CSC 2024
CORONARY AND STRUCTURAL COURSE
CURSO CORONARIO Y ESTRUCTURAL
MADRID

10º ANIVERSARIO
6, 7 y 8 NOVIEMBRE
HOTEL RIU PLAZA DE ESPAÑA

3DStent a new tool for stent optimization

GE HealthCare

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Clínic Barcelona | Universitat de Barcelona

Conflicts of interest

Speaker's name : Salvatore Brugaletta

☑ I have the following potential conflicts of interest to declare:

Participation in a company sponsored speaker's bureau: Abbott, GE HealthCare, iVascular, Translumina

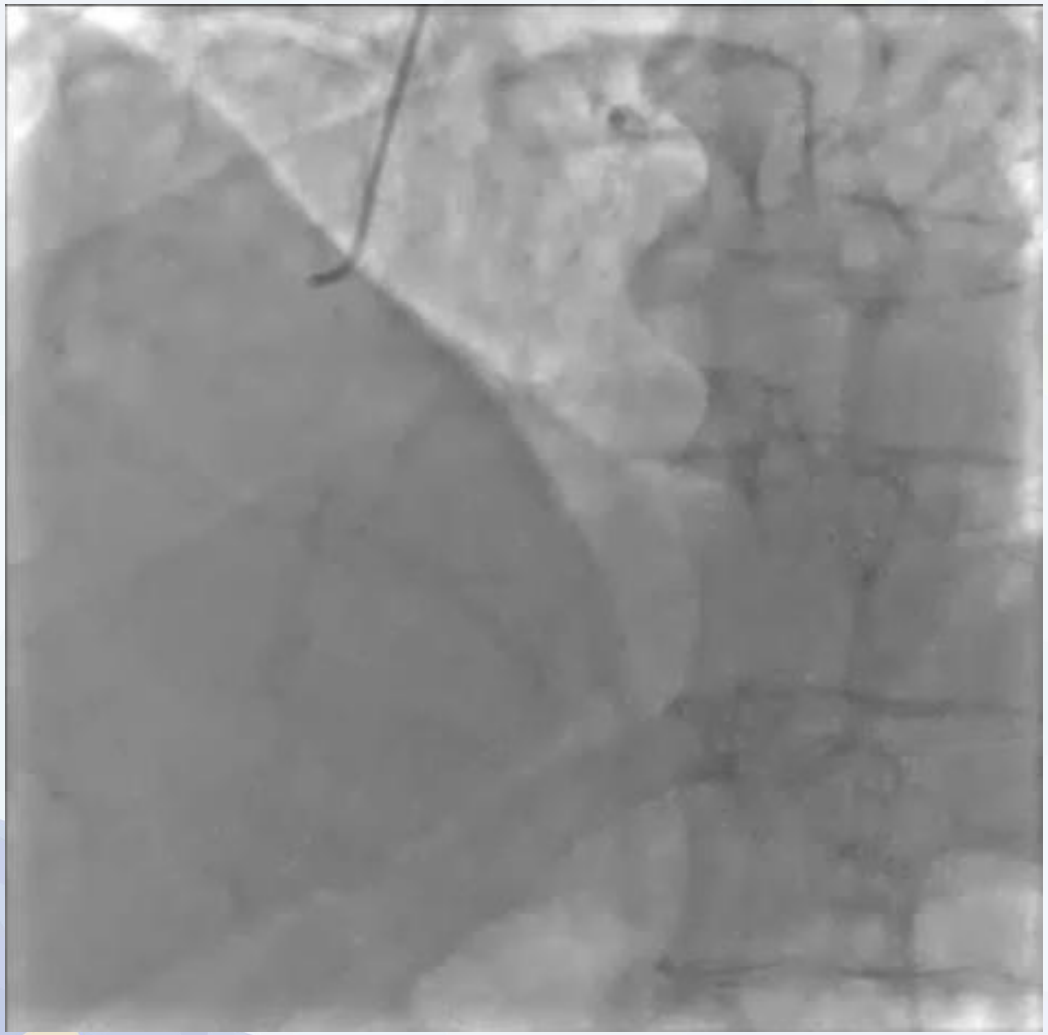
Receipt of grants / research support: Abbott

Receipt of honoraria or consultation fees: Boston Scientific, Insight Lifetech, Novo Nordisk, Zoll

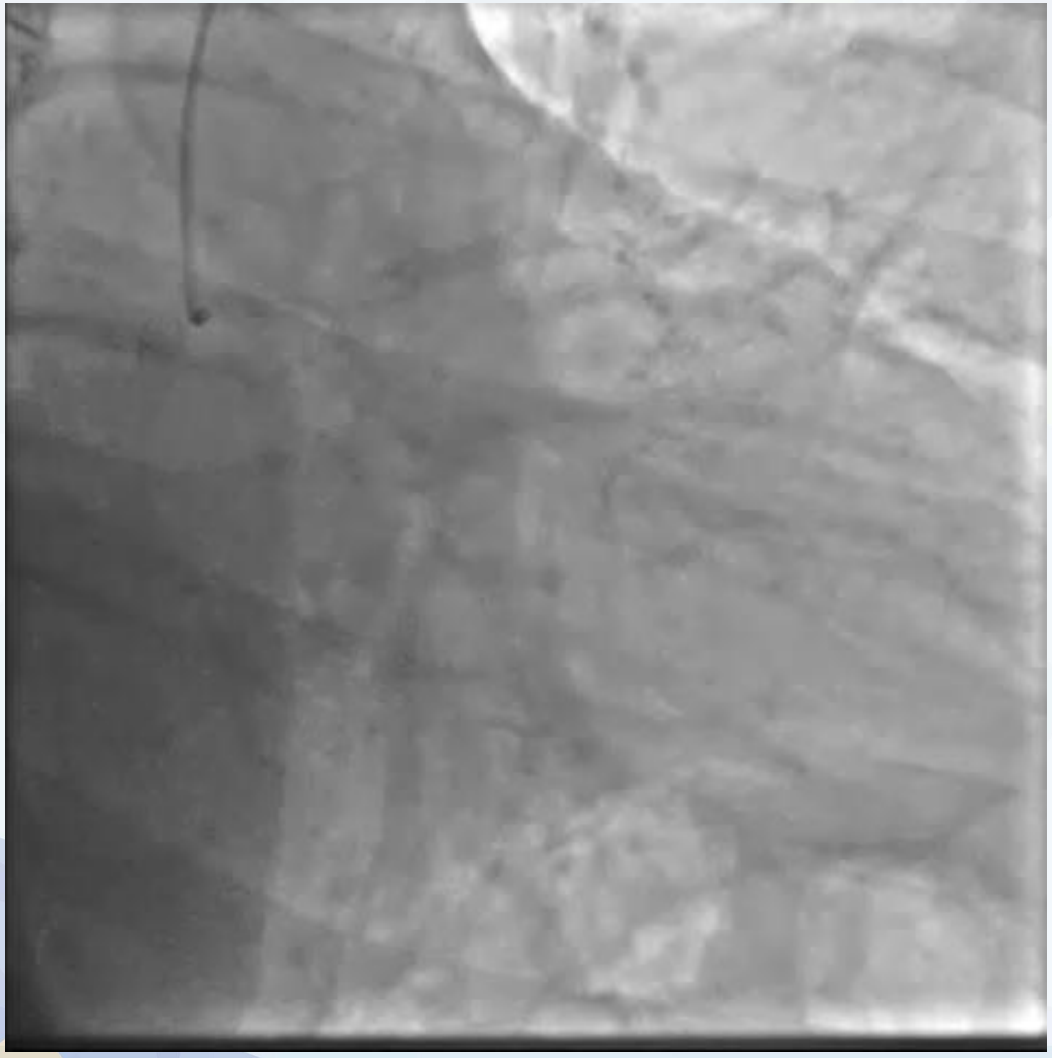
3DStent-guided PCI

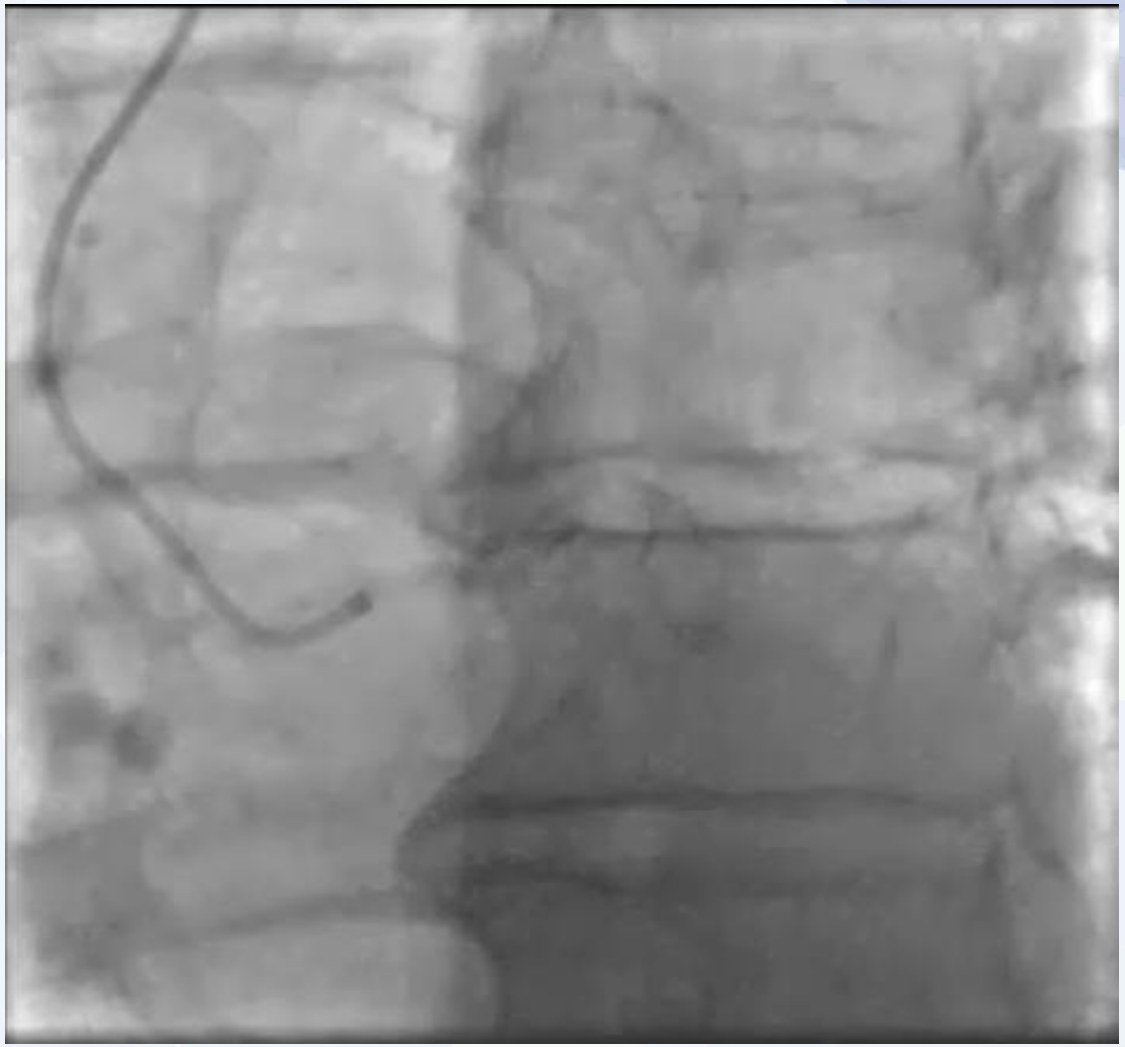
AGE	69
SEX	Male
ALLERGY	No
CARDIOVASCULAR RISK FACTORS	• Hypertension • Dyslipidaemia
Comorbidities	• Claudicatio intermittens
Cardiac history	• NSTEMI

