

Fractional Flow Reserve and Tandem Lesion

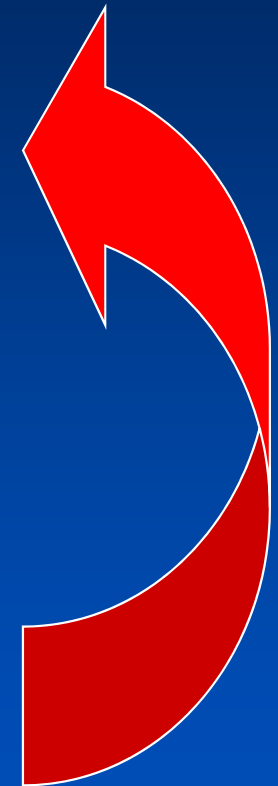
Lee seung yong RT. Asan Medical Center

Derivation of FFR

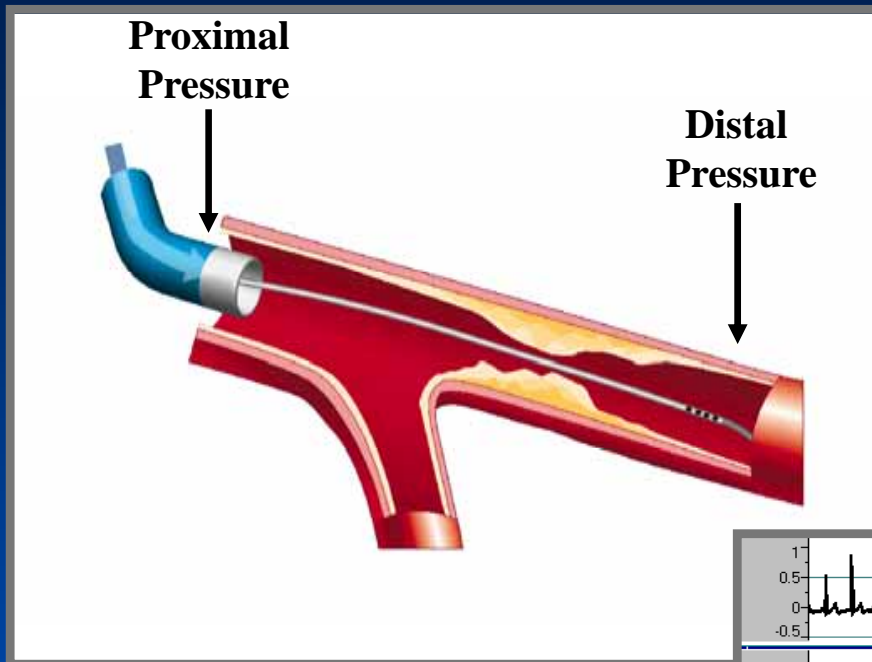
- $FFR = \frac{\text{Coronary Pressure (Stenosis)}}{\text{Coronary Pressure (Normal)}}$

