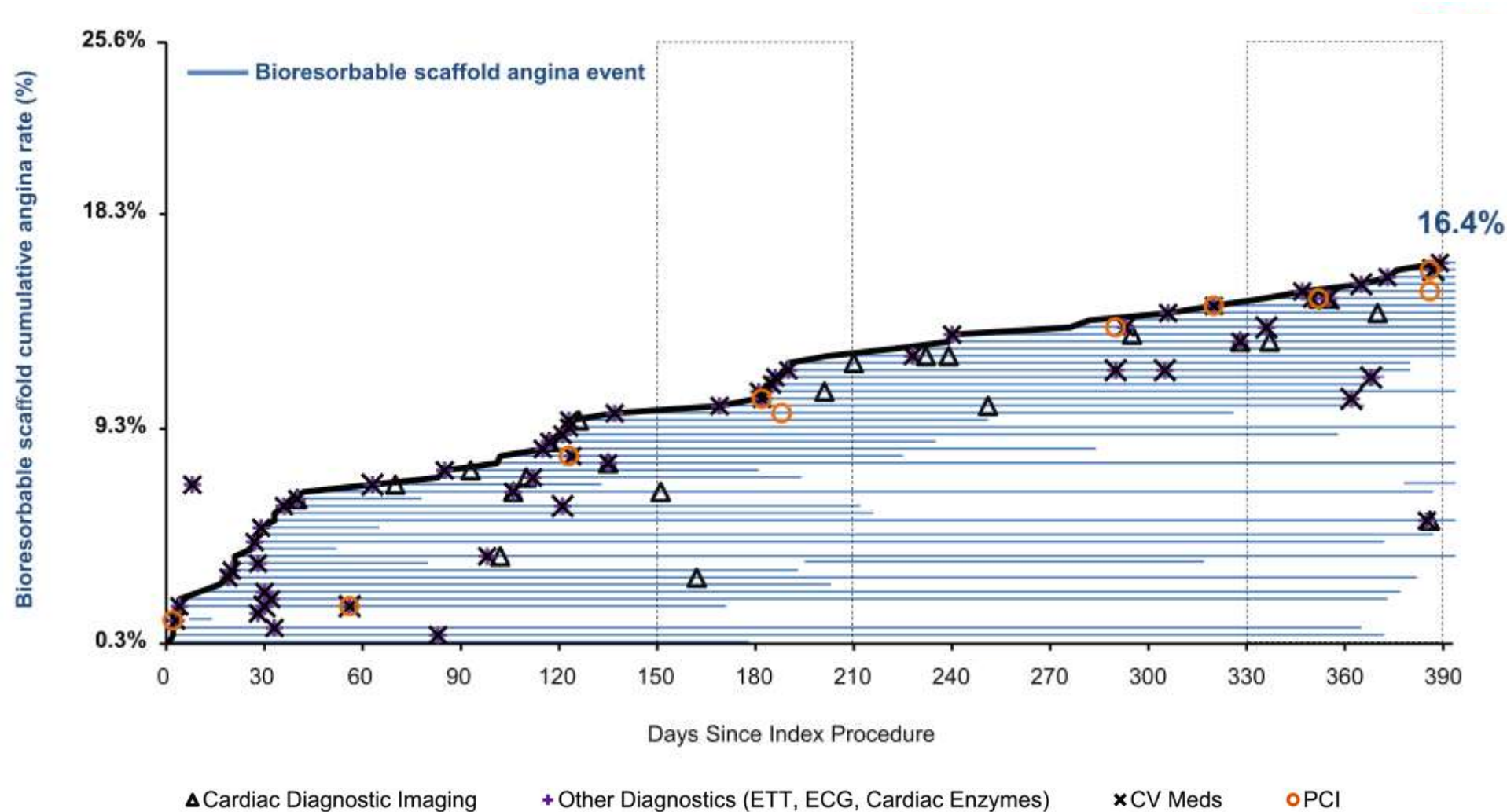


**Less angina with Absorb when compared to
a metallic stent?**

**An enigma in search for physiological
answers**

Less angina in the Absorb arm than in the Xience arm

A difference in angina rate captured through adverse event form was observed, however, this warrants further physiological and clinical investigations (ABSORB III and IV)



Why is the site-diagnosed angina less in the ABSORB arm than in the Xience arm?

