

Future Perspectives of BRS: Will They Go Forward or Not?

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Disclosures

- Chair of the Absorb global clinical trial program (uncompensated)
- Consultant to Reva

Fully Bioresorbable Scaffolds (BRS)

- Designed to provide the mechanical support and drug delivery functions of metallic DES within the first year, and then completely resorb within 2-4 years, removing the nidus for **very late** adverse events

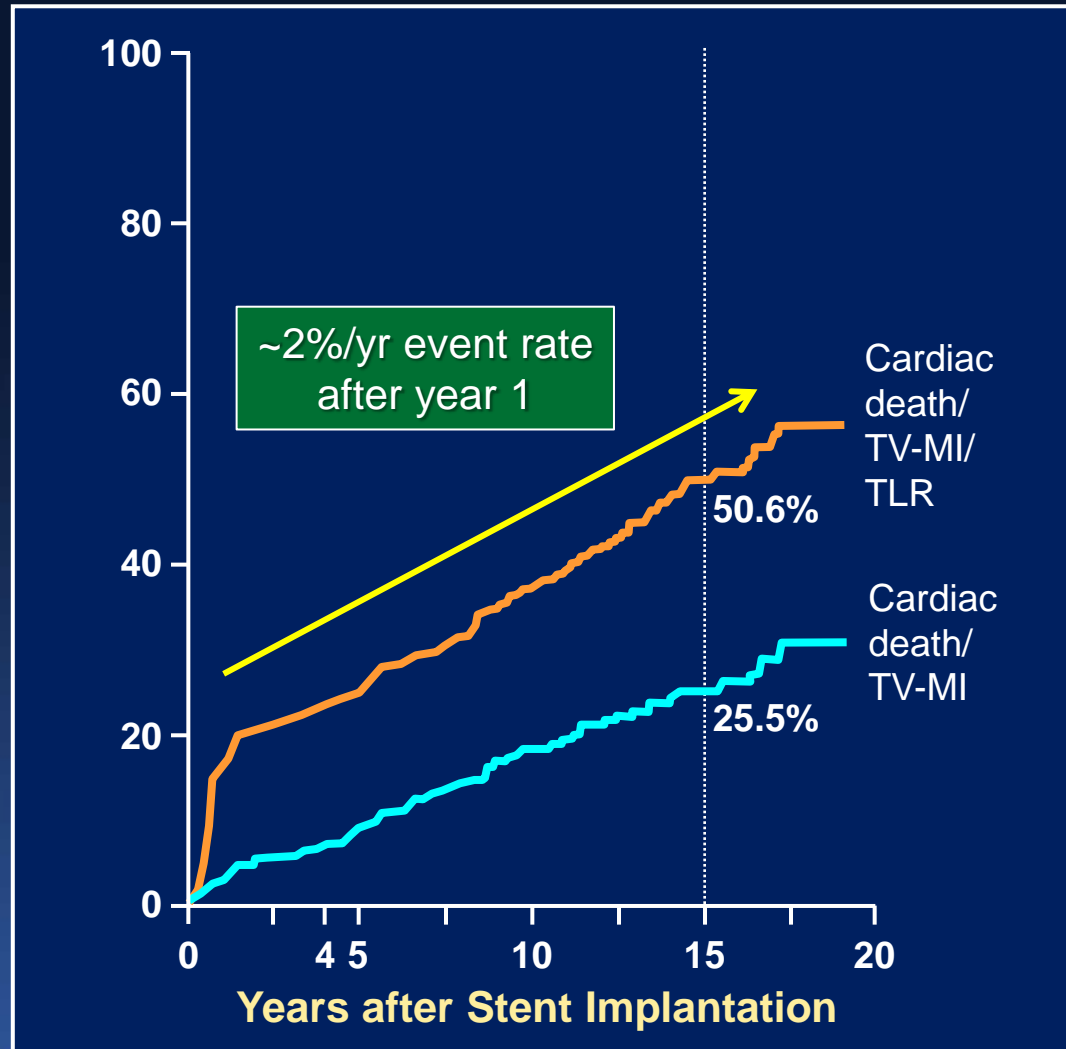
Why We Need Bioresorbable Scaffolds in 2018

Metallic DES result in...

- Ongoing risk of very late events (lifelong)
- Suboptimal outcome in special situations:
 - STEMI and NSTEMI (high stent thrombosis rates)
 - Bifurcations (jailed side branches)
 - Diffuse disease (full metal jacket)
 - Treatment of in-stent restenosis (layer on layer)
- Permanent implant not desirable for many pts

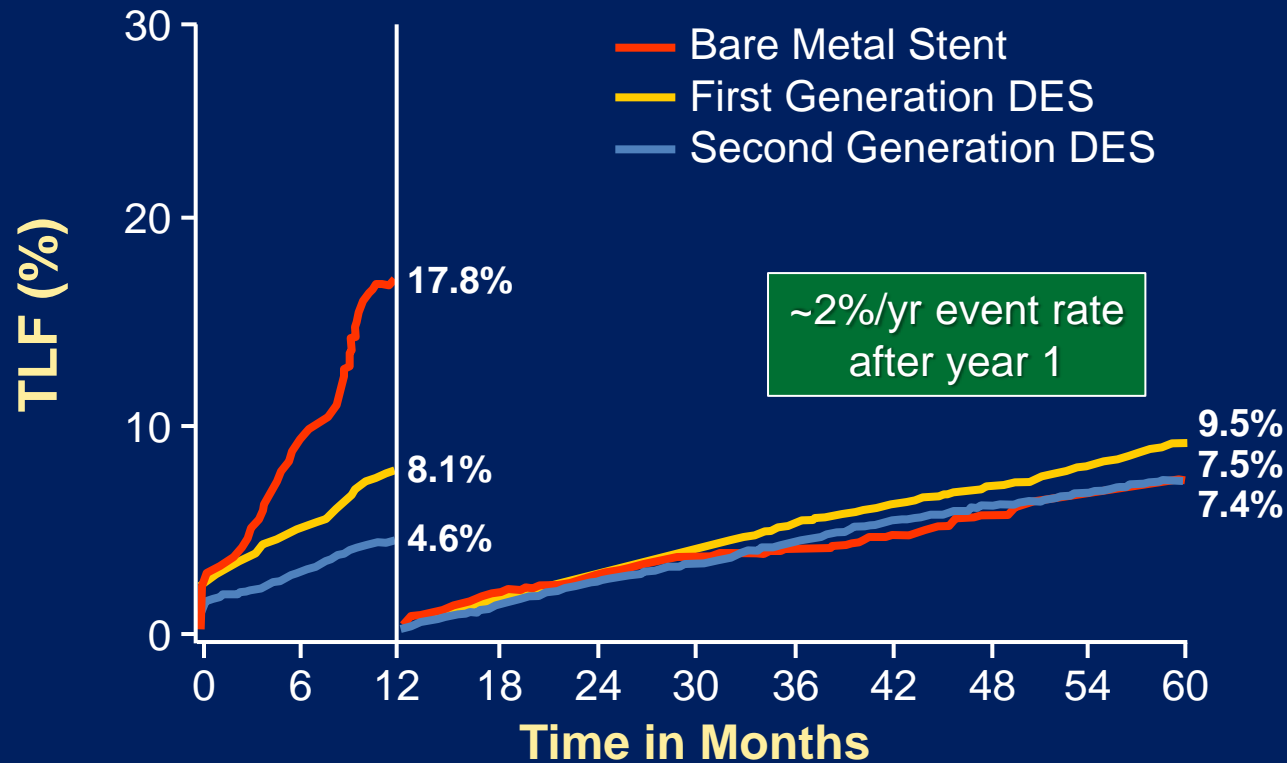
15-year Follow-up After BMS (1990-1993)

