7th IMAGING & PHYSIOLOGY SUMMIT 2014

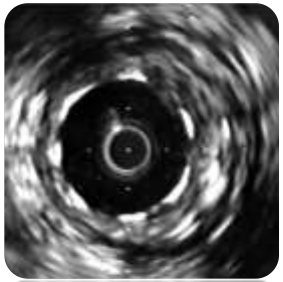
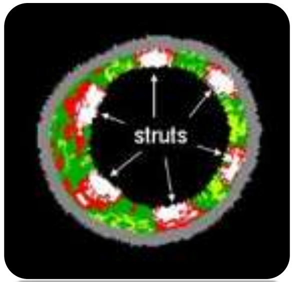
Grand International Seoul Palmas, Seoul Korea

December 6, 2014 15:28-15:36 Main arena, Level 5

Invasive imaging for coronary artery disease

Case presentation

How to do stent sizing and optimization by OCT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Disclosure Statement of Financial Interest

Within the past 12 months, I or my spouse/partner have had a financial interest/arrangement or affiliation with the organization(s) listed below.

Affiliation/Financial Relationship	Company
Grant/Research Support	St. Jude Medical, Terumo, Abbott Vascular, Pfizer
Consulting Fees/Honoraria	St. Jude Medical, Terumo, Sumitomo
Major Stock Shareholder/Equity	No
Royalty Income	No
Ownership/Founder	No
Intellectual Property Rights	No
Other Financial Benefit	No

Case: 71yo, M

Clinical diagnosis

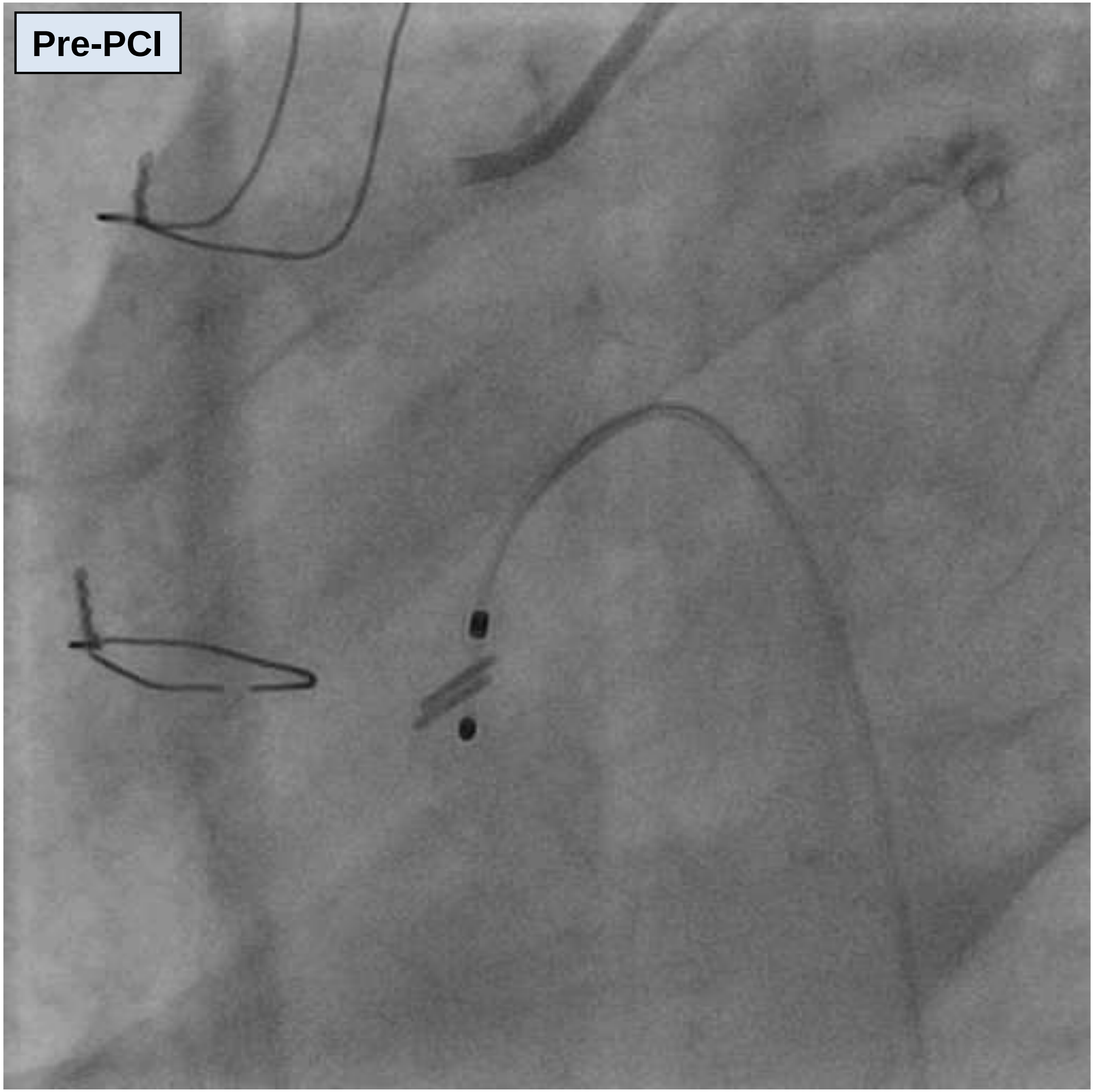
Stable AP, AF

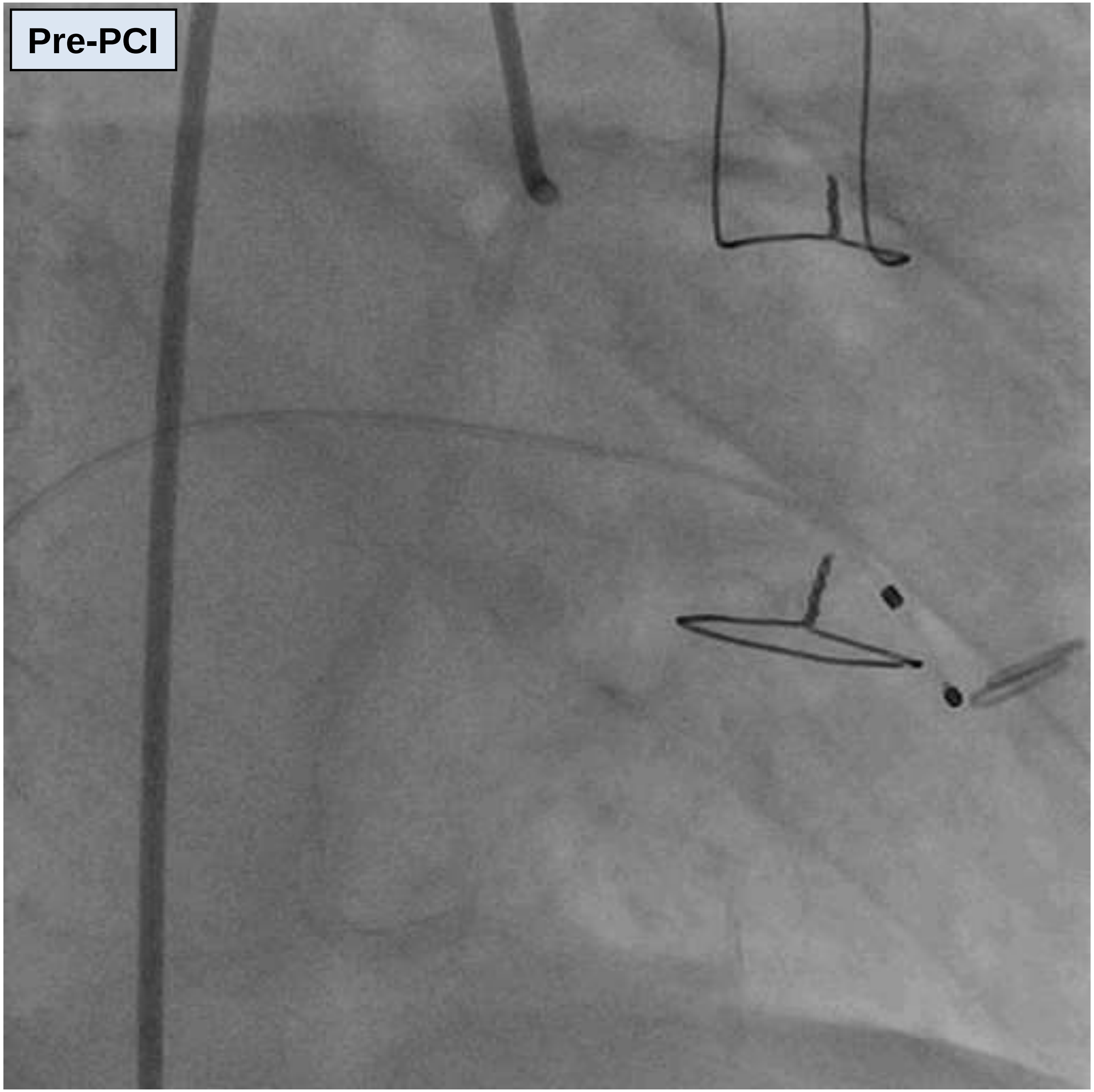
Clinical history

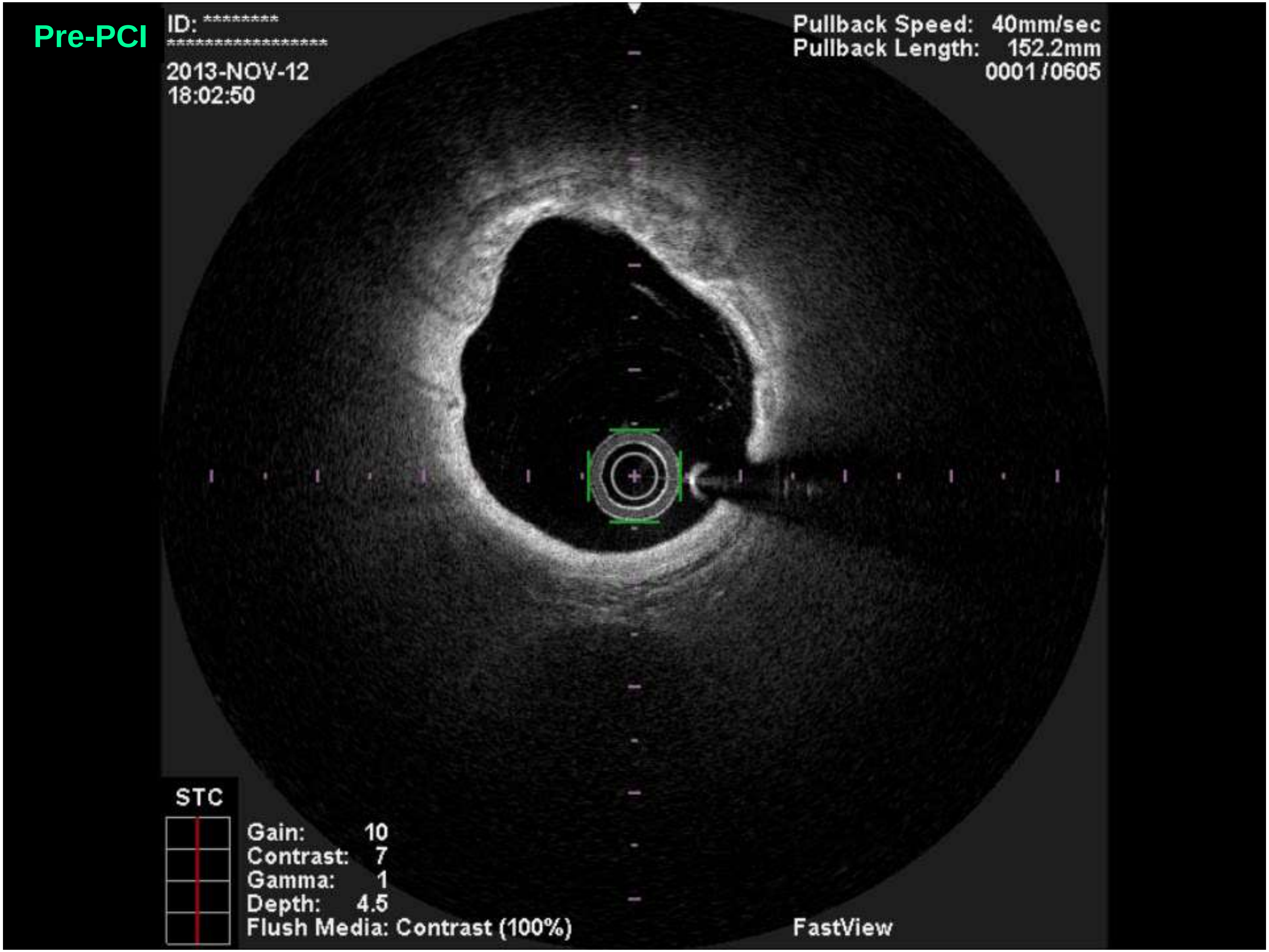
1978. CKD (Glomerular nephritis) ⇒ Hemodialysis
2003. Effort AP, LAD prox lesion, CABG (LITA to LAD)
2013. Scintiscan: LV inferior ischemia