- $\text{Flow} = \frac{\text{Pressure}}{\text{Resistance}}$

- *at maximal hyperemia* $\text{Flow} \approx \text{Pressure}$

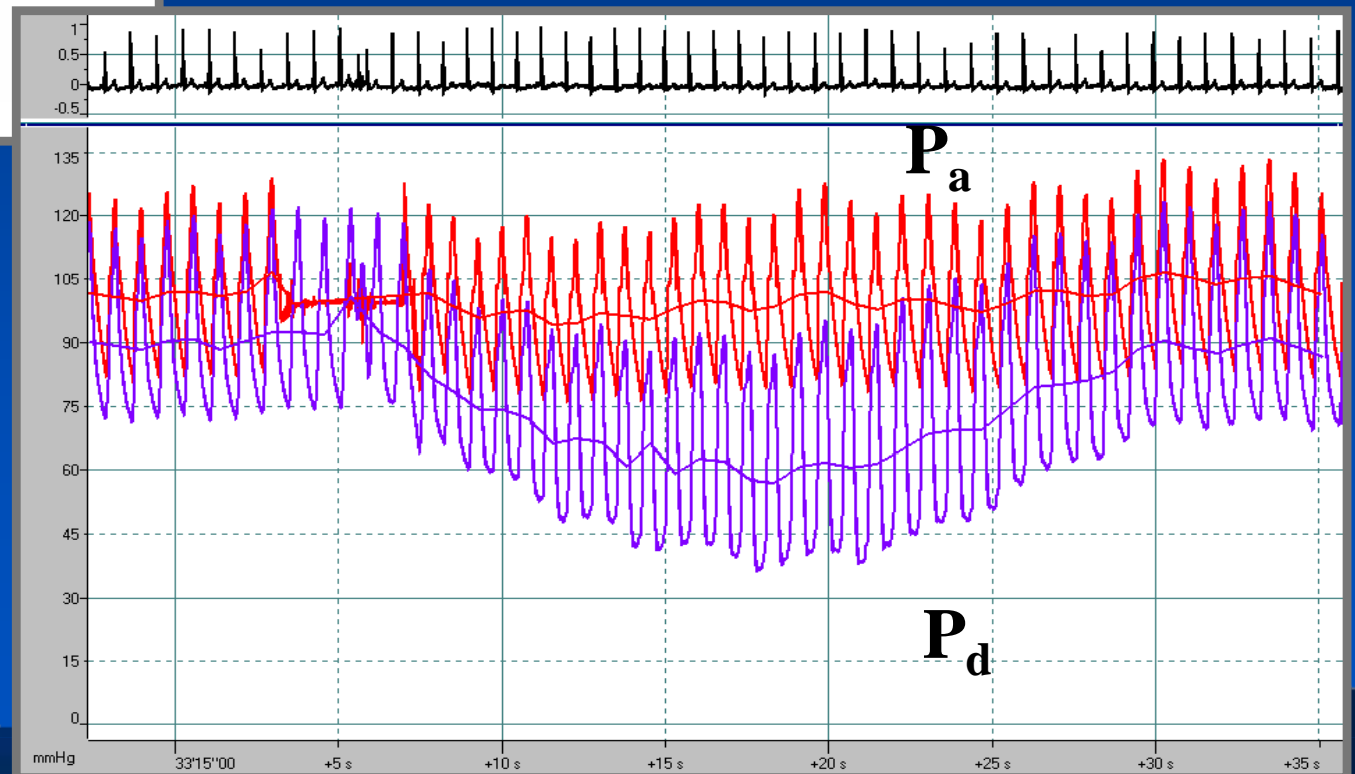


Fractional Flow Reserve



$$\text{FFR} = P_d / P_a$$

during maximal flow

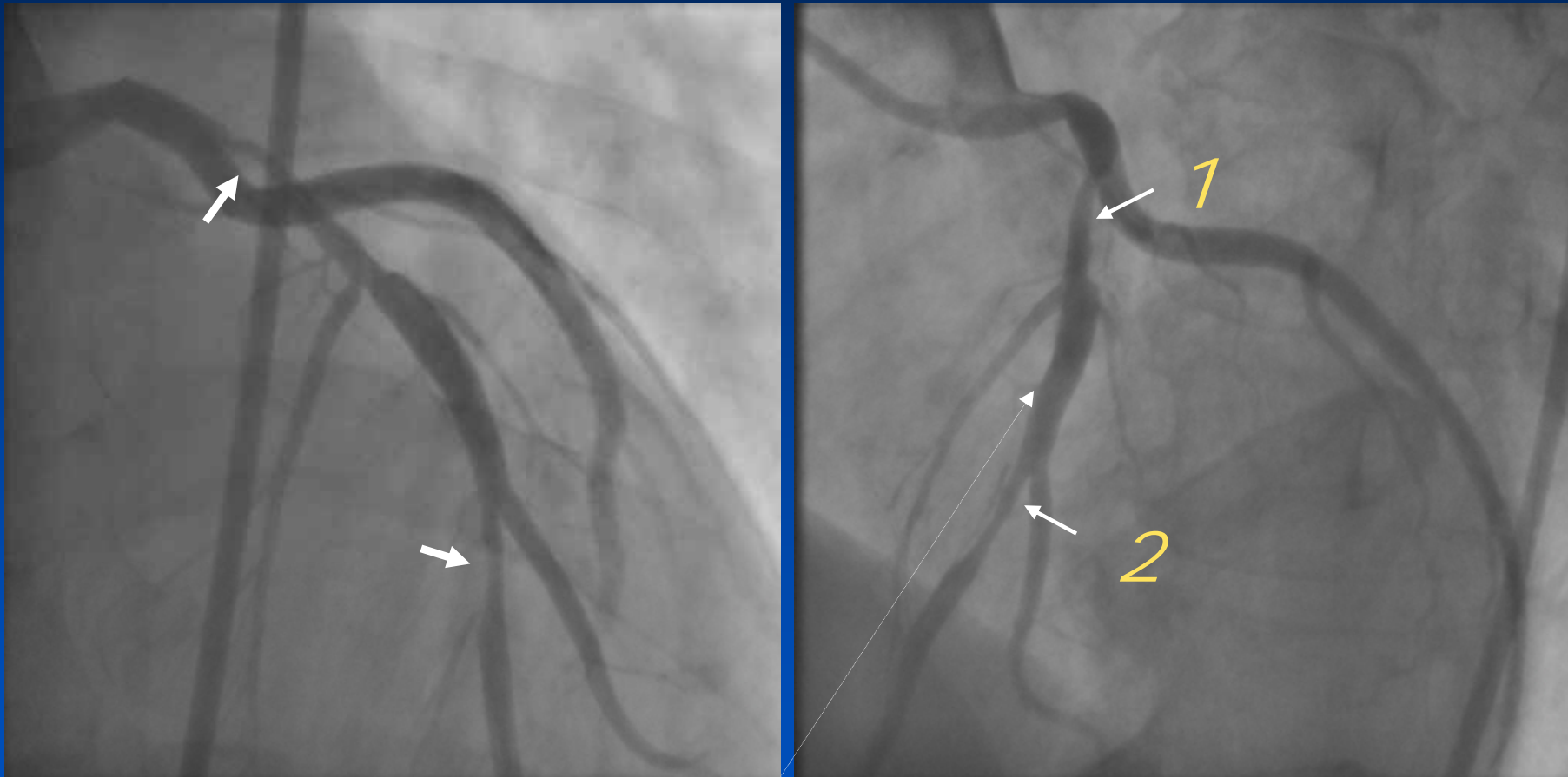


Tandem lesion

What is tandem lesion?

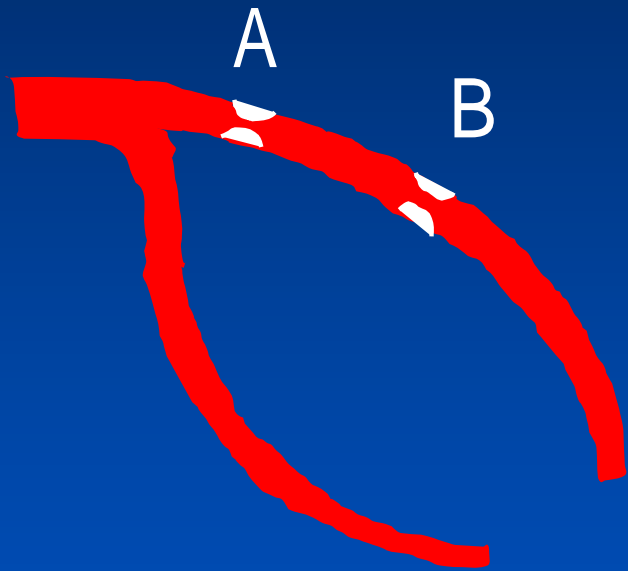
- Defined by lesions requiring > 2 DES, which can be divided by normal looking area.