N=405



17 RCTs, 21,830 patients

TLF Between 0-1 and 1-5 Years by Stent Type (Landmark Analysis)

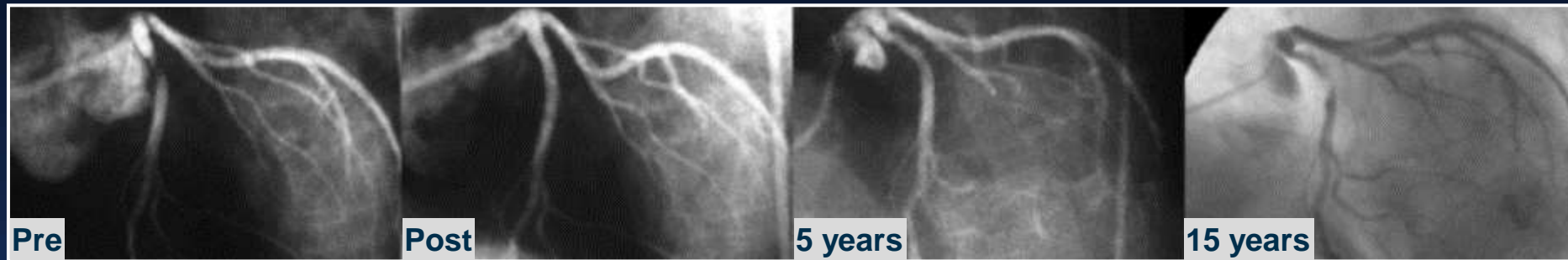


No. at risk											
Bare Metal Stent	1,830	1,636	1,468	1,425	1,401	1,365	1,340	1,314	1,272	1,223	480
First Generation DES	4,591	4,296	4,124	4,022	3,929	3,828	3,477	3,172	2,860	2,465	1,474
Second Generation DES	9,955	9,606	9,334	9,149	8,962	8,799	8,160	5,125	4,559	3,852	2,366

Why do we Need a New Approach for Coronary Artery Disease?

Very late adverse events after metallic stents

In-stent restenosis (at 15 years)



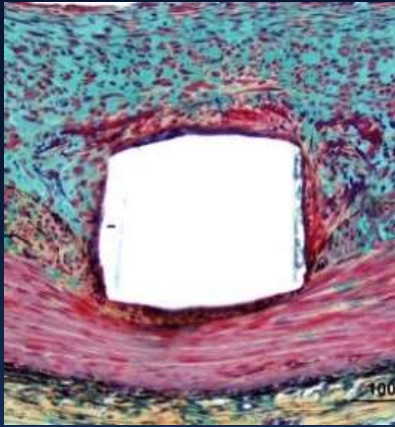
Stent thrombosis (at 17 years)



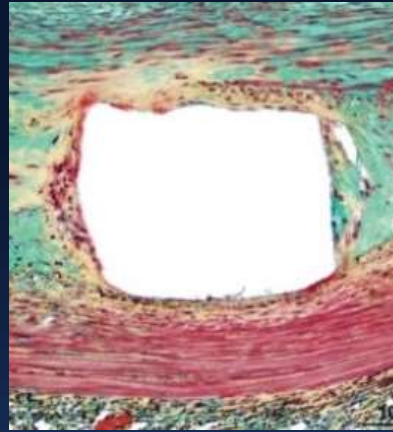


Full Bioresorption of Absorb Within ~3 Years

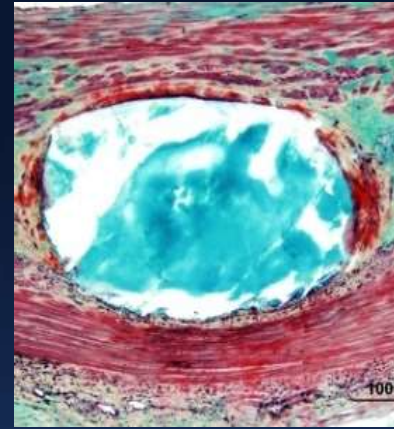
Porcine Histology



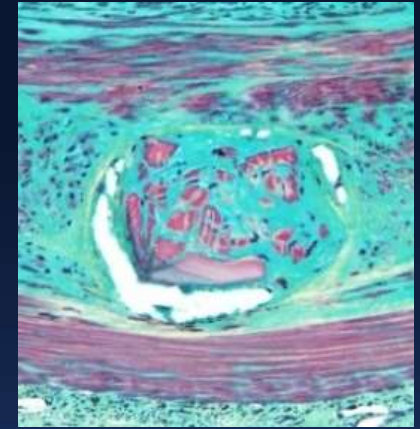
1 month



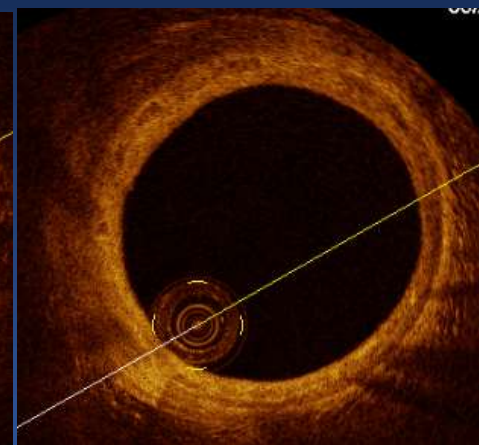
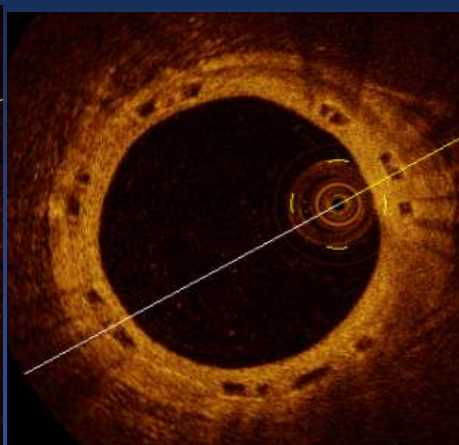
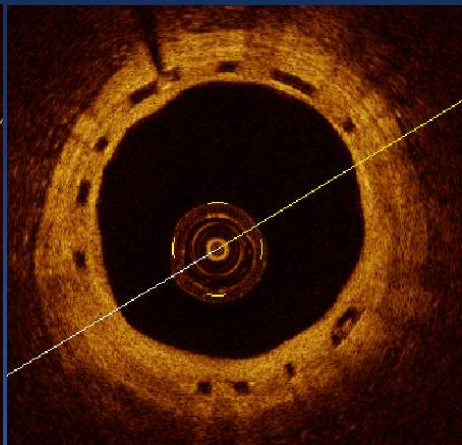
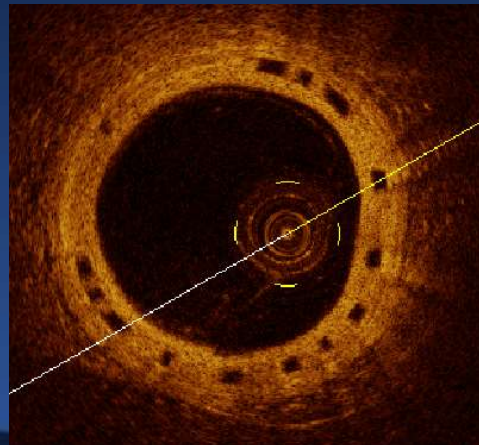
12 months



