Current Application of VH and OCT in ACS

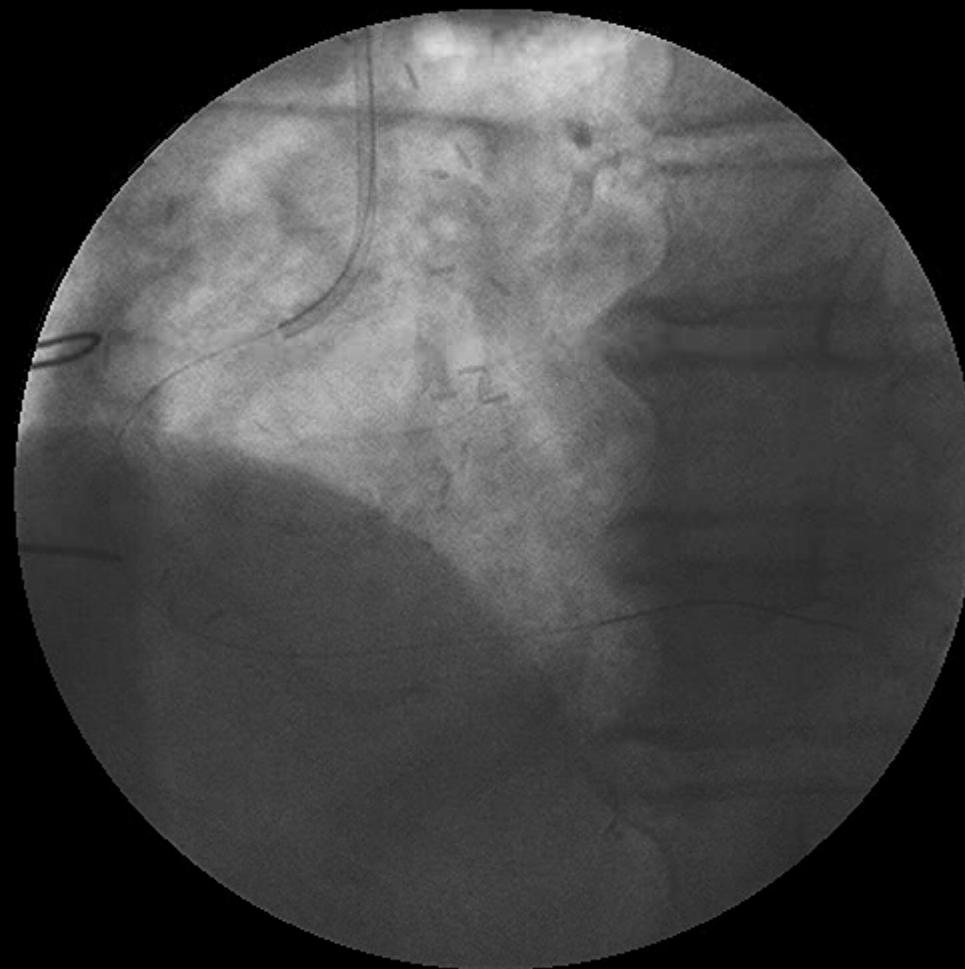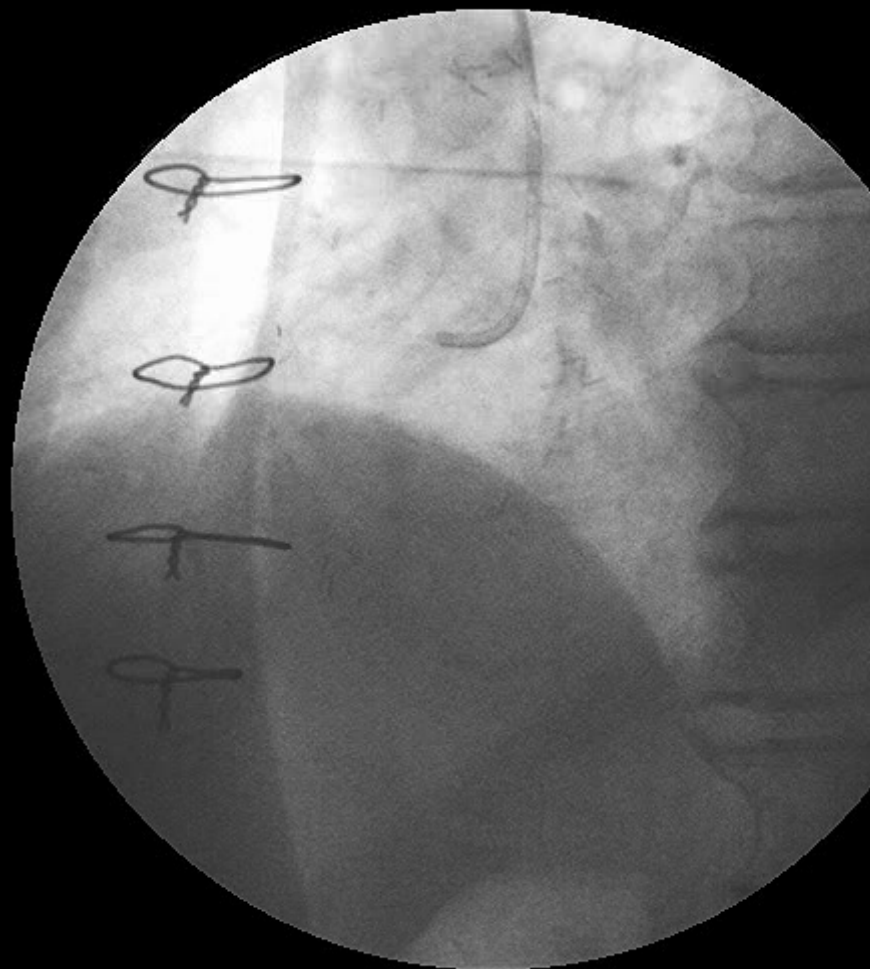**Junko Honye, MD**
Director of Imaging Laboratory
Fuchu Keijinkai Hospital, Tokyo, JAPAN
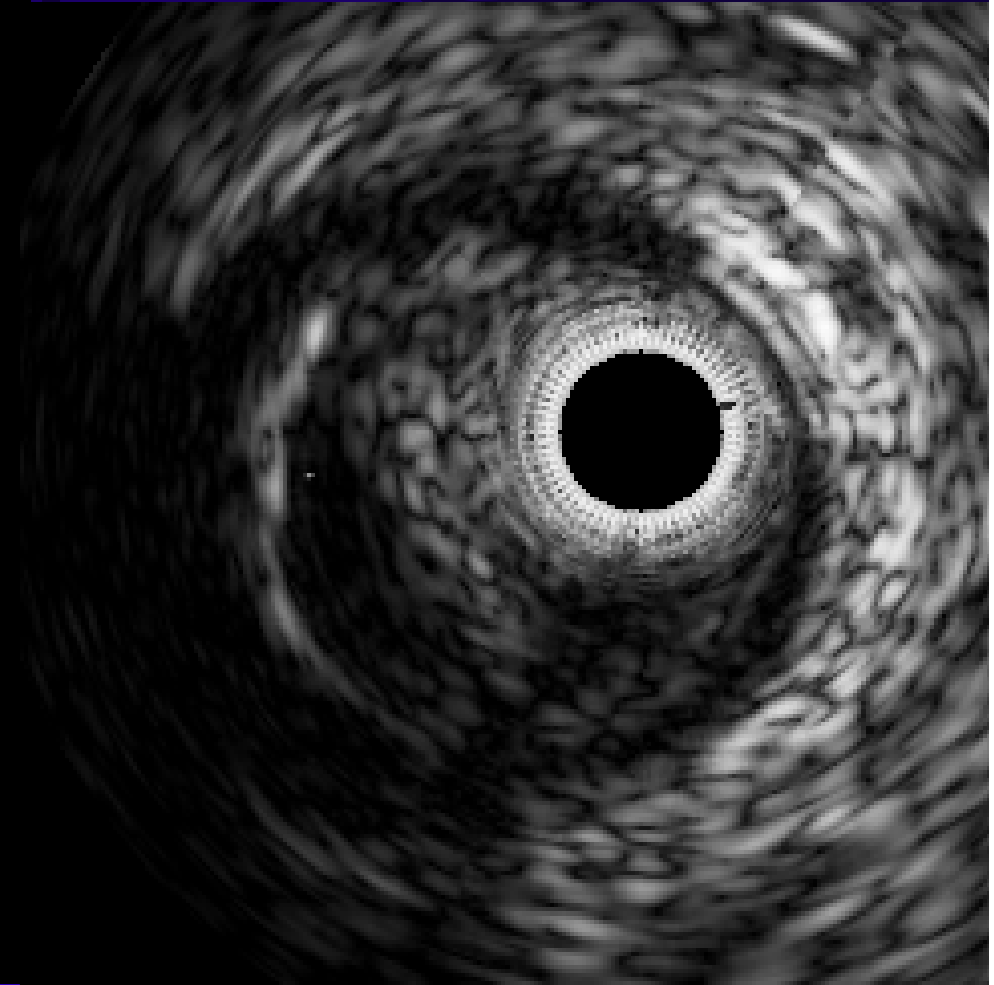**E-mail: hone-circ@umin.ac.jp**