Coronary risk factors

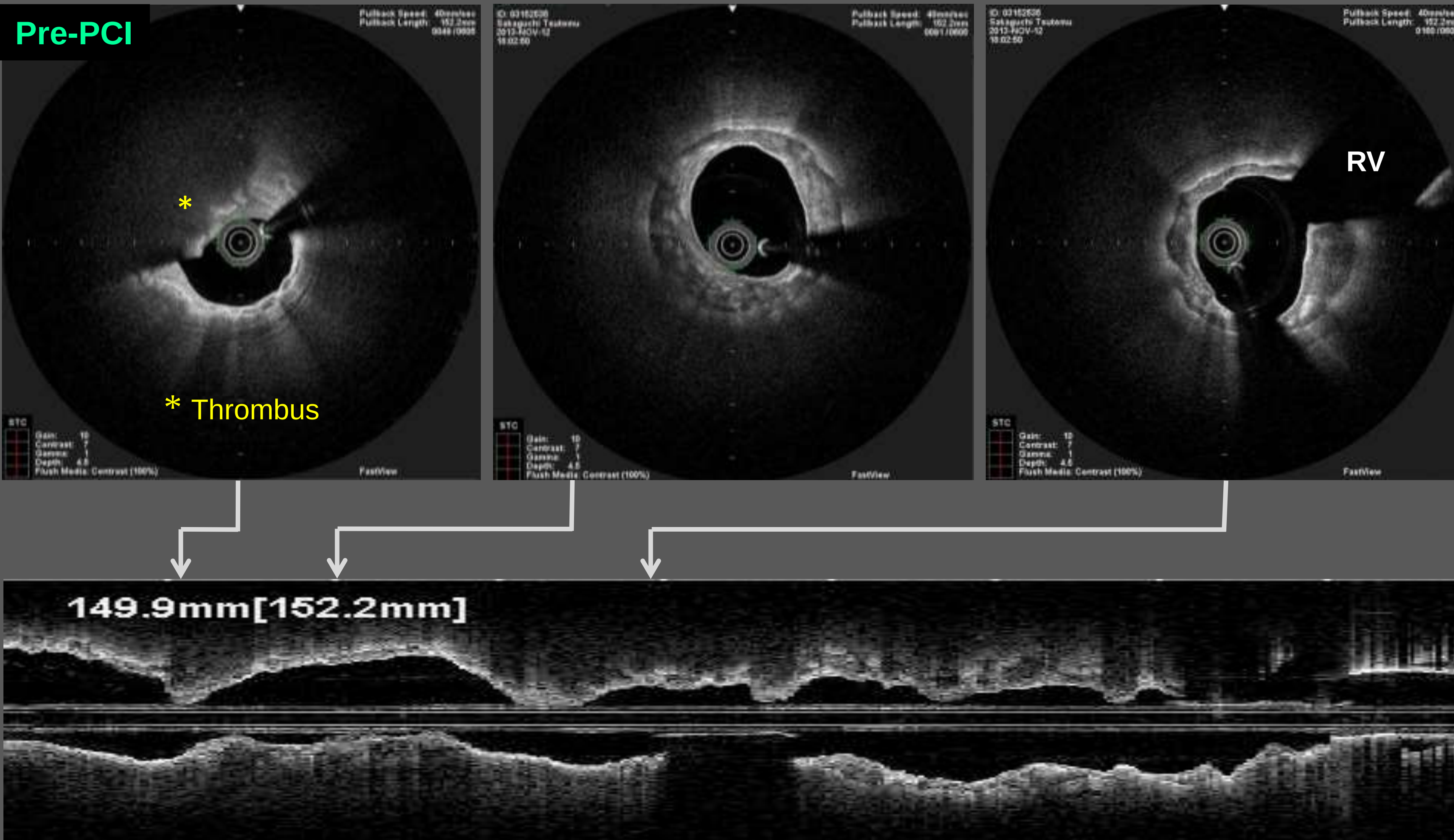
HT (-), DLP (-), DM (-), Obesity (-), Smoker (+)


Pre-PCI

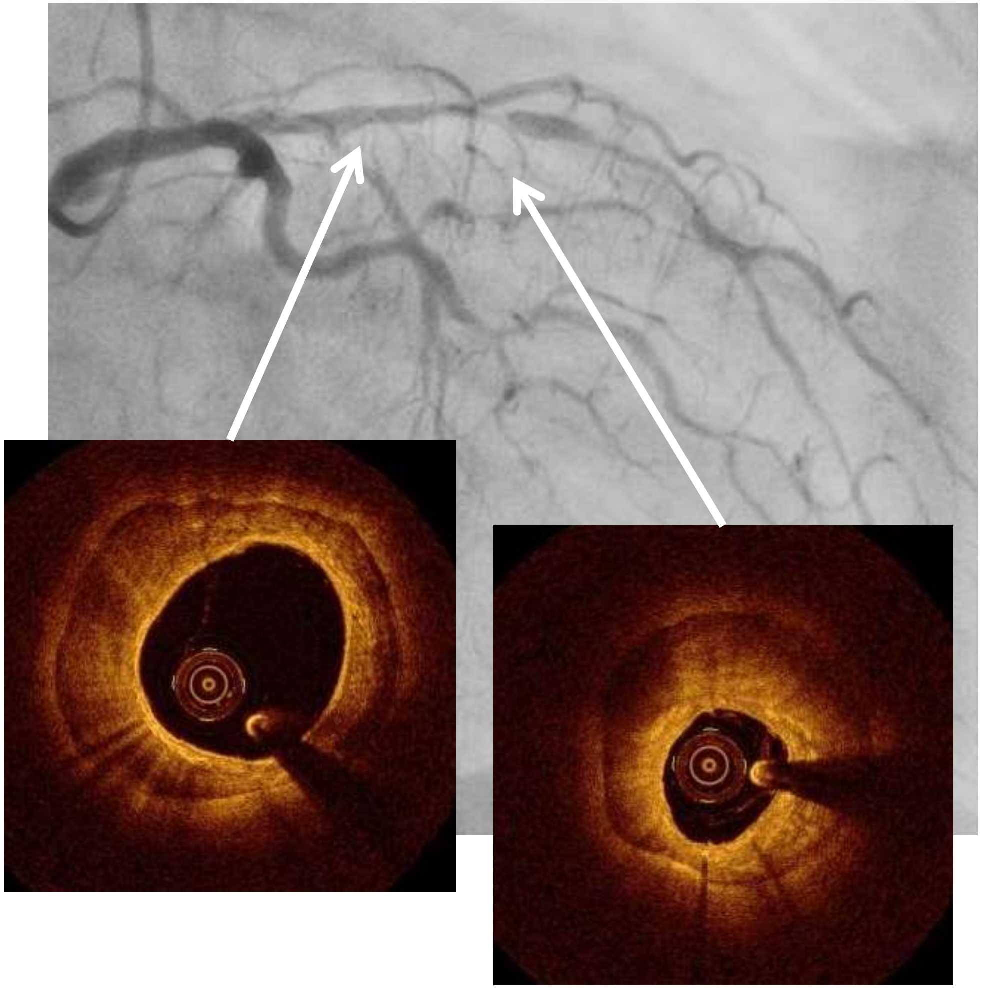

Pre-PCI

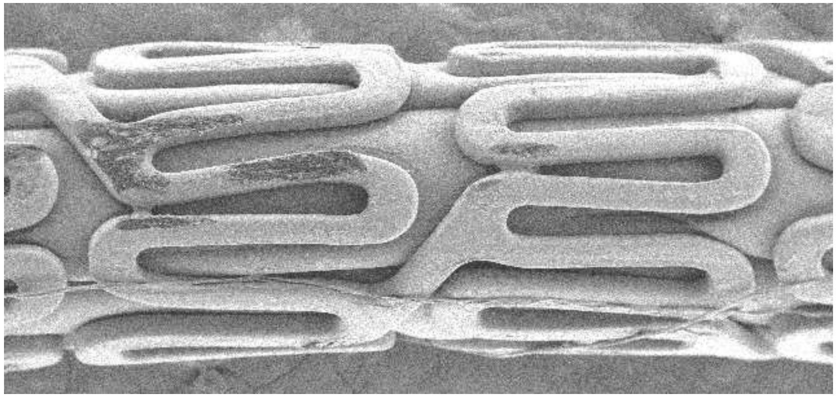

Pre-PCI
ID: ********
****
2013-NOV-12
18:02:50
Pullback Speed: 40mm/sec
Pullback Length: 152.2mm
0001 / 0605
STC
Gain: 10
Contrast: 7
Gamma: 1
Depth: 4.5
Flush Media: Contrast (100%)
FastView

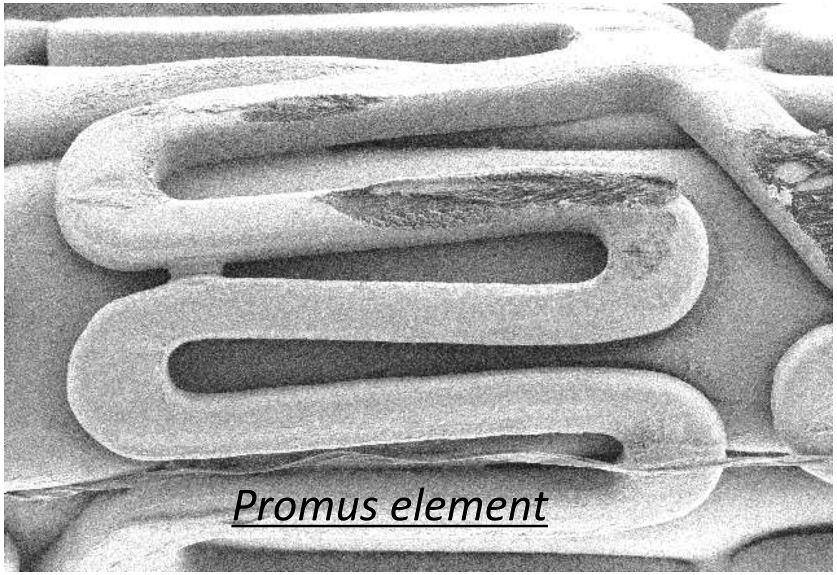
Minimum lumen area site | **Severe calcification** | **Severe calcification**

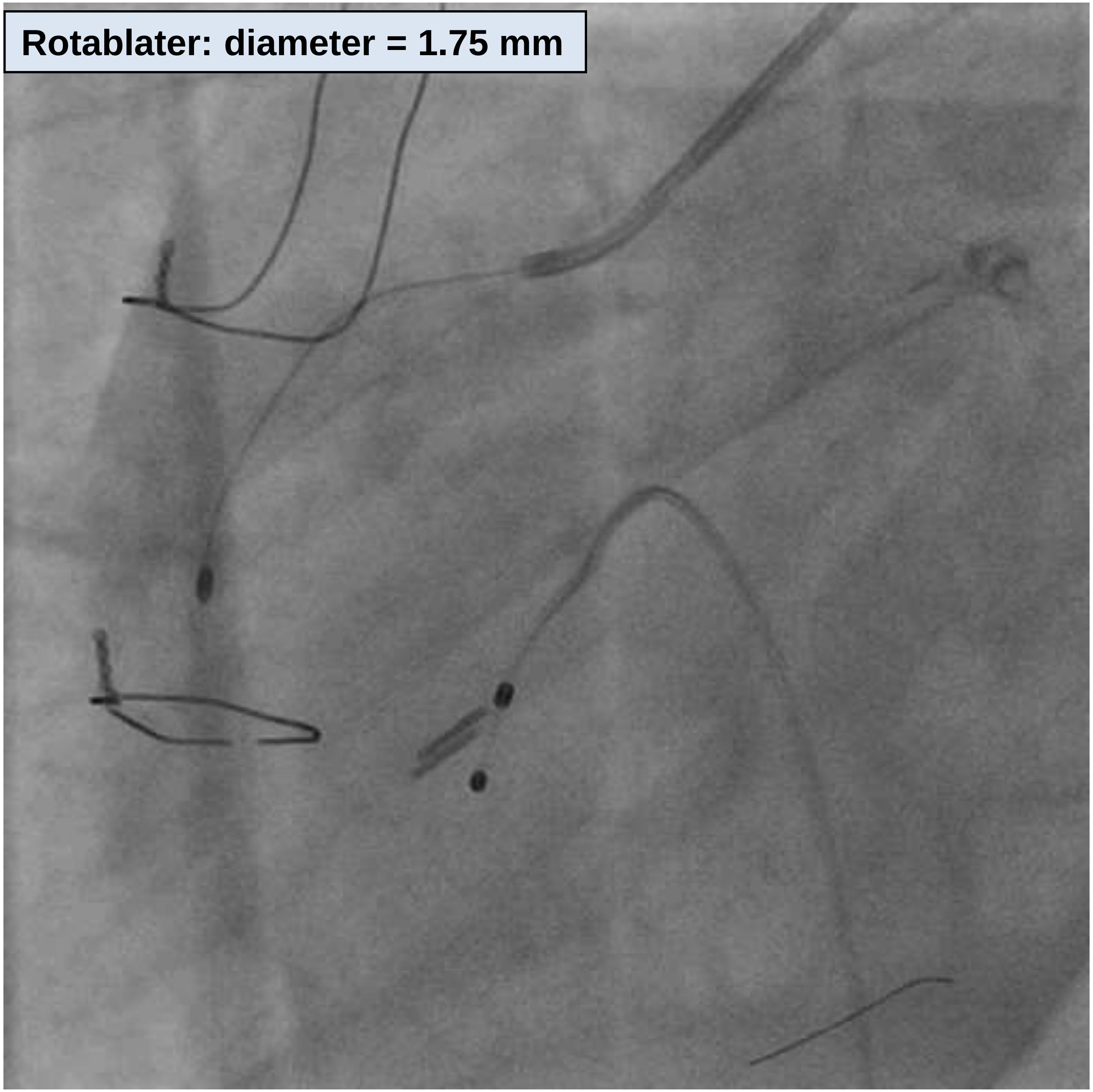


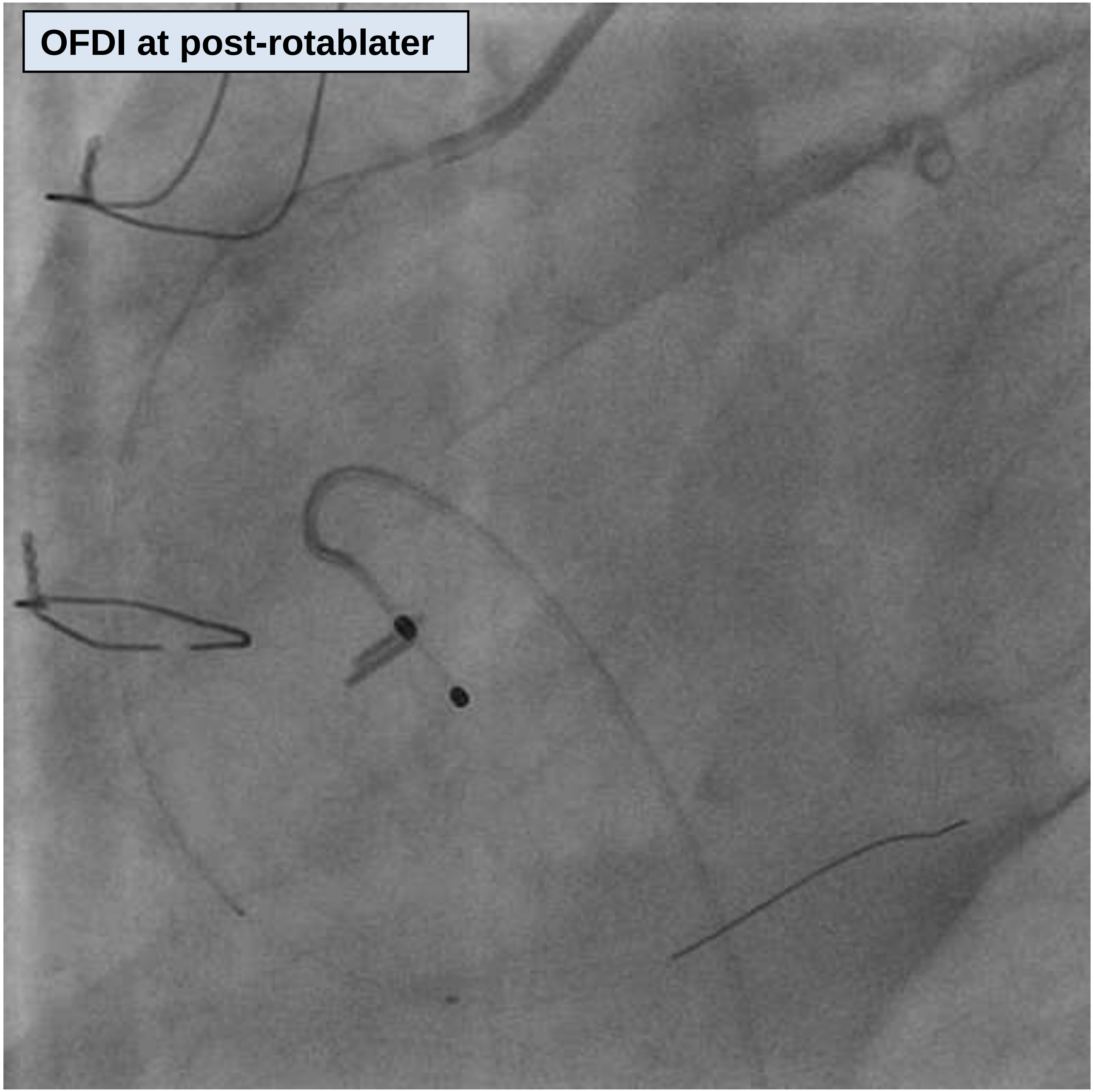
Polymer damage of DES during PCI in OCT-derived severe calcified lesion