24 months



36 months

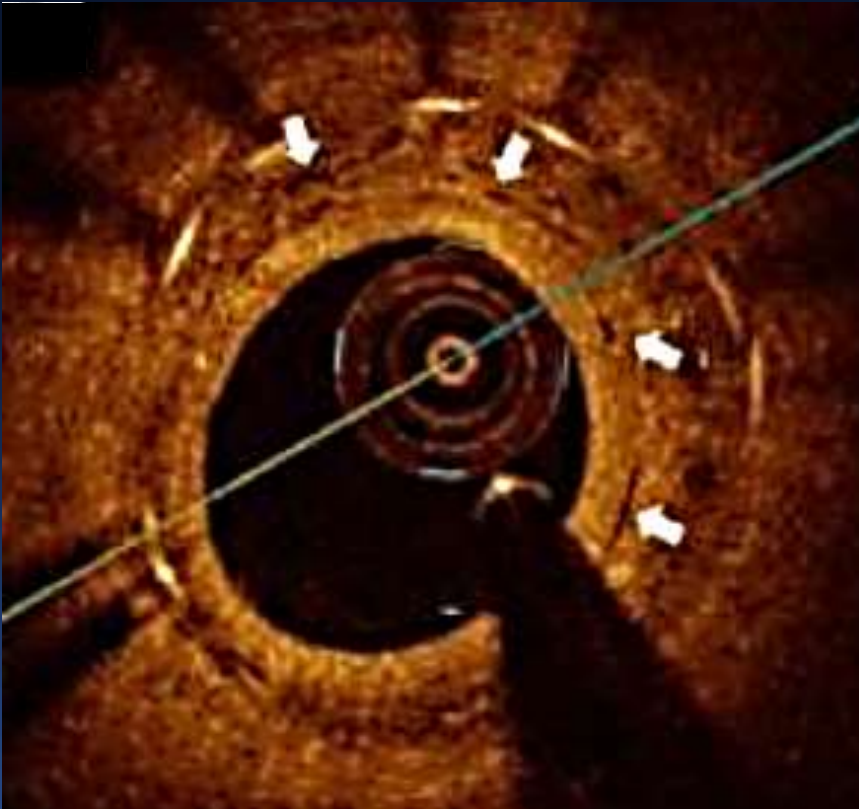


Human OCT

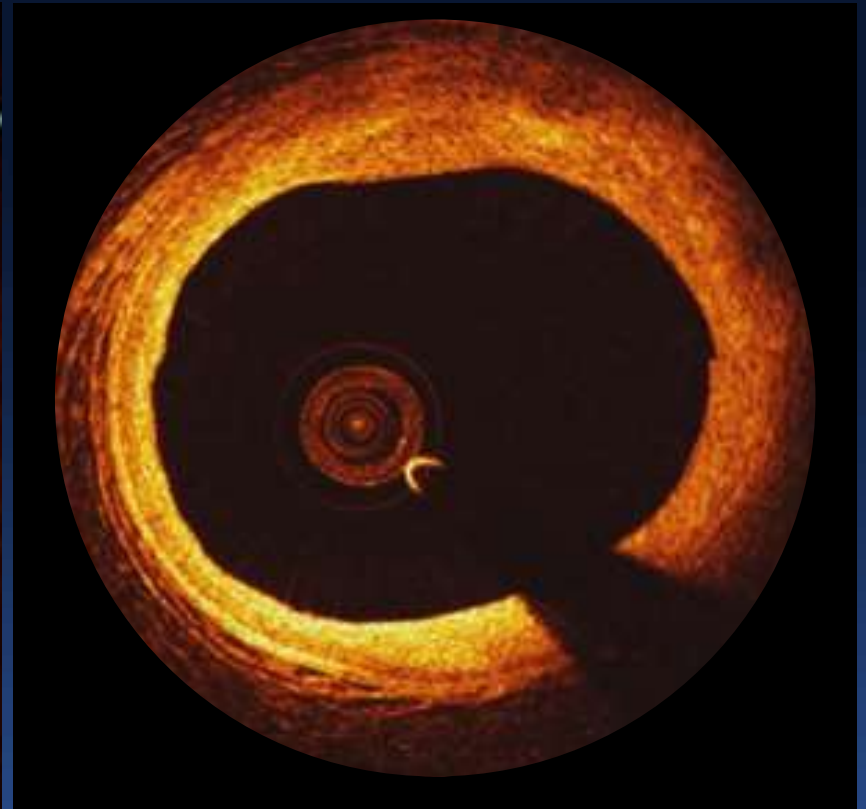


Metallic DES vs. Absorb BVS

Representative Human images at 5 Years



Metallic DES¹

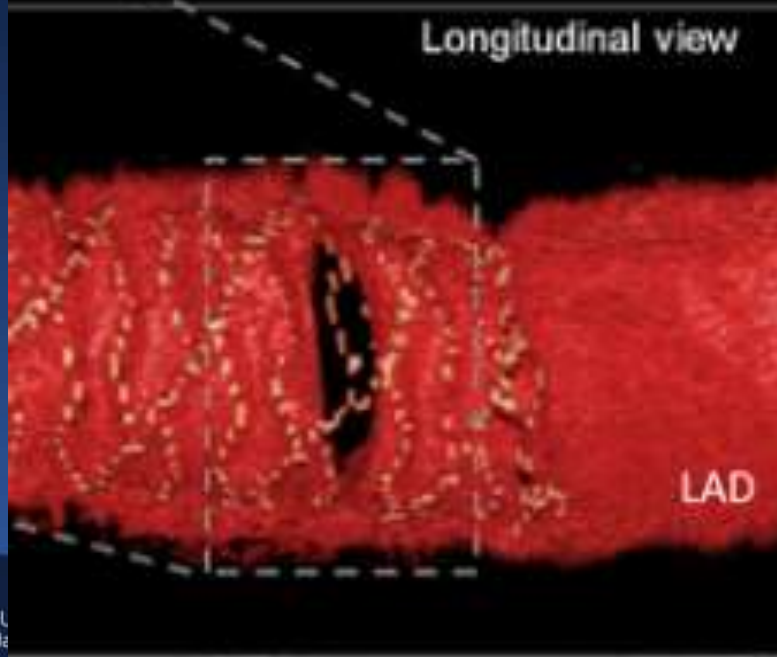
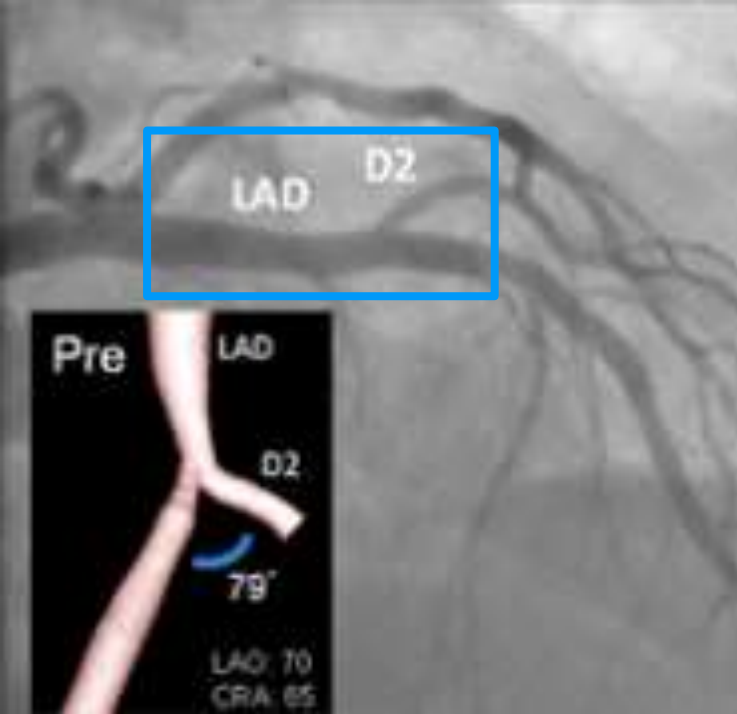


Absorb-Treated Artery²

Fully Bioresorbable Scaffolds Address Practical Limitations of Metallic Stents

- “Un-jail” covered side branches
- “Un-jacket” long treated segments (preserving late CABG options)
- “Un-layer” treated in-stent restenosis
- Eliminate artifacts with non-invasive imaging (e.g. CTA)

Jailed Side Branches with Metallic Stents Never go away!