Case 1: *Unstable angina*

ST elevation post POBA

Case 1: Grayscale vs VH
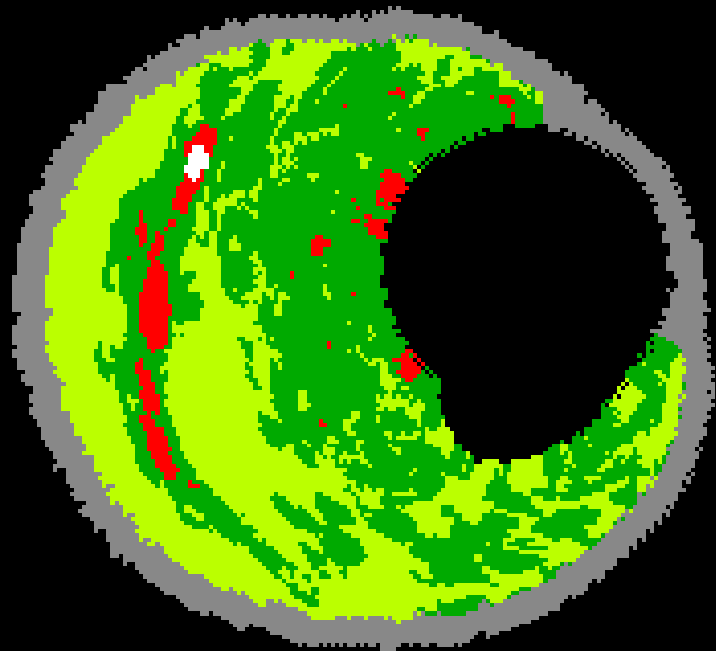
Fibro-fatty component with 2 layer?

Case 1: Unstable angina
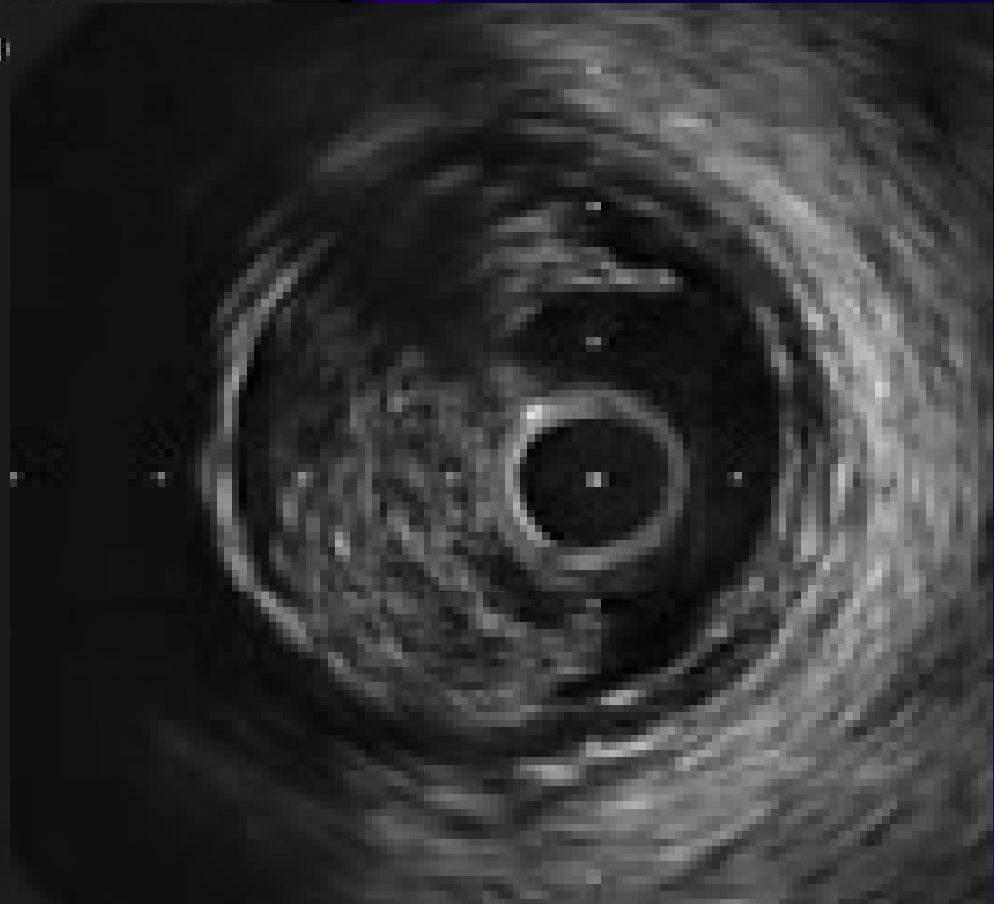
Some material caused peripheral embolization.

Impact of Culprit Plaque Composition on the No-Reflow Phenomenon in Patients With Acute Coronary Syndrome
— An Intravascular Ultrasound Radiofrequency Analysis —

Yasutomi Higashikuni, MD; Kengo Tanabe, MD; Shuzou Tanimoto, MD; Jiro Aoki, MD;
Hirosada Yamamoto, MD; Gaku Nakazawa, MD; Ruri Chihara, MD;
Yoshinobu Onuma, MD; Shuji Ohtsuki, MD; Atsuhiko Yagishita, MD; Sen Yachi, MD;
Hiroyoshi Nakajima, MD; Kazuhiro Hara, MD

Background   The difference in the culprit plaque composition of acute coronary syndrome (ACS) patients with and without the no-reflow phenomenon has not been fully evaluated.

Methods and Results   Intravascular ultrasound radiofrequency data of culprit plaques were obtained and analyzed in 49 ACS patients. The no-reflow phenomenon was defined as a decrease of at least 1 grade in 'Thrombolysis In Myocardial Infarction' flow immediately after mechanical dilatation compared with before mechanical dilatation, with no evidence of thrombus, spasm, or dissection. The no-reflow phenomenon was observed in 9 individuals. Culprit plaques with the no-reflow phenomenon contained a higher percentage of necrotic core component and a smaller percentage of fibrous component than plaques in the patients without the no-reflow phenomenon (necrotic core component, $22.1\pm9.3\%$ vs $11.7\pm7.9\%$, $p=0.0011$; fibrous component, $59.6\pm11.2\%$ vs $68.3\pm10.2\%$, $p=0.027$). Multivariate analysis identified the percentage of necrotic core component as an independent predictor of the no-reflow phenomenon after adjustment for plaque geometry and procedural factors (odds ratio, 1.7; 95% confidence interval, 1.1 to 2.5; $p=0.015$).

Conclusion   Culprit plaques of patients with the no-reflow phenomenon differ from those in patients without the no-reflow phenomenon.   (*Circ J* 2008; **72**: 1235–1241)

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It may be difficult to predict no-reflow phenomenon in each particular case.

