TCTAP 2024

Clinical Use of Intracoronary Imaging
Guidance and Optimization of Coronary Interventions

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Disclosure

Evelyn Regar serves as medical advisor for

- Zed-Medical Inc, Livermore, CA, USA
- Kaminari Medical BV, Rotterdam, The Netherlands

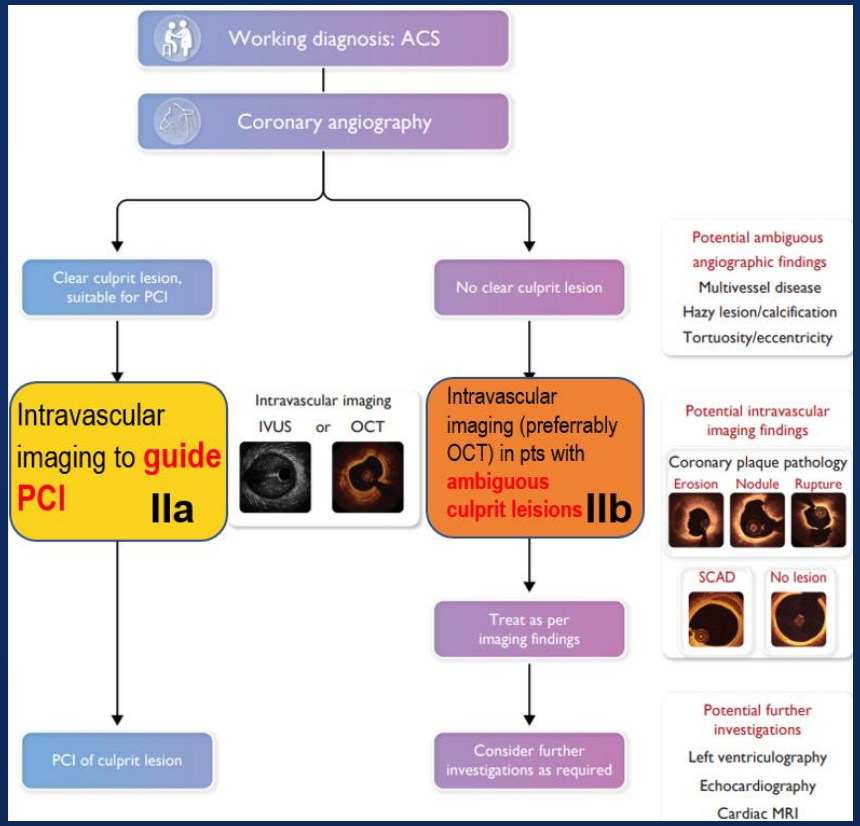
Clinical Use of Intracoronary Imaging
Current Guidelines: Moderate Class IIa Recommendations

10.3 Use of Intravascular Imaging

COR	LOE	RECOMMENDATIONS
2a	B-R	1. In patients undergoing coronary stent implantation, IVUS can be useful for procedural guidance, particularly in cases of left main or complex coronary artery stenting, to reduce ischemic events.
2a	B-R	2. In patients undergoing coronary stent implantation, OCT is a reasonable alternative to IVUS for procedural guidance, except in ostial left main disease.
2a	C-LD	3. In patients with stent failure, IVUS or OCT is reasonable to determine the mechanism of stent failure.

CLASS 2a (MODERATE) **Benefit >> Risk**

2021 ACC/AHA/SCAI Coronary Revascularization Guidelines

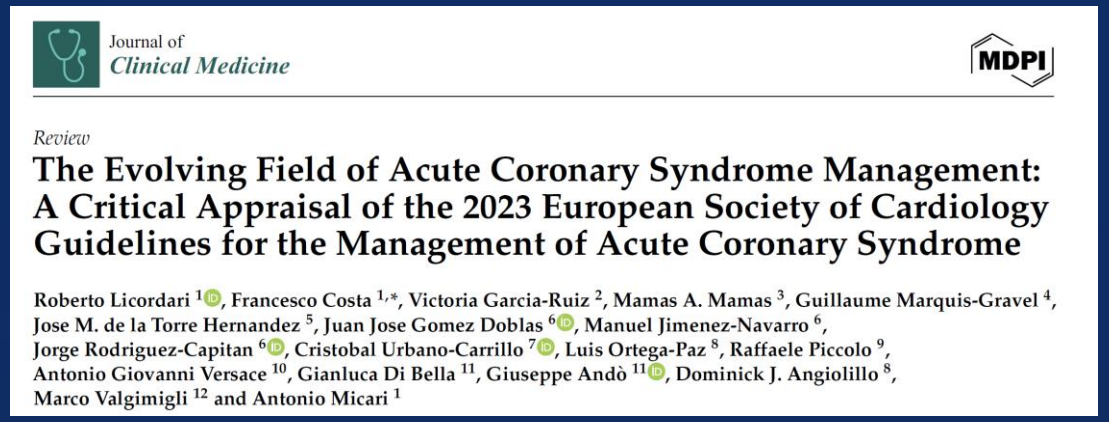


2023 ESC Guidelines for the management of ACS

Lawton et al. JACC 2022; 79 (2)

Byrne et al. EHJ 2023; 44

Clinical Use of Intracoronary Imaging
Updated Concepts 2024: Strong Recommendations



Journal of *Clinical Medicine*

MDPI

Review

The Evolving Field of Acute Coronary Syndrome Management: A Critical Appraisal of the 2023 European Society of Cardiology Guidelines for the Management of Acute Coronary Syndrome

Roberto Licordari [1], Francesco Costa [1,*], Victoria Garcia-Ruiz [2], Mamas A. Mamas [3], Guillaume Marquis-Gravel [4], Jose M. de la Torre Hernandez [5], Juan Jose Gomez Doblas [6], Manuel Jimenez-Navarro [6], Jorge Rodriguez-Capitan [6], Cristobal Urbano-Carrillo [7], Luis Ortega-Paz [8], Raffaele Piccolo [9], Antonio Giovanni Versace [10], Gianluca Di Bella [11], Giuseppe Andò [11], Dominick J. Angiolillo [8], Marco Valgimigli [12] and Antonio Micari [1]

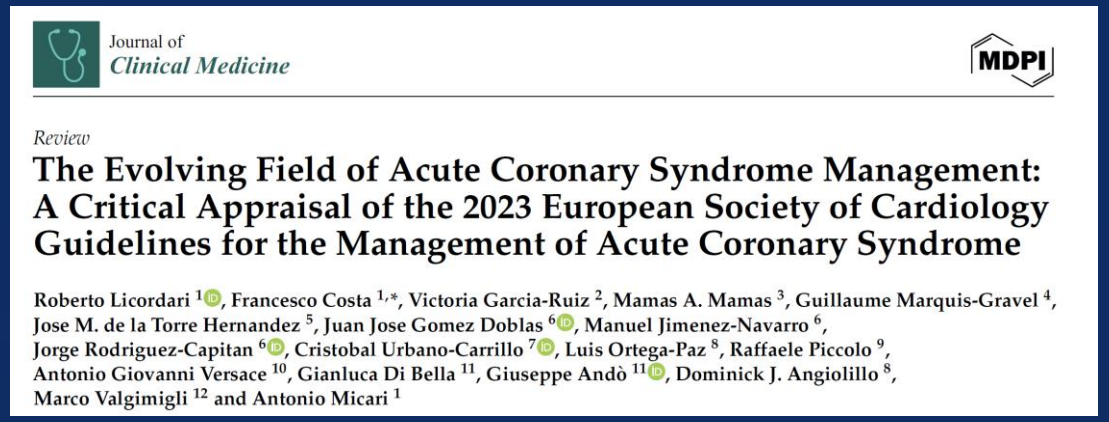
Licordari R et al. J. Clin. Med. 2024, 13, 1885

"In fact, given the **abundance of data** from multiple randomized controlled trials and meta-analyses **supporting better clinical outcomes with imaging-guided PCI**, especially through IVUS, **we believe that not providing a higher class of recommendation for this strategy** might be considered as a

missed opportunity

in this document"

Clinical Use of Intracoronary Imaging
Updated Concepts 2024: Strong Recommendations



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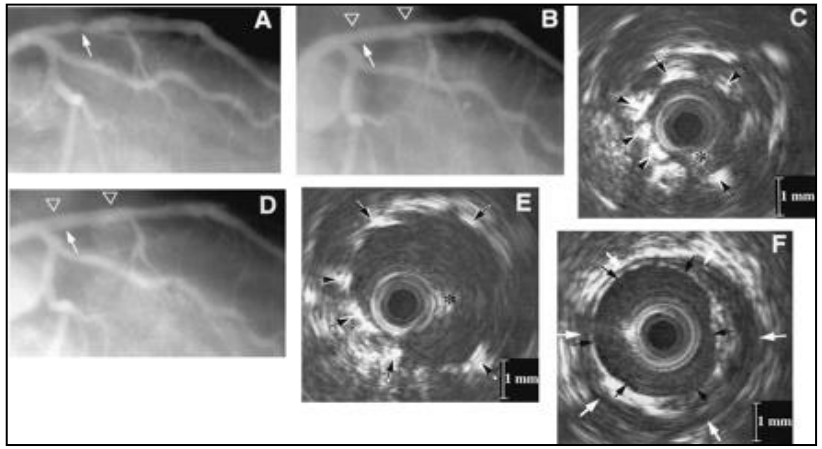
Licordari R et al. J. Clin. Med. 2024, 13, 1885

"As such, **it is time** for the scientific community **to acknowledge** and embrace the consistent and **convincing evidence favoring the routine use of intracoronary imaging**"

Clinical Use of Intracoronary Imaging
Updated Concepts 2024: Evidence & 30 Years of Experience!

The Italian Way

Intracoronary Stenting Without Anticoagulation Accomplished With Intravascular Ultrasound Guidance



Colombo A et al. Circulation. 1995

Stent Expansion

Clinical Use of Intracoronary Imaging
Updated Concepts 2024: Evidence & 30 Years of Experience!