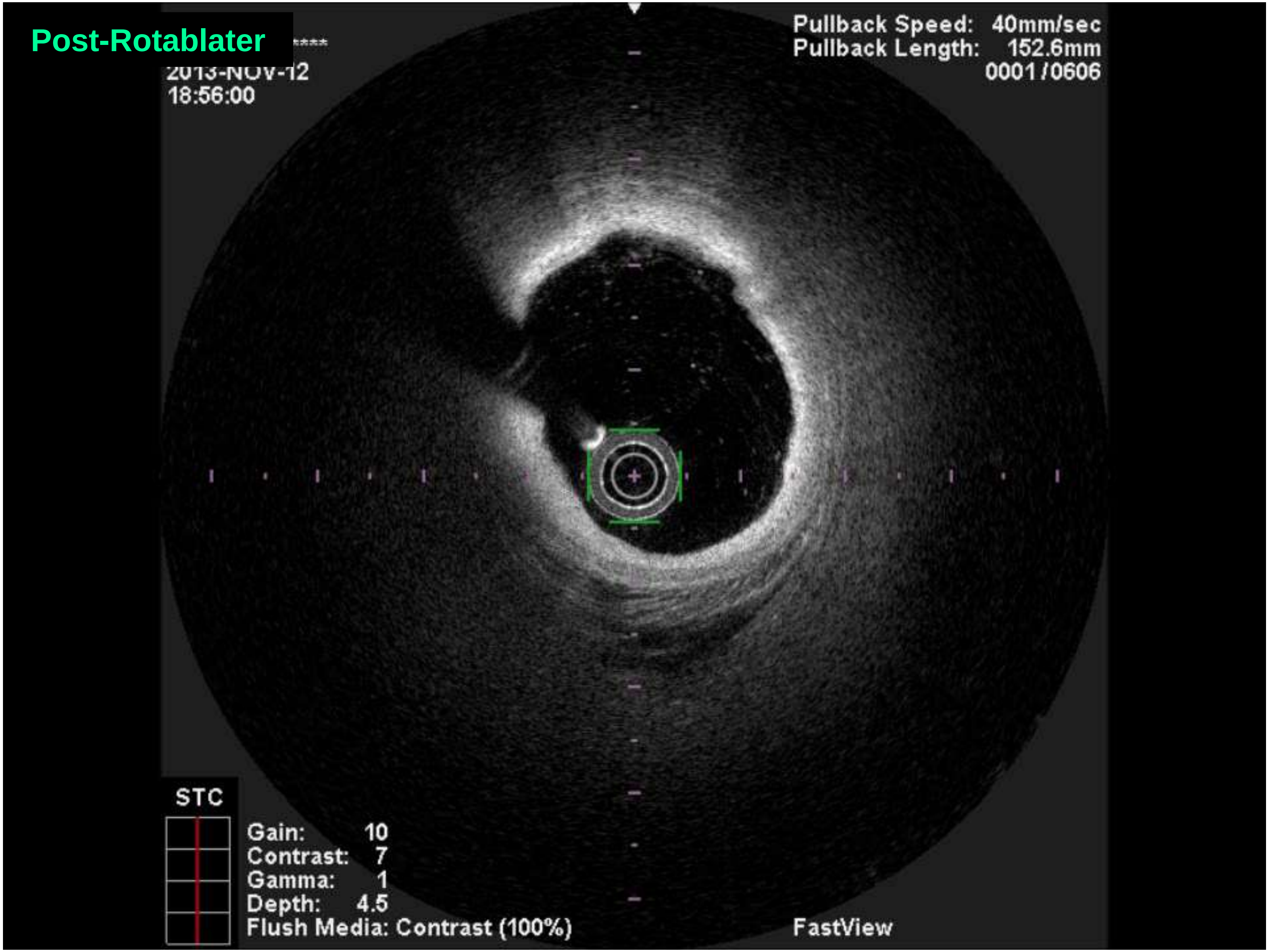




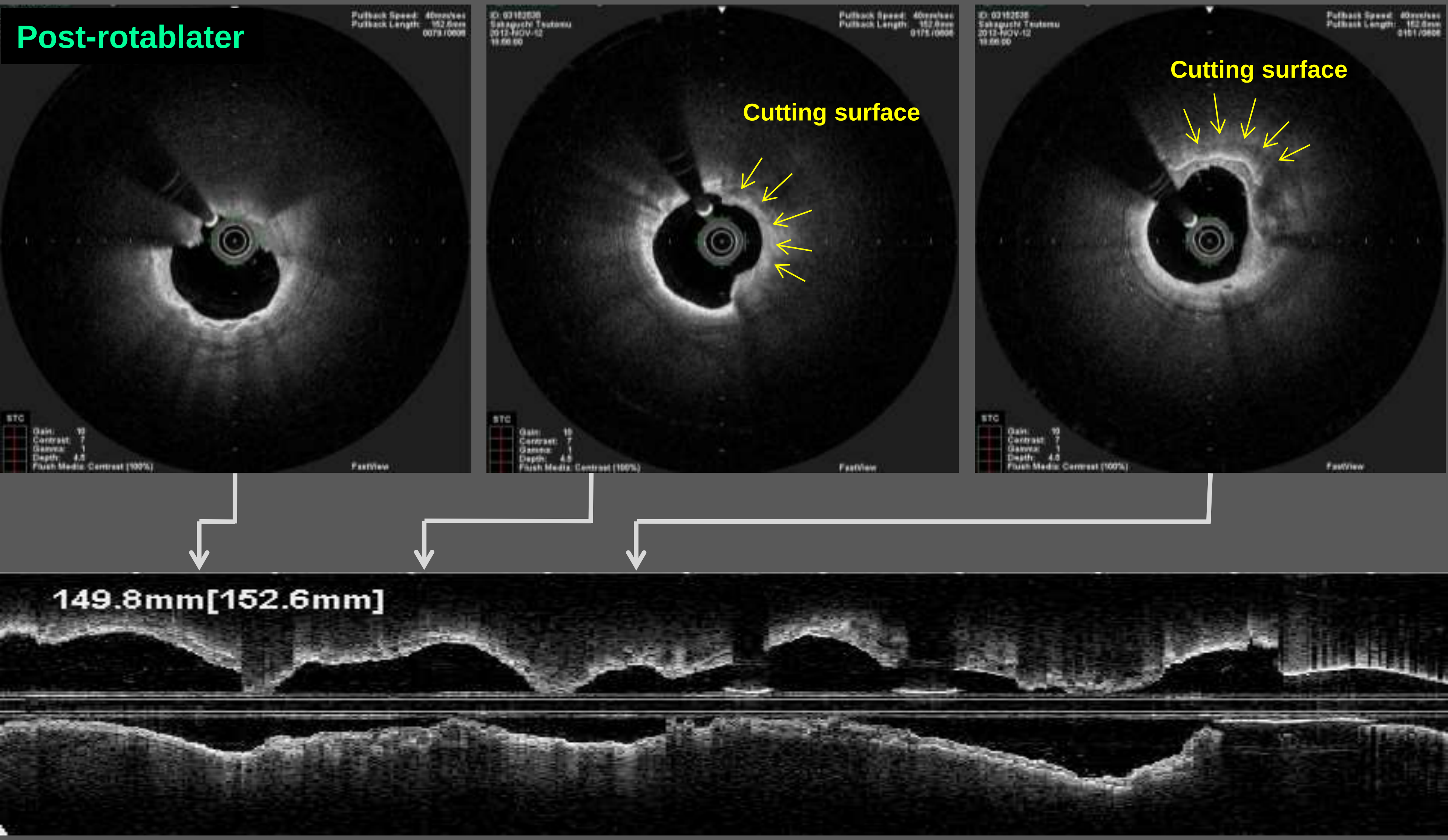



Rotablater: diameter = 1.75 mm

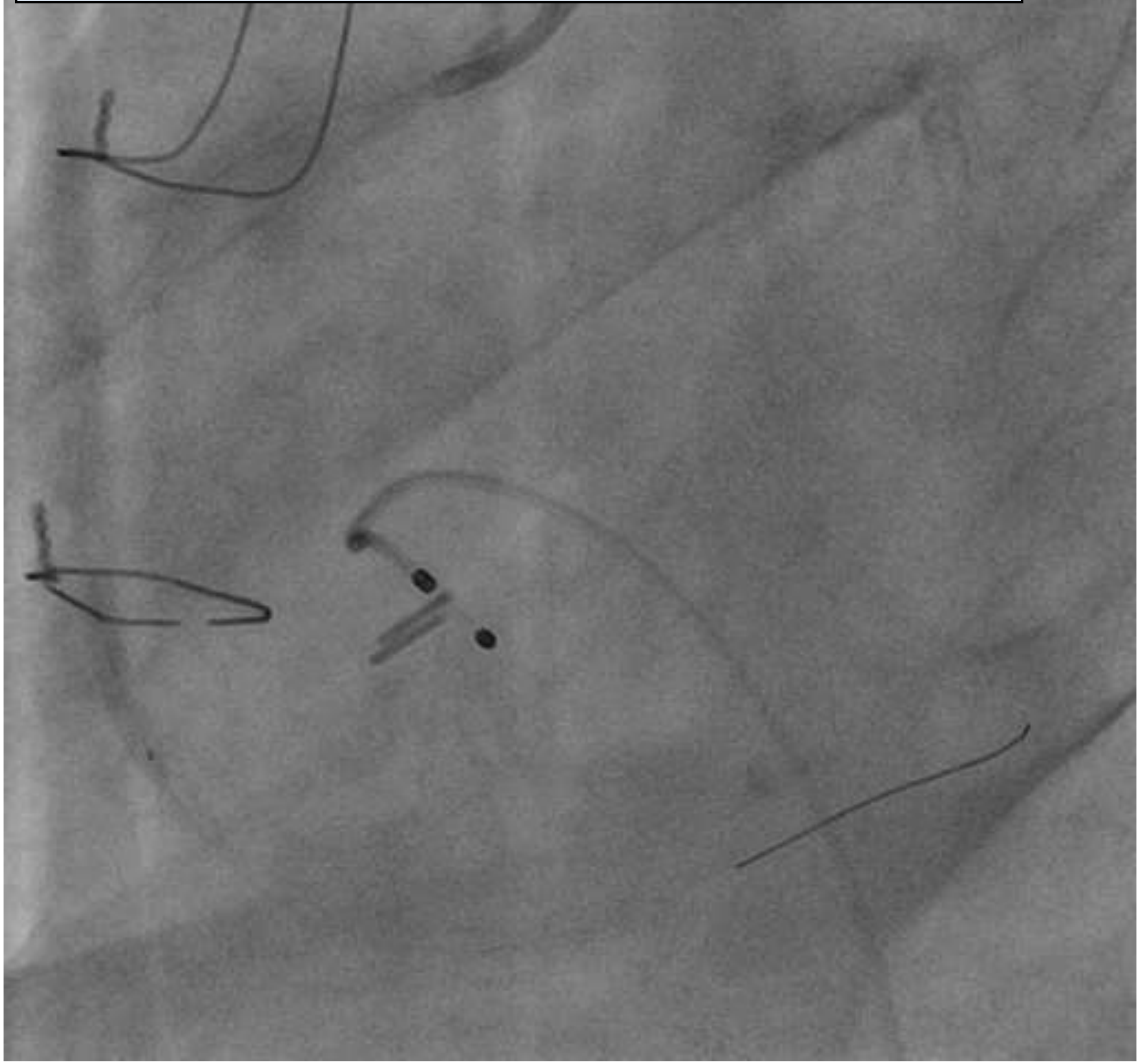

OFDI at post-rotablater


Post-Rotablater
2013-NOV-12
18:56:00
Pullback Speed: 40mm/sec
Pullback Length: 152.6mm
0001 /0606
STC
Gain: 10
Contrast: 7
Gamma: 1
Depth: 4.5
Flush Media: Contrast (100%)
FastView