RCA

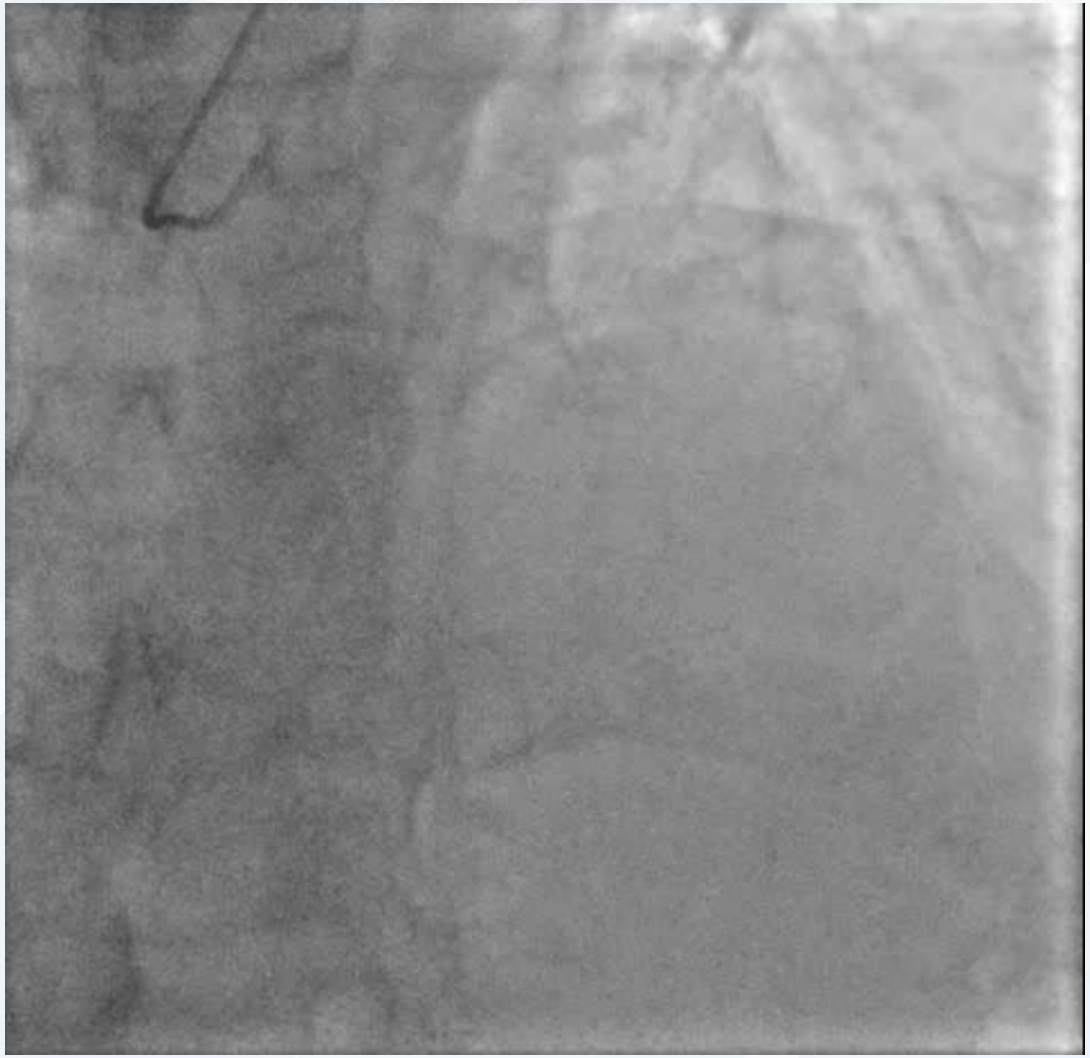


LCx





LAD



He was discussed in heart team and the surgeon turned down CABG for poor distal vessel. PCI of RCA was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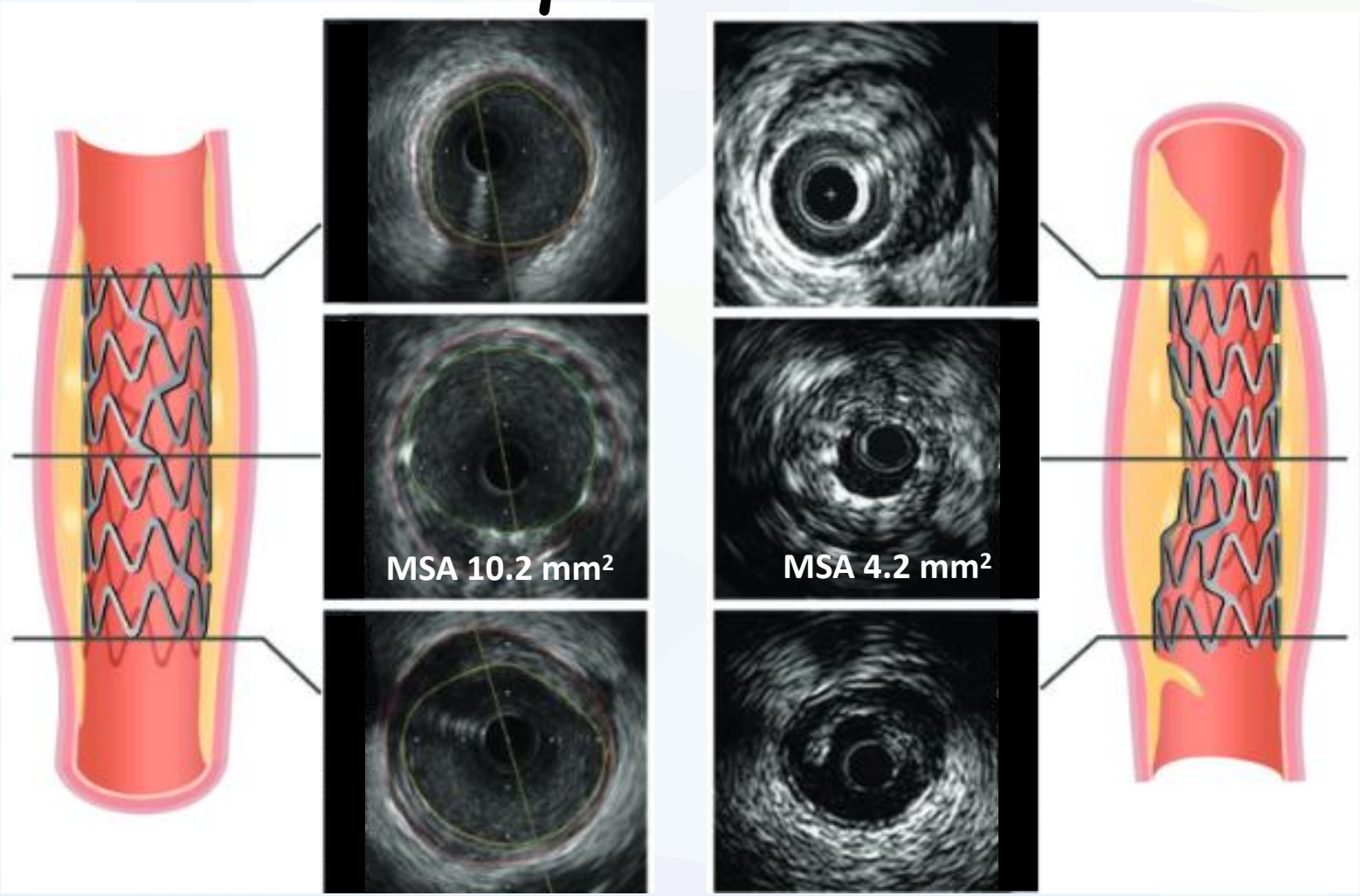
What is stent (under) expansion?



MSA by IVUS
<5.5 mm²

MSA by OCT
<4.5 mm²

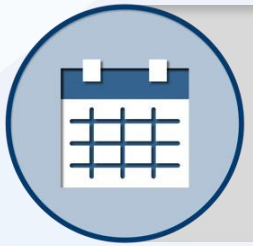
Stent Expansion
<80%

Mechanisms leading to adverse events after PCI

Stent failure

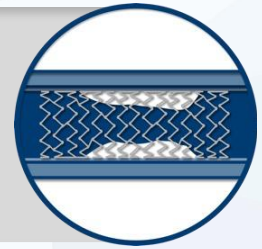
Stent thrombosis

Acute presentation
Acute coronary syndrome
Intra-stent thrombus



Acute 0-24 hours
Subacute 24 H-30 D
Late 30 D-1Yr
Very late >1 Yr

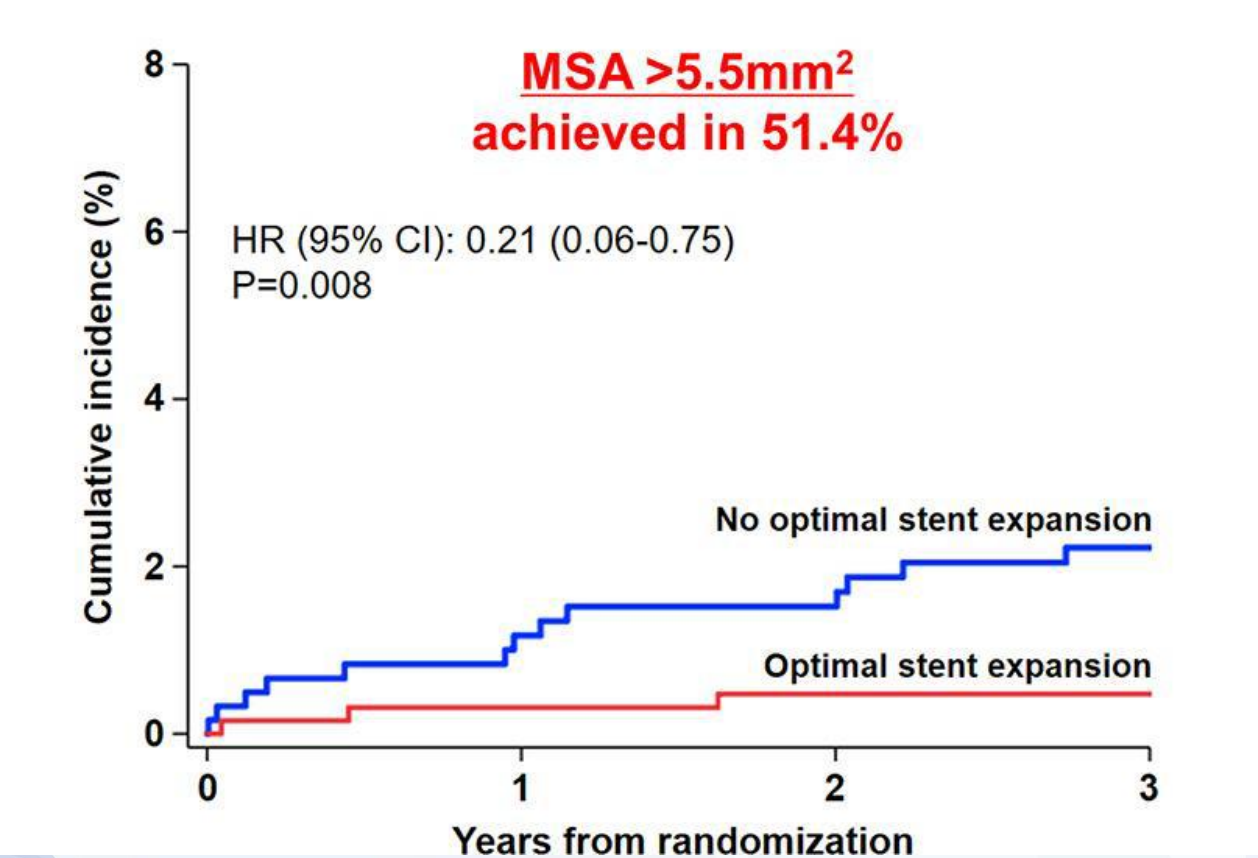
In-stent restenosis



Chronic and acute presentations
Multiple mechanisms

>50% stenosis within the stent or within 5 mm of its edges

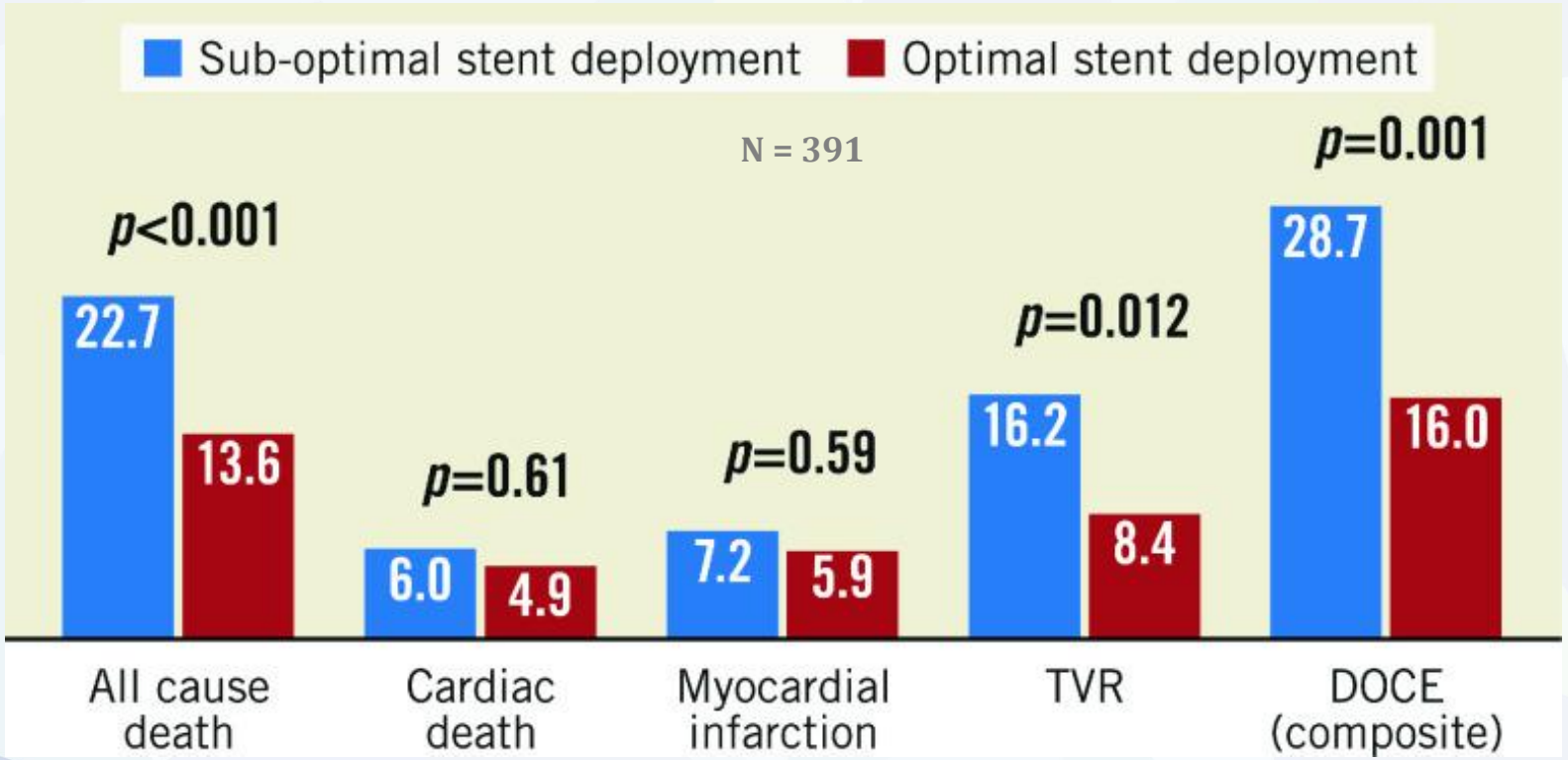
Impact of suboptimal stent implantation



80% reduction in stent-related complication when adequate expansion is achieved

Lee YJ et al.