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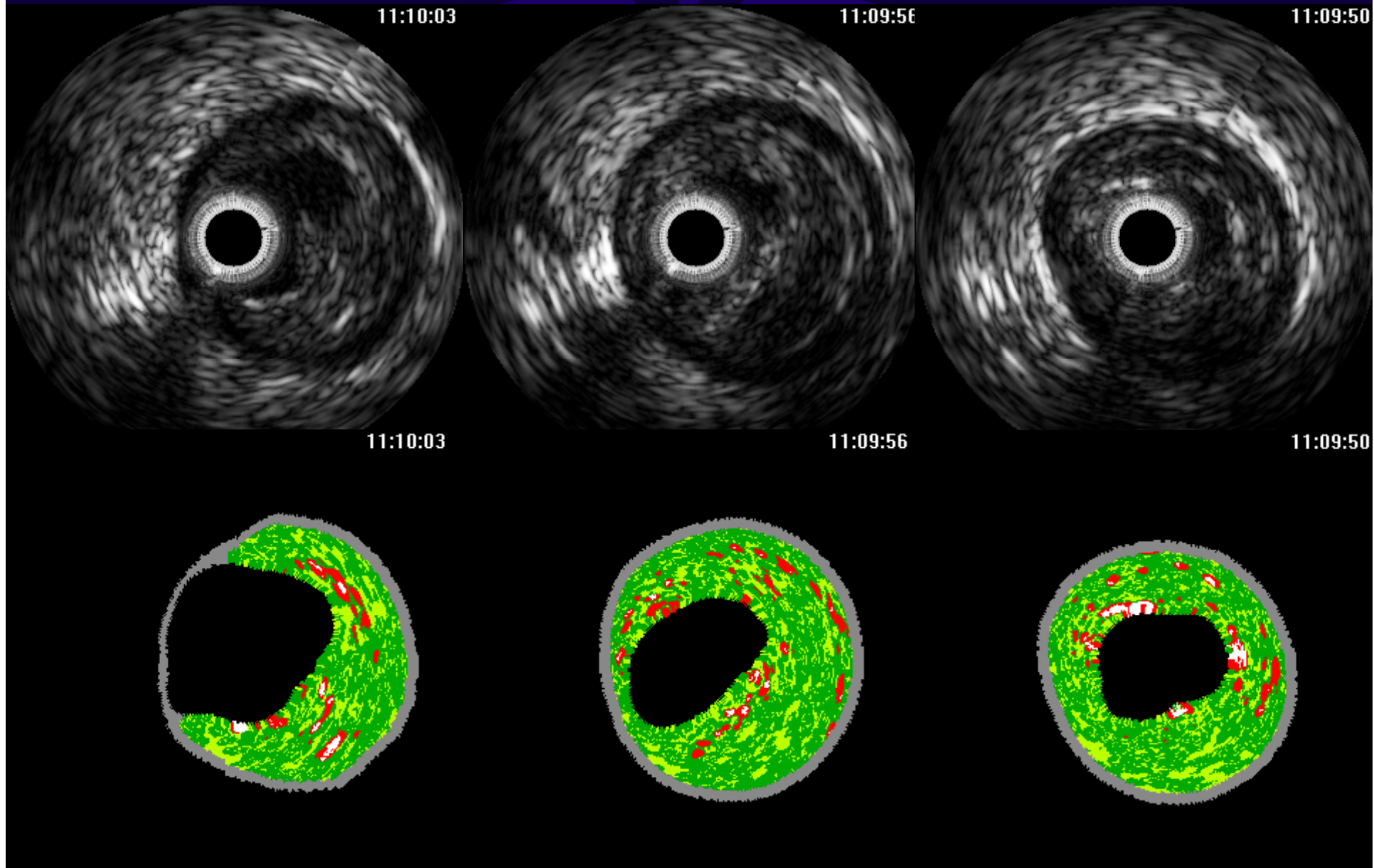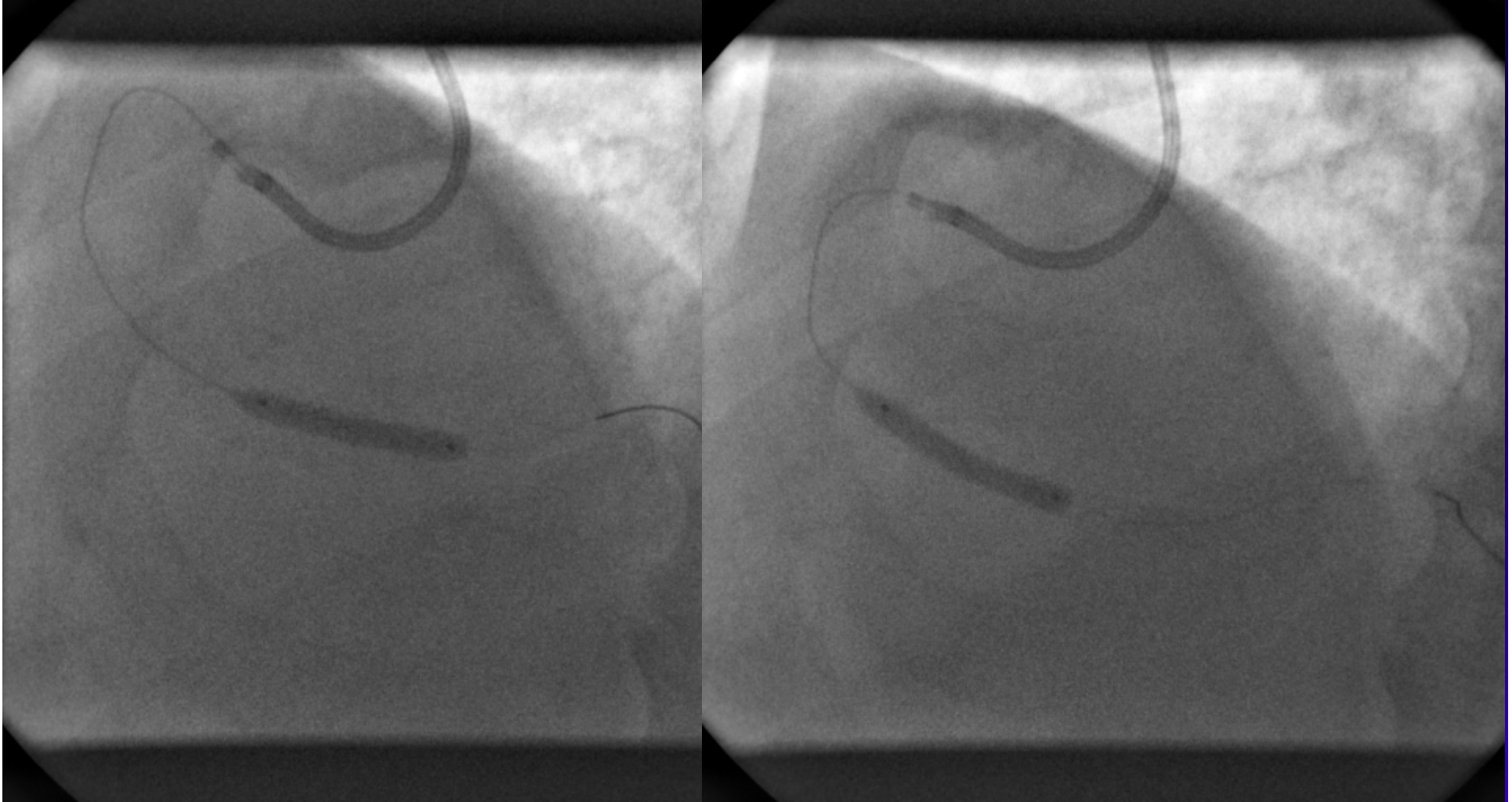
Case 2: Unstable angina
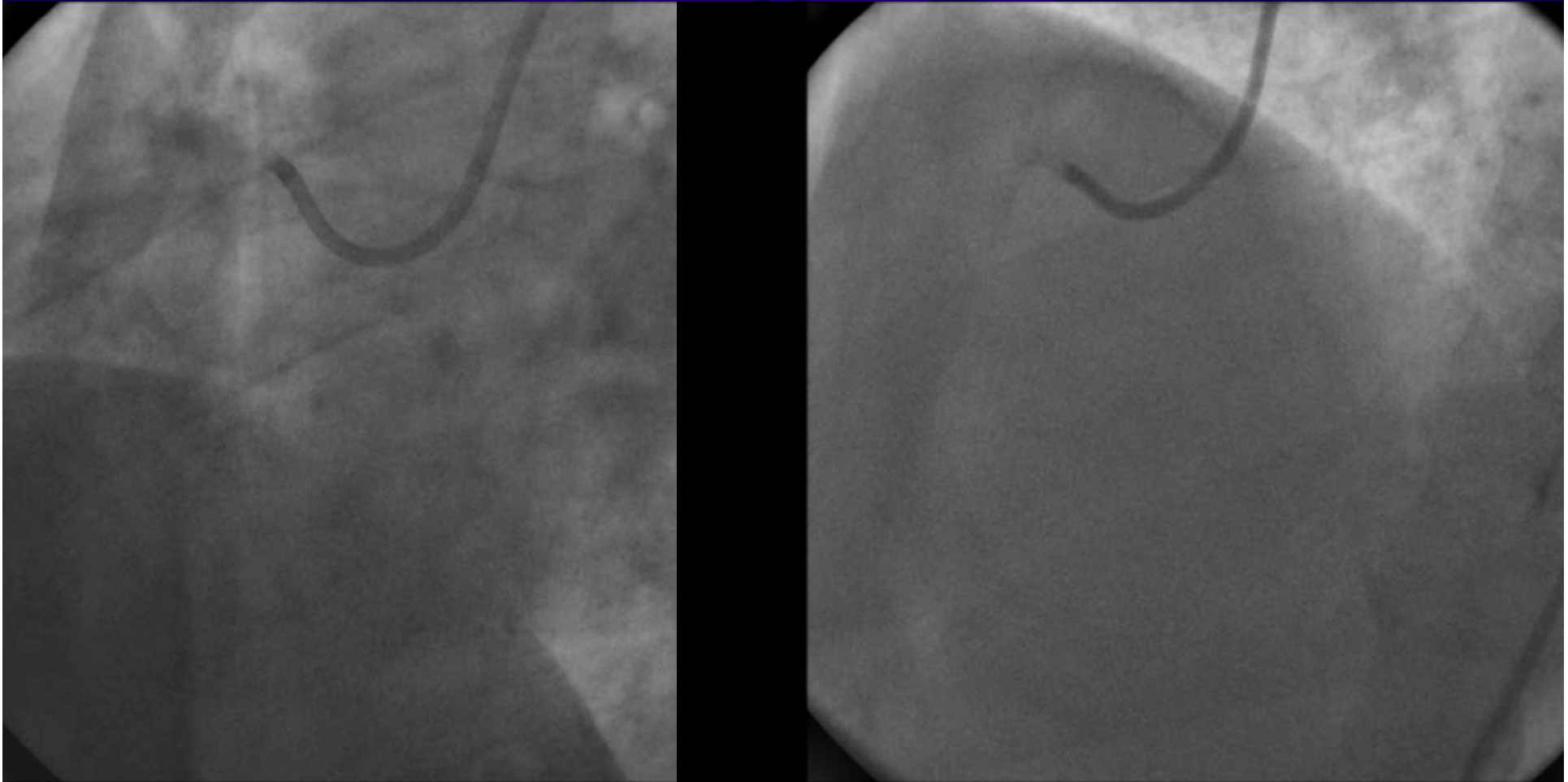
Grayscale and VH-IVUS
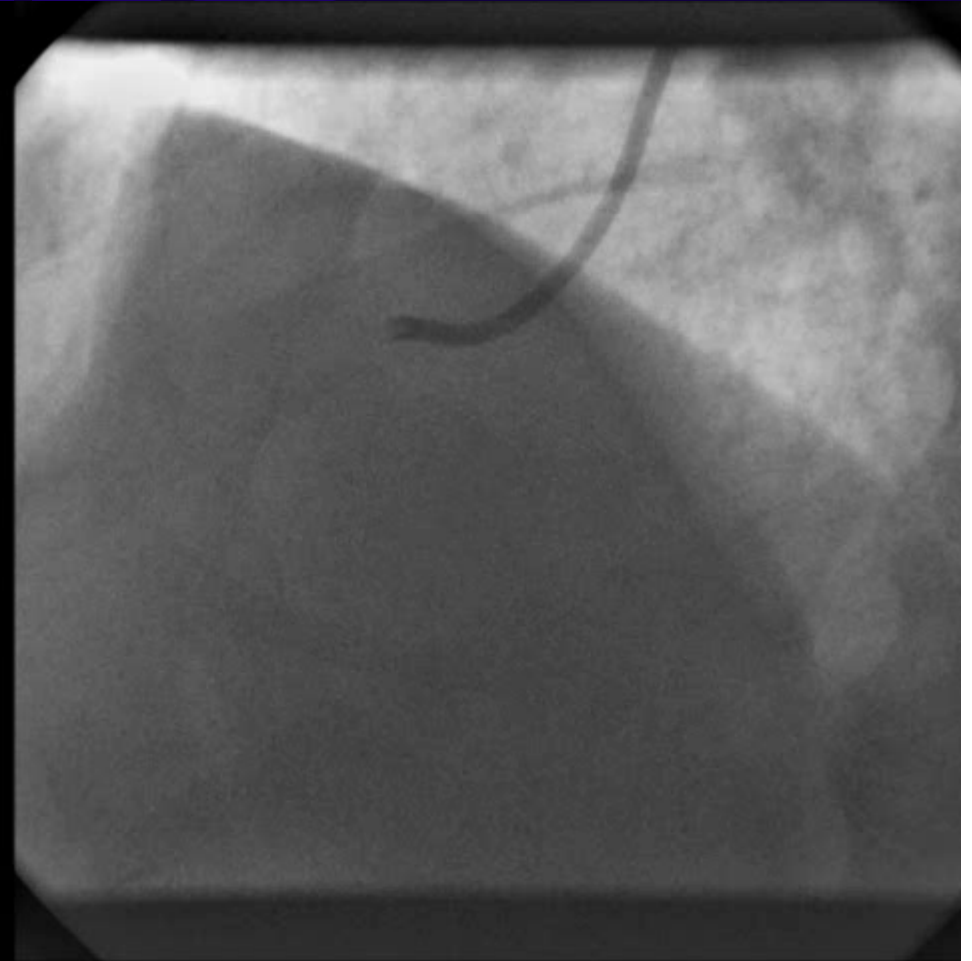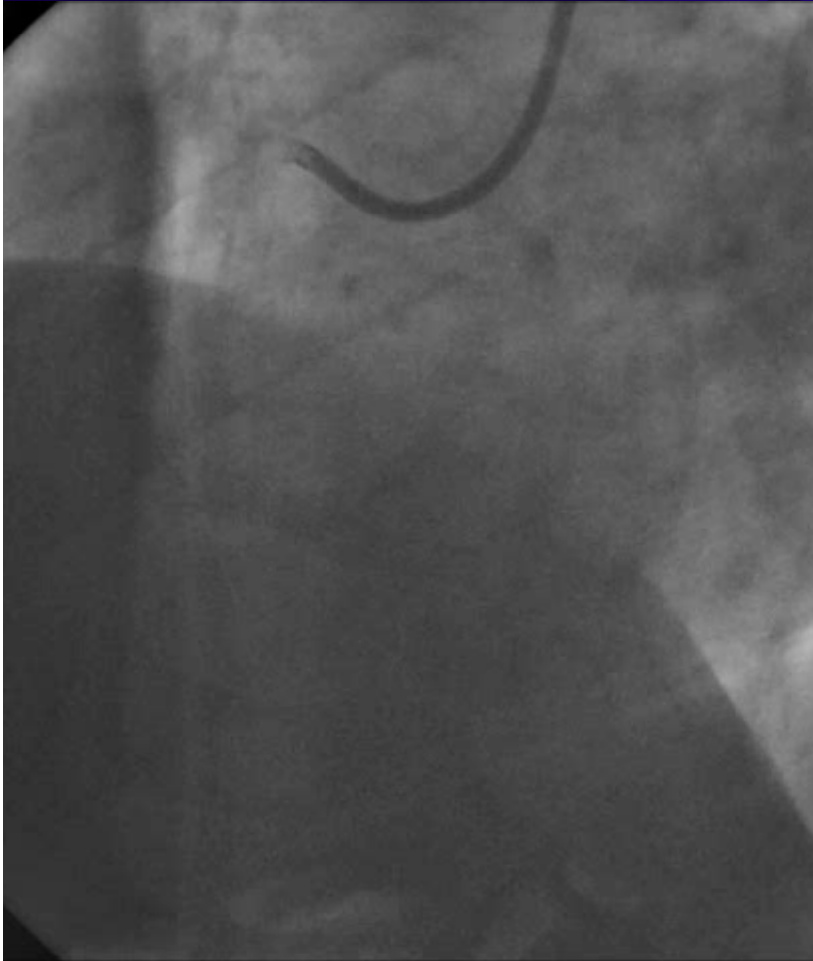