Early

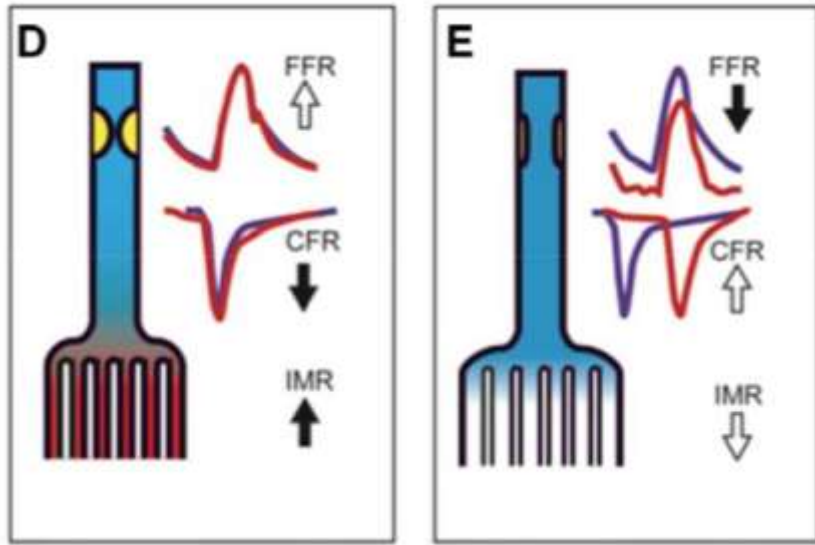
- **Placebo effect in absence of blinding**
- **Better systolic and diastolic conformability of the scaffold to the vessel (angulation change)**
- **Less aggressive postdilatation – less stretching of adventitia (neurogenic theory)**
- **Wide scaffold struts with snow-boot effect vs. penetration of thin metallic struts with knife-in-butter effect**

Late

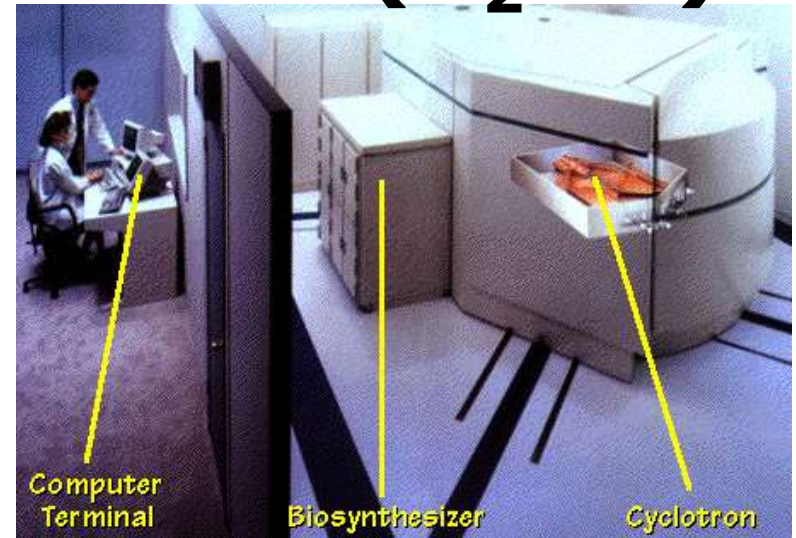
- **Vasomotion: better response to nitrate and shear stress**
- **Normal endothelial cell function in Absorb vs. dysfunctional endothelia in metal**
- **Cyclic Strain**
- **Impact of diastolic recoil (Cyclic strain) of scaffolded segment on microcirculation (forward pulse wave) vs. permanently stiff stented segment**
- **Reduction of microvascular resistance for unknown reason**
- **Absence of compliance mismatch at the edge of device**
- **Late lumen enlargement**
- **Local release of lactic acid molecule and metabolic interference to the vessel wall**

Three modes of Research to elucidate the reduction of angina pectoris after ABSORB implantation

