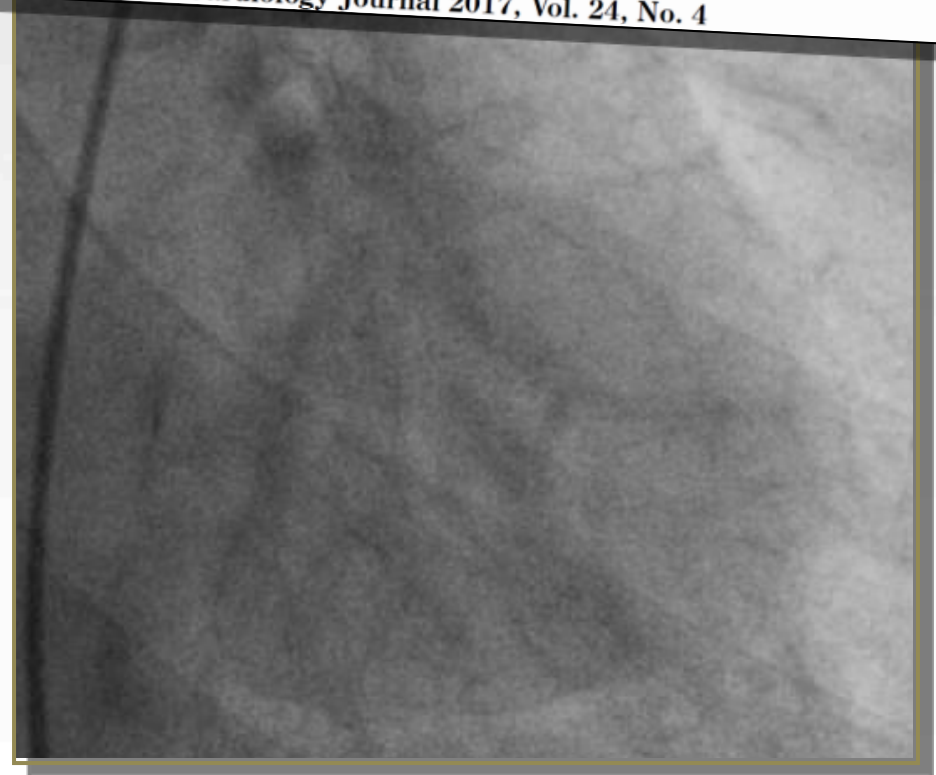
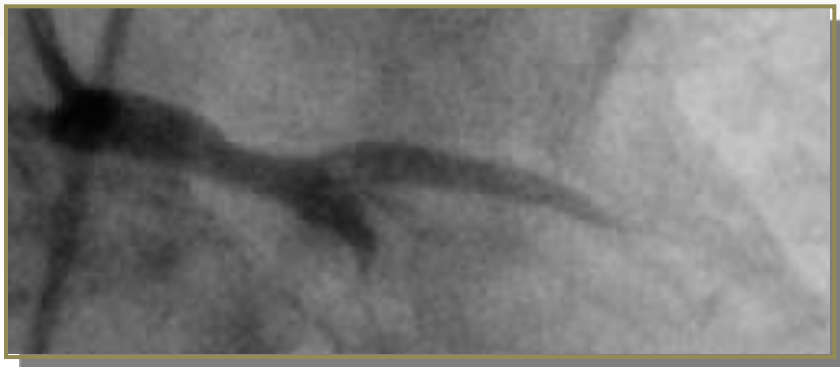


**Very late stent thrombosis in everolimus-eluting stent with predisposing mechanical factors:
Differential features**

Milosz Jaguszewski^{1,2,3*}, Carlos Cortés^{1,4*}, Halyna Daucher¹, Michele Schincariol²,
Michal Halejcio⁵, Petra Besuch⁵, Juan Luis Gutiérrez-Chico^{1,2}
Cardiology Journal 2017, Vol. 24, No. 4

- **Clinical presentation**
 - **72 y.o. female**
 - **DES in LADp and LCXp**
 - **3y ago**
 - **Another hospital**
 - **No further information**
 - **Currently: NSTEMI**
 - **Ongoing ischemia**



Jaguszewski M, Cortés C, Gutiérrez-Chico. Cardiol J 2017

Recommendations for the clinical value of intracoronary diagnostic techniques

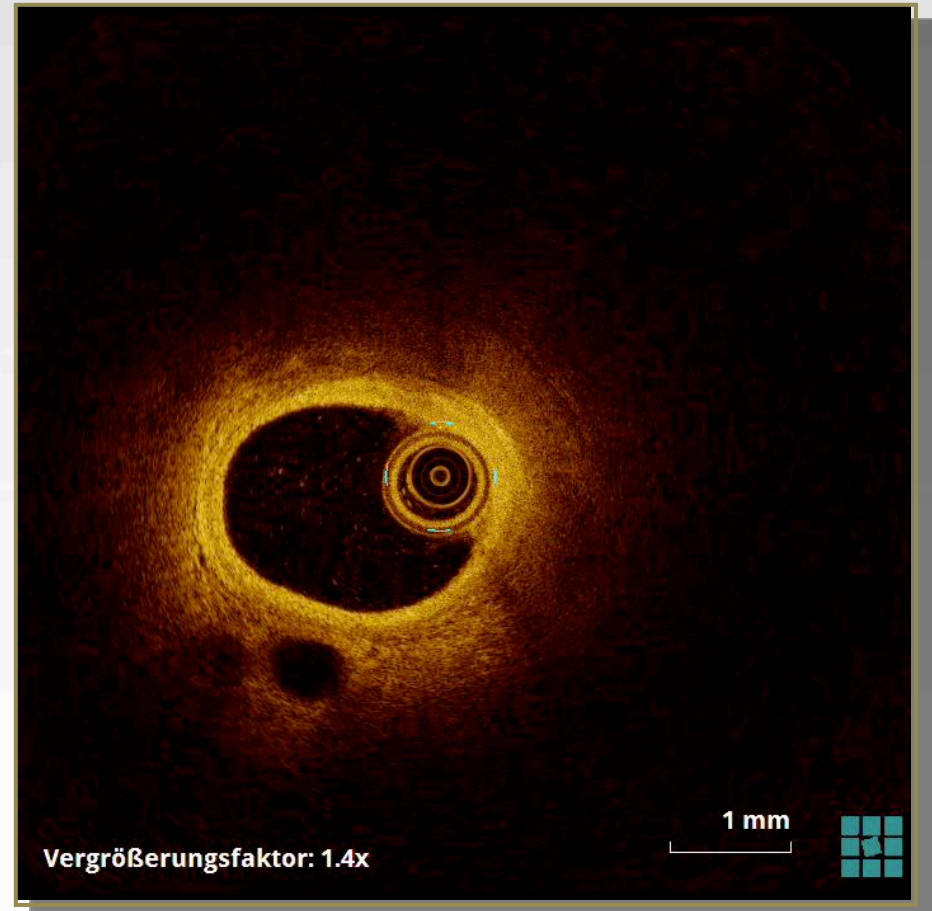
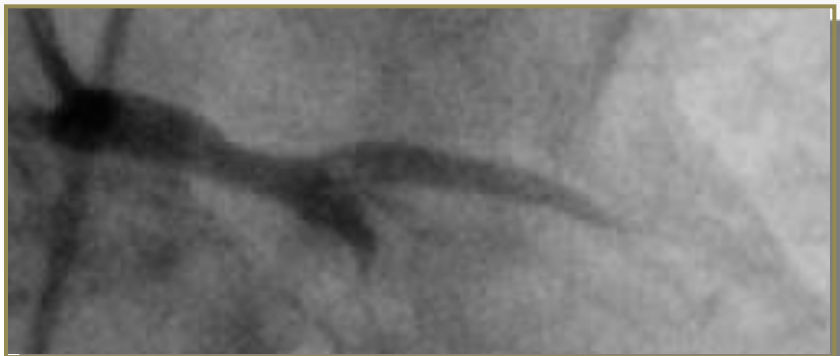
Recommendations	Class ^a	Level ^b	Ref. ^c
FFR to identify haemodynamically relevant coronary lesion(s) in stable patients when evidence of ischaemia is not available.	I	A	50,51,713
FFR-guided PCI in patients with multivessel disease.	IIa	B	54
IVUS in selected patients to optimize stent implantation.	IIa	B	702,703,706
IVUS to assess severity and optimize treatment of unprotected left main lesions.	IIa	B	705
IVUS or OCT to assess mechanisms of stent failure.	IIa	C	
OCT in selected patients to optimize stent implantation.	IIb	C	

