PHYSIOLOGICAL IMPACT OF CTO OPENING TO CORONARY CIRCULATION

Hitoshi Matsuo M.D., Junko Honye M.D.,
Katsumi Ueno M.D.,
And Takahiko Suzuki M.D.,

Gifu Heart Center and Toyohashi Heart Center
Gifu and Toyohashi, Japan

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Backgrounds

- The ischemic burden is the key determinant of the patients prognosis with Ischemic heart disease.
- CTO recanalization can reduce the ischemic burden if the ischemic myocardium is large.
- Patients with a significant reduction in ischemic burden have improved long-term survival when compared to those without reduced ischemia following CTO PCI.

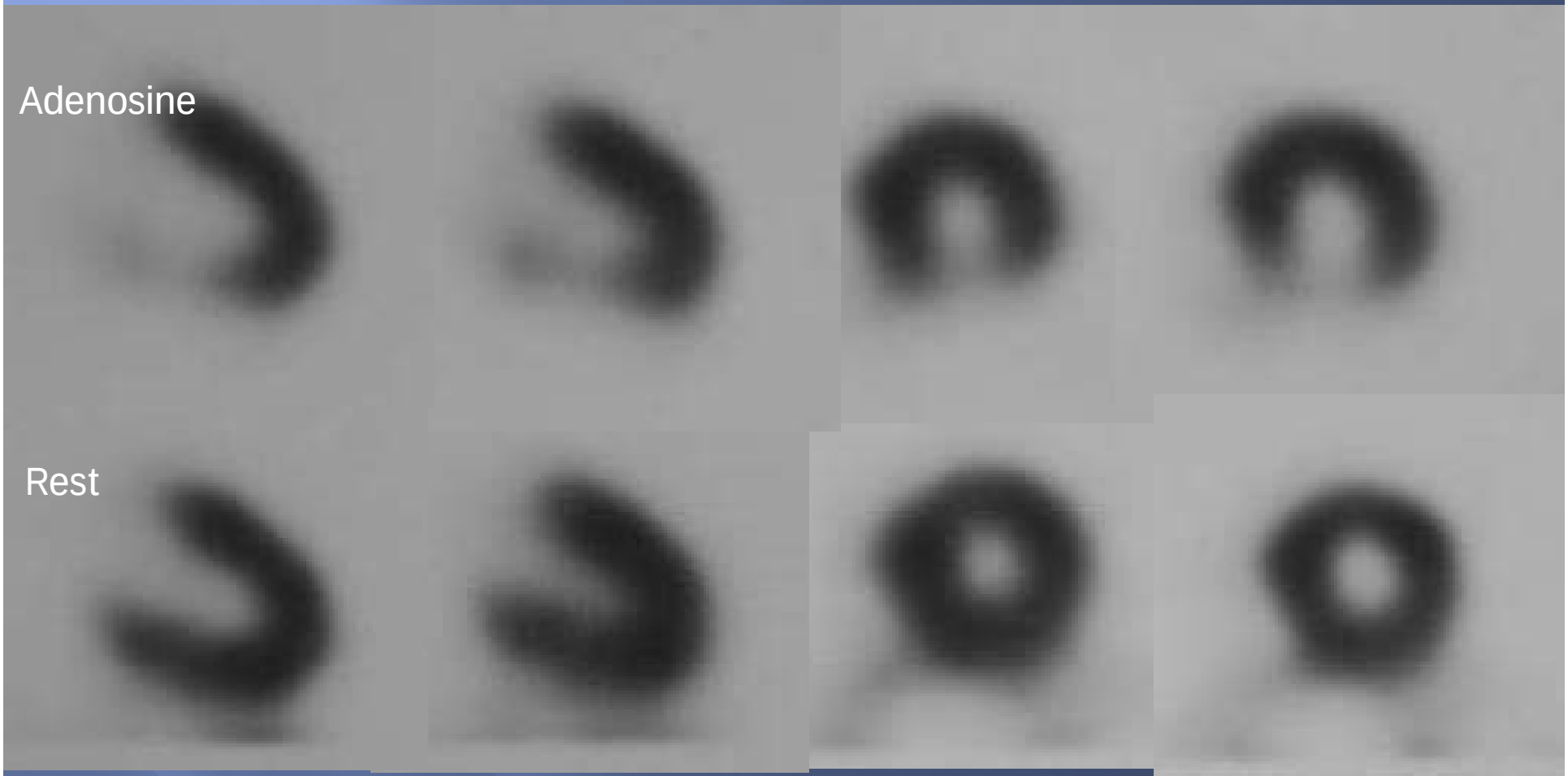
FFRmyo as the index of myocardial perfusion

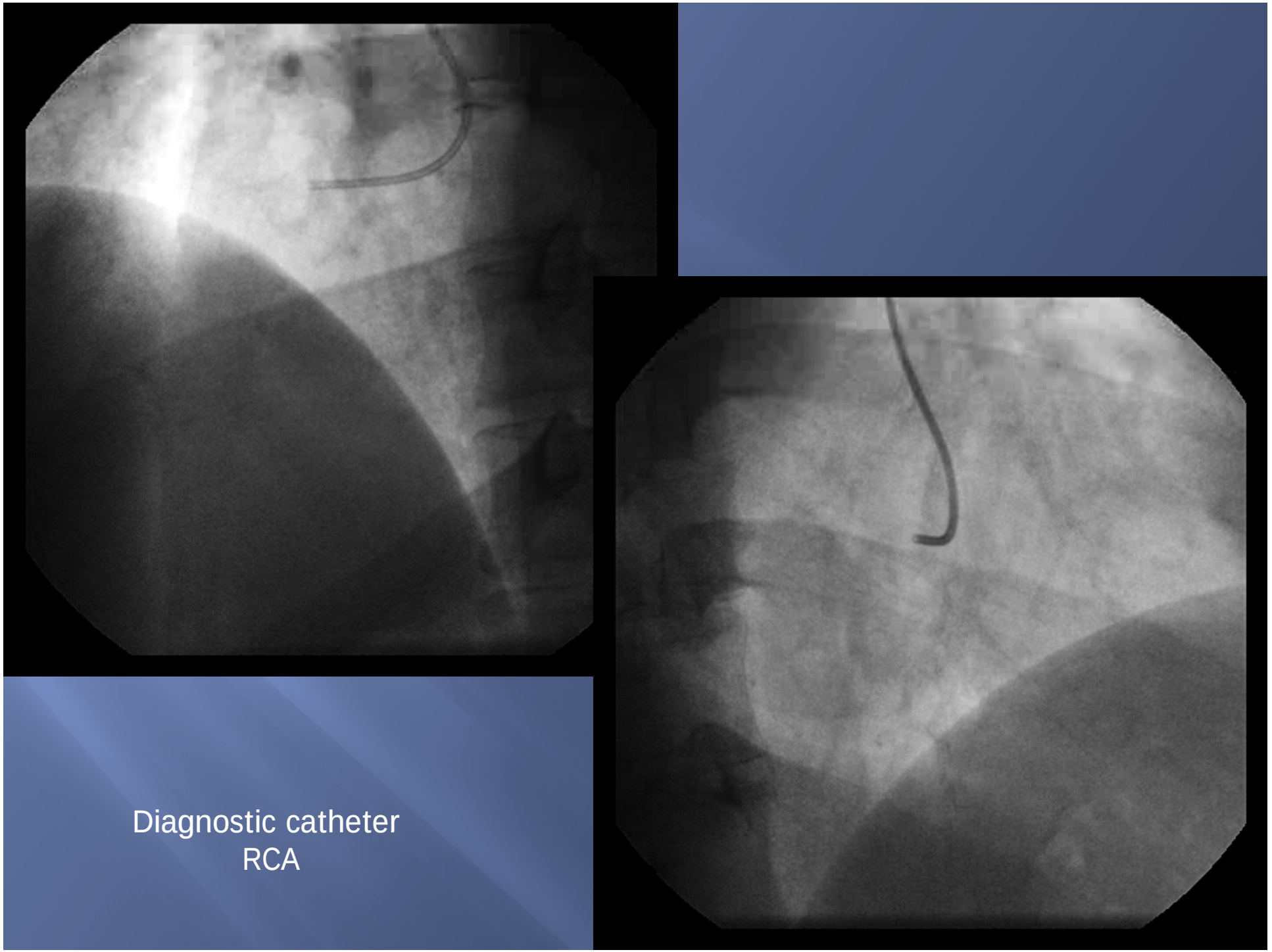
- Fractional flow reserve (FFR) is defined as the ratio of maximum blood flow in a diseased artery to maximum flow, if the same artery would be normal.
- FFR has an uniform normal value of 1.0 for every patient and every coronary artery and FFR <0.75 is validated as the threshold value of inducible ischemia .
- The value of FFRmyo is very quantitative.
- It accounts for collateral flow as well as the amount of myocardium perfused.

Case A.M 44y.o M.

