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Universitair Medisch Centrum Rotterdam

Next Generation 3D-OCT: How Beneficial in Practice?

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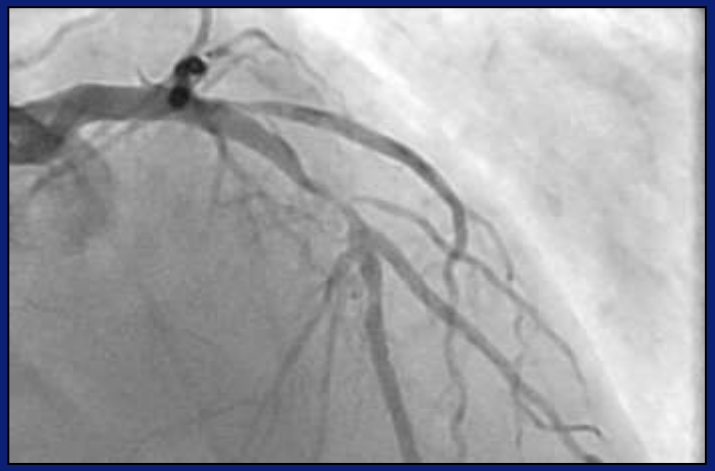
3D-OCT:
How beneficial in clinical practise?

- Atherosclerosis is a disease of the arterial vessel wall

- The standard imaging method, angiography, however, does only visualize the lumen, not the arterial wall



We work in 3D space on a moving object using
- 2D imaging method
- Only indirect visualization of anatomy
- Poor visualization of devices

3D-OCT:
How beneficial in clinical practise?

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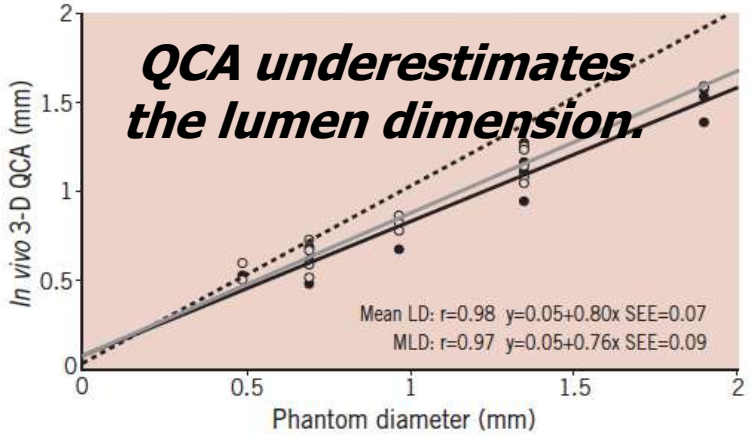
Clinical research

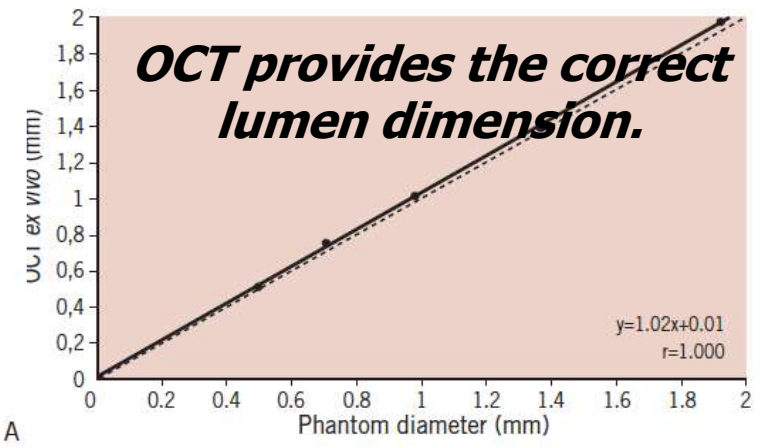
EuroIntervention

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

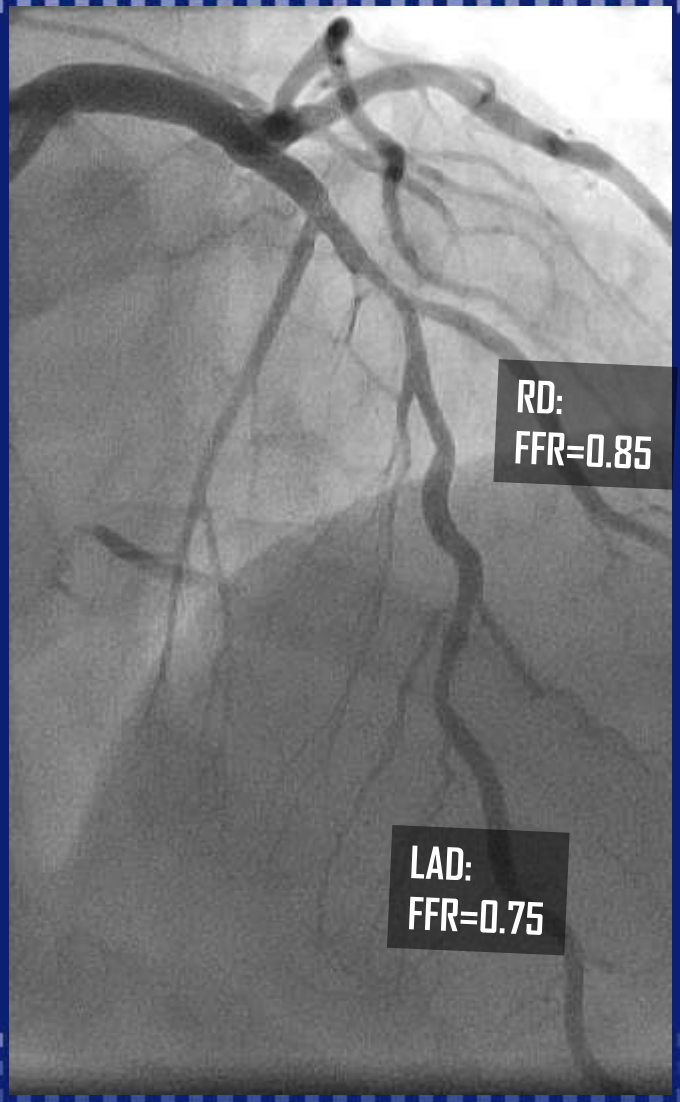
Keiichi Tsuchida, MD, PhD; Willem J. van der Giessen, MD, PhD; Mark Patterson, MRCP; Shuzou Tanimoto, MD; Héctor M. García-García, MD, MSc; Evelyn Regar, MD, PhD; Jurgen M. R. Ligthart, BSc; Anne-Marie Maugenest; Gio Maatrijk; Jolanda J. Wentzel, PhD; Patrick W. Serruys*, MD, PhD, FACC, FESC

Thoraxcenter, Erasmus Medical Center, Rotterdam, The Netherlands





3D-OCT:
How beneficial in clinical practise?



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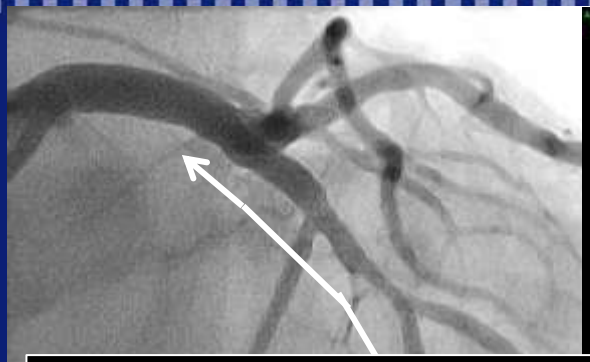
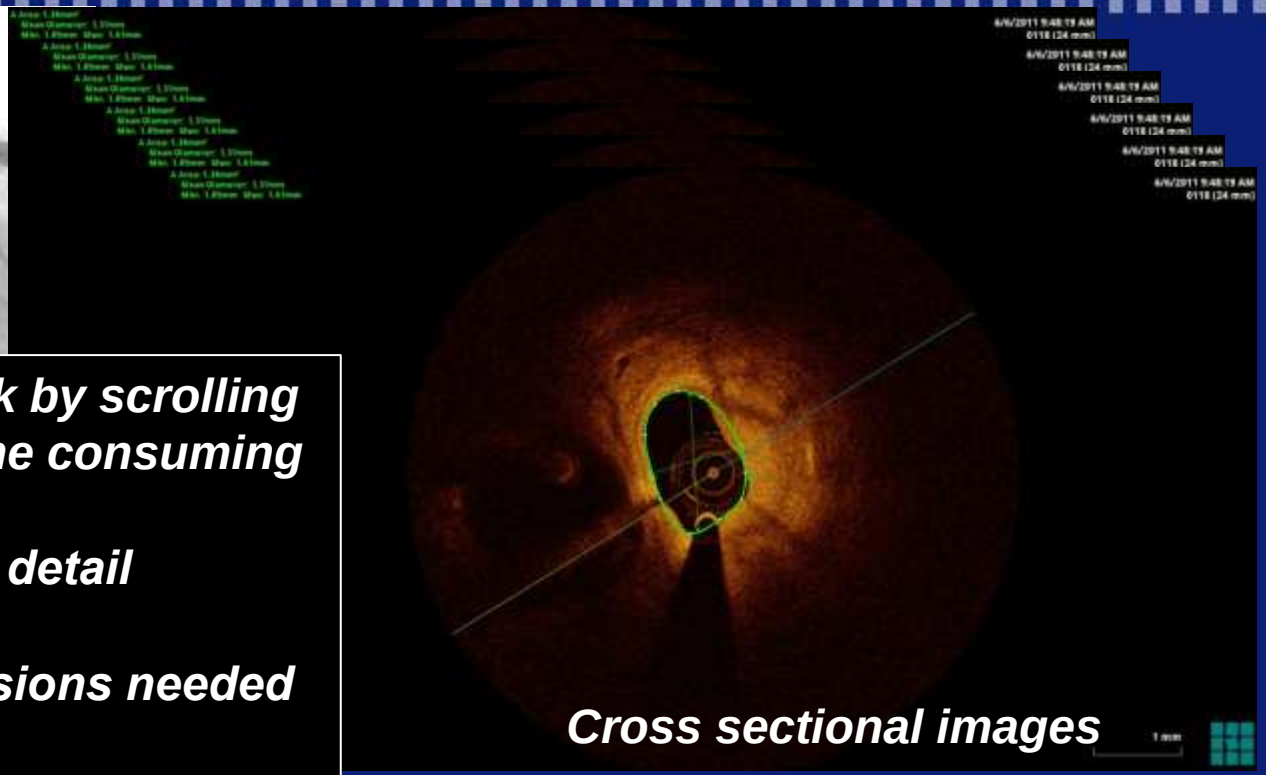
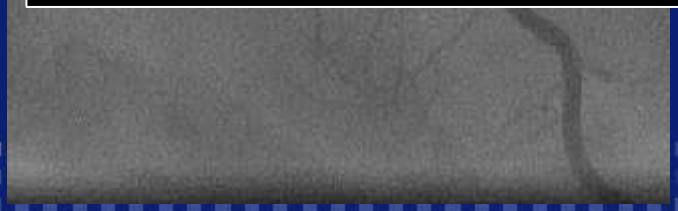




- *Reviewing a pullback by scrolling back and forth is time consuming*
- *Risc to “overlook” a detail*
- *What’s about dimensions needed for Tx planning:*
  - *->Stent diameter?*
  - *->Stent length?*



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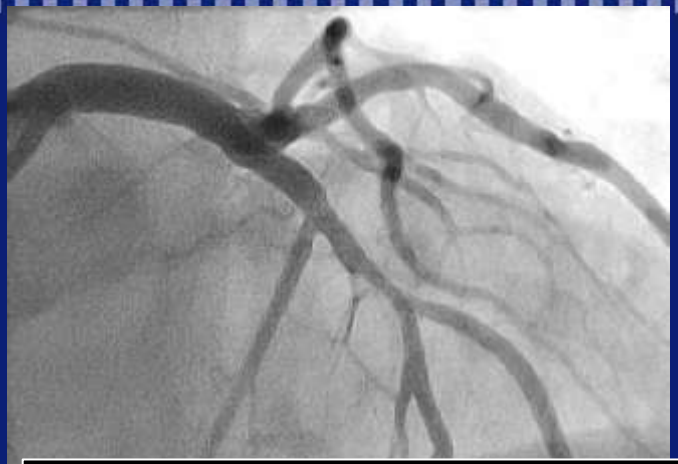
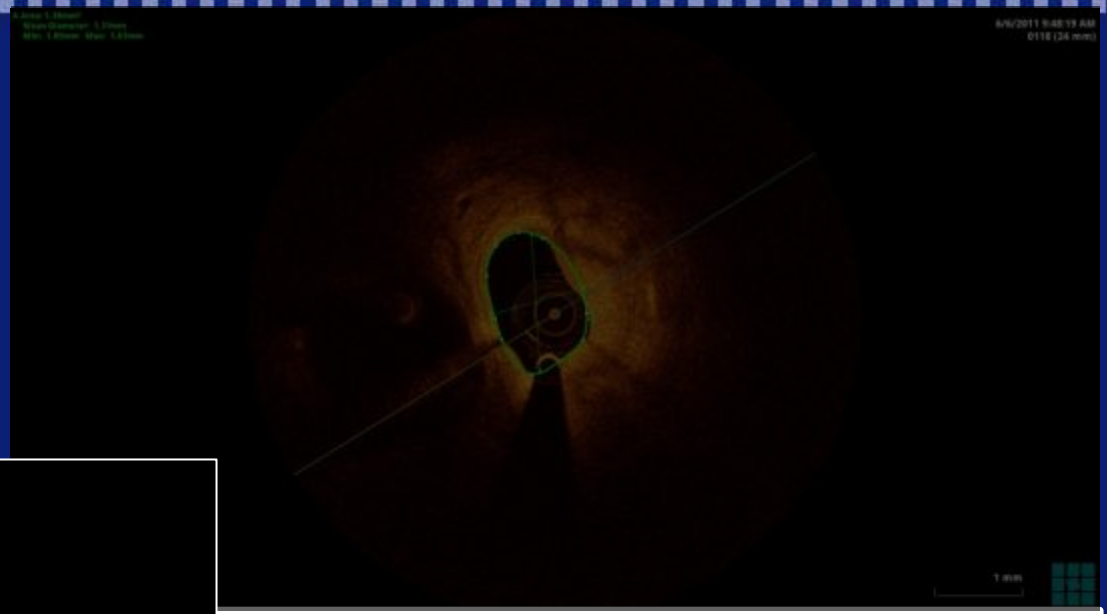
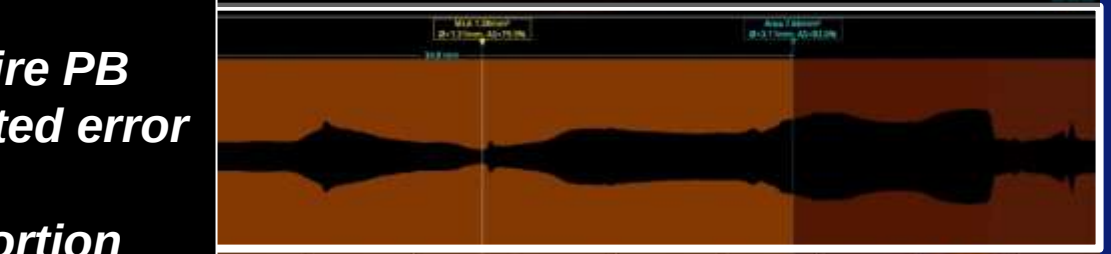
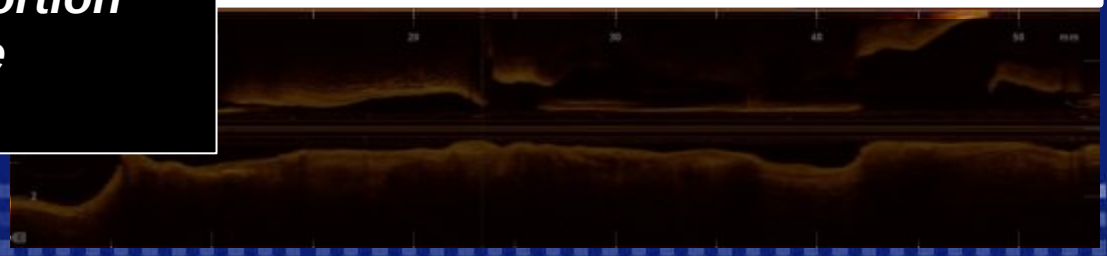


