Erasmus MC
Universitair Medisch Centrum Rotterdam

Symposium: Vulnerable Plaque Update

Imaging-Guided BVS Implantation

E. Regar

Thoraxcenter
Erasmus Medical Center
Rotterdam, NL

Key To Success
Lessons from BVS Failure

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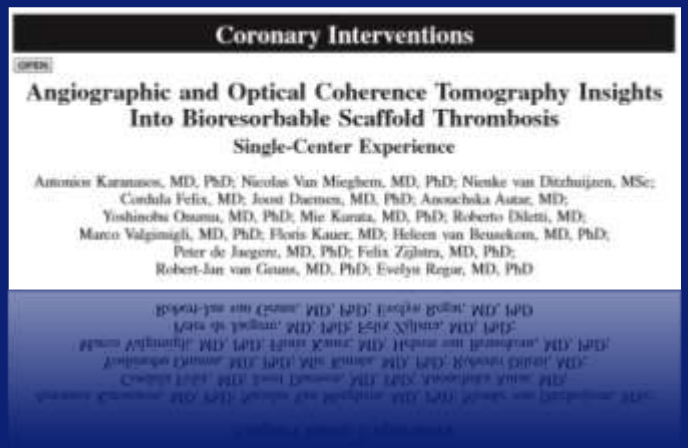
Device Failure

BVS 1.1: BVS Thrombosis



Coronary Interventions

OPEN

Angiographic and Optical Coherence Tomography Insights Into Bioresorbable Scaffold Thrombosis

Single-Center Experience

Antonios Karanasos, MD, PhD; Nicolas Van Mieghem, MD, PhD; Nienke van Ditzhuijzen, MSc; Cordula Felix, MD; Joost Daemen, MD, PhD; Anouchska Autar, MD; Yoshinobu Onuma, MD, PhD; Mie Kurata, MD, PhD; Roberto Diletti, MD; Marco Valgimigli, MD, PhD; Floris Kauer, MD; Heleen van Beusekom, MD, PhD; Peter de Jaegere, MD, PhD; Felix Zijlstra, MD, PhD; Robert-Jan van Geuns, MD, PhD; Evelyn Regar, MD, PhD

Main Pathomechanisms

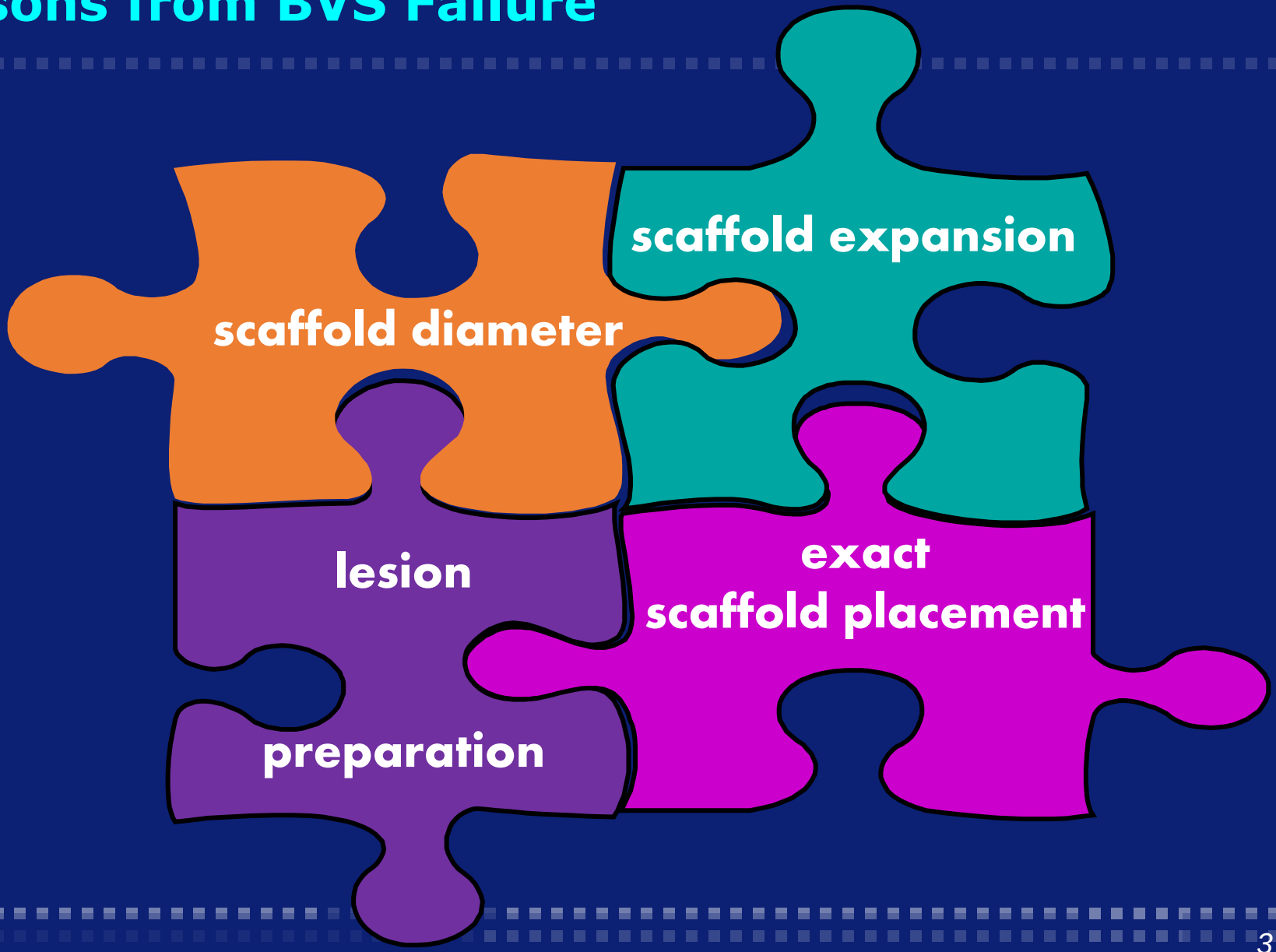
- **Incomplete lesion coverage**
- **Underexpansion &**
- **Malapposition**

Operator Failure

Seems to be triggered by implantation technique and thus, potentially avoidable

Karanasos A et al. Circ Cardiovasc Intervent 2015.

Key To Success
Lessons from BVS Failure



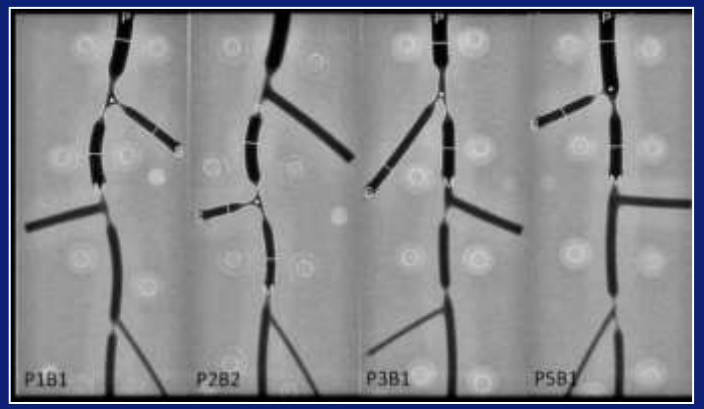
The Problem Really Is....

Angiography

Angiography Is A Poor Tool To Visualize Coronary Dimensions

Visual assessment of stenosis severity is poor!

poor validity and high variability



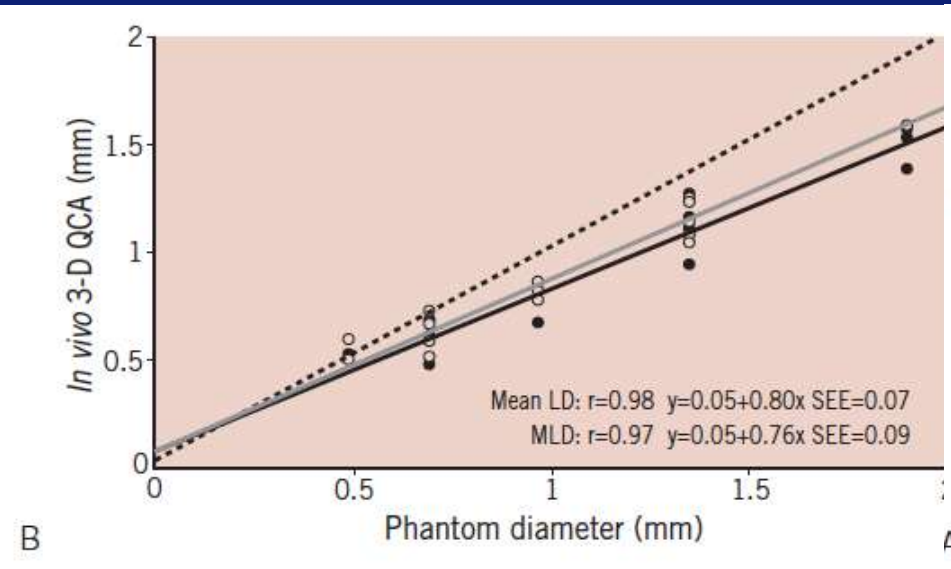
<u>36 experts</u> assessed % stenosis in phantom lesions

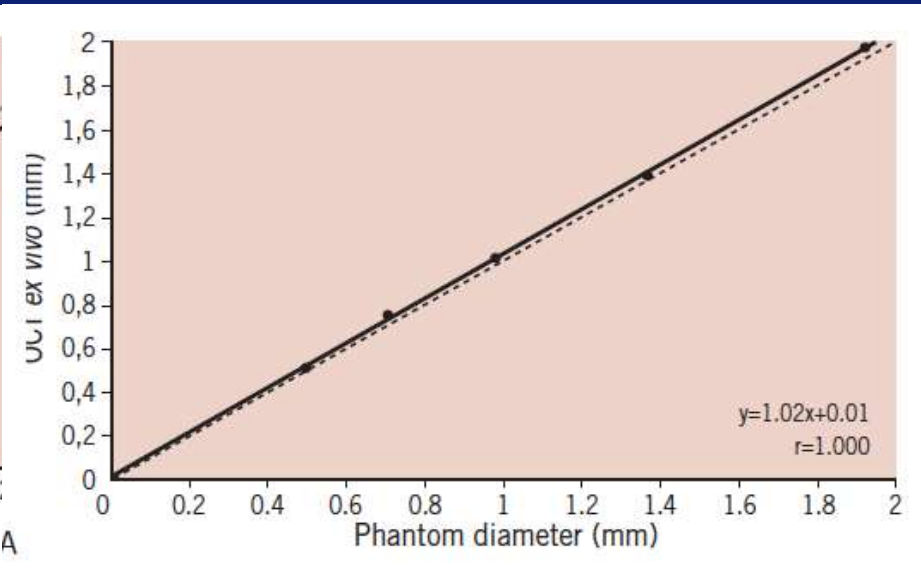
- **Overestimated = 49 %**
- **Underestimated = 26 %**
- **Exact = 25%**

Angiography Is A Poor Tool To Visualize Coronary Dimensions

QCA underestimates the lumen dimension !

OCT provides the correct lumen dimension.

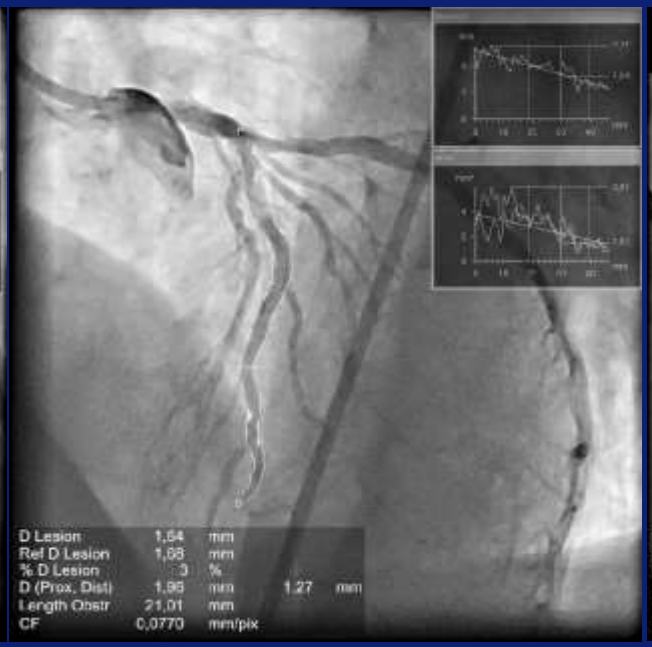


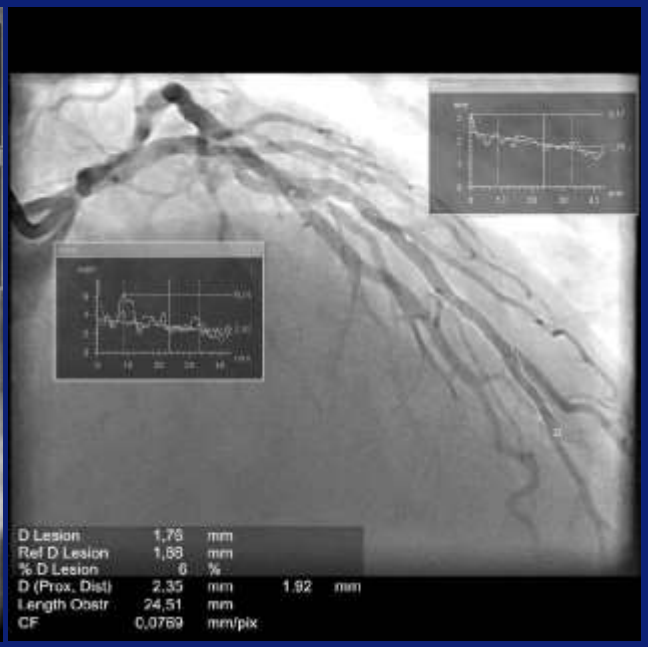


In vivo validation of a novel three-dimensional quantitative coronary angiography system (CardiOp-B™): comparison with a conventional two-dimensional system (CAAS II™) and with special reference to optical coherence tomography

Tschuchida et al. EuroIntervention

Angiography Is A Poor Tool To Visualize Lesion Length





19,19 mm **21,01 mm** **24,51 mm**

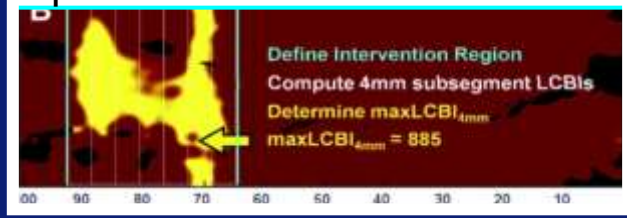
Same vessel, different projections, different lengths.