- Silent myocardial ischemia
- Risk factor : Hypertension, Dyslipidemia
- Exercise ECG :
  ST depression in ⅡⅢaVF V4-V6 0.2mV
- Angiography :
  RCA CTO LAD seg6 intermediate stenosis
- LVEF 75% normal LV wall motion

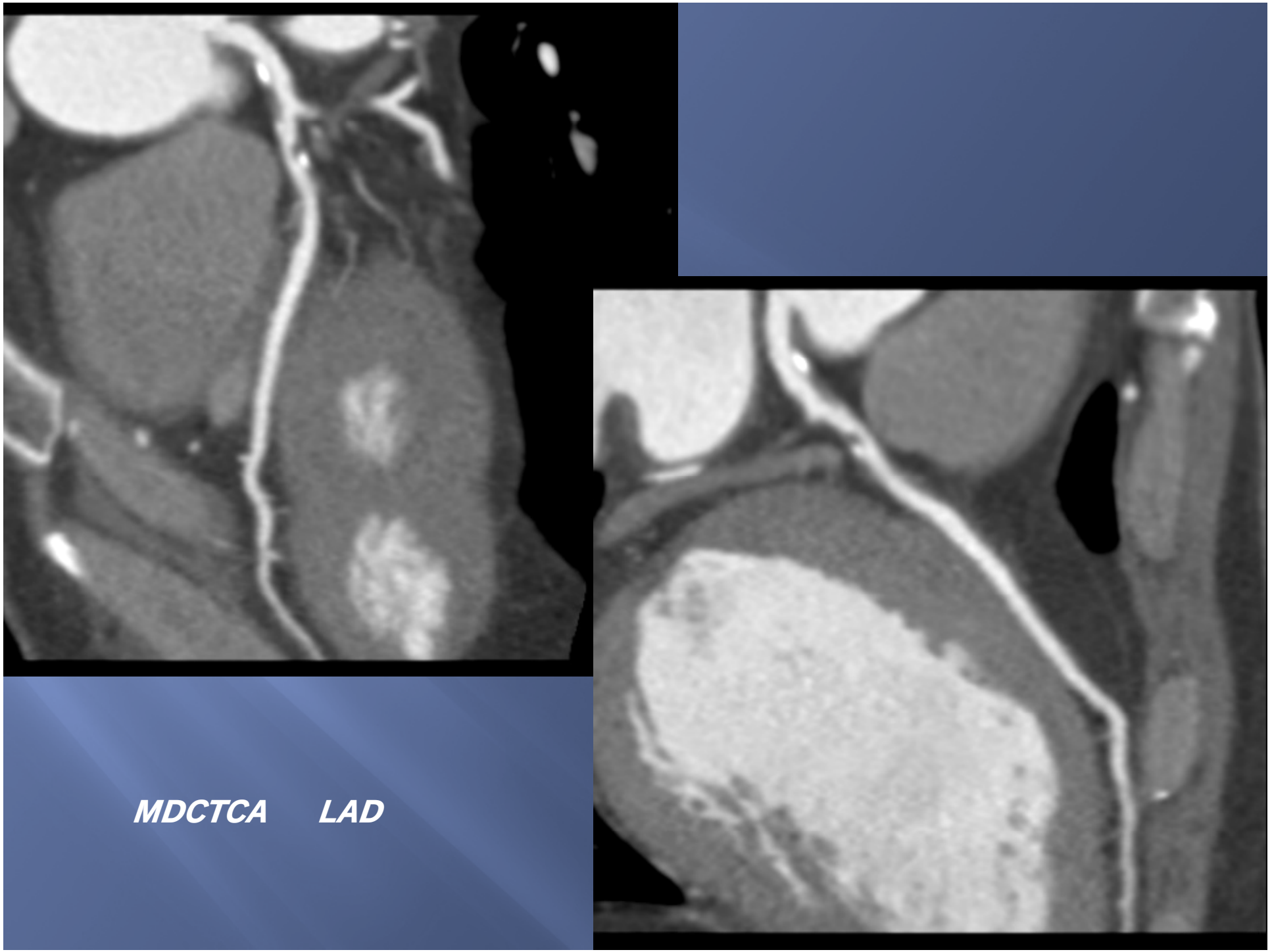