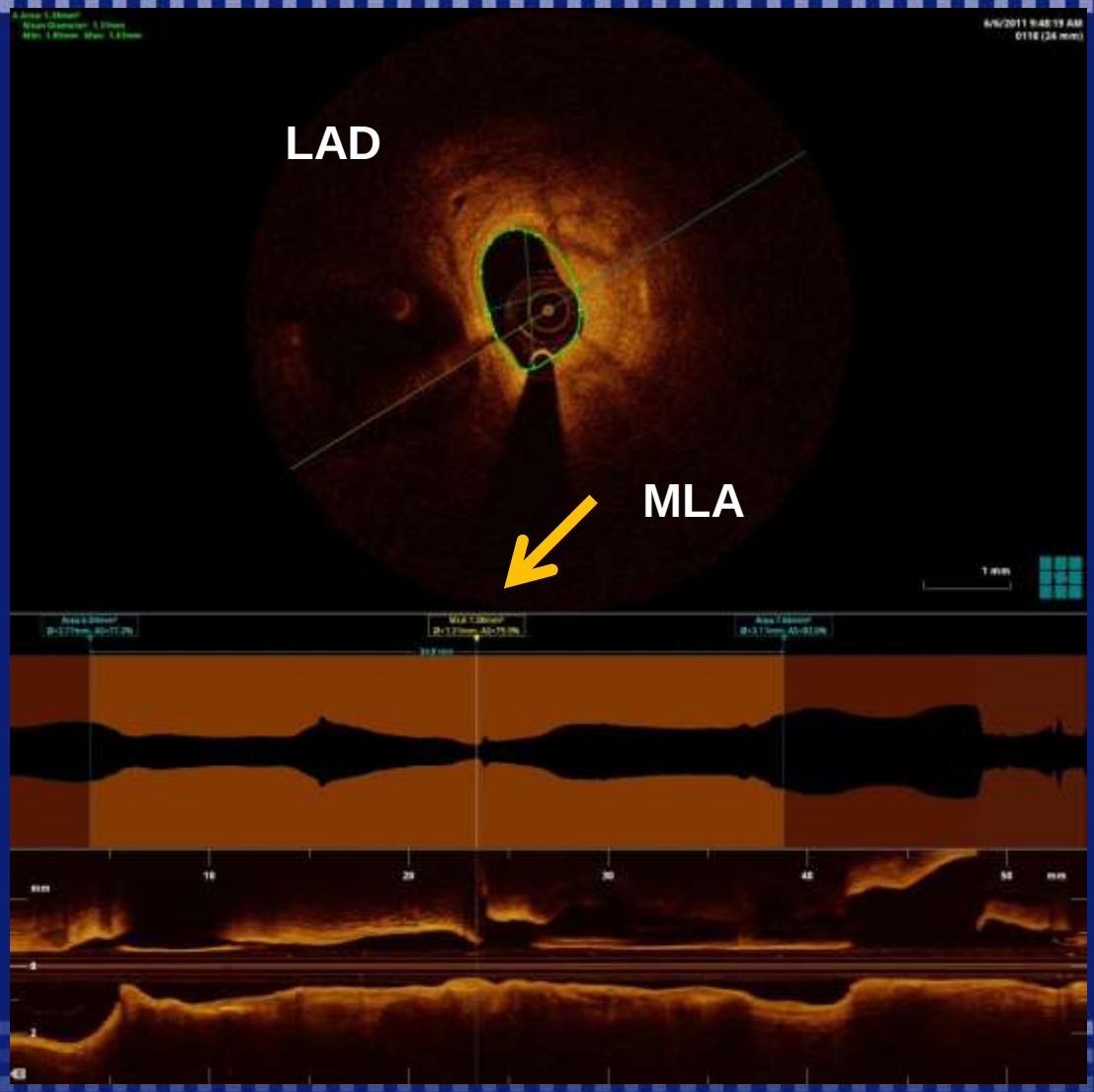






- *OCT = 3D dataset*
- *Representation of*
  TRUE lumen diameter
  over the length of the entire PB
  - *no projection-related error*
  - *no foreshortening*
  - *no geometric distortion*
- *Instantaneously available*

3D-OCT:
How beneficial in clinical practise?



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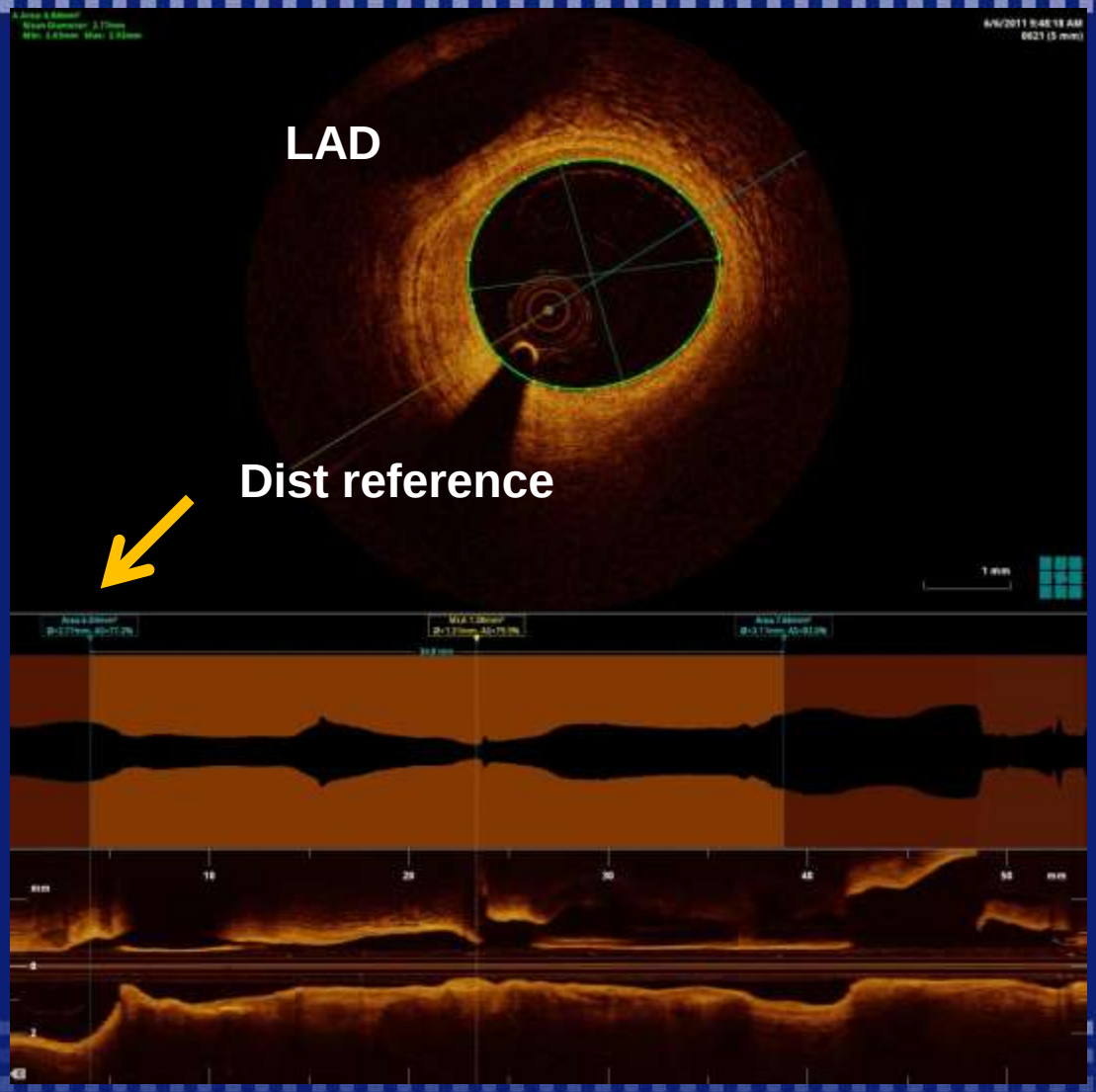

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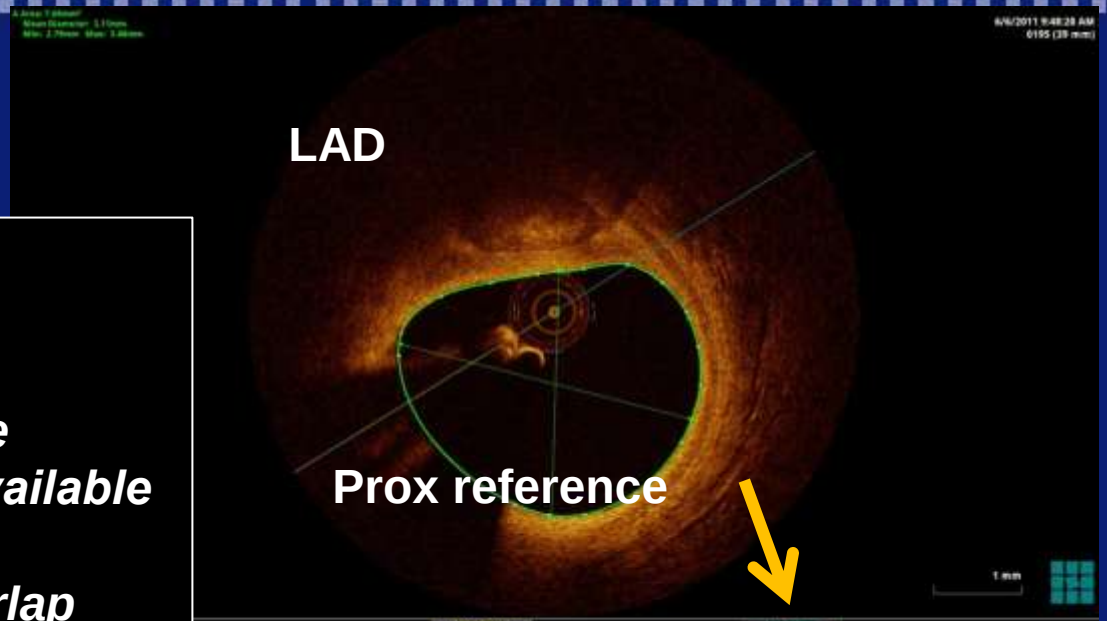
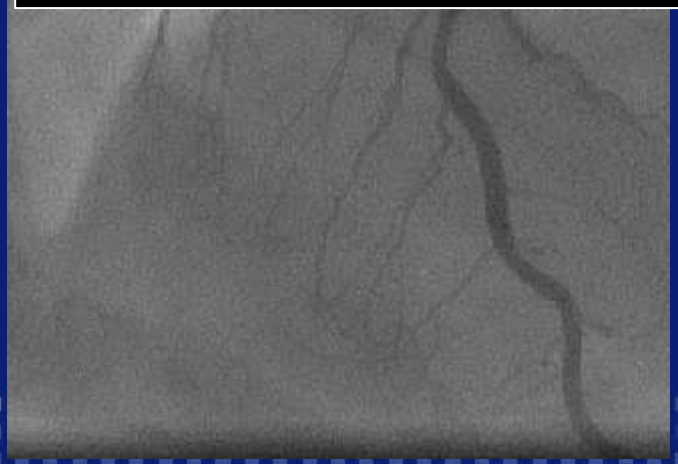
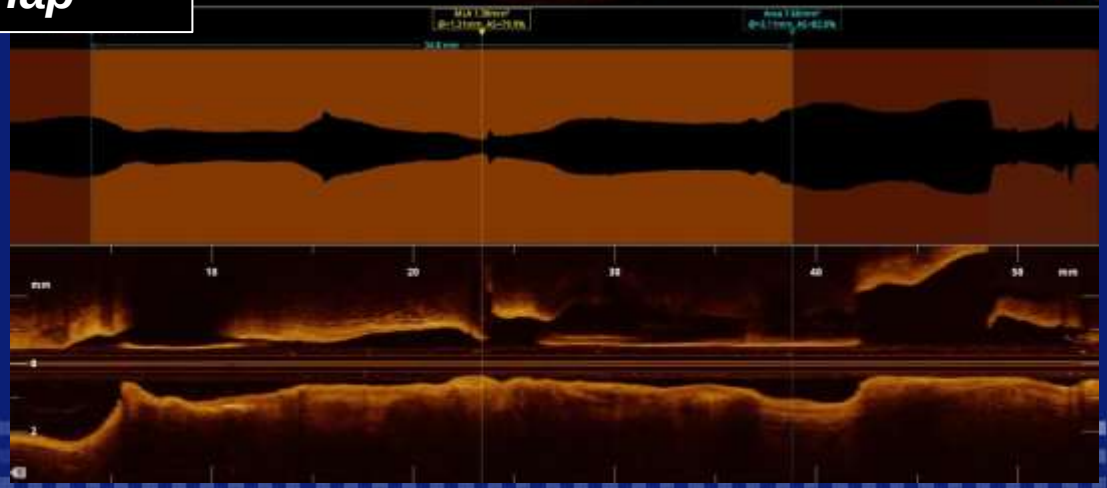