Irregular surface
Thrombus?

Double layer appearance

Grayscale and VH-IVUS
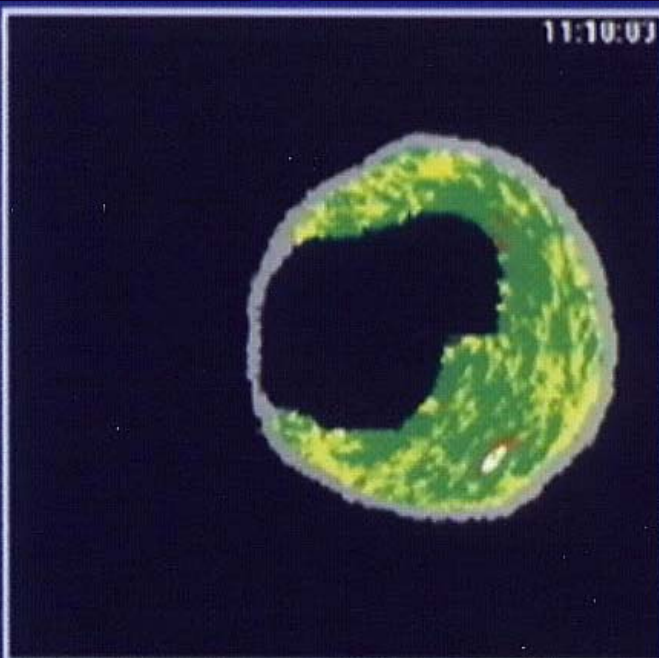
Stenting

Post stent implantation
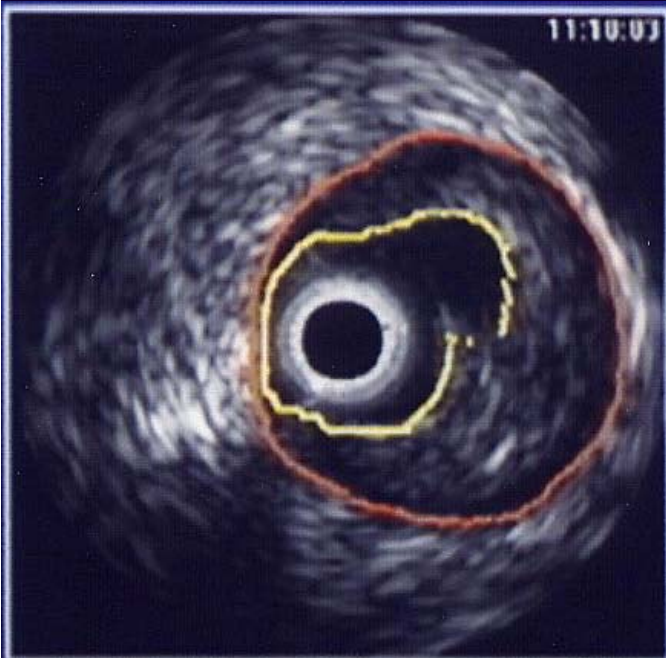
VL A, Segment: 3
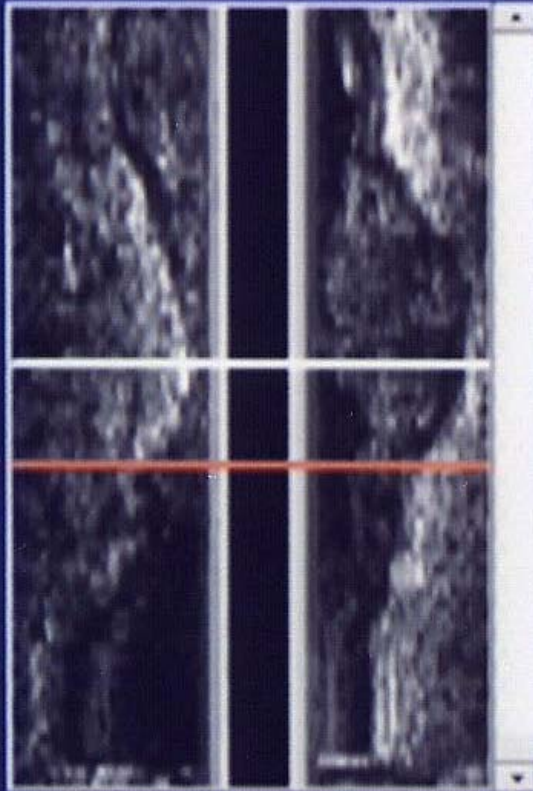
Lumen Area	9.4 mm²	
EEL Area	26.8 mm²	
Plaque Area	17.5 mm²	
% Plaque Burden	65 %	
FI Green Area	8.9 mm²	66 %
FF Light Green Area	4.3 mm²	32 %
DC White Area	0.1 mm²	0 %
NC Red Area	0.1 mm²	1 %

More ...