Courtesy J. Ligthart, EMC

Angiography Is A Poor Tool To Visualize Lesion Length: Plaque Extent

Lipid-rich lesions

Maximum 4-mm subsegment lipid-core burden index



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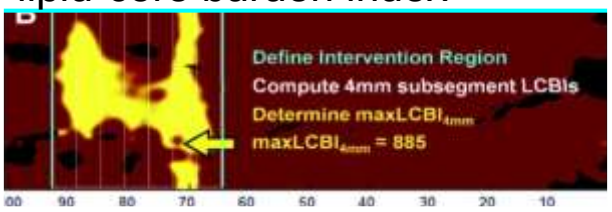


- raise risk for periprocedural MI ≈ 10 times

Goldstein J at el. Circ Cardiovasc Interv 2011:4:429-437

Lee et al. Circ Cardiovasc Interv 2011:4; 378-86

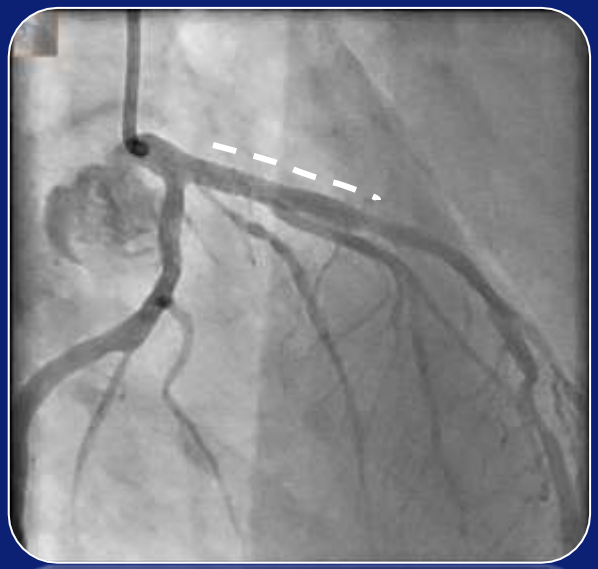
Stone GW et al. JACC Intv 2015; 8(7):927-36

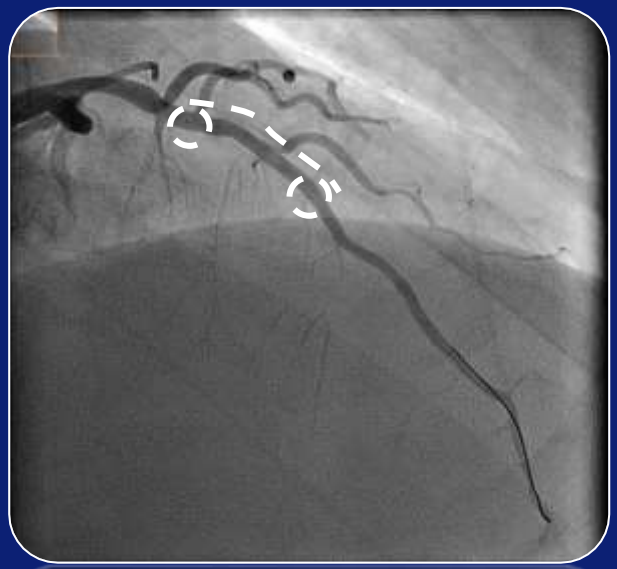
- raise risk for plaque progression & thrombosis when incompletely covered ?

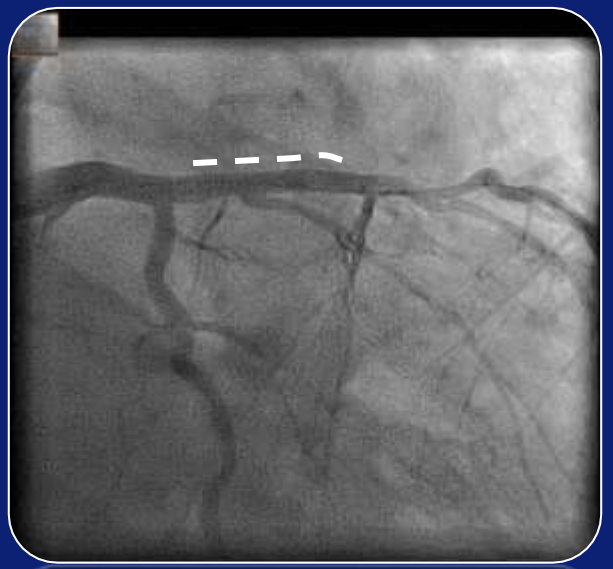
Farb A et al. Circulation 2003 7;108(14):1701-6.

Waxman S et al. Circ Cardiovasc Interv. 2010 Apr;3(2):193-6

Angiography Is A Poor Tool To Visualize BVS





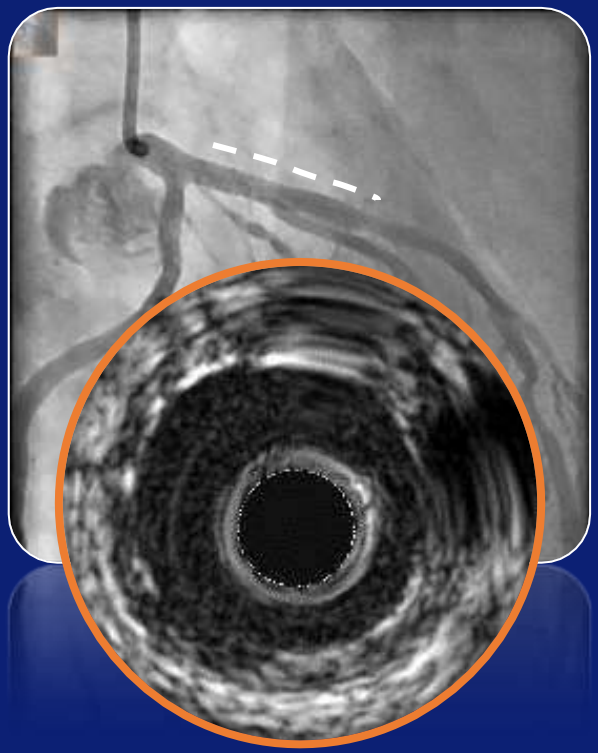


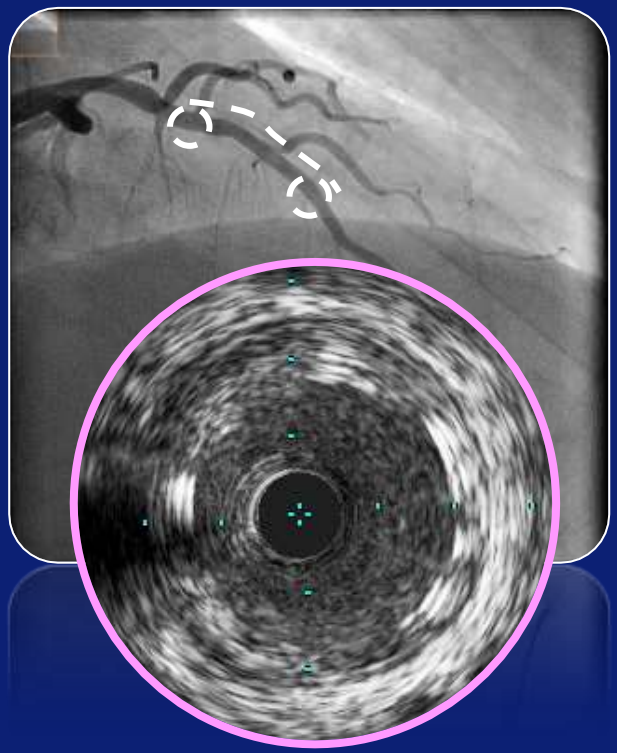
Xience V™ DES

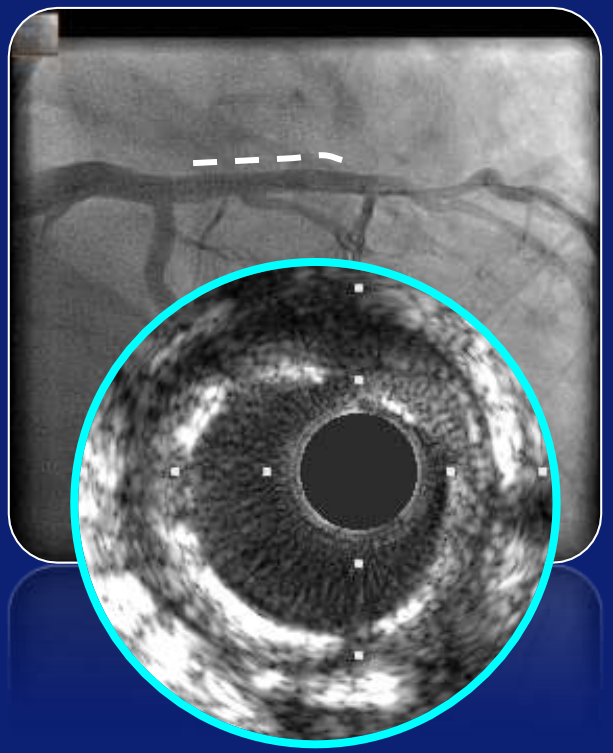
Abbott Absorb™ BVS

REVA Fantom™ BVS

Angiography Is A Poor Tool
IVUS Can Visualize BVS

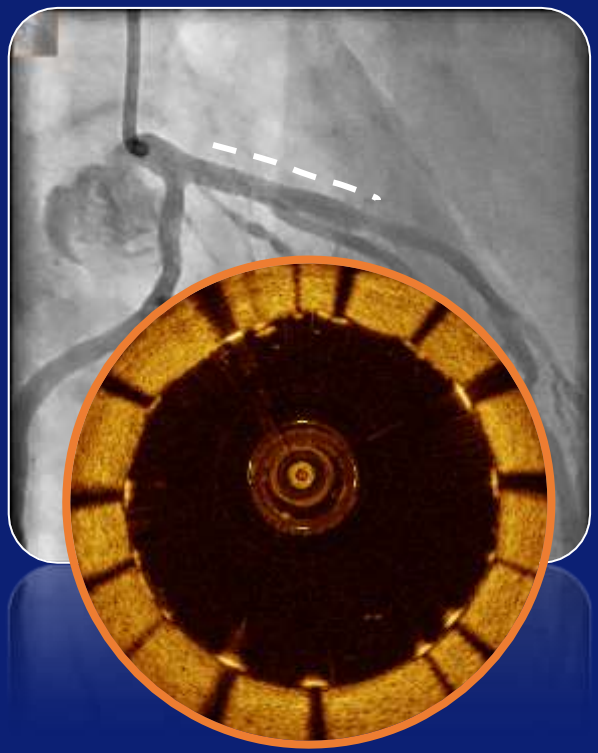


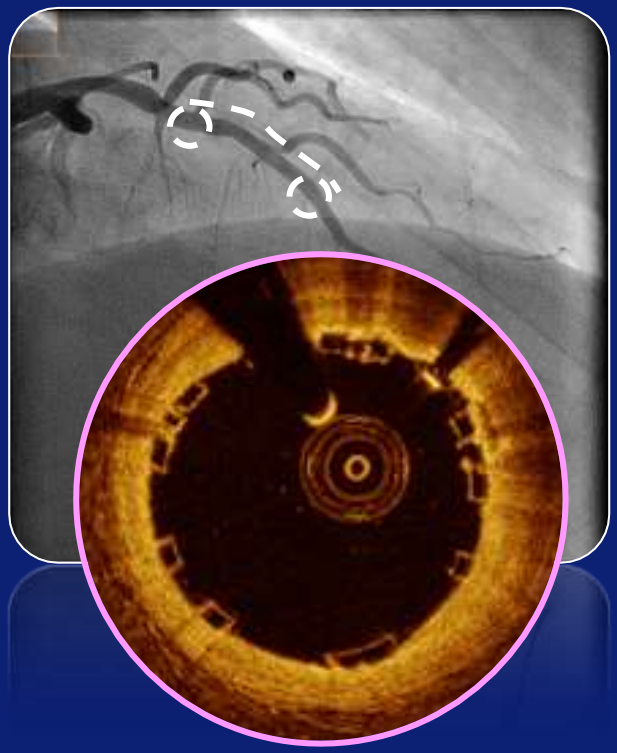


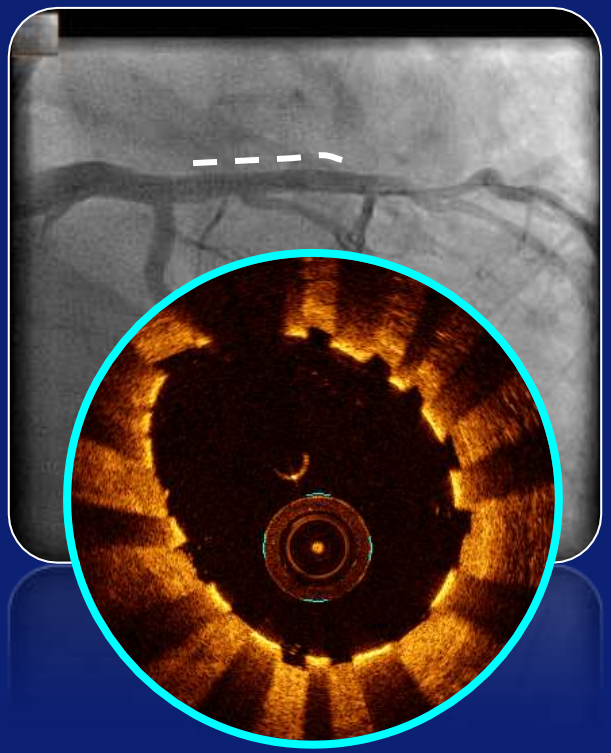


Xience V™ DES *Abbott Absorb™ BVS* *REVA Fantom™ BVS*

Angiography Is A Poor Tool
OCT Can Visualize BVS







Xience V™ DES *Abbott Absorb™ BVS* *REVA Fantom™ BVS*

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The *Next* Problem Really Is....