■ OCT indications:

- Stent optimization: IIb
- Stent failure IIa
 - ISR (in-stent restenosis)
 - Stent thrombosis

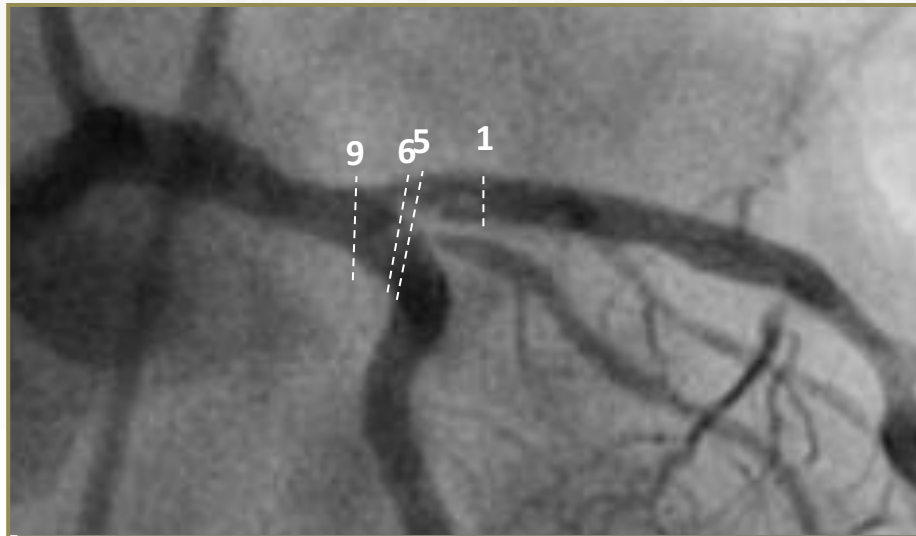
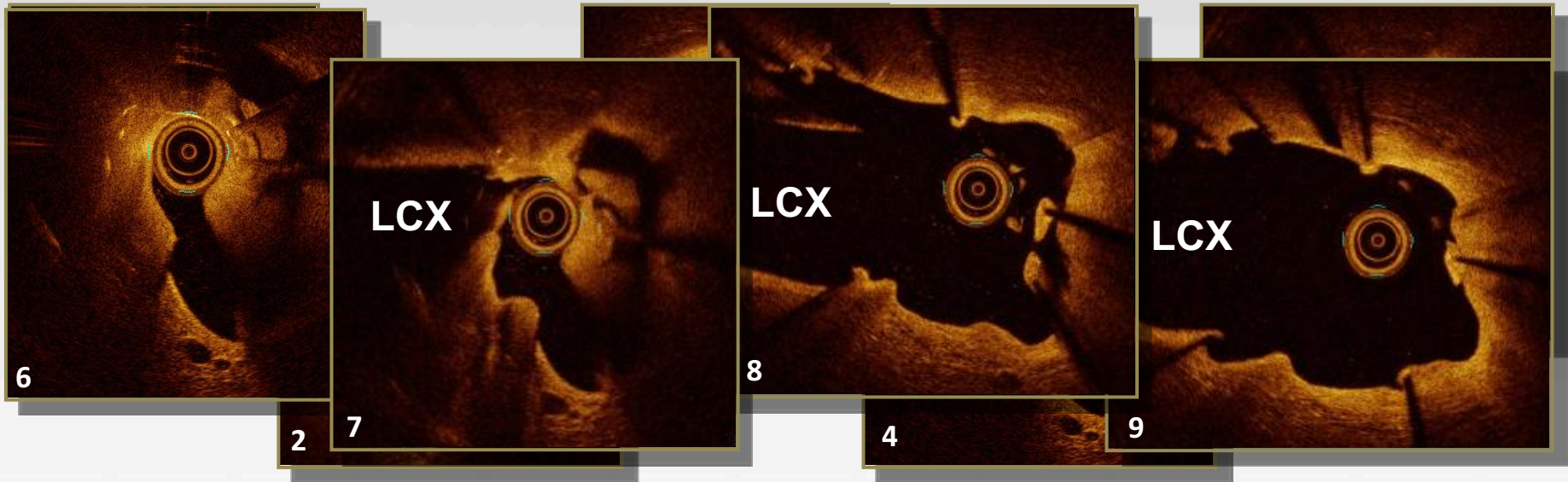
Recommendations	Class ^a	Level ^b
Restenosis		
Repeat PCI is recommended, if technically feasible.	I	C
DES are recommended for the treatment of in-stent re-stenosis (within BMS or DES).	I	A
Drug-coated balloons are recommended for the treatment of in-stent restenosis (within BMS or DES).	I	A
IVUS and/or OCT should be considered to detect stent-related mechanical problems.	IIa	C
Stent thrombosis		
Emergency PCI is recommended to restore stent and vessel patency and myocardial reperfusion.	I	C
DAPT with use of potent P2Y ₁₂ inhibitors (prasugrel or ticagrelor) is recommended over clopidogrel	I	C
Adjunctive thrombus aspiration and high-pressure balloon dilation should be considered.	IIa	C
IVUS and/or OCT should be considered to detect stent-related mechanical problems.	IIa	C

- **Clinical presentation**
 - 72 y.o. female
 - DES in LADp and LCXp
 - 3y ago
 - **Another hospital**
 - No further information
 - **Currently: NSTEMI**
 - Ongoing ischemia