The Italian Way

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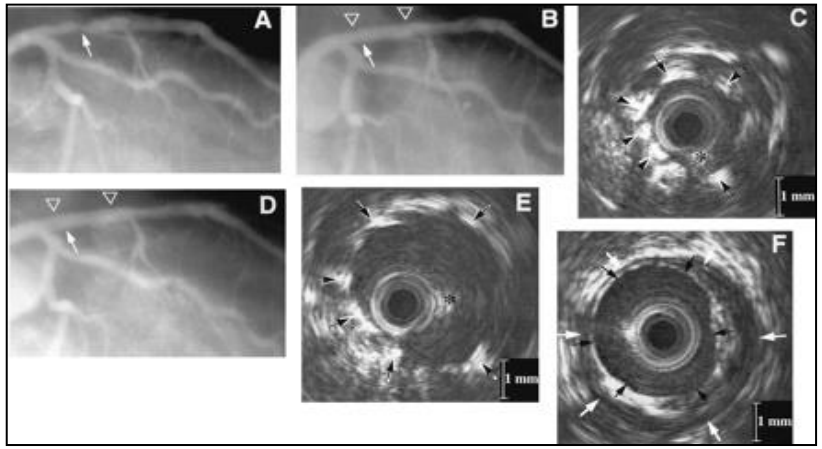


Colombo A et al. Circulation. 1995

Stent Expansion

Clearly defined goal:

Optimal flow conditions through the vessel

- **Optimal stent expansion**
- **Optimal stent position**
- **No residual vessel damage**

Clinical Use of Intracoronary Imaging
Updated Concepts 2024: Evidence & 30 Years of Experience!

IMPROVE Trial

The IMPact on Revascularization Outcomes of intraVascular ultrasound-guided treatment of complex lesions and Economic impact (IMPROVE) trial: Study design and rationale

Evan Shlofmitz, DO,[a] Rebecca Torguson, MPH,[a] Gary S. Mintz, MD,[a] Cheng Zhang, PhD,[a] Andrew Sharp, MD,[b] John McB. Hodgson, MD,[c] Binita Shah, MD,[d] Gautam Kumar, MD,[c] Jasvindar Singh, MD,[f] Becky Inderbitzen, MSE,[g] William S. Weintraub, MD,[a] Hector M. Garcia-Garcia, MD, PhD,[a] Carlo Di Mario, MD,[h] and Ron Waksman, MD[a] *DC, OH, NY, GA, MO, USA; Cardiff, United Kingdom; Amsterdam, Netherlands; and Florence, Italy*

Intravascular ultrasound (IVUS)–guided percutaneous coronary intervention (PCI) has been shown in clinical trials, registries, and meta-analyses to reduce recurrent major adverse cardiovascular events after PCI. However, IVUS utilization remains low. An increasing number of high-risk or complex coronary artery lesions are treated with PCI, and we hypothesize that the impact of IVUS in guiding treatment of these complex lesions will be of increased importance in reducing major adverse cardiovascular events while remaining cost-effective. The "IMPact on Revascularization Outcomes of intraVascular ultrasound-guided treatment of complex lesions and Economic impact" trial (registered on clinicaltrials.gov: NCT04221815) is a multicenter, international, clinical trial randomizing subjects to IVUS-guided versus angiography-guided PCI in a 1:1 ratio. Patients undergoing PCI involving a complex lesion are eligible for enrollment. *Complex lesion* is defined as involving at least 1 of the following characteristics: chronic total occlusion, in-stent restenosis, severe coronary artery calcification, long lesion (≥28 mm), or bifurcation lesion. The clinical investigation will be conducted at approximately 120 centers in North America and Europe, enrolling approximately 2,500 to 3,100 randomized subjects with an adaptive design. The primary clinical end point is the rate of *target vessel failure* at 12 months, defined as the composite of cardiac death, target vessel–related myocardial infarction, and ischemia-driven target vessel revascularization. The co-primary imaging end point is the final post-PCI minimum stent area assessed by IVUS. The primary objective of this study is to assess the impact of IVUS guidance on the PCI treatment of complex lesions. (Am Heart J 2020;228:65-71.)

Shlofmitz E et al. Am Heart J 2020, 228, 65-71

Optimal Stent Deployment is achieved

if on final IVUS the following 3 criteria have been met:

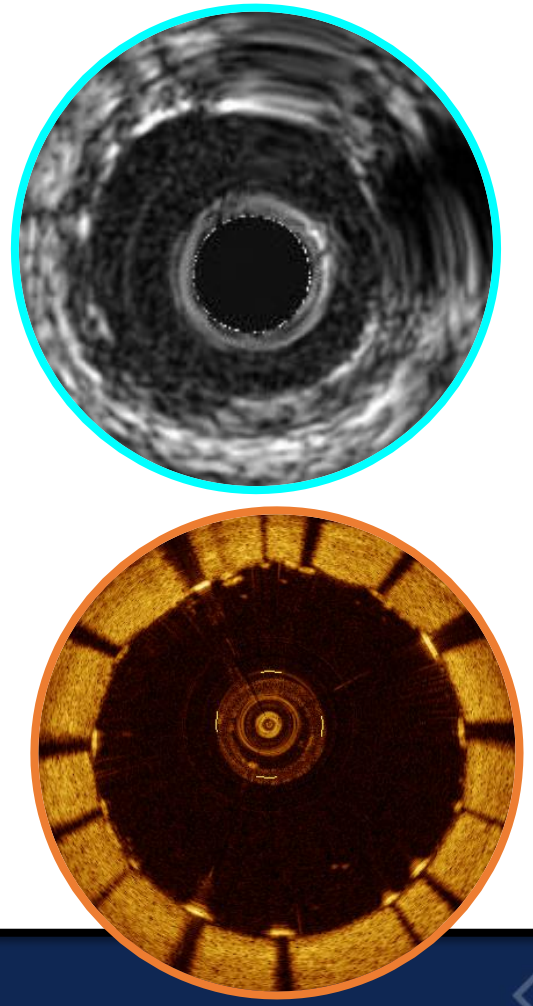
- minimal stent area **MSA >90% of distal reference lumen** area
- **absence of** geographic miss, defined as **plaque burden >50% within 5 mm from the proximal or distal stent edge**, or both
- **no edge dissection** involving the media with arc ≥60° and length ≥3 mm

Clinical Use of Intracoronary Imaging
Updated Concepts 2024: Evidence & 30 Years of Experience!

Know-How to achieve the goal:

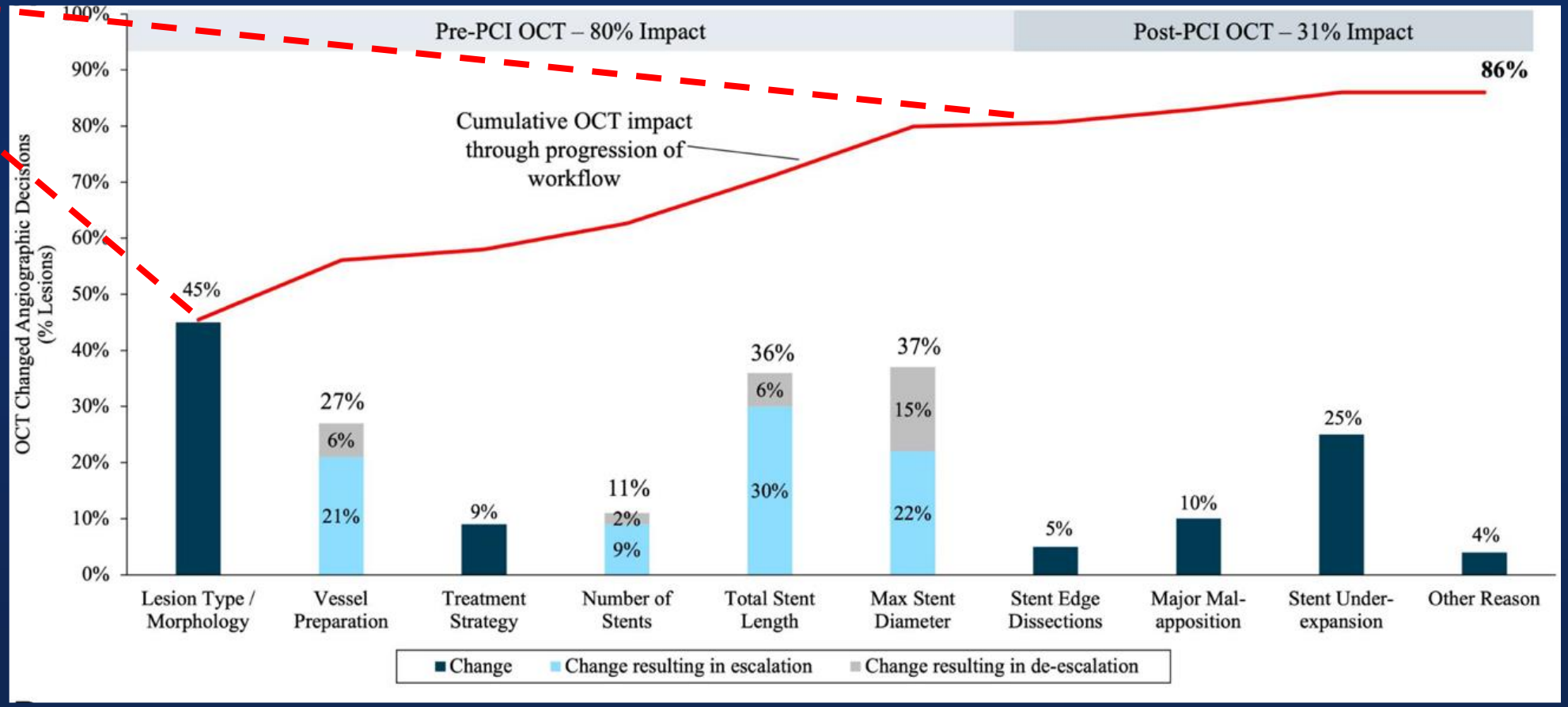
Optimal flow conditions through the vessel

- **Image upfront**
- **Define PCI strategy accordingly**
- **Execute PCI strategy**
- **Document result, optimize if necessary**



Clinical Use of Intracoronary Imaging
Updated Concepts 2024: Evidence & 30 Years of Experience!