Scaffold

Adequate BVS Sizing Is Crucial
Limited Range of Diameter Expansion

Key issue with the ABSORB scaffold

Limited range of expansion

2.5 mm scaffold → up to 3.0mm

3.0 mm scaffold → up to 3.5mm

3.5 mm scaffold → up to 4.0mm

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Onuma Y et al. J Am Coll Cardiol Intv 2014;7:1400-11.

Adequate BVS Sizing Is Crucial
Struts Can Break!

Key issue with the ABSORB scaffold

Limited range of expansion

2.5 mm scaffold → up to 3.0mm

3.0 mm scaffold → up to 3.5mm

3.5 mm scaffold → up to 4.0mm

Beyond that range, struts can break.

Onuma Y et al. J Am Coll Cardiol Intv 2014;7:1400-11.

Adequate BVS Sizing Is Crucial
Too Small Scaffold Diameter is Uncorrectable

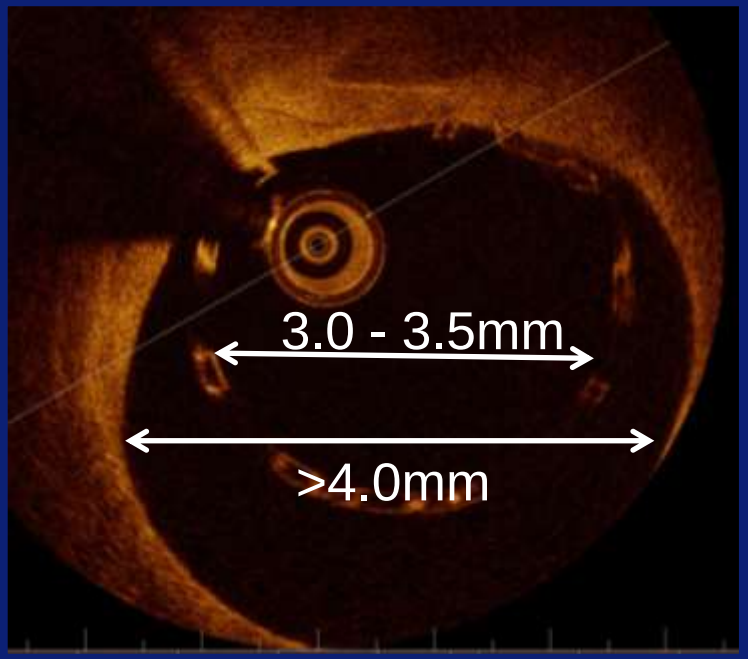
Small malapposition

- **Correctable by post dilatation**
- **Resolve at FUP**

Large malapposition

- **Uncorrectable (Persistent at FUP)**
- **Overexpansion by a large balloon**

  → Acute disruption



Post procedural

Courtesy *Y* Onuma

Onuma Y et al. J Am Coll Cardiol Intv 2014;7:1400-11.

Adequate BVS Sizing Is Crucial
Too Small Scaffold Diameter is Uncorrectable

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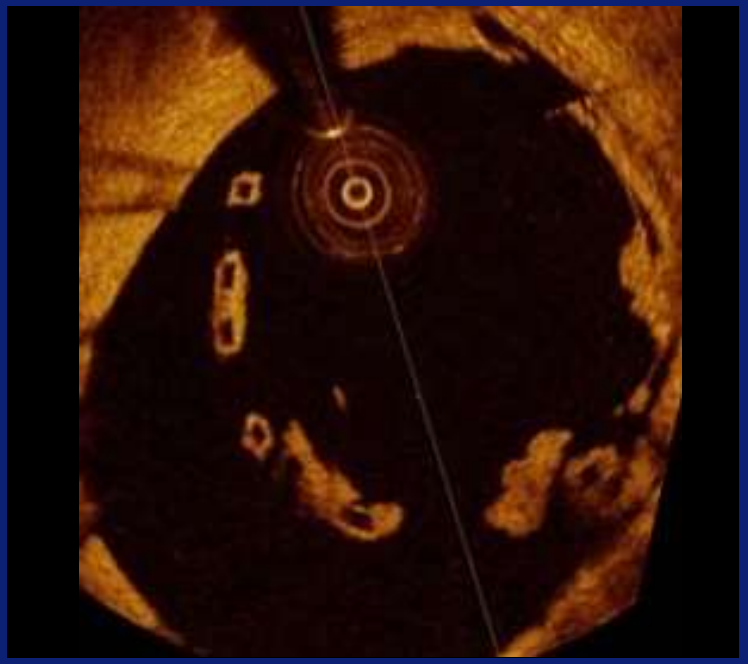

12M Follow-up

Onuma Y et al. J Am Coll Cardiol Intv 2014;7:1400-11.

Adequate BVS Sizing Is Crucial
Too Small Scaffold Diameter is Uncorrectable

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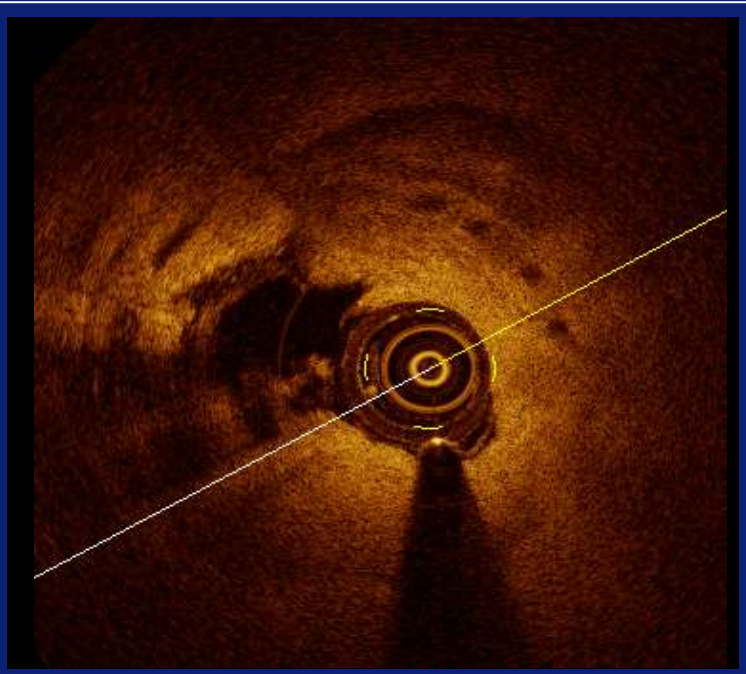
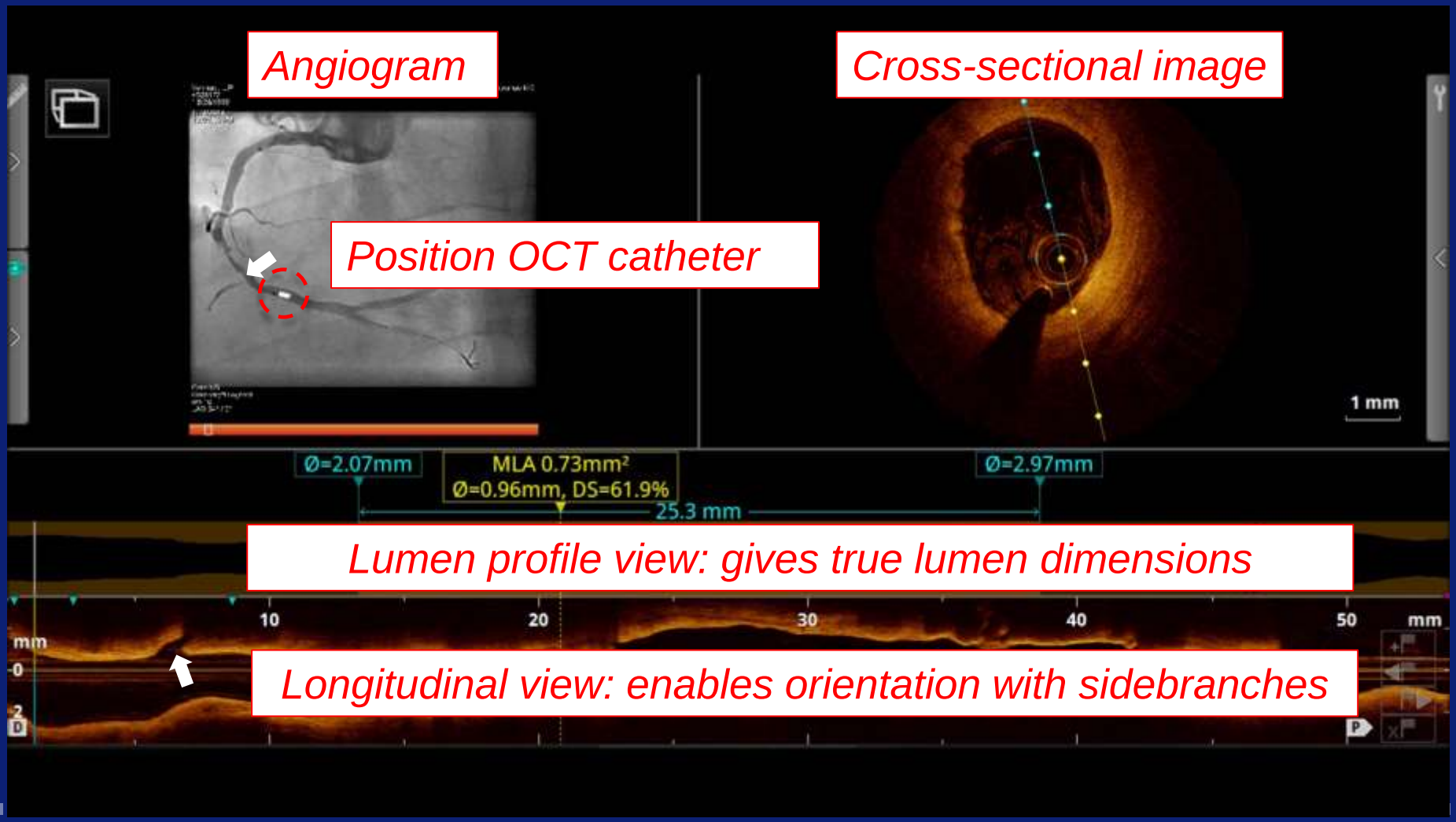


18M Follow-up

Onuma Y et al. J Am Coll Cardiol Intv 2014;7:1400-11.

A Solution ....

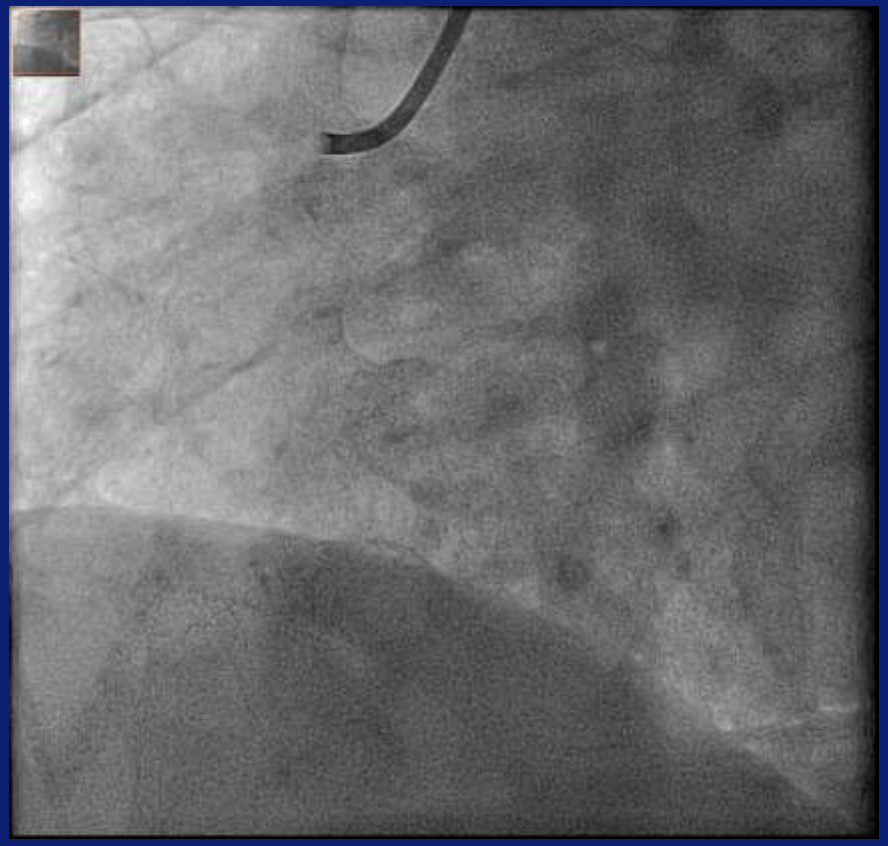
A Solution
OCT Can Provide All Coronary Key Dimensions