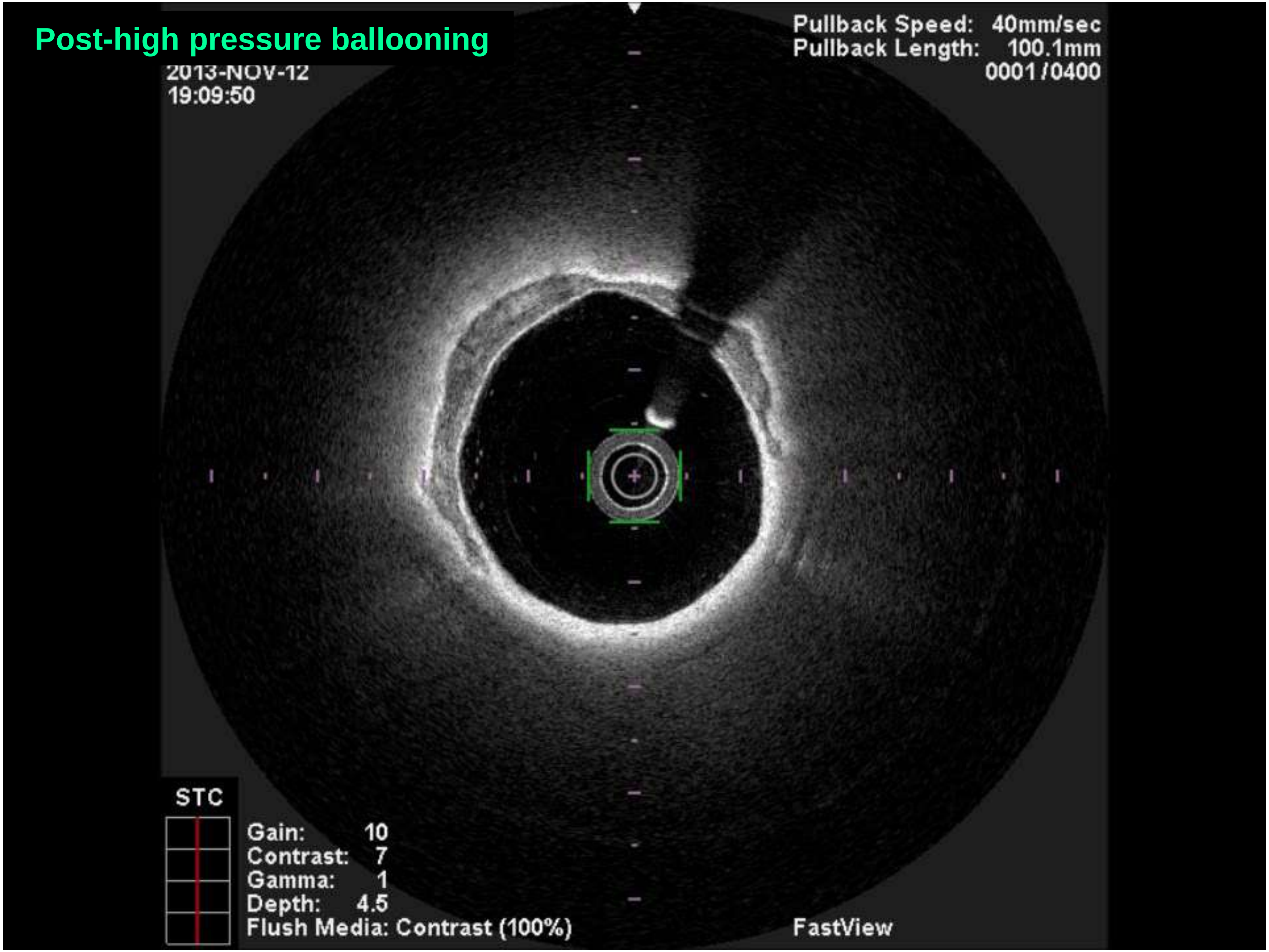
Minimum lumen area site | Calcification | Calcification



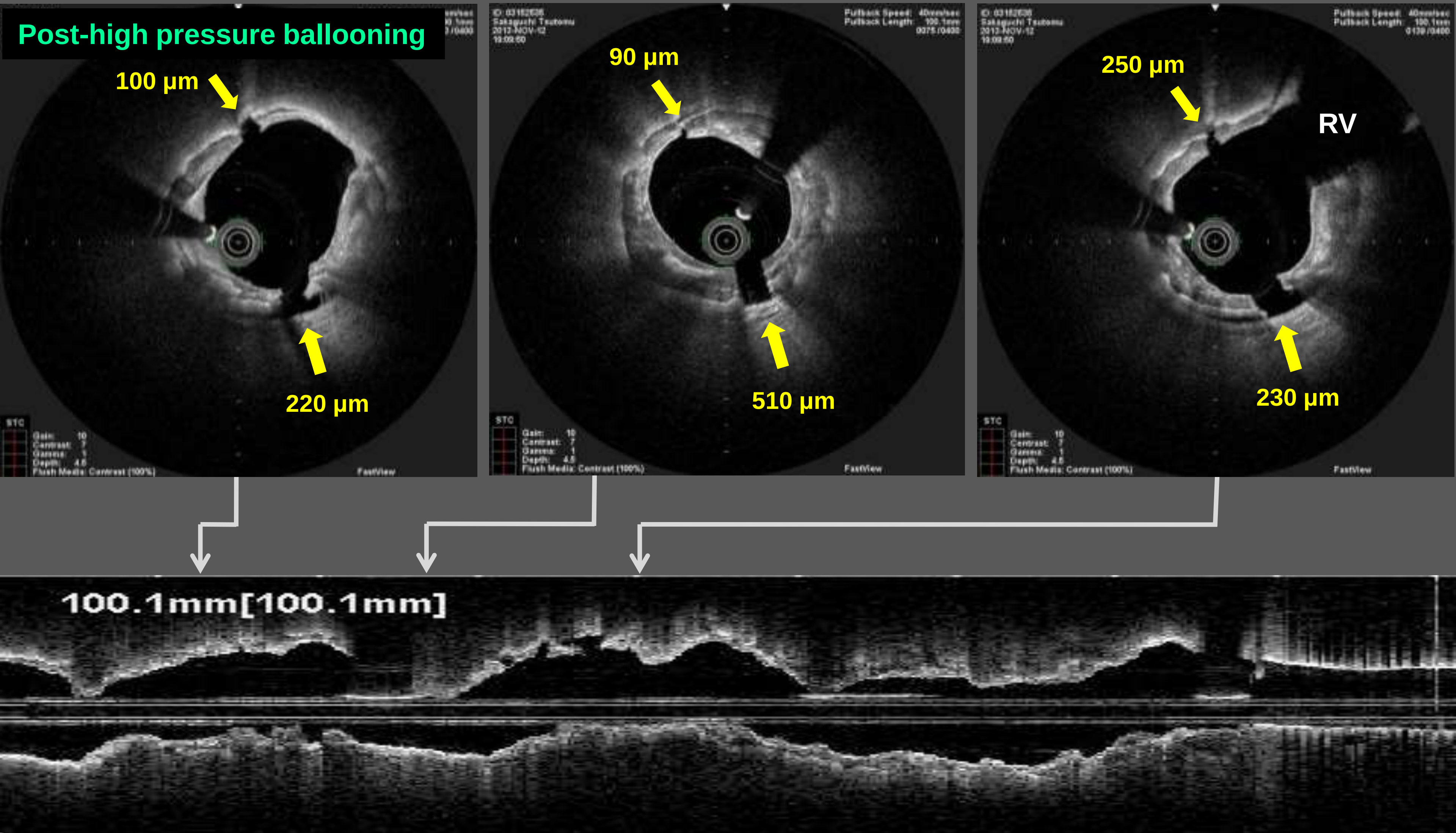
High pressure ballooning (Hiryu Plus 3*12mm, 20atm)




Post-high pressure ballooning


Post-high pressure ballooning
2013-NOV-12
19:09:50
Pullback Speed: 40mm/sec
Pullback Length: 100.1mm
0001 /0400
STC
Gain: 10
Contrast: 7
Gamma: 1
Depth: 4.5
Flush Media: Contrast (100%)
FastView

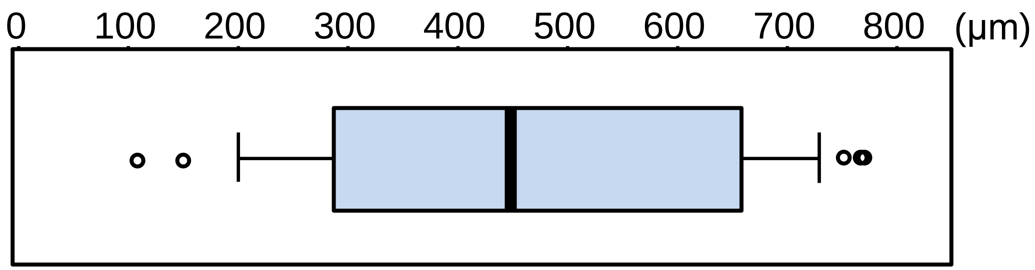
Broken calcium plate **Broken calcium plate** **Broken calcium plate**



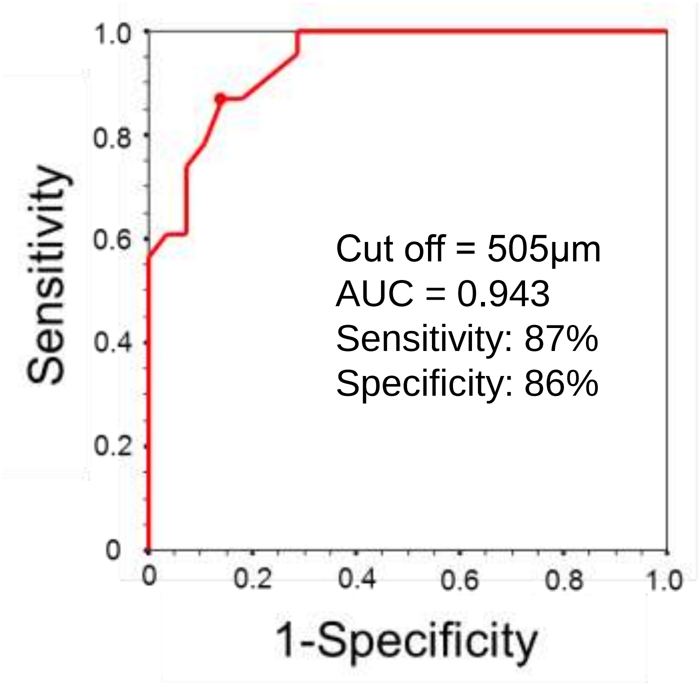
Prediction of calcium plate fracture by ballooning

OFDI was performed to assess vascular response immediately after high pressure ballooning in 51 patients with severe calcified coronary lesion.

Thickness distribution of calcium fracture



Median = 450μm; Lower quartile = 300μm; Upper quartile = 660μm; Minimum = 110μm; and Maximum = 770μm.



Conclusion. A calcium plate thickness < 505 μm was the corresponding cut-off value for predicting calcium plate fracture by high pressure ballooning.