Landing zone selection

- ***Largest lumen with***
- ***Least disease***
- ***Coverage of necrotic core***
- ***"Virtual planning" with available stent length***
- ***Plan regions of stent overlap***





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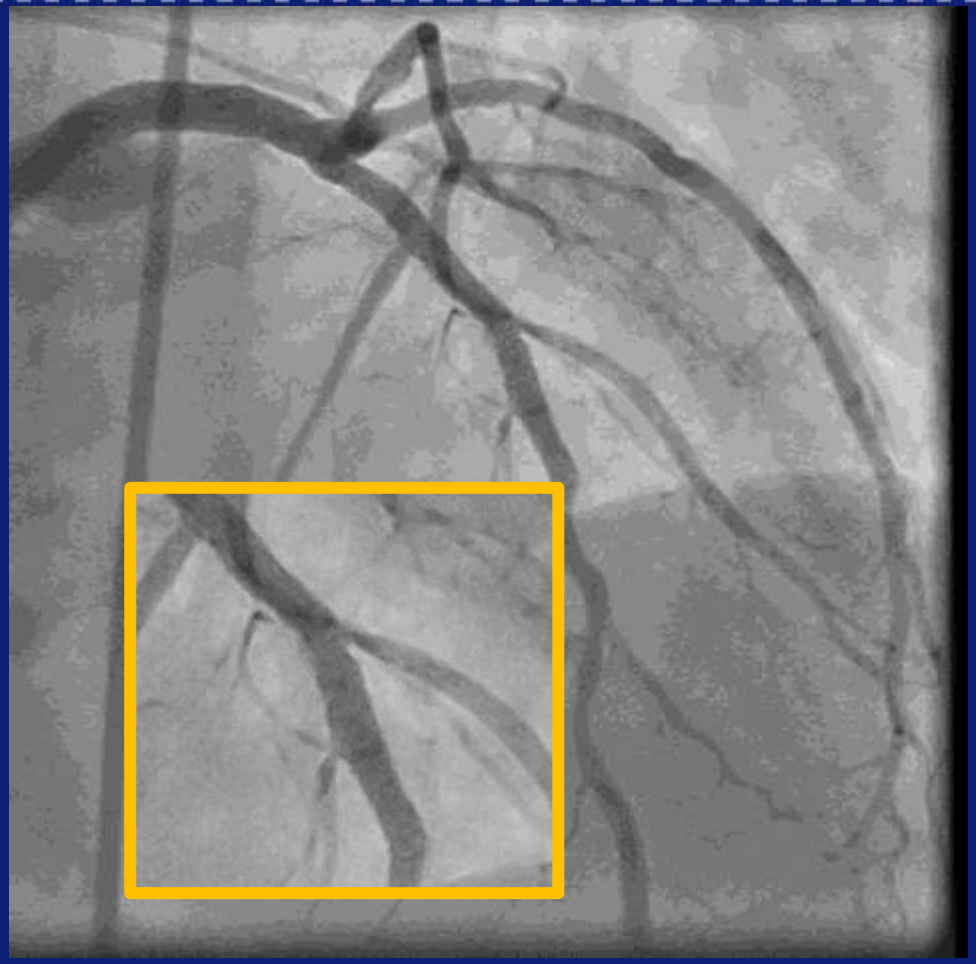

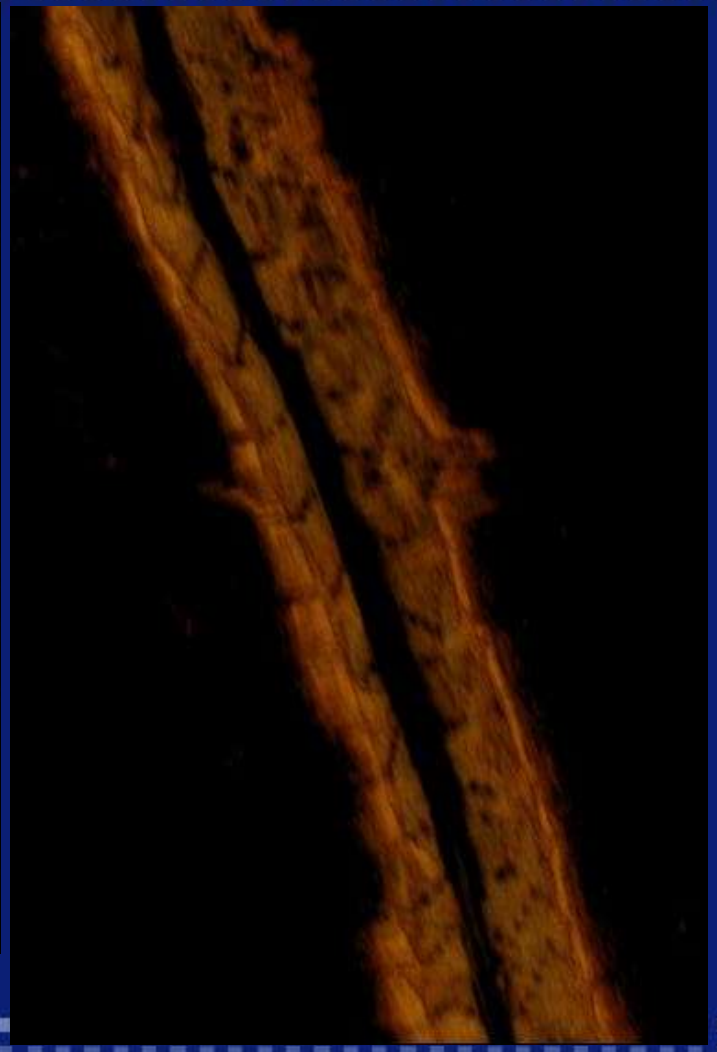

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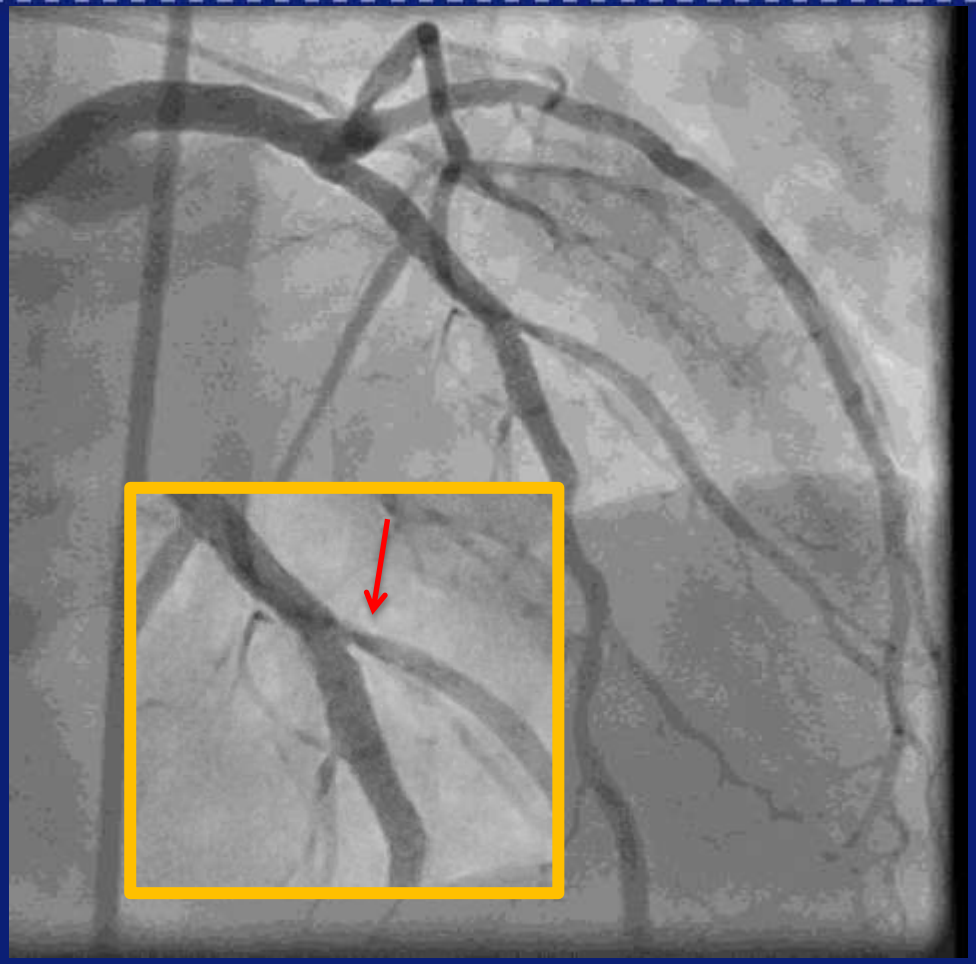
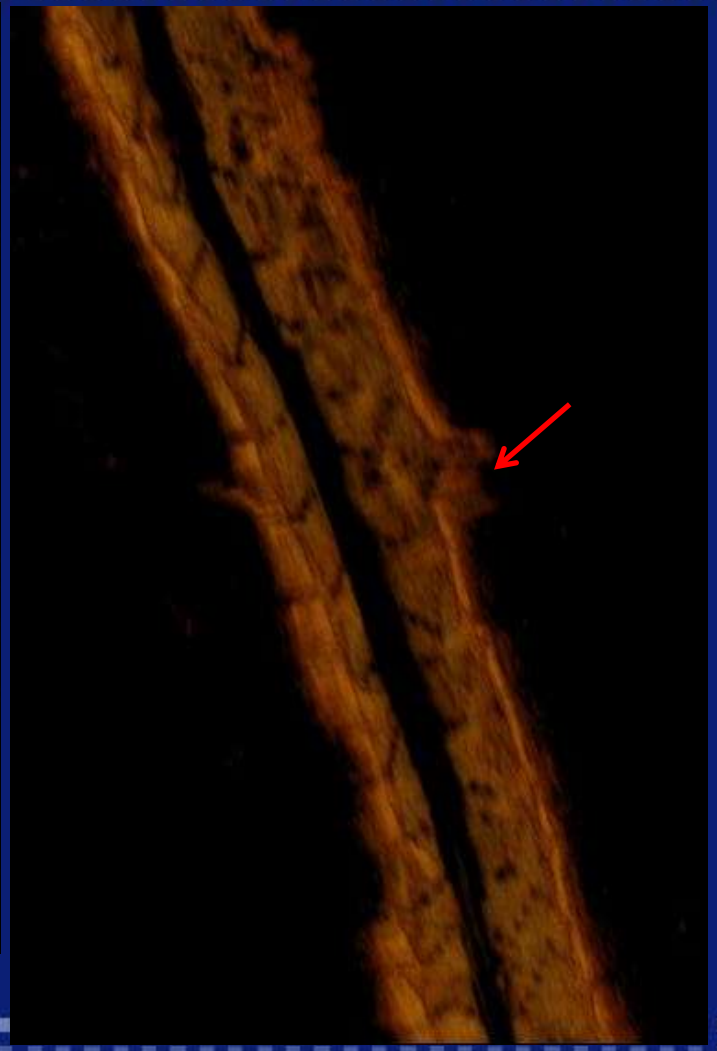
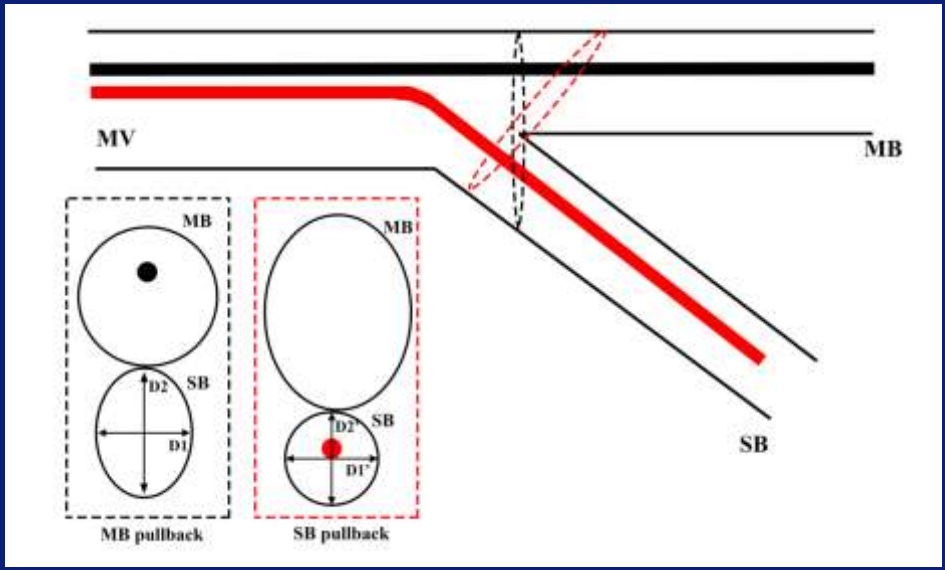




3D-OCT
Bifurcation PCI guidance
Assessment of SB ostium



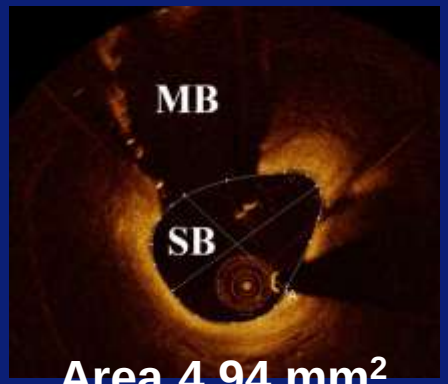
- **Potential error in SB measurements when performed from a MB pullback**