Impact of suboptimal stent implantation

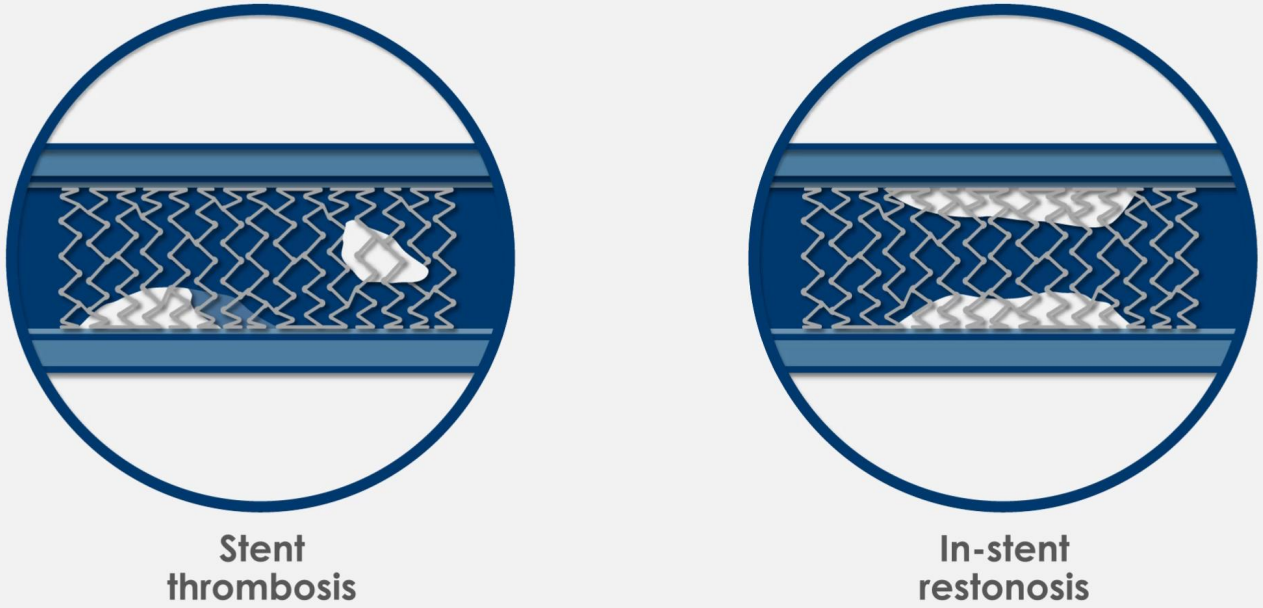


Hazard Ratio
1.75

Suboptimal stent deployment = MLA <4.5 mm²

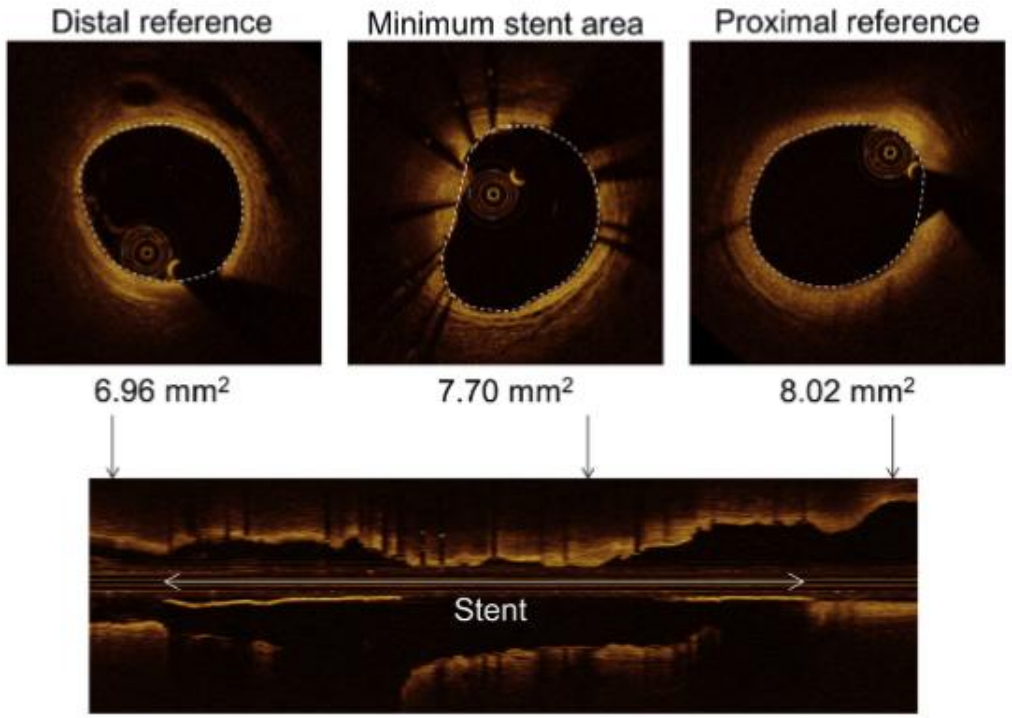
EuroIntervention. 2022 Jun; 18(2): e150-e157

Stent Failure

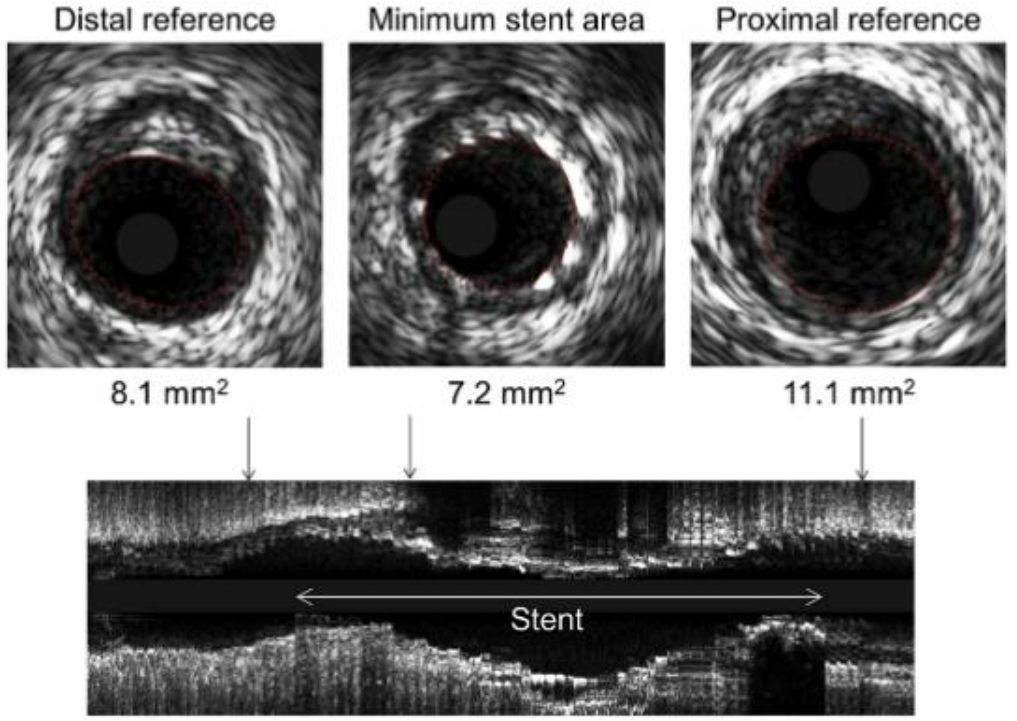


Current tools to evaluate stent expansion

OCT



IVUS

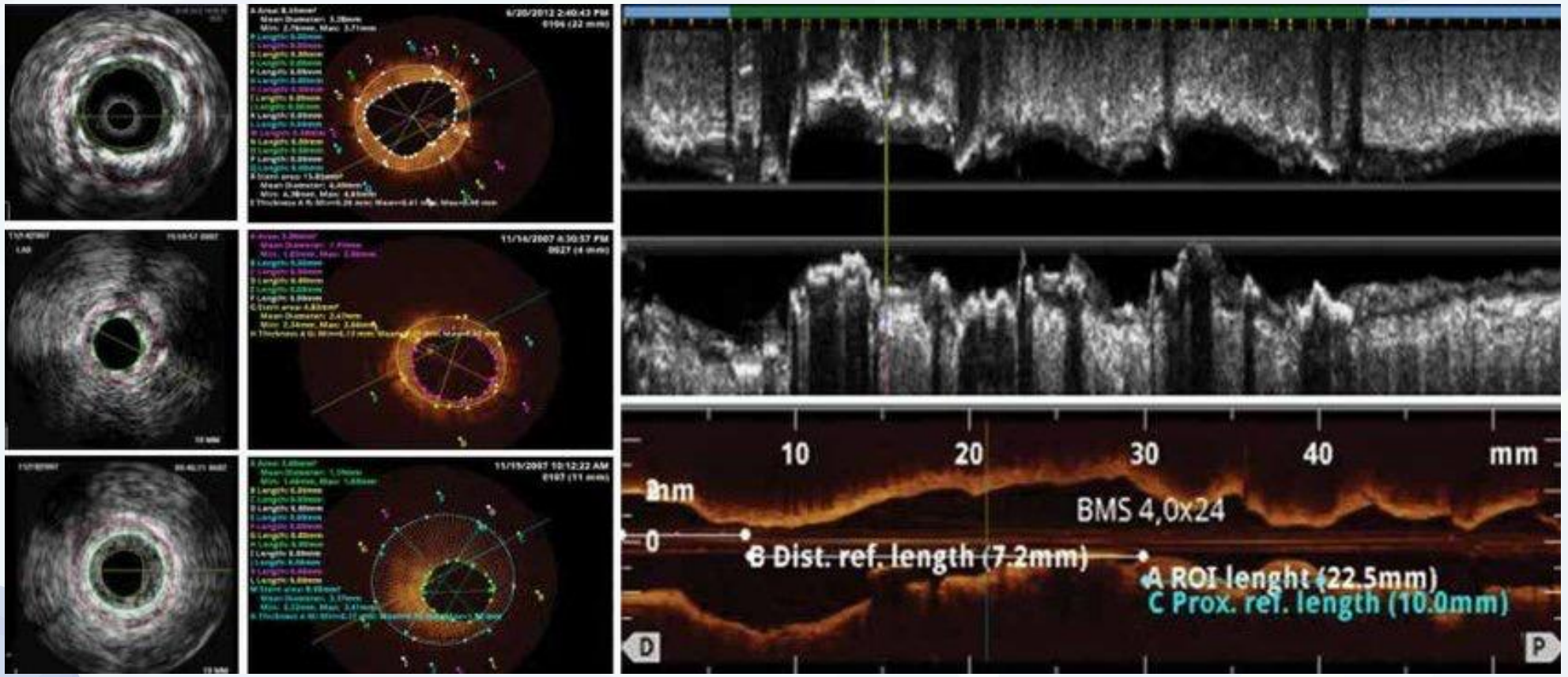


Maehara A et.al JACC Cardiovasc Interv. 2015 Nov;8(13):1704-14.