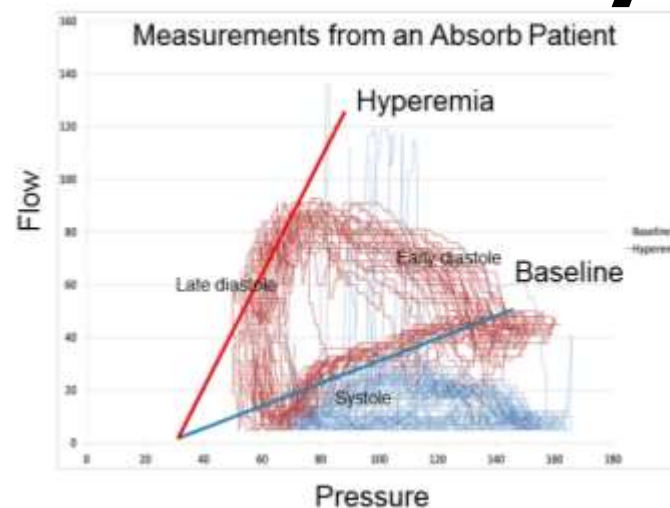
CFR



PET ($H_2^{15}O$)



Pressure velocity Loop



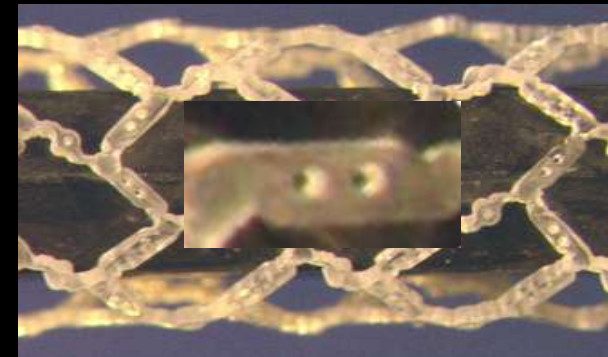
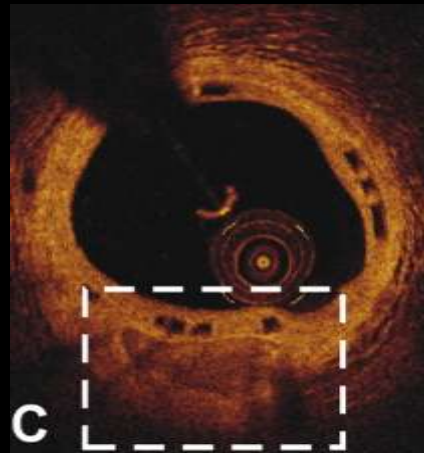
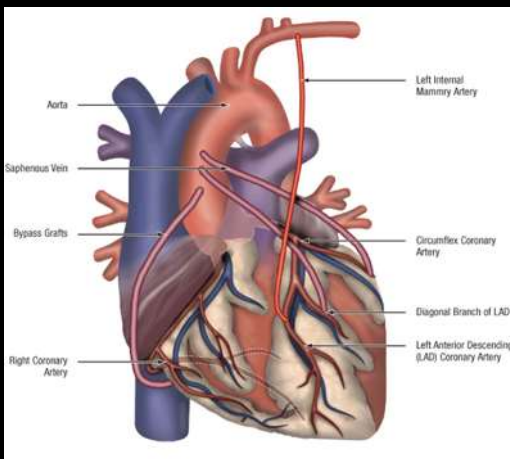
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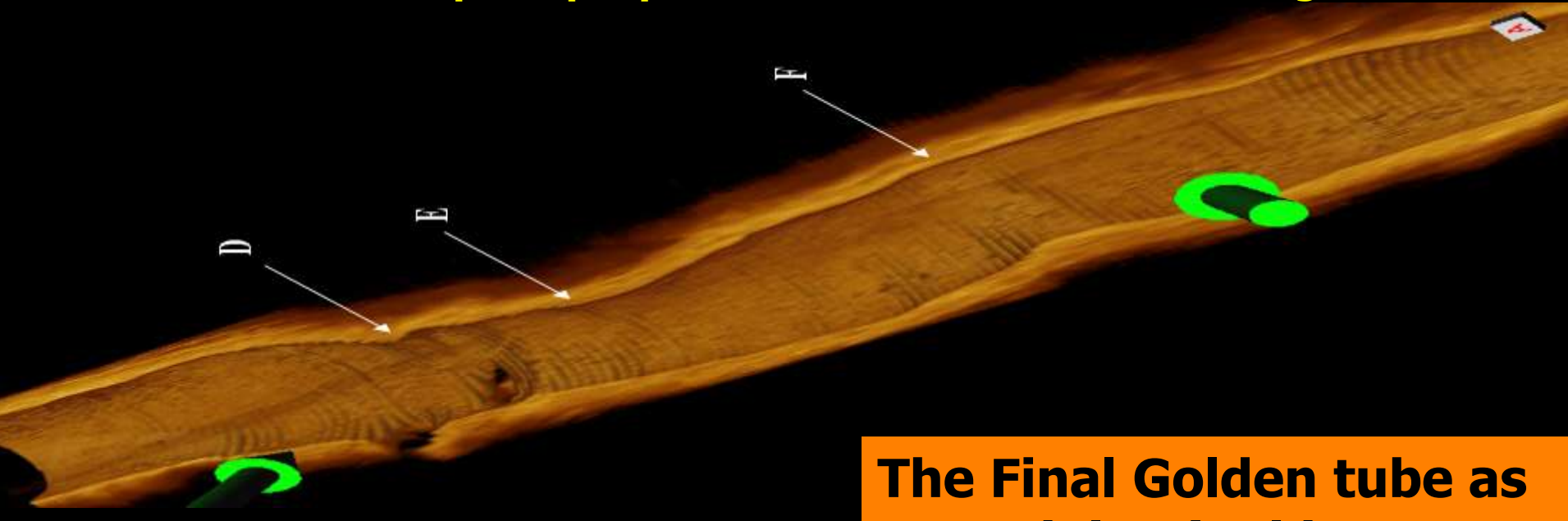
Eurointervention 2014