Tandem lesion



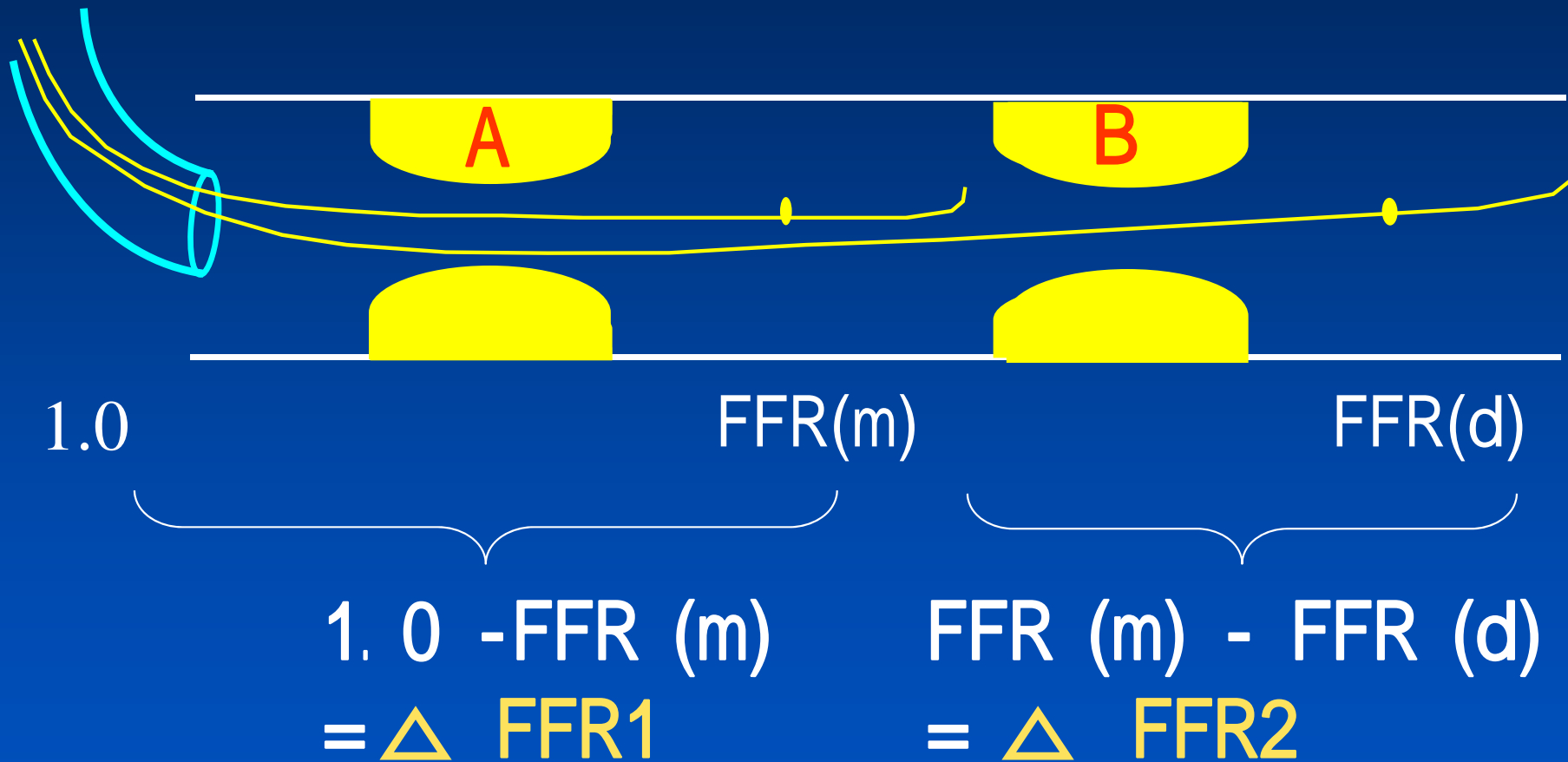
normal looking area

FFR guided **Spot** Stenting



How can we select
the **first** target lesion ?

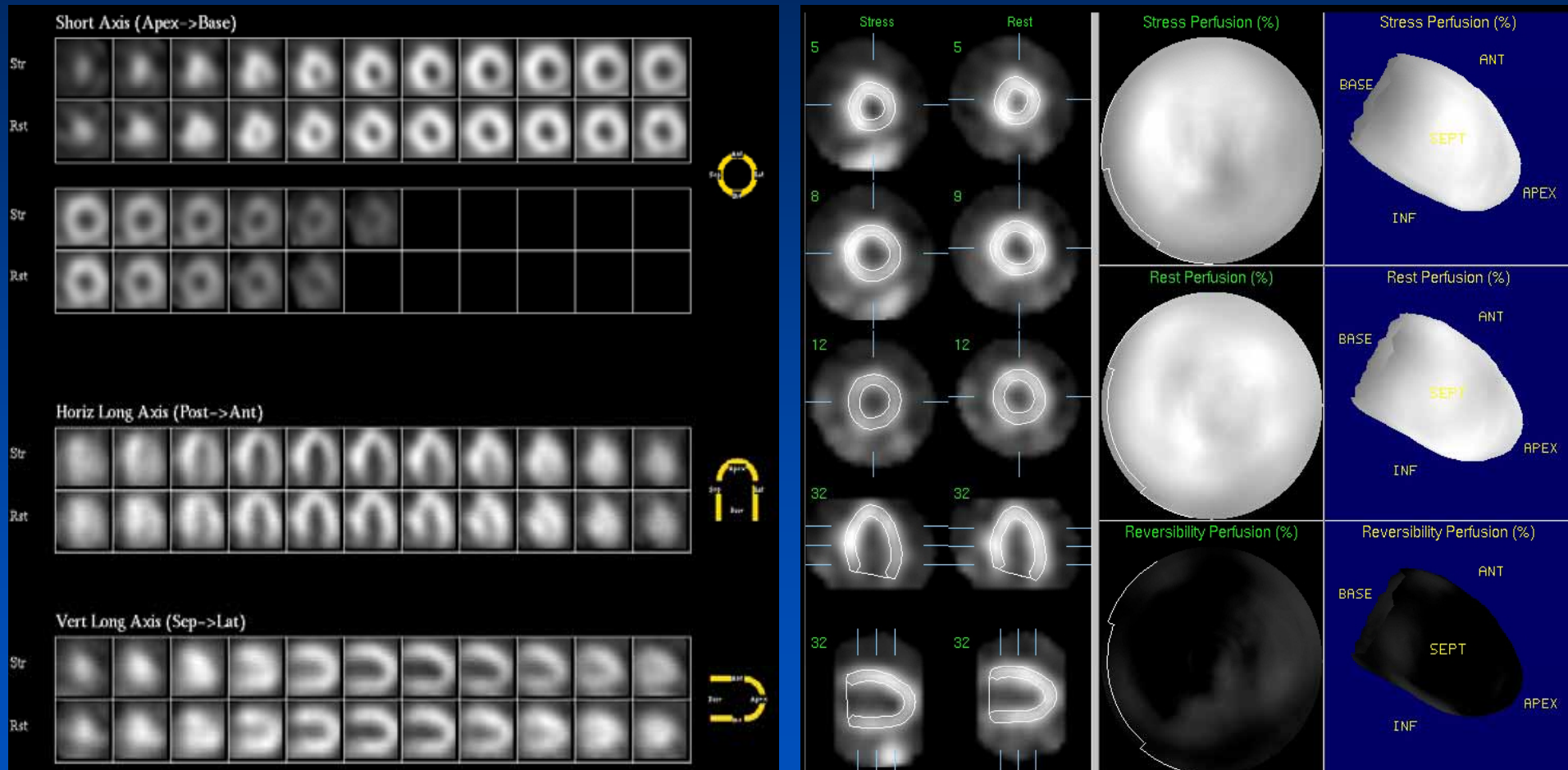
The Bigger Delta (Δ FFR), the Tighter Stenosis !