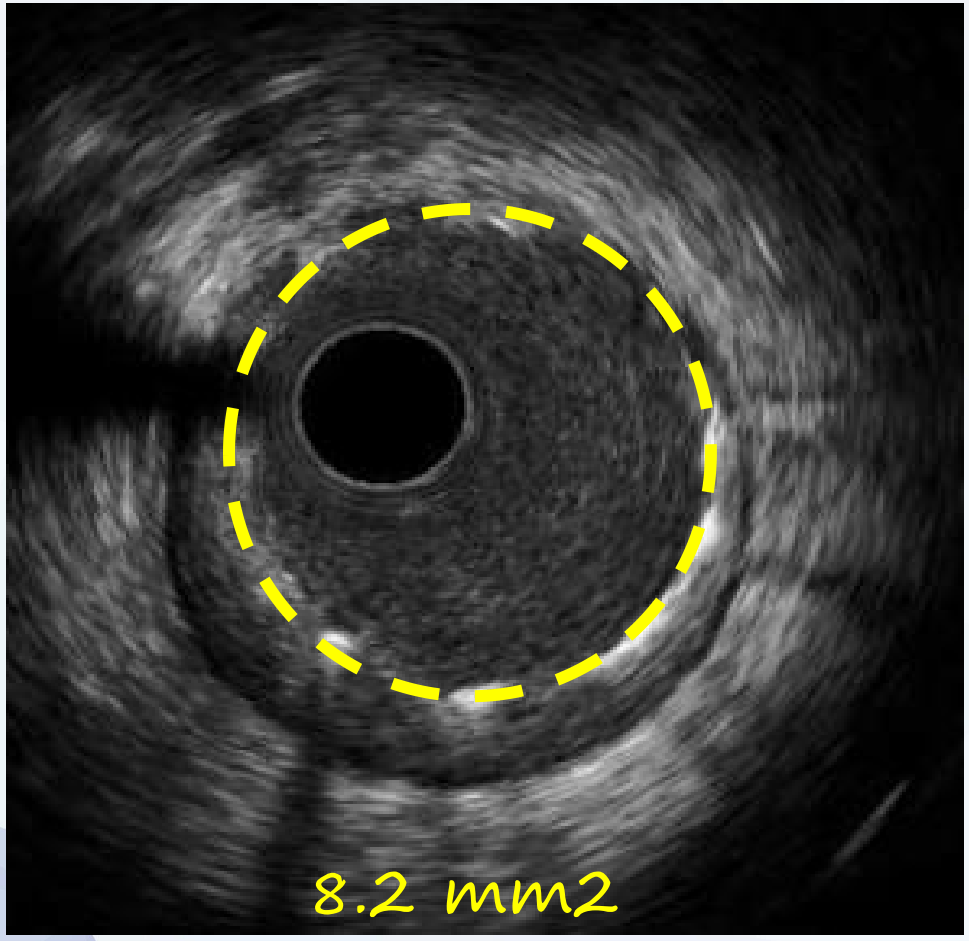
Ensure adequate stent expansion

IVUS

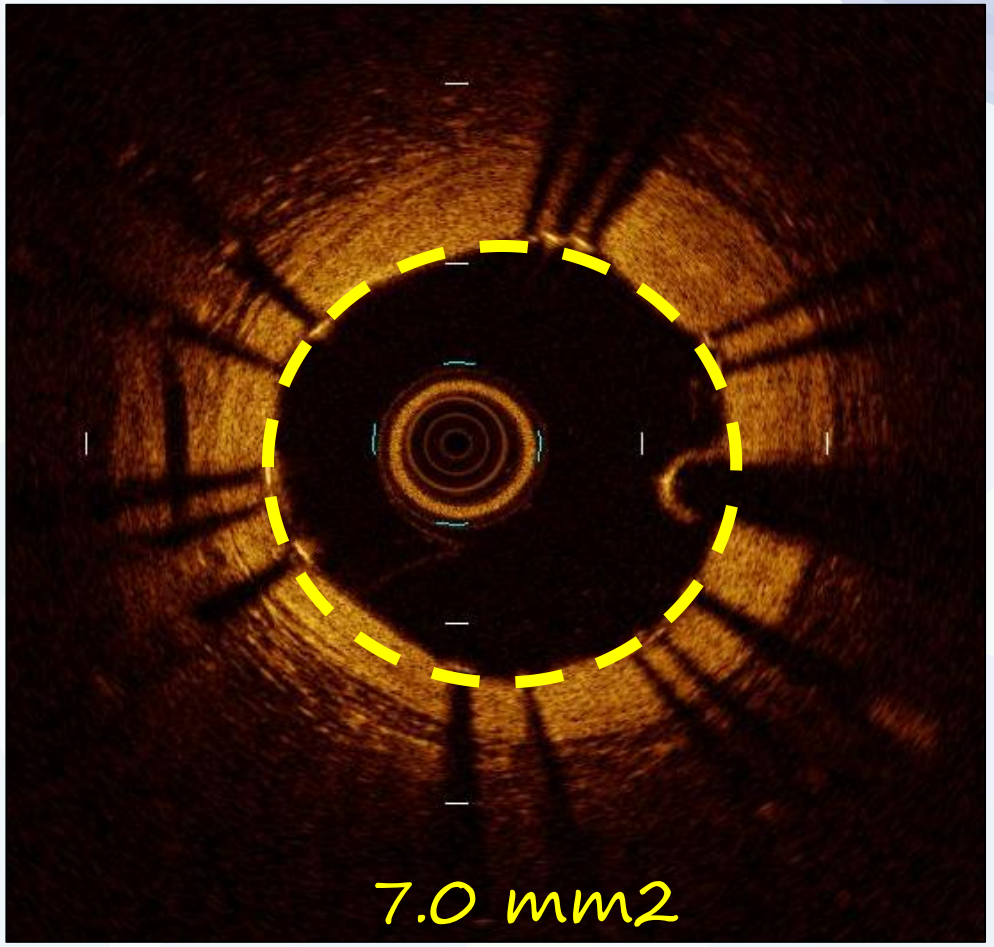
OCT



IVUS

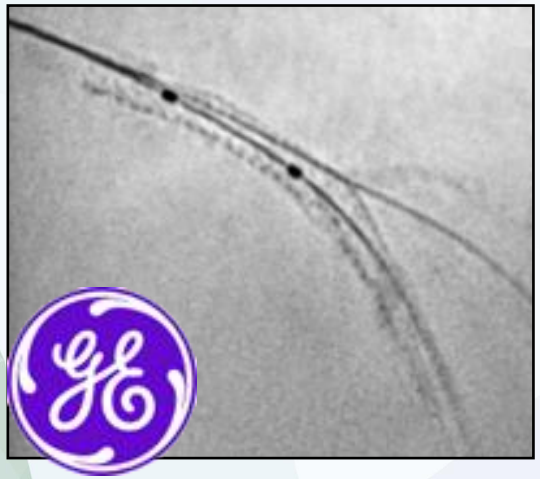


OCT

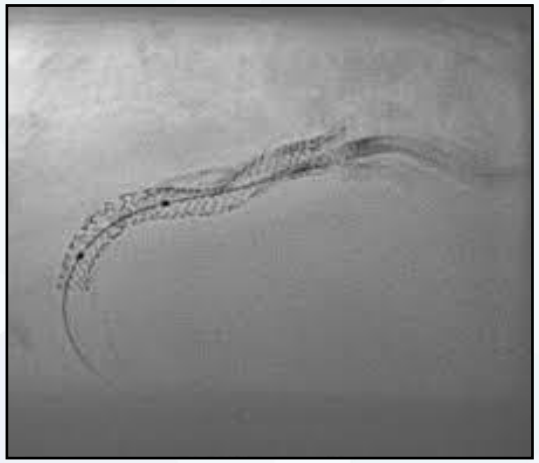


Enhanced stent visualization

Stent Viz

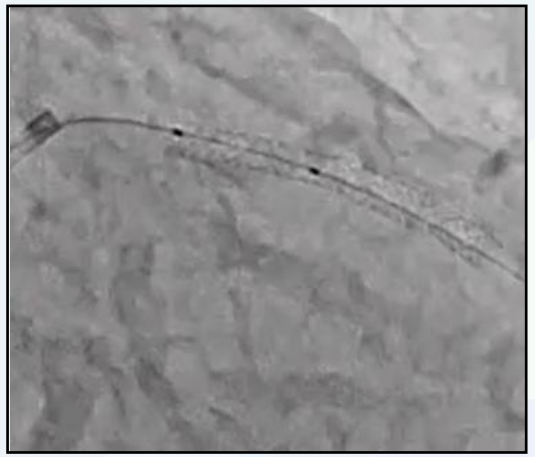


Clear Stent

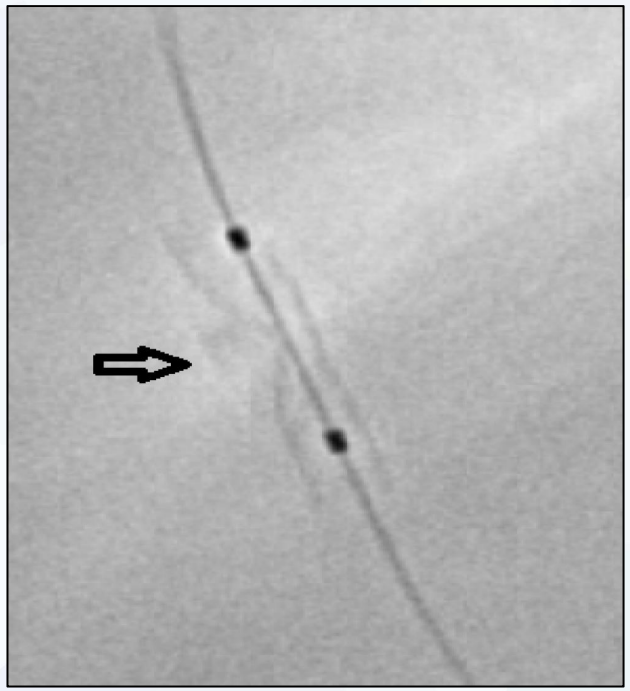


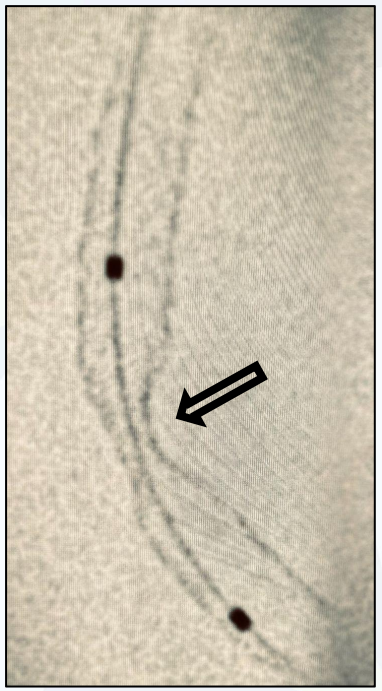
Stent Boost

Stent Mode

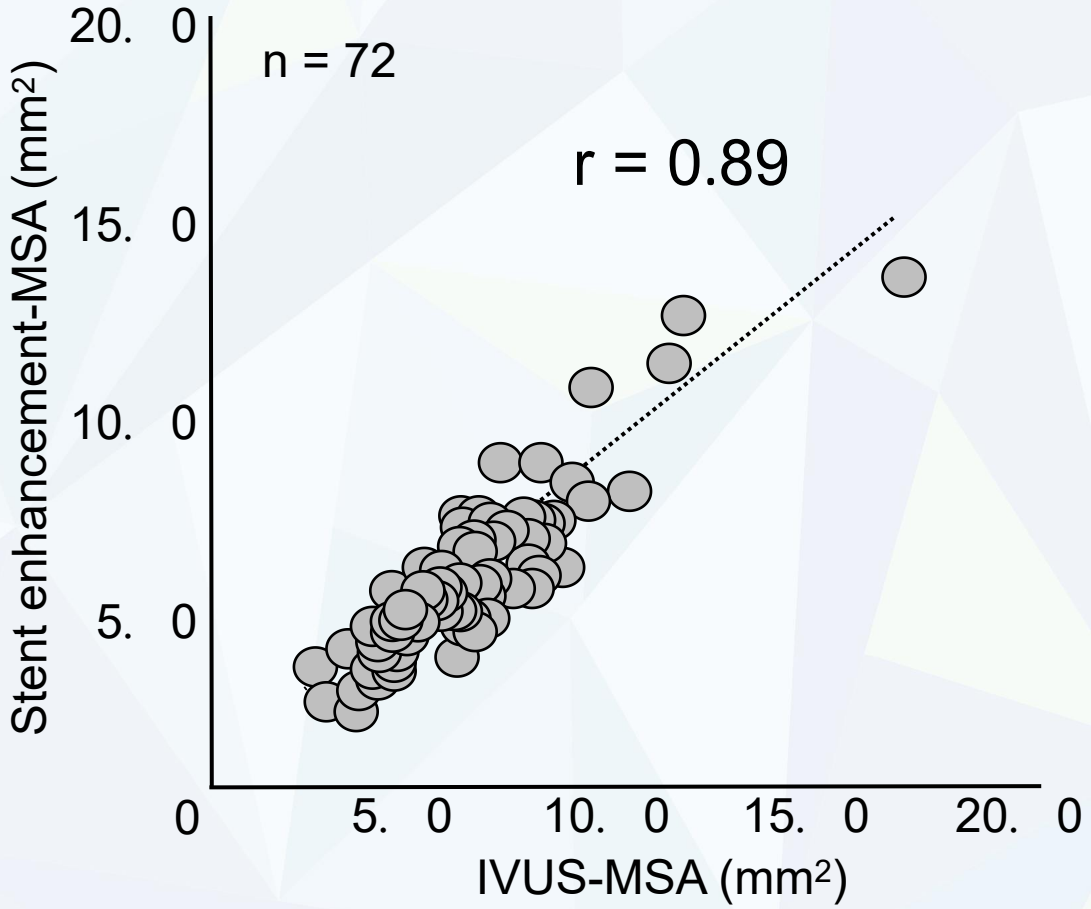


Stent underexpansion





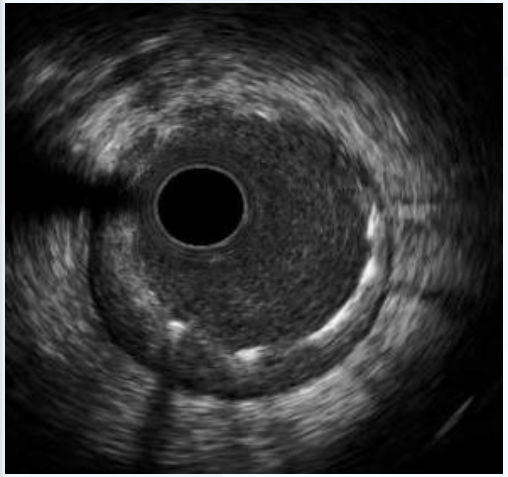
MSA: IVUS and Stent enhancement



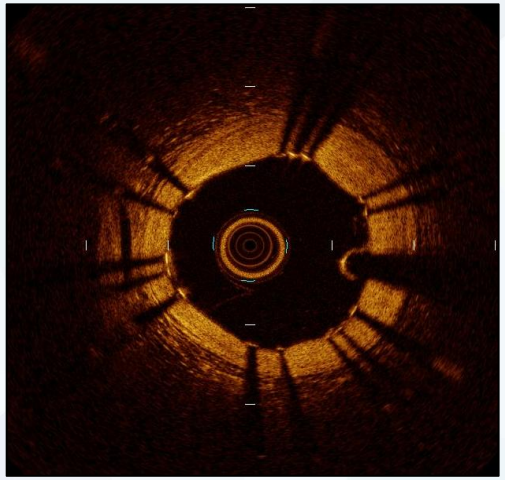
Tanaka N et al. Heart Vessels. 2013 Jan;28(1):1-6.

New tool for stent optimization

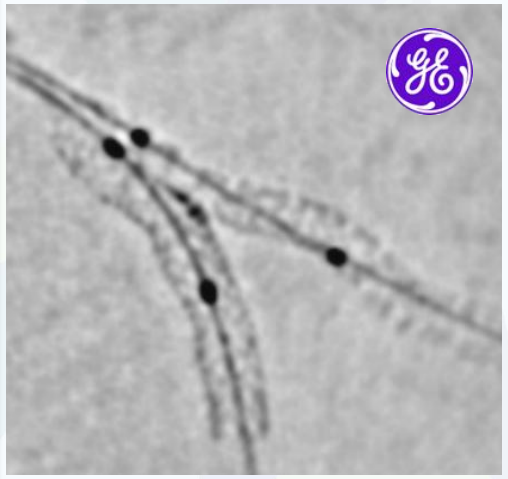
IVUS



OCT



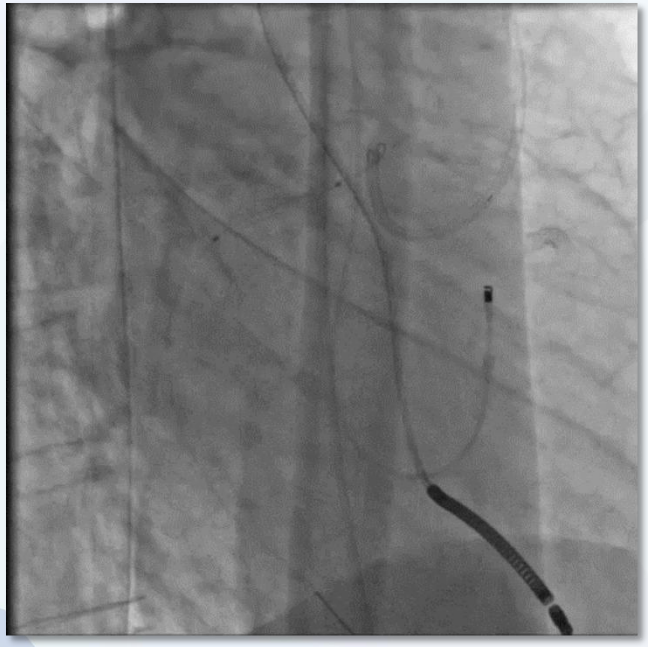
StentViz



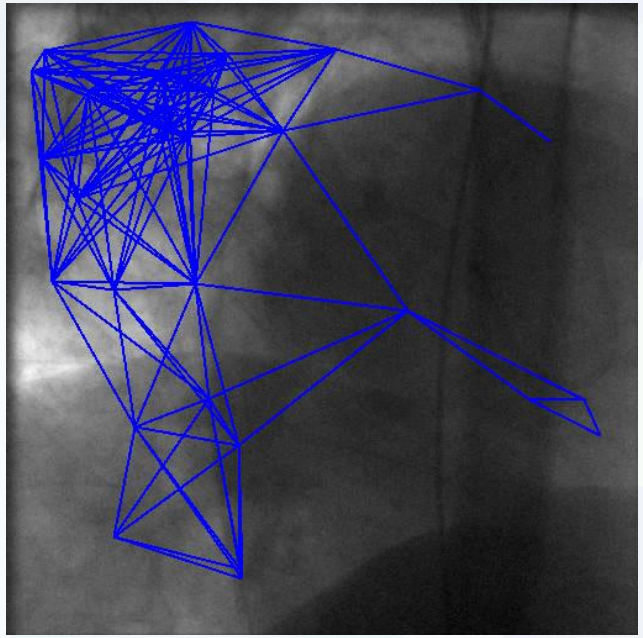
3DStent

What is 3DStent?