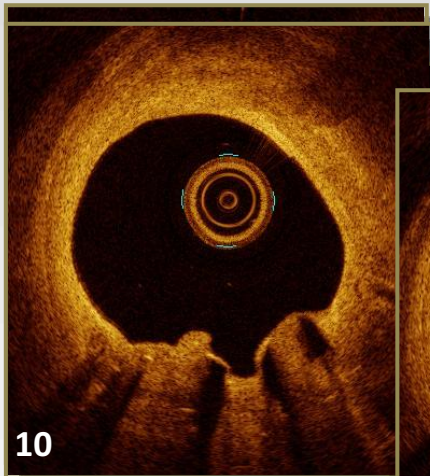


Pullback LAD-LM

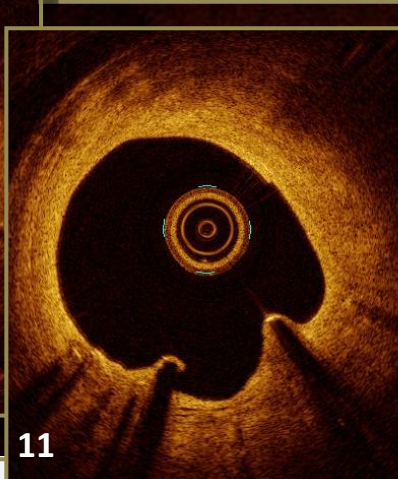
Jaguszewski M, Cortés C, Gutiérrez-Chico. *Cardiol J* 2017



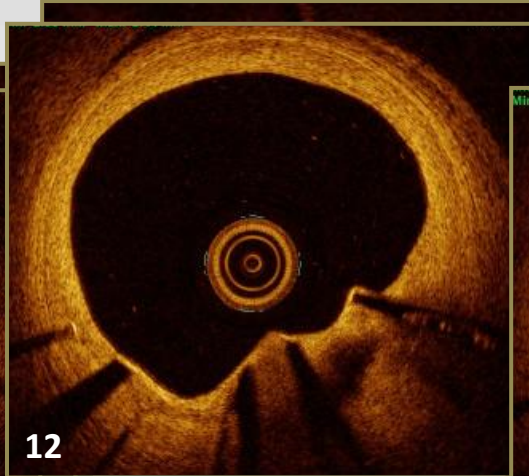
- **VLST**
 - LAD stent nicely healed
 - Gap between stents
 - Mechanical problem LCx stent
 - Jailed LAD
 - Thrombus
 - Attached to jailing struts



10



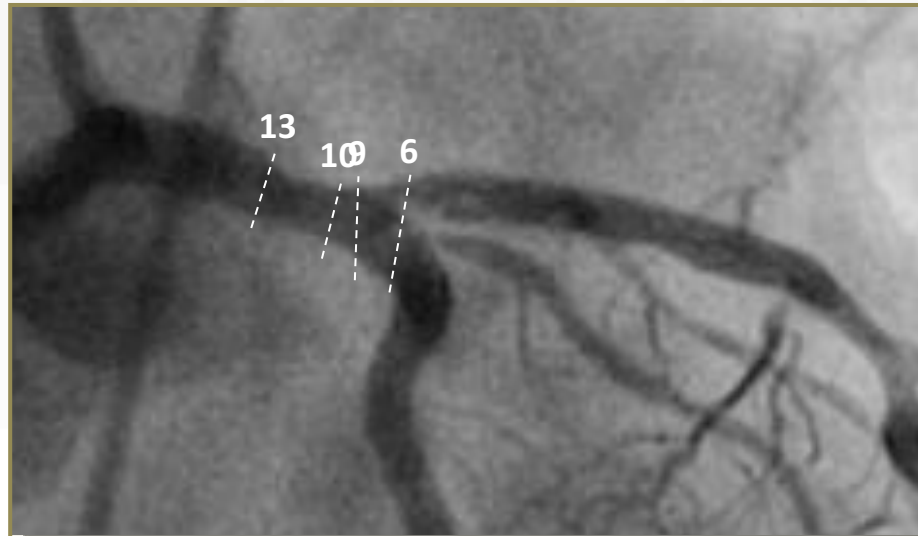
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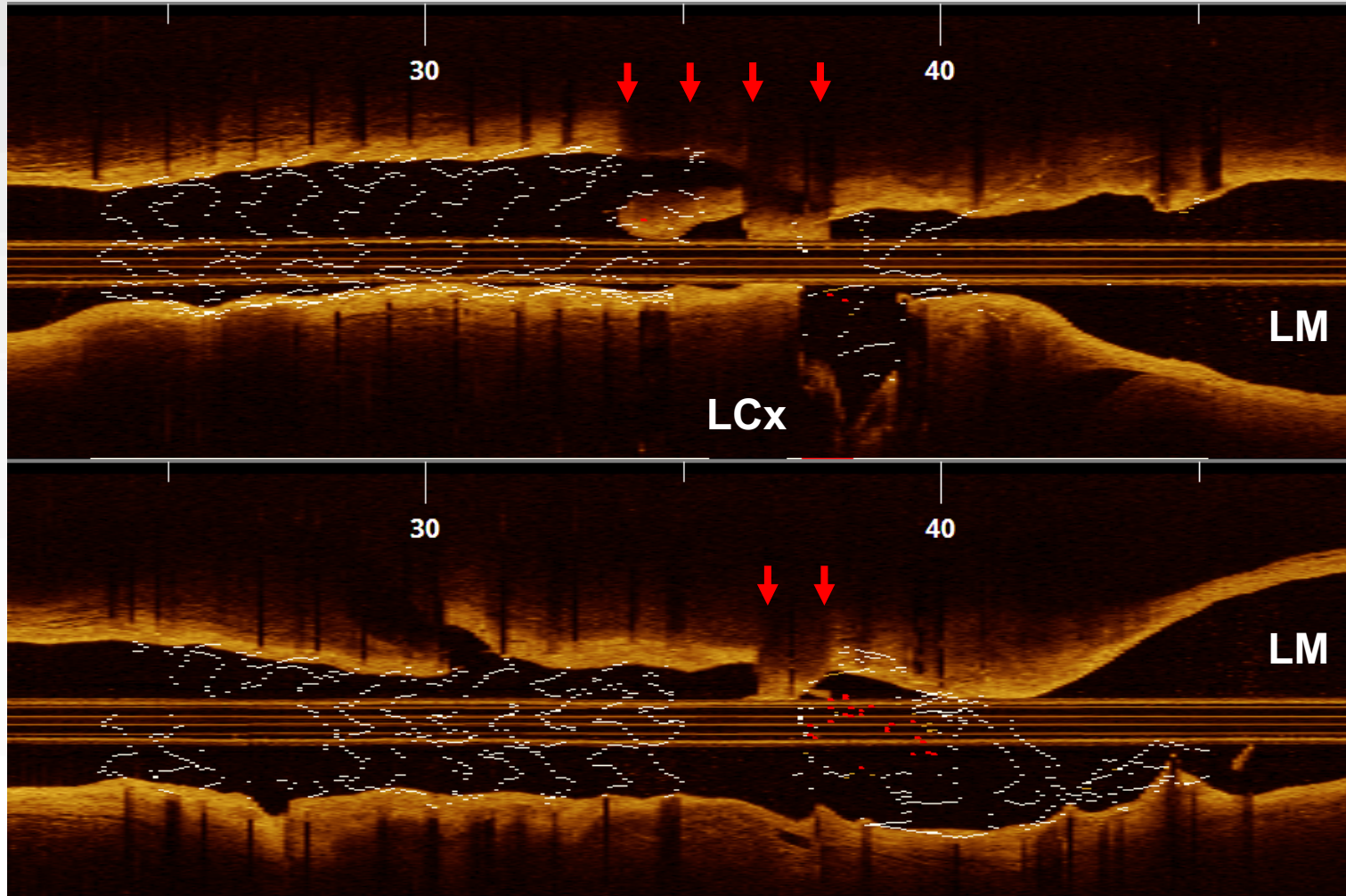