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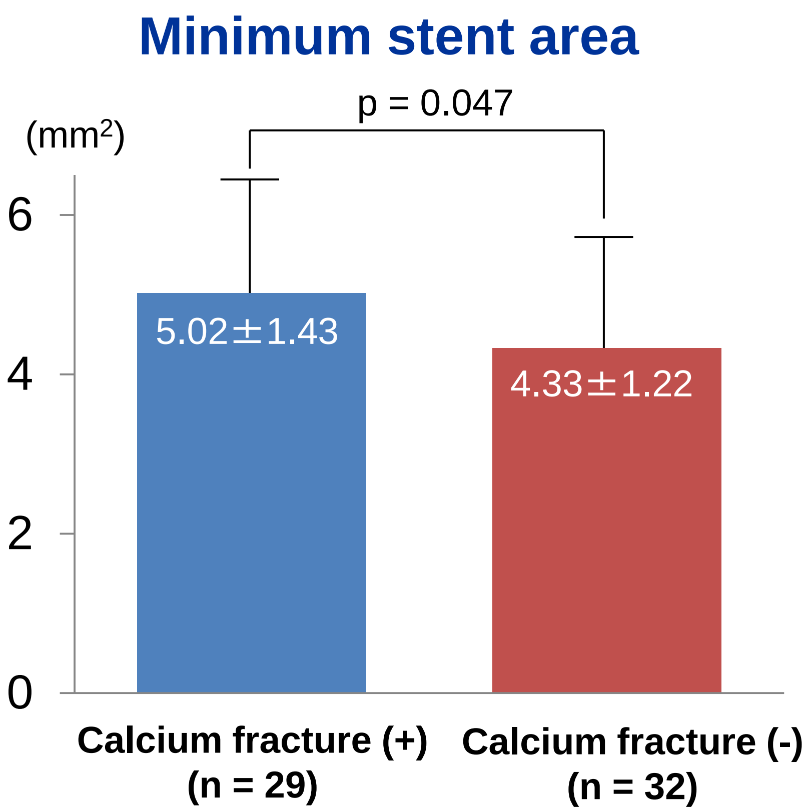
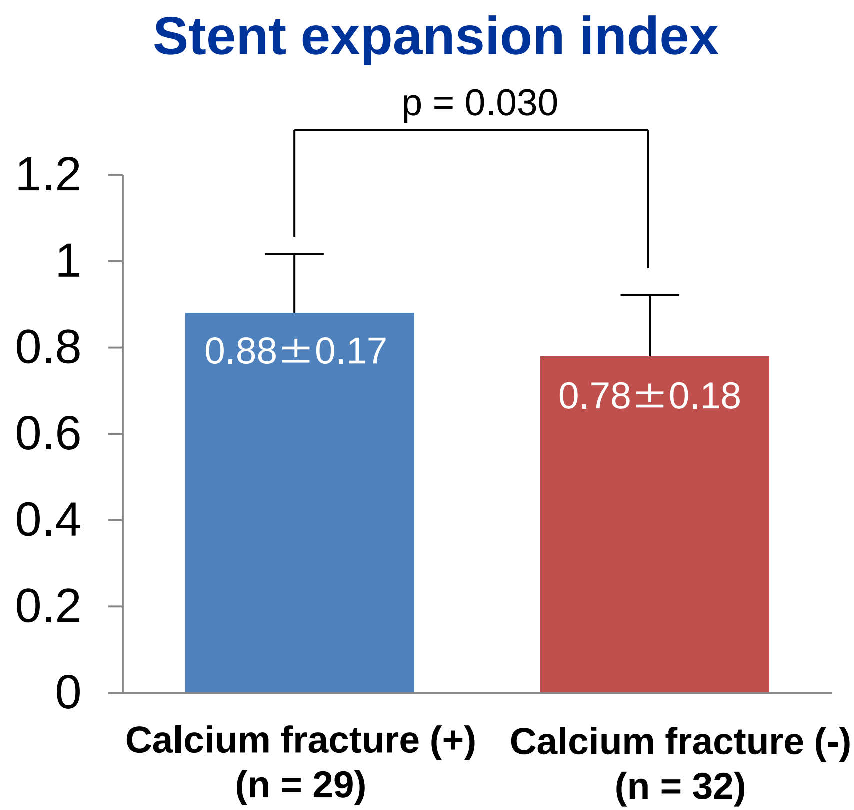
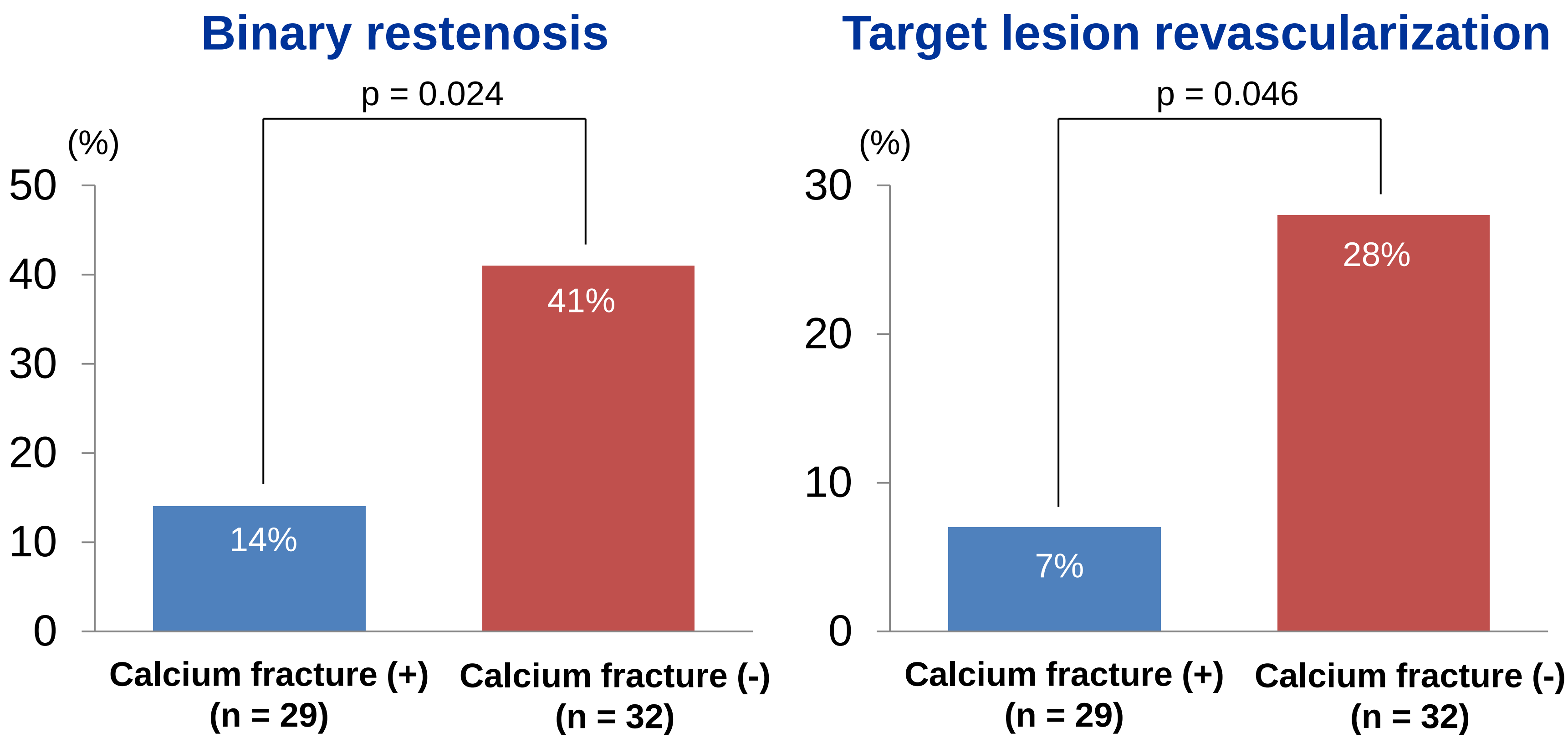
Stent expansion at post-PCI





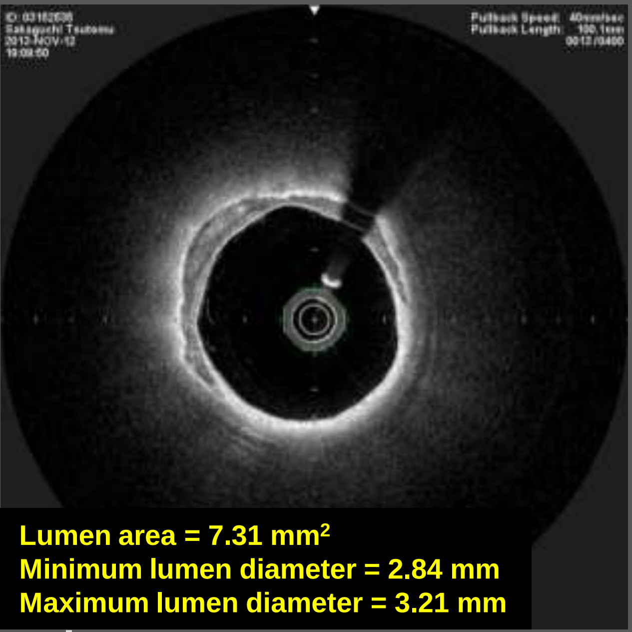
Minimum stent area and stent expansion index were significantly greater in the group with calcium fracture compared with the group without calcium fracture.

Restenosis and TLR at 10 months follow-up

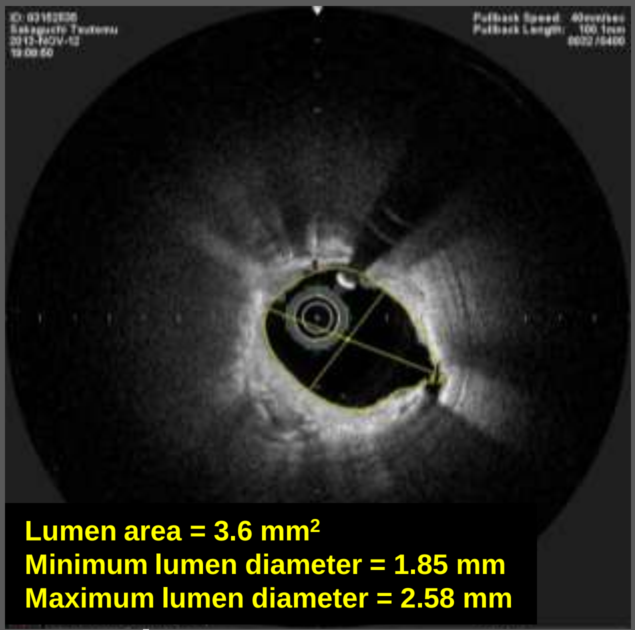


The frequency of binary restenosis and target lesion revascularization was significantly lower in the group with calcium fracture compared with the group without calcium fracture.

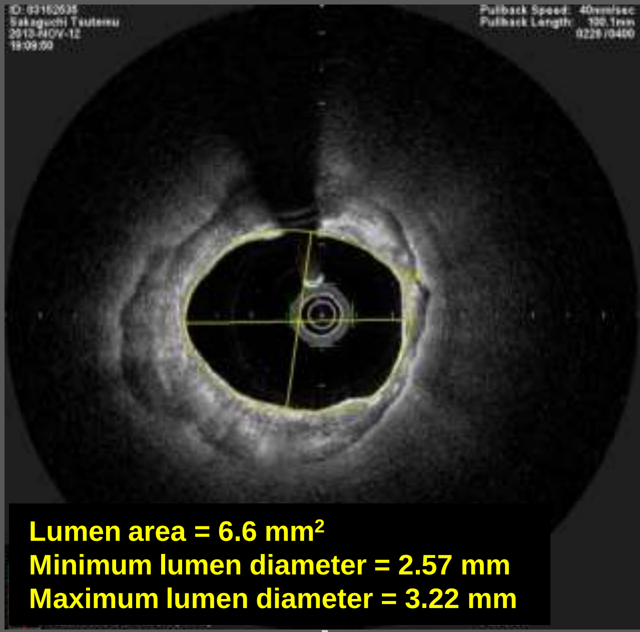
Distal reference

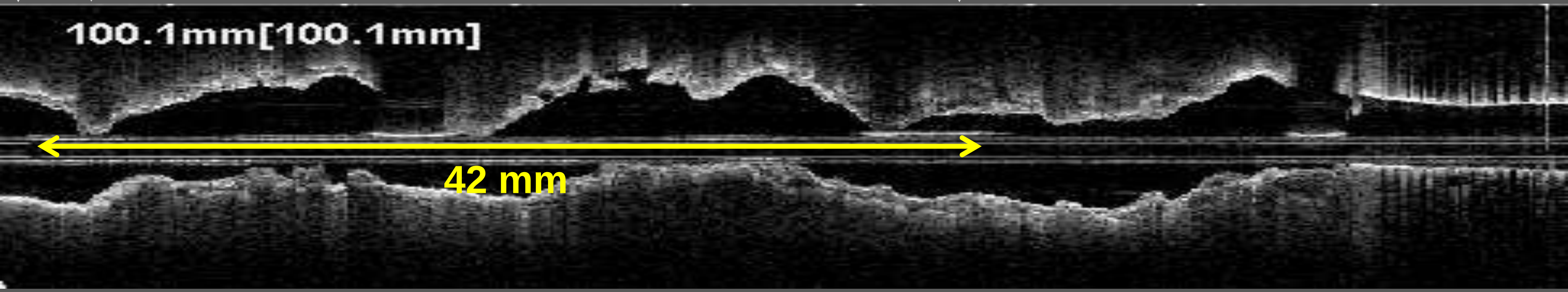


Minimum lumen area site



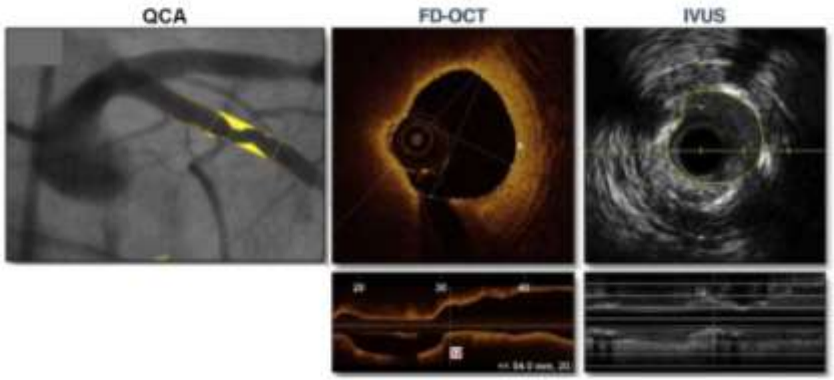
Proximal reference



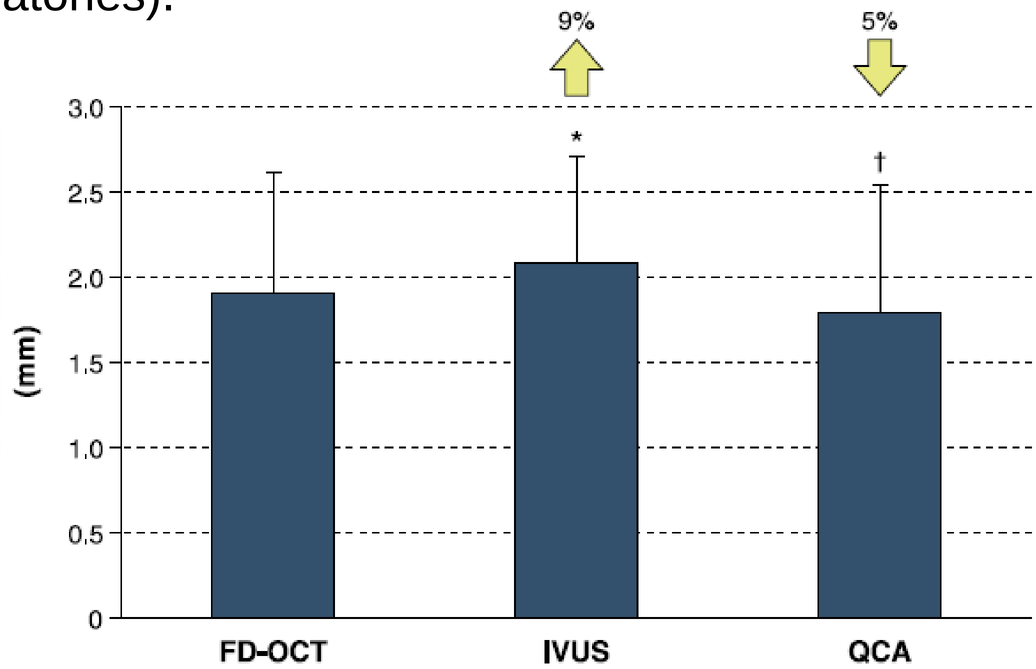


Accuracy of OCT measurement in vivo

The accuracy of FD-OCT and IVUS measurements was evaluated by using in-vivo in humans (n=100, in 5 catheter laboratories).