Rotational acquisition after stent deployment



Motion-compensated 3D reconstruction of the stent using CMCT*



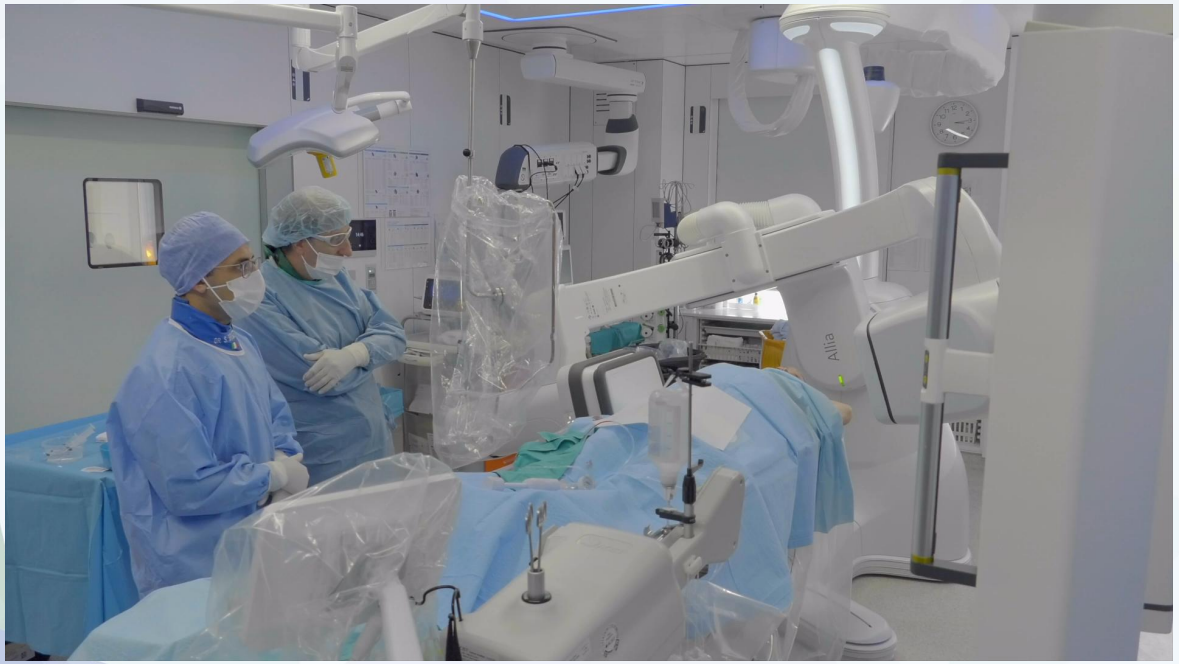
Auto-adaptative detection of the balloon
Multi-model stent motion estimation
Automatic optimization of the image quality

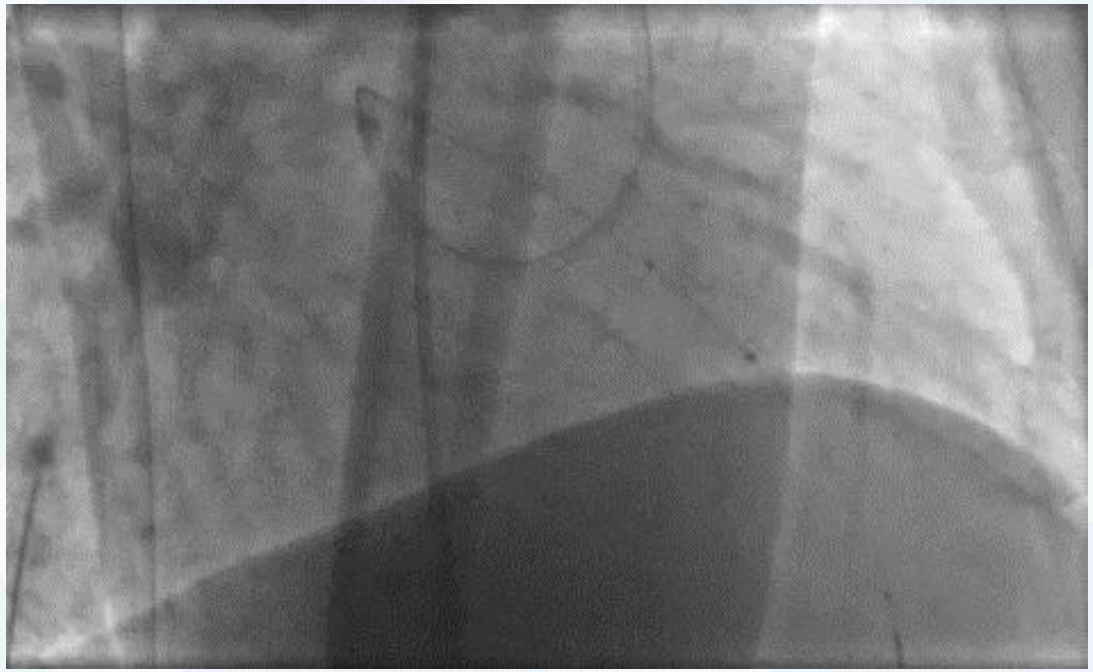
Intra-procedural visualization of the stent in 3D

Unique multi-planar and 3D views using X-Ray only

*CMCT: C-arm Motion compensated Computed

3DStent acquisition





For illustrative purposes, only commercially available in the new ALLIA system from GE HealthCare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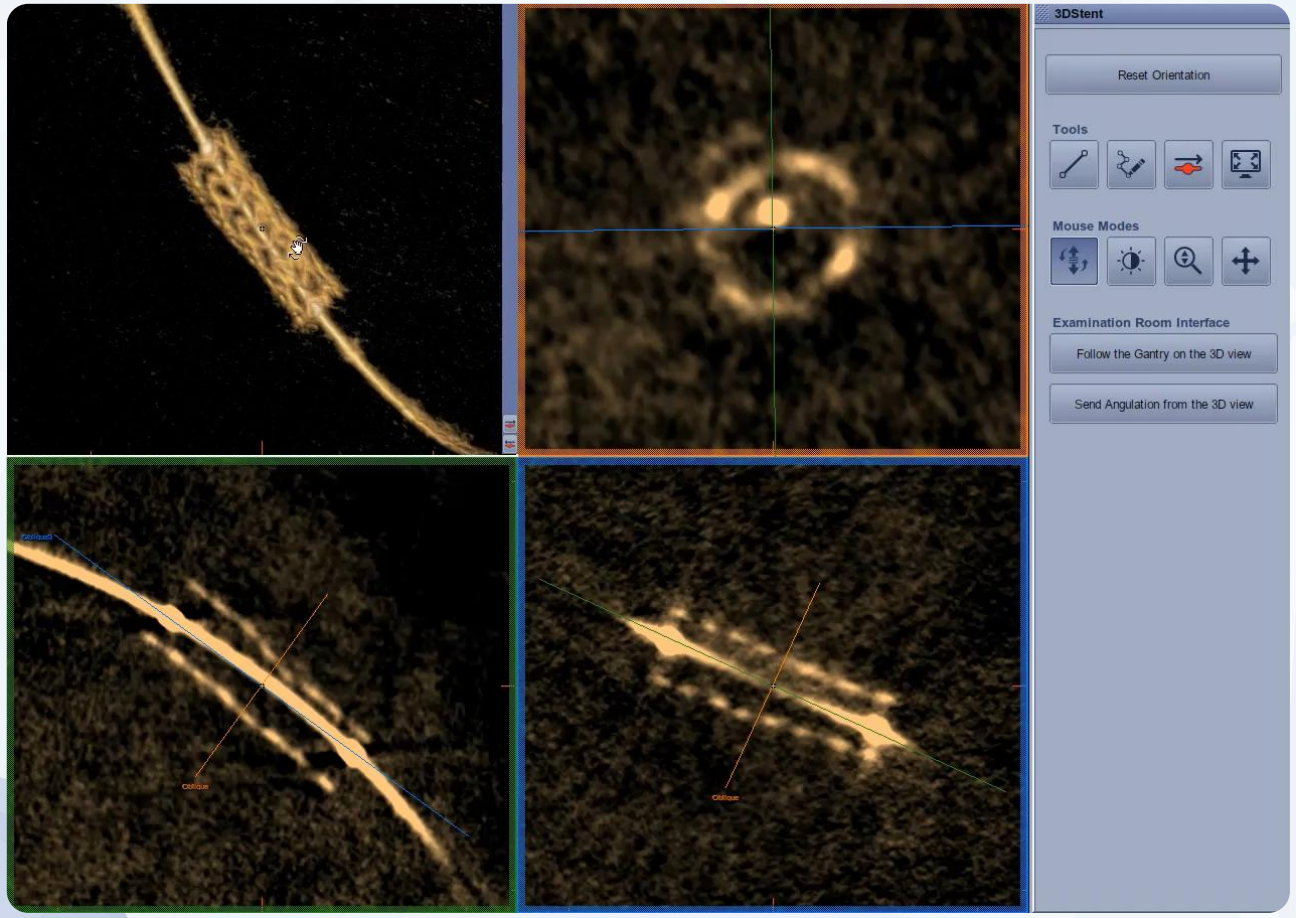
3DStent reconstruction rotational image

Xience stent 2.5 x 28mm

3DStent analysis



- Measure **diameters**
- Measure **stent area (MSA)**
- Ask system to reach desired angulation displayed on the VR view (Send Angles)
- Ask the VR view to follow gantry's angulation (Follow the gantry)

OCT vs 3DStent

OCT

Resolution Longitudinal

200 µm

Axial Longitudinal

20 µm

3DStent

Resolution Longitudinal

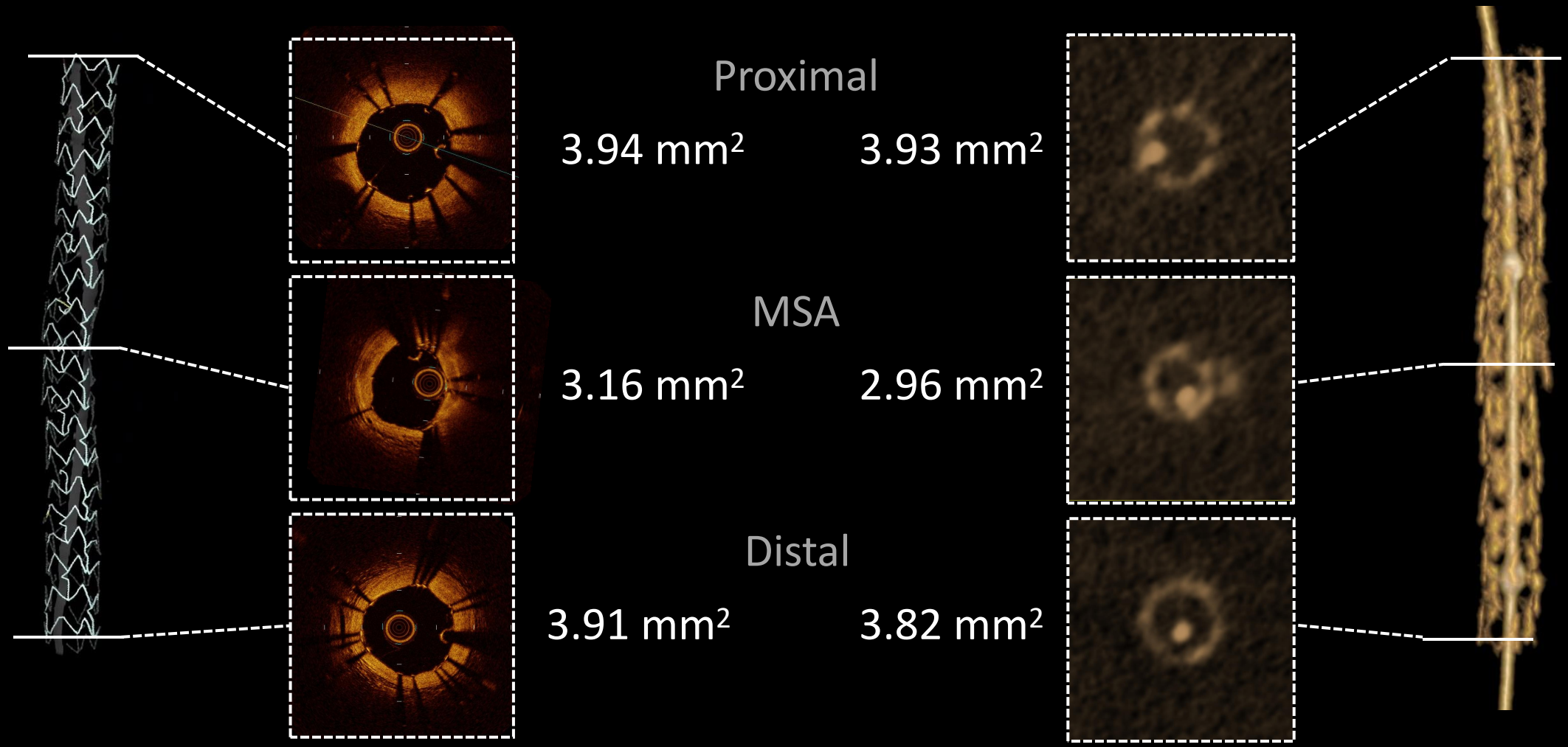
100 µm

Axial Longitudinal

100 µm

Xcience 2.5 x 28 mm

MSA: OCT vs 3DStent



Patients with CAD
and
post-PCI **OCT + 3DStent imaging**

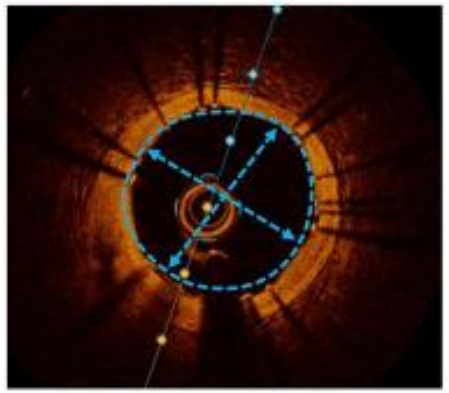
ENDPOINTS
- Stent area
- Stent diameter

Analyst 1
OCT analysis

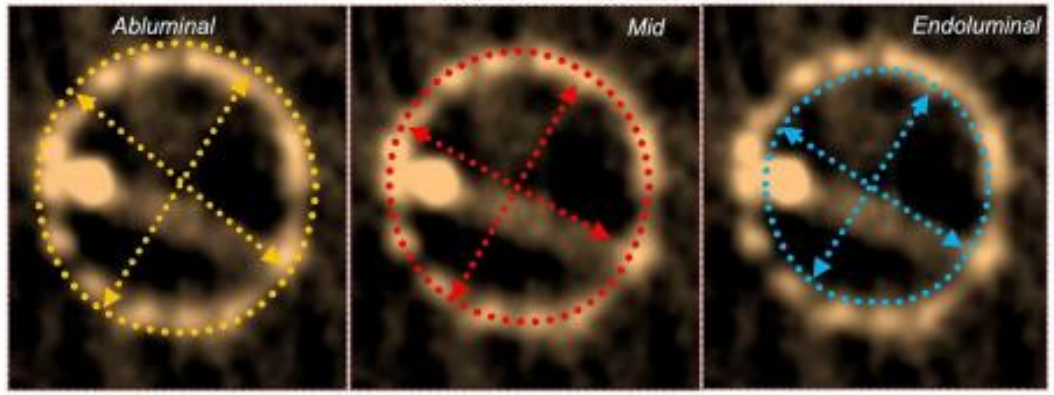
Analyst 2
3DStent analysis
Baseline and 3 months (intra-observer agreeement)

Analyst 3
3DStent analysis
(inter-observer agreement)