80% impact on stent deployment is gained **by upfront imaging!**



Bergmark B et al *Circ Cardiovasc Interv.* 2022

Clinical Use of Intracoronary Imaging: PCI Guidance

Angiogram

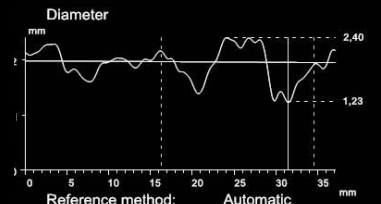
Clinical Use of Intracoronary Imaging: PCI Guidance

Angiogram and QCA measurements

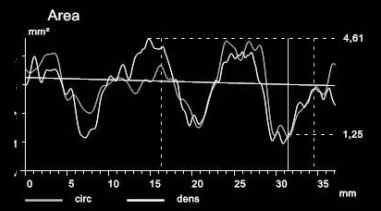
Online QCA

DS 37%
Prox RD 2,1 mm
Dist RD 1,9 mm
MLD 1,2 mm
Length 18 mm

W7-1803734E4EE6/thorint



Reference method: Automatic



nosis	(%)
% D	37
%A Circ	61
%A Dens	58

Obstruction Segment

	Diameter (mm)	A Circ (mm²)	A Dens (mm²)
Lesion	1,23	1,18	1,25
Ref	1,96	3,01	3,01
Mean	1,87	2,84	2,68

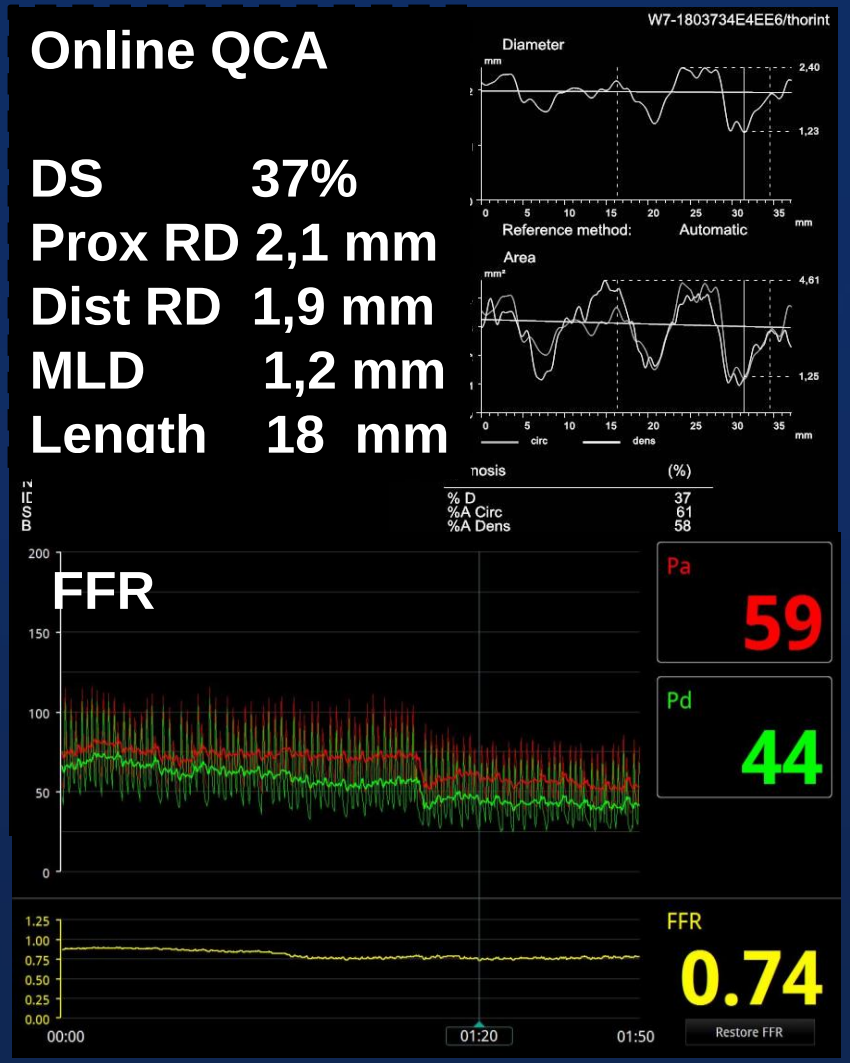
D Prox Obstr	2,14	mm
D Dist Obstr	1,92	mm
Pos Prox Obstr	16,36	mm
Length Obstr	18,17	mm
V Obstr	51,67	mm³
Plaque A	3,96	mm²
Plaque V	10,74	mm³
Plaque Symmetry	0,42	

Physician	
Hospital	
Acquisition Date	7-11-2014
Series	9
Frame/Total	46/78
Rot/Ang	RAO2/CRA40
Segment name	
Trial Name	
Intervention	
Cal Factor	0,0745 mm/pix
Cal Object	- mm Auto

Page 1/3

Clinical Use of Intracoronary Imaging: PCI Guidance

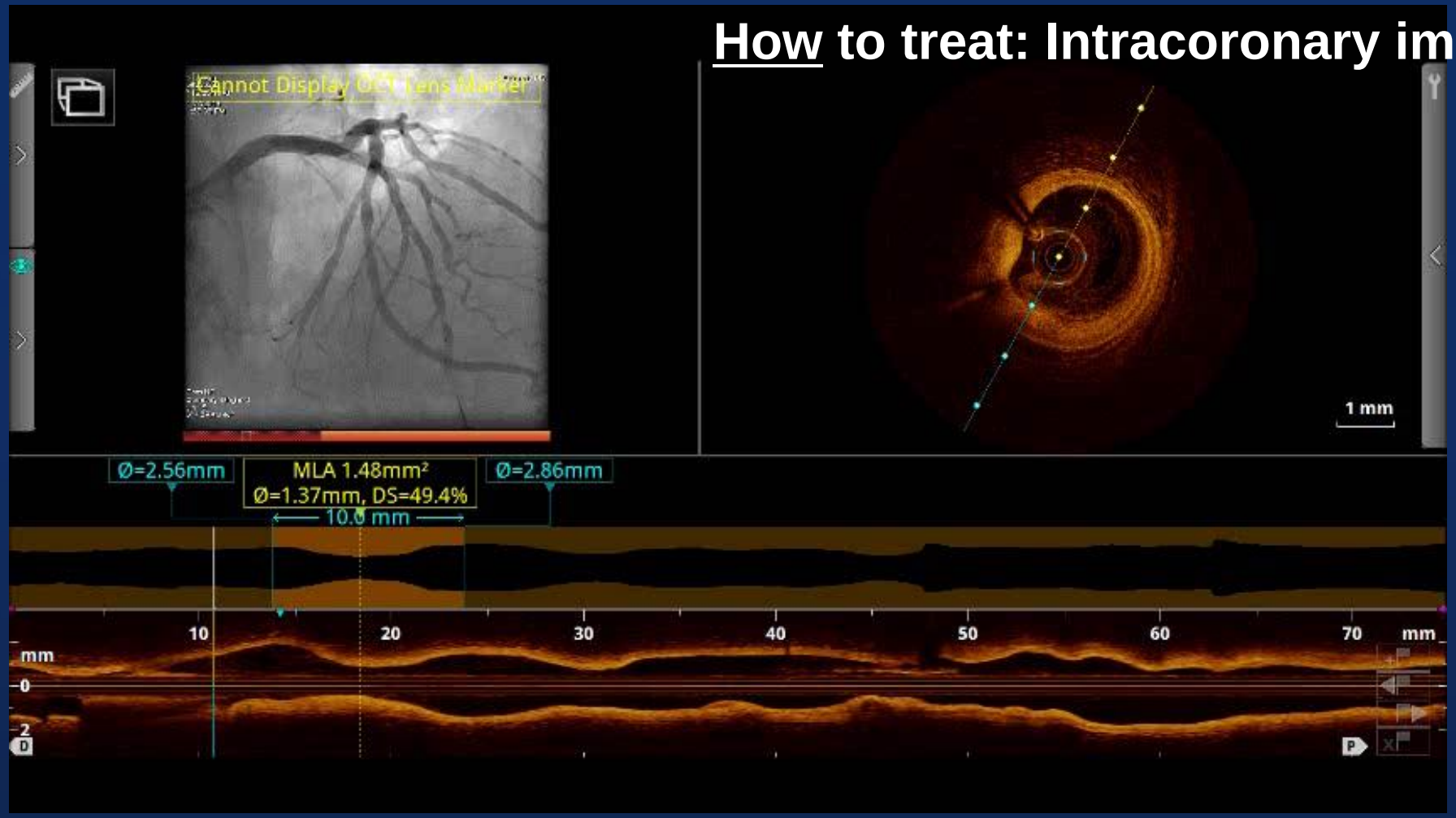
Functional assessment with FFR



What to treat: FFR

Clinical Use of Intracoronary Imaging: PCI Guidance

Assess lesion- and plaque characteristics



Pullback 36mm/sec

Clinical Use of Intracoronary Imaging: PCI Guidance

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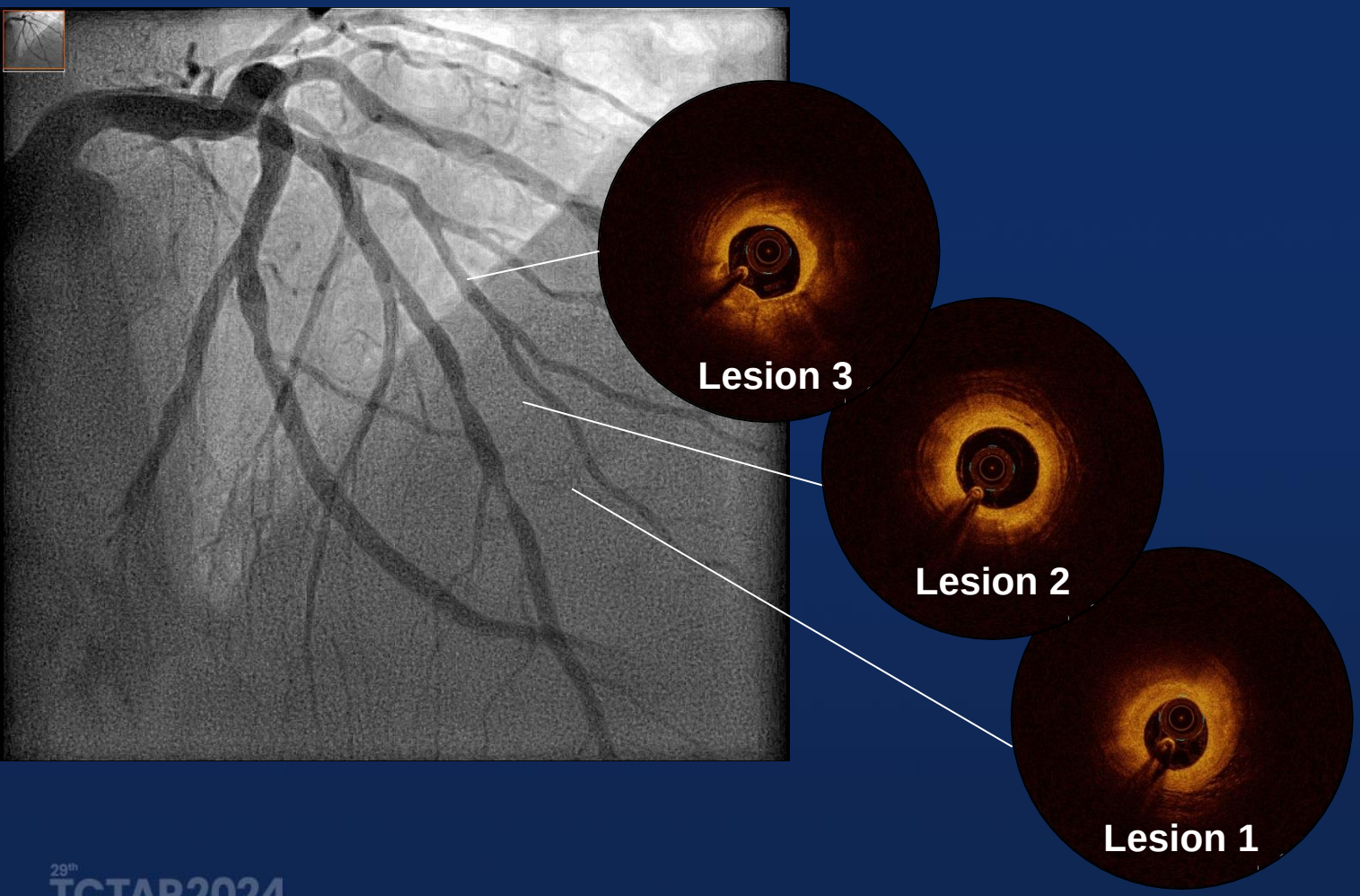