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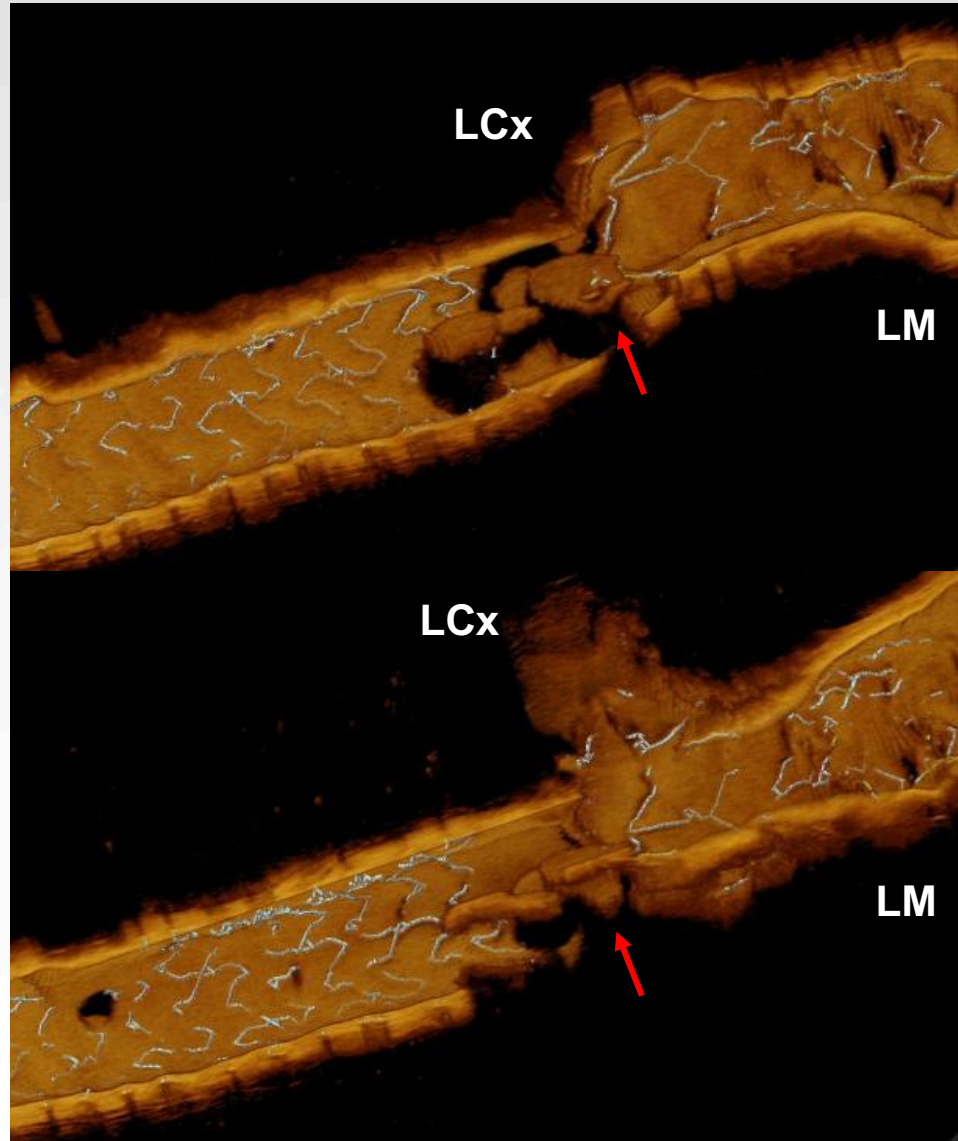


- **VLST**
 - LAD stent nicely healed
 - Gap between stents
 - Mechanical problem LCx stent
 - Jailed LAD
 - Crushed in the LM
 - Thrombus
 - Attached to jailing struts

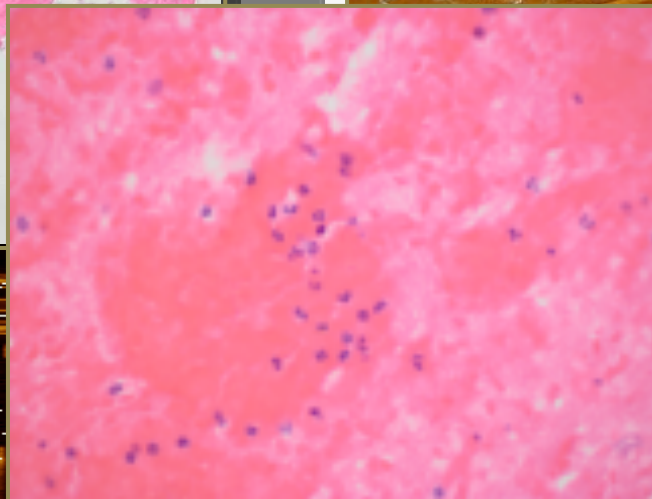
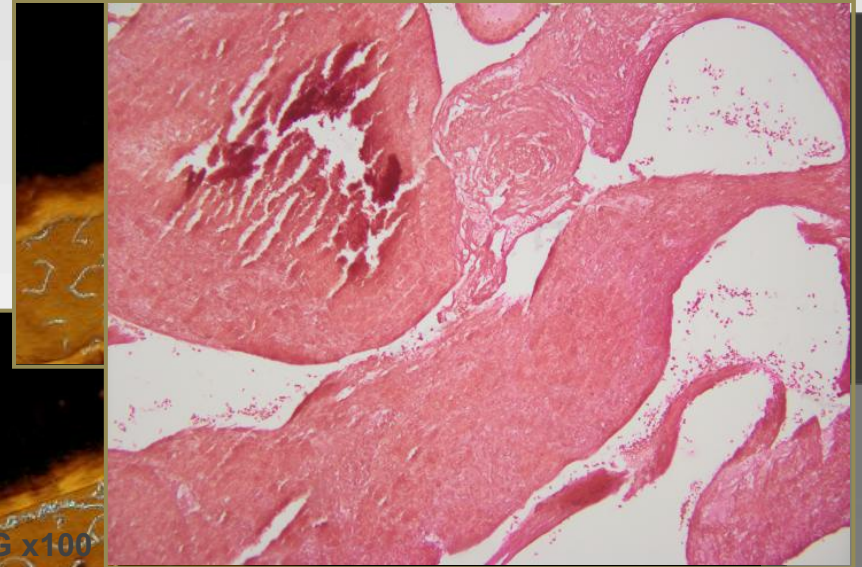
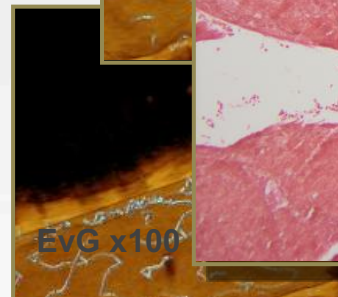
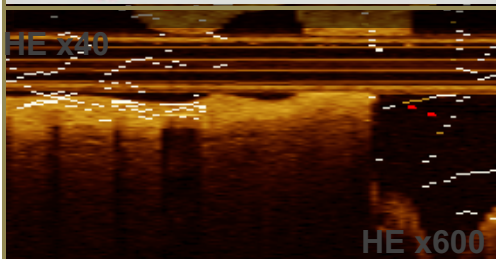
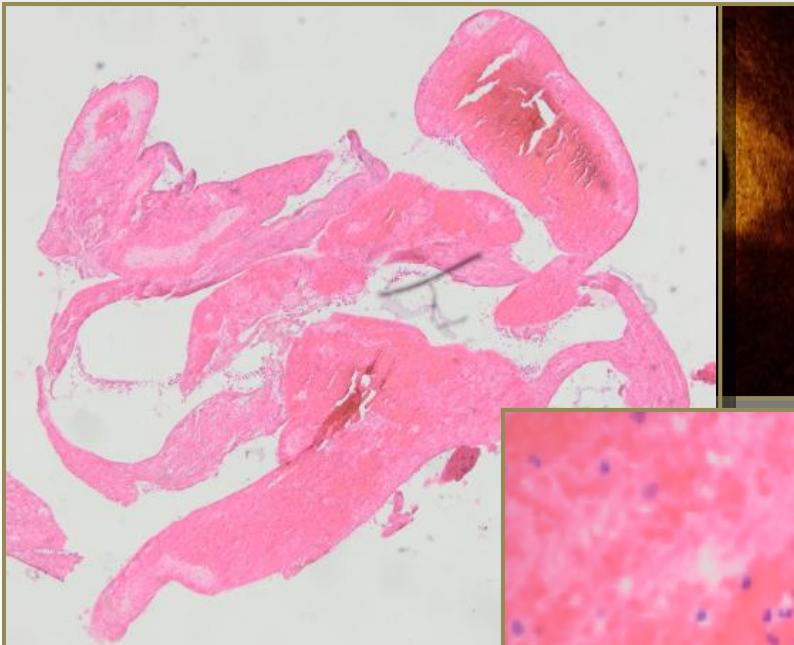
- Automatic strut detection