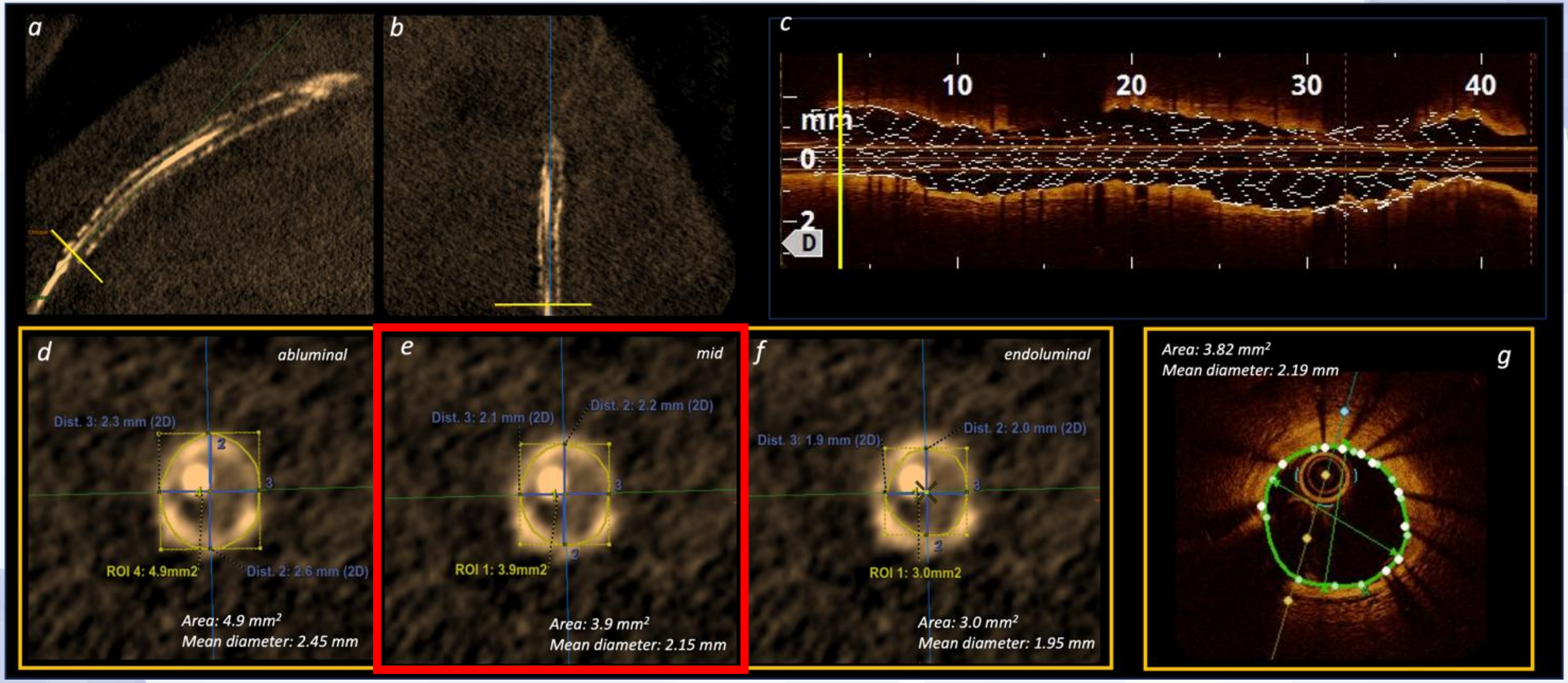
contiguous cross-sectional measurements (every 1 mm)



contiguous cross-sectional measurements (every 1 mm) at **abluminal, mid** and **endoluminal level**

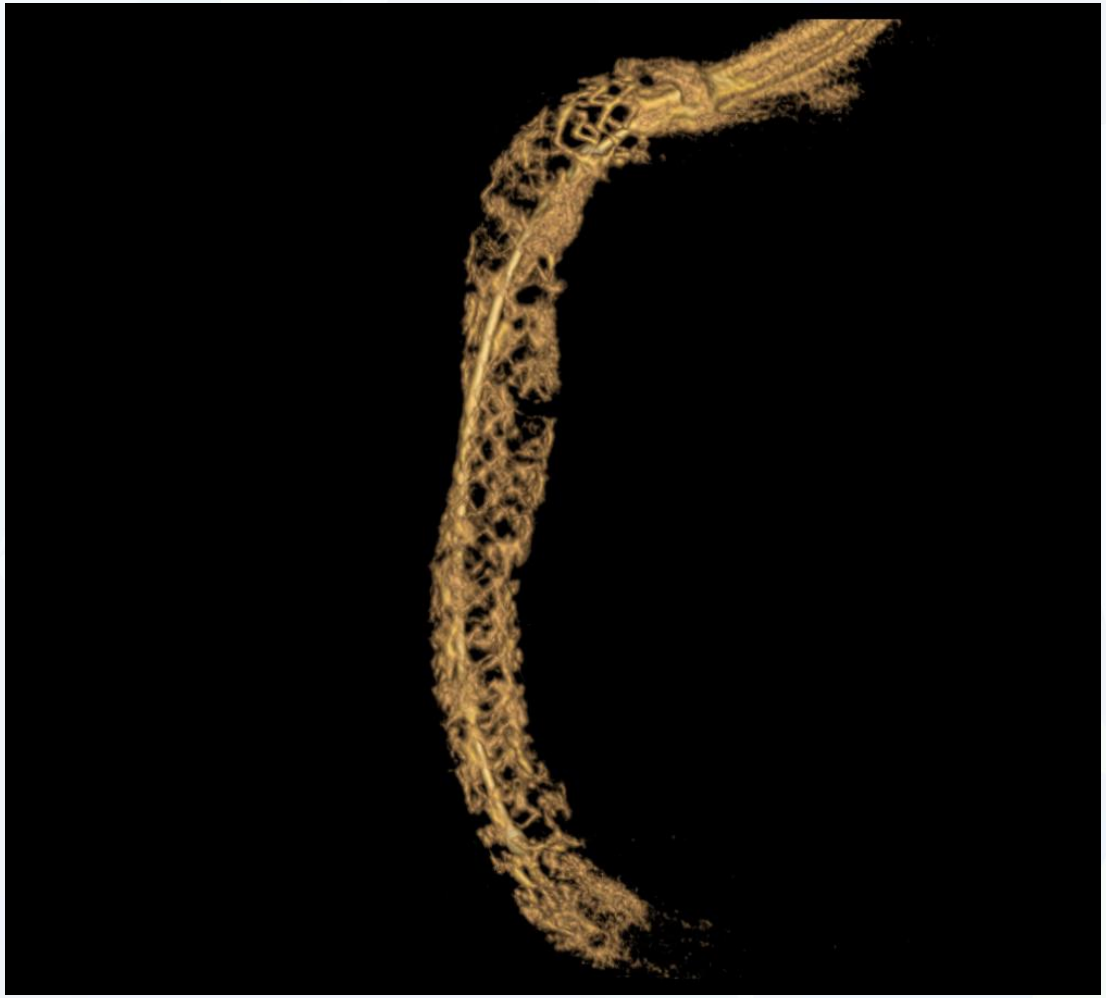


Ruberti A et.al Int J Cardiovasc Imaging, 2024.

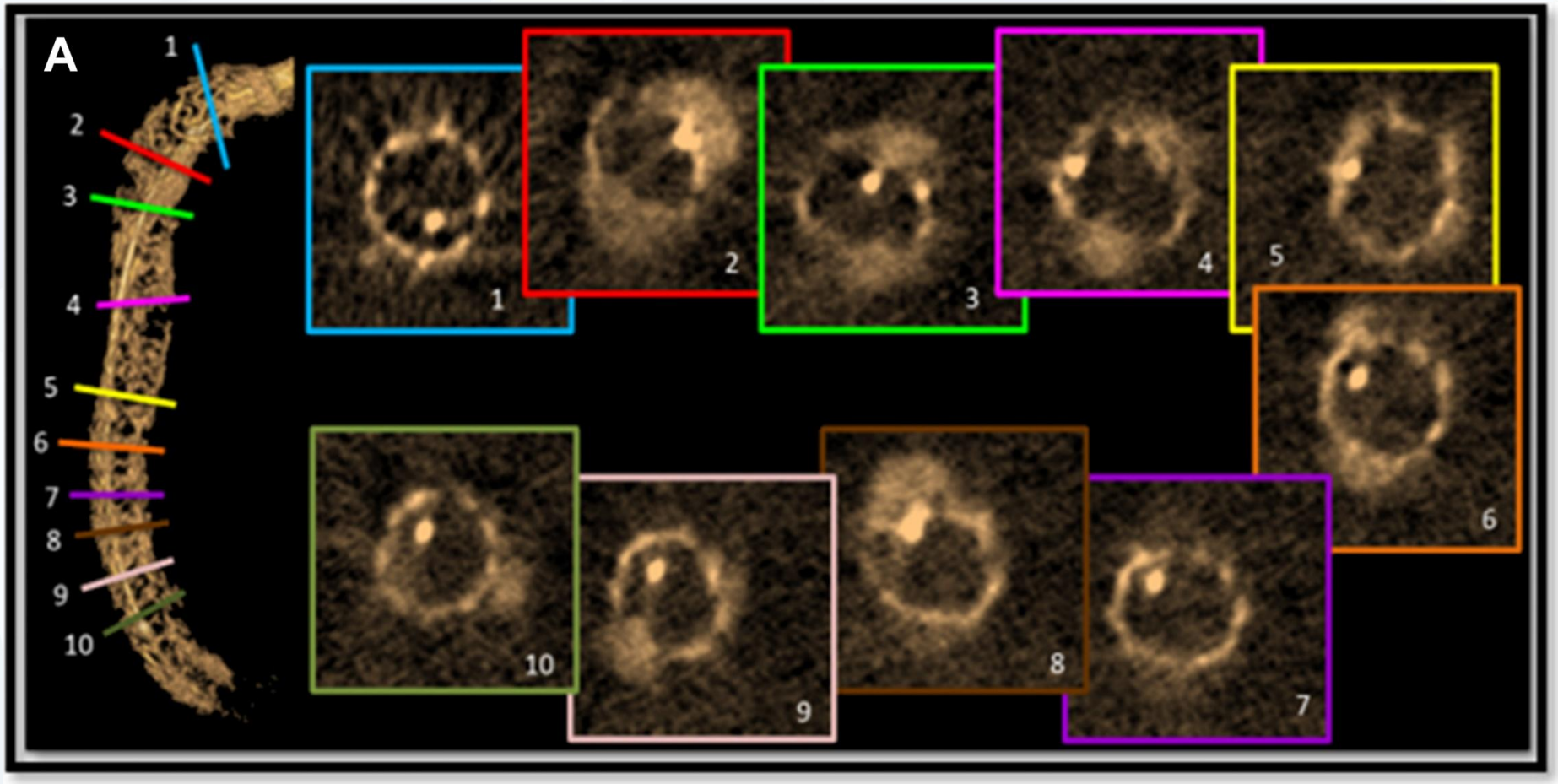


Ruberti A et.al Int J Cardiovasc Imaging, 2024.

3DStent in calcified disease



3DStent in calcified disease



JACC Case Reports 2024, Volume 29,

Limitations

- **Unable to assess stent apposition**
- **X-ray radiation**:
  - Can be minimized by using appropriate collimation
  - Dose distributed over a large skin surface, minimizing the risk of skin injury. (200° gantry rotation)
  - The 3D acquisition can be launched from the control room.
- **Image quality** may be sub-optimal with high BMI patients (greater than 35 kg/m²)
- **Spatial resolution and measurement accuracy**:
  - No validation yet available with IVI
  - Clinical studies are currently being initiated


GETINGE

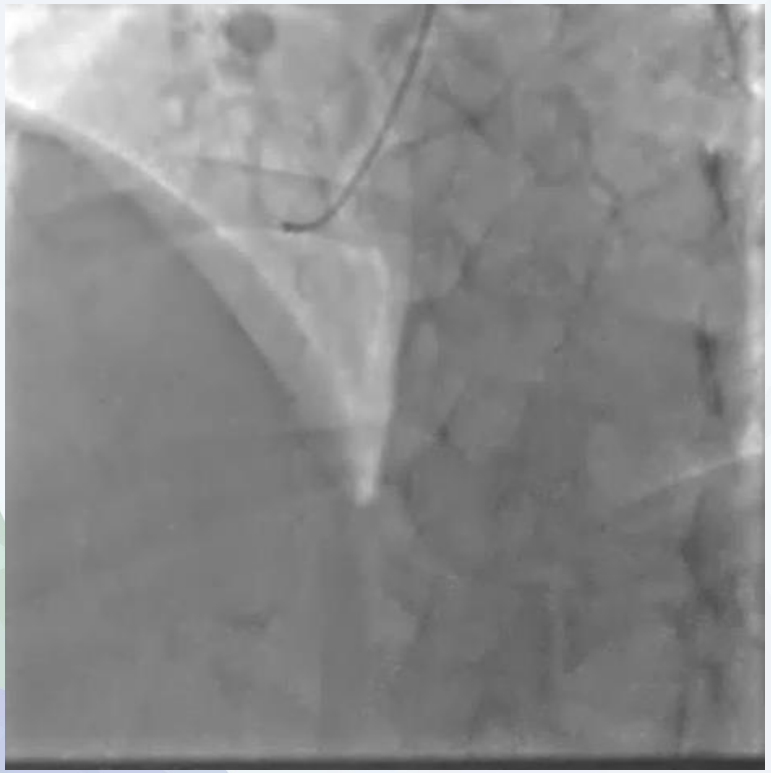
Take-home messages

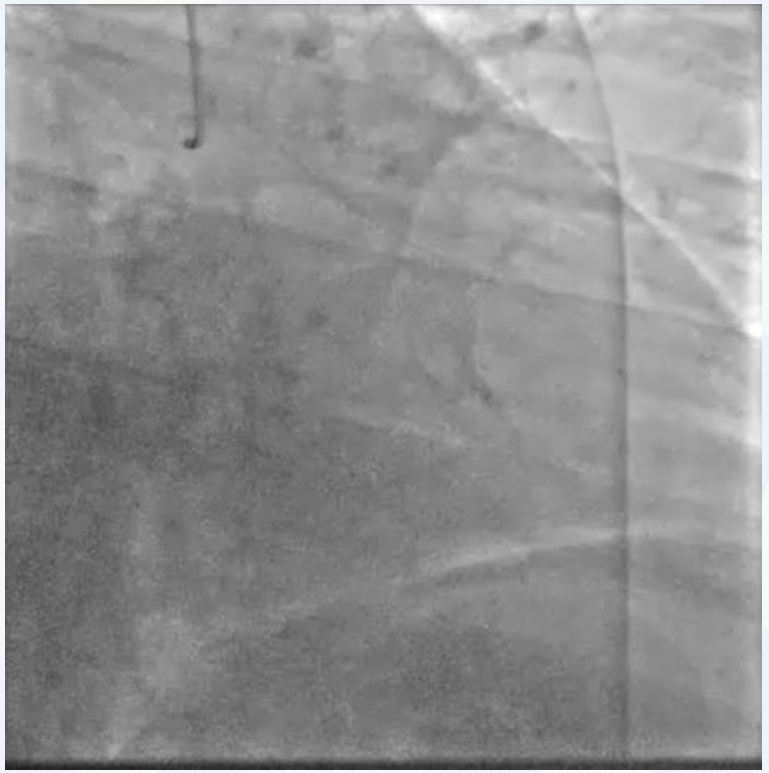
- **3DStent** may be used for **evaluating MSA** to guide stent optimization and to avoid stent underexpansion
- This is particularly useful in those situations where IC imaging catheters are not able to cross the lesion