Clinical Use of Intracoronary Imaging: PCI Guidance

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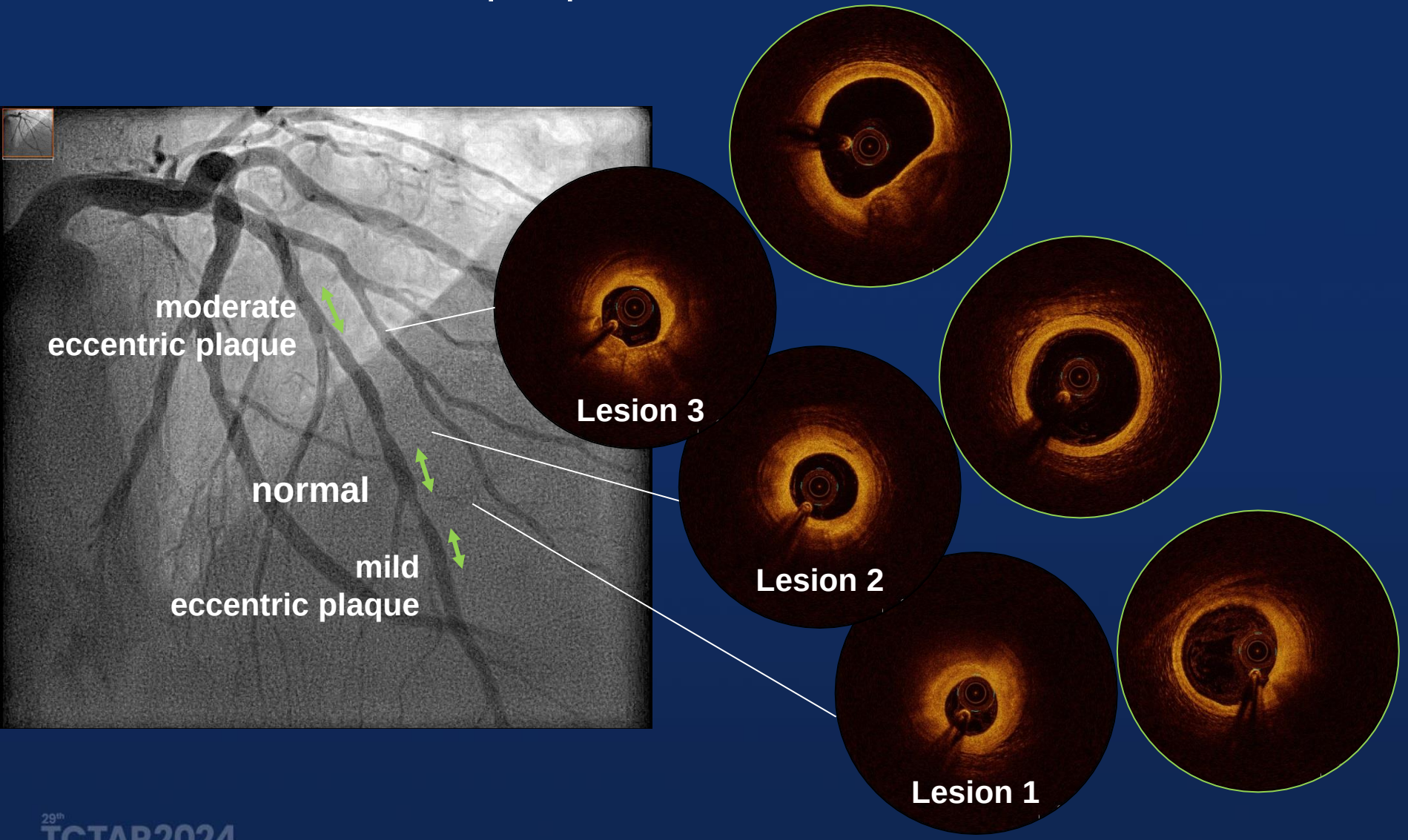
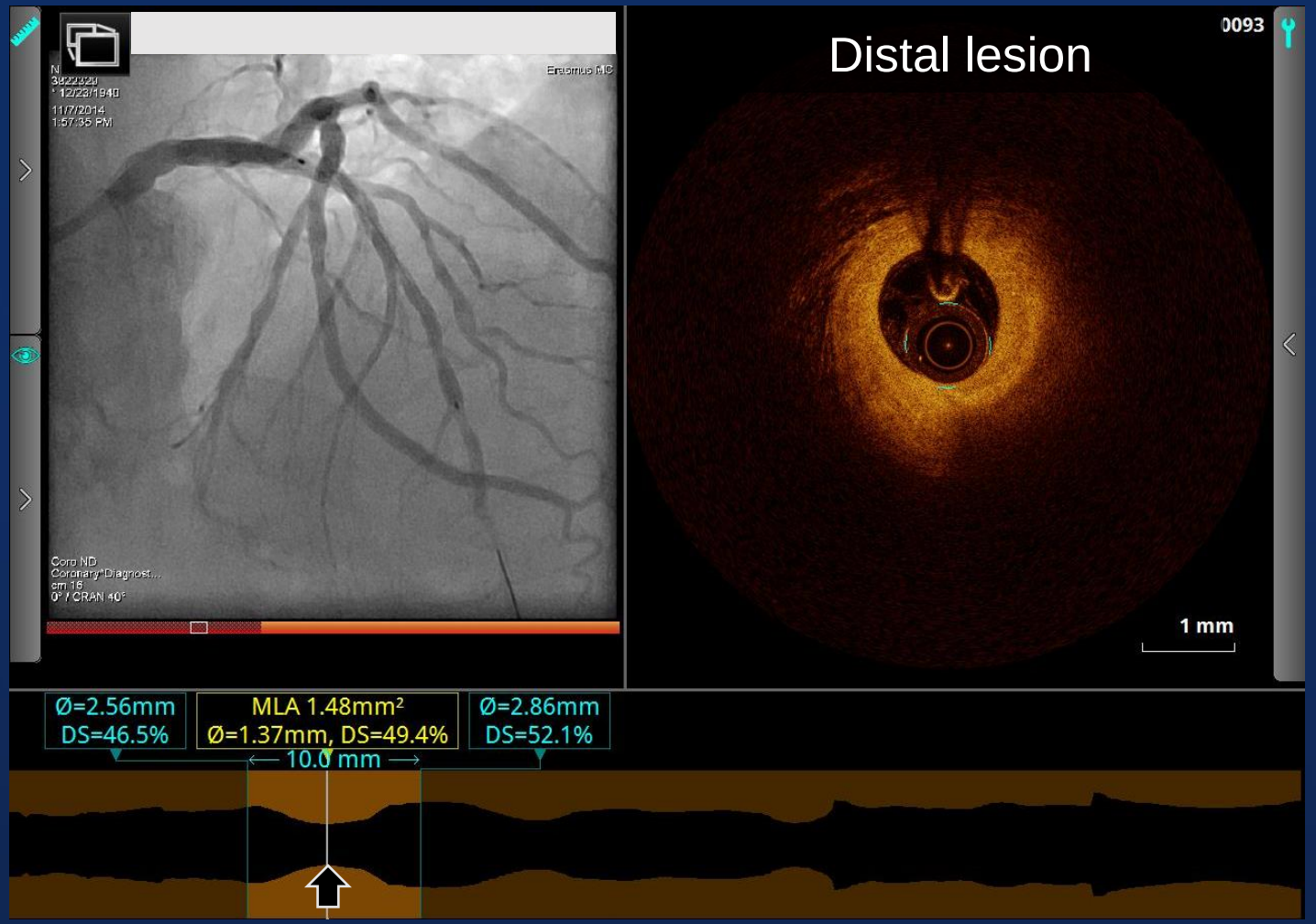