SB side branch
MB main branch

3D-OCT
Bifurcation PCI guidance
Assessment of SB ostium

SB Pullback

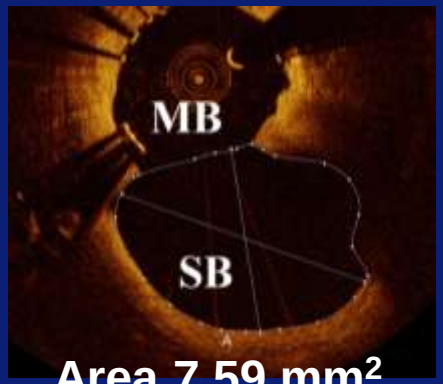
Conventional analysis



Area 4.94 mm²

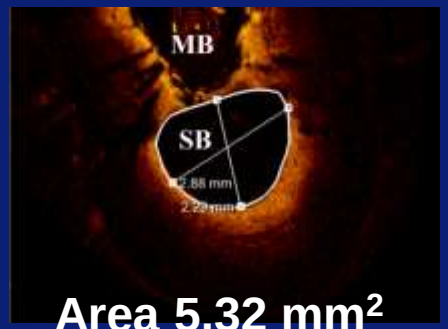
MB Pullback

Conventional analysis



Area 7.59 mm²

Cut plane analysis

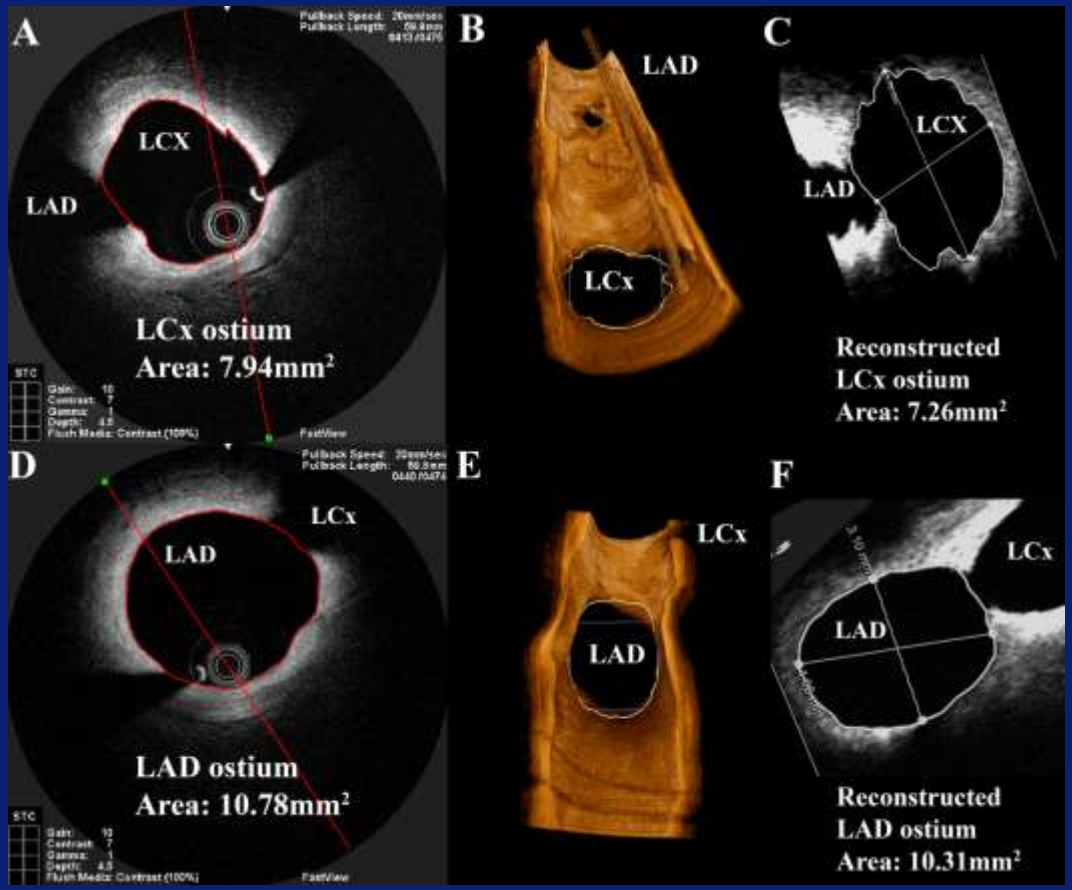


Area 5.32 mm²

- Potential error in SB measurements when performed from a MB pullback
- 3D rendering can help assessment of the ostium

Karanasos et al. EuroPCR 2013

3D-OCT
Bifurcation PCI guidance
Assessment of SB ostium



- Potential error in SB measurements when performed from a MB pullback
- 3D rendering can help assessment of the ostium
- Reconstruction of the SB ostia using a contralateral OCT pullback

Karanasos et al. EuroPCR 2013

3D-OCT
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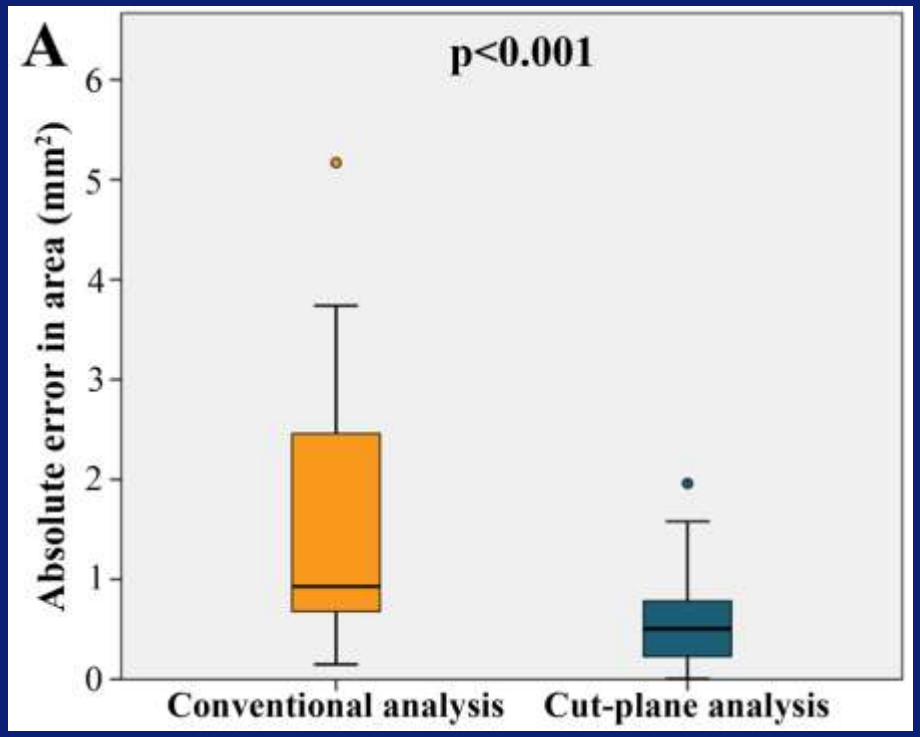
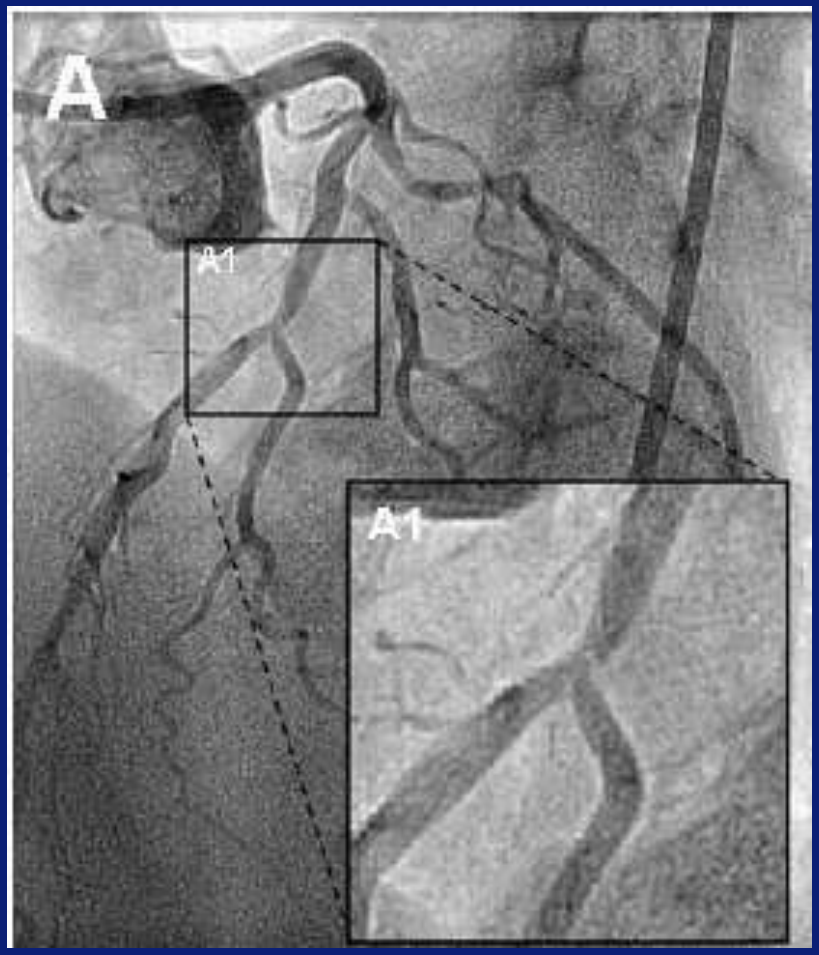


- Potential error in SB measurements when performed from a MB pullback
- 3D rendering can help assessment of the ostium
- Reconstruction of the SB ostia using a contralateral SB OCT pullback
- **Reduction of the error in SB assessment with 3D-OCT based analysis**

Karanasos et al. EuroPCR 2013

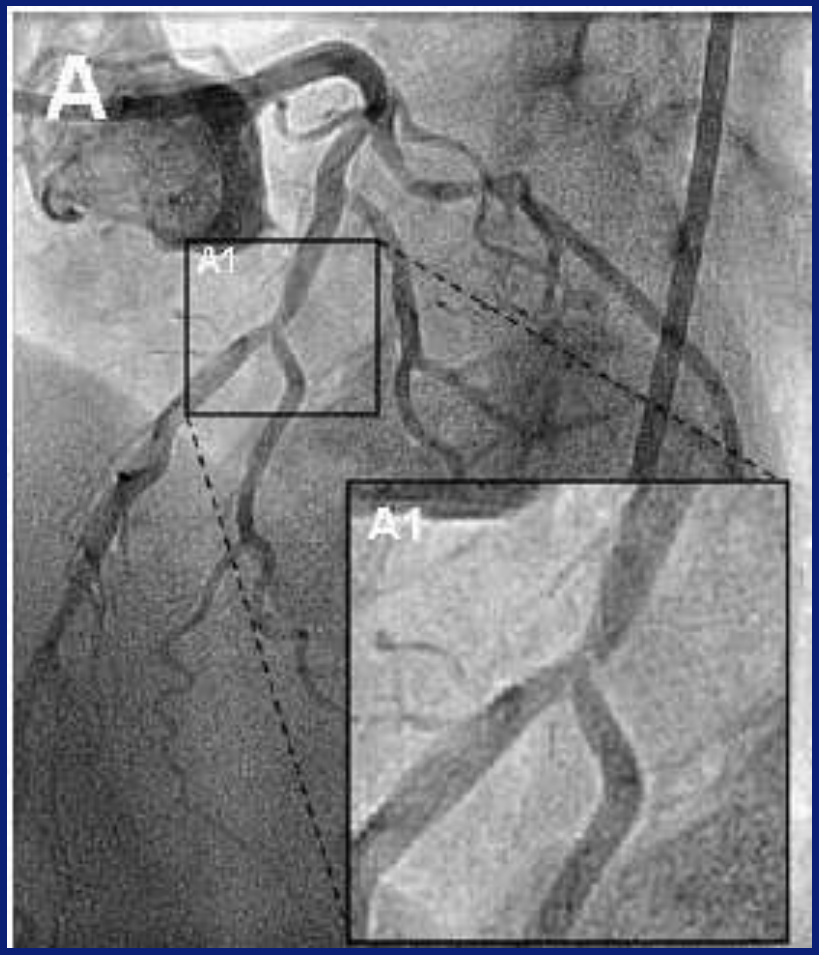
3D-OCT
Bifurcation PCI guidance
Wiring



- 55 year old woman with SA
- LAD-LD bifurcation lesion

Van Ditzhuijzen et al. Can J Cardiol in press

3D-OCT
Bifurcation PCI guidance
Wiring



- 55 year old woman with SA
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- Procedural plan: guidewire LAD + guidewire diagonal branch for patency protection

Van Ditzhuijzen et al. Can J Cardiol in press

3D-OCT
Bifurcation PCI guidance
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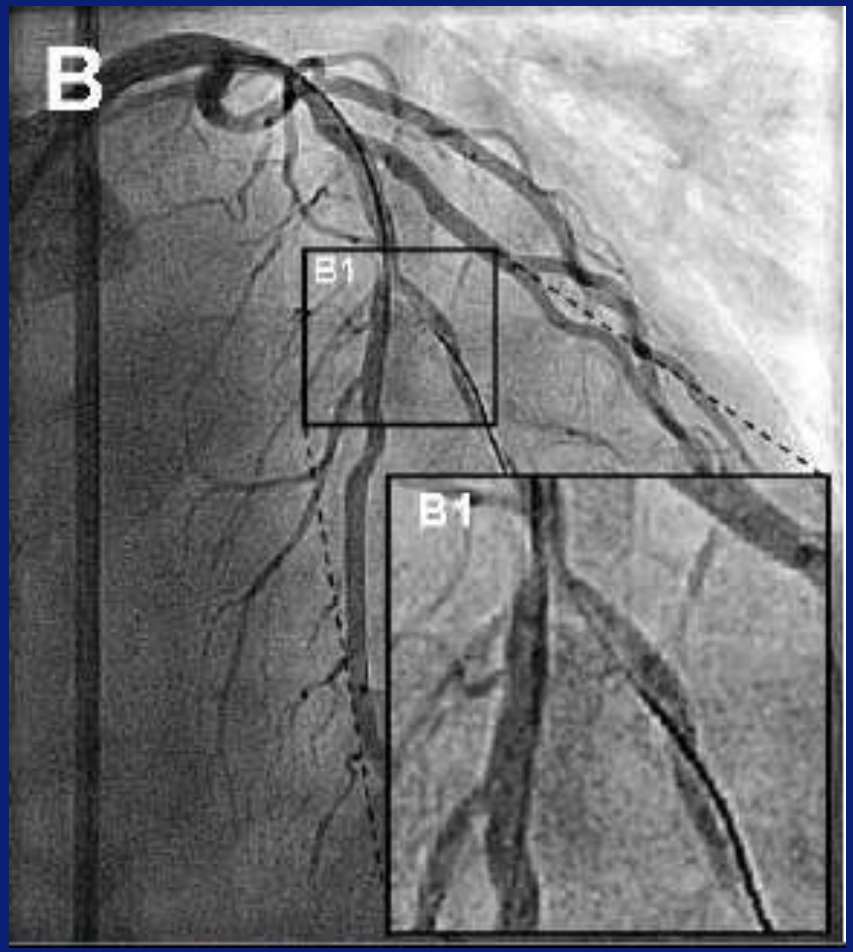