3D (image fusion)

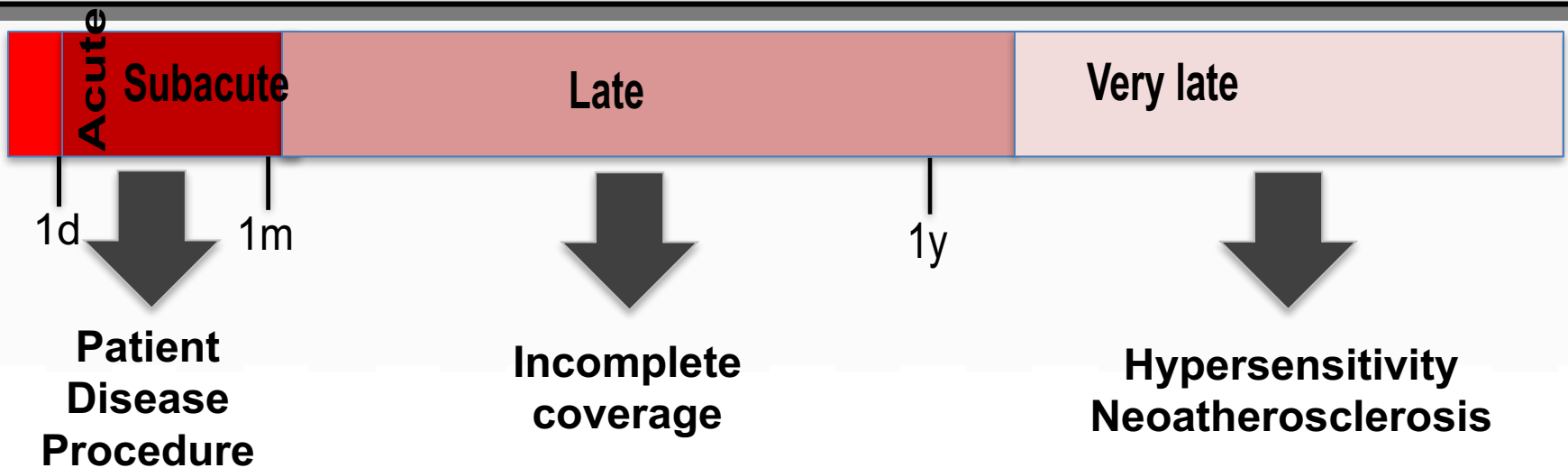
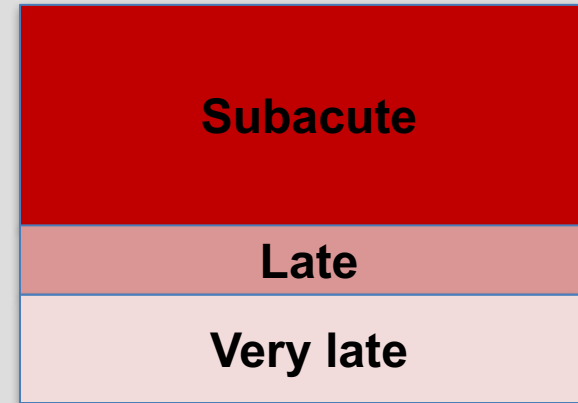