Clinical Use of Intracoronary Imaging: PCI Guidance

Assess lumen dimensions & plaque distribution



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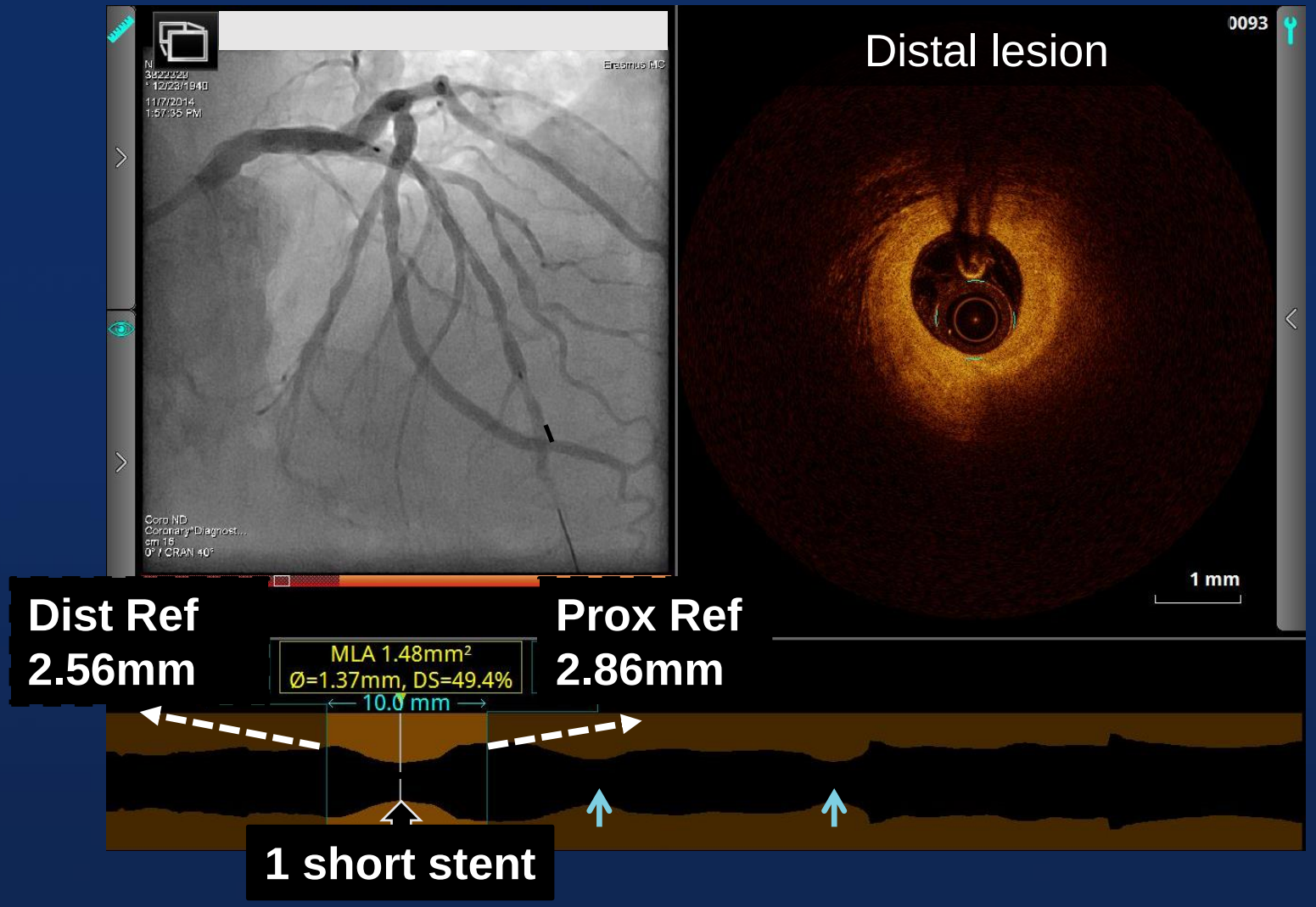

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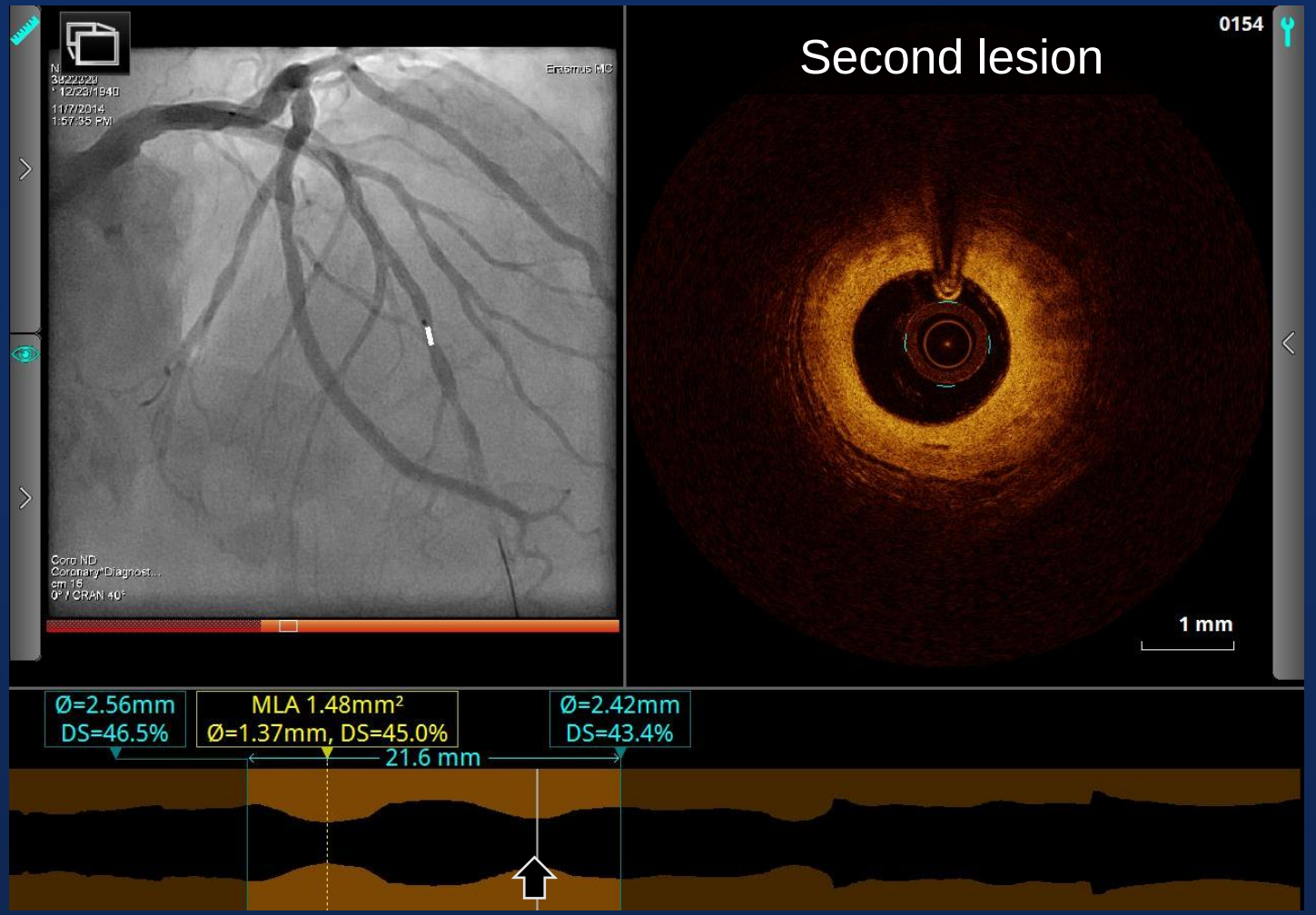

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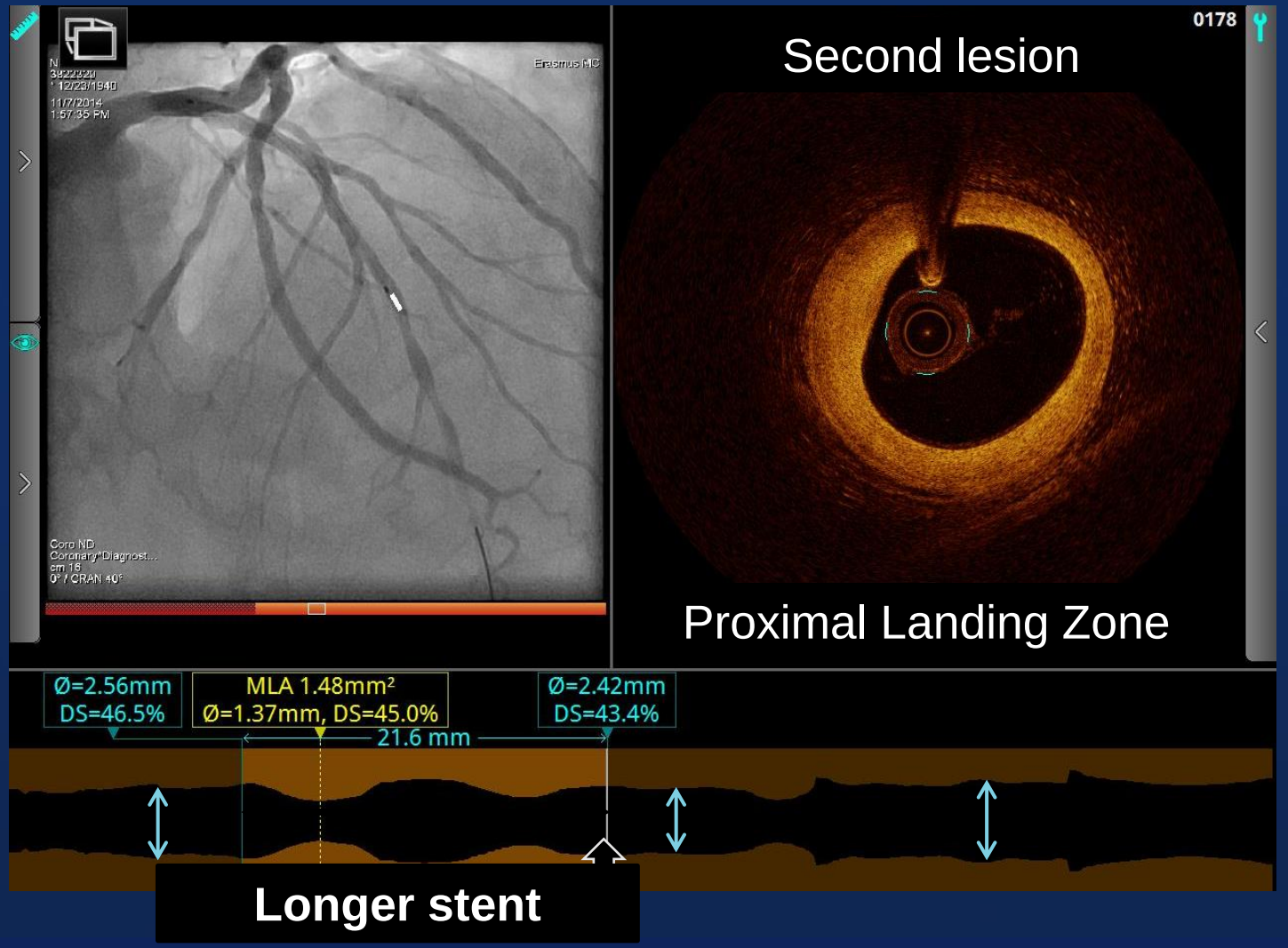
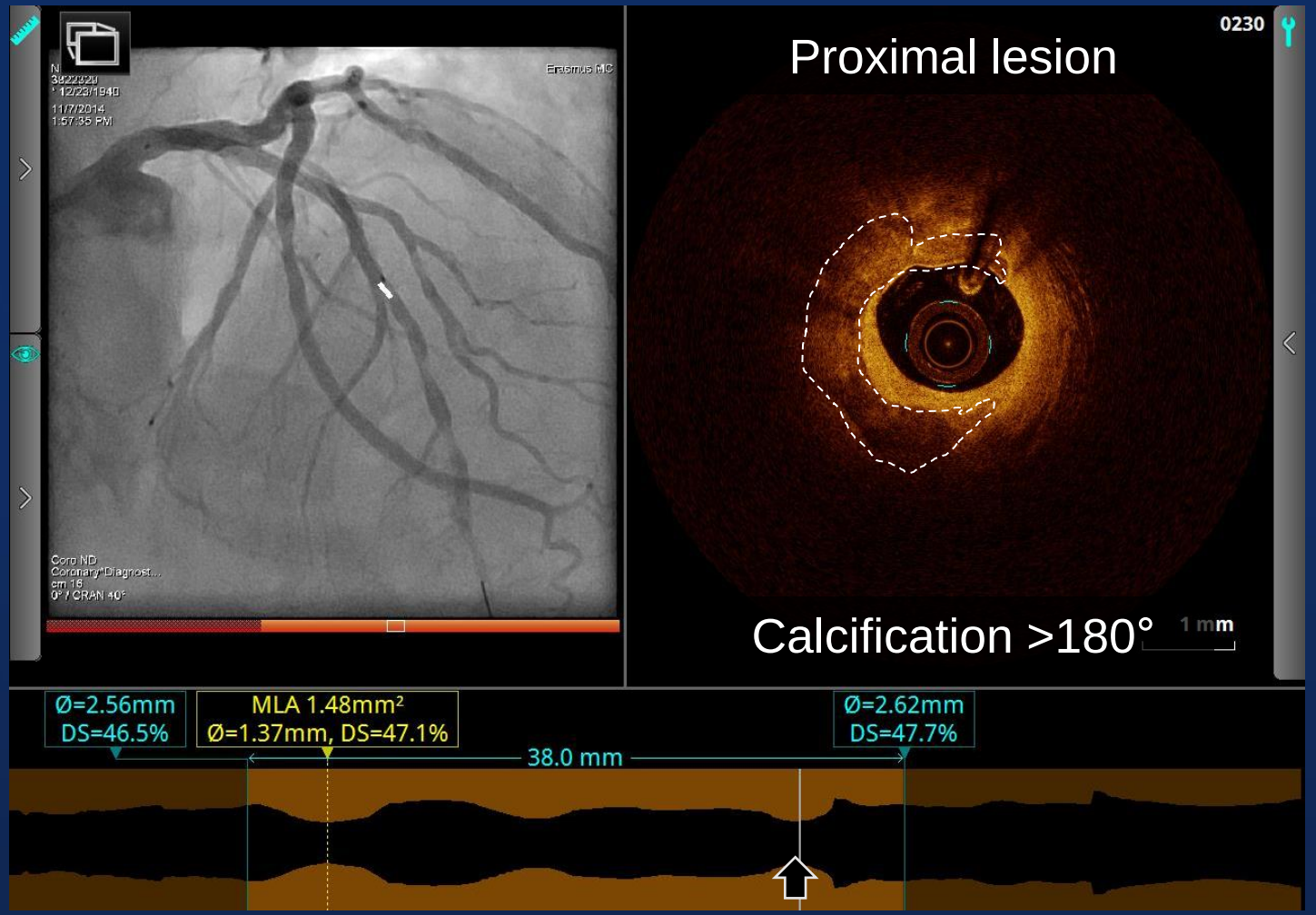