Tandem Lesion

- 68 Years-Old Male
- Chief Complaint – dyspnea (NYHA class II)
- Risk Factors
 - Hyperlipidemia, HTN ,smoking

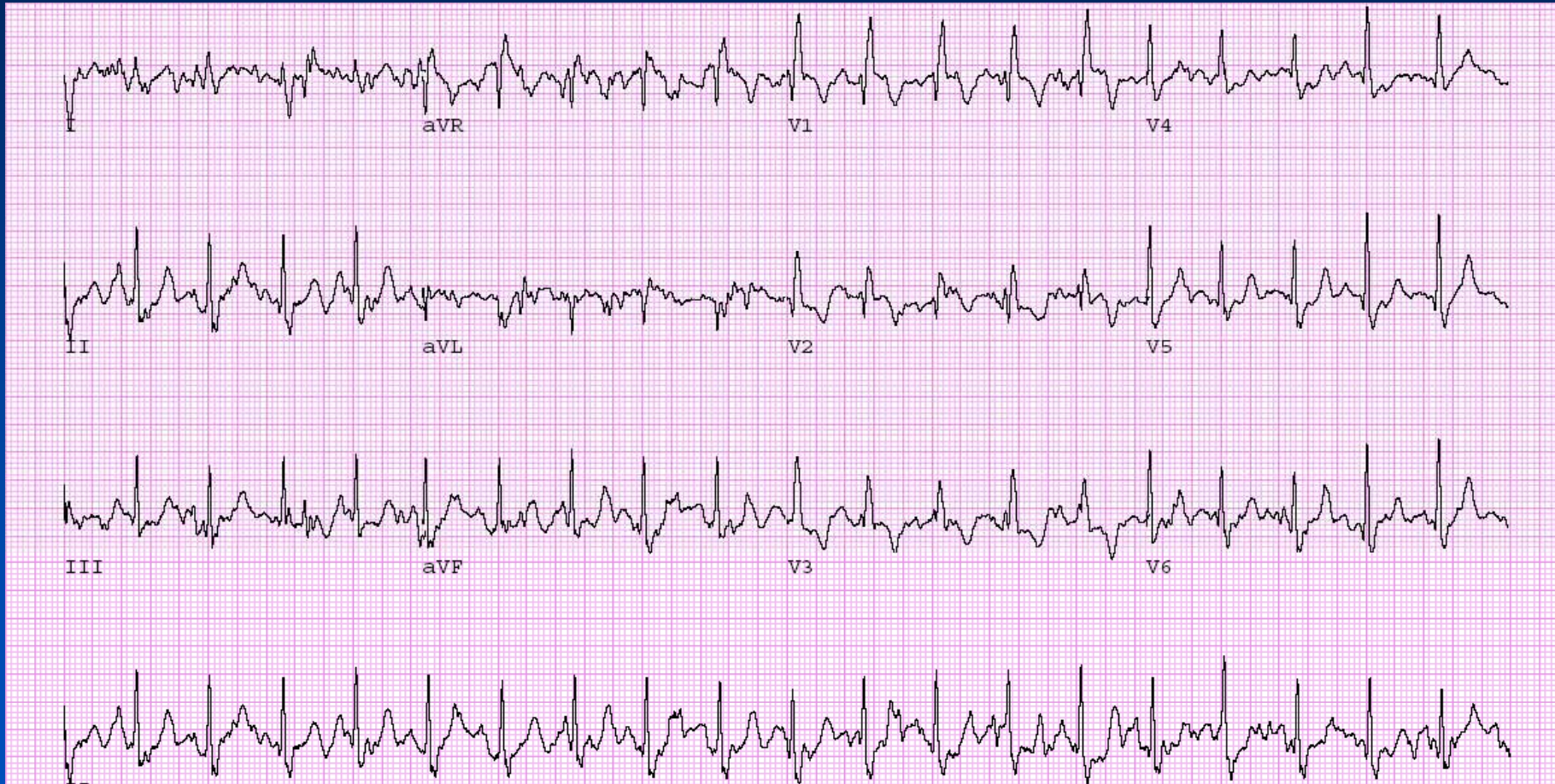
Tandem Lesion Thallium SPECT



Reversible large sized in anterolateral and inferolateral wall