- Red Thrombus
- Minimal presence of neutrophils

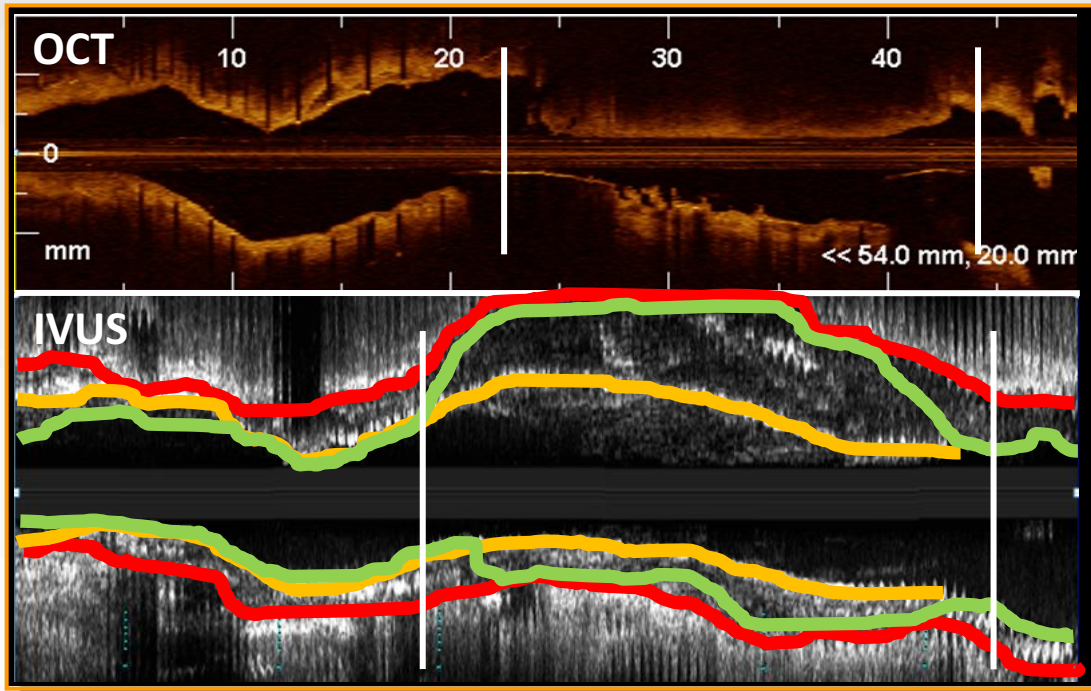


IVUS or OCT to assess mechanisms of stent failure. **Ila** **C**

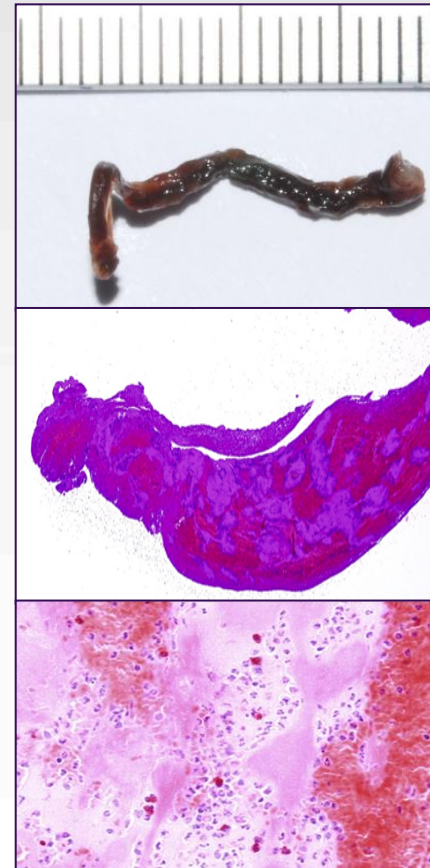
- **Thrombosis**
 - **Mechanical cause amenable to optimization**
 - Undersizing
 - Underexpansion
 - ISA
 - Fracture
 - Incomplete / delayed coverage
 - Vasotoxic reaction
 - Neoatherosclerosis



- **Very late stent thrombosis**
 - Neoatherosclerosis
 - Vasotoxic reaction: hypersensitivity



DES very late stent thrombosis
Late-acquired ISA

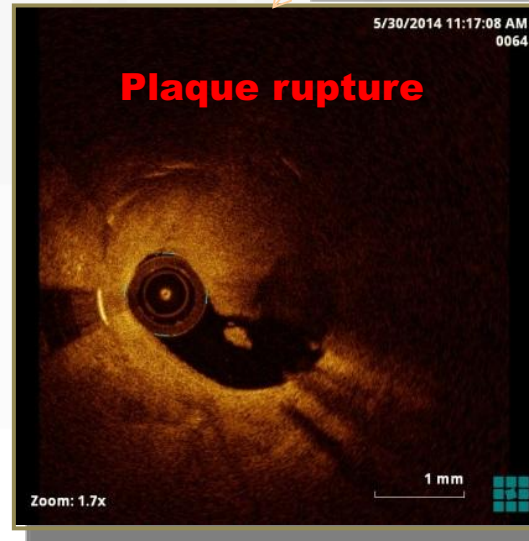
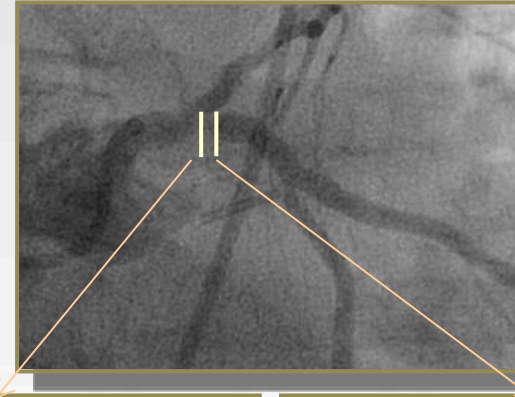
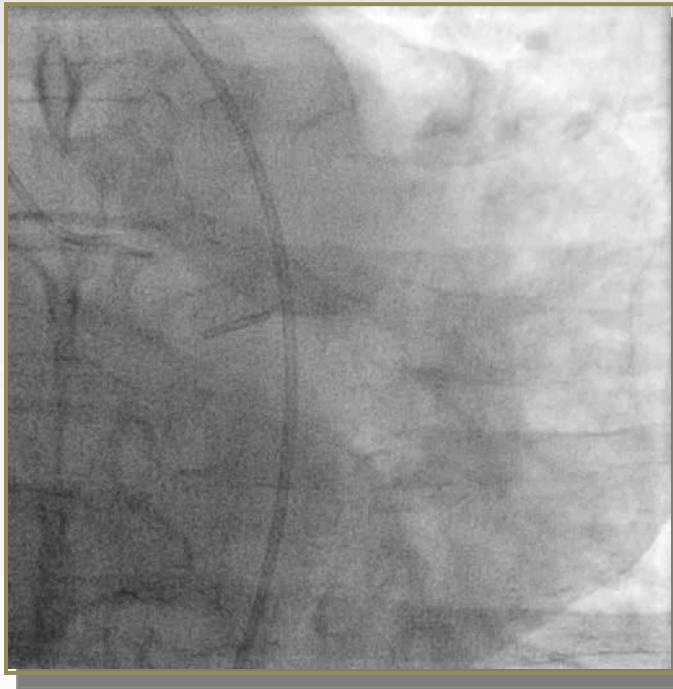


Thrombus

Eosinophils

Courtesy of R ber L. Inselspital. Bern. Switzerland

- **Very late stent thrombosis**
 - **Neoatherosclerosis**



- **Detached struts**
 - **Altered i.c. fluid dynamics**
 - **High SS rate**
 - Platelets activation
 - **Delayed neointimal healing**

Circulation
 JOURNAL OF THE AMERICAN HEART ASSOCIATION

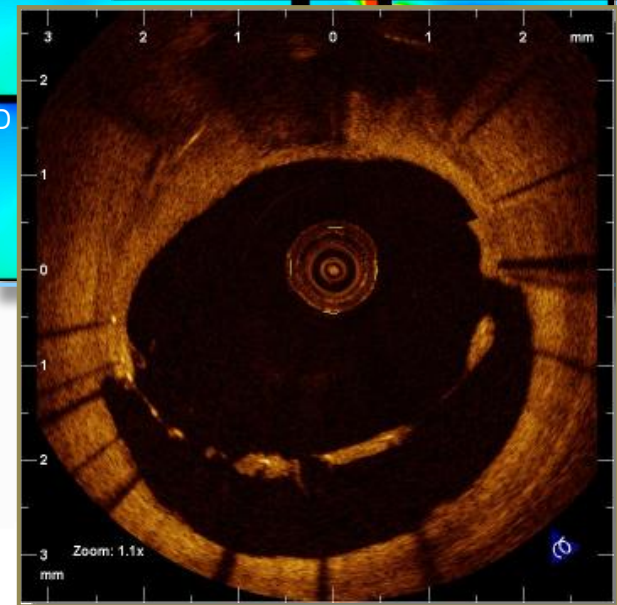
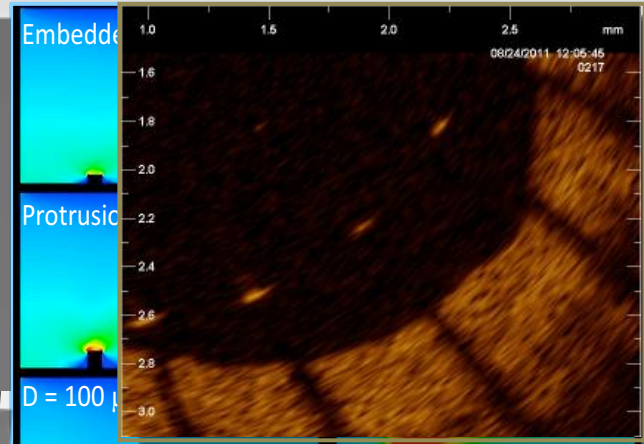
American Heart Association
 Learn and LiveSM