Stress myocardial perfusion imaging



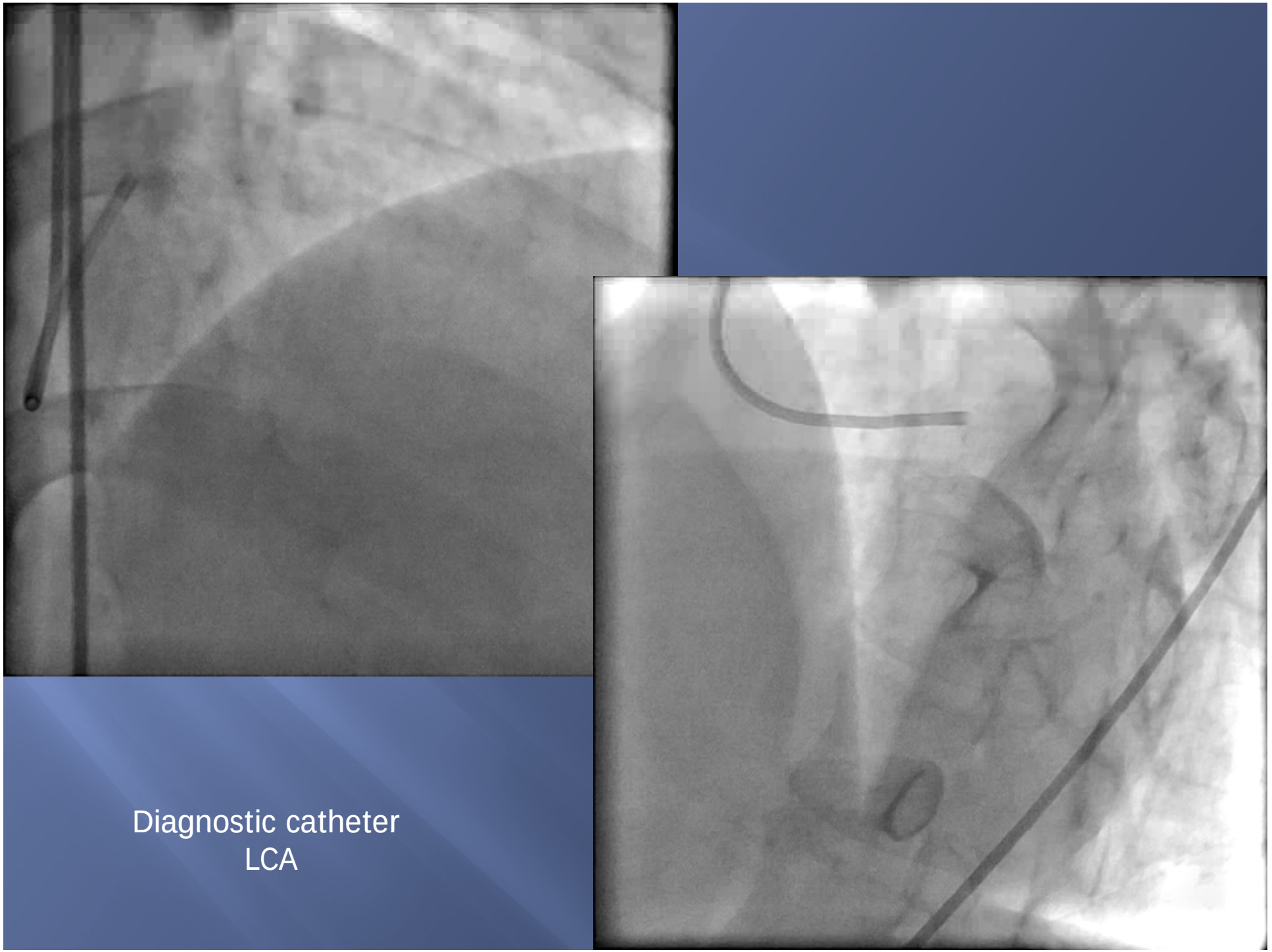


Diagnostic catheter
RCA

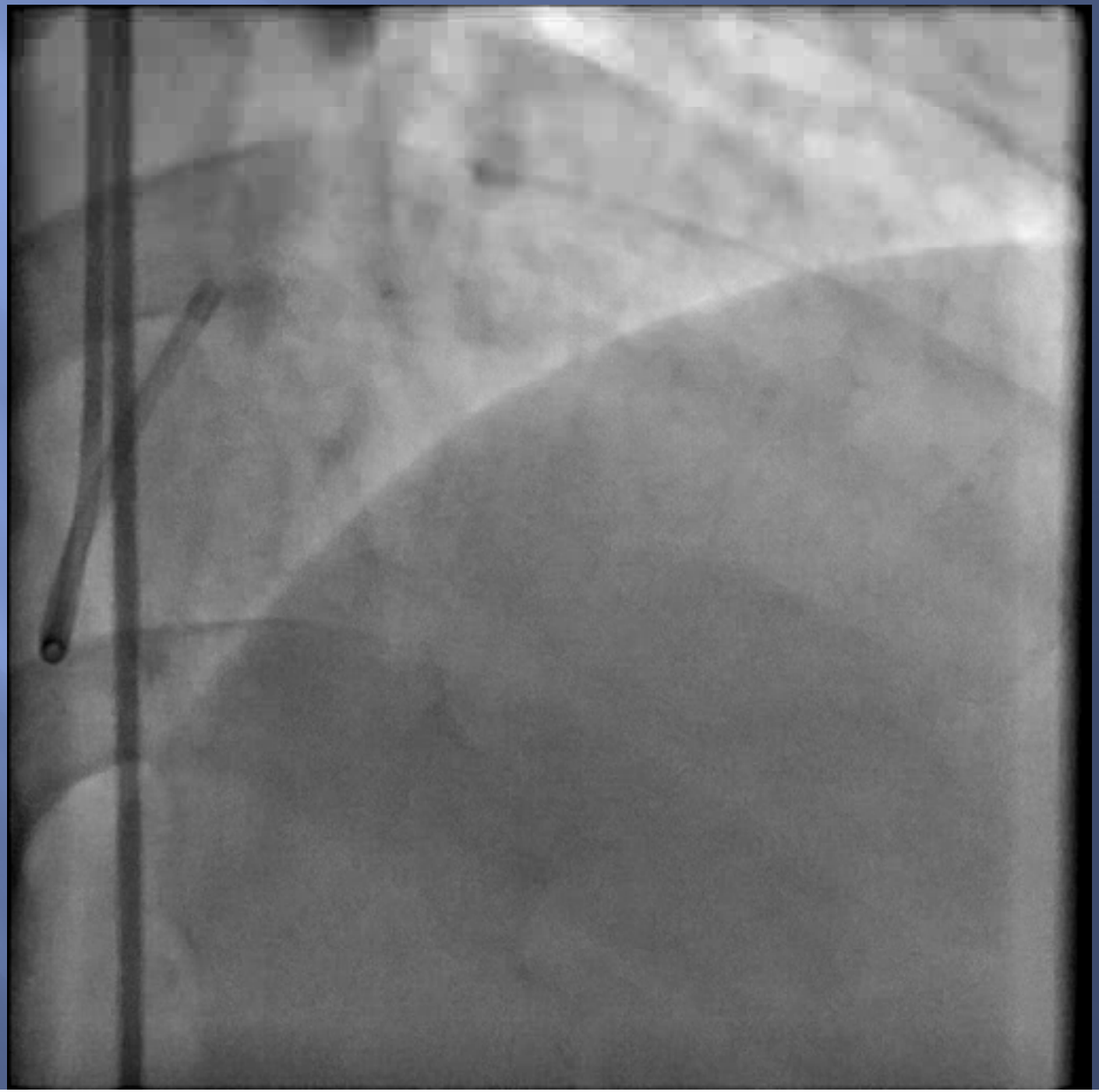
MDCTCA RCA

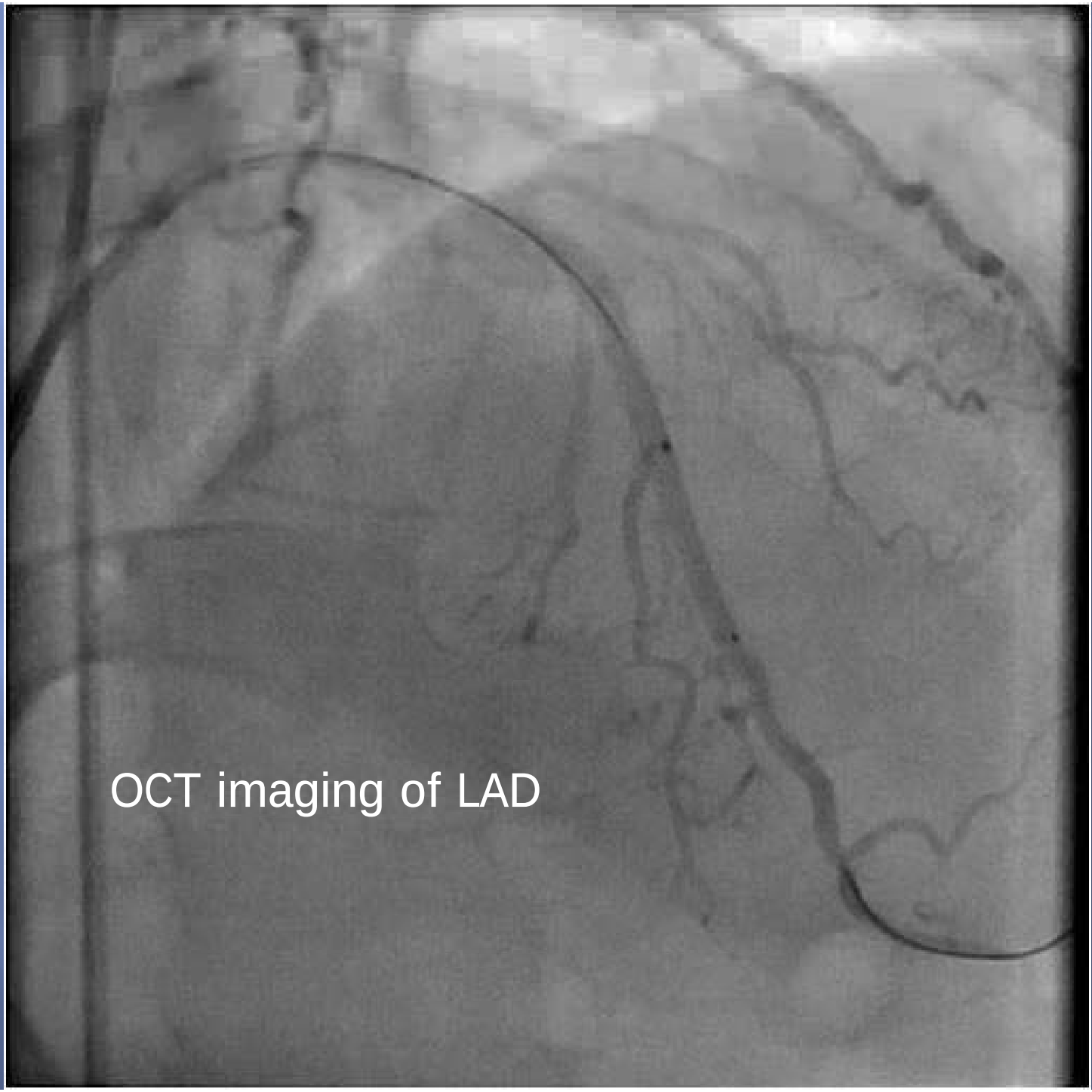


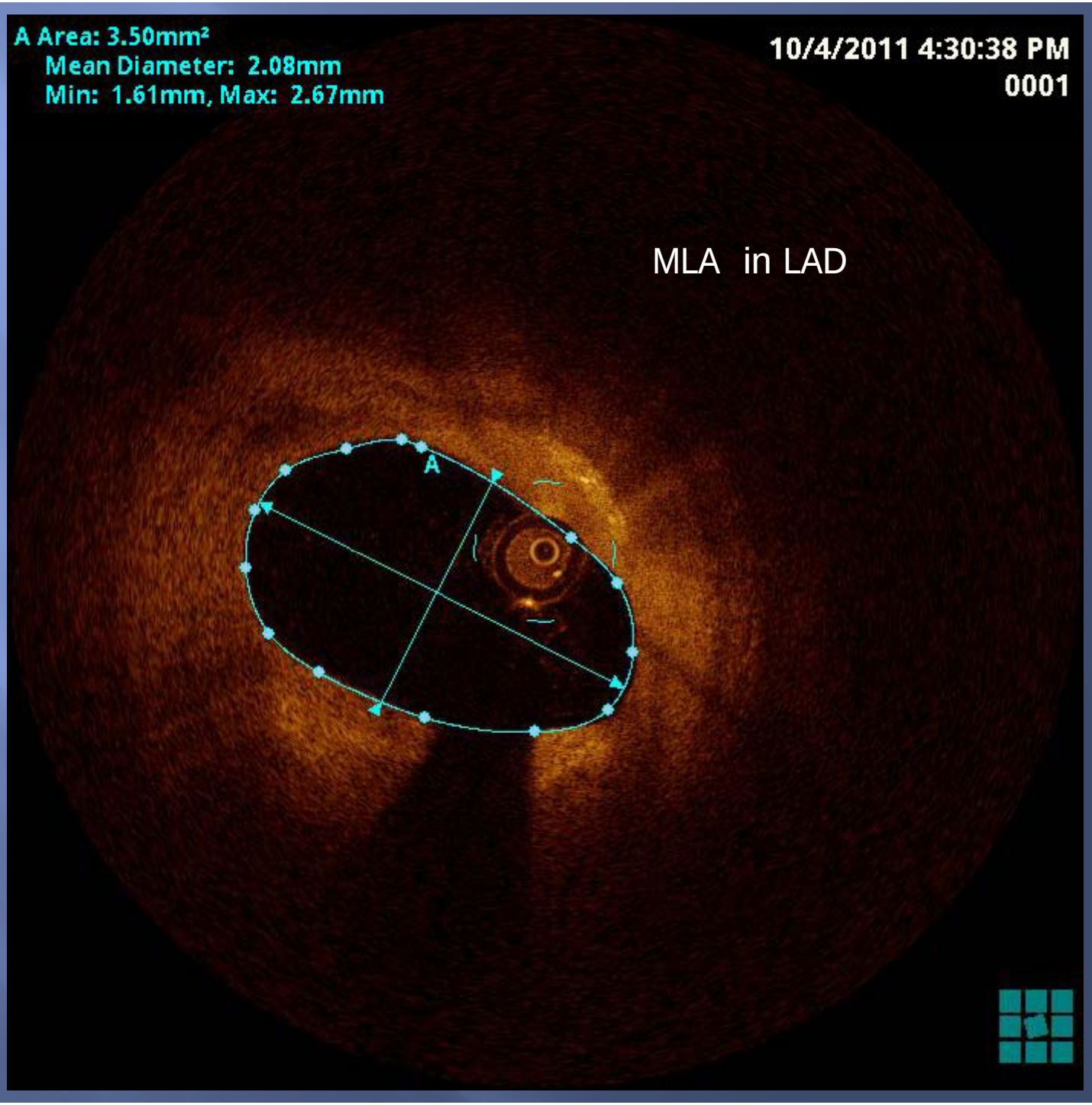
MDCTCA LAD