Tandem Lesion

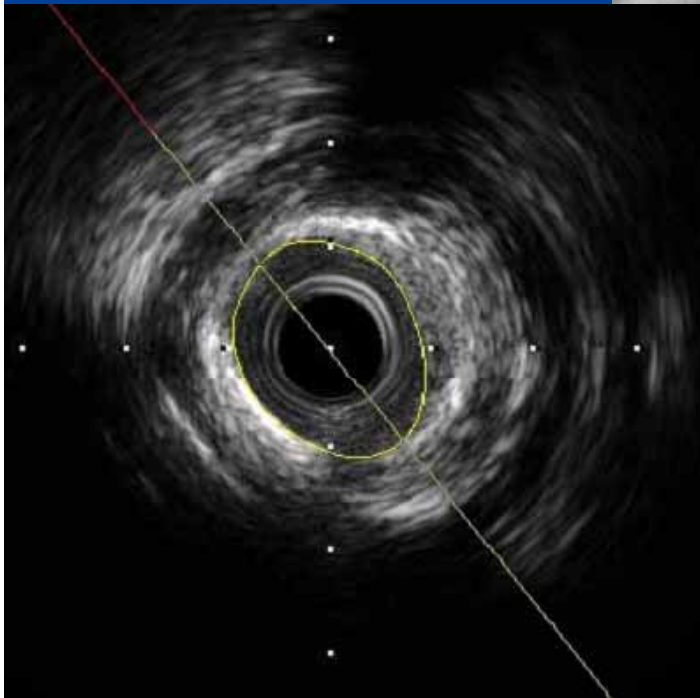
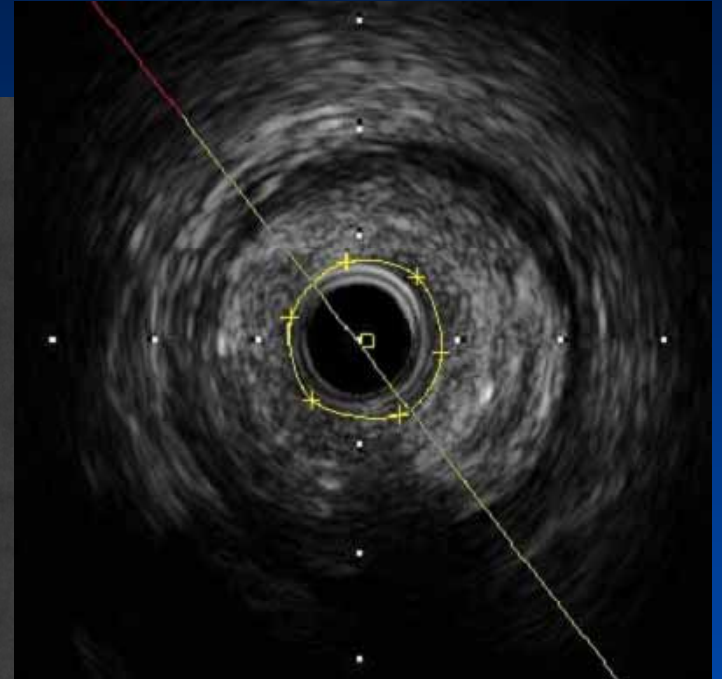
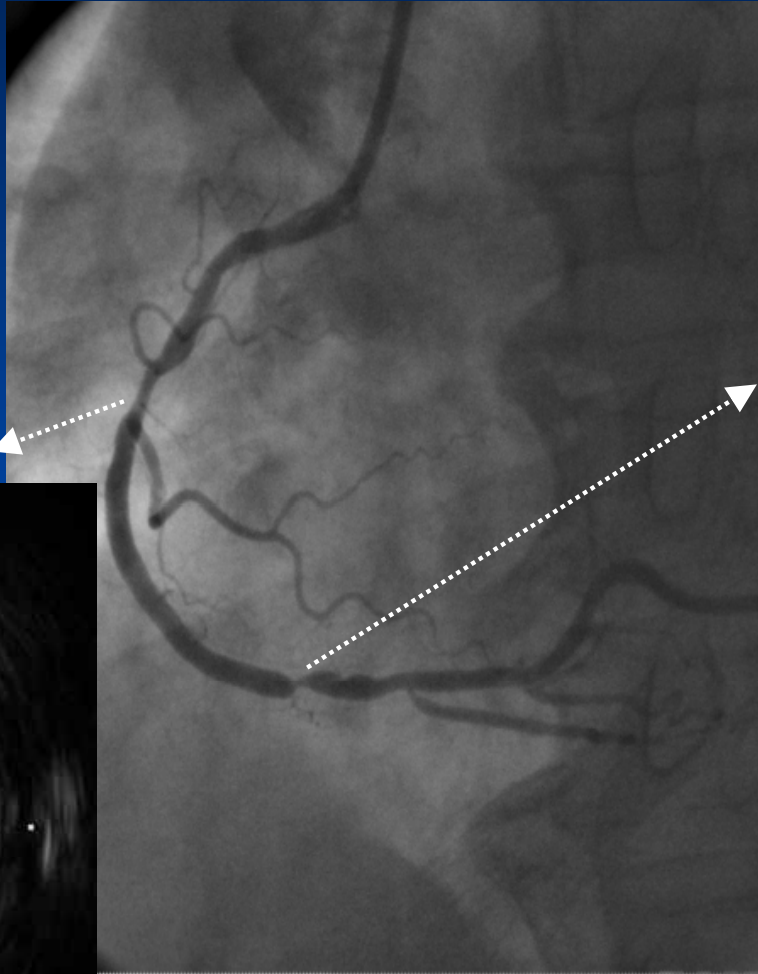
Treadmill Test – Stage 3



Early termination due to Dyspnea / Claudication / Fatigue (leg)
Conclusion - Negative