Bioresorbable vascular scaffold treatment induces the formation of neointimal cap that seals the underlying plaque without compromising the luminal dimensions: a concept based on serial optical coherence tomography data

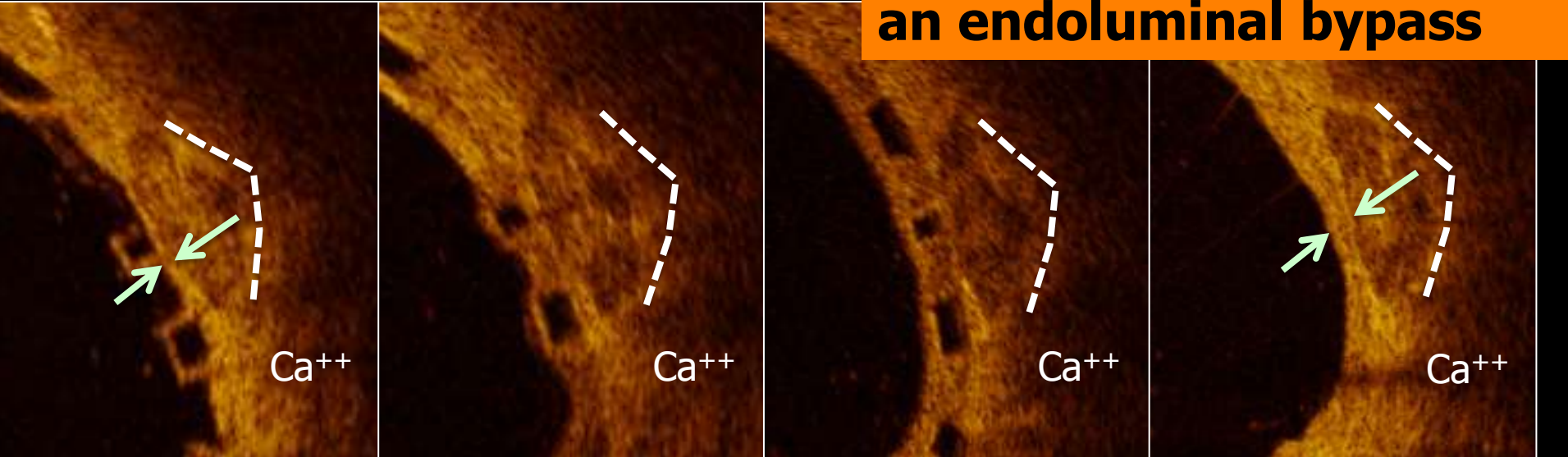
A Christos V. Bourantas¹, MD, PhD; Patrick W. Serruys^{1*}, MD, PhD; Shimpei Nakatani¹, MD;
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 Chrysafios Girasis^a, Robert-Jan van Geuns^a, Leif Thuesen^d, Dougal McClean^e, Bernard Chevalier^f,
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 Patrick W. Serruys^{a,*}