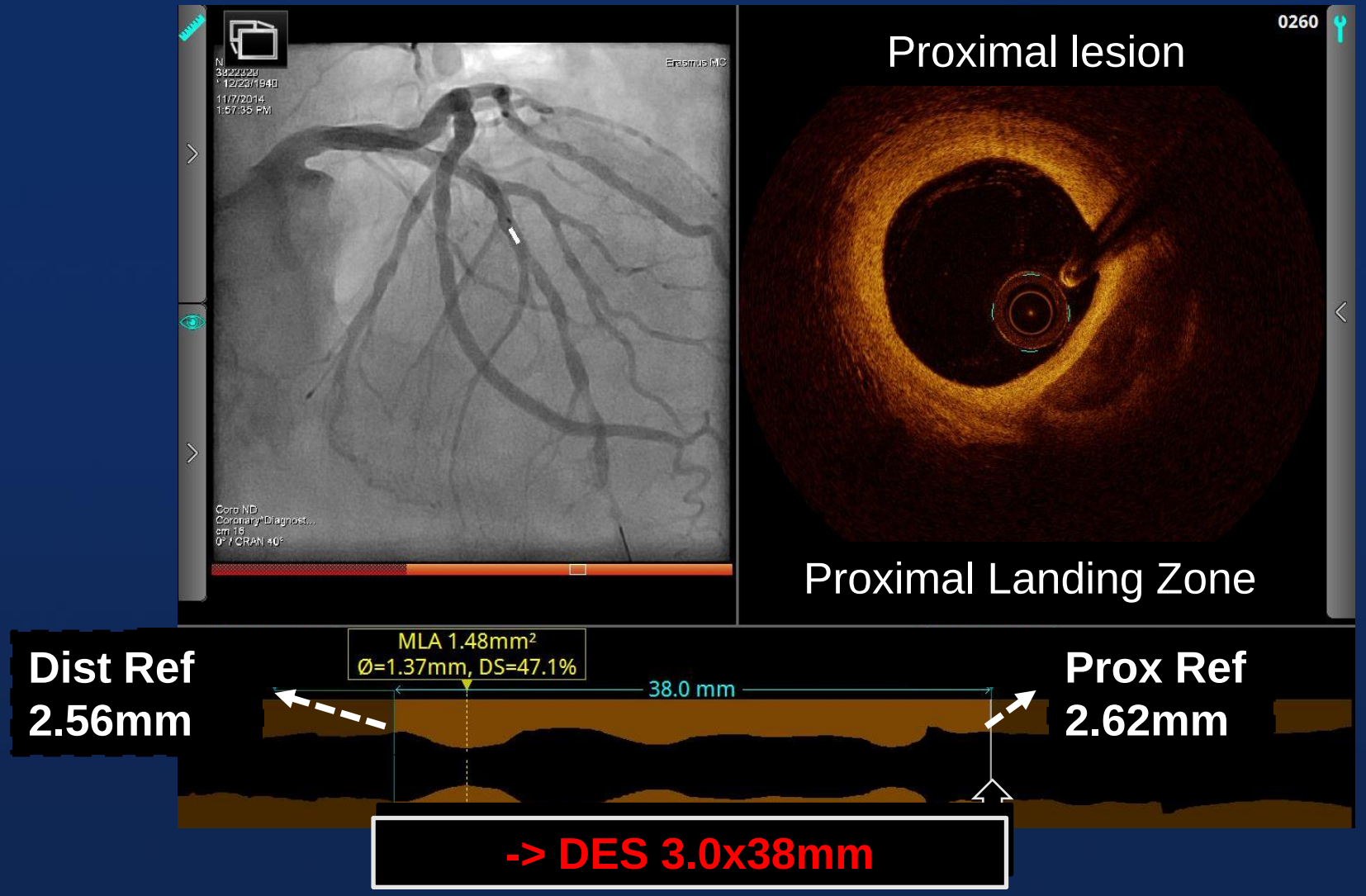
Clinical Use of Intracoronary Imaging: PCI Guidance

Assess lumen dimensions & plaque distribution



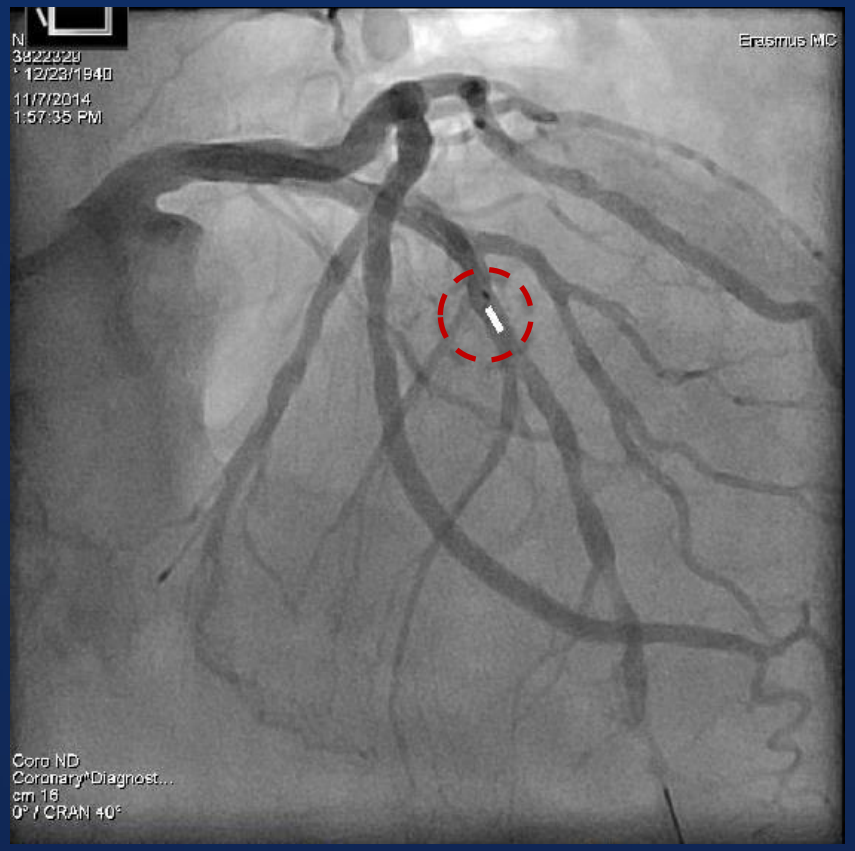
Clinical Use of Intracoronary Imaging: PCI Guidance

Select “landing zones”