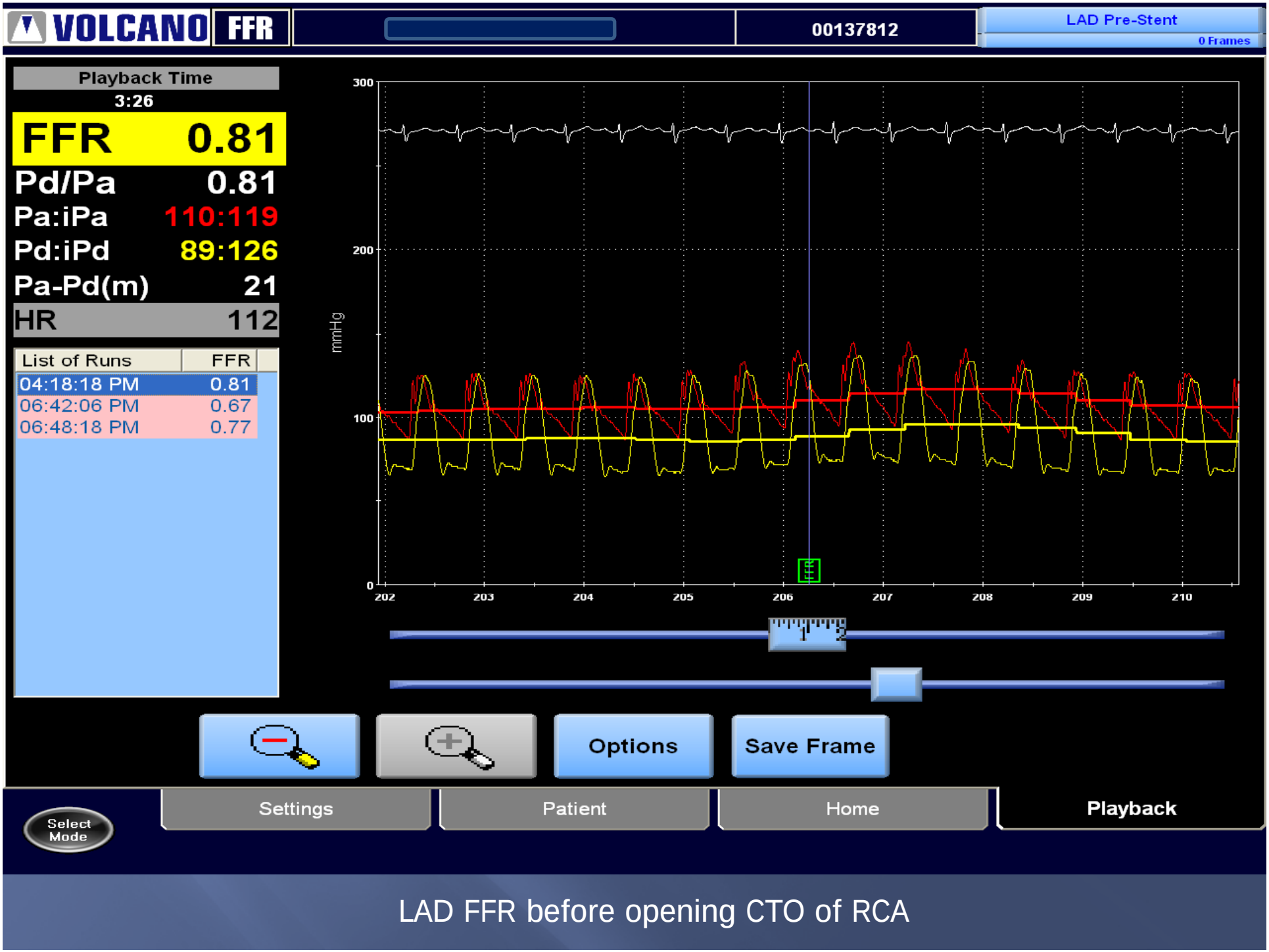


Diagnostic catheter
LCA

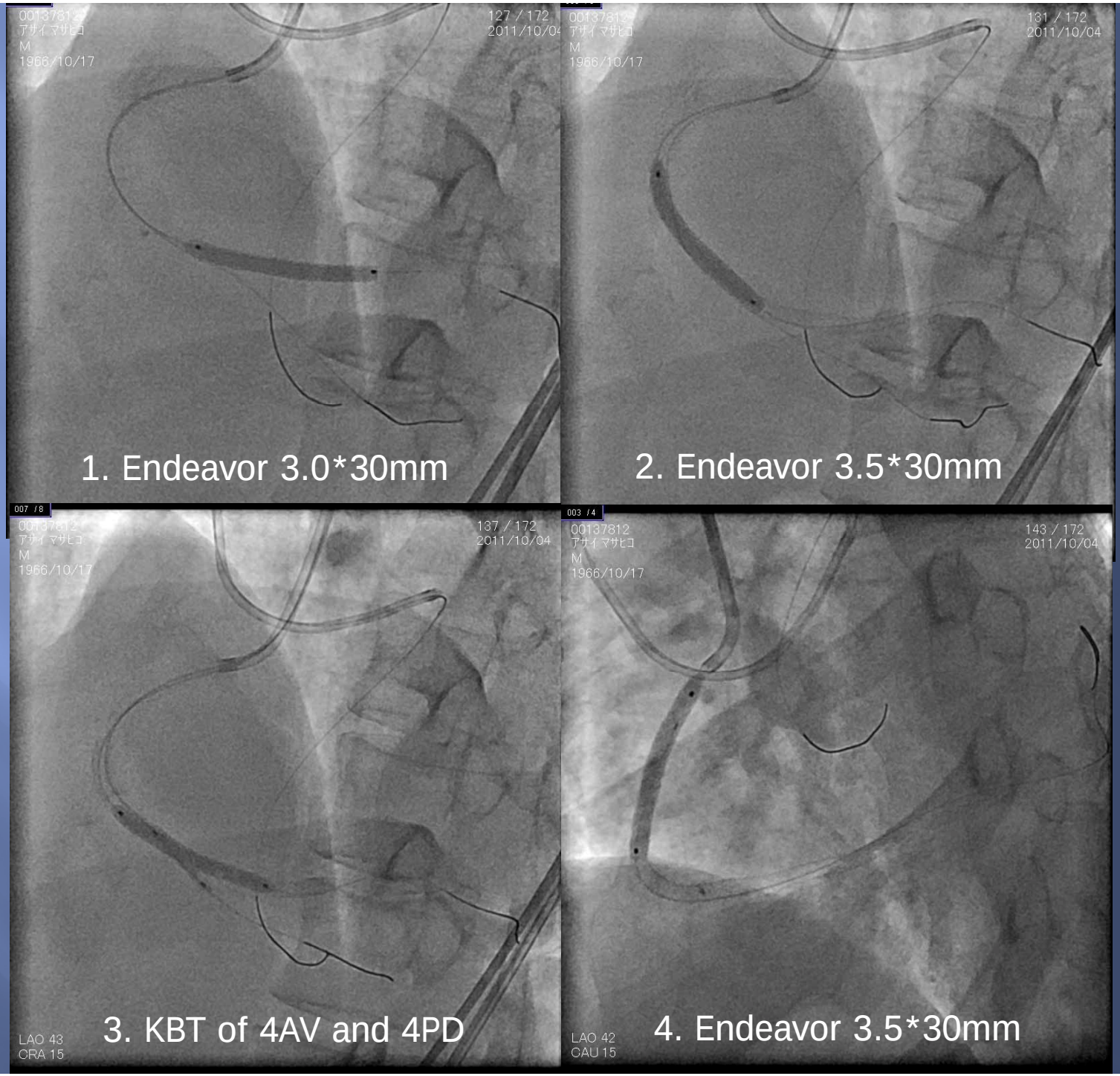


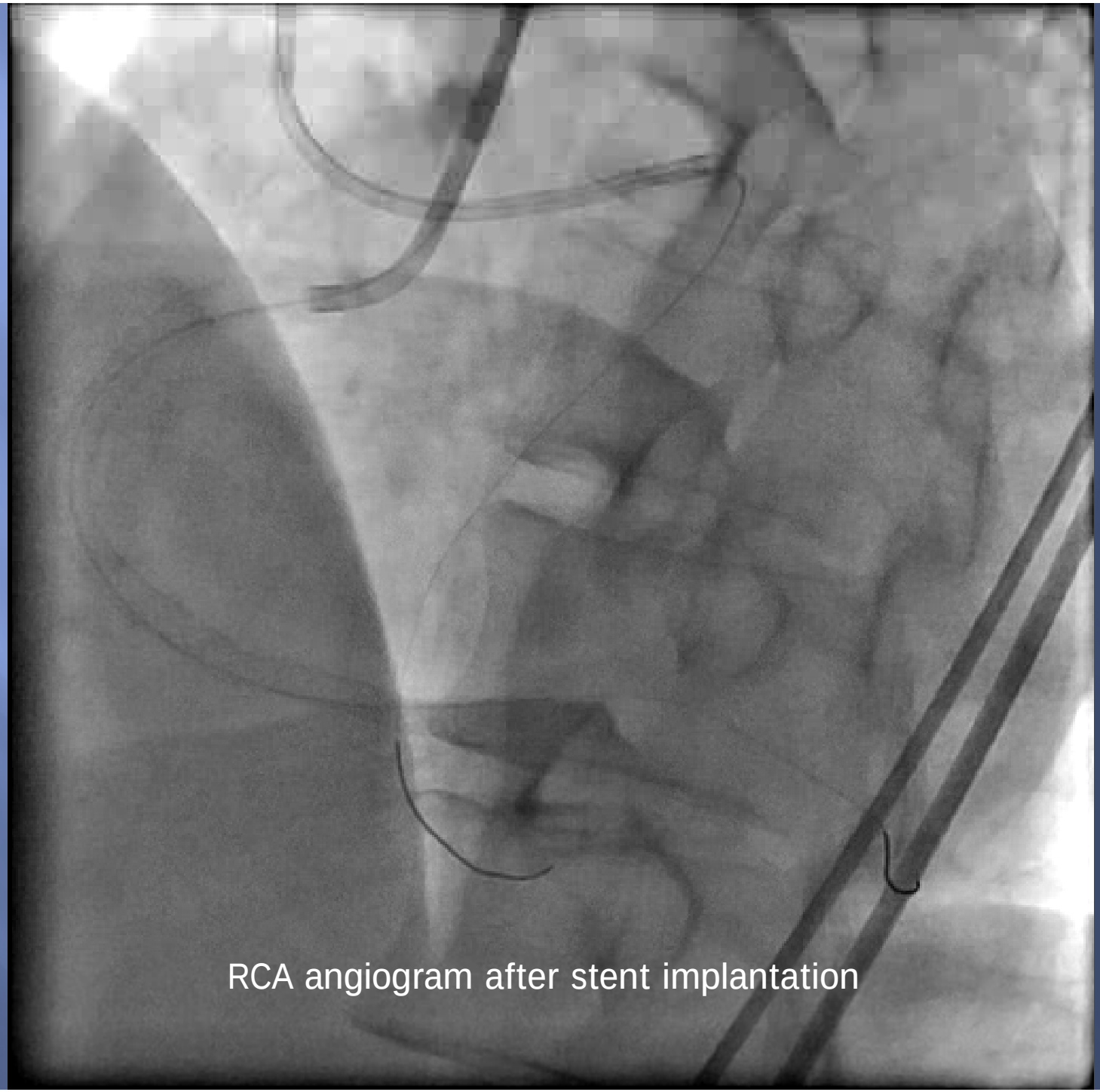

OCT imaging of LAD


A Area: 3.50mm²
Mean Diameter: 2.08mm
Min: 1.61mm, Max: 2.67mm
10/4/2011 4:30:38 PM
0001
A
MLA in LAD