Distal Frame	—	1
Current Frame	—	64
Proximal Frame	—	73

11:10:03

Impact of Intramural Thrombus in Coronary Arteries on the Accuracy of Tissue Characterization by In Vivo Intravascular Ultrasound Radiofrequency Data Analysis

Kenya Nasu, MD[a,*], Etsuo Tsuchikane, MD, PhD[a], Osamu Katoh, MD[a], D. Geoffrey Vince, PhD[b], Pauliina M. Margolis, MD, PhD[b], Renu Virmani, MD[c], Jean-Francois Surmely, MD[a], Mariko Ehara, MD[a], Yoshihisa Kinoshita, MD[a], Hiroshi Fujita, MD[a], Masashi Kimura, MD[a], Keiko Asakura, MD[a], Yasushi Asakura, MD[a], Tetsuo Matsubara, MD[a], Mitsuyasu Terashima, MD, PhD[a], and Takahiko Suzuki, MD, PhD[a]

Virtual Histology (VH) intravascular ultrasound (IVUS) allows differentiation between 4 different tissue phenotypes. However, the current classification tree for analysis cannot differentiate the presence of intramural thrombus. The aim of this study was to evaluate the impact of intramural thrombus for correlative accuracy between in vitro histopathology of coronary atherosclerotic plaque obtained by directional coronary atherectomy and corresponding in vivo tissue characterization obtained by VH IVUS. Coronary IVUS imaging of 30 coronary artery lesions was obtained using a 20-MHz phased-array IVUS catheter with a motorized pull-back system at set 0.5 mm/s. The debulking region of the in vivo histologic image was predicted from comparison between pre- and post–first debulking VH IVUS images. Cross-sectional histologic slices were cut every 0.5 mm starting from the most proximal part of the formalin-fixed debulking tissue. Histologic slices were divided into 2 groups by the presence or absence of pathologic thrombus. A total of 259 in vitro histologic slices were obtained, and pathologic thrombus was detected in 81 slices. Correlation was favorable, with high sensitivity for all plaque components, but specificities for fibrous (thrombus slices vs nonthrombus slices 36% vs 94%) and fibrofatty (9% vs 60%) tissue were lower in thrombus slices. Therefore, predictive accuracies for the 2 plaque components were lower in thrombus slices (fibrous tissue 78% vs 99%, fibrofatty tissue 68% vs 83%, respectively). In conclusion, intramural thrombus was colored as fibrous or fibrofatty by VH IVUS, reducing VH accuracy in these kinds of lesions. (Am J Cardiol 2008;101:1079–1083)