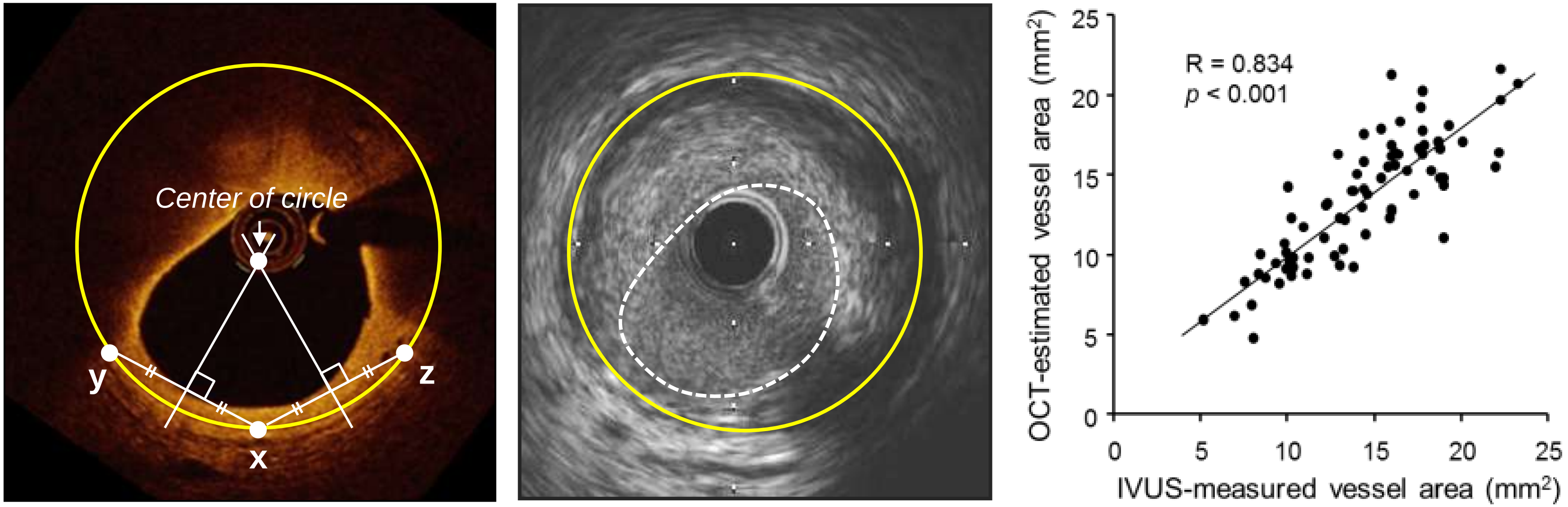
In Vivo Measurements of Lumen Dimensions by QCA, FD-OCT, and IVUS. In this representative case, frequency domain optical coherence tomography (FD-OCT) and intravascular ultrasound (IVUS) was performed for the proximal circumflex coronary artery stenosis of which minimum lumen diameter (MLD) was 1.59 mm in quantitative coronary angiography (QCA). MLA measured using FD-OCT and IVUS was 2.75 mm2 and 3.50 mm2 (MLD was 1.87 mm and 2.13 mm), respectively.



Conclusion: MLD by IVUS was greater than that by FD-OCT (relative reference 9%). MLD by QCA was smaller than that by FD-OCT (relative reference –5%).

Vessel circumference approximation in OCT

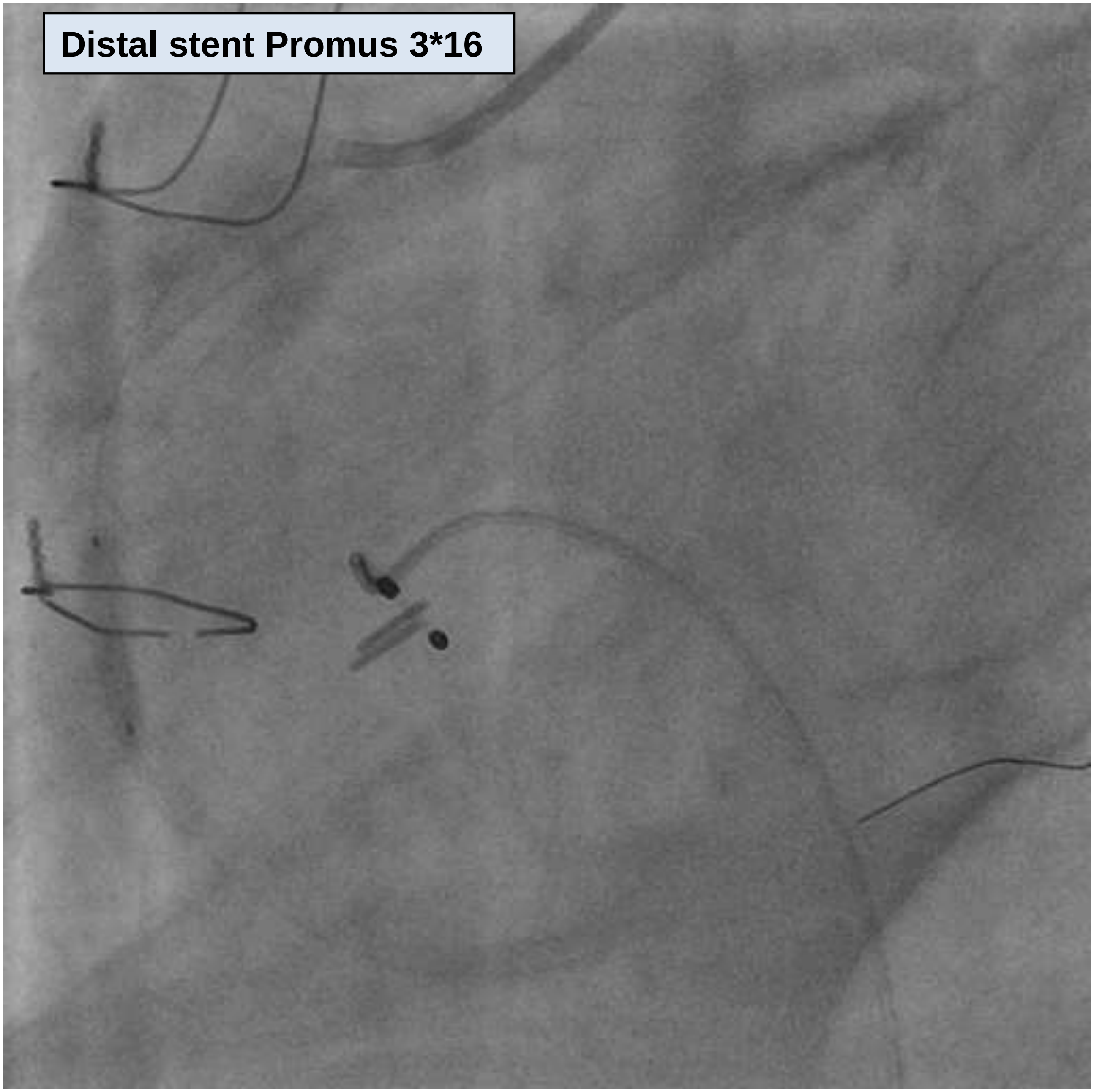
Feasibility of approximating algorithm of vessel circumference in OCT were evaluated in 80 coronary artery segments.

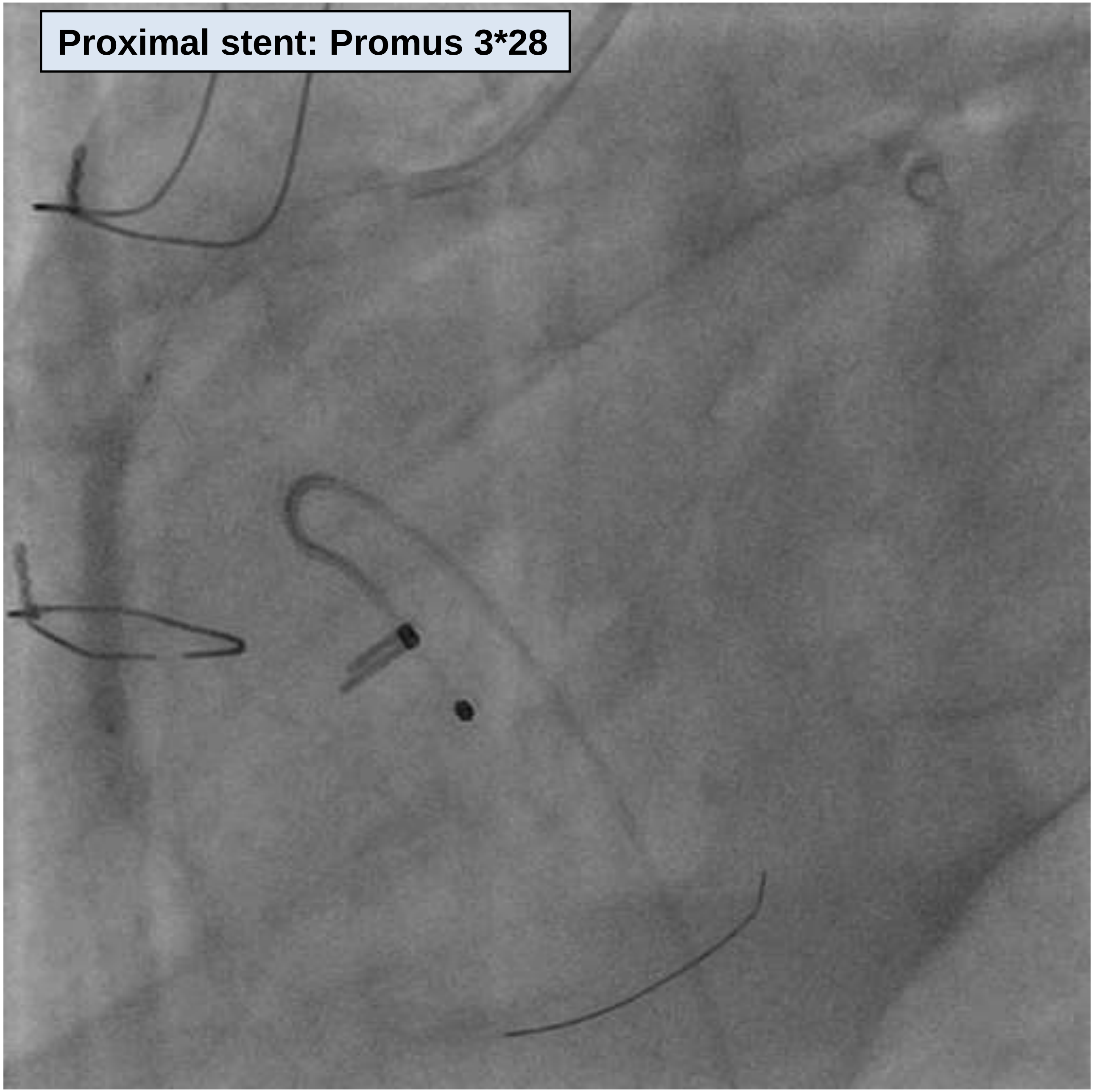


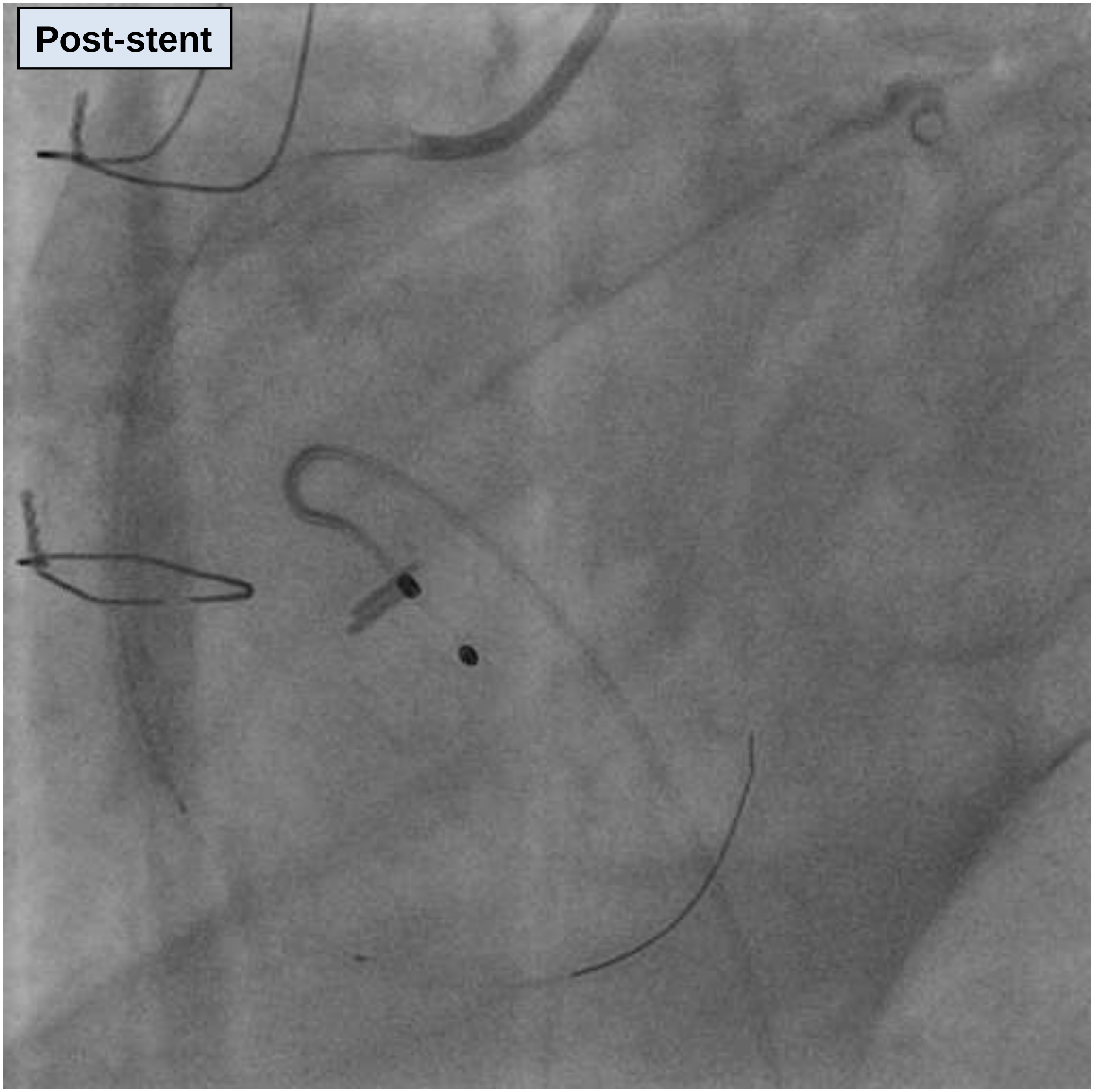
Three points (x, y, z) are placed on the visible circular arc. The central point (x) is connected with the other two points (y and z) by straight lines. Through the mid-point of each straight line, perpendicular line is drawn. Intersection of the two perpendicular lines is assumed to be the center of the circle. This makes circular approximation.