Unjailing Side Branches with Absorb BVS

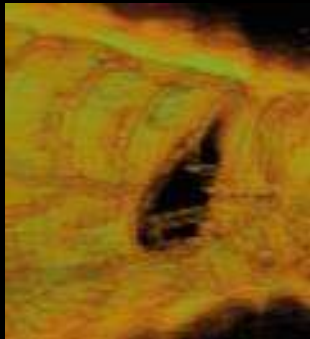
**Post-
procedure**

1 Year

3 Years

5 Years

Longitudinal



**Single
cut plane**



Unjailing Side Branches with Absorb BVS

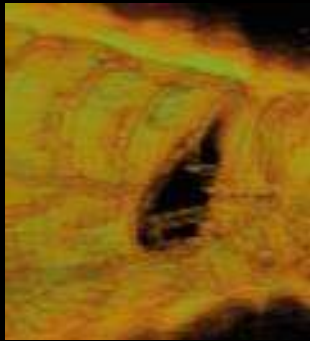
**Post-
procedure**

1 Year

3 Years

5 Years

Longitudinal



**Single
cut plane**



Unjailing Side Branches with Absorb BVS

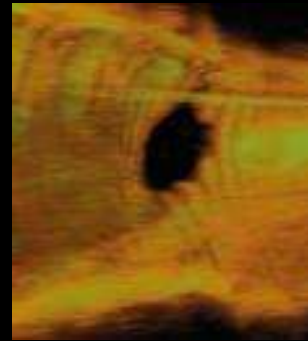
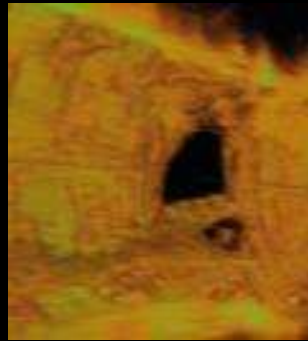
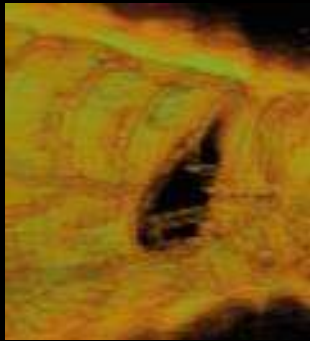
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**Single
cut plane**



Unjailing Side Branches with Absorb BVS

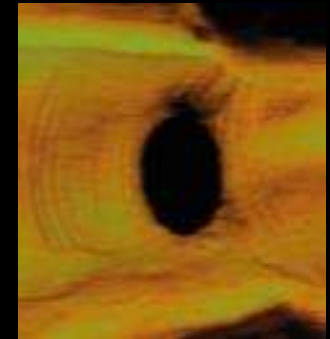
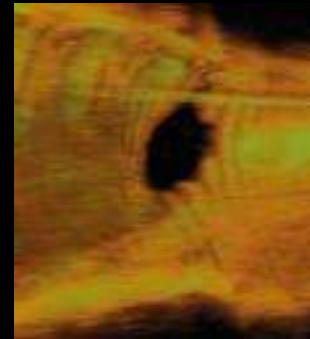
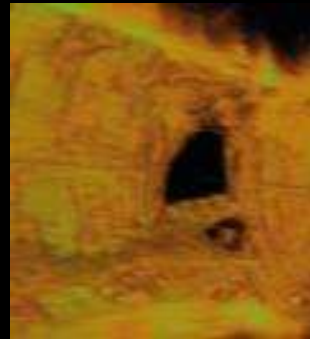
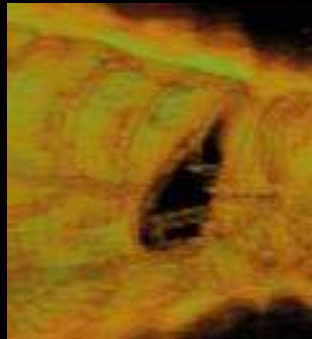
**Post-
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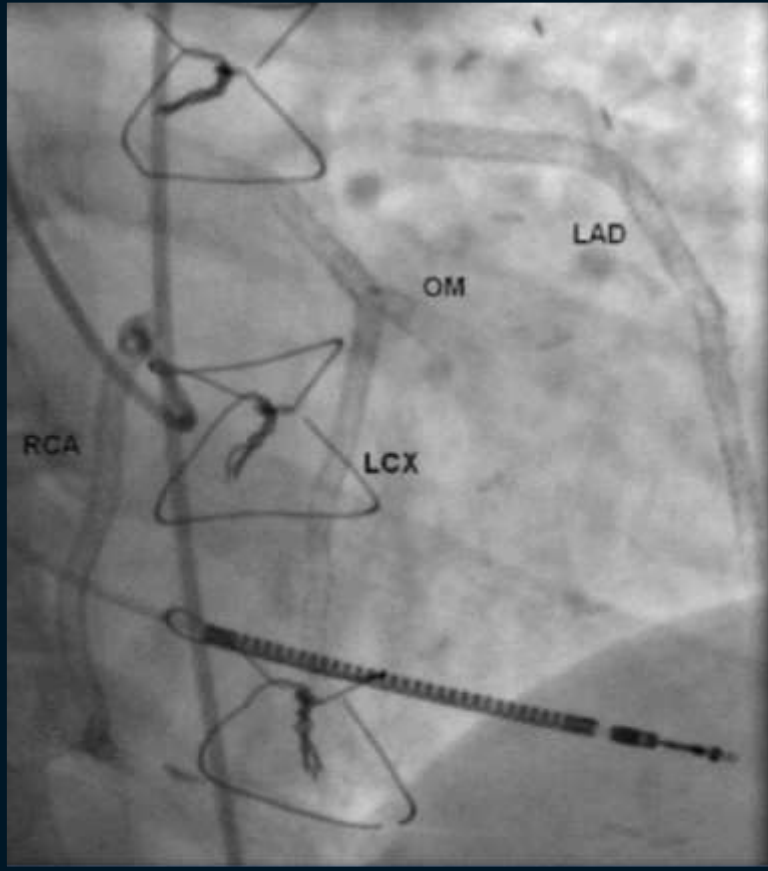
**Single
cut plane**