**Sealing of plaques as a result of Bioresorbable Scaffold implantation:
Can the scaffold cap the plaque... and create late lumen enlargement !!!**



The Final Golden tube as an endoluminal bypass



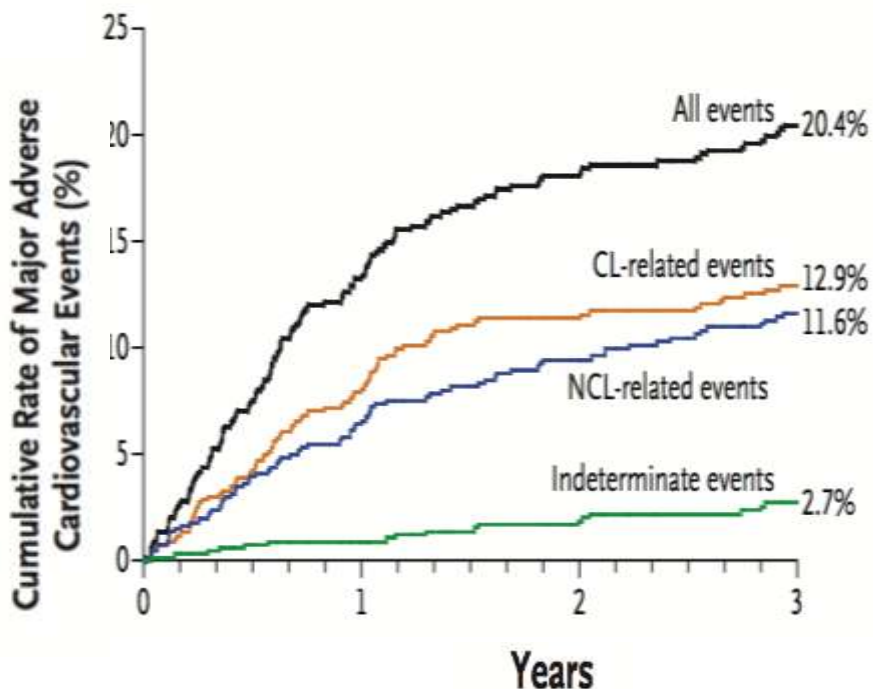
Future of the primary PCI

The NEW ENGLAND JOURNAL of MEDICINE

The NEW ENGLAND JOURNAL of MEDICINE

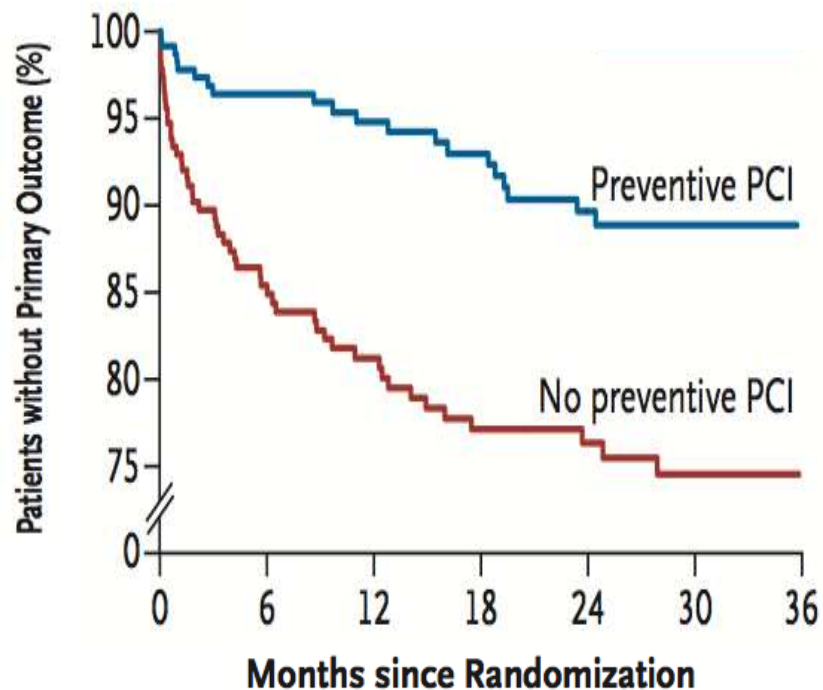
ORIGINAL ARTICLE

A Prospective Natural-History Study of Coronary Atherosclerosis



ORIGINAL ARTICLE

Randomized Trial of Preventive Angioplasty in Myocardial Infarction

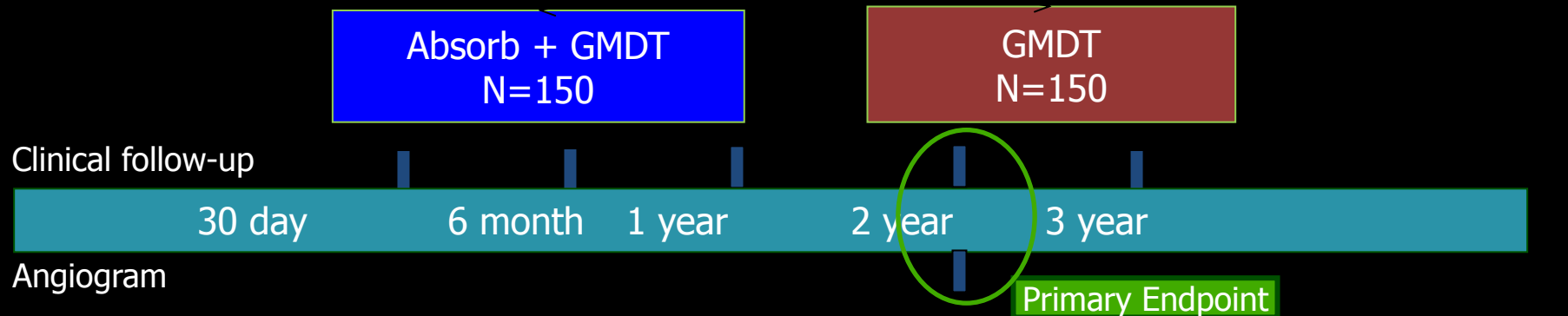


**PROSPECT + PRAMI = recipe for prospect II,
preventive PCI of non-flow limiting high risk lesions
with bioresorbable scaffolds**

PROSPECT ABSORB study

PROSPECT ABSORB is an investigator initiated multicenter, randomized trial, which for the first time will evaluate the **ability of a bioresorbable scaffold to safely increase luminal dimensions of vulnerable plaque**

Patients with plaque at high risk of causing future coronary events (plaque burden $\geq 70\%$)



Primary Endpoint: Minimal Lumen Area (MLA) at 2 years and TLF at 2 years
Secondary Endpoints: MACE up to 2 years, IVUS and Near Infra-Red Spectroscopy parameters

PROSPECT ABSORB will test the feasibility of an interventional approach in preventing future major adverse events arising from plaques which appear angiographically innocuous but are in fact the source of future acute coronary syndromes