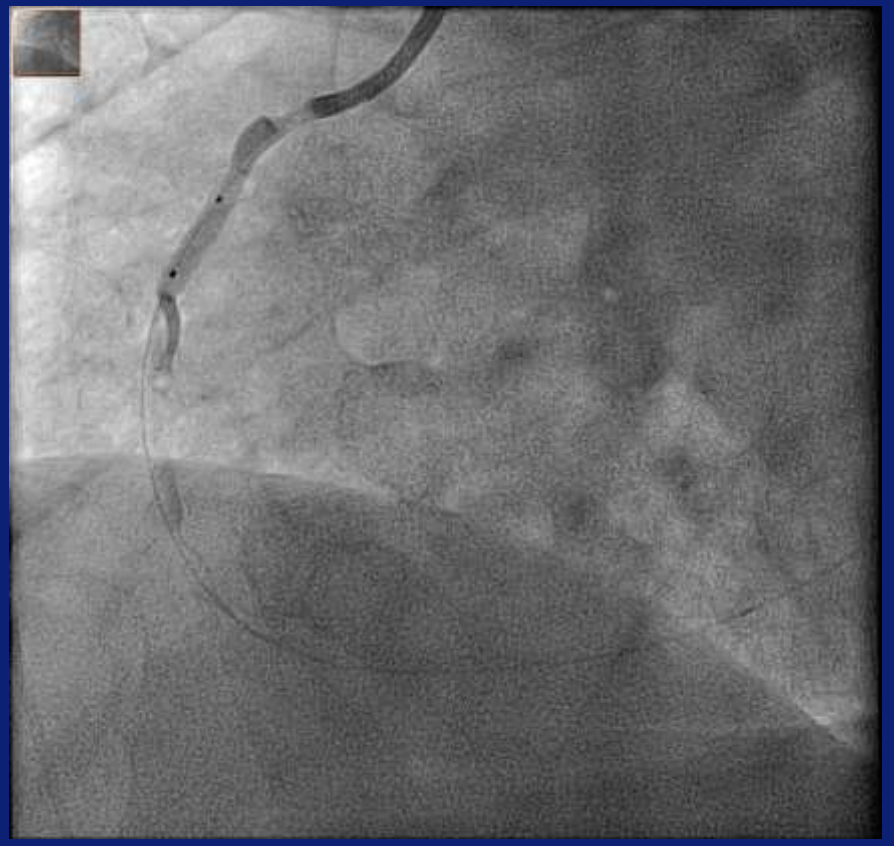
OCT To Guide BVS Implantation

Case Example

NSTEMI; 62 year old male, active smoker , medical history: CVA



Pre-interventional



Predilation with Sprinter 2.5x10 mm balloon

OCT To Guide BVS Implantation

Case Example

Pre-interve *inter*

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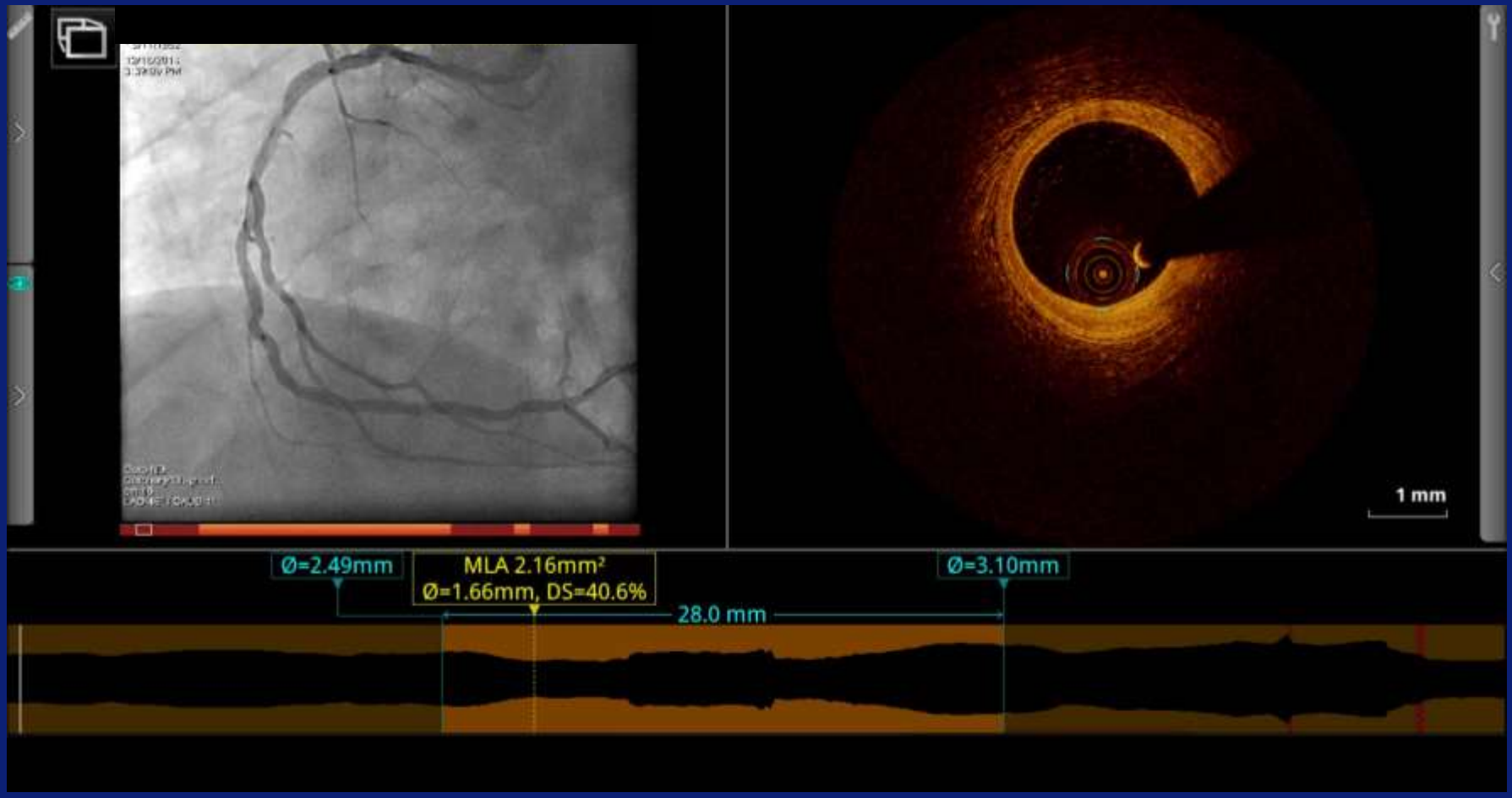
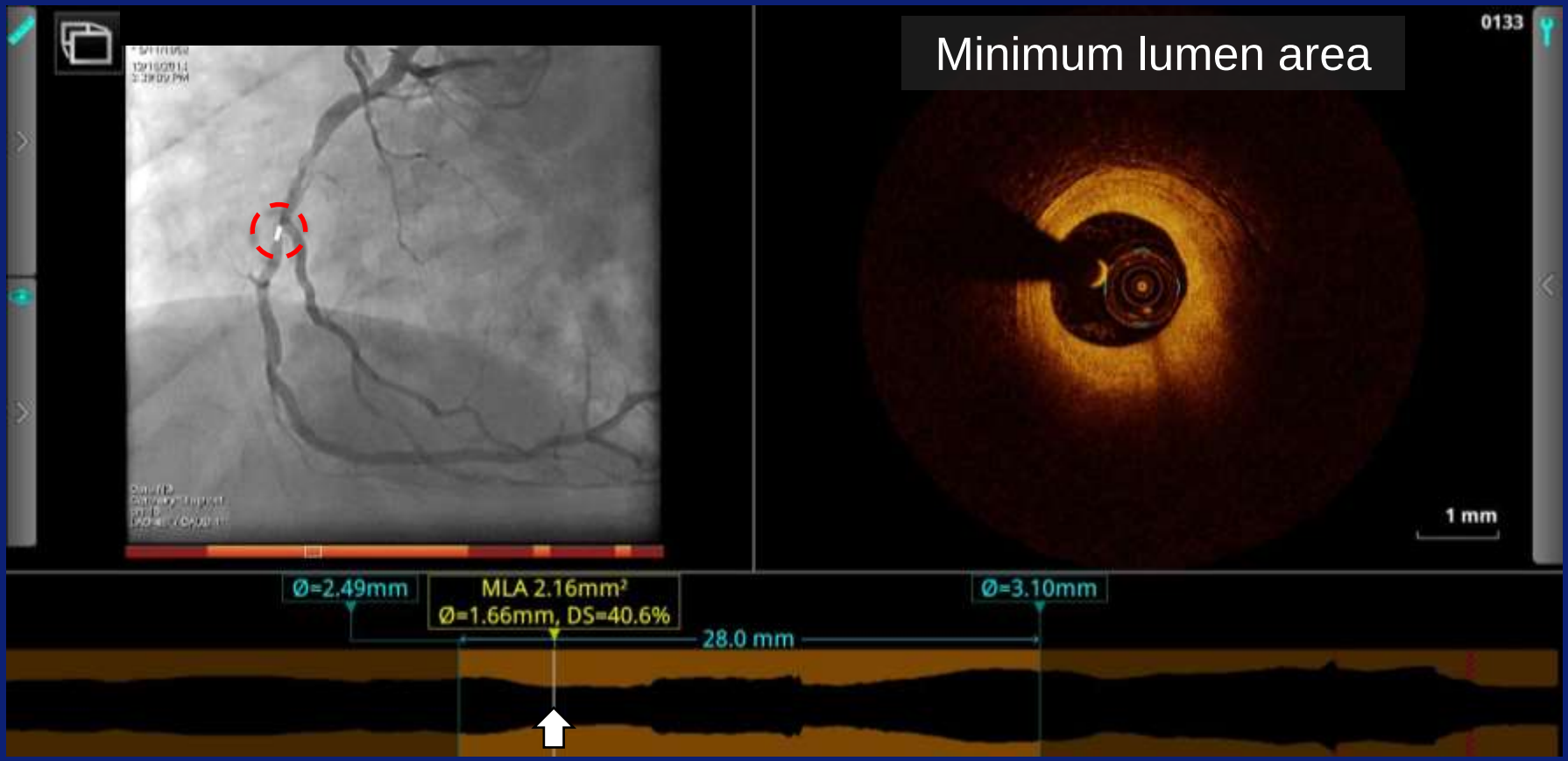
Case Example



Pullback 36mm/sec

OCT To Guide BVS Implantation

Case Example



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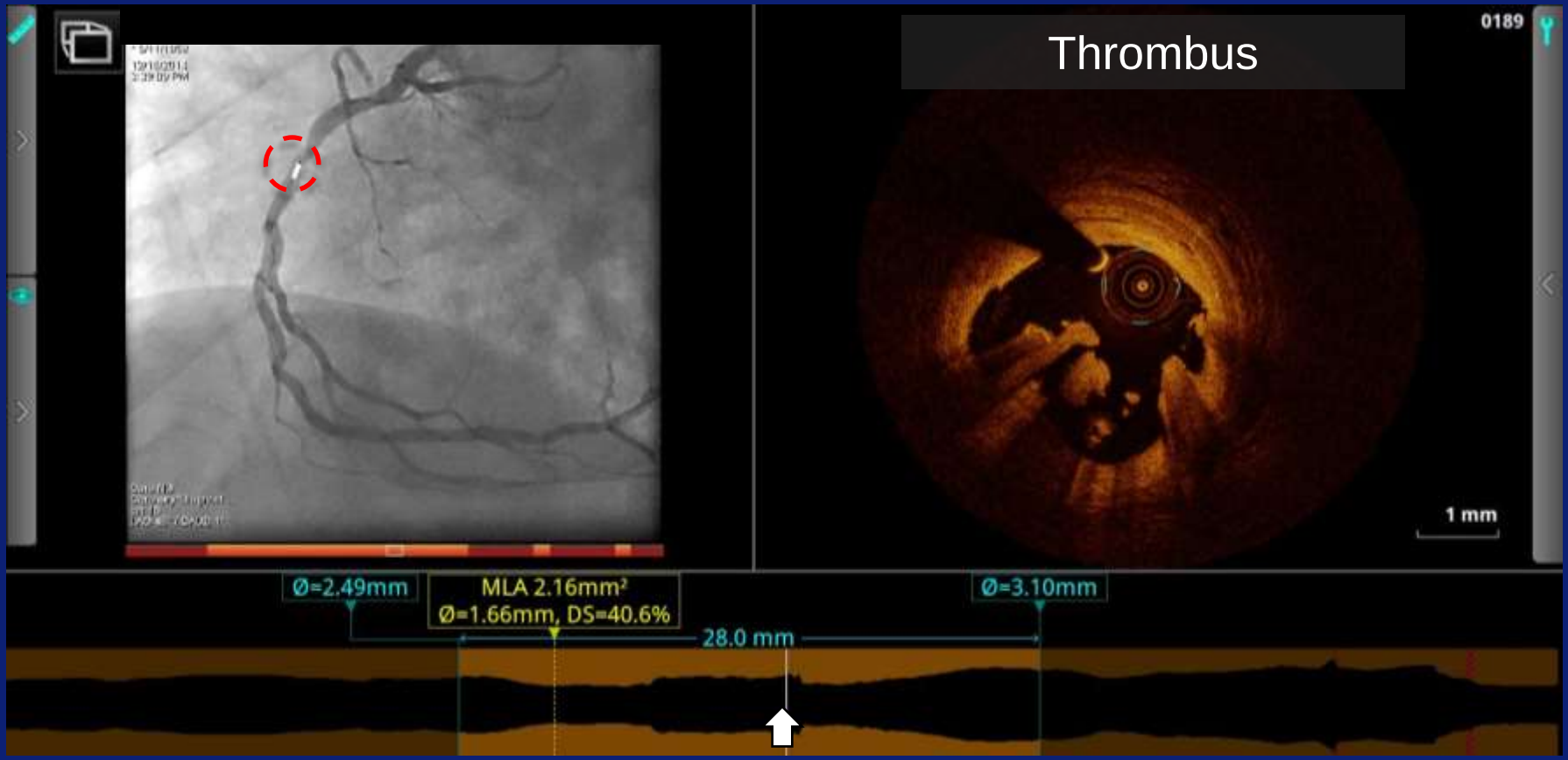
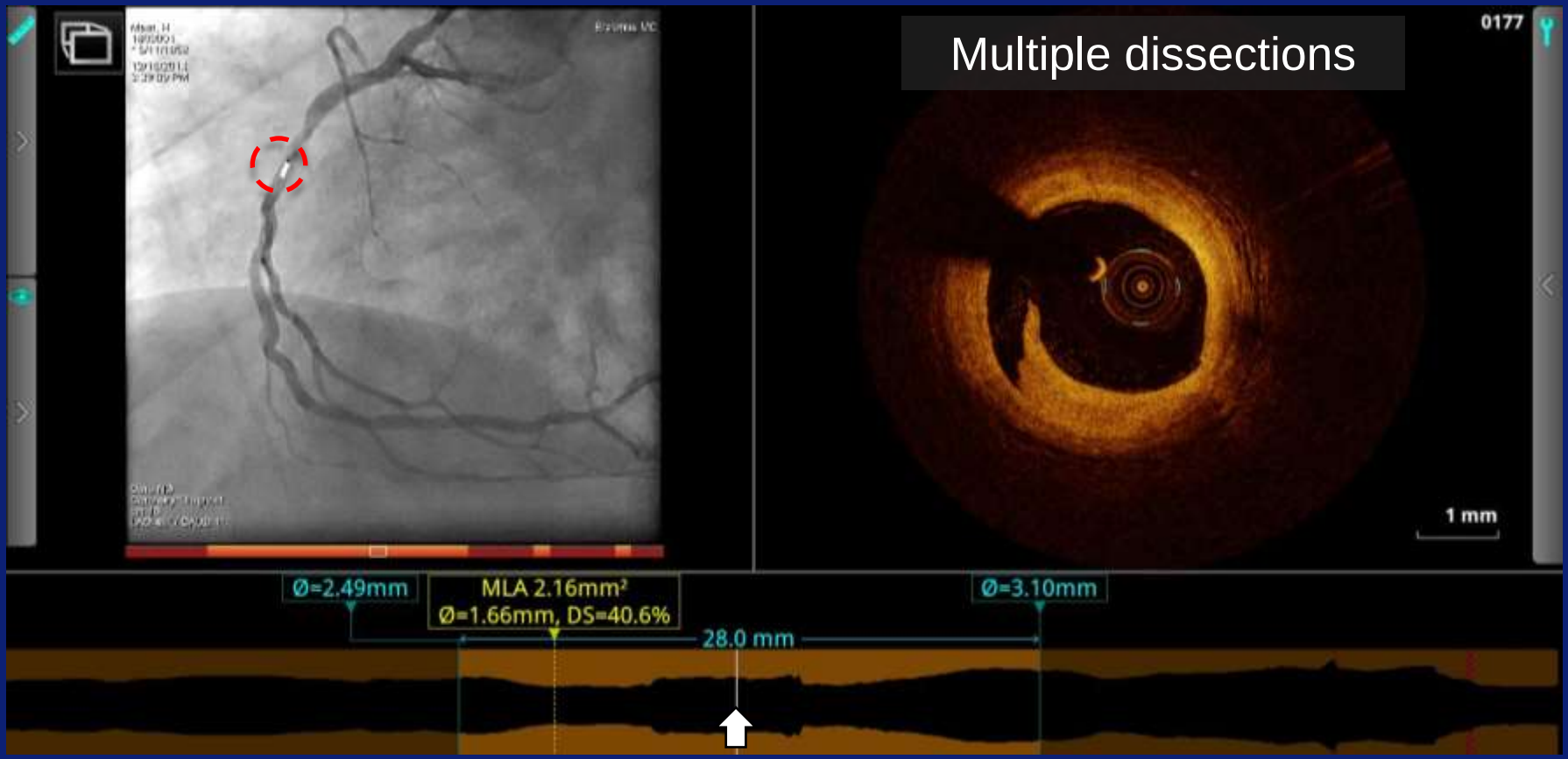
Case Example