Delayed Coverage in Malapposed and Side-Branch Struts With Respect to Well-Apposed Struts in Drug-Eluting Stents : In Vivo Assessment With Optical Coherence Tomography

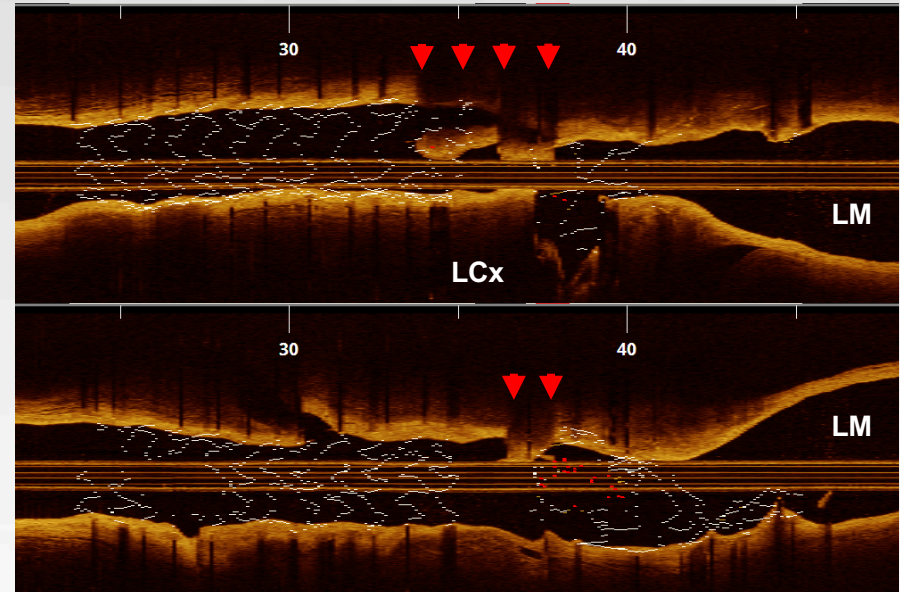
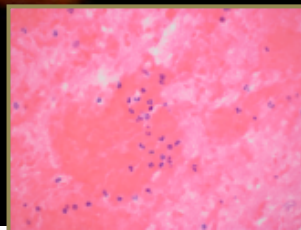
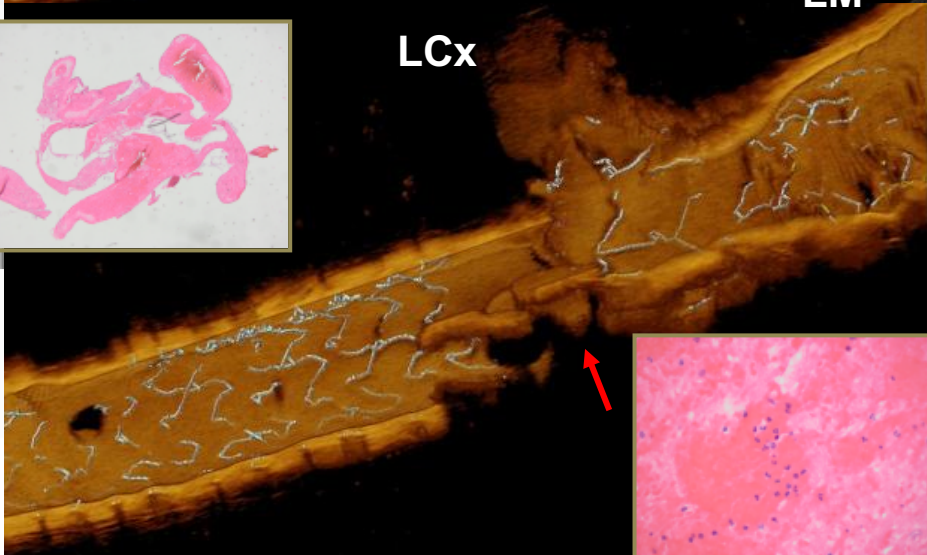
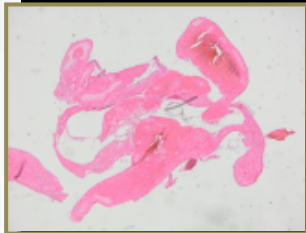
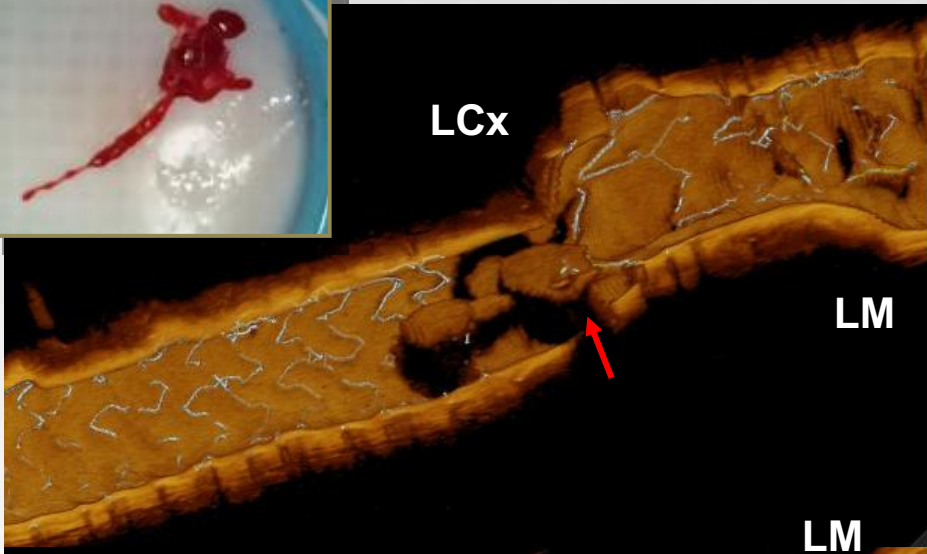
Juan Luis Gutiérrez-Chico, Evelyn Regar, Eveline Nüesch, Takayuki Okamura, Joanna Wykrzykowska, Carlo di Mario, Stephan Windecker, Gerrit-Anne van Es, Pierre Gobbens, Peter Jüni and Patrick W. Serruys

Vascular Tissue Reaction to Acute Malapposition in Human Coronary Arteries
 Sequential Assessment With Optical Coherence Tomography