The Full Polymer Jacket

Full Metal Jacket

67 stents over 10 years



Khouzam RN et al. JACC. 2010;56:1605

Multiple Absorb Scaffolds

Diffusely diseased LAD and LCX



C/O Antonio Colombo

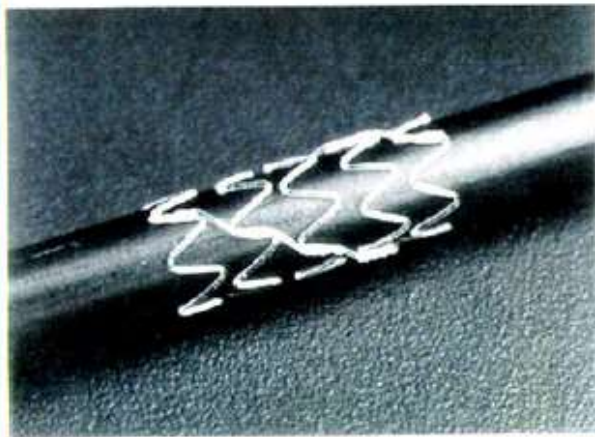
An Undeniable Fact

Based on cultural, religious or personal beliefs, many patients prefer not to live their lives with permanently implanted devices

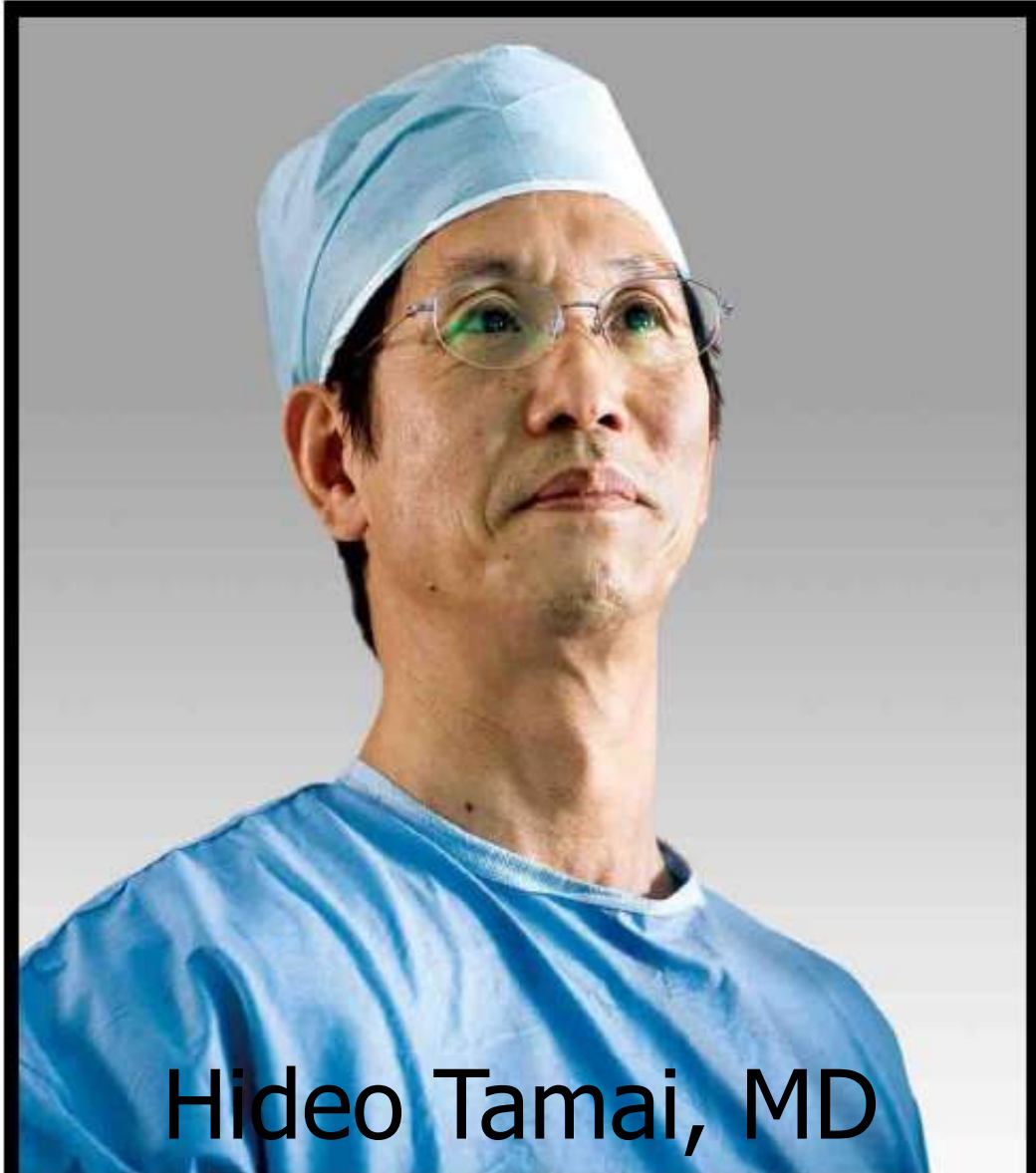
A Reliable Prediction

If BRS were as safe and effective as metallic DES within the first few years (prior to their complete bioresorption), they would ultimately replace metallic DES

Igaki-Tamai Stent (2000)