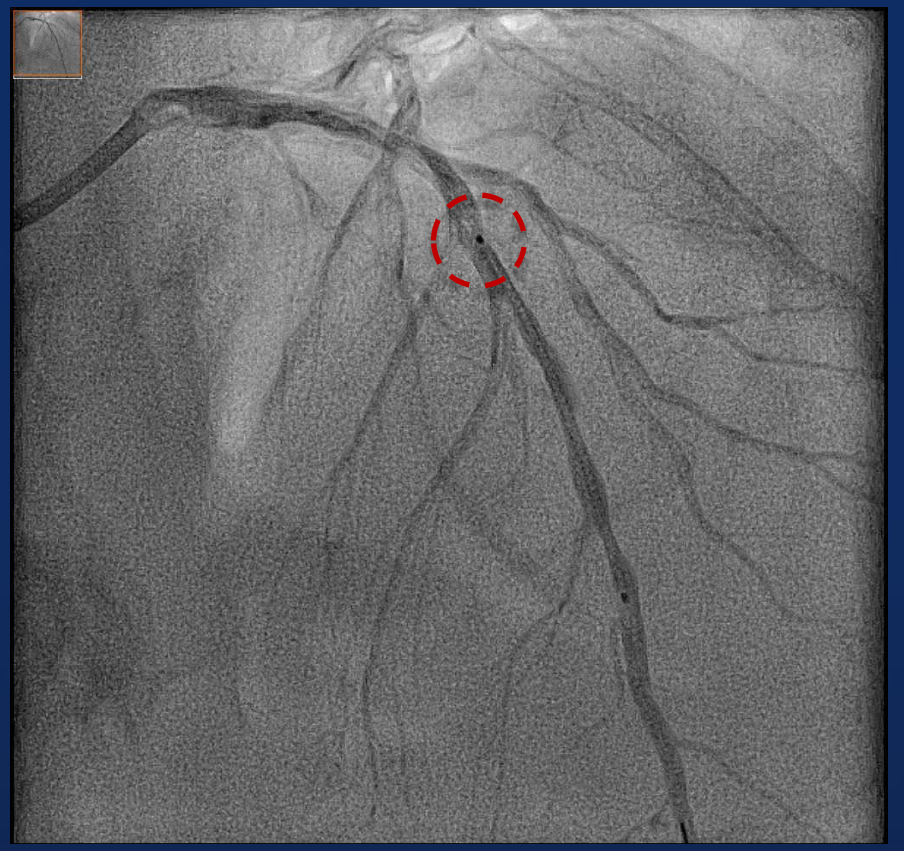


Clinical Use of Intracoronary Imaging: PCI Guidance

Stent implantation & postdilation



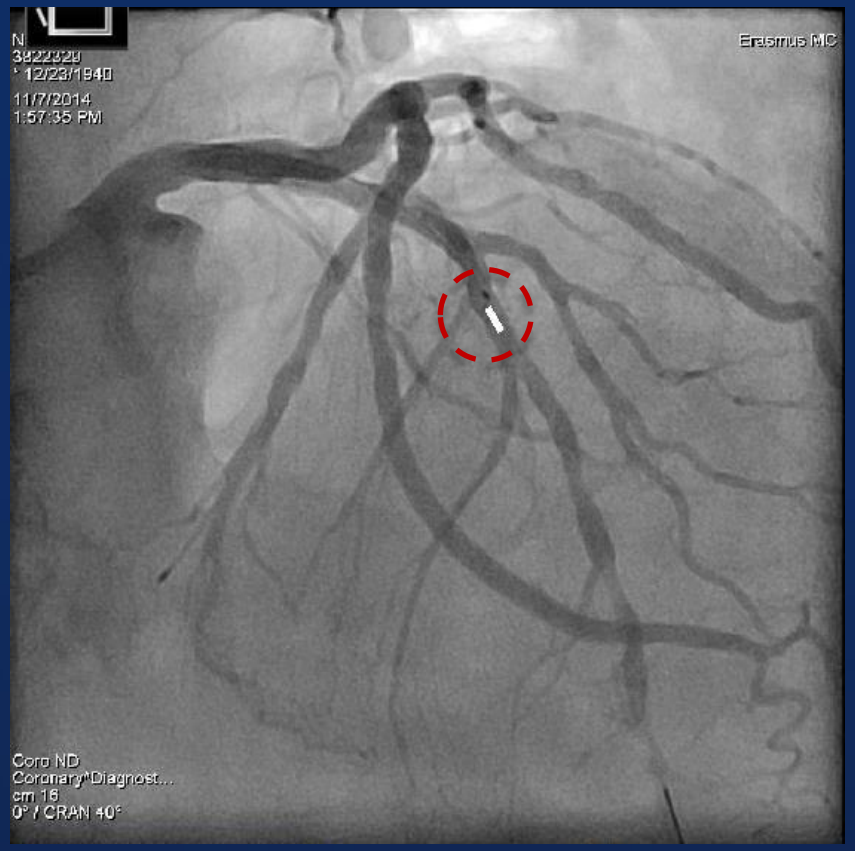
Position of proximal LZ on cross-sectional OCT image.



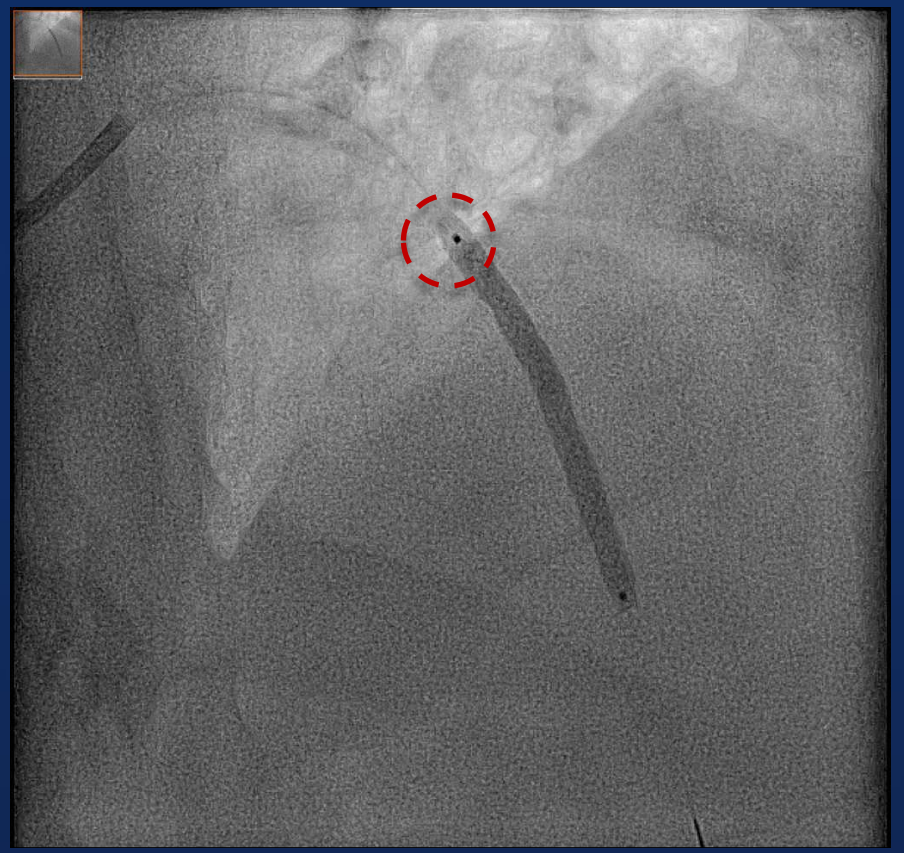
Match proximal stent marker to OCT-position.

Clinical Use of Intracoronary Imaging: PCI Guidance

Stent implantation & postdilation



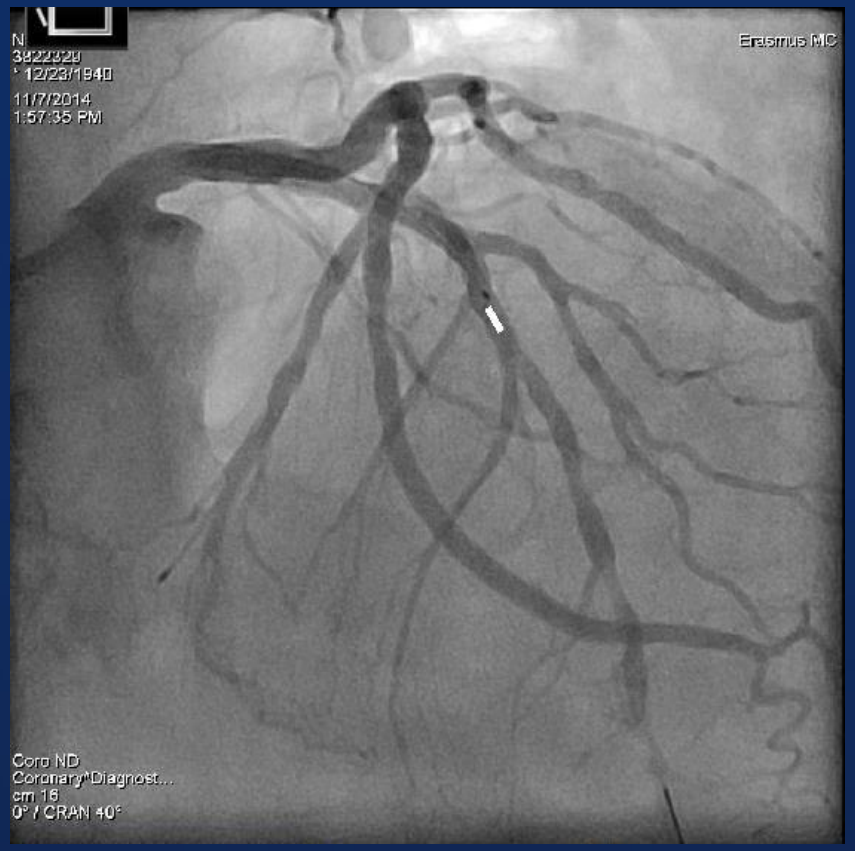
Position of proximal LZ on cross-sectional OCT image.