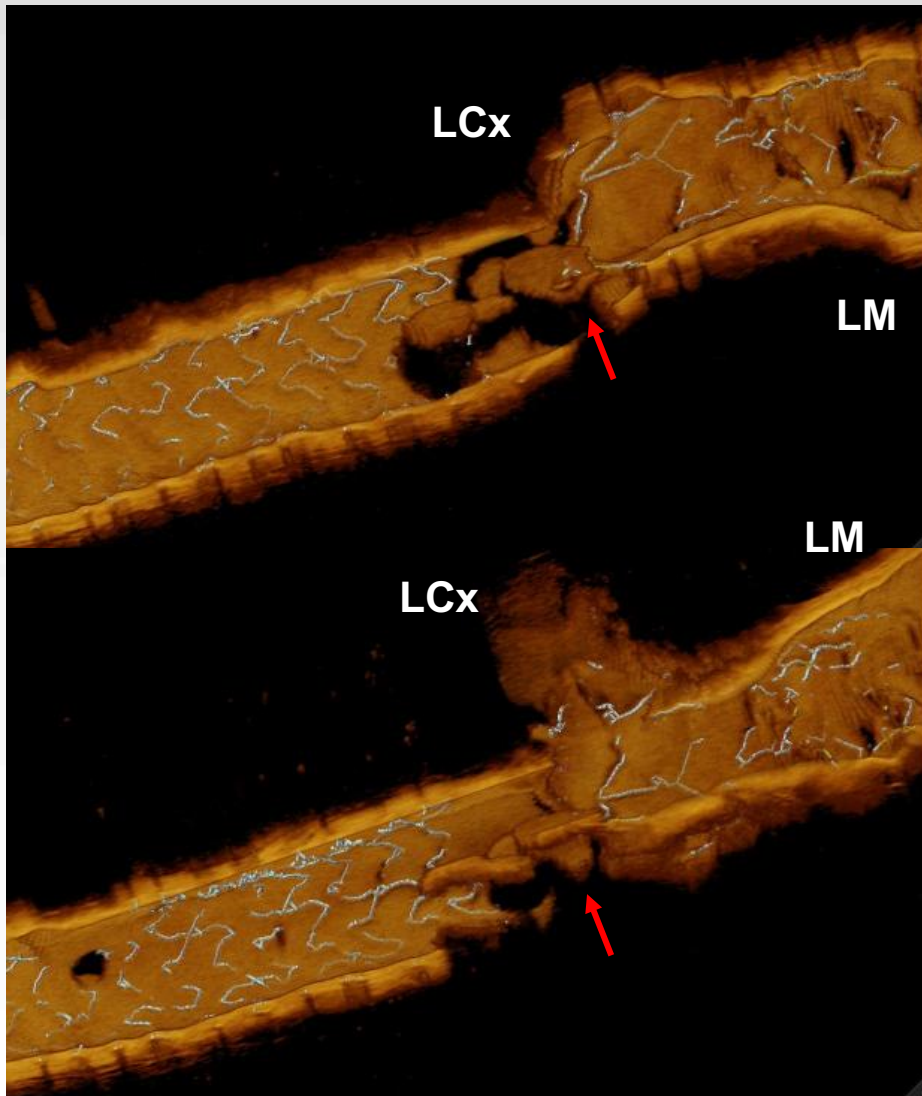
Juan Luis Gutiérrez-Chico, MD, PhD; Joanna Wykrzykowska, MD, PhD; Eveline Nüesch, PhD; Robert Jan van Geuns, MD, PhD; Karel T. Koch, MD, PhD; Jacques J. Koolen, MD, PhD; Carlo di Mario, MD, PhD; Stephan Windecker, MD, PhD; Gerrit-Anne van Es, MSc, PhD; Pierre Gobbens, MSc; Peter Jüni, MD; Evelyn Regar, MD, PhD; Patrick W. Serruys, MD, PhD
 (Circ Cardiovasc Interv. 2012;5:20-29)



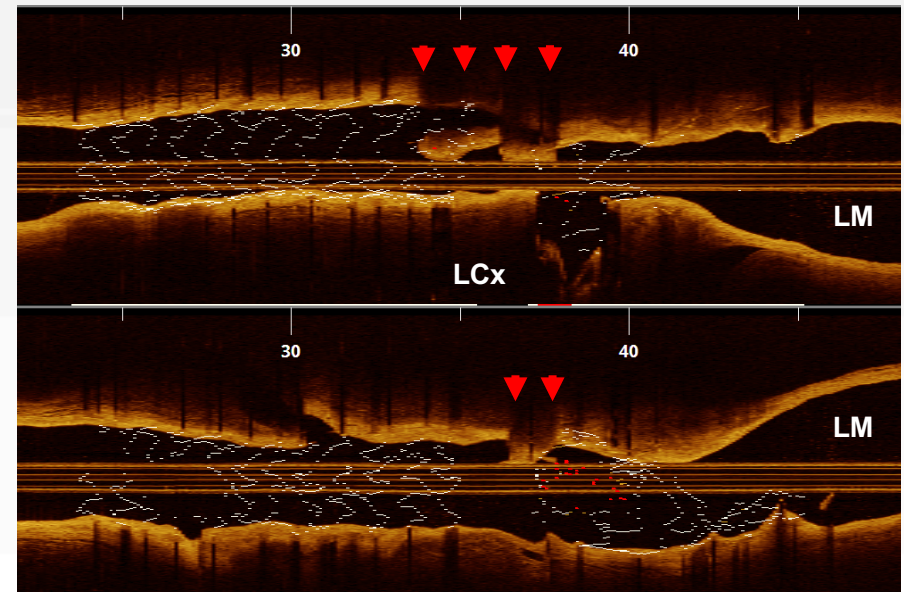
Foin, Gutiérrez-Chico, Circ Cardiovasc Interv 2014



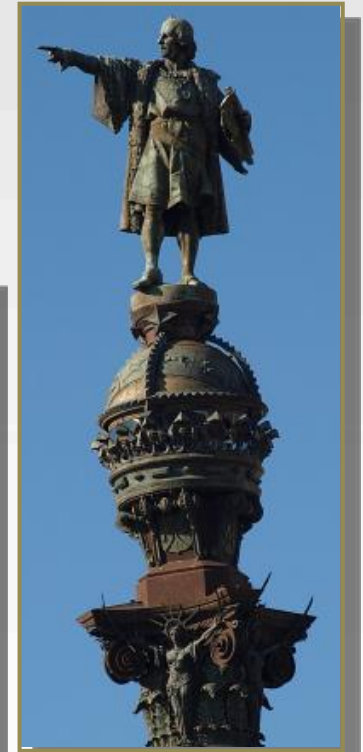
- **Clinical evidence is missing**
 - **Missing link between**
 - Biomechanics of detached struts
 - Stent thrombosis
 - **Differentiated mechanism of thrombosis**
 - **Limitation: single case**



- Diagnostic accuracy of OCT to identify the type of stent
 - Whenever unknown
 - 3D-image fusion
 - Automatic strut detection



Cortés C, Schincariol M, Jaguszewski M, Gutiérrez-Chico. *Cardiol J* (in press)



Thank you very much for your attention

juanluis.gutierrezchico@ictra.es