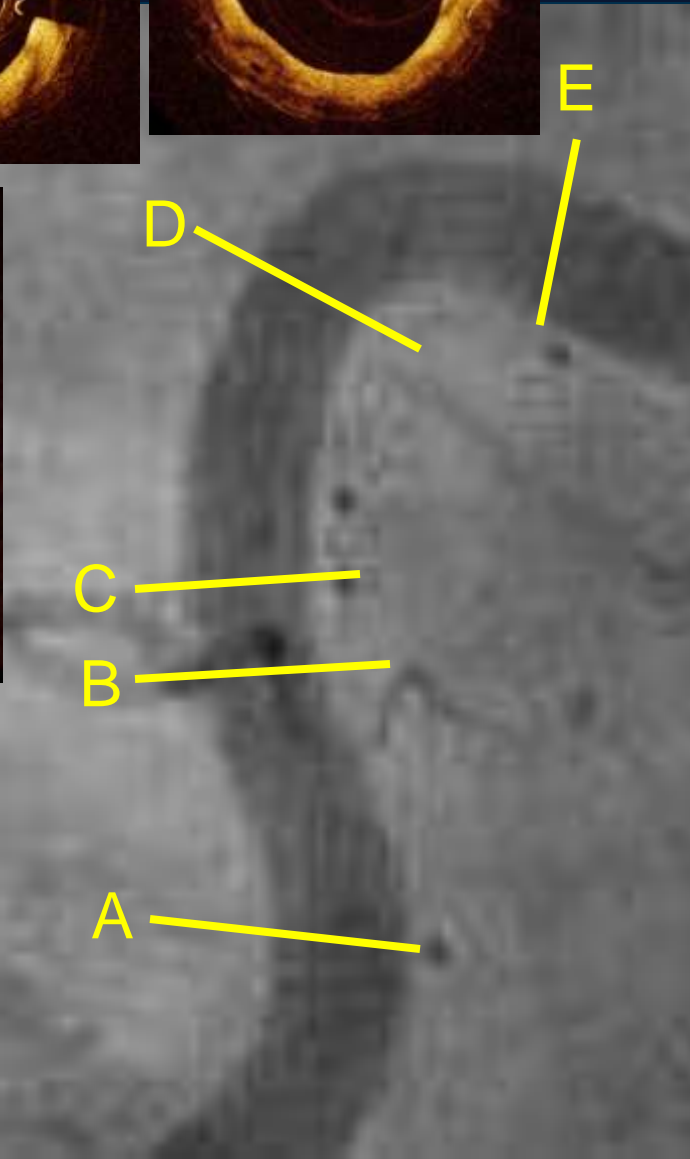
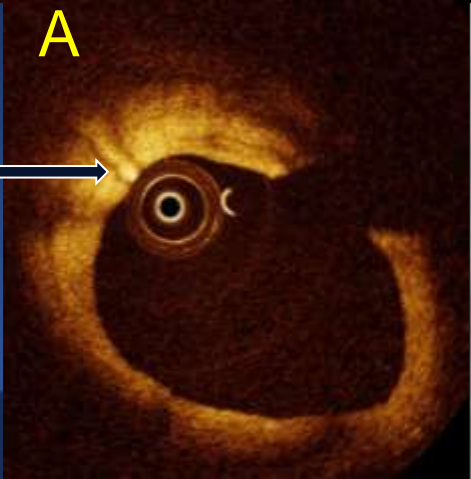
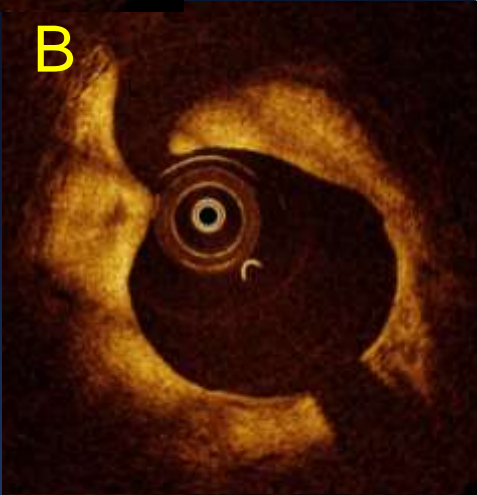
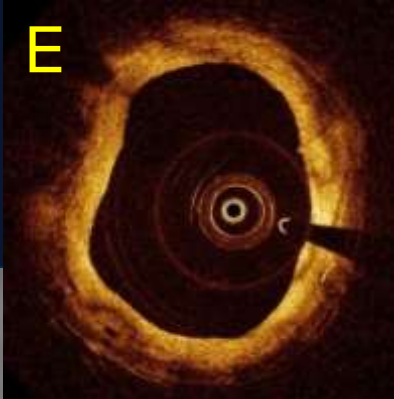
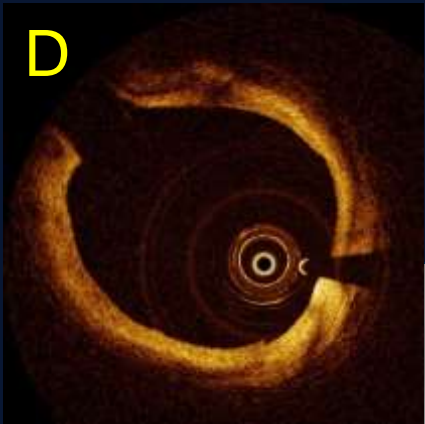
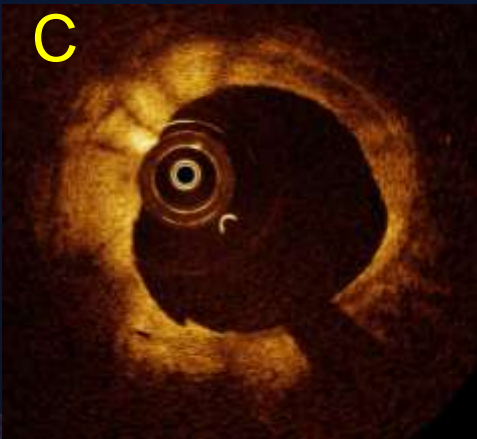
Tamai et al, CCI 2001



Hideo Tamai, MD

Igaki-Tamai stent at 10 years!

Gold markers *



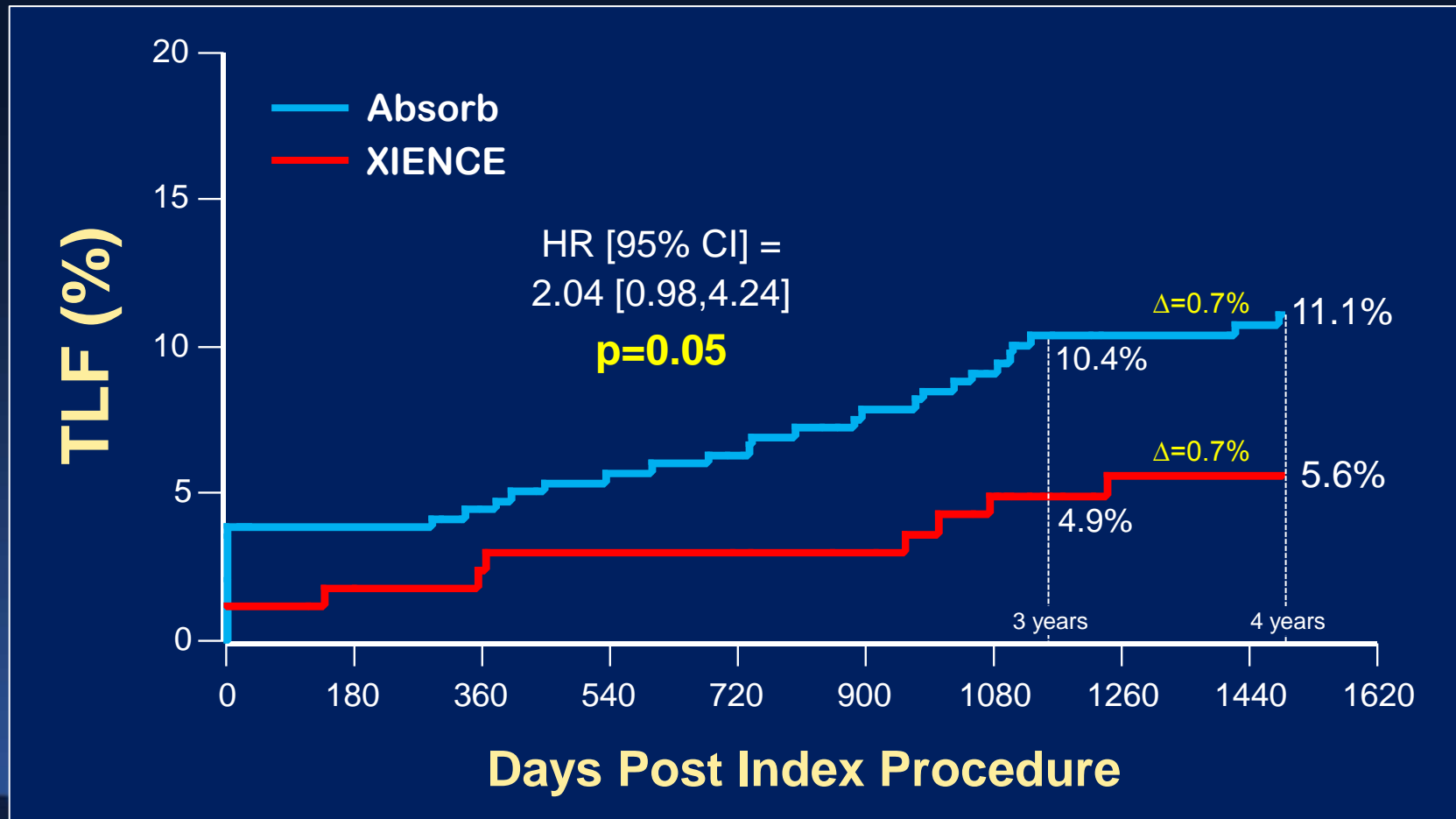


ABSORB II 4-year

Target Lesion Failure

501 pts randomized 2:1 BVS vs. EES

Routine angio FU at 3 yrs; 428 (85%) 4-year FU (re-consent required)