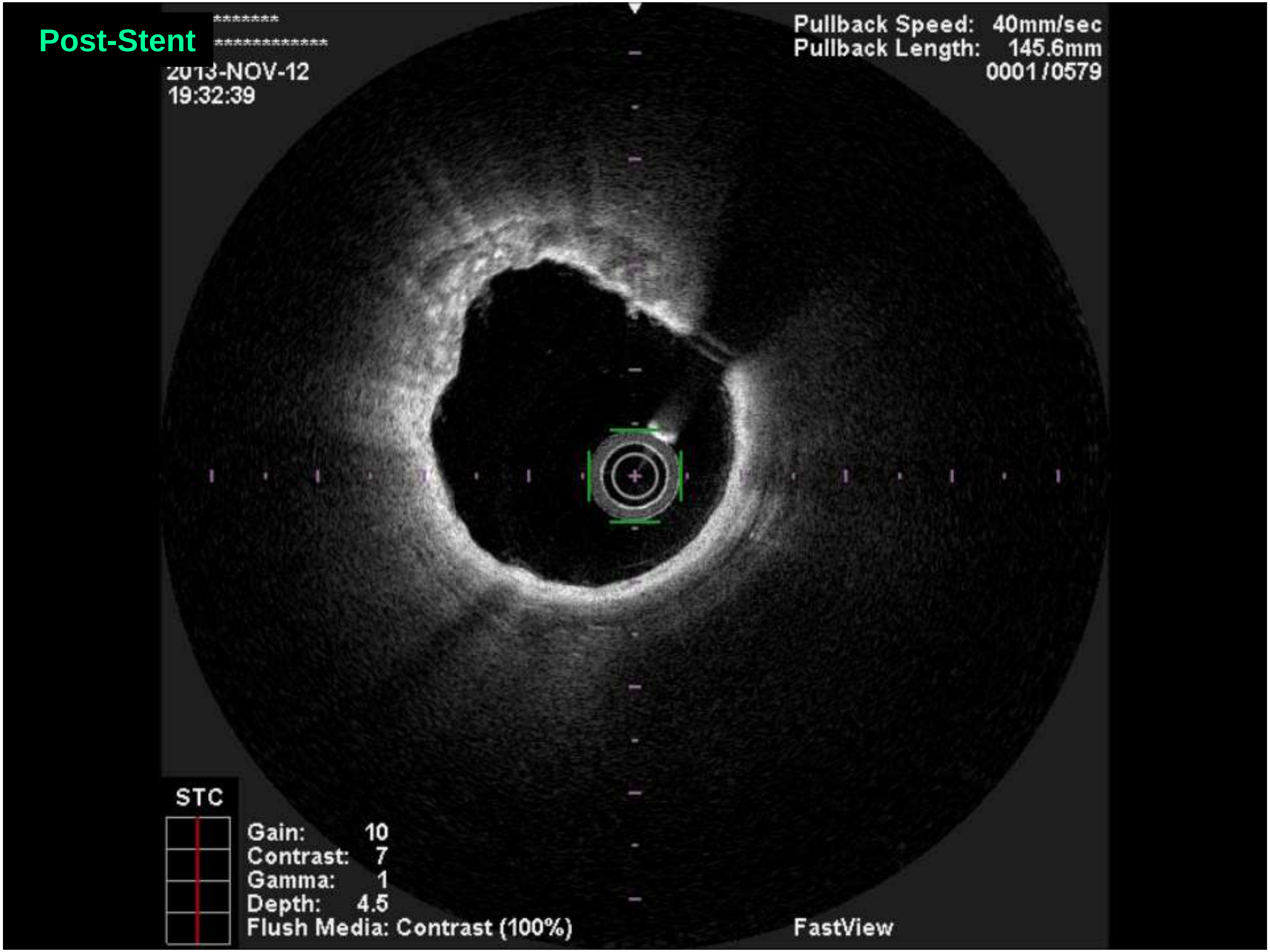
Conclusion: By approximating algorithm of vessel circumference, OCT can estimate vessel area in coronary arteries with lipidic plaque.

Kubo T, Akasaka T et al, Circ J 2015 in press

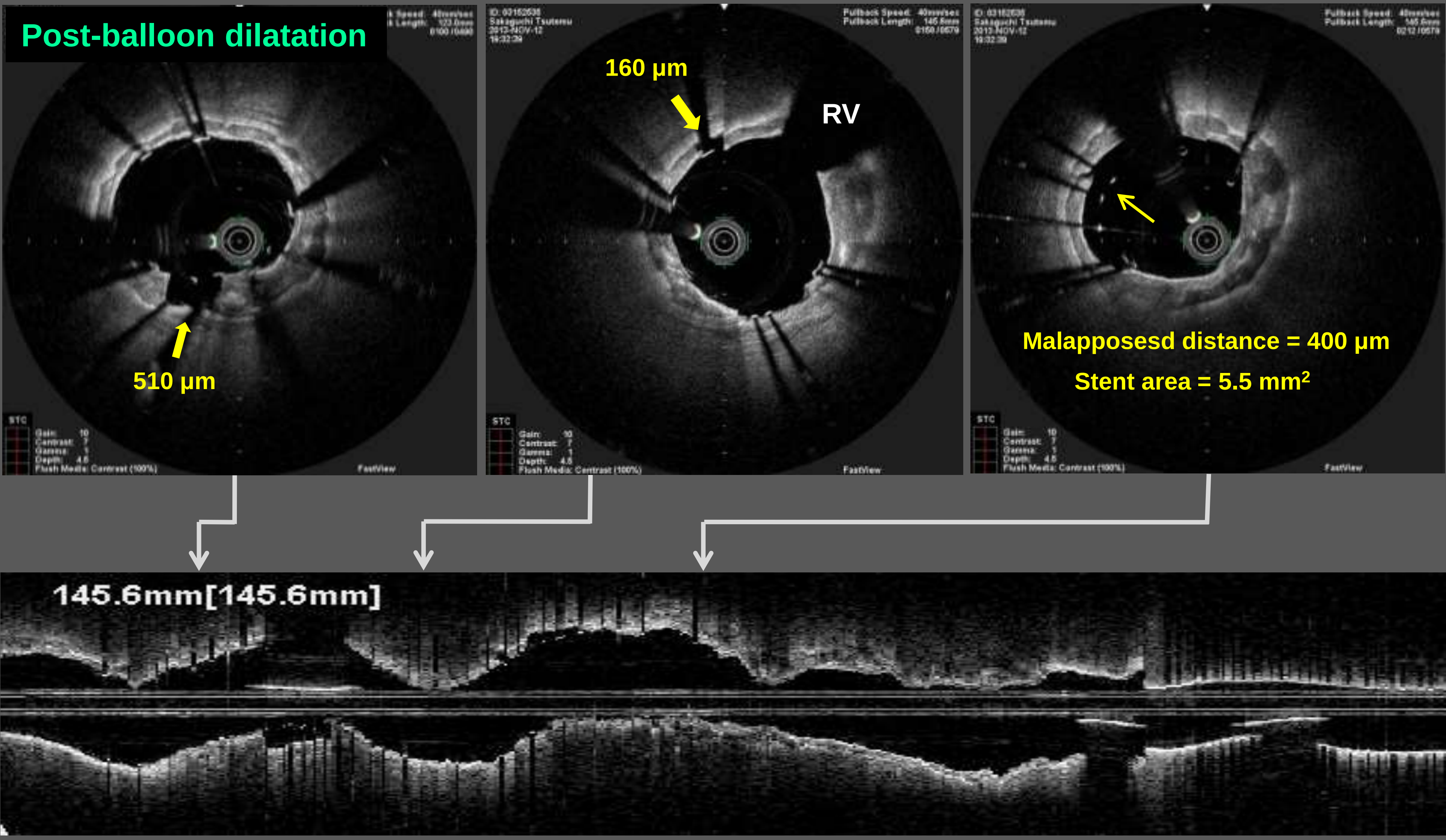

Distal stent Promus 3*16


Proximal stent: Promus 3*28


Post-stent

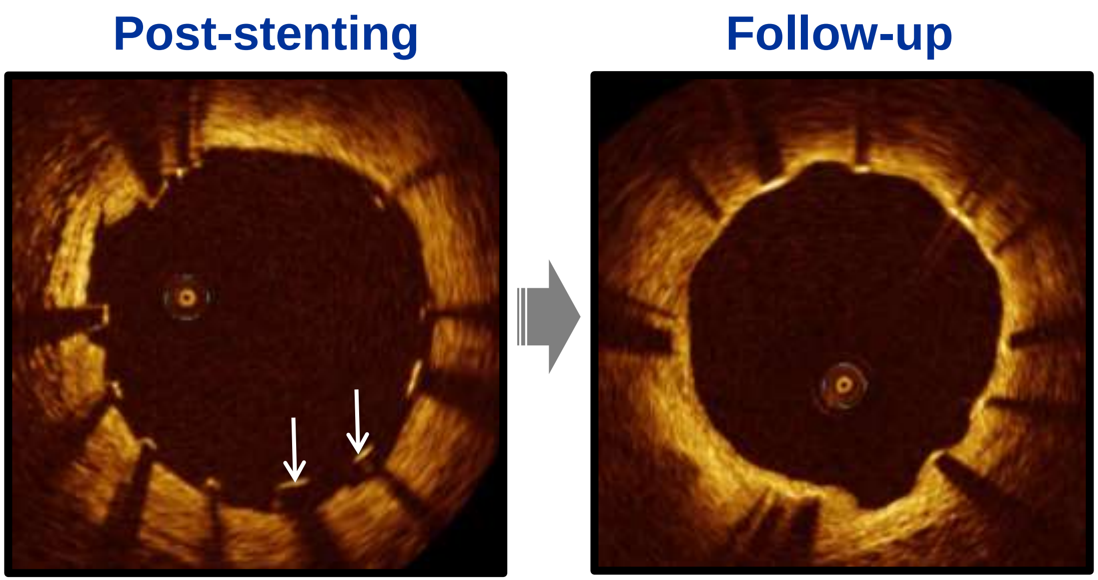

Post-Stent
2013-NOV-12
19:32:39
Pullback Speed: 40mm/sec
Pullback Length: 145.6mm
0001 / 0579
STC
Gain: 10
Contrast: 7
Gamma: 1
Depth: 4.5
Flush Media: Contrast (100%)
FastView

Broken calcium plate | **Broken calcium plate** | **Stent malappsoition**

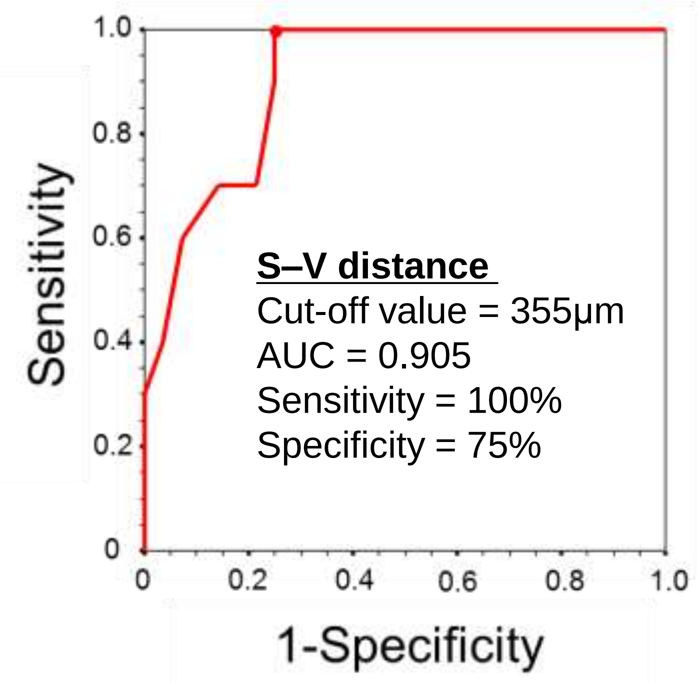


Resolution of stent malapposition in EES

Serial OCT examination (post-stenting and 8-12 months follow-up) was performed to assess the change of stent malapposition of the 2nd generation EES (n=38).