OCT To Guide BVS Implantation

Case Example



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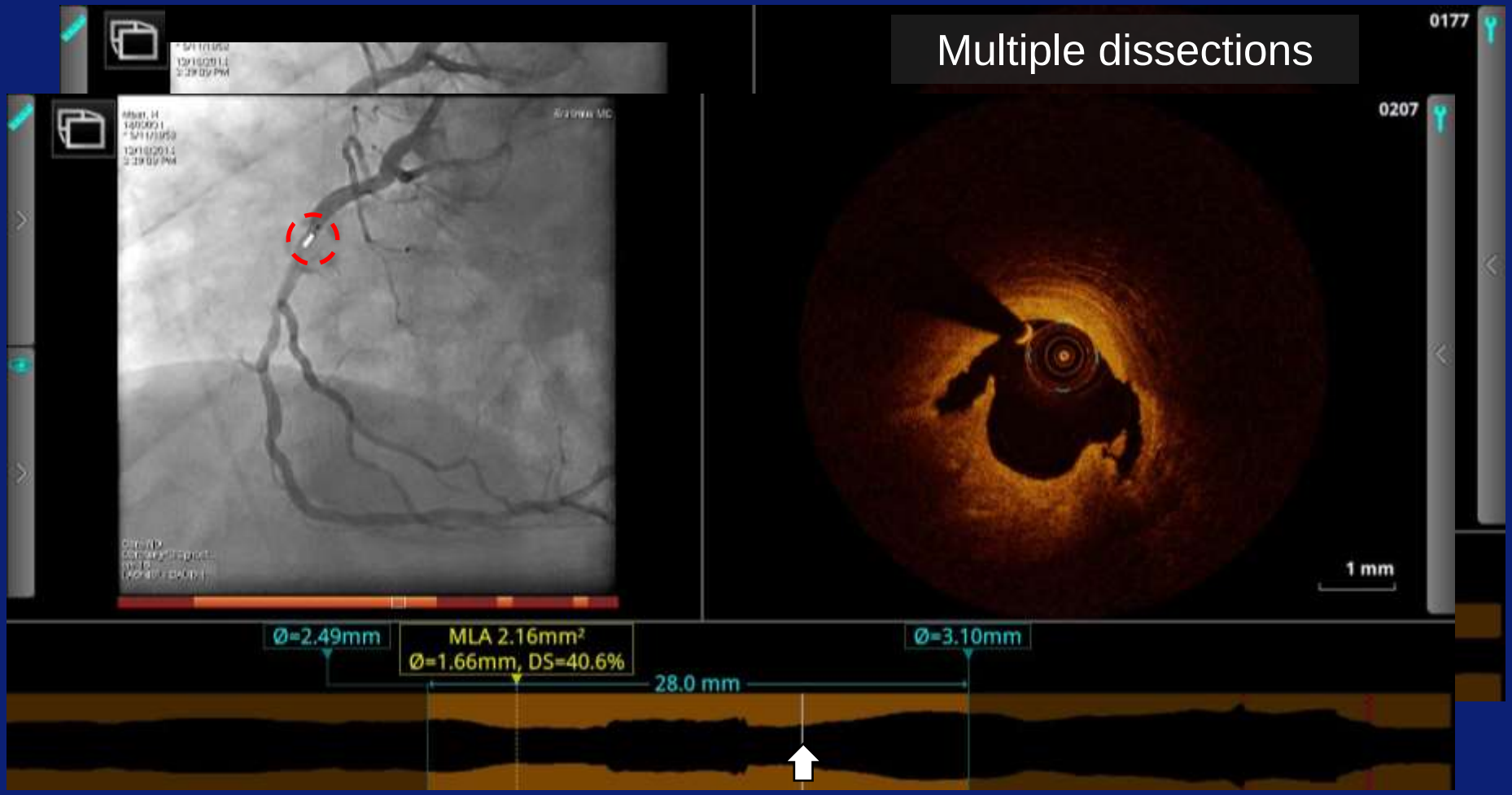
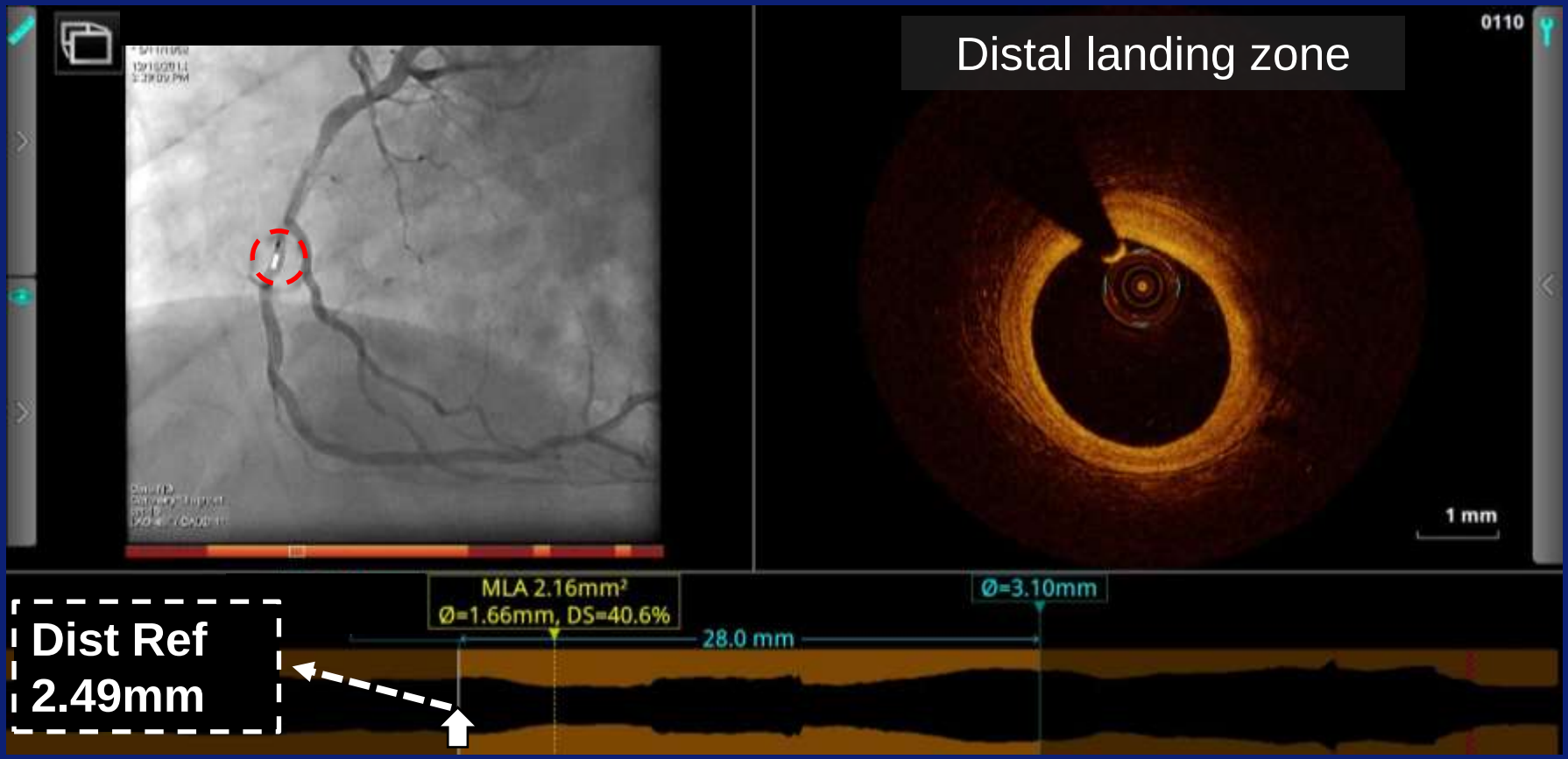
Case Example