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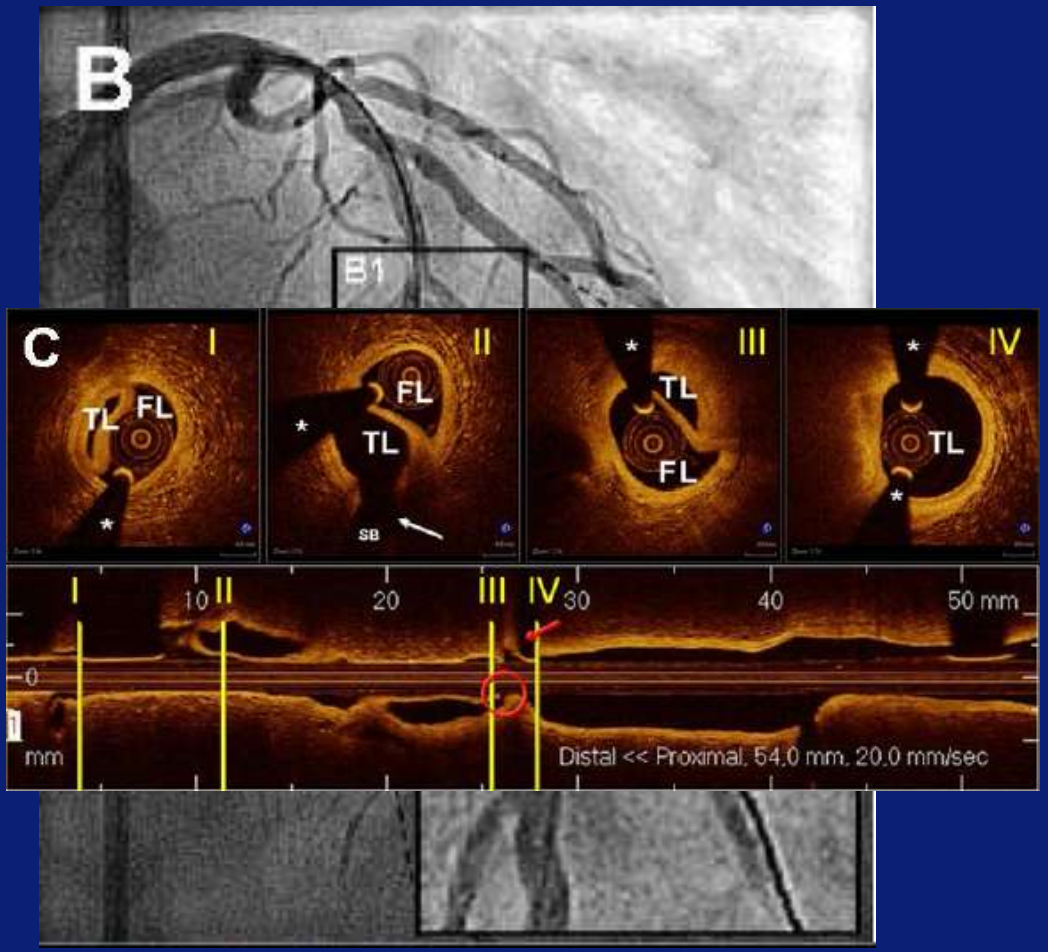

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- 2D OCT shows wire in false lumen without clear tracking of the course

Van Ditzhuijzen et al. Can J Cardiol in press

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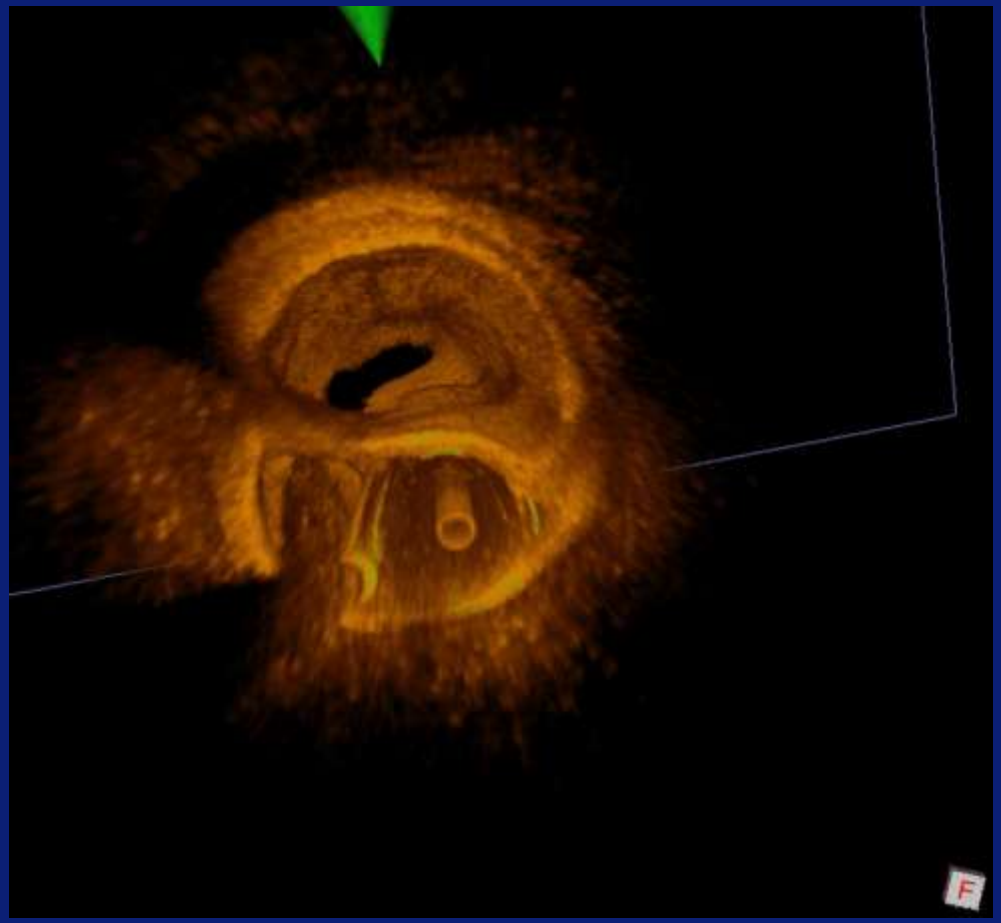

- 55 year old woman with SA
- LAD-LD bifurcation lesion
- Procedural plan: guidewire LAD + guidewire diagonal branch for patency protection
- Angiography suggestive for dissection
- 2D OCT shows wire in false lumen without clear tracking of the course
- 3D OCT demonstrates clearly the extent of the dissection – wire entirely in false lumen

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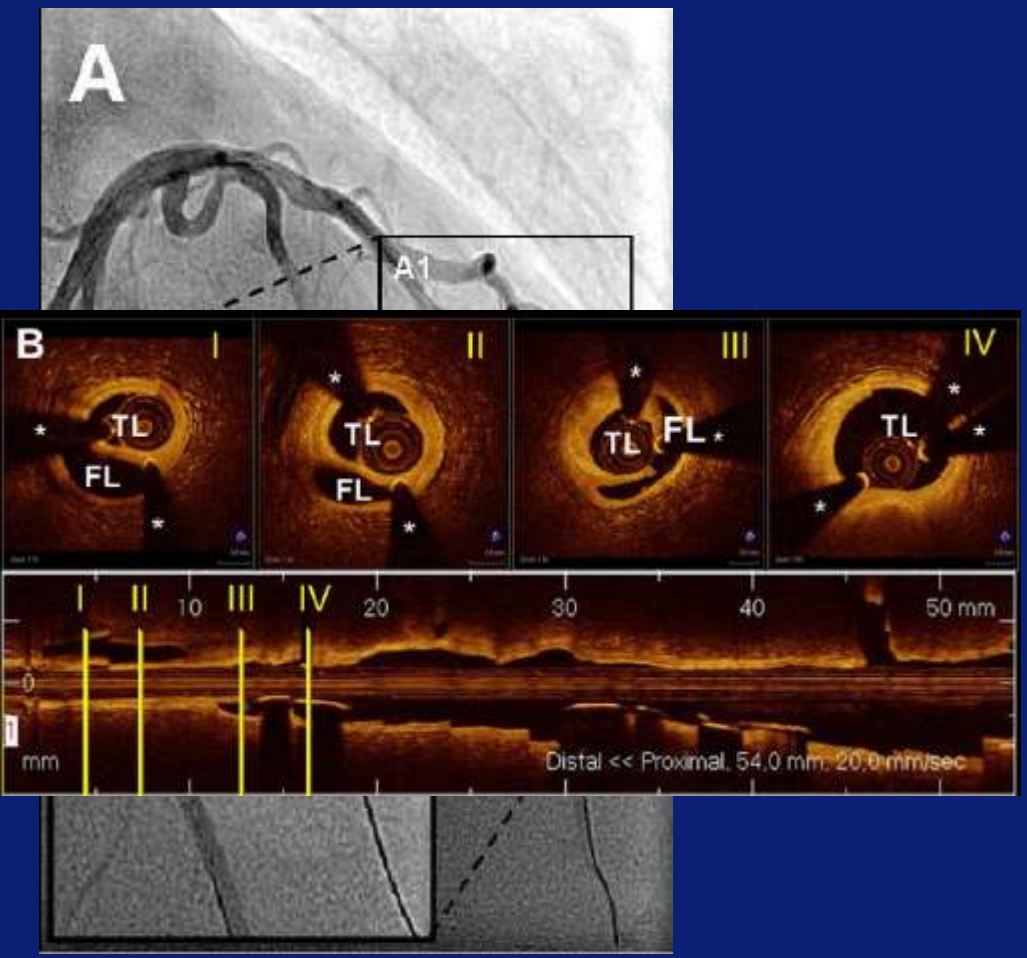
3D-OCT
Bifurcation PCI guidance
Wiring

- After re-wiring the SB, dissection remains and position of the GW is uncertain
- Repeat OCT study

Van Ditzhuijzen et al. Can J Cardiol in press

3D-OCT
Bifurcation PCI guidance
Wiring



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Van Ditzhuijzen et al. Can J Cardiol in press

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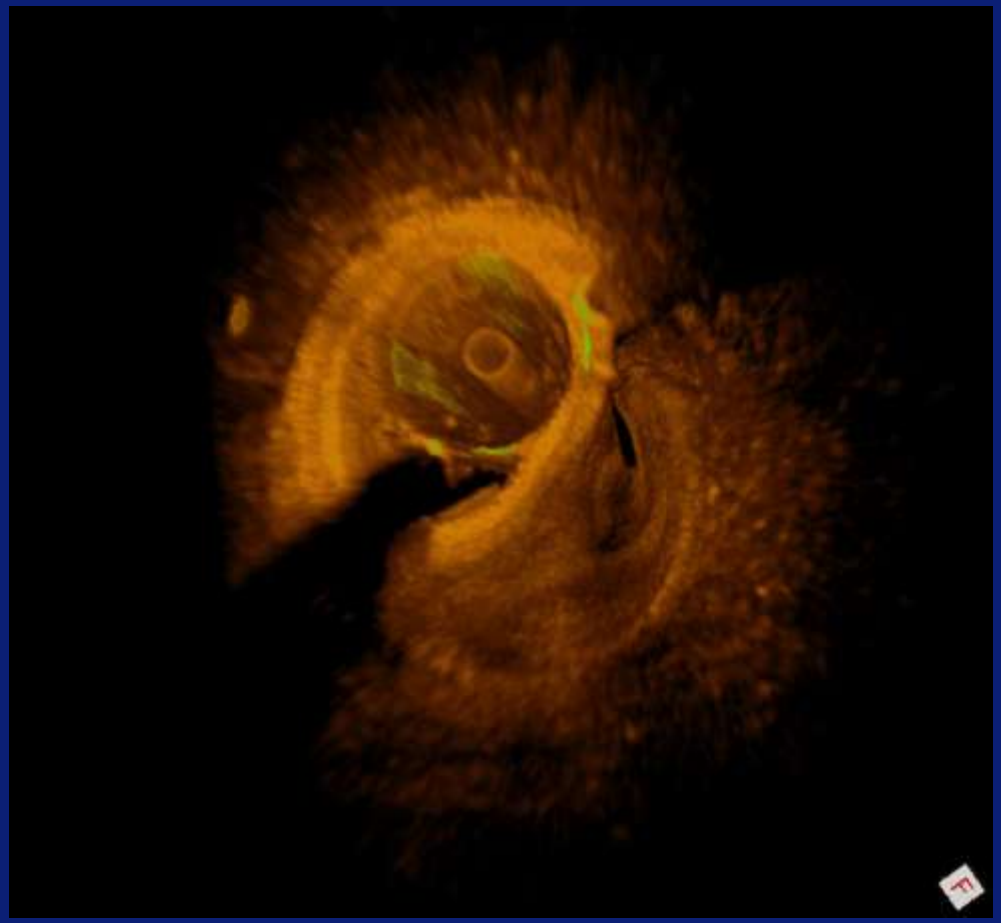

- After re-wiring the SB, dissection remains and position of the GW is uncertain
- Repeat OCT study
- Guide wire seems in the true lumen
- Confirmation by 3D OCT