Tandem Lesion IVUS

MLA : 3.05 mm²

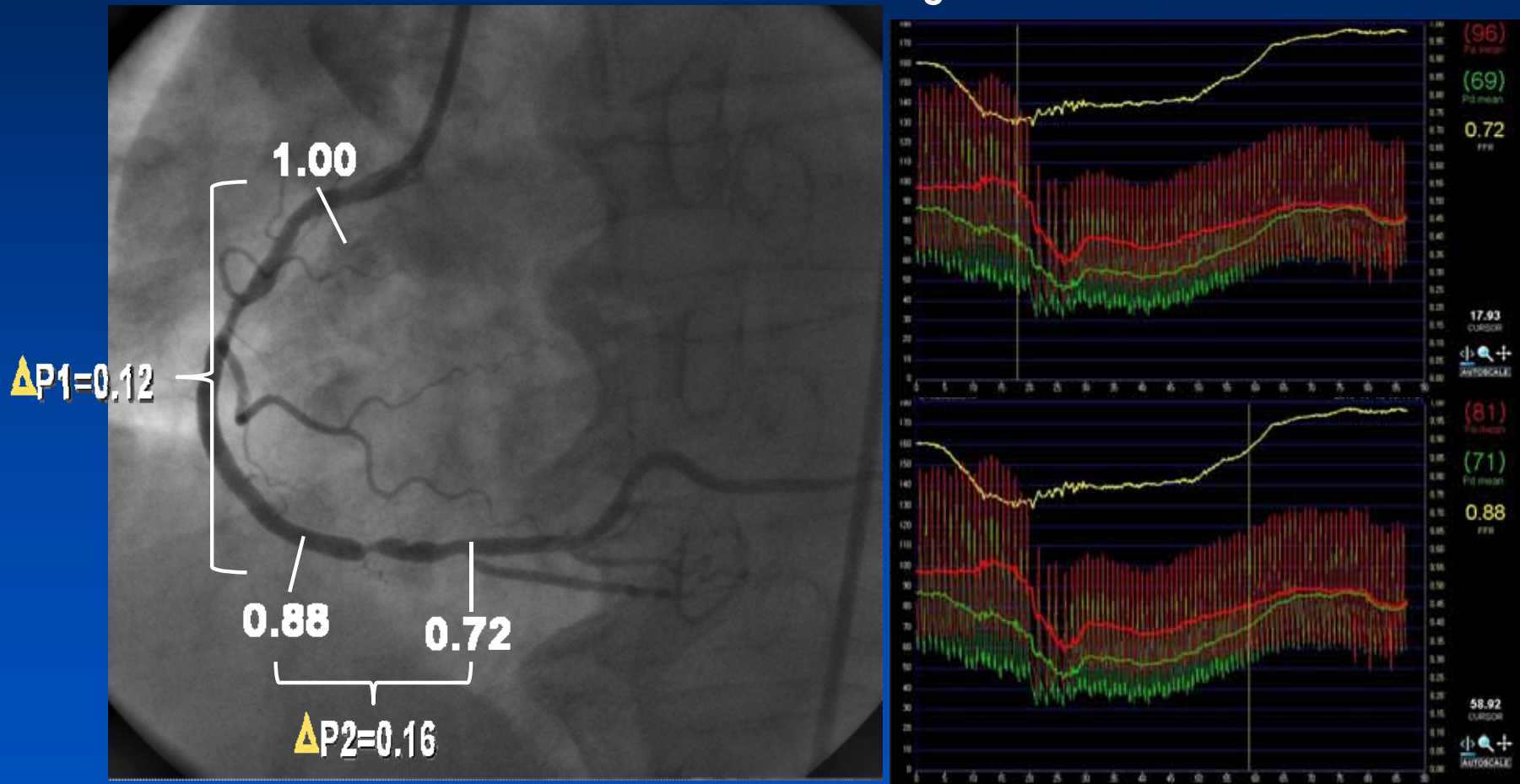


MLA : 1.81 mm²



“ Delta of FFR ”

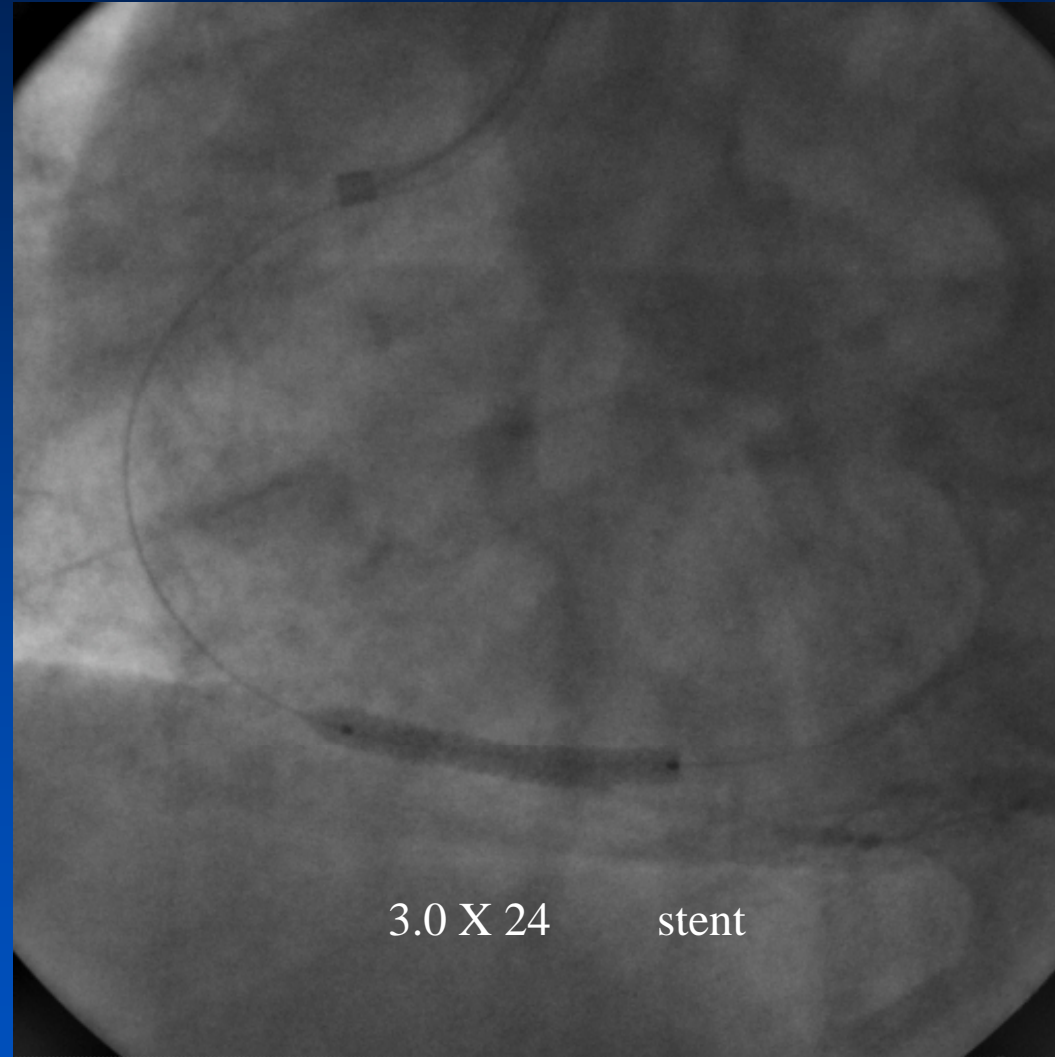
Pre PCI - N/S 100cc + Denosin 180mg mix I.V. infusion 287cc/hr



△ FFR1

△ FFR2

Stenting Distal First !