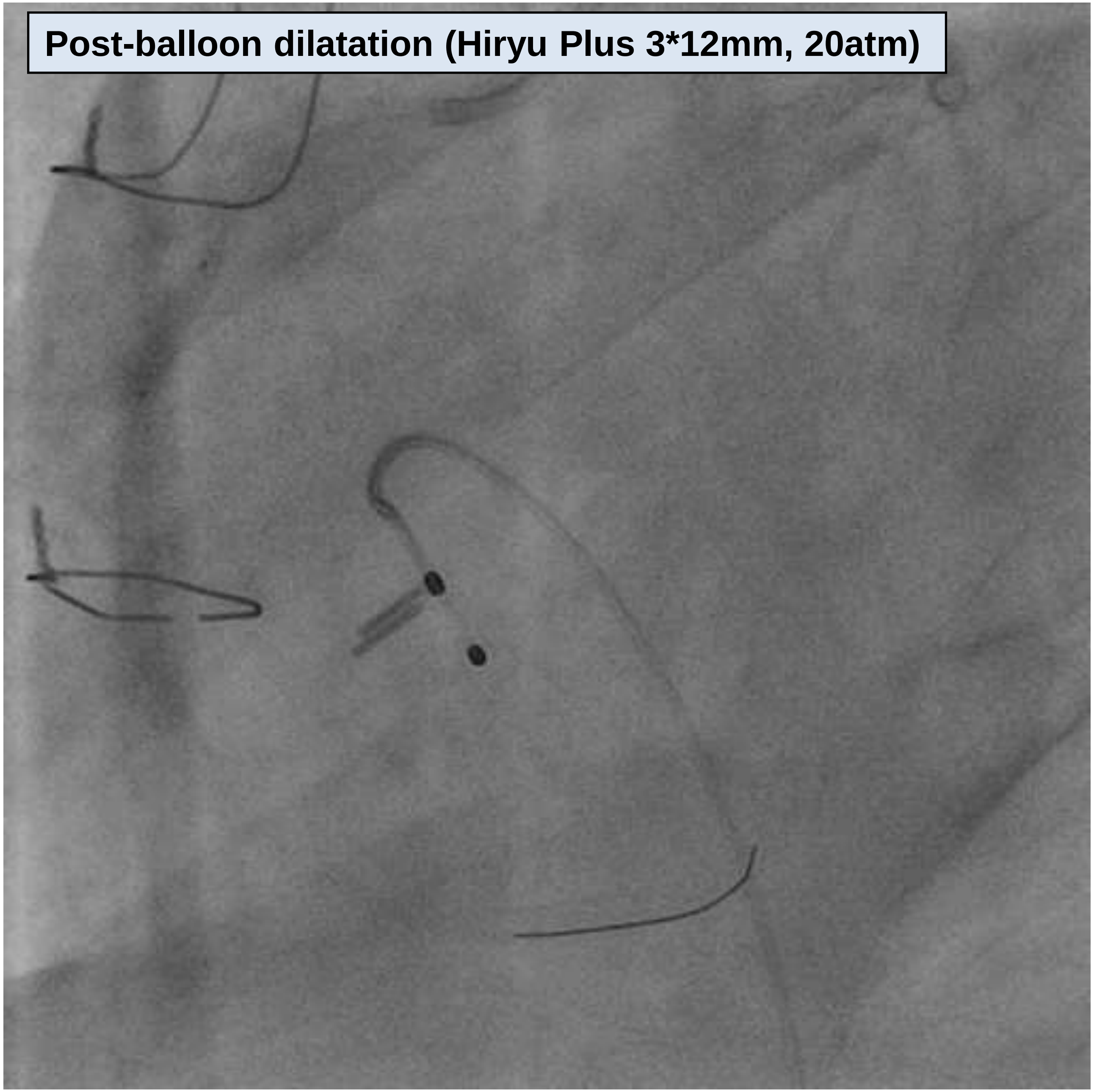


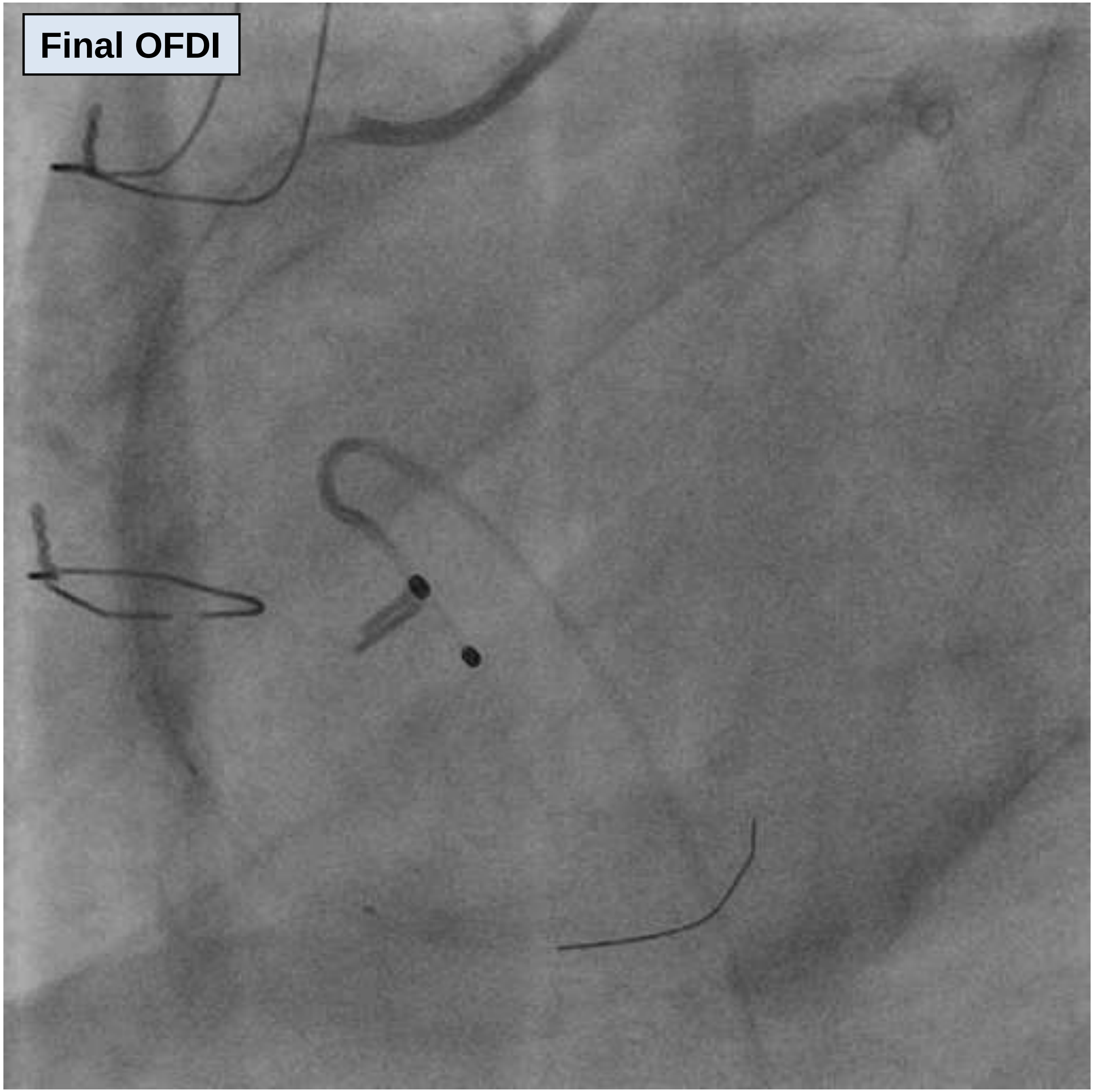
ISA at post-stenting (arrows) resolved at follow-up in EES [(A) Maximum ISA distance = 370 μm to 0 μm; ISA area = 0.71 mm^2 to 0 mm^2; intra-stent lumen area = 7.18 mm2 to 5.91 mm^2]



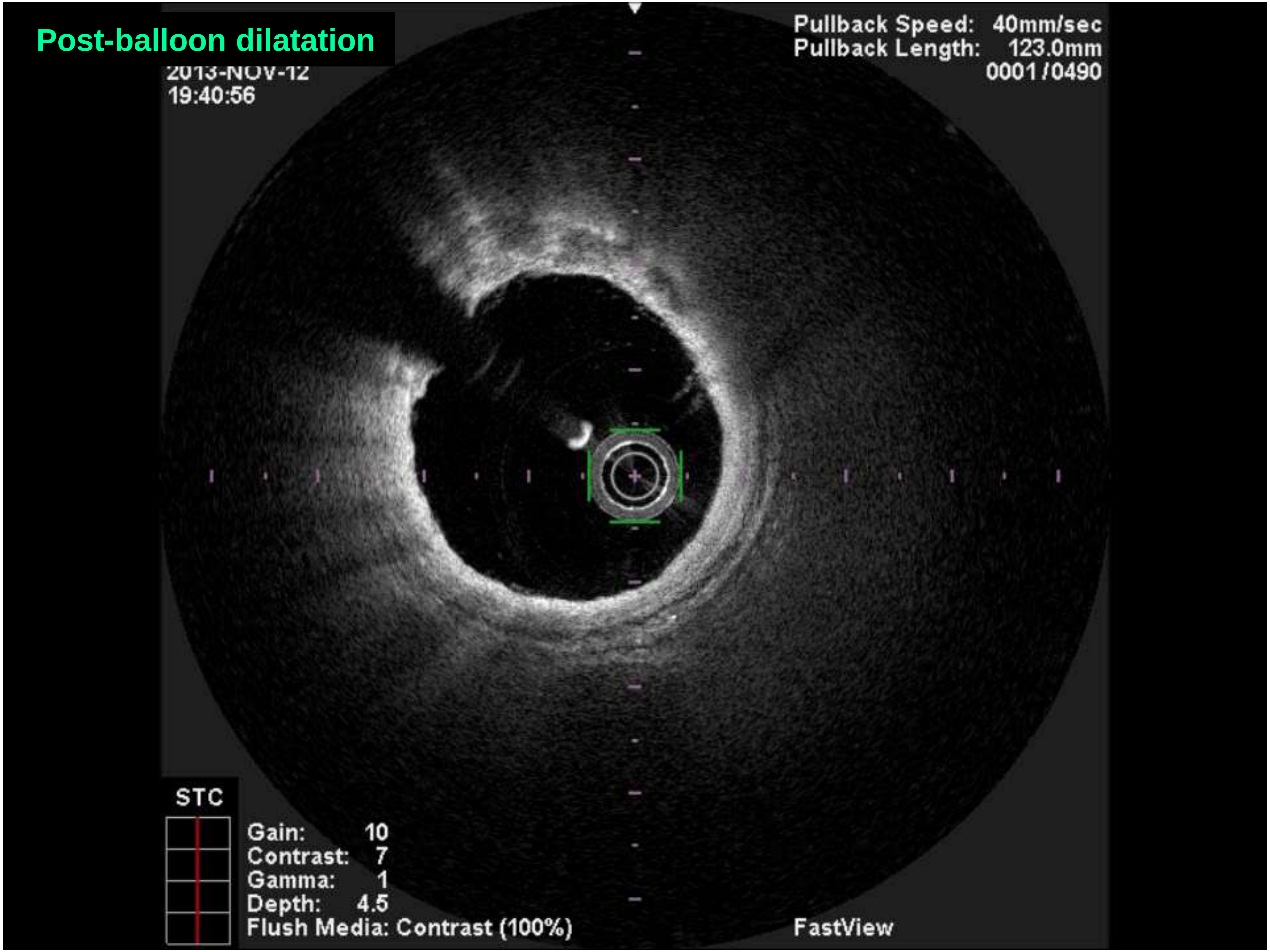
Conclusion. An S–V distance <355 μm was the corresponding cut-off value for a spontaneous resolution of malapposed strut after EES.

Post-balloon dilatation (Hiryu Plus 3*12mm, 20atm)

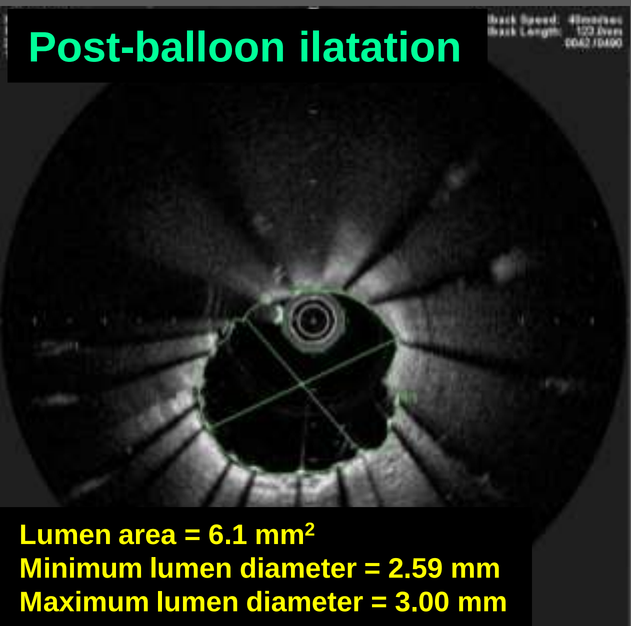



Final OFDI

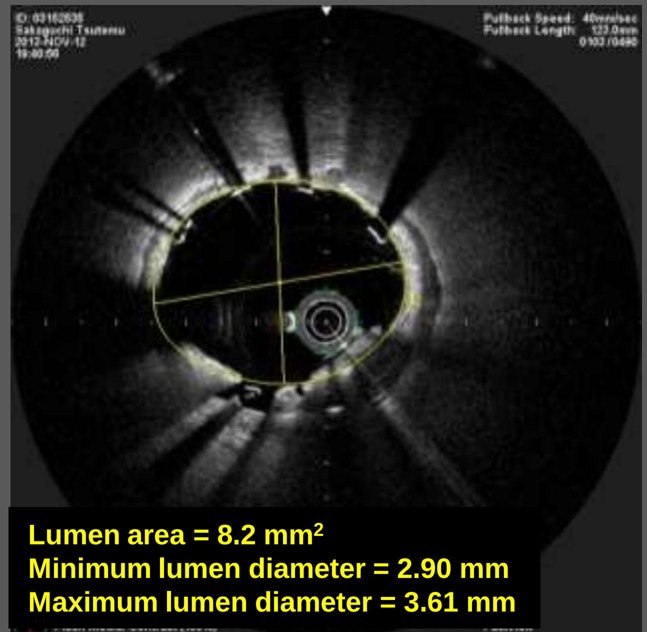
Post-balloon dilatation



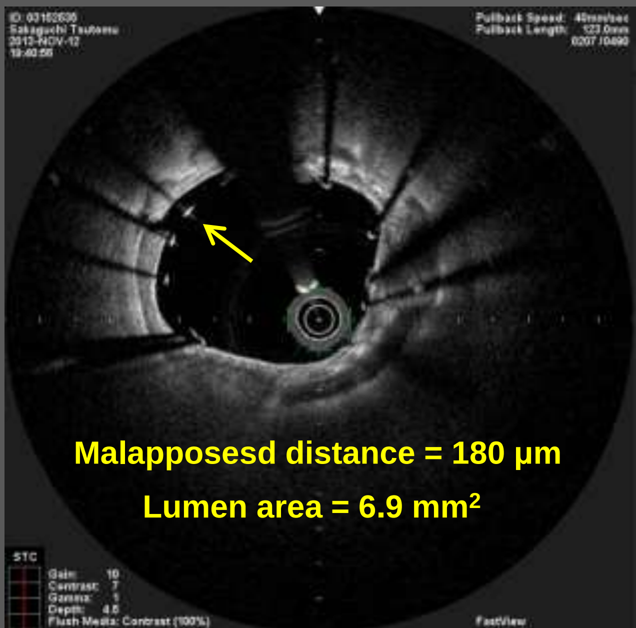
Minimum stent area site

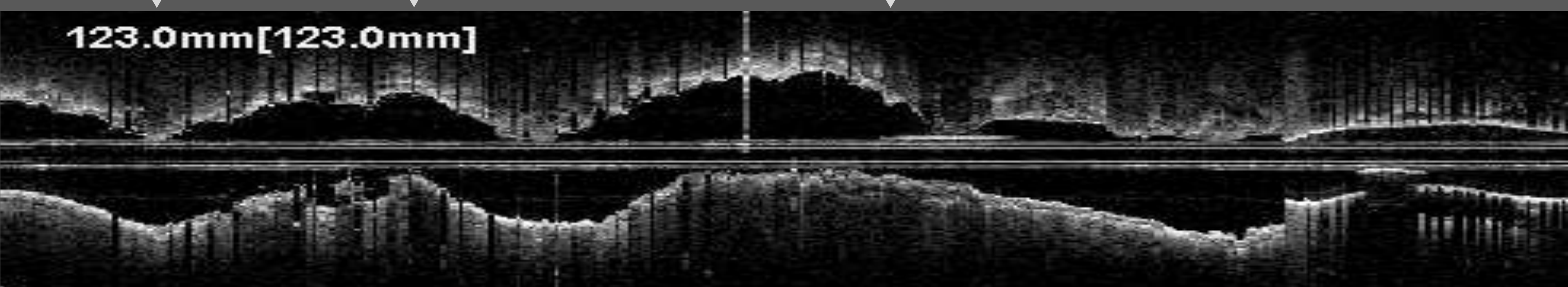


Maximum stent area site



Stent malapposition





Conclusion

- OCT can provide valuable information for stent sizing and PCI optimization.