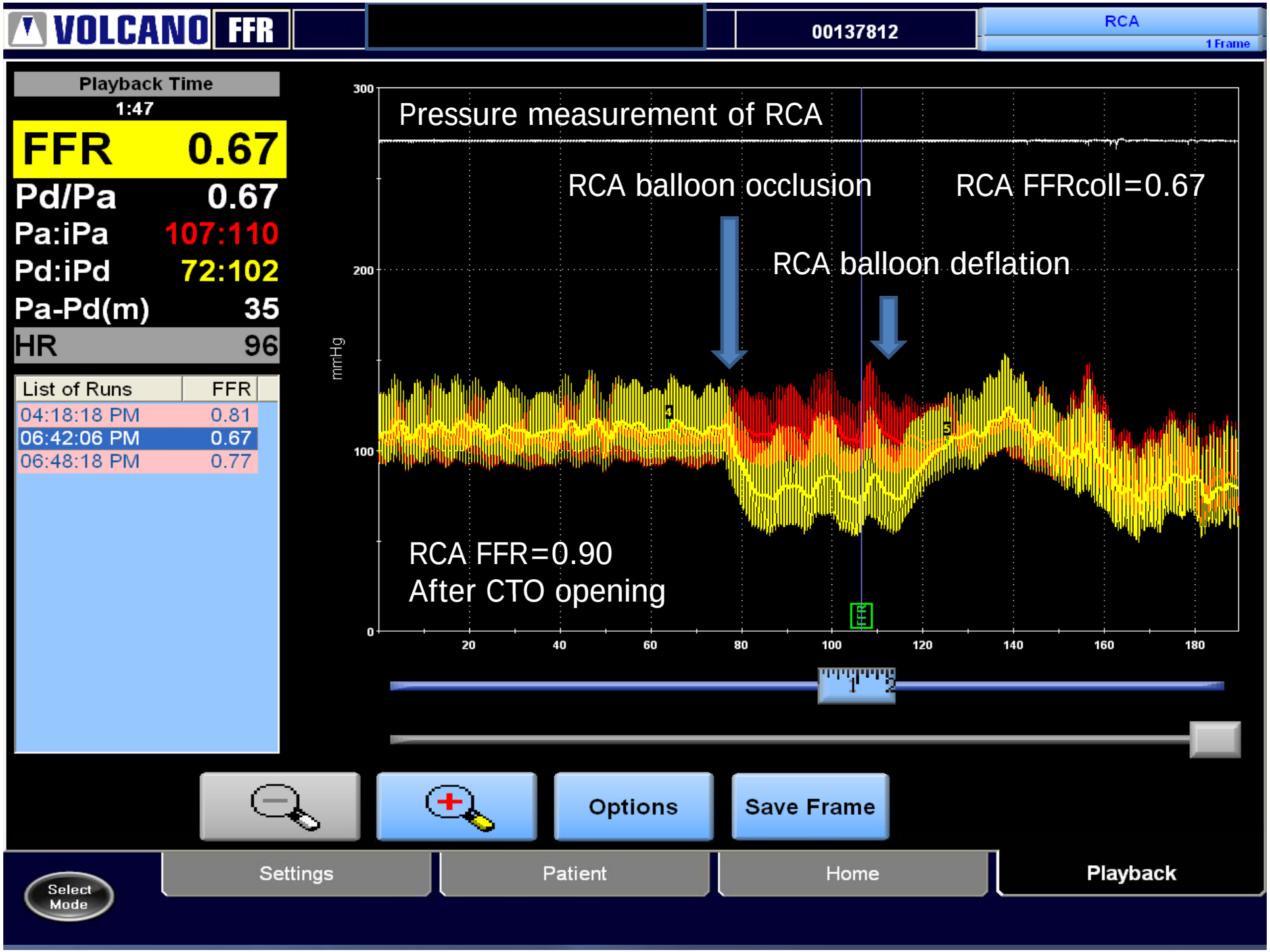


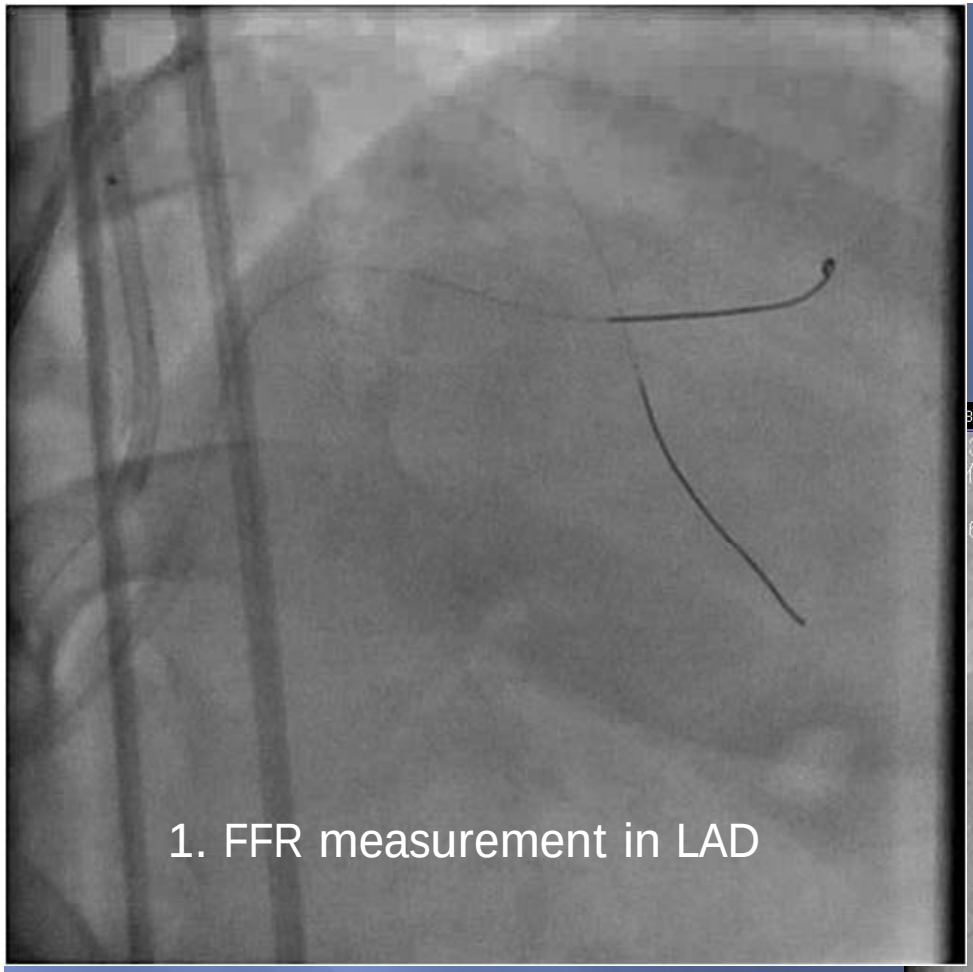
LAD FFR before opening CTO of RCA


1. Endeavor 3.0*30mm
2. Endeavor 3.5*30mm
3. KBT of 4AV and 4PD
4. Endeavor 3.5*30mm

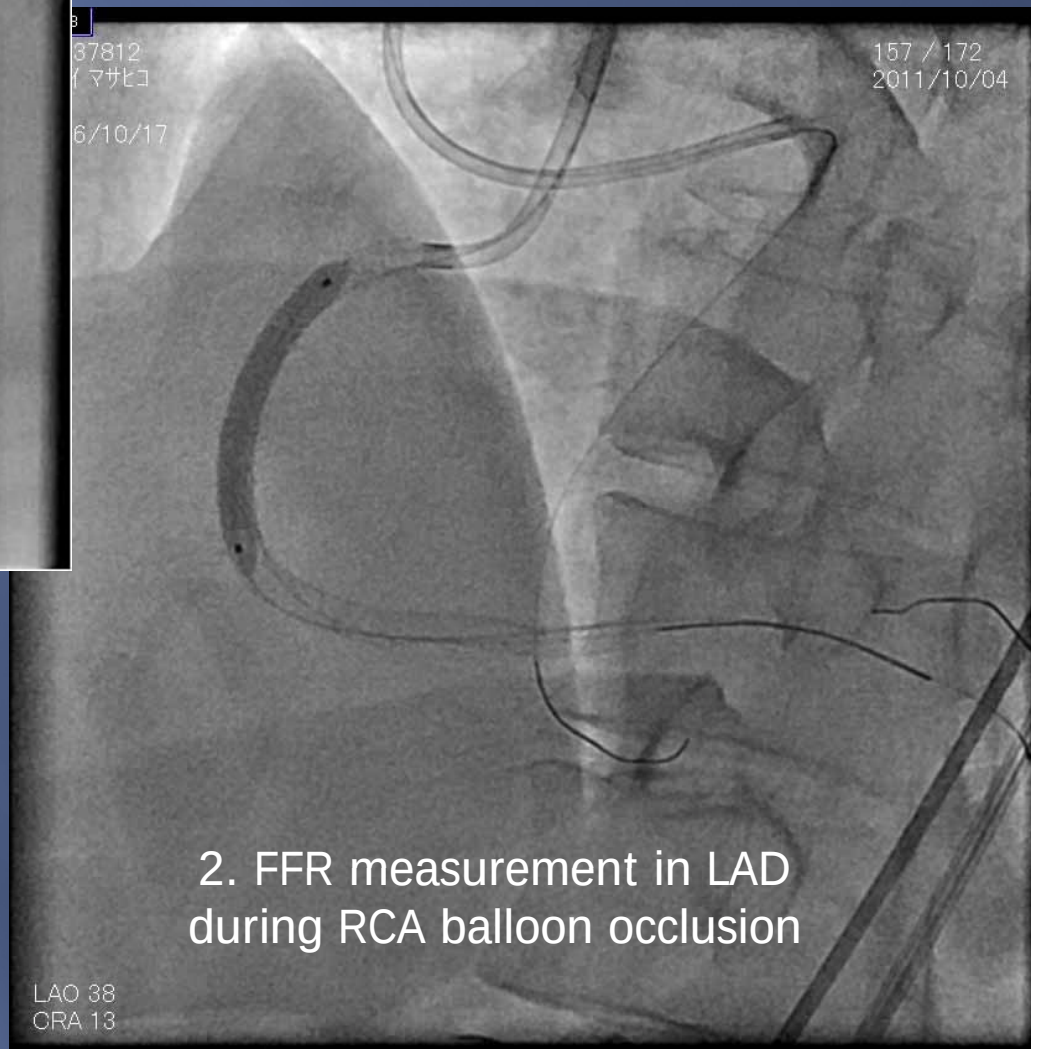


RCA angiogram after stent implantation

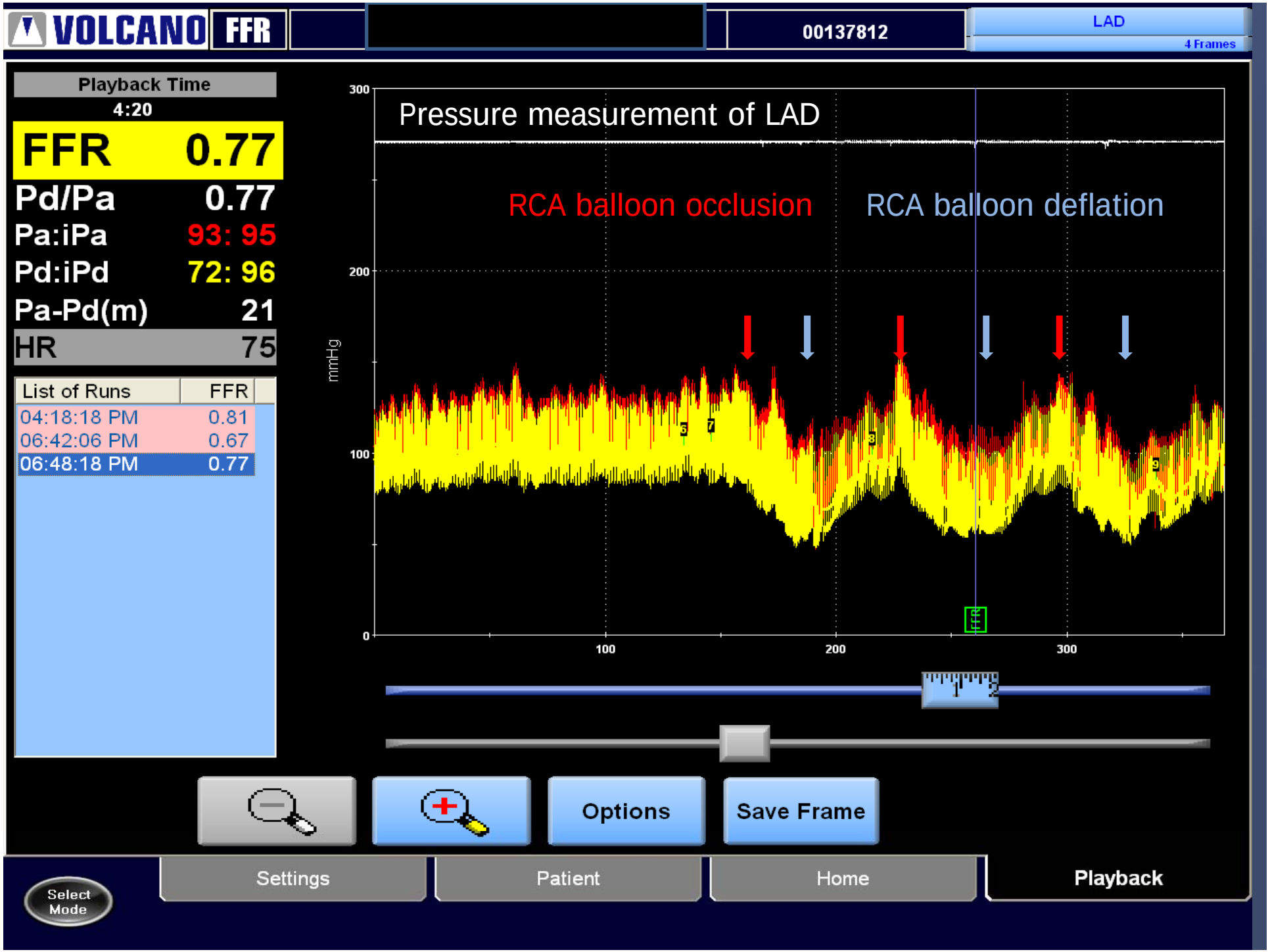

VOLCANO
FFR
00137812
RCA
1 Frame
Playback Time
1:47
FFR 0.67
Pd/Pa 0.67
Pa:iPa 107:110
Pd:iPd 72:102
Pa-Pd(m) 35
HR 96
List of Runs
FFR
04:18:18 PM 0.81
06:42:06 PM 0.67
06:48:18 PM 0.77
Pressure measurement of RCA
RCA balloon occlusion
RCA FFRcoll=0.67
RCA balloon deflation
RCA FFR=0.90
After CTO opening
mmHg
300
200
100
0
20
40
60
80
100
120
140
160
180
Options
Save Frame
Settings
Patient
Home
Playback
Select Mode