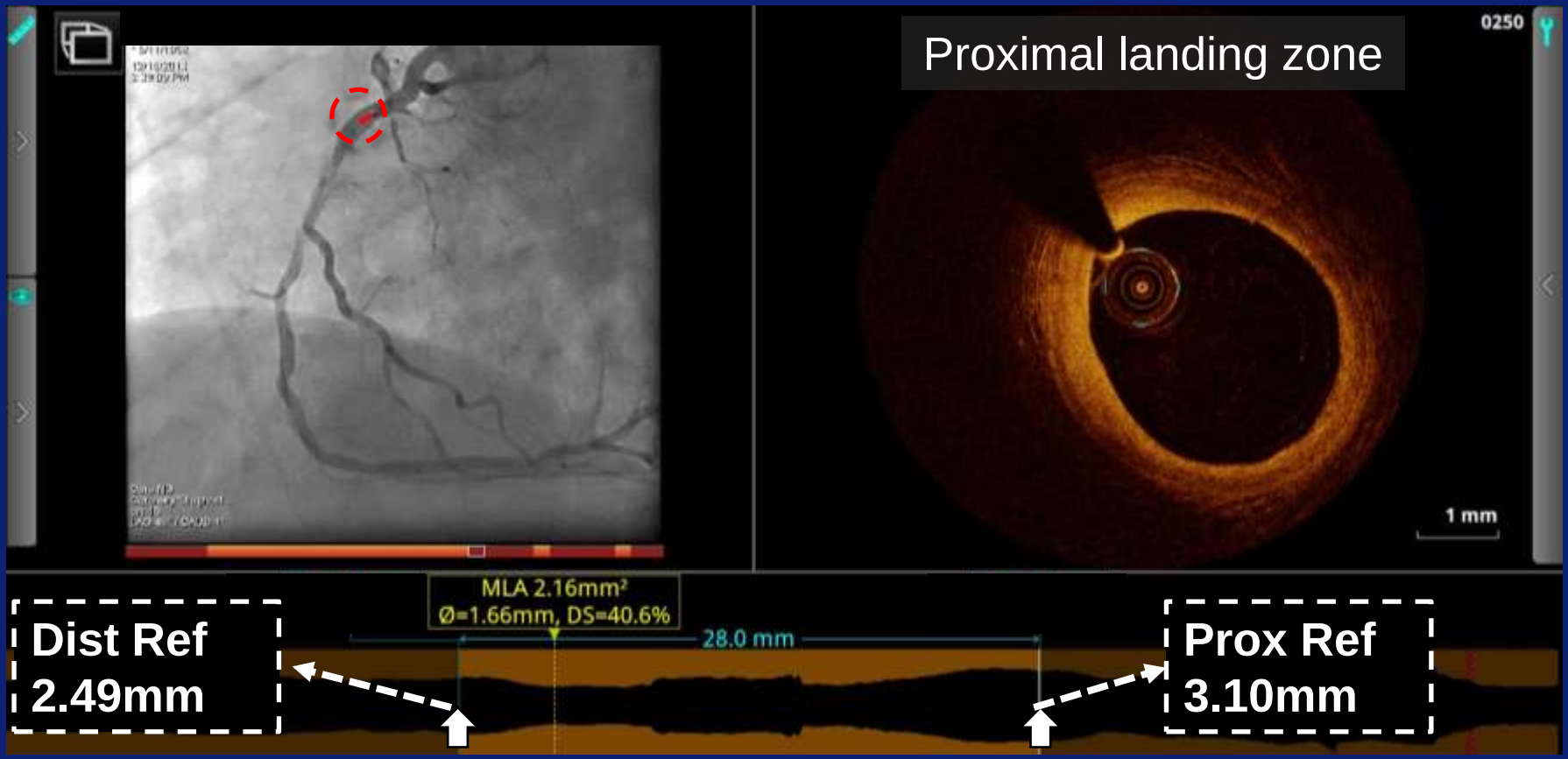
OCT To Guide BVS Implantation

Case Example



OCT To Guide BVS Implantation

Case Example



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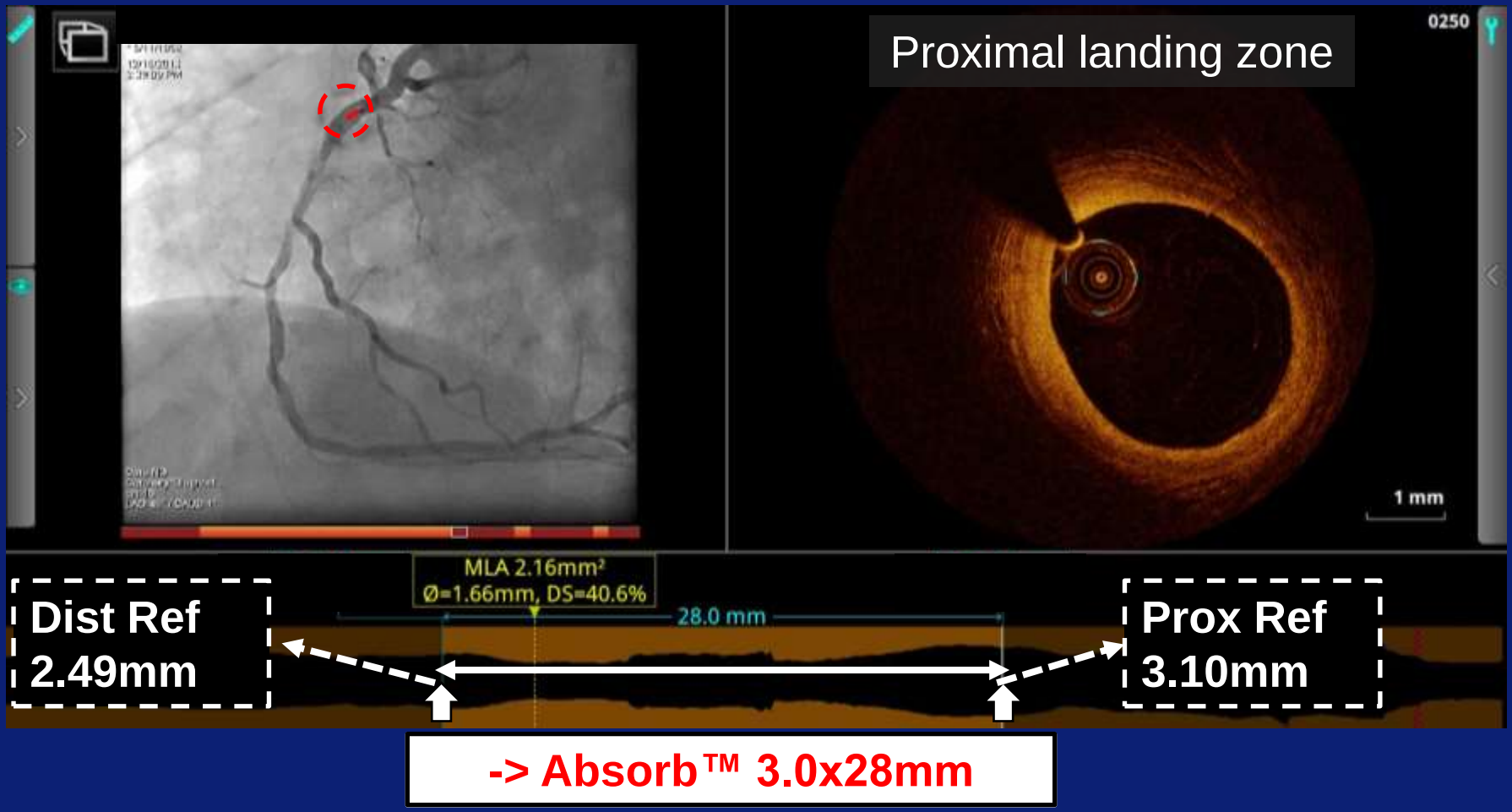
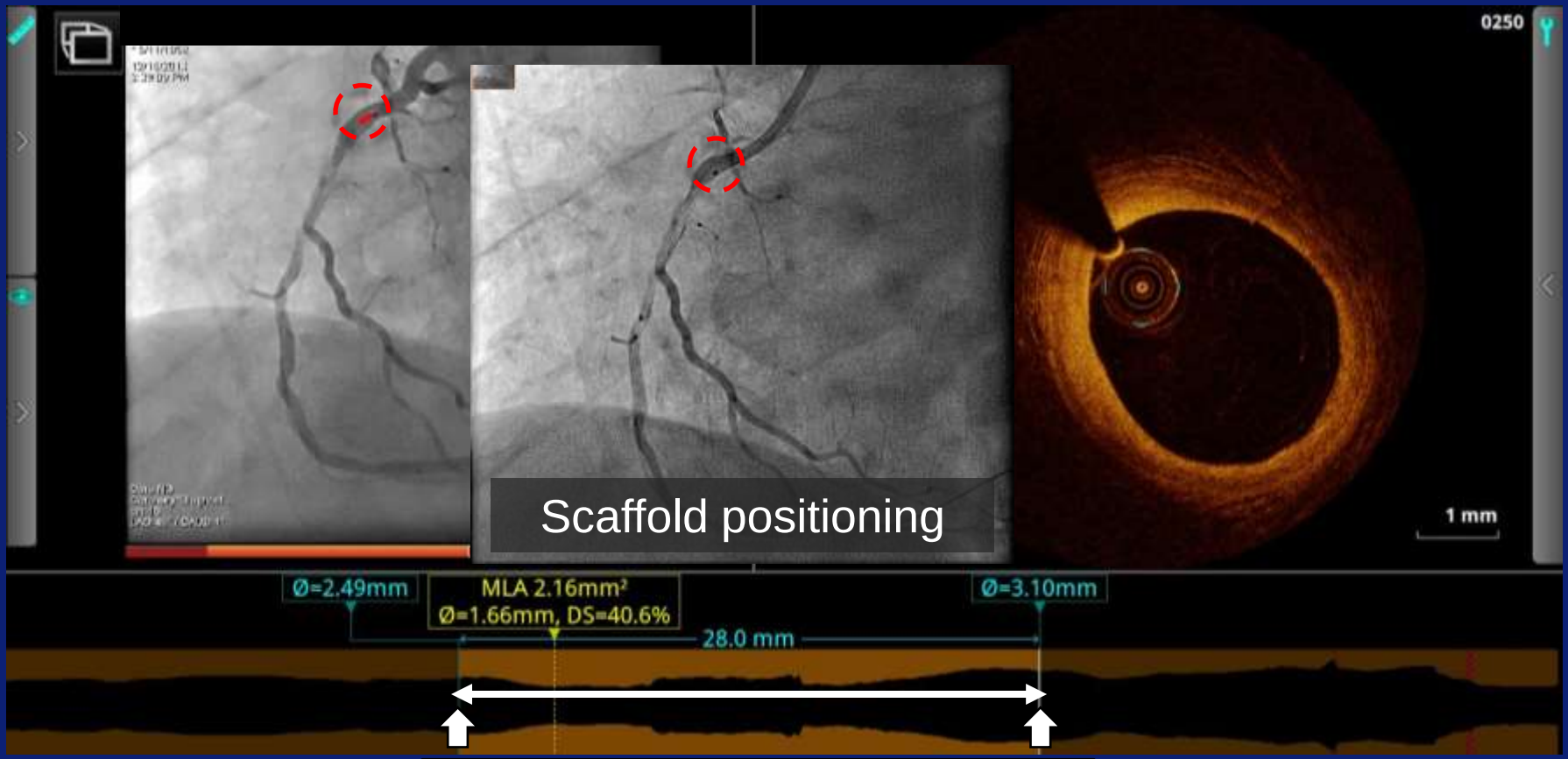
Case Example



OCT To Guide BVS Implantation

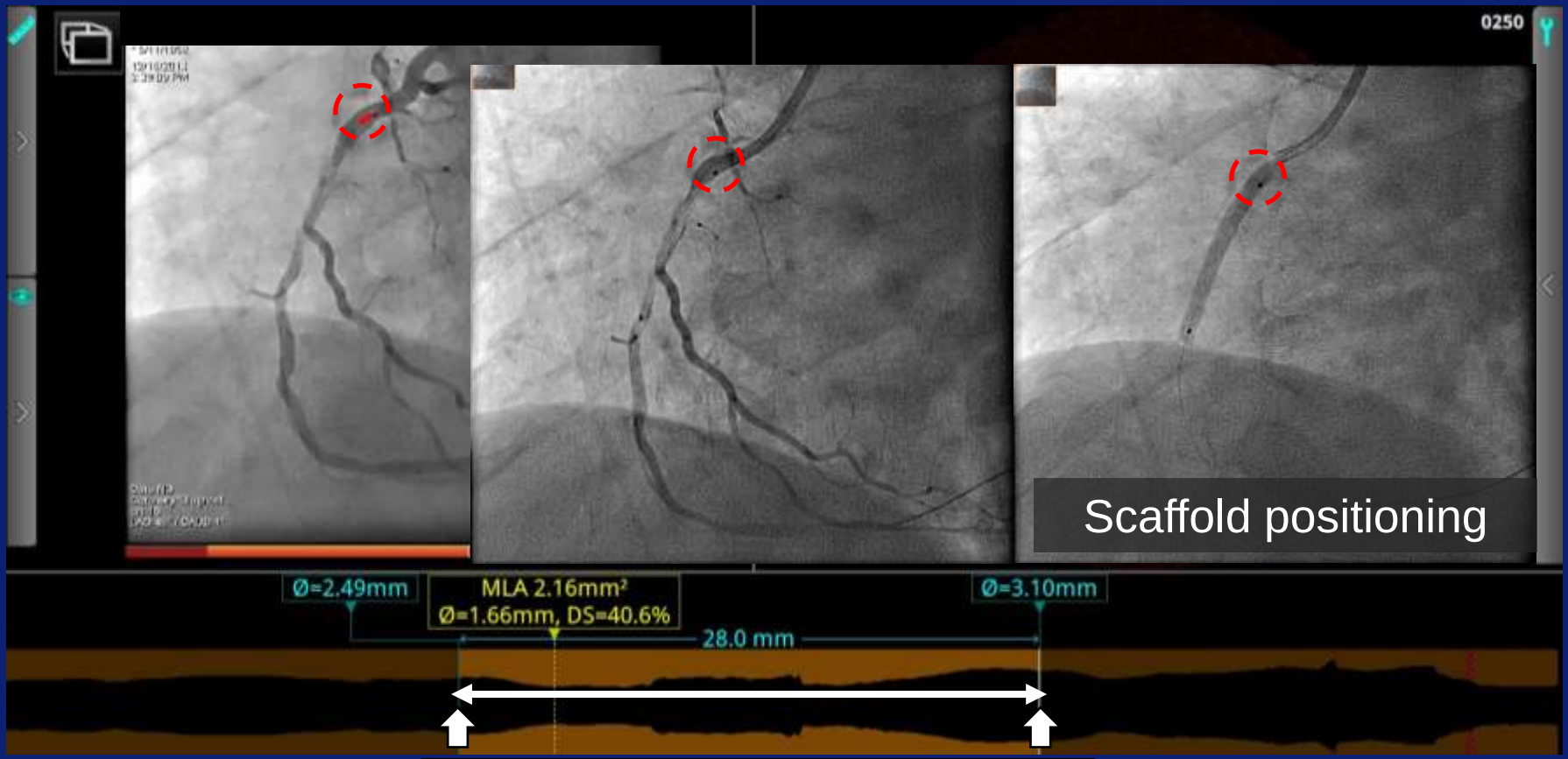
Case Example



-> Absorb™ 3.0x28mm

OCT To Guide BVS Implantation

Case Example



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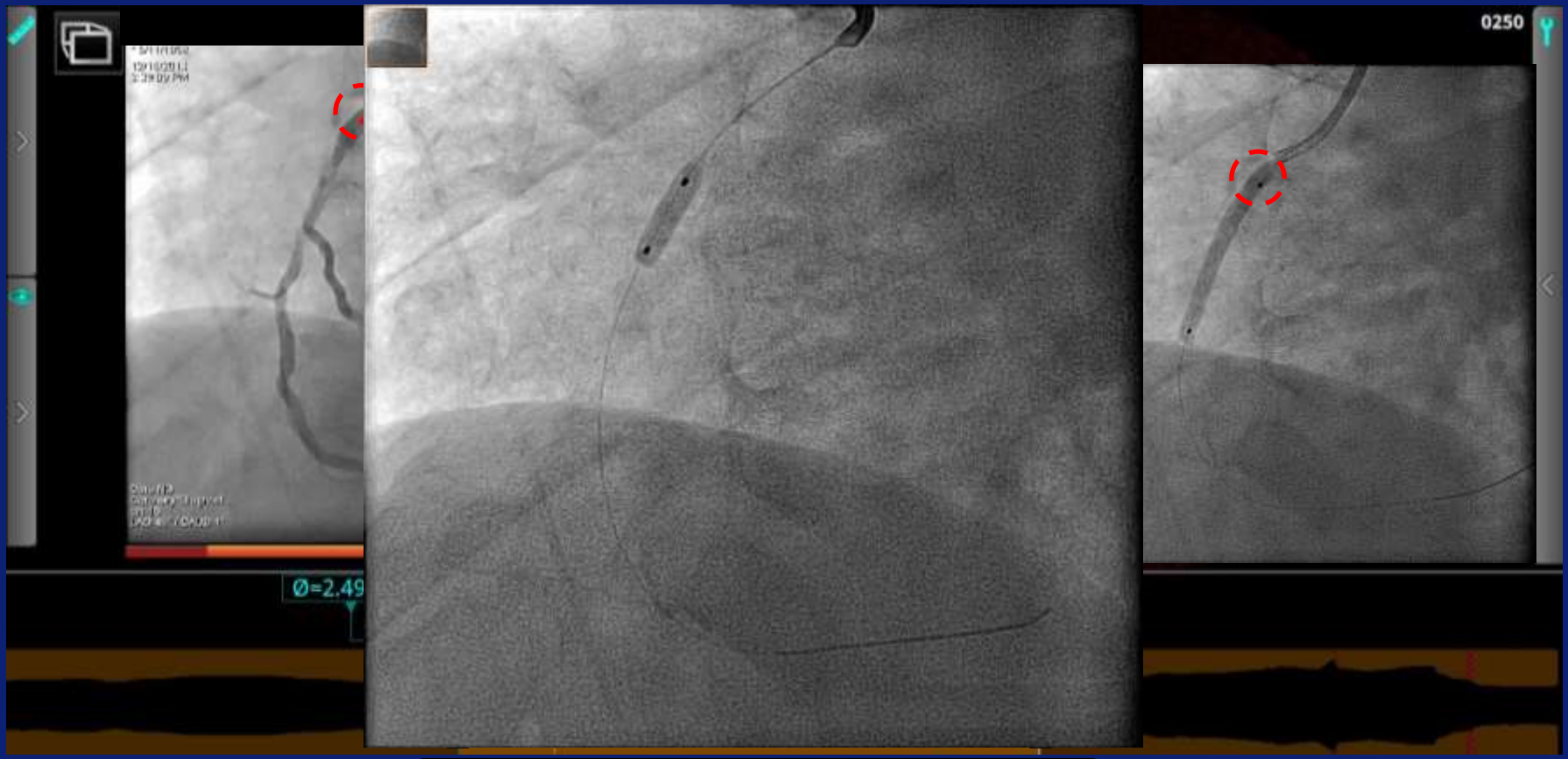
OCT To Guide BVS Implantation