GMDT: Guideline Directed Medical Therapy

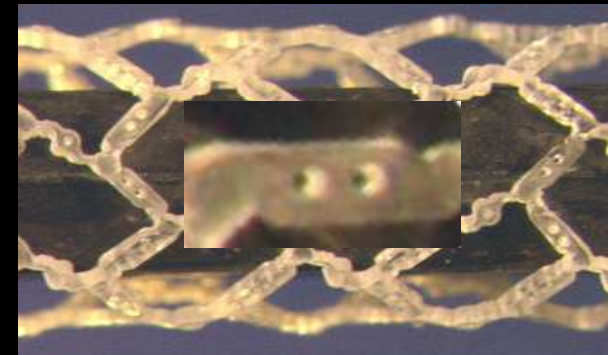
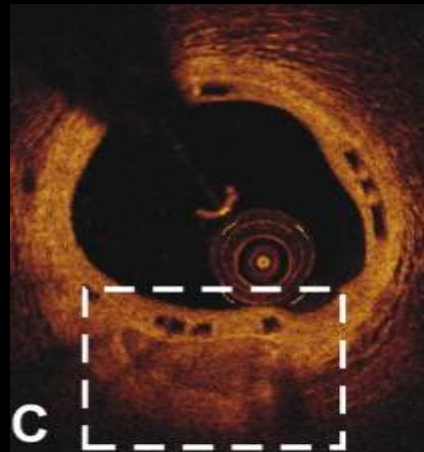
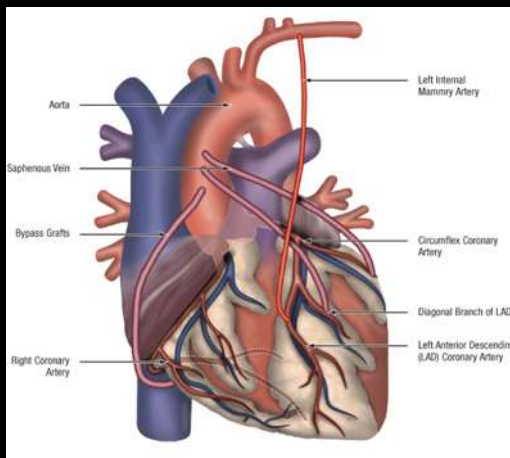
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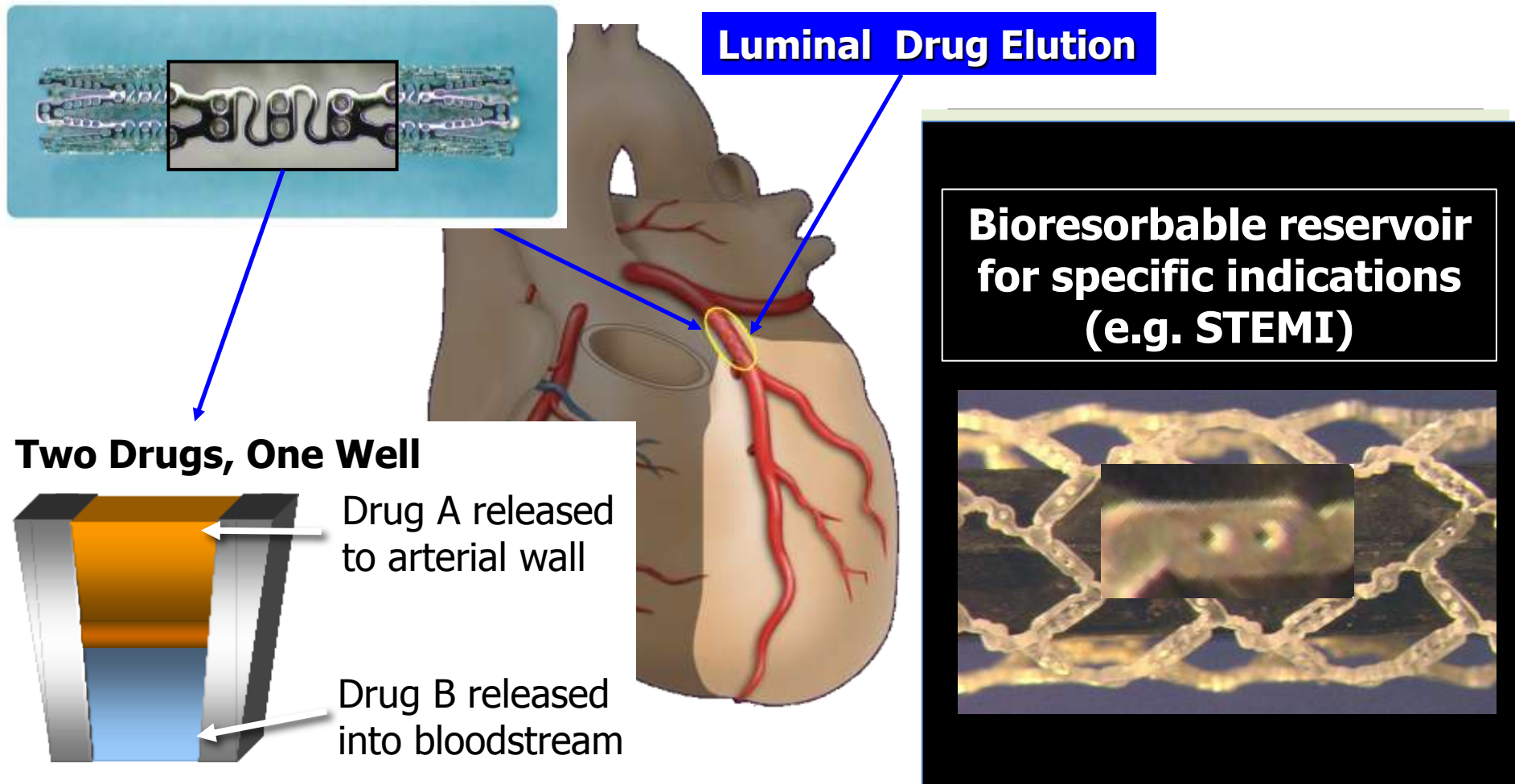
**Bioresorbable
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Prophecy on short term