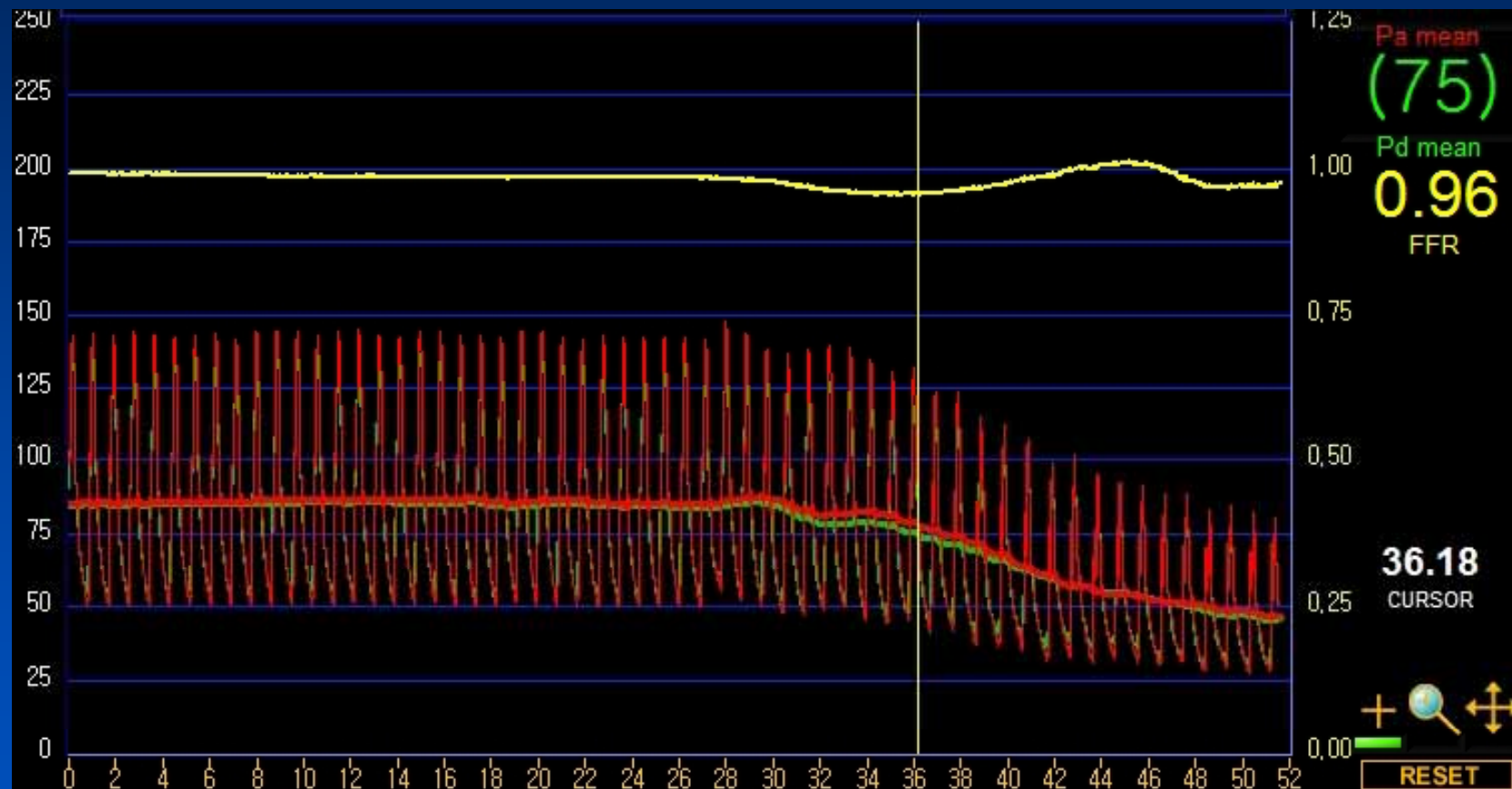
3.0 X 24 stent

Tandem Lesion

Distal Lesion Stent First

FFR

Post PCI - N/S 100cc + Denosin 180mg mix I.V. infusion 287cc/hr



Pre Denosin infusion : 1.0 Post Denosin infusion : 0.96

Tandem Lesion Angiography



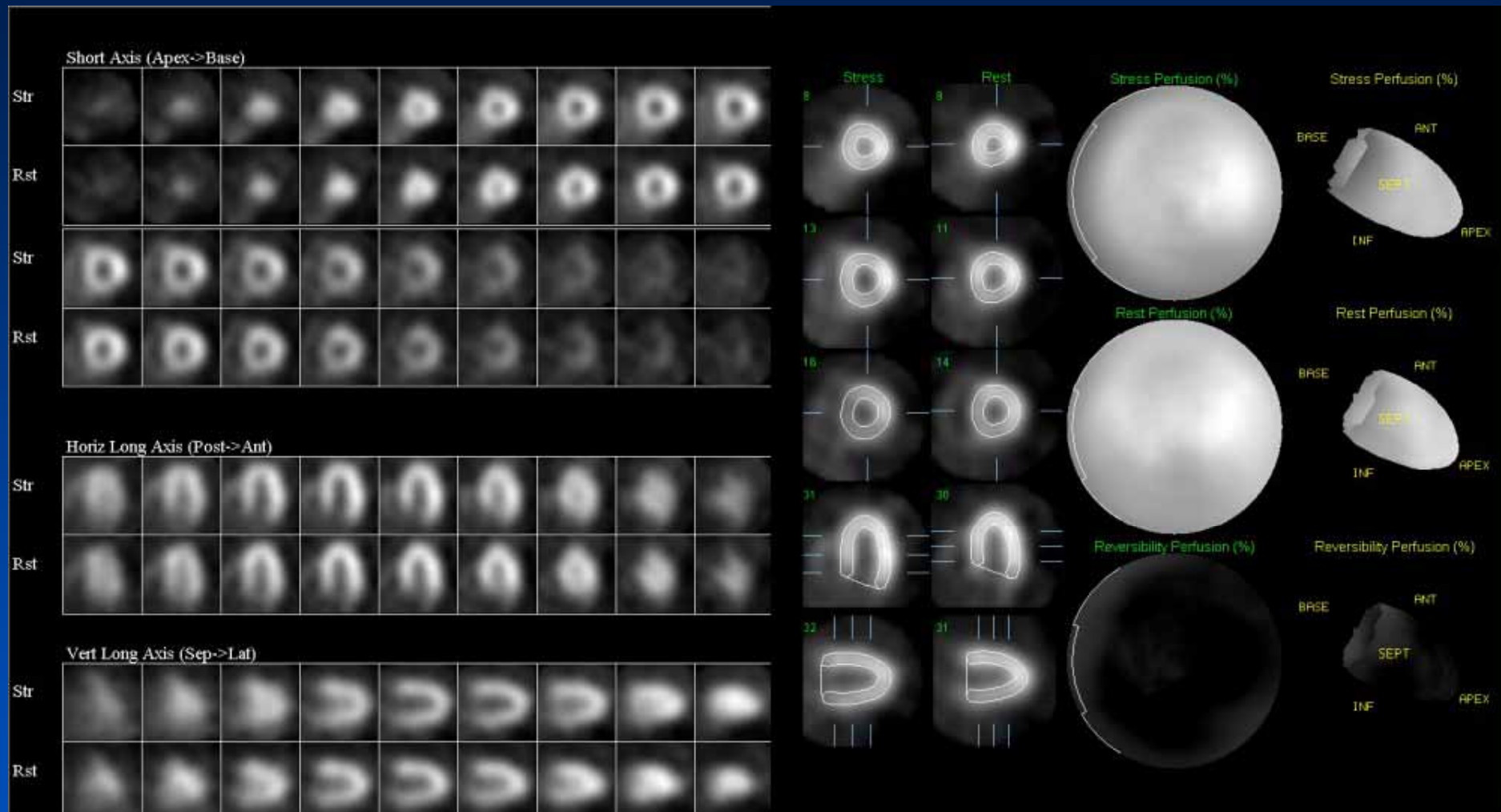