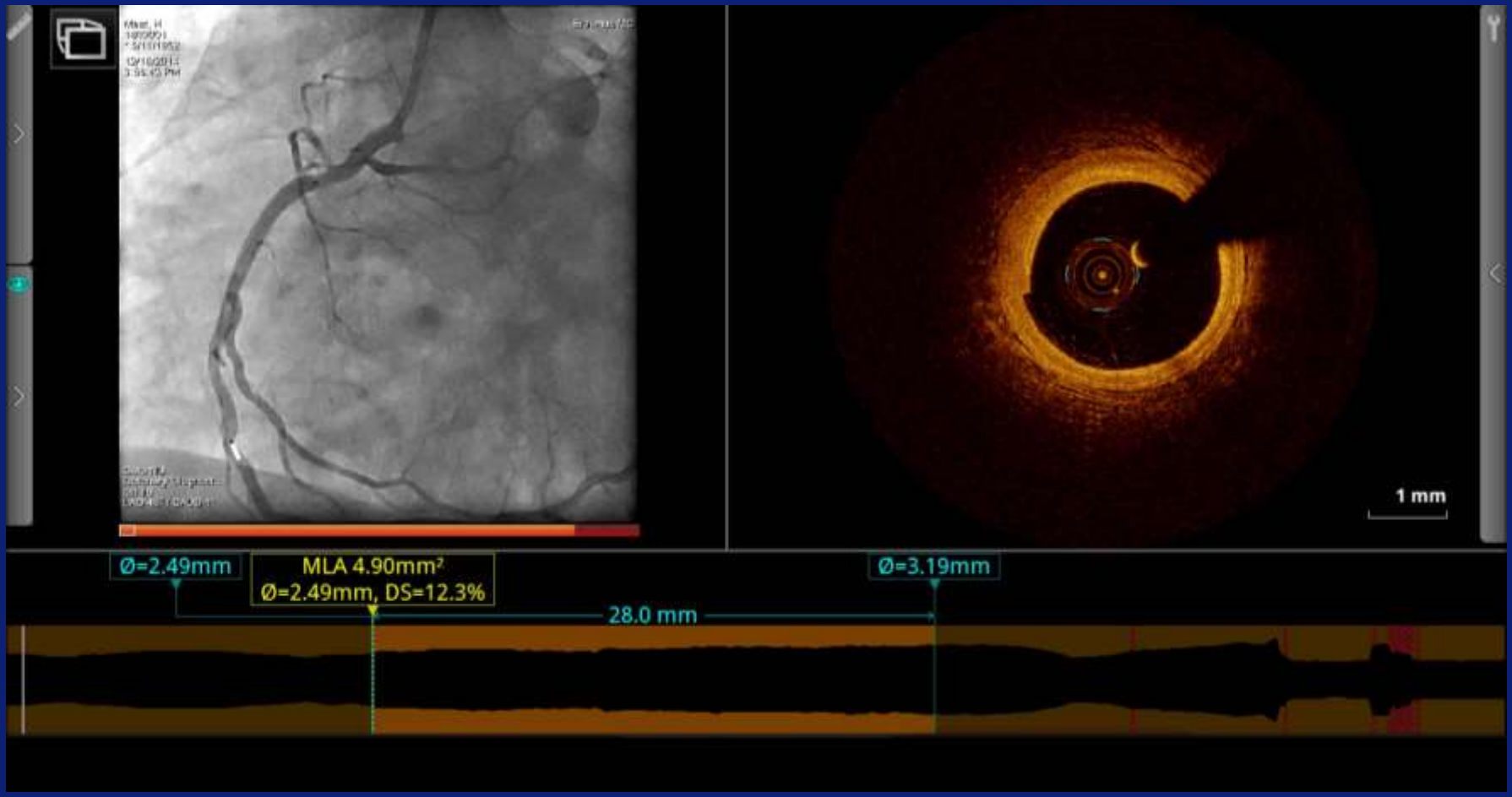
Case Example



Tapering

OCT To Guide BVS Implantation

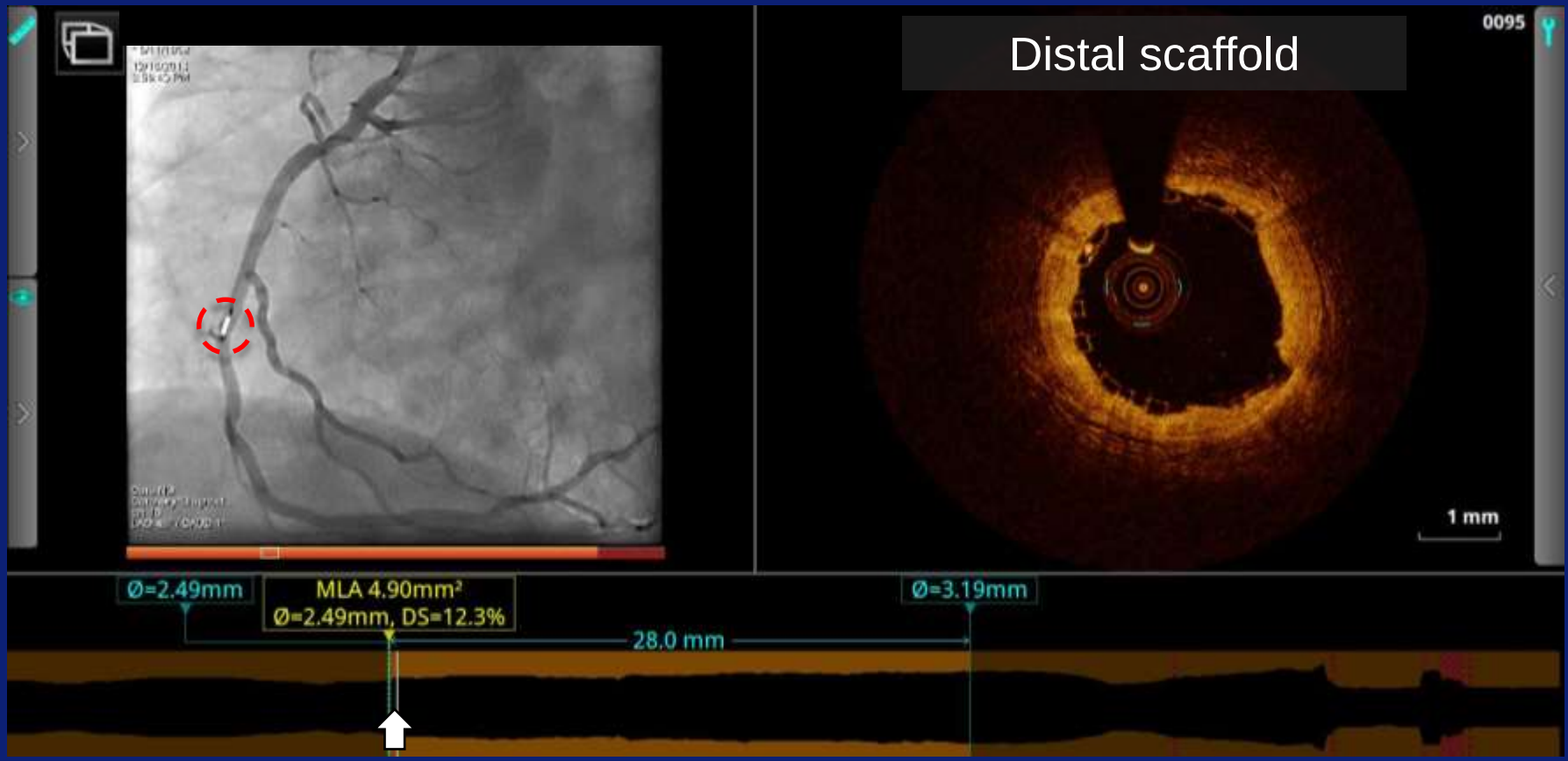
Case Example



Pullback 36mm/sec

OCT To Guide BVS Implantation

Case Example



OCT To Guide BVS Implantation

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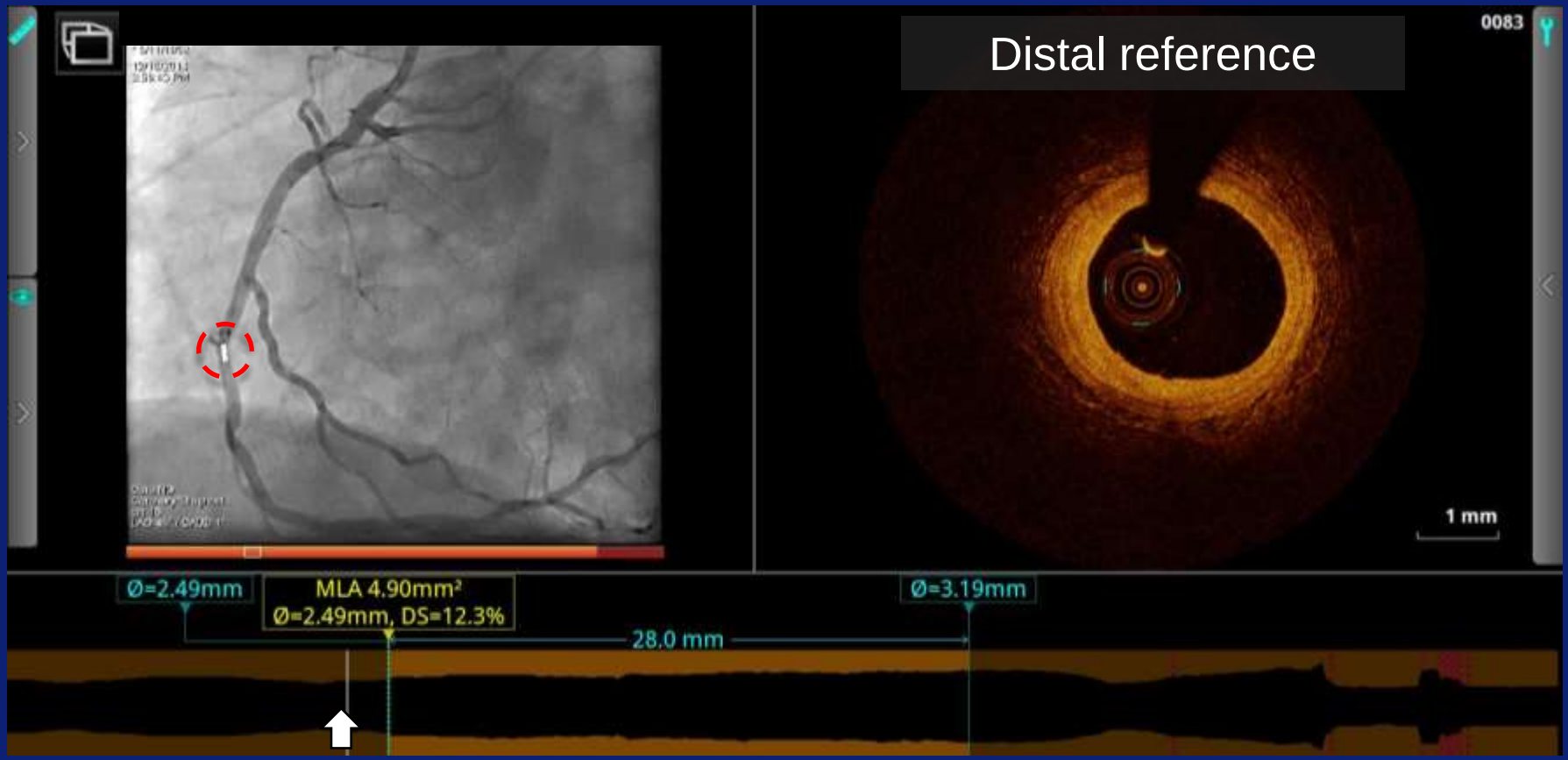

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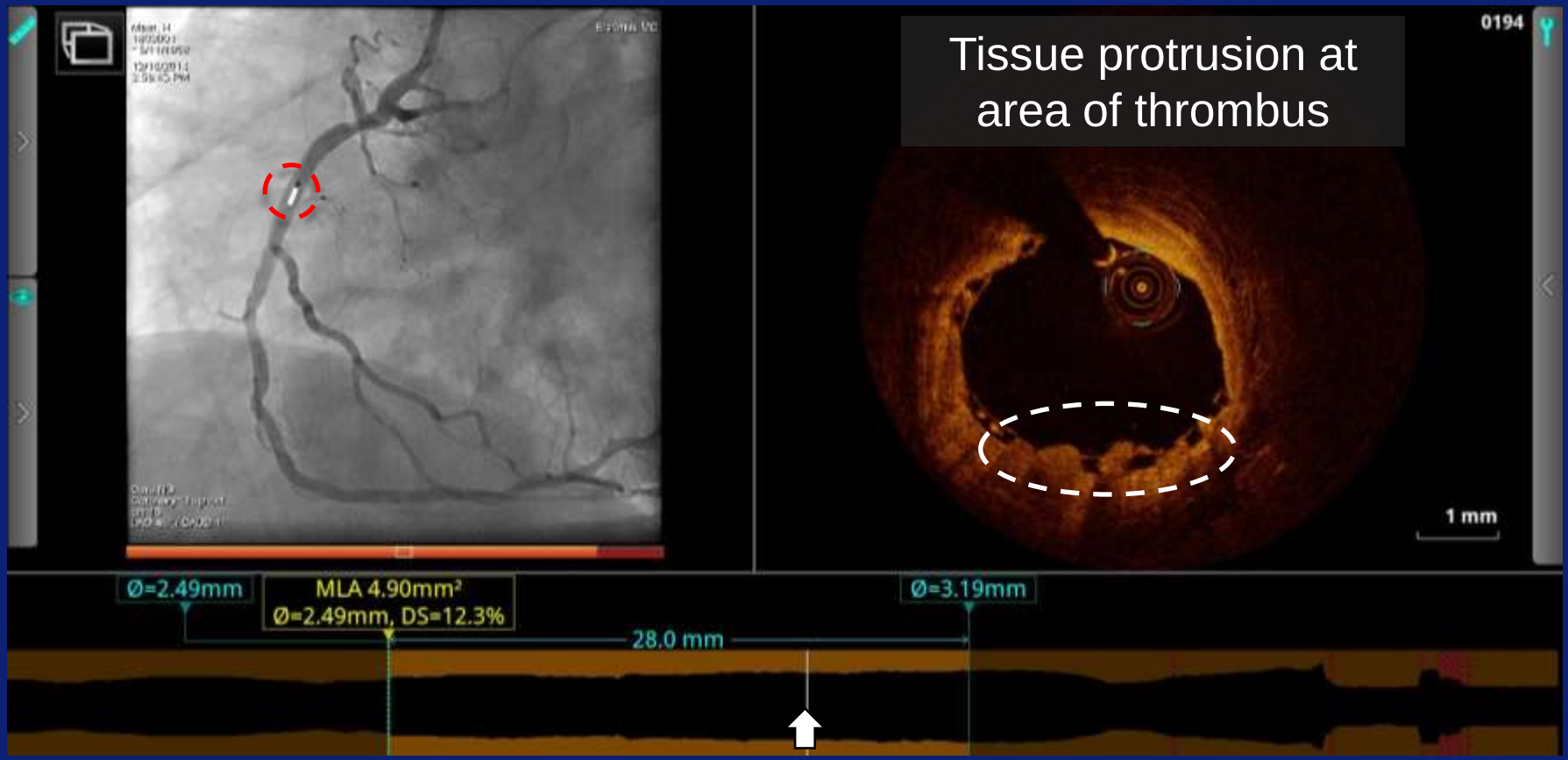
Case Example