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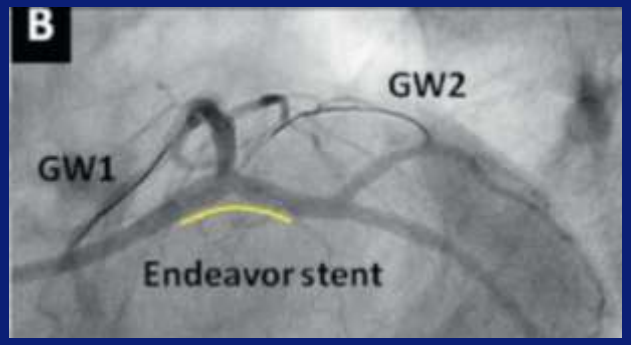
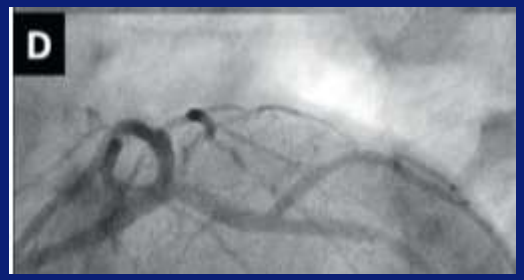
3D-OCT
Bifurcation PCI guidance
Wiring

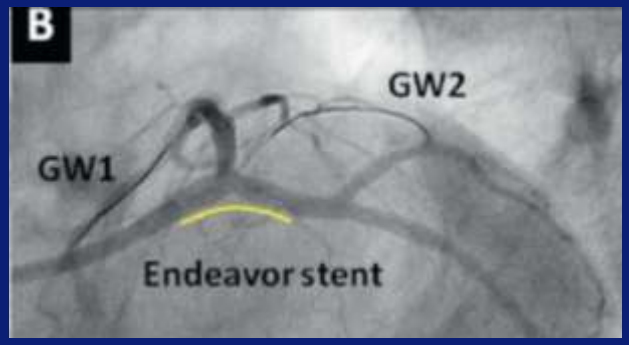


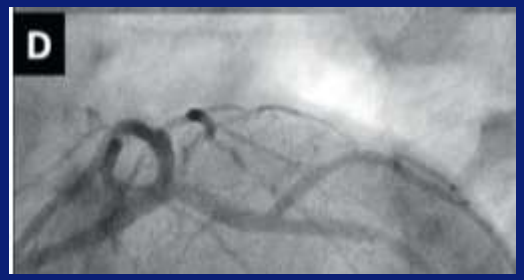


Okamura et al. Eurointervention 2011

3D-OCT
Bifurcation PCI guidance

Wiring





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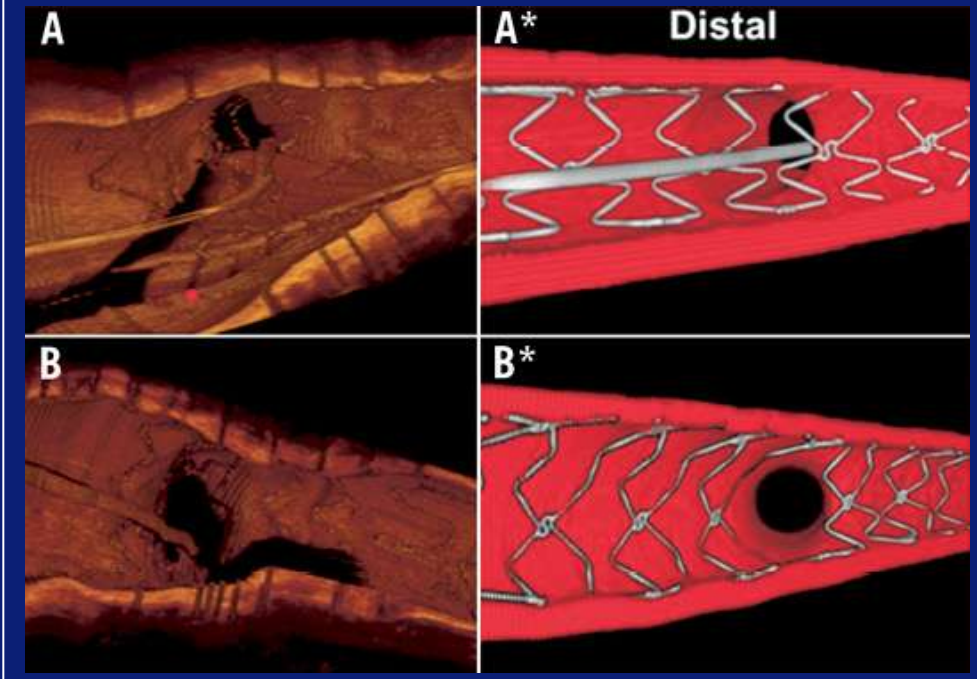
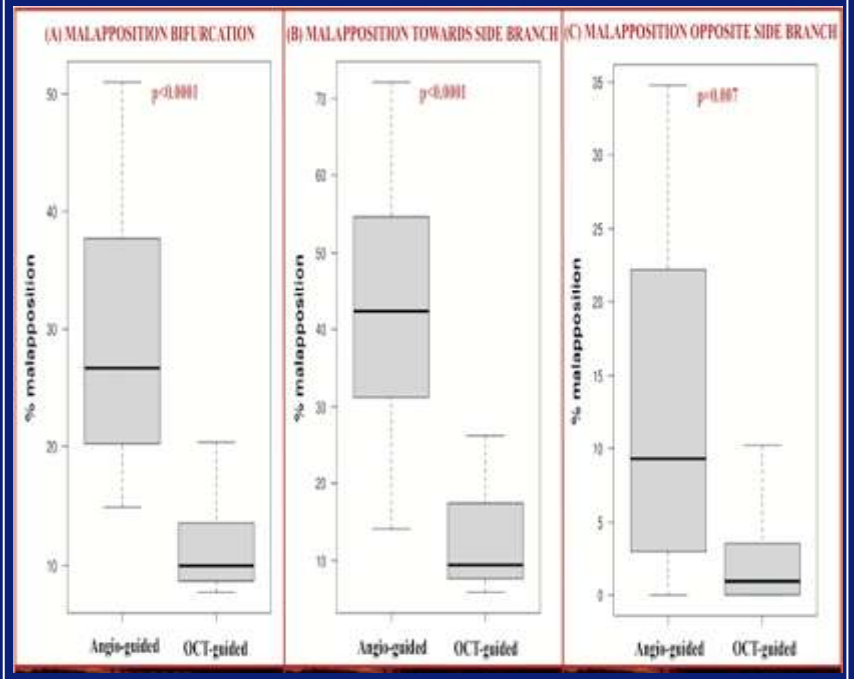


Assessment of SB recrossing: distal vs proximal

Distal recrossing -> better strut opening



Lower SB malapposition rates with OCT guidance of wire position

Di Mario et al. Eurointervention 2011

3D-OCT:
Is Beneficial in Clinical Practise!

- Information easily available in the cathlab

- Correct assessment of lumen dimensions
- Correct assessment of lesion length
- Efficient treatment planning

- Bifurcation treatment
- Guide wire position in complex lesions
- Stent deformation
- BVS assessment

3D OCT: Future Developments
Co-Registration with Angiography

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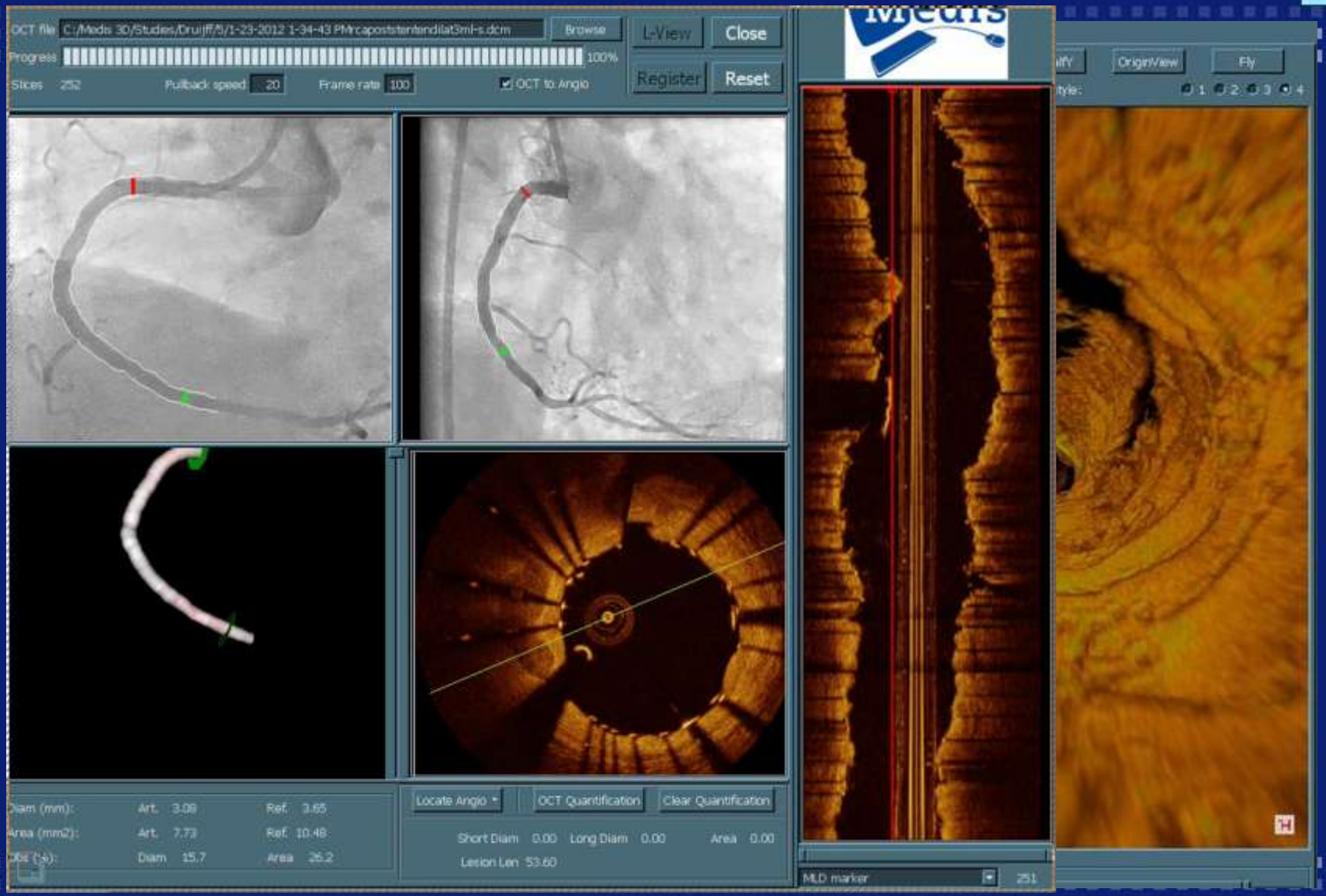
proximal

Fast
Easy
Reliable

No disturbance of work-flow

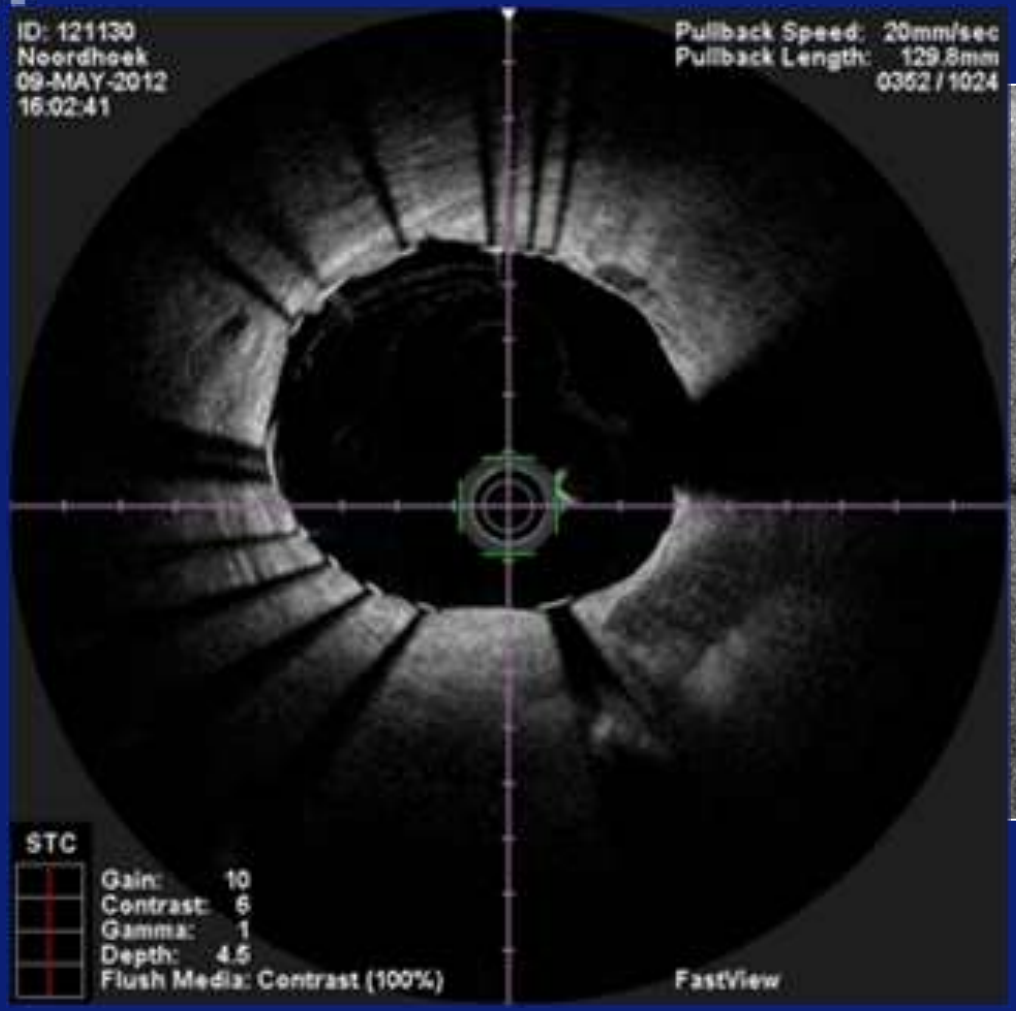
distal

3D OCT: Future Developments
Co-Registration with Angiography



3D OCT: Future Developments
High Quality 3D Visualization

Erasmus MC



LAD-LM
After Stenting Across LCx
& Kissing Balloon

3D OCT: Future Developments
High Quality 3D Visualization

LAD-LM
After Stenting Across LCx
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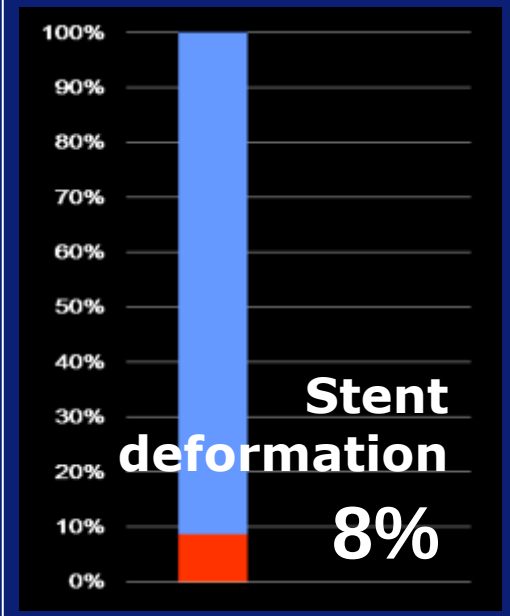
3D OCT: Future Developments?
High Quality 3D Visualization