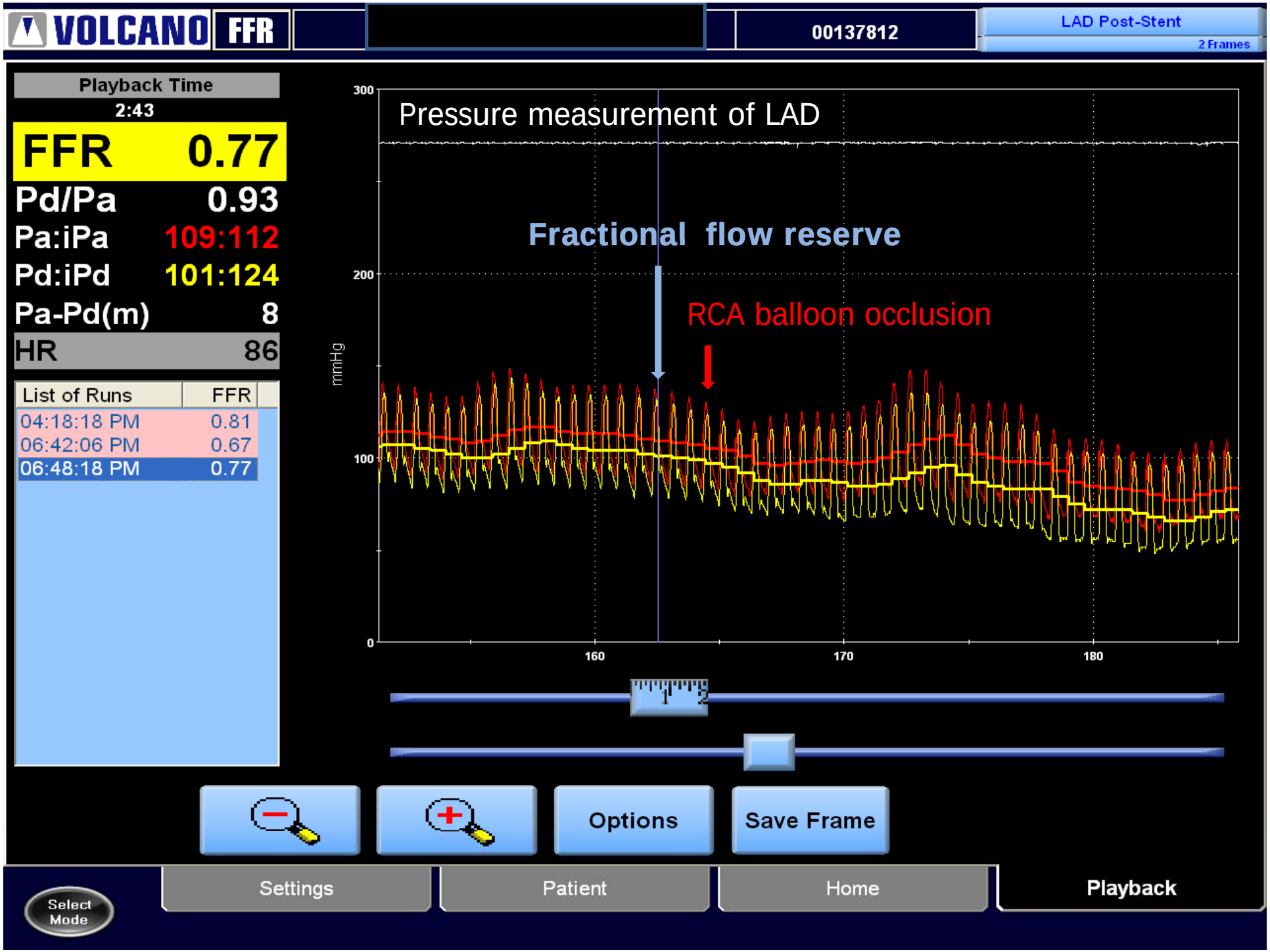


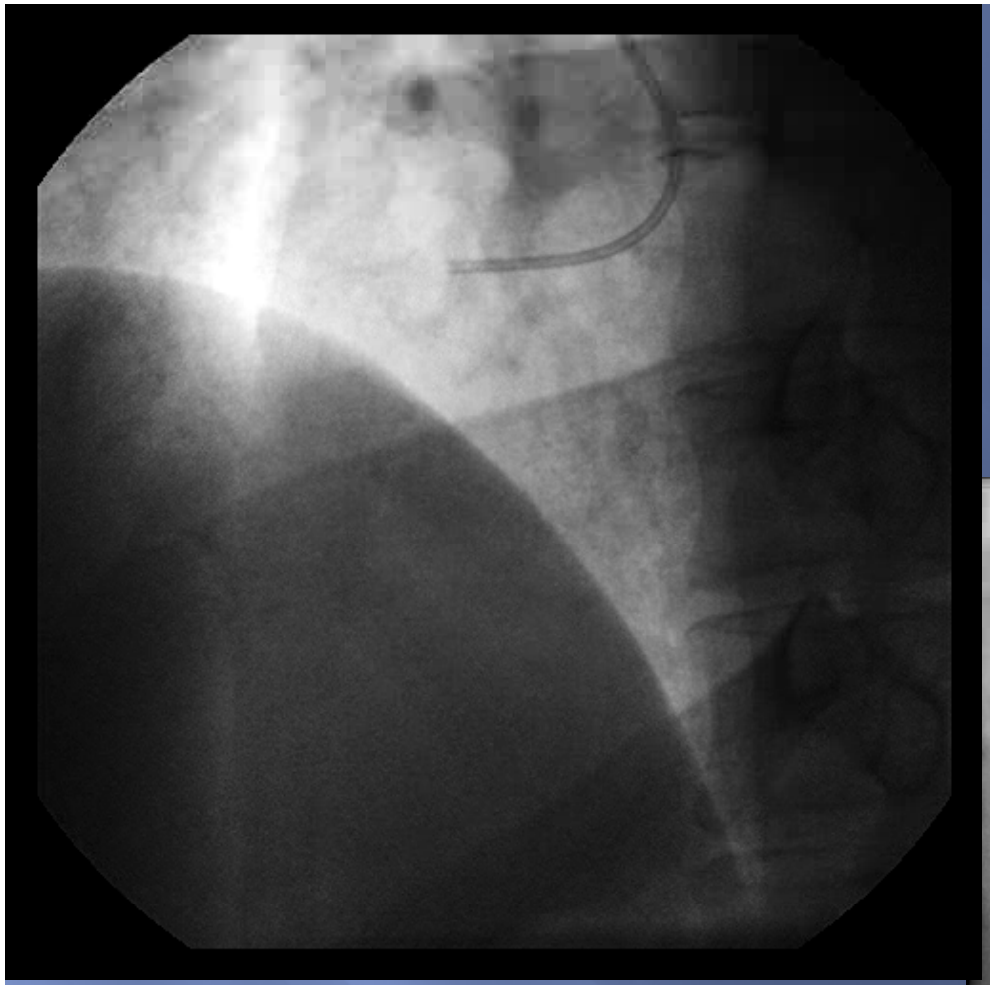
1. FFR measurement in LAD



2. FFR measurement in LAD
during RCA balloon occlusion

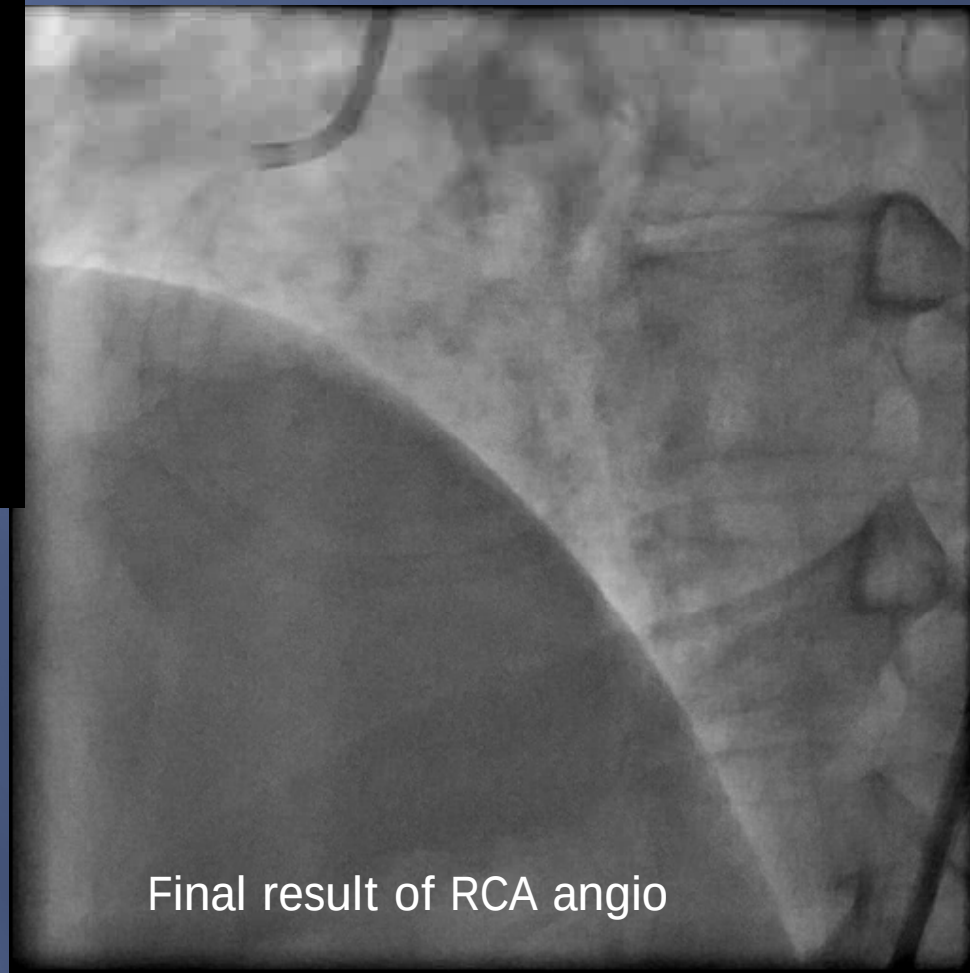

VOLCANO
FFR
00137812
LAD
4 Frames
Playback Time
4:20
FFR 0.77
Pd/Pa 0.77
Pa:iPa 93: 95
Pd:iPd 72: 96
Pa-Pd(m) 21
HR 75
List of Runs
FFR
04:18:18 PM 0.81
06:42:06 PM 0.67
06:48:18 PM 0.77
Pressure measurement of LAD
RCA balloon occlusion
RCA balloon deflation
mmHg
300
200
100
0
100
200
300
Options
Save Frame
Select Mode
Settings
Patient
Home
Playback


VOLCANO
FFR
00137812
LAD Post-Stent
2 Frames
Playback Time
2:43
FFR 0.77
Pd/Pa 0.93
Pa:iPa 109:112
Pd:iPd 101:124
Pa-Pd(m) 8
HR 86
List of Runs
FFR
04:18:18 PM 0.81
06:42:06 PM 0.67
06:48:18 PM 0.77
Pressure measurement of LAD
Fractional flow reserve
RCA balloon occlusion
mmHg
300
200
100
0
160
170
180
Options
Save Frame
Settings
Patient
Home
Playback
Select Mode