Stone GW. TCT 2017

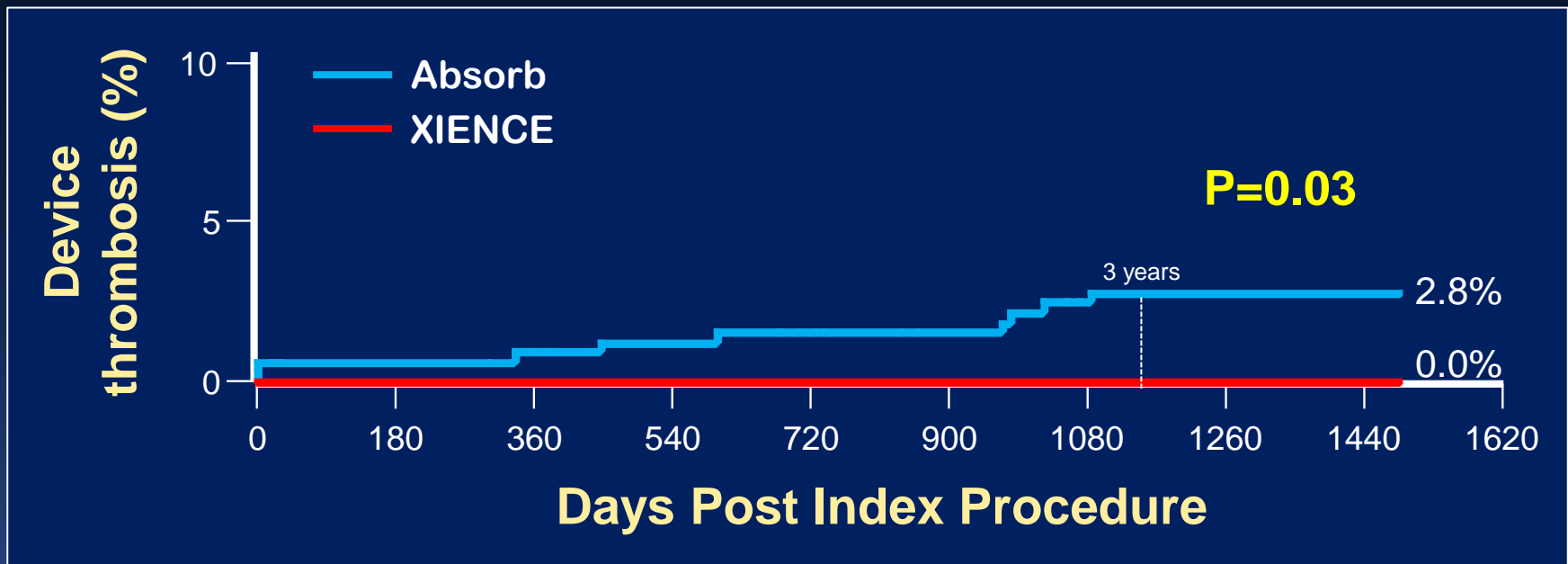


ABSORB II 4-year

Device Thrombosis (def/prob)

501 pts randomized 2:1 BVS vs. EES

Routine angio FU at 3 yrs; 428 (85%) 4-year FU (re-consent required)



No device thromboses after 3 years
(in either arm)

Long-term ABSORB Results



- ABSORB II 5-year results in 501 pts
- ABSORB III, ABSORB China and ABSORB Japan 4-year results in 2,888 randomized pts