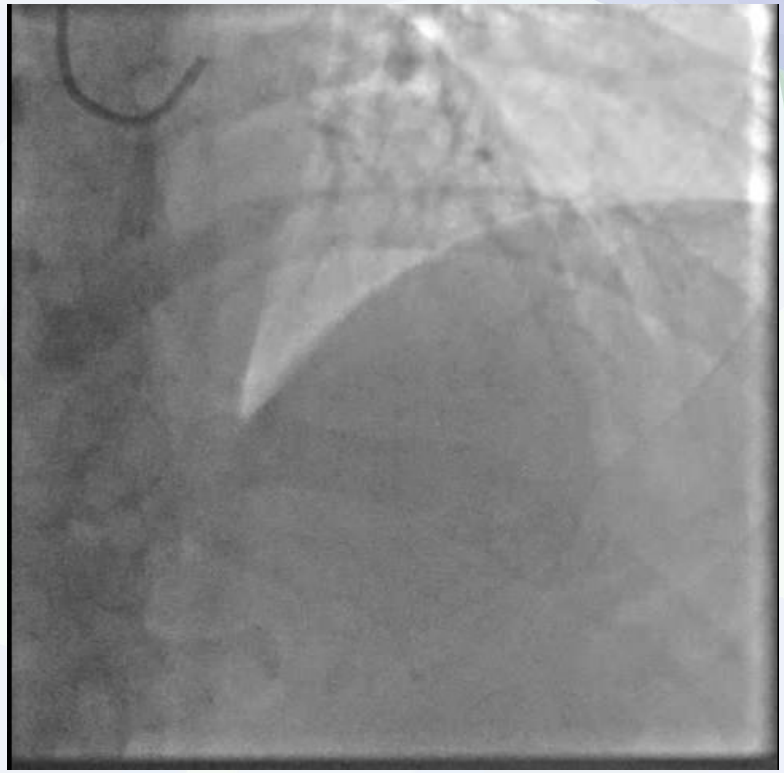
Hands-on

Patient History

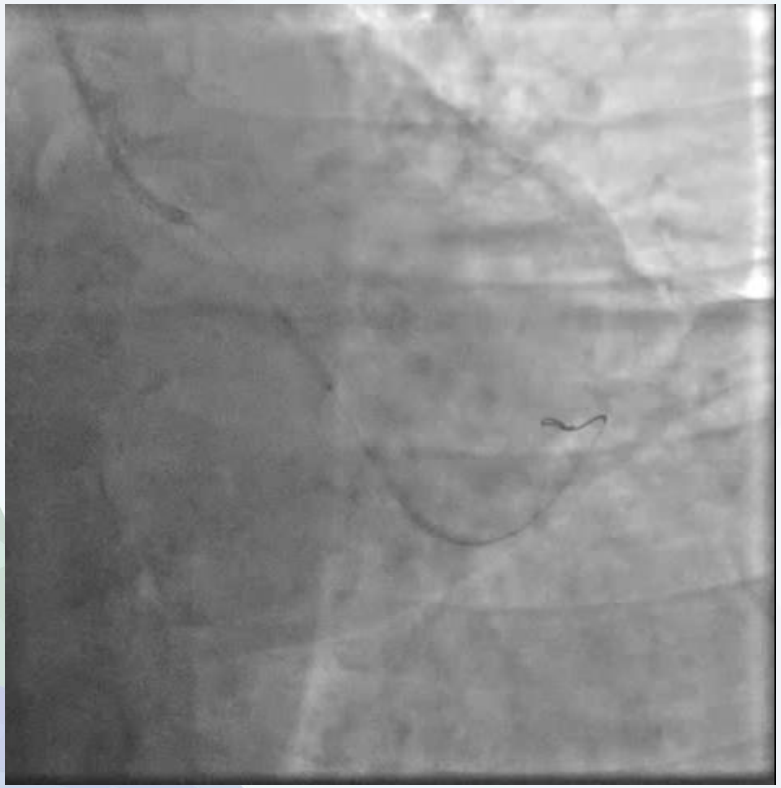
- Man 66 yo (BMI: 30.5)
- CV risk factors: DM, hypertension, dyslipidaemia
- Chest pain under effort since 1 month with SPECT showing infero-lateral ischaemia
- AAS, beta-blockers, ACE-inhibitors, statins, nitrates