**Specific stent device (reservoir with drug) for specific syndrome
(e.g. myocardial infarction and diabetes)**

Vascular Drug Delivery: Acute MI



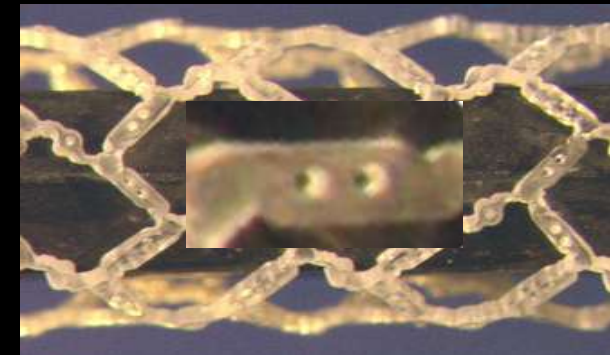
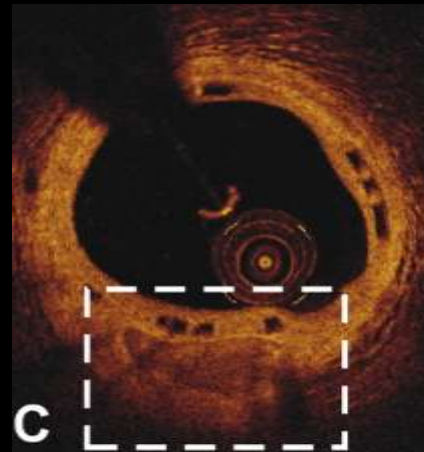
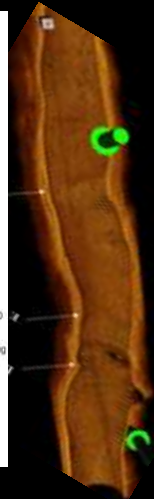
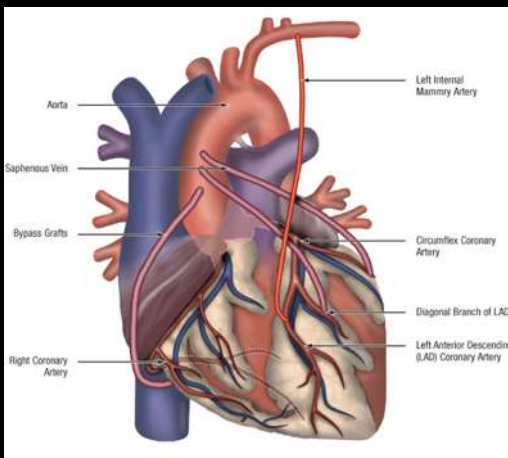
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IVUS vs. angiography guidance for CTOs: two-year results from randomised AIR-CTO study

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