Pre PCI Image

Post PCI Image

Tandem Lesion

- 66 Years-Old Male
- Chief Complaint – Effort chest discomfort
- Risk Factors
 -

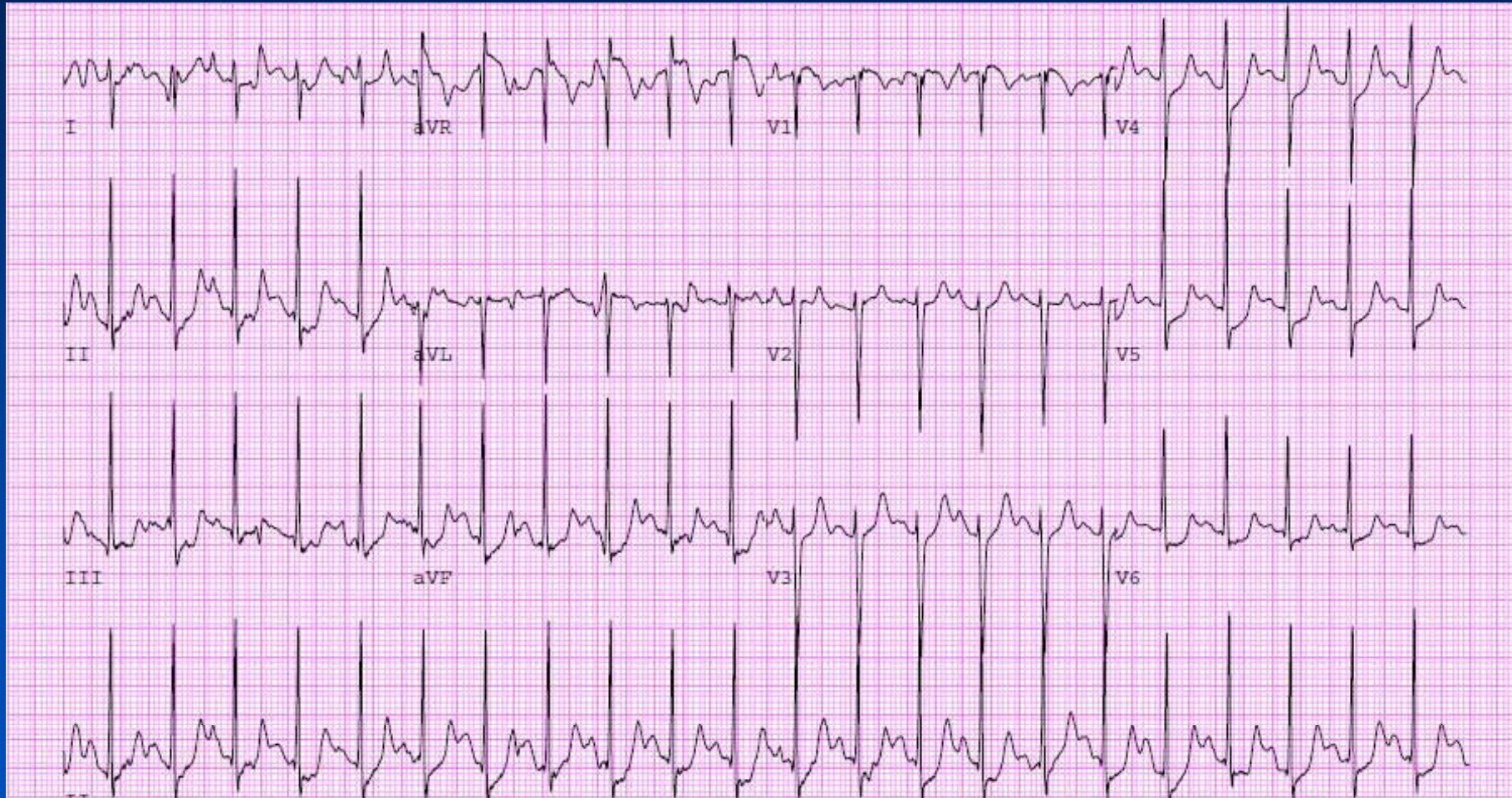
Tandem Lesion



Normal gated myocardial perfusion

Tandem Lesion

Treadmill Test – Stage 4