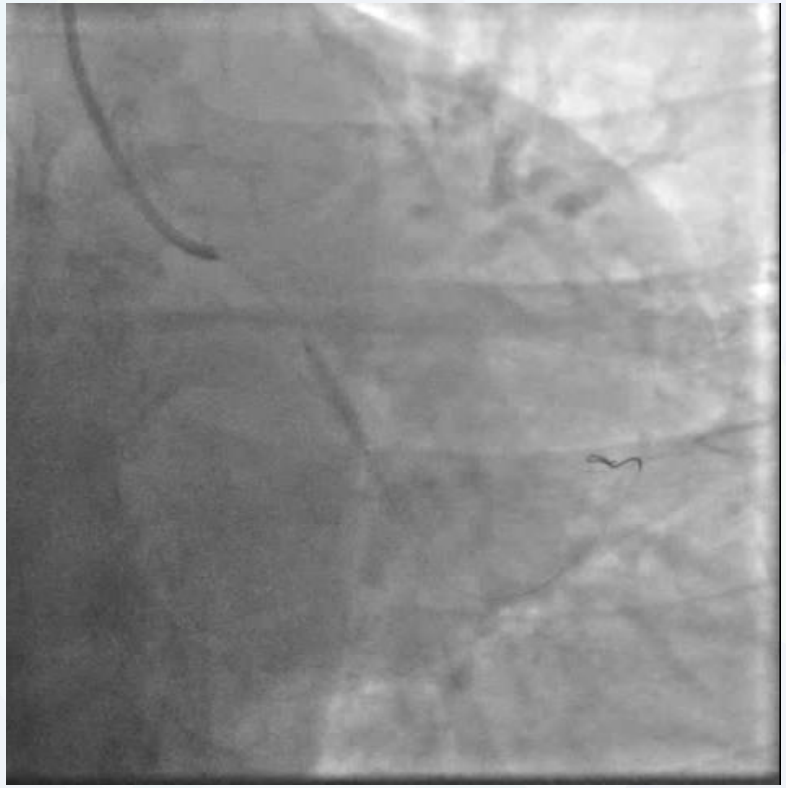




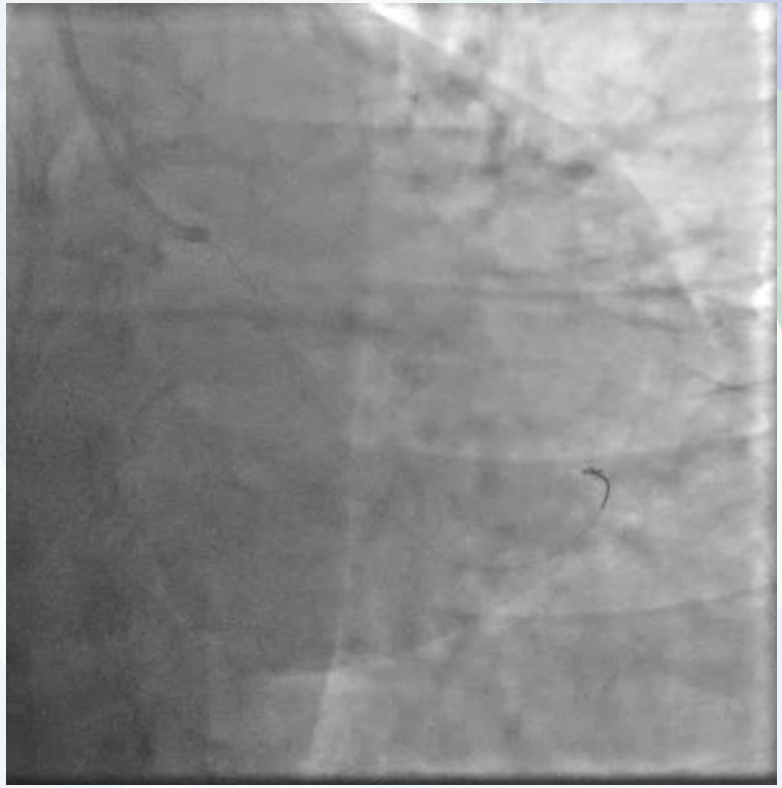
LCx PCI



NC balloon 2.5 x 12

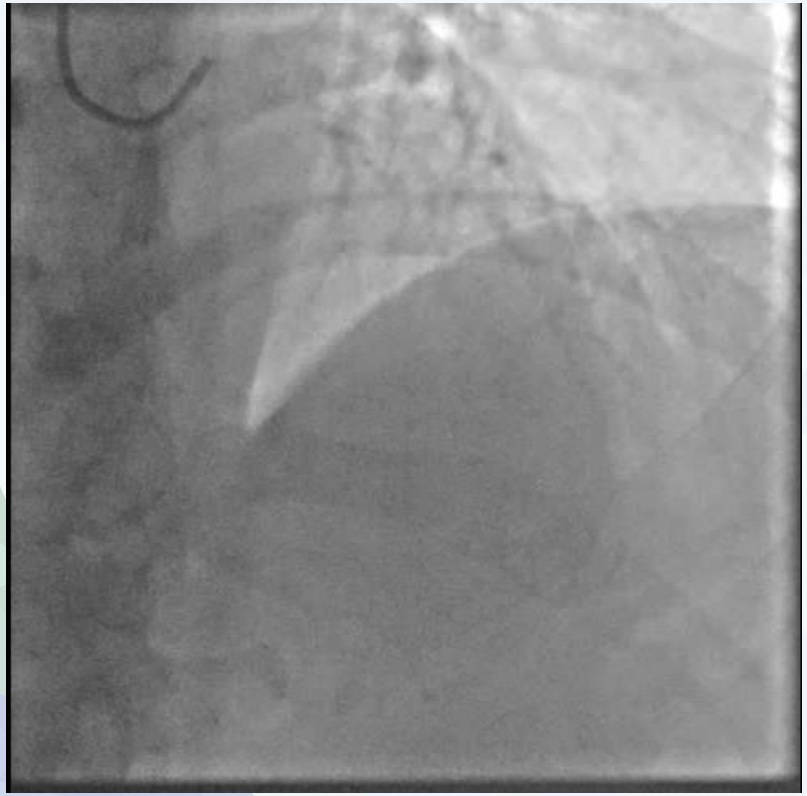


DES 2.5 x 16 mm

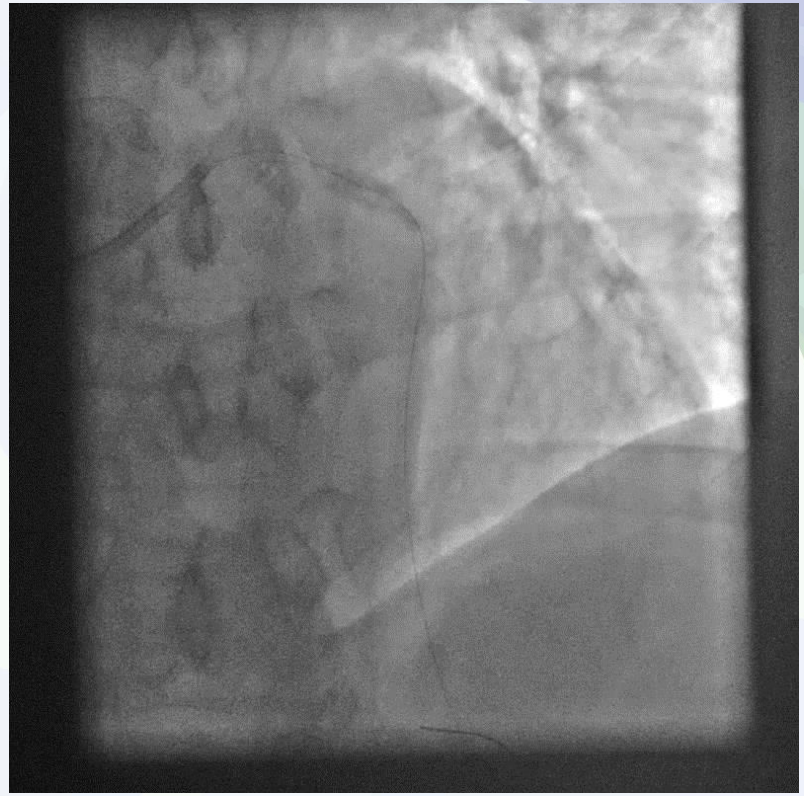


Final result

LAD PCI

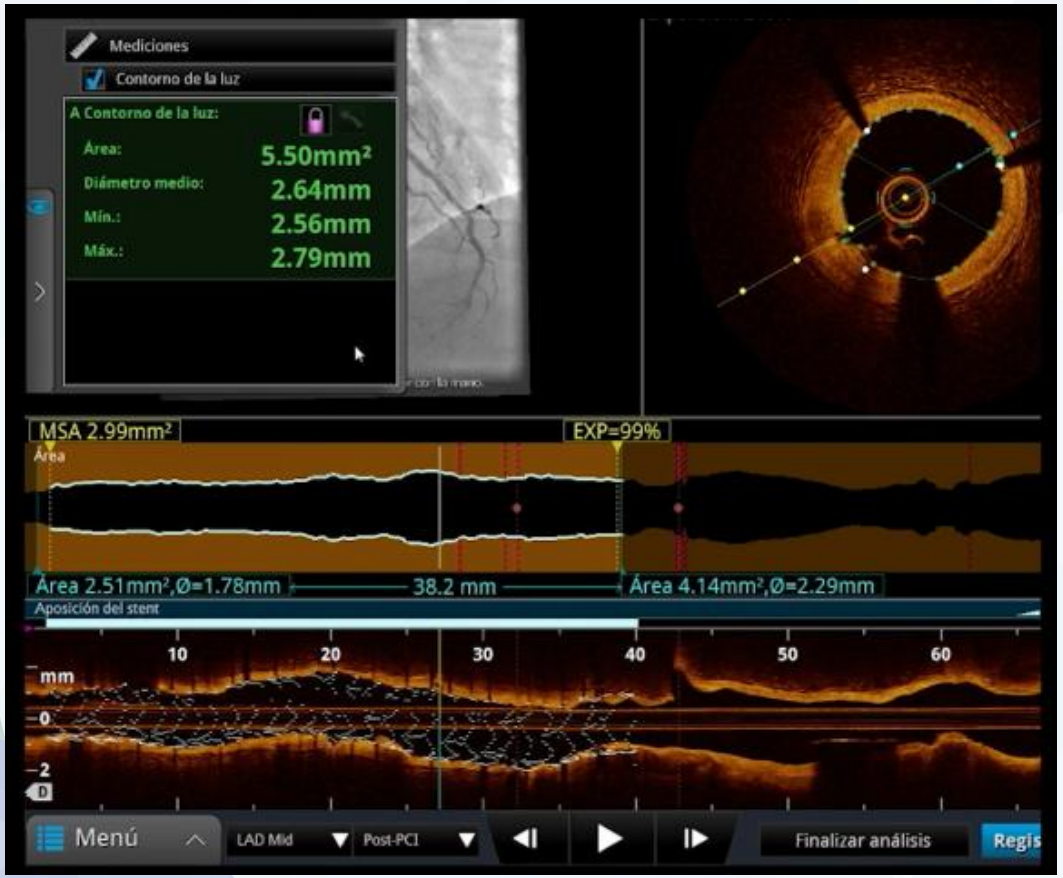


DES 2.5 x 39 mm

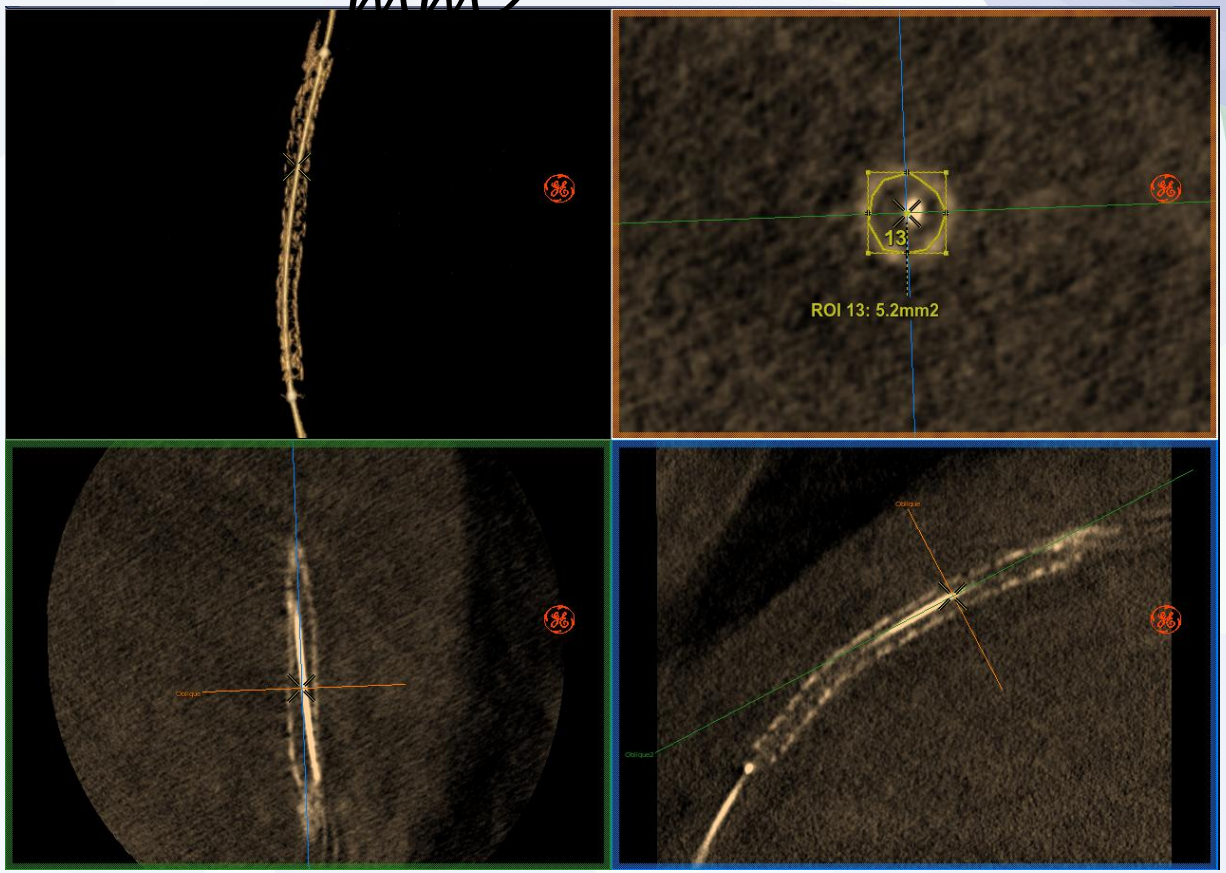


Final result

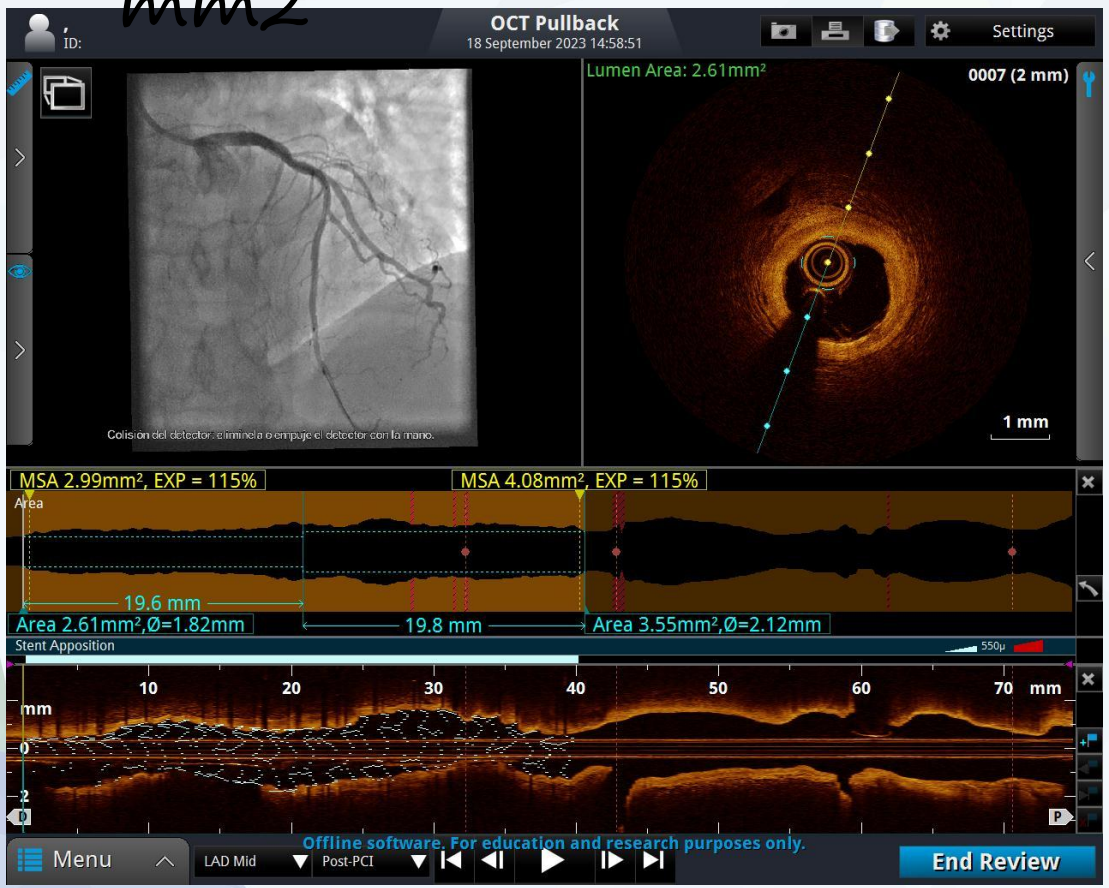
OCT: 5.5 mm2



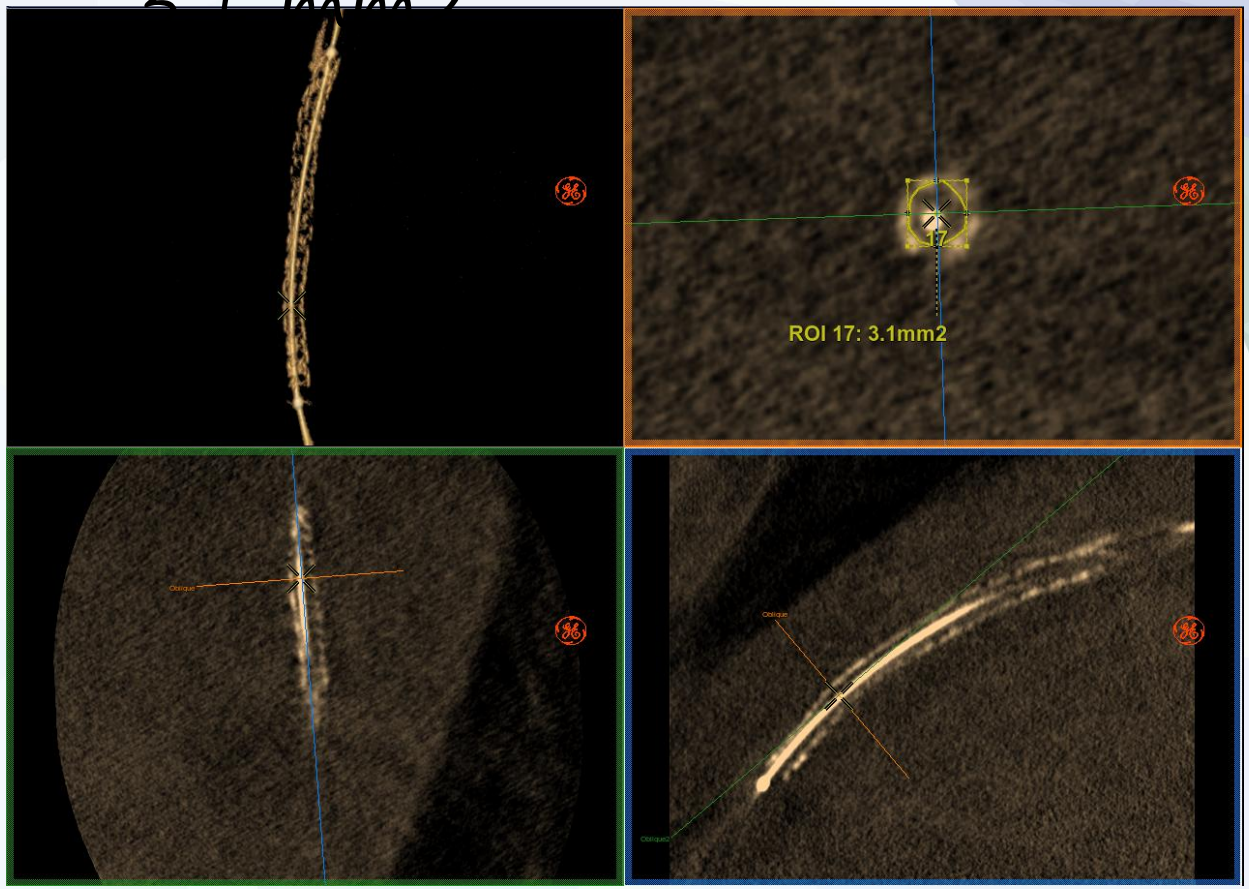
3DStent: 5.2 mm2



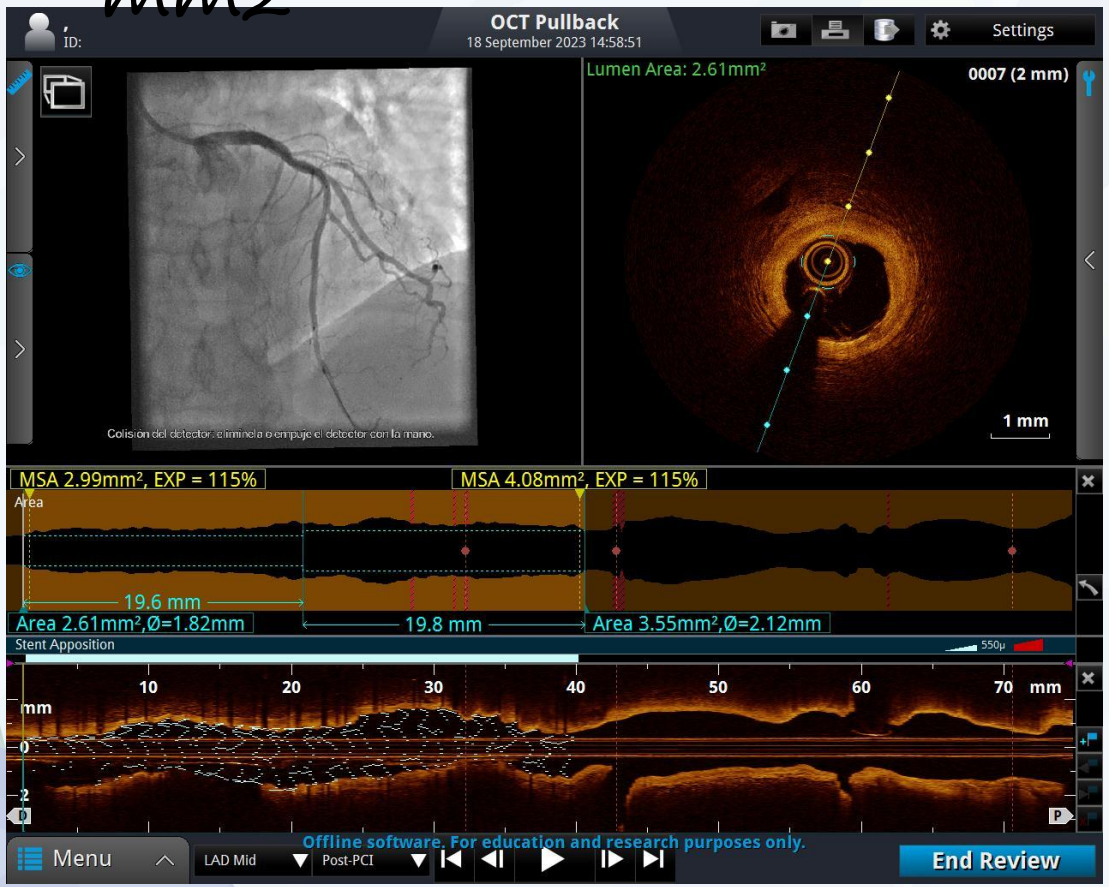
OCT distal MSA: 2.99 mm2



3DStent distal MSA: 3.1 mm2



OCT proximal MSA: 4.08 mm2



3DStent proximal MSA: 4.2 mm2