How to Improve BRS Outcomes Prior to Their Complete Bioresorption

**Improve the
Technique**

PSP

Imaging

**Prolonged
DAPT**

**Improve the
Device**

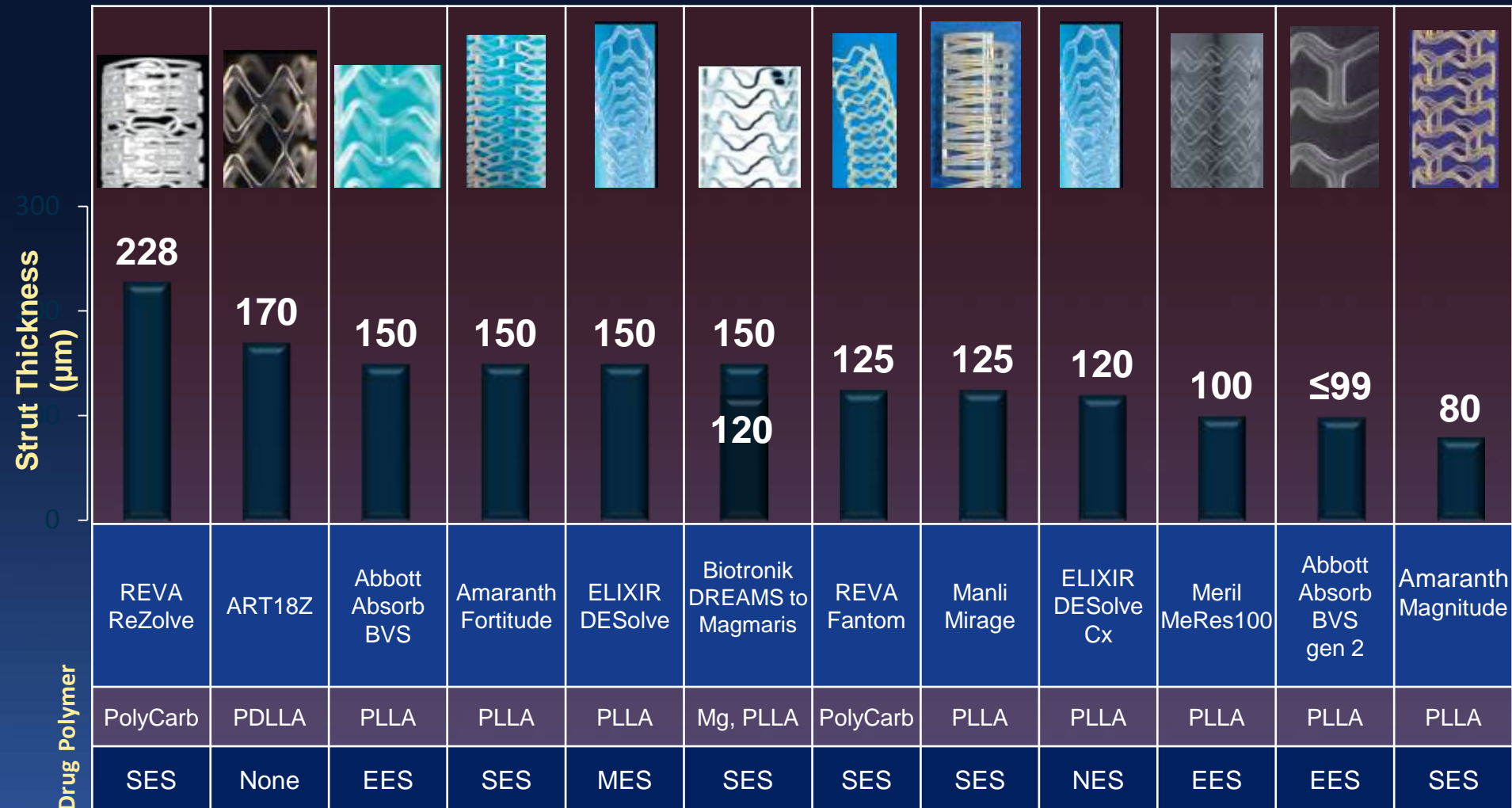
**Thinner
struts**

**Improved
mechanical
properties**

Bioresorbable Scaffolds: **Rapidly thinning**

1st Generation BRS

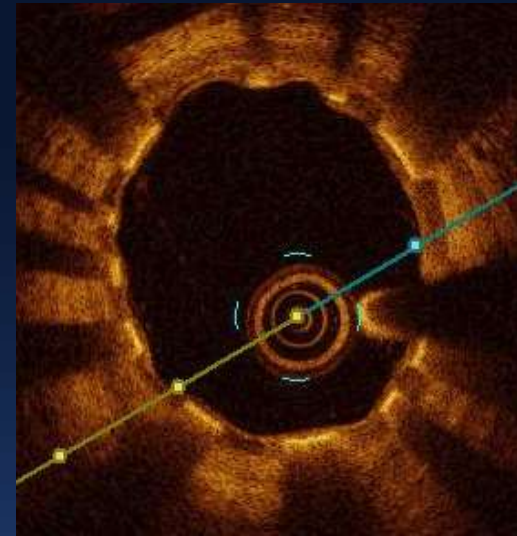
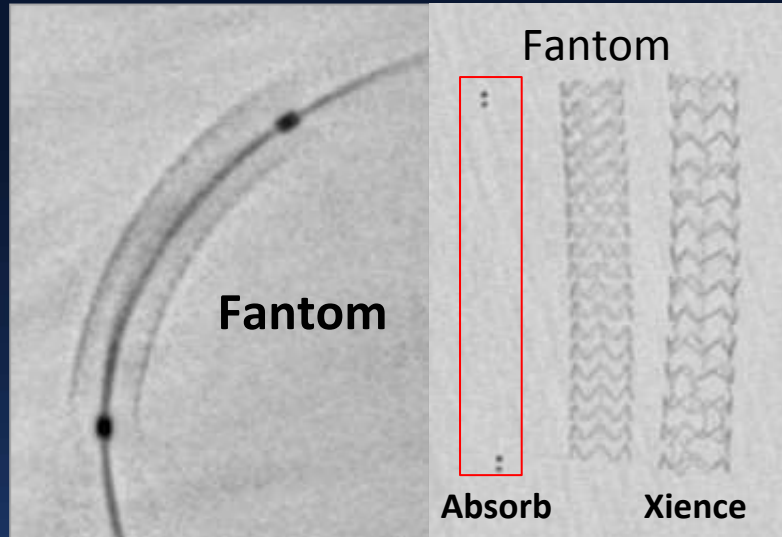
2nd Generation BRS



SES = sirolimus-eluting scaffold, EES = everolimus-eluting scaffold
MES=myolimus-eluting scaffold, NES = novolimus-eluting scaffold

Fantom Bioresorbable Scaffold (Reva)

Iodinated desaminotyrosine polycarbonate polymer, sirolimus-eluting

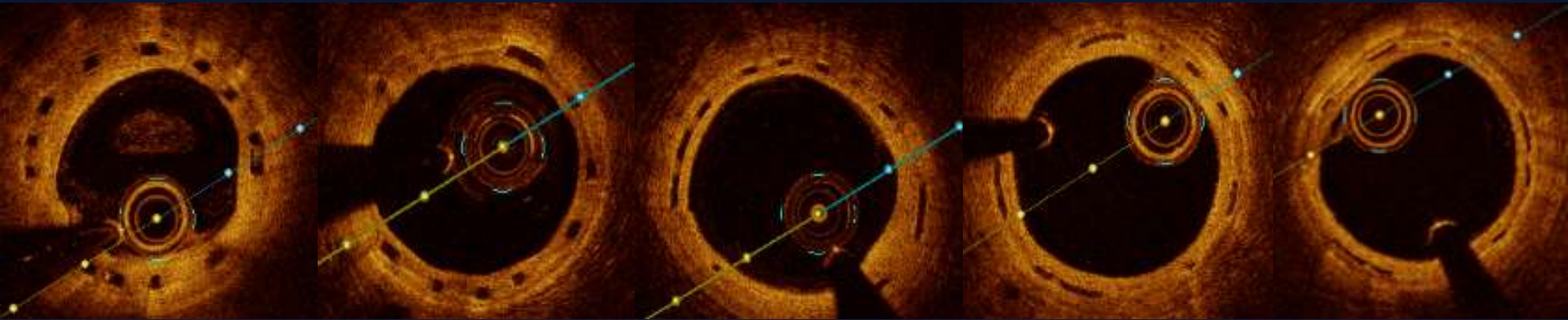


Key Features

- DES-like scaffold visibility under x-ray
- 125 μm thickness
- Good radial strength
- Wide expansion range (0.75-1.0 mm)
- Single-step continuous inflation
- No special storage or handling requirements

Amaranth: Highly Amorphous, Ultra-High MW PLLA

Step-Wise Reduction of Strut Thickness



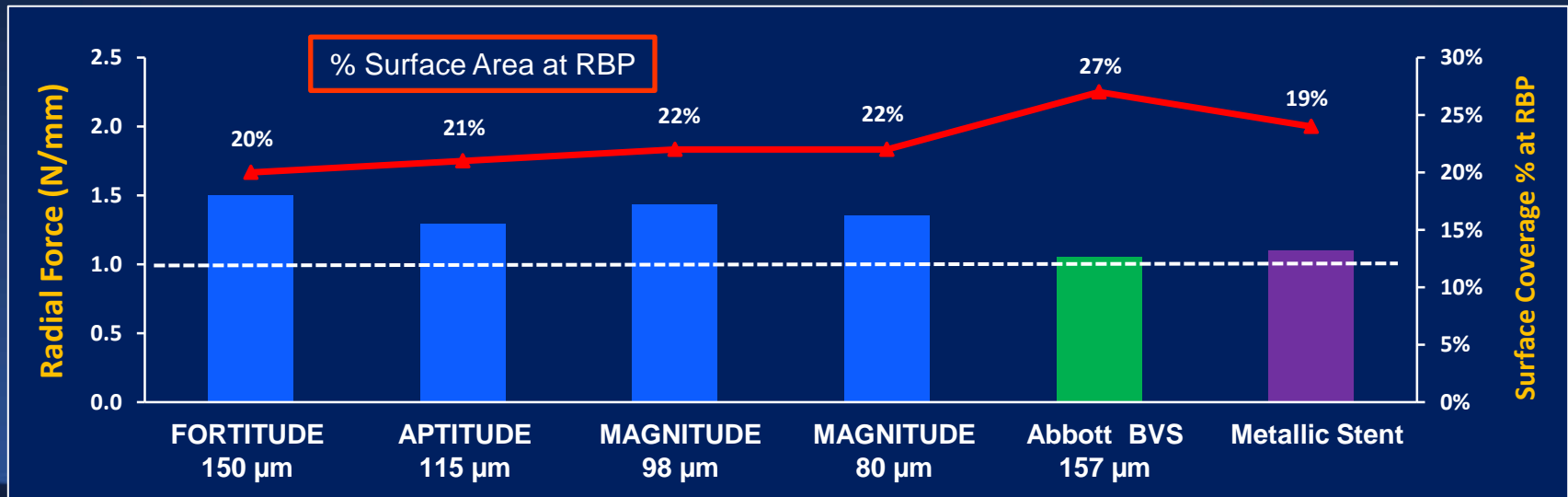
Absorb BVS
157 μm

FORTITUDE
150 μm

APTITUDE
115 μm

MAGNITUDE
98 μm

MAGNITUDE
80 μm



Data on file (Amaranth Medical)

Conclusions: An Optimistic Perspective on Bioresorbable Scaffolds

- Data have emerged that optimizing technique when implanting the 1st gen Absorb BVS can improve mid-term results
- Improved BRS have been developed that promise to overcome many of the current limitations
- Despite the setbacks to date, improved BRS devices implanted with optimized technique are likely to improve lifelong outcomes for patients with coronary artery disease