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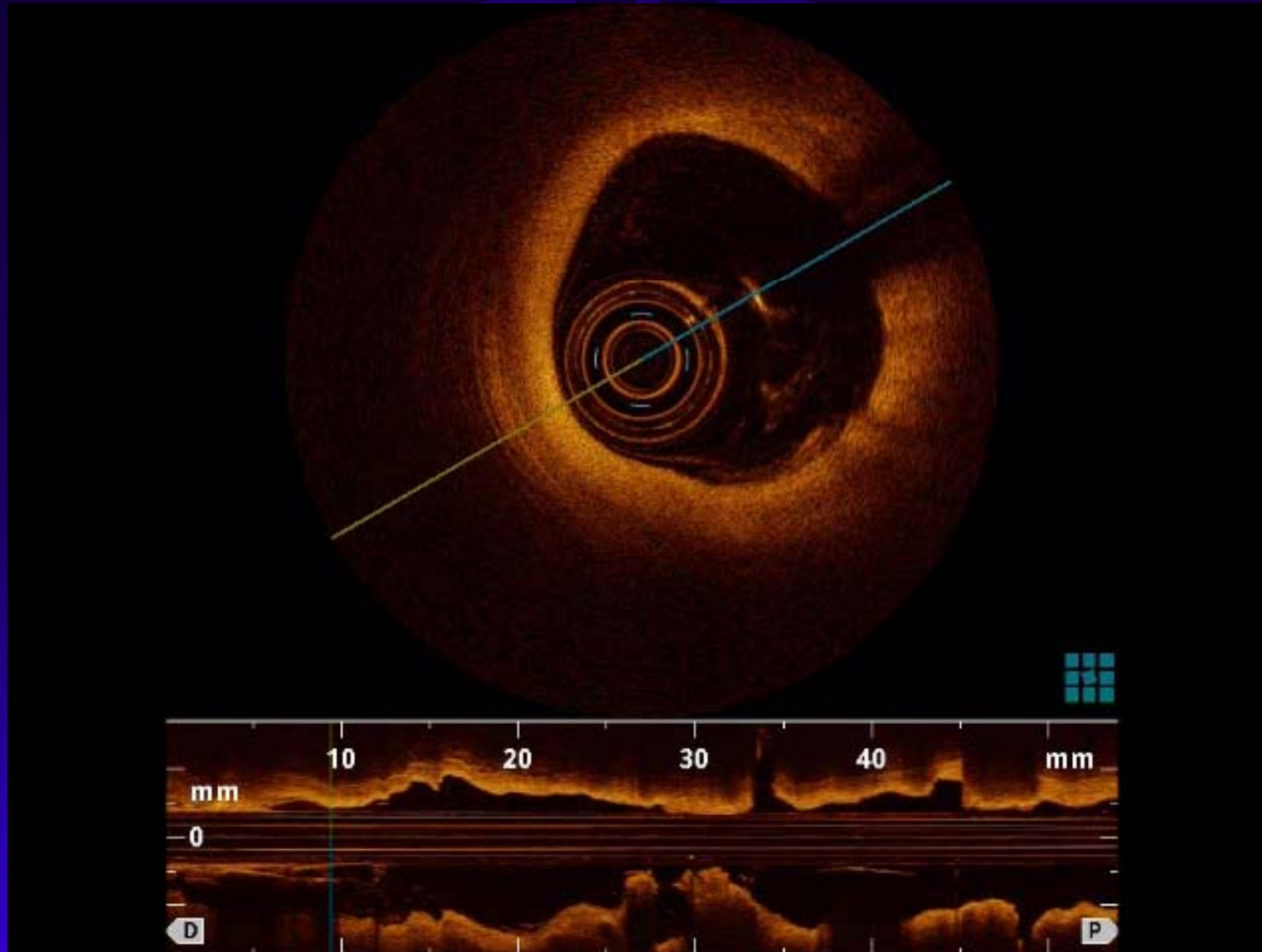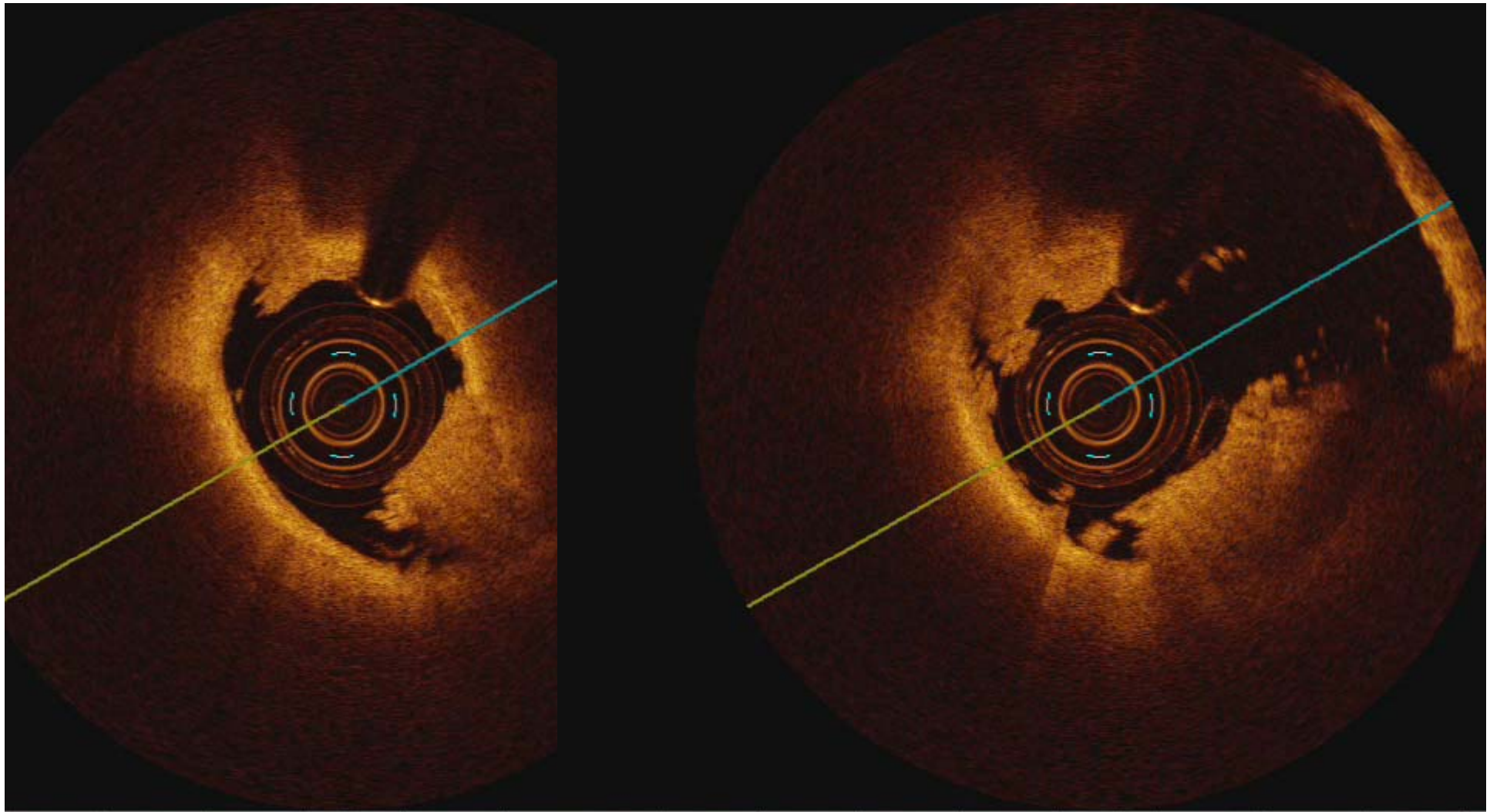
Case 3: AMI
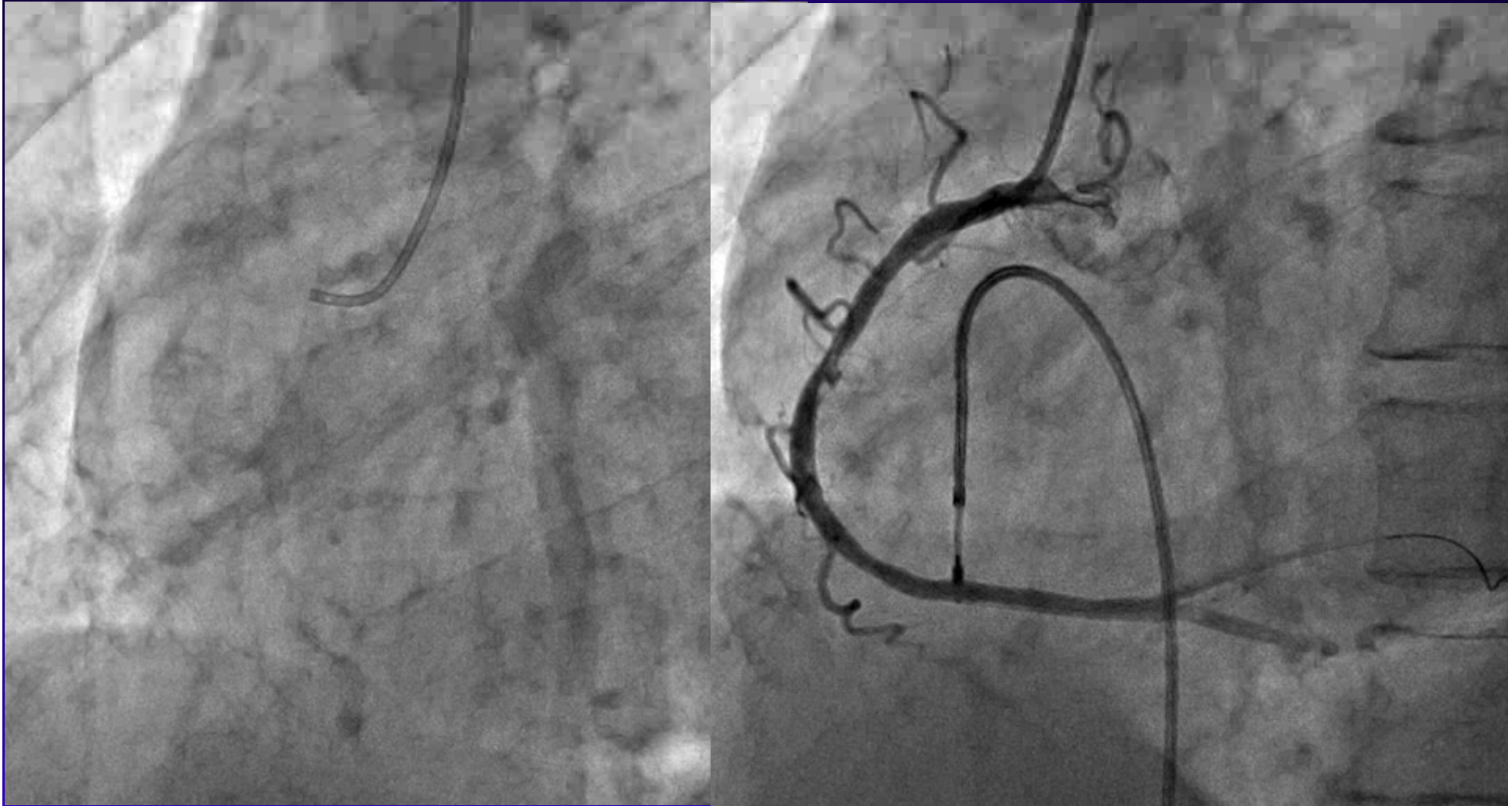
Post thrombectomy
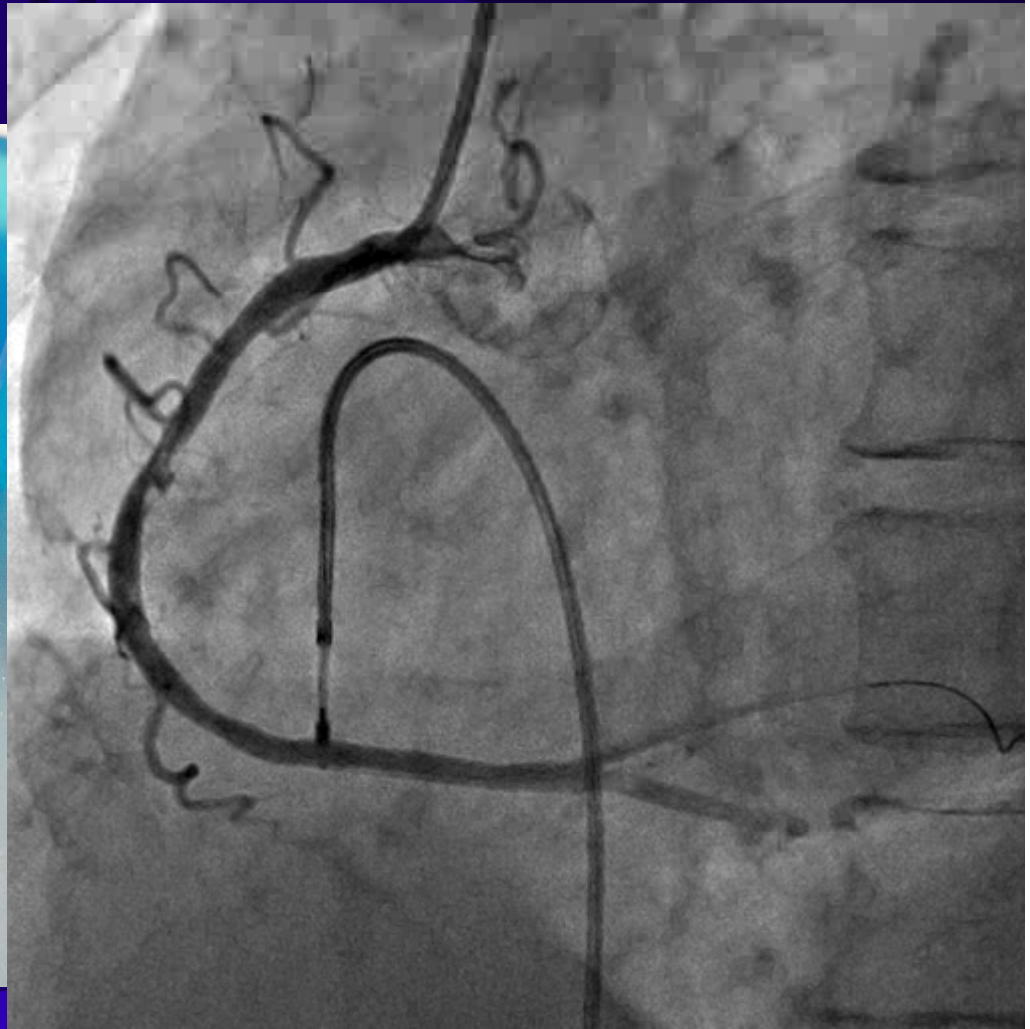
Case 3: AMI