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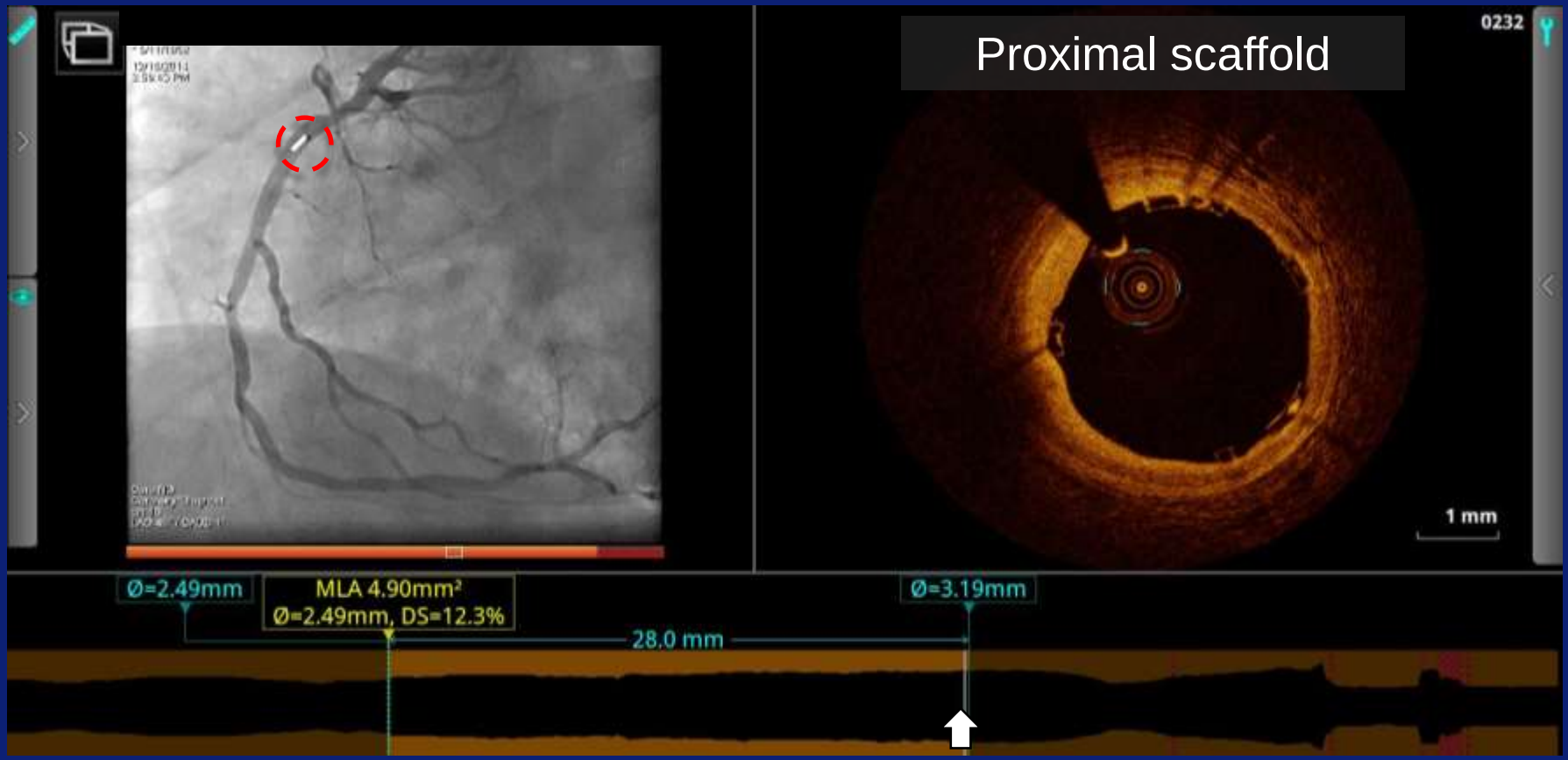
Case Example



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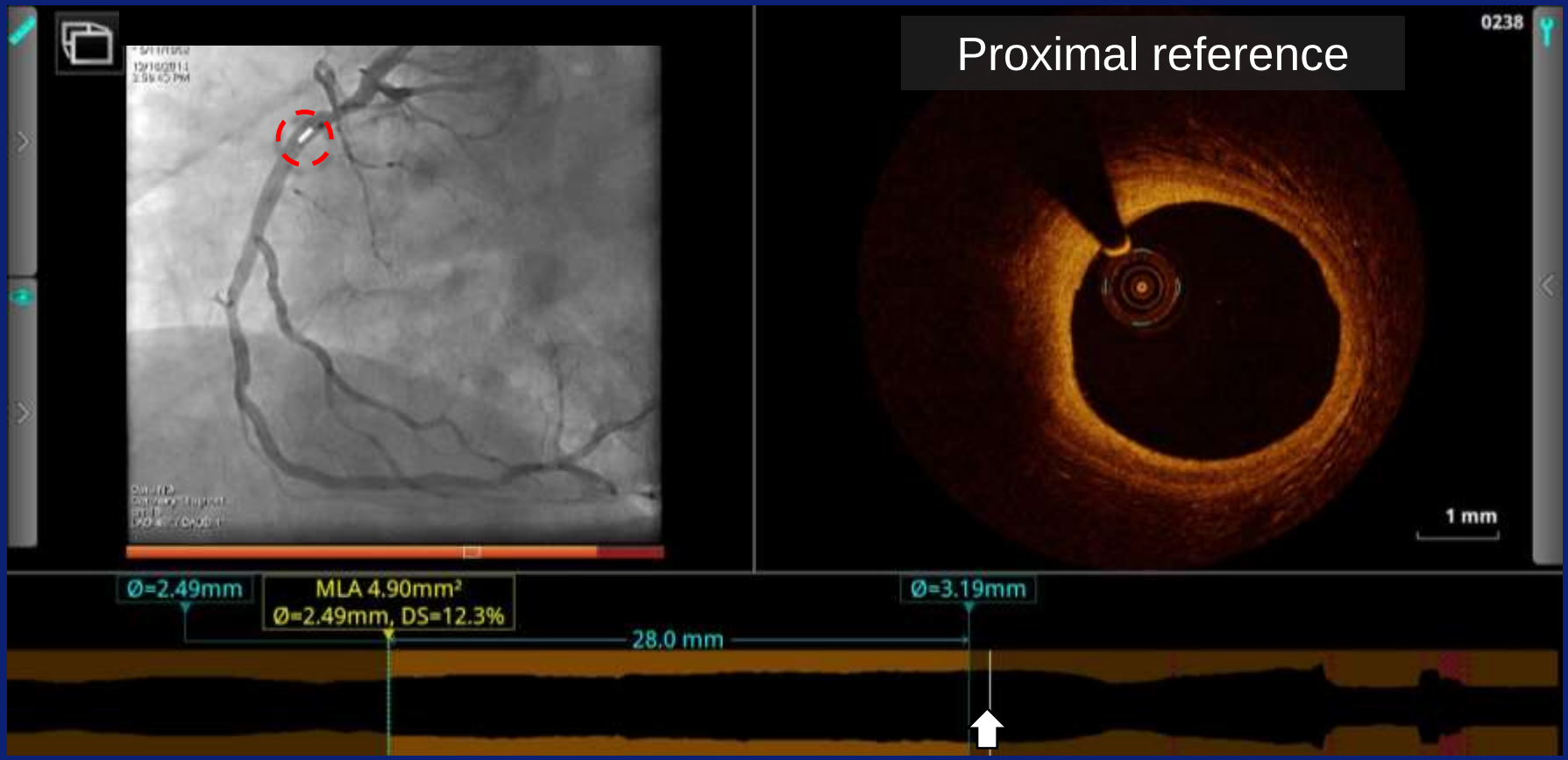


OCT Guidance Acts As Equalizer !

No Difference in Scaffold Expansion to Modern DES!

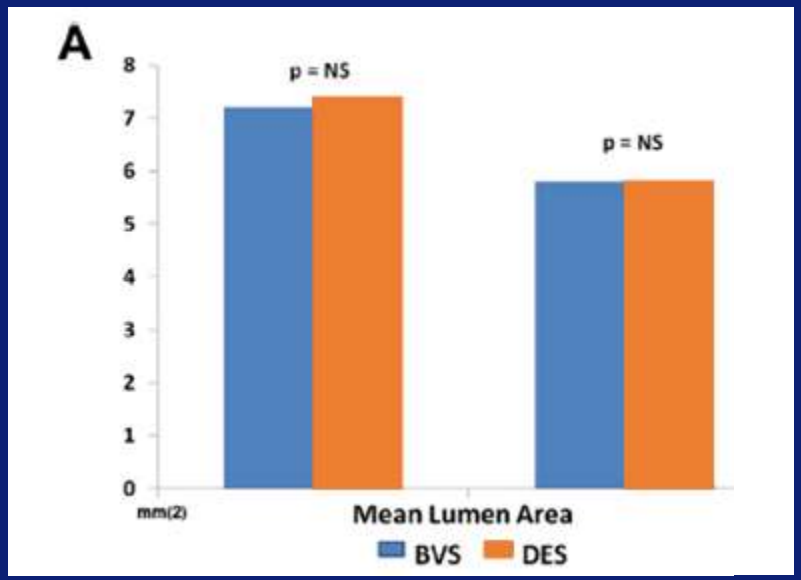
OCT Guidance Acts As Equalizer !

No Difference in Scaffold Expansion to Modern DES!

Comparison of ABSORB BVS with 2nd gen DES:

Similar post-procedure result: **Lumen Area**

Mean LA **Min LA**



BVS bioresorbable vascular scaffold
DES drug-eluting stent
MPS metallic platform stent


ABSORB Biodegradable Stents Versus Second-Generation Metal Stents

A Comparison Study of 100 Complex Lesions Treated Under OCT Guidance

OCT Guidance Acts As Equalizer !

No Difference in Scaffold Expansion to Modern DES!

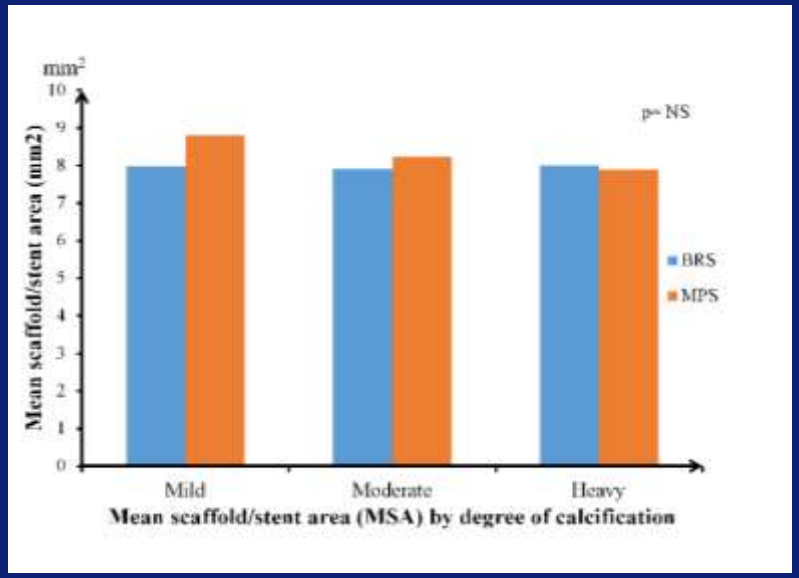
Comparison of ABSORB BVS with 2nd gen DES:

Similar post-procedure result: **Regardless of Calcification**

Mean Scaffold Area

across calcification strata

Mild Moderate Heavy



Fam et al. Presented at EuroPCR 2015

Imgaging-Guidance For BVS Implantation

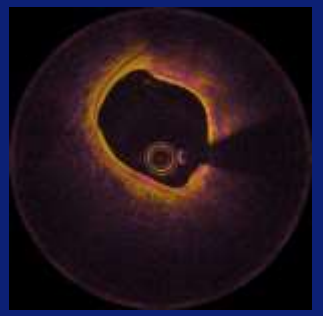
- Allows to overcome intrinsic limitations of angiography.
- Allows for optimal selection of BVS diameter, length & position.
- Assures acute results comparable to DES.

For potential treatment of vulnerable plaque (lipid-rich and/or TCFA) consider
- the risk of periprocedural myocardial injury
- the need for complete lesion coverage

Thank You For Your Attention!

PhD Students & Guest Researchers

A. Karanasos
J. van der Sijde
J.M. Fam
B. Zhang
N. van Ditzhuijsen



Interventional Cardiology

J. Ligthart
K. Witberg
R.J. van Geuns (BVS)
P. de Jaegere
N. van Mieghem
J.Daemen
R. Diletti
F. Zijlstra

Experimental Cardiology

H. van Beusekom

Hemodynamics Laboratory

J. Wentzel
F. Gijsen

Bioengineering

G. van Soest
A.F.W. van der Steen

Imaging Group

N. Bruining
K. Sihan