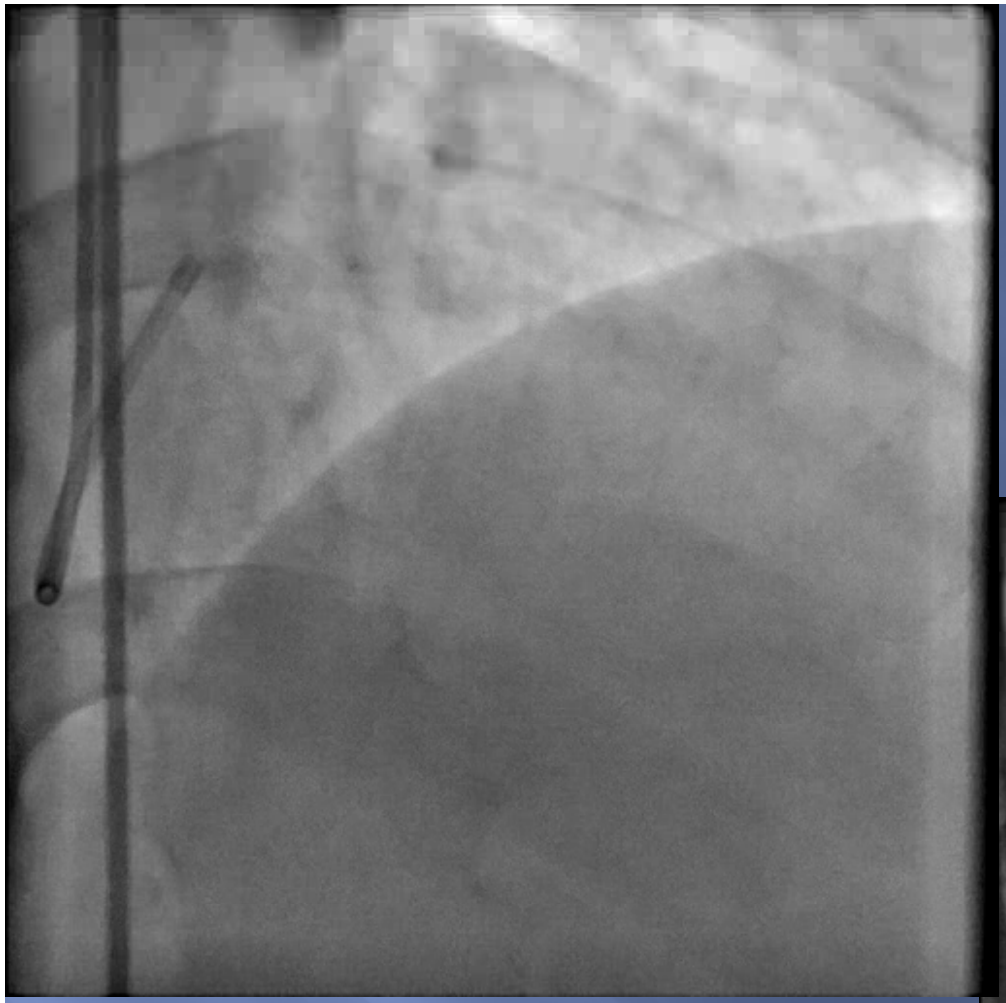


Before opening CTO
FFR***coll*** 0.67

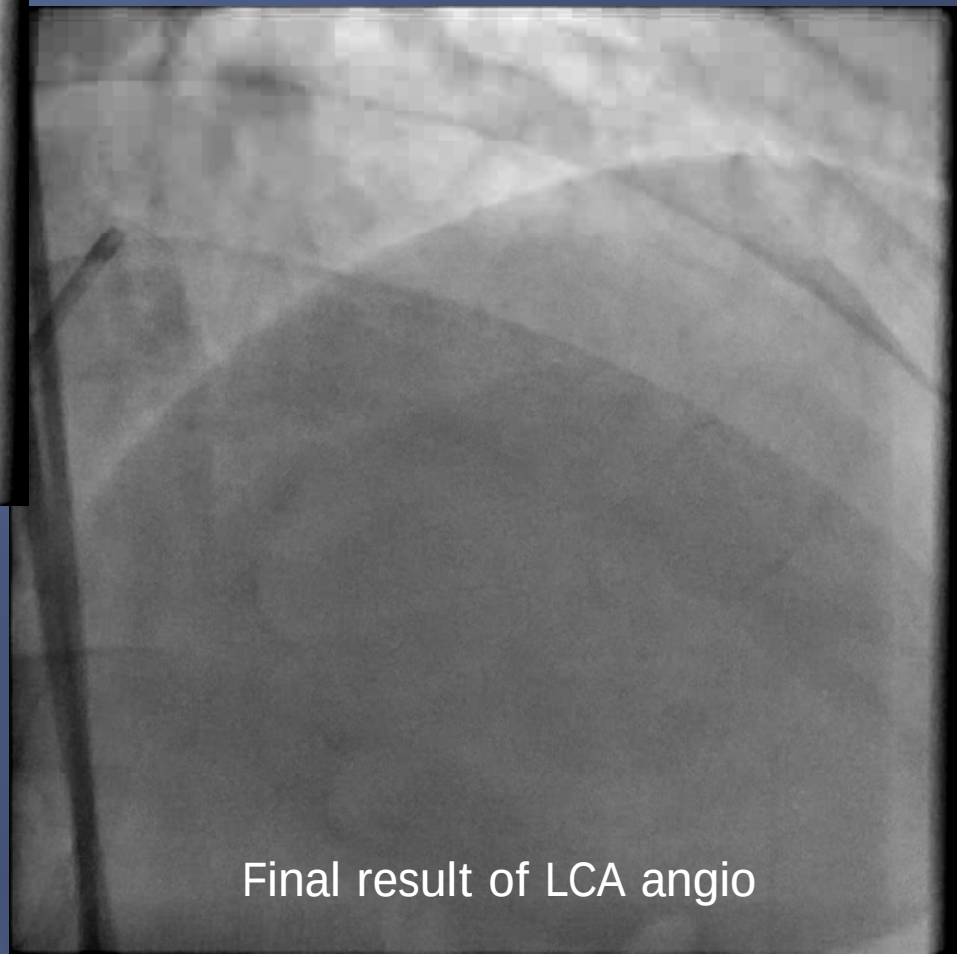
After opening CTO
FFR***myo*** 0.90



Final result of RCA angio



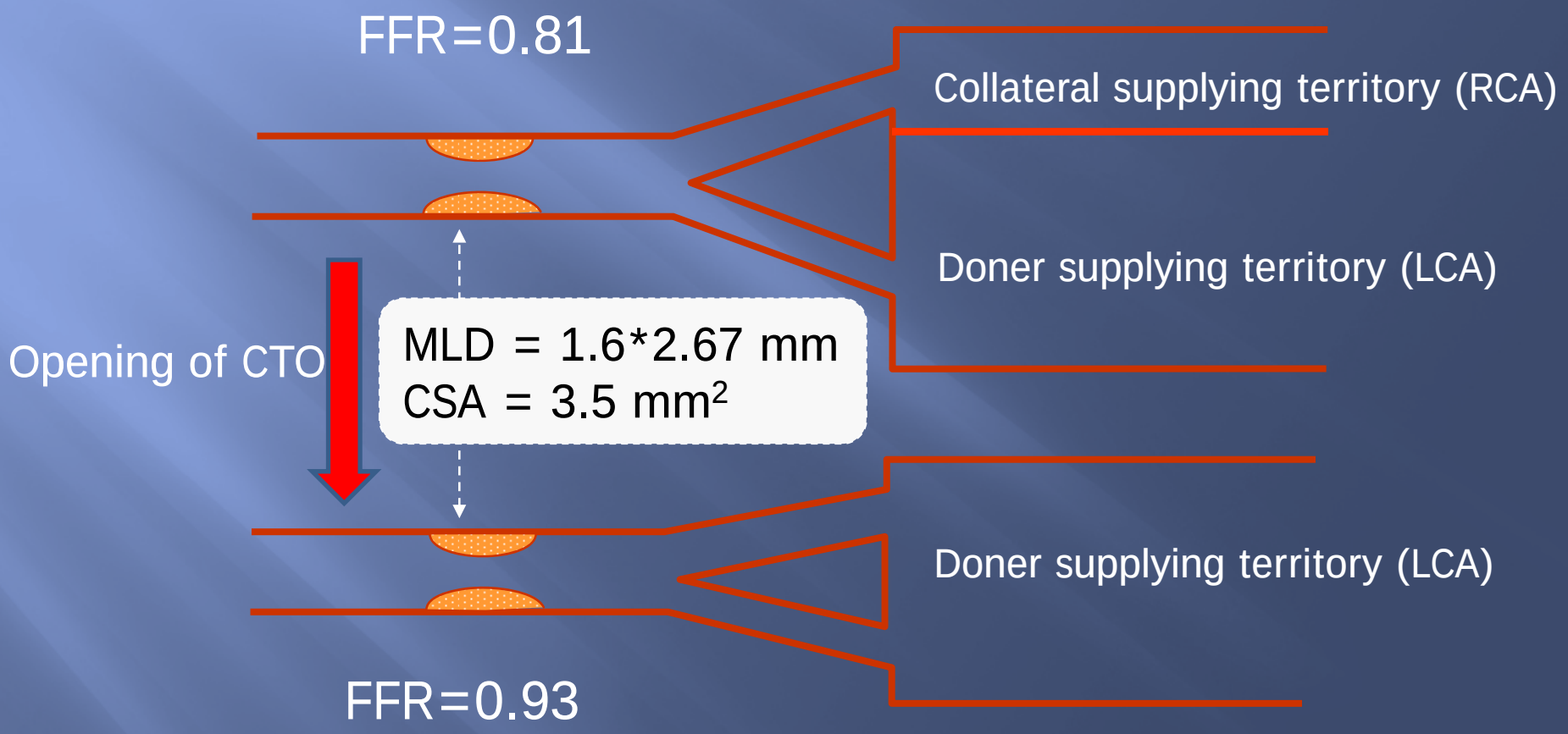
After opening CTO
FFR***myo*** 0.93



Final result of LCA angio

Before opening CTO
FFR***myo*** 0.67

Improved perfusion of collateral doner artery after CTO opening



Physiological impact (meaning) of CTO opening in this case

- Myocardium supplied by CTO vessel

  FFR increased from 0.67 to 0.90

  23% increase of max flow during hyperemia
- Myocardium supplied by remote opening vessels

  FFR increased from 0.81(0.77) to 0.93

  12% increase of max flow during hyperemia

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By CTO opening in this case

- Coronary flow under maximum vasodilatation increased not only in the myocardium supplied by occluded artery, but also in that supplied by contralateral open coronary artery.
- Clinical consequences may closely related to the change of physiological ischemic burden and should be followed up by this point of view.