Fast
Easy
Reliable

No disturbance of work-flow

3D OCT: Future Developments
High Quality 3D Visualization

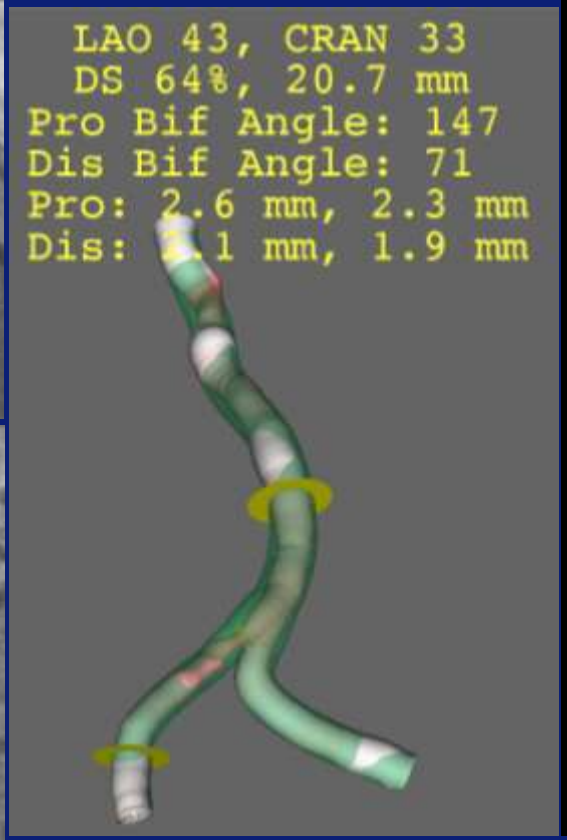
PTCA for Left Main Disease (n=64 pts)



despite POT plus kissing technique

Prati. ACC 2014

3D OCT: Future Developments
High Quality TRUE 3D Visualization



Research software in cooperation with Medis, Leiden, NL

3D OCT: Future Developments
3D Angio – OCT Fusion and Flow Computation

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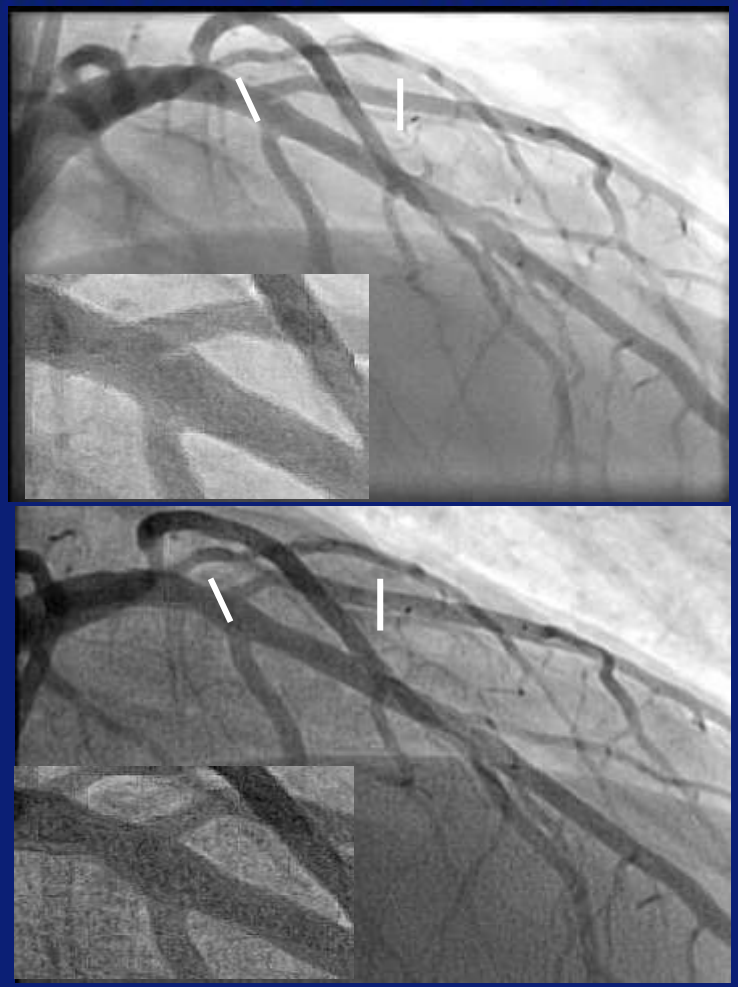

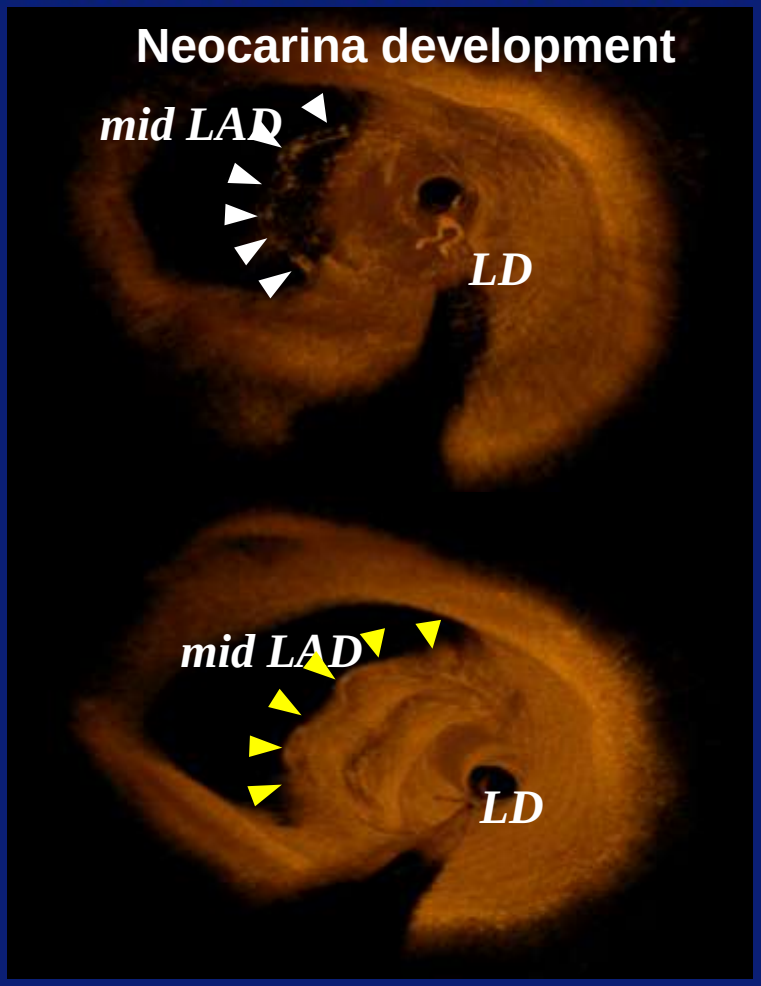

Downstream fly-through view

Research software in cooperation with Medis, Leiden, NL

3D OCT: Future Developments
3D Angio – OCT Fusion and Flow Computation

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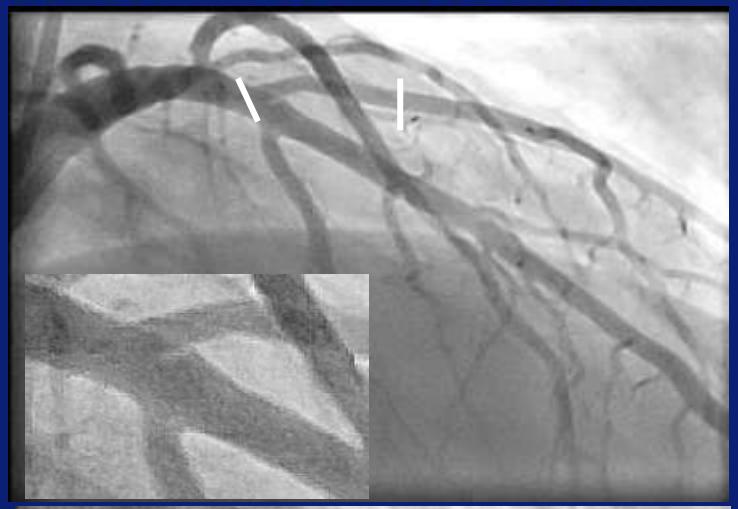
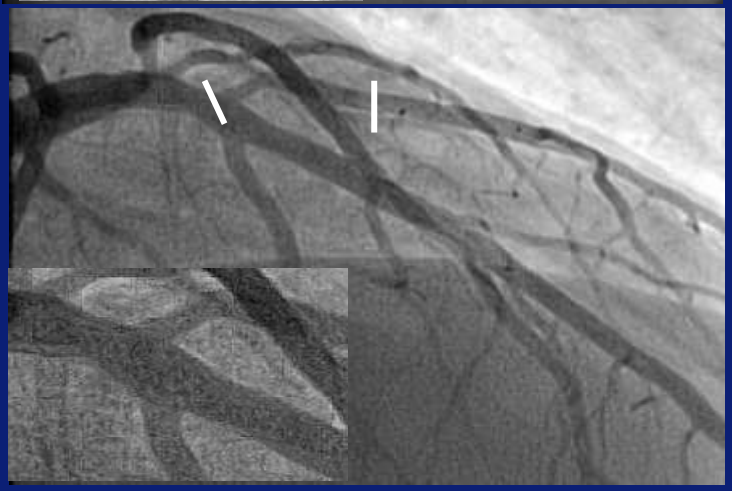
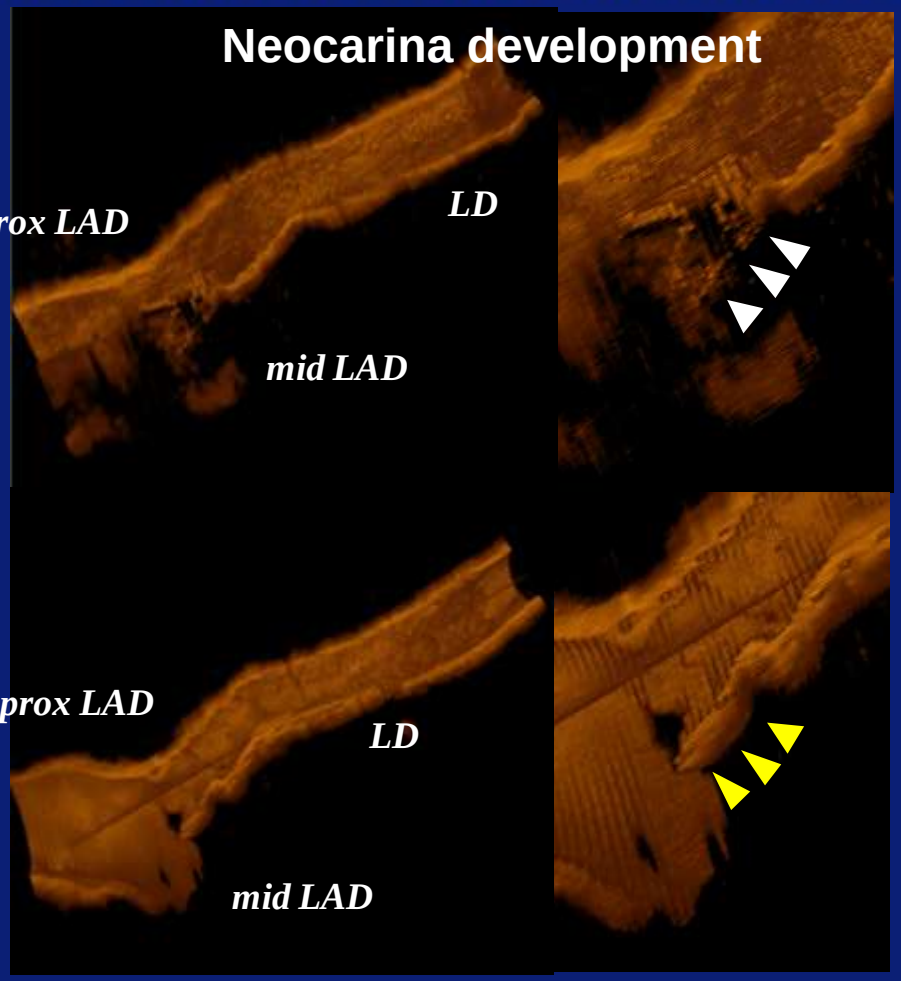
Baseline