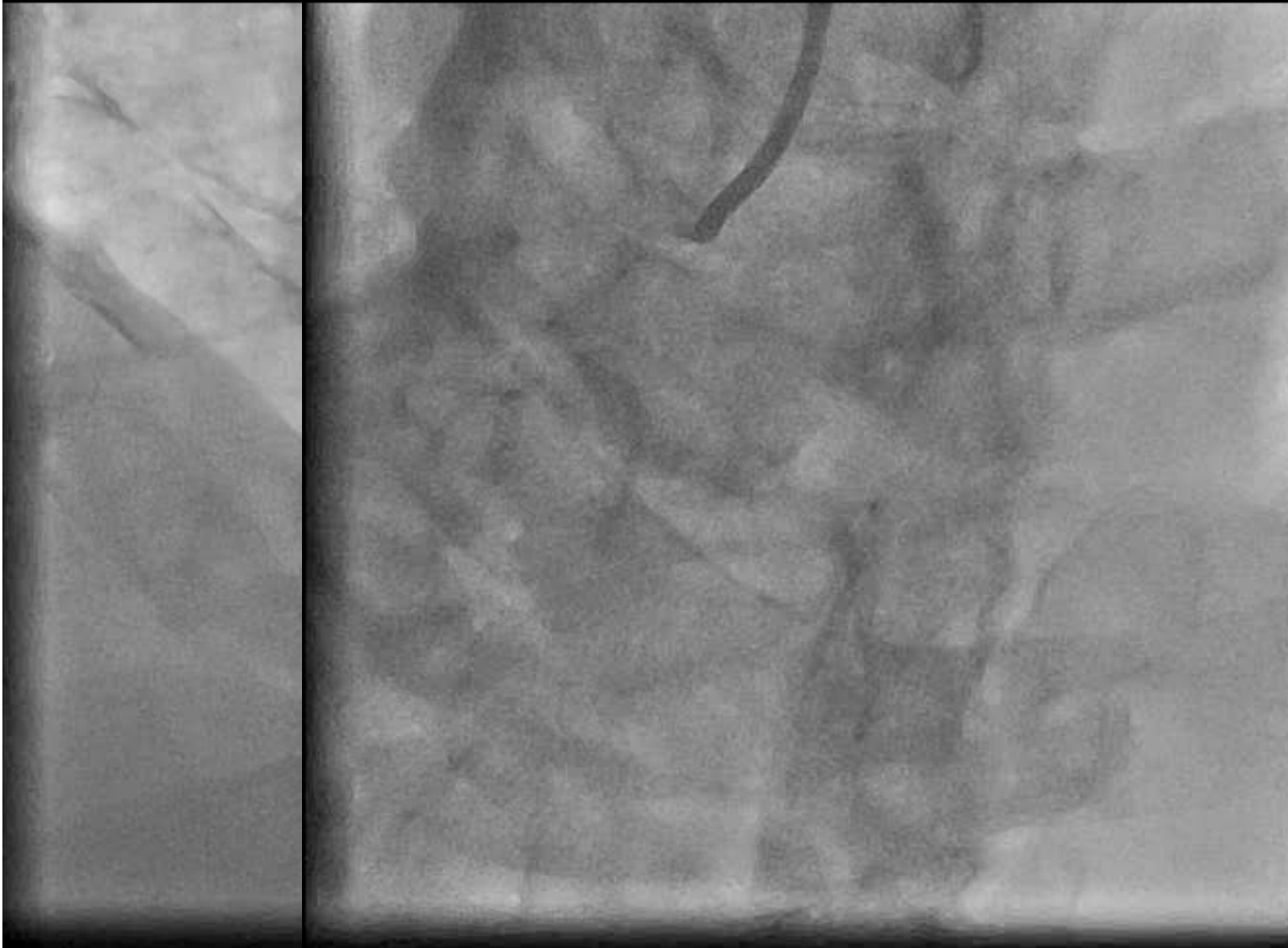

Post thrombectomy

Case 3: AMI

OCT demonstrates a large amount of superimposed thrombus, plaque rupture with thin fibrous cap clearly, however, it is difficult to evaluate the actual vessel size of this kind of lesions with positive remodeling.
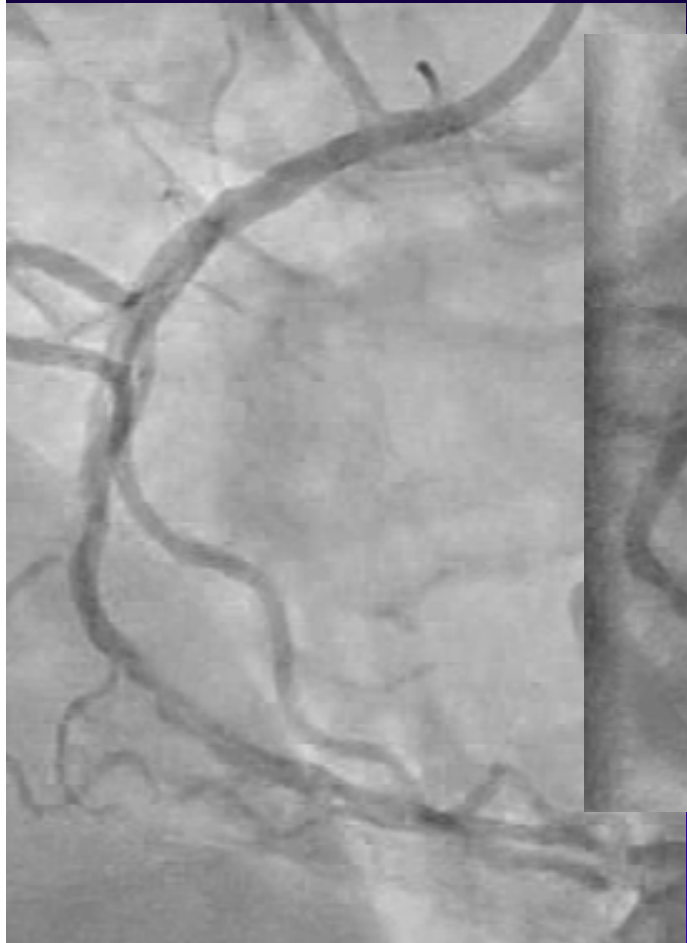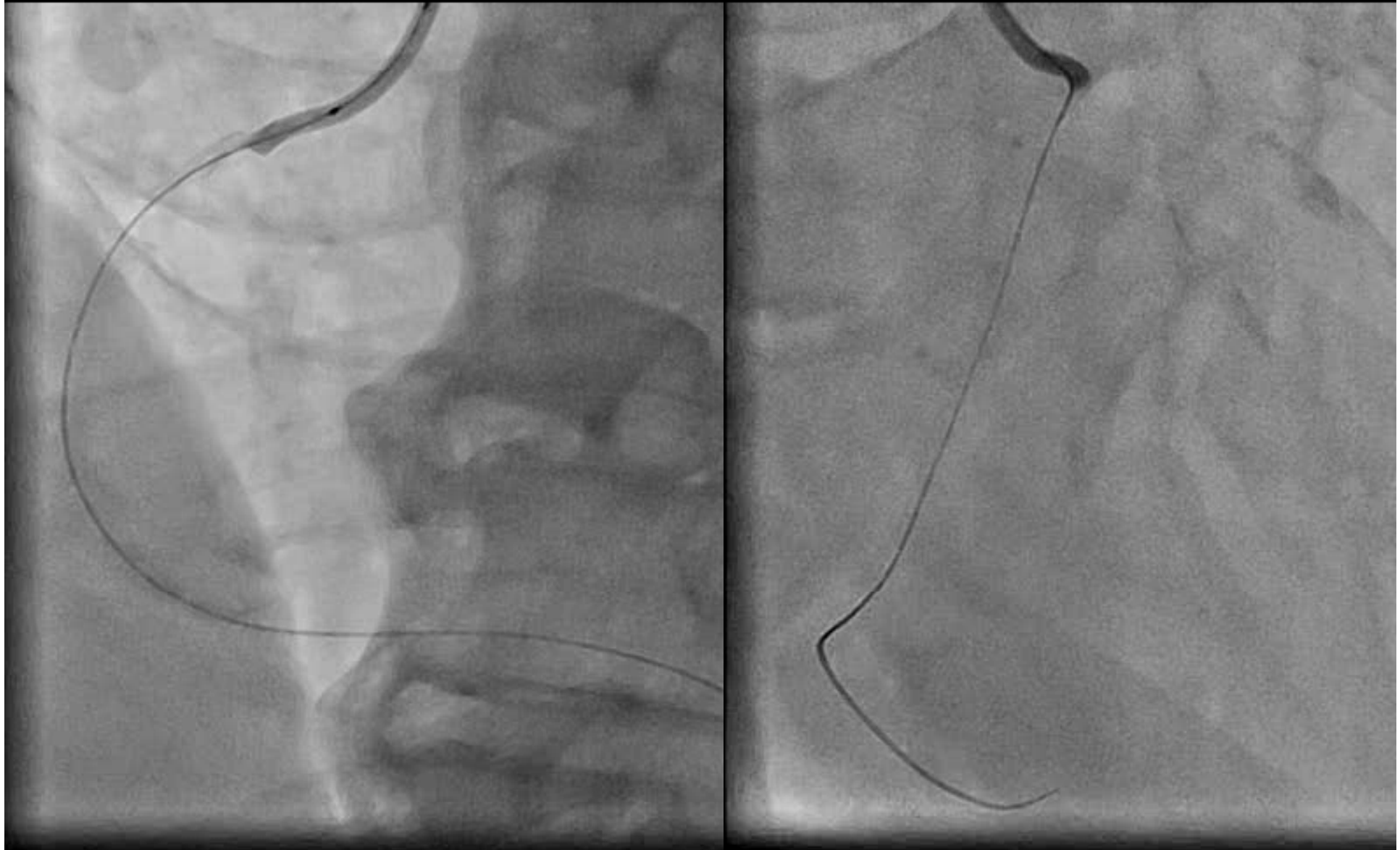
Case 4: Recent MI