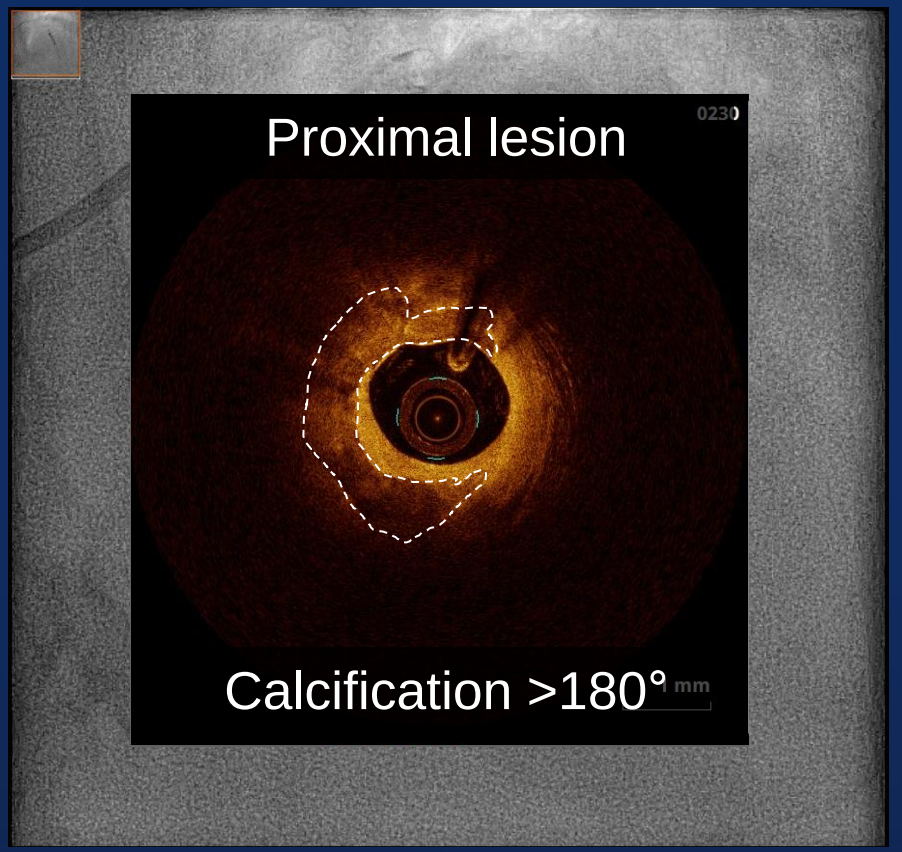
Direct stenting
DES 3.0x38mm

Clinical Use of Intracoronary Imaging: PCI Guidance

Stent implantation & postdilation

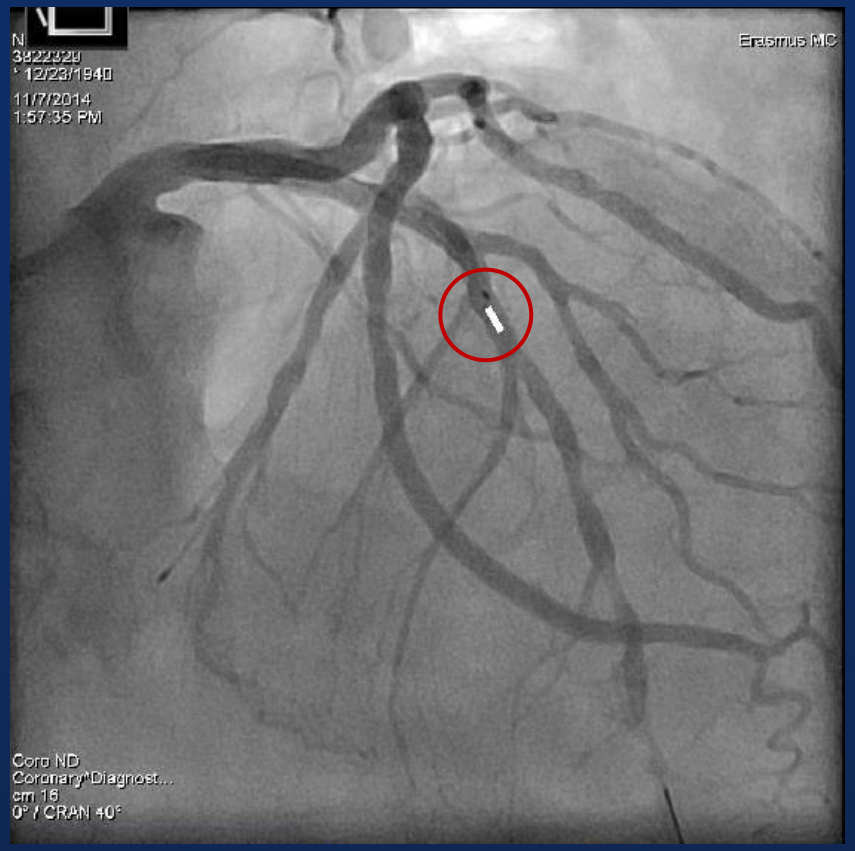


Position of proximal LZ on cross-sectional OCT image.

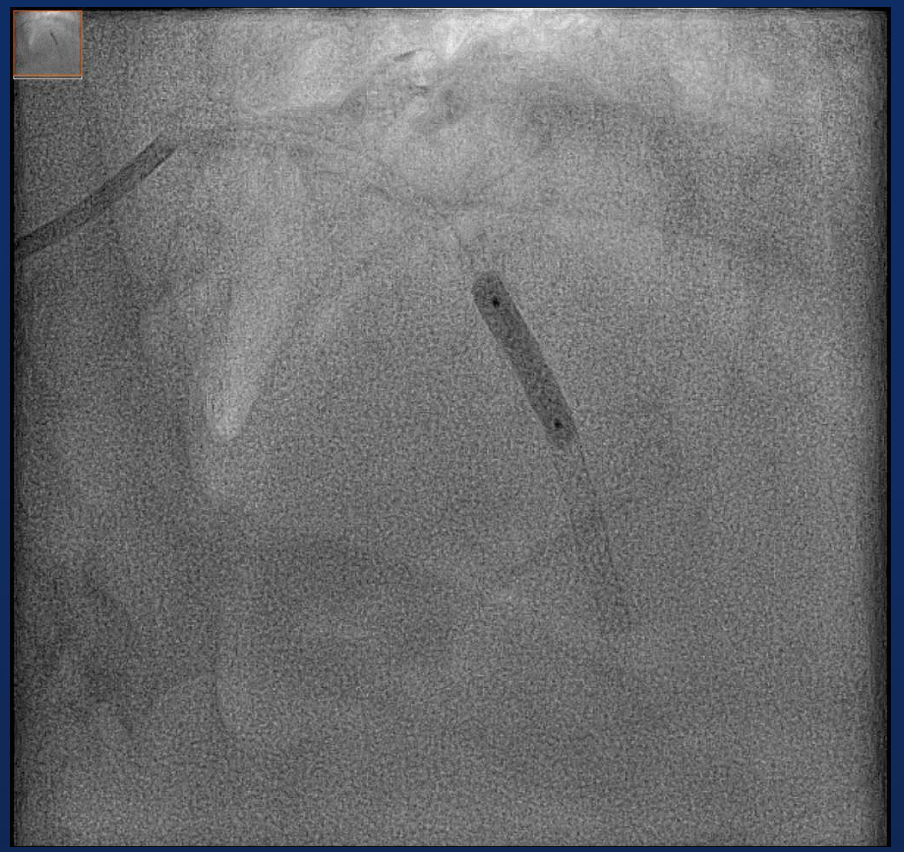


Clinical Use of Intracoronary Imaging: PCI Guidance

Stent implantation & postdilation



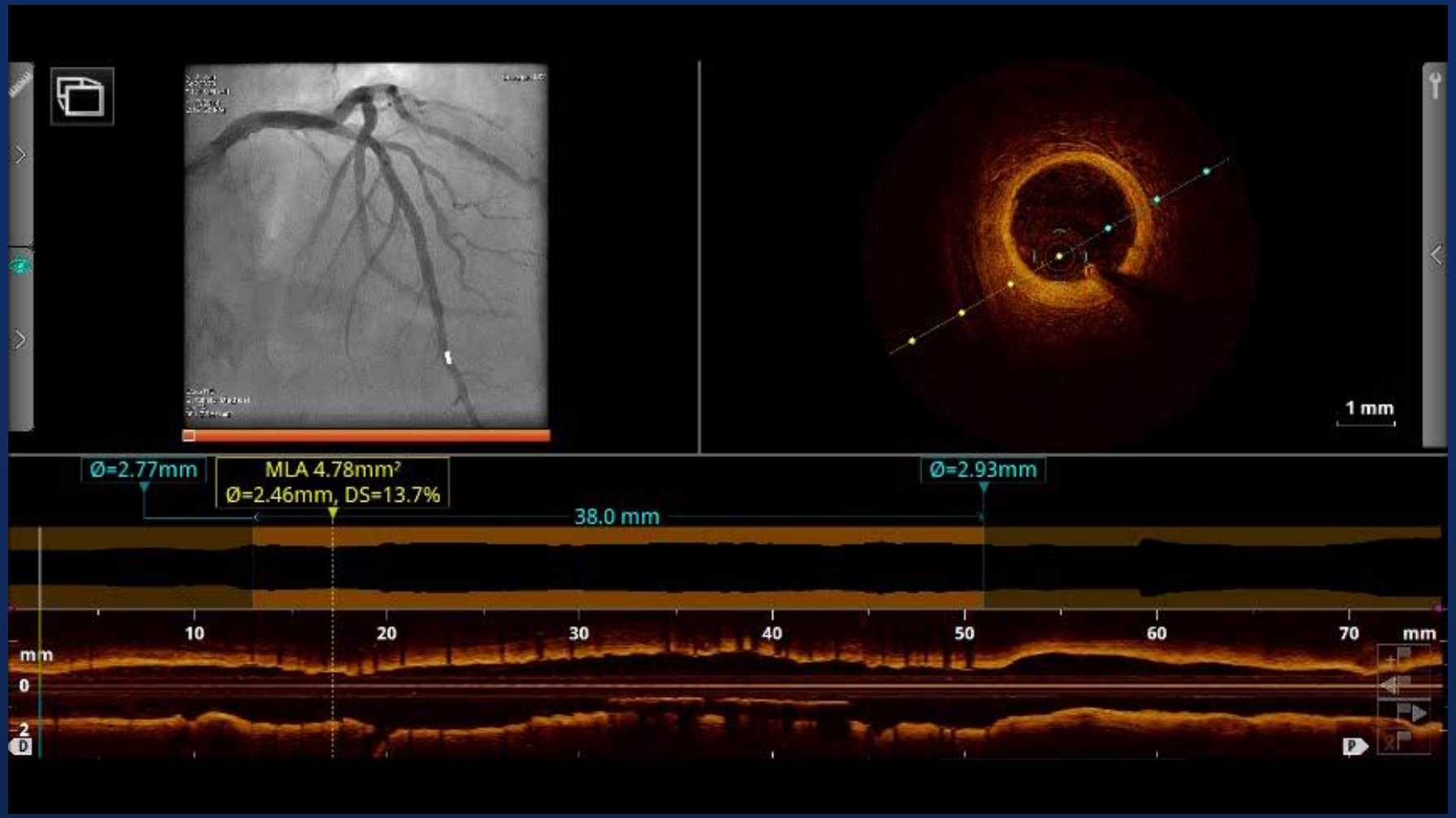
Position of proximal LZ on cross-sectional OCT image.



Post dilatation with 3.0x15mm NC balloon

Clinical Use of Intracoronary Imaging: PCI Guidance

Stent implantation: assess result



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Clinical Use of Intracoronary Imaging
Conclusion

- There is vast evidence, that intracoronary imaging reduces hard clinical endpoints
- There is vast experience, how to use intracoronary imaging

- Use intracororary imaging upfront, before stent implantation, in order to define
  - Lesion characteristics & length
  - Reference segments and diameters
  - Stent diameter & length
  - Need for lesion preparation
  - Need for postdilatation

- Use Intracorornary imgaging to document result and optimize, if necessary