Follow-up





Longitudinal cut-away view

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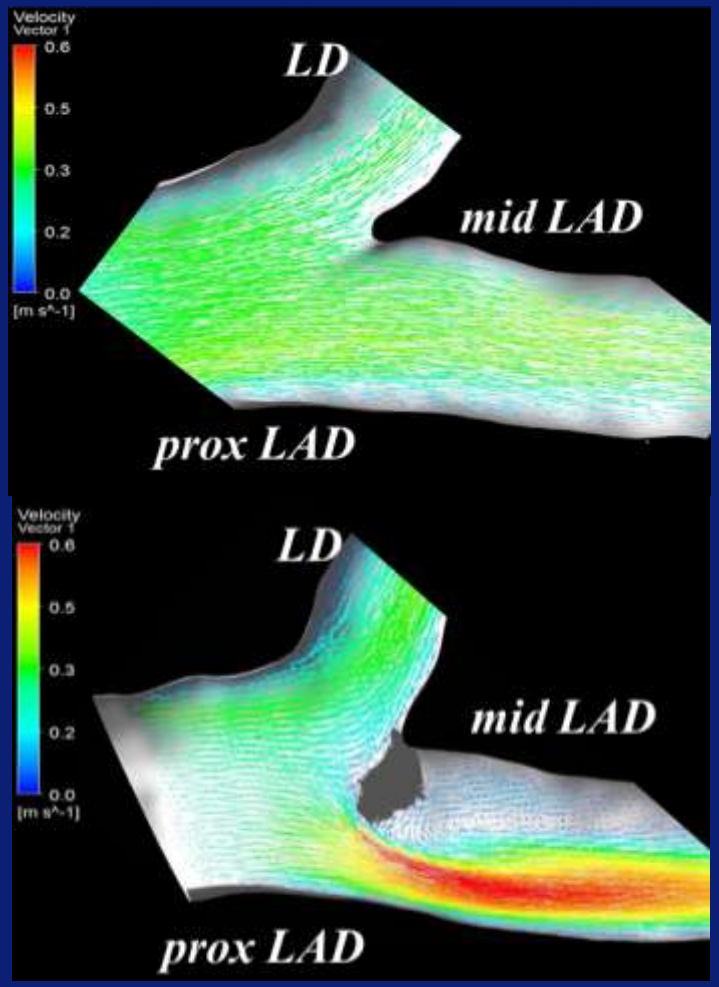
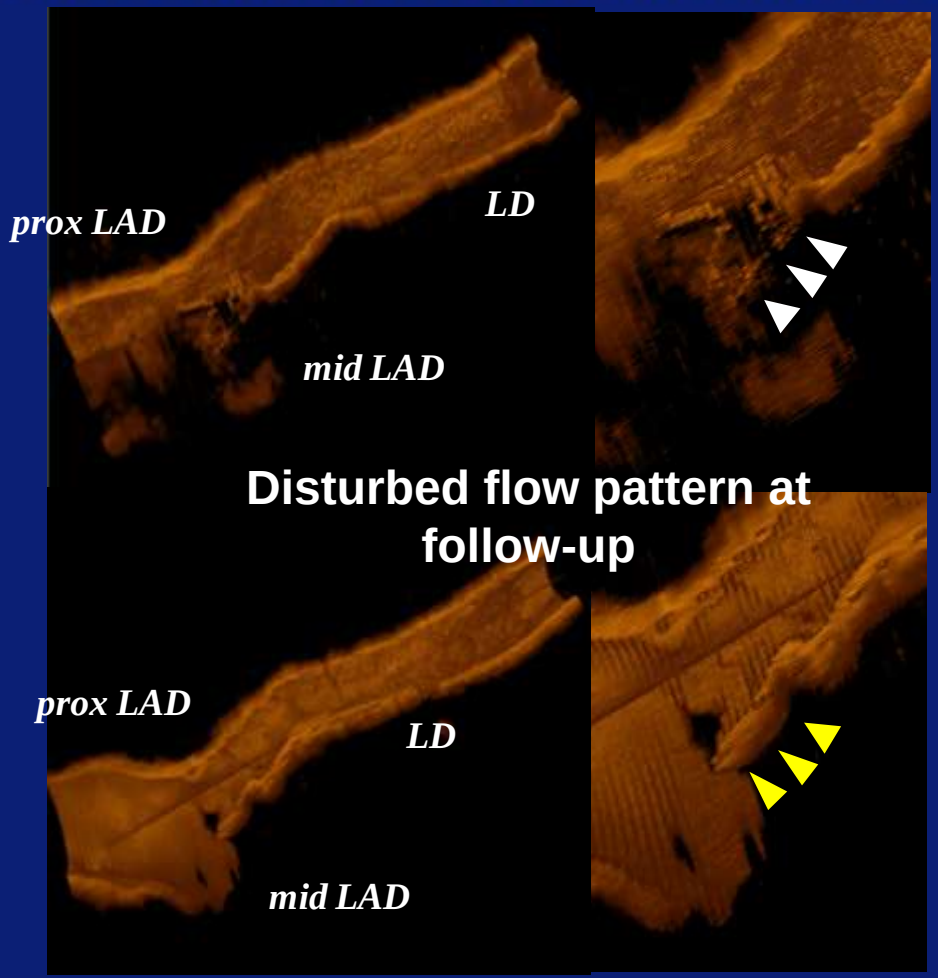
3D OCT: Future Developments
3D Angio – OCT Fusion and Flow Computation

Erasmus MC





Disturbed flow pattern at follow-up

Longitudinal cut-away view

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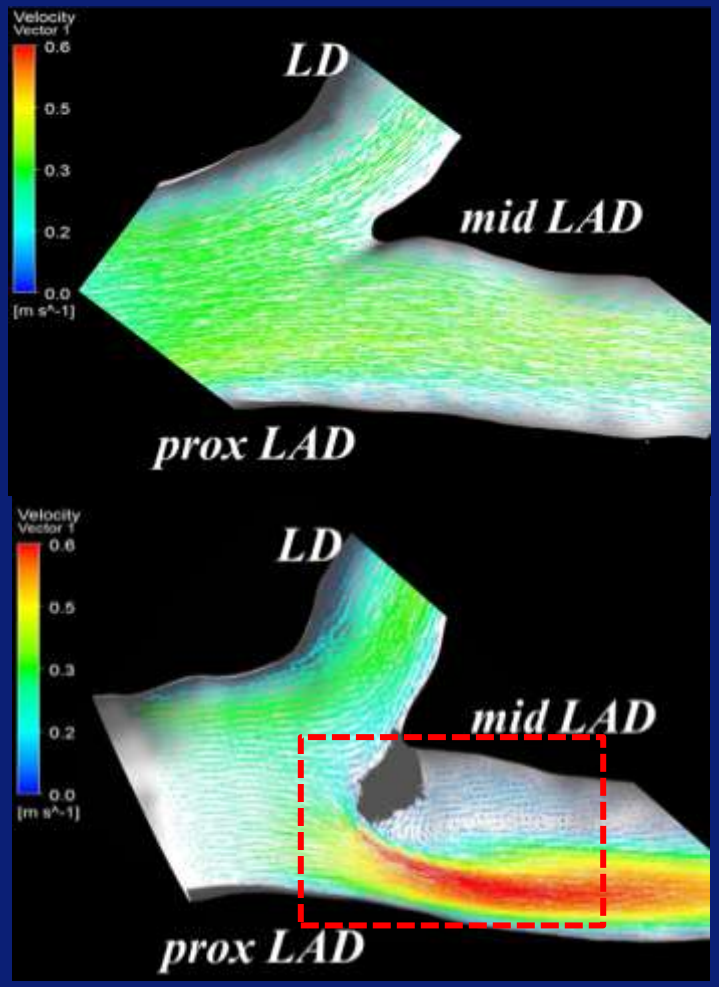
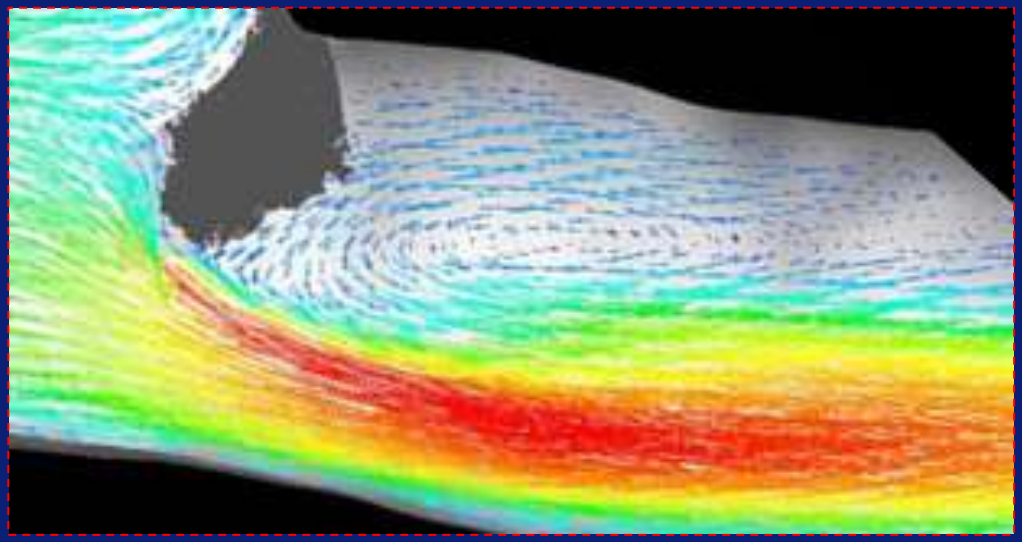
3D OCT: Future Developments
3D Angio – OCT Fusion and Flow Computation

Erasmus MC



Disturbed flow pattern at follow-up



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3D OCT: Future Developments
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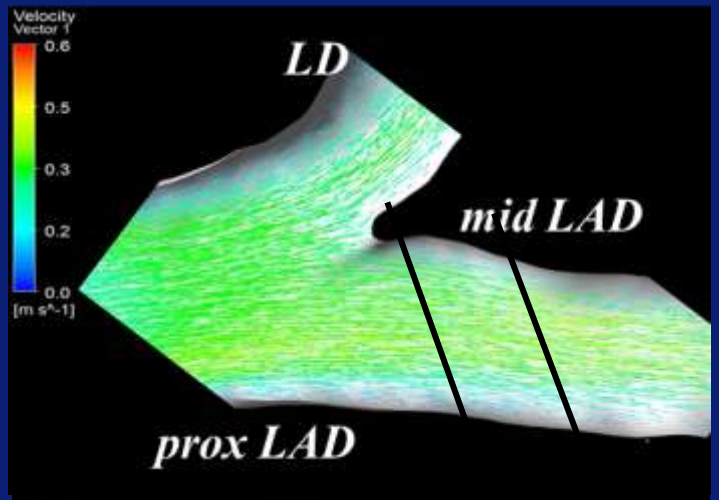
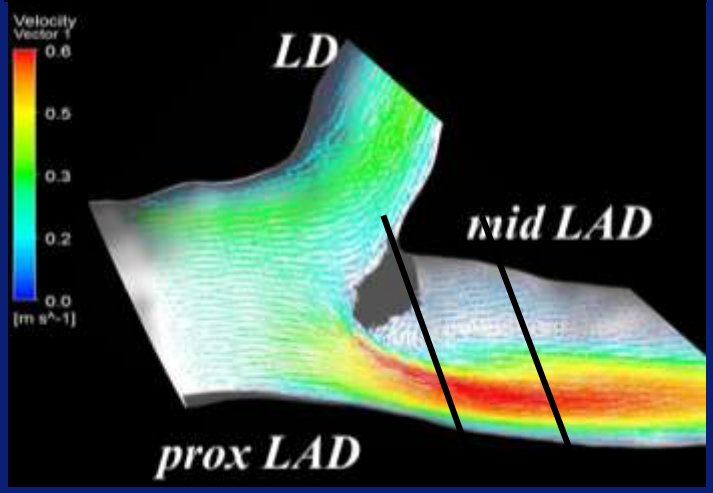
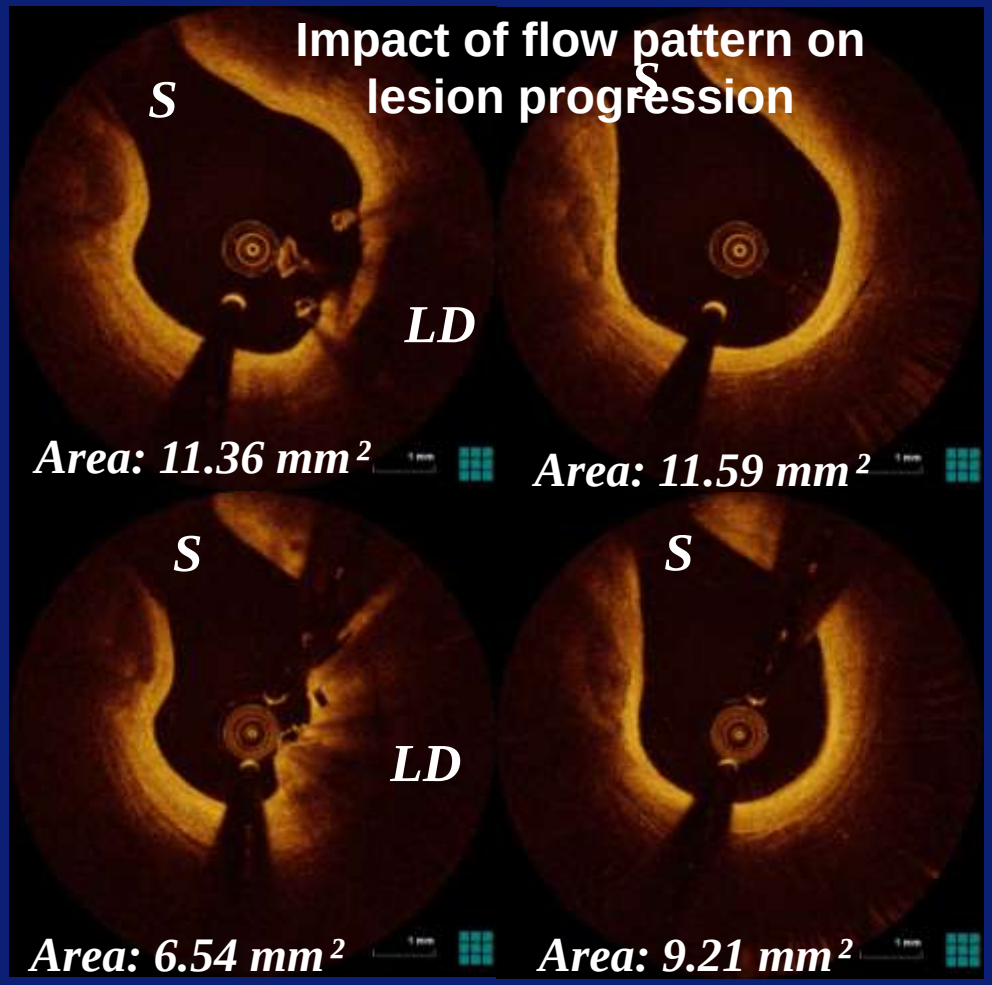
Baseline



Follow-up





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Thank you for your attention!

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