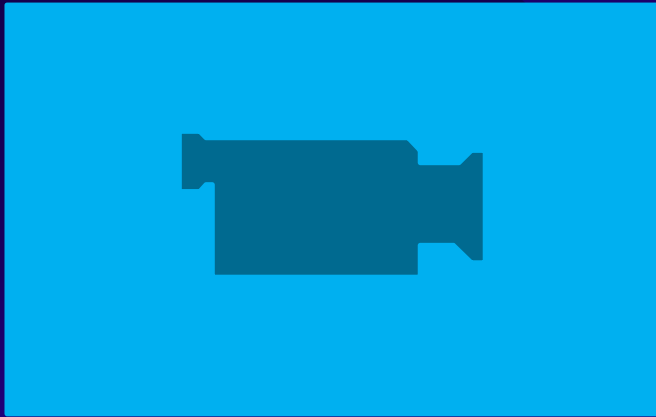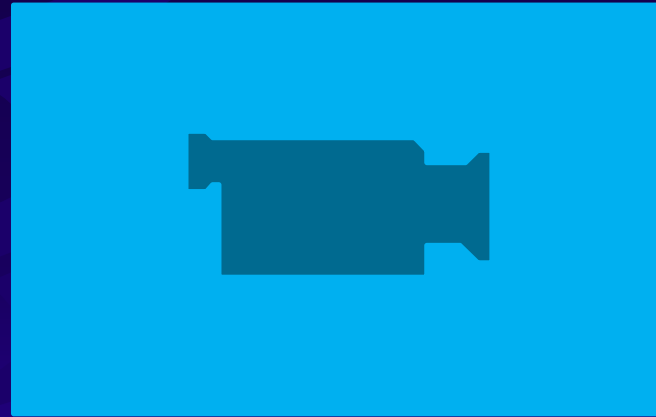Case 4: Recent MI

Case 4: Recent MI

Case 4: Recent MI

Guidewire

IVUS post POBA

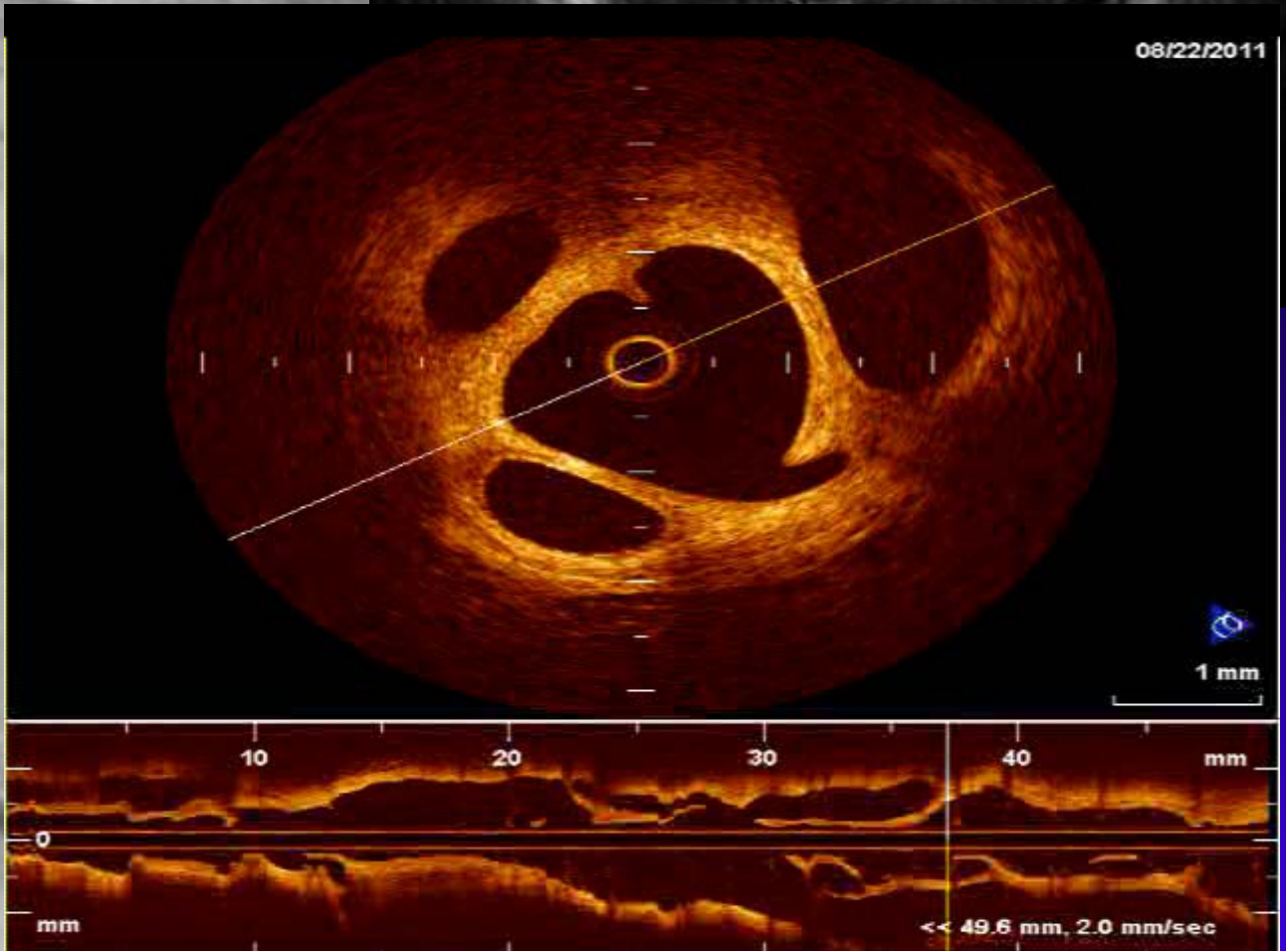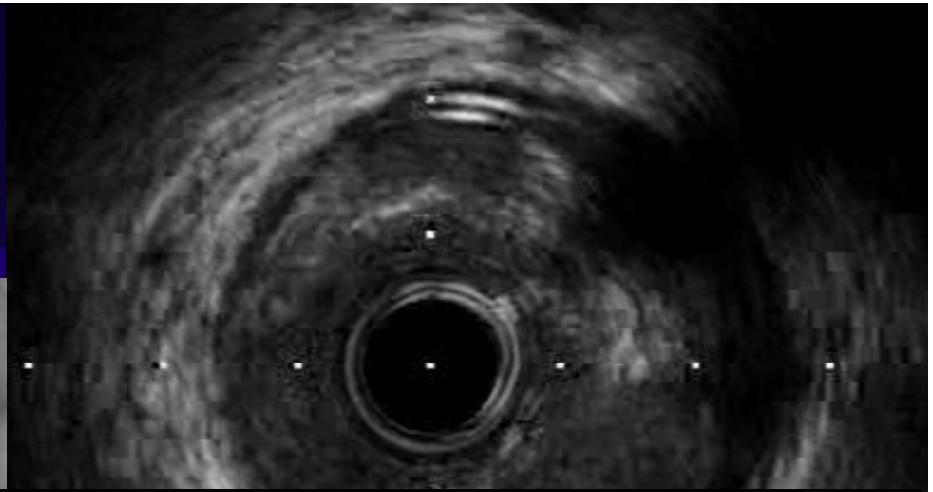# *IVUS and OCT*

IVUS

OCT

Slit?

Double-barreled appearance on CAG

- ➤ **IVUS and OCT demonstrate lotus root appearance or honey comb like findings.**
- ➤ **Spontaneous recanalization of the thrombotic RCA occlusion**
- ➤ **ECG or UCG demonstrates obstructive findings which suggest previous myocardial infarction.**
- ➤ **Smooth surface of multiple channels suggested organized thrombus.**

Which is the best modality in various situations?

1. To guide PCI procedures
   IVUS is mainly used as guidance
   OCT-guided PCI? Limited cases

2. To evaluate vulnerable plaques
   OCT, angioscopy, VH (RF analysis)

3. DES follow-up
   OCT, angioscopy, IVUS

4. To evaluate pharmacological intervention
   IVUS, VH (RF analysis), angioscopy

Summary

1. In Japan VH use has been very limited in patients with ACS, because conventional grayscale IVUS plays an important role to guide PCI procedures so that many operators prefer to use higher frequency mechanical IVUS catheters.

2. Based on the previous papers, we know that there are good correlations between VH plaque characteristics (i.e. necrotic core) and remodeling or flow disturbance post PCT.

3. It is very interesting to know the pathogenesis of ACS with VH and OCT, and practical use would be recommended if you want to conduct clinical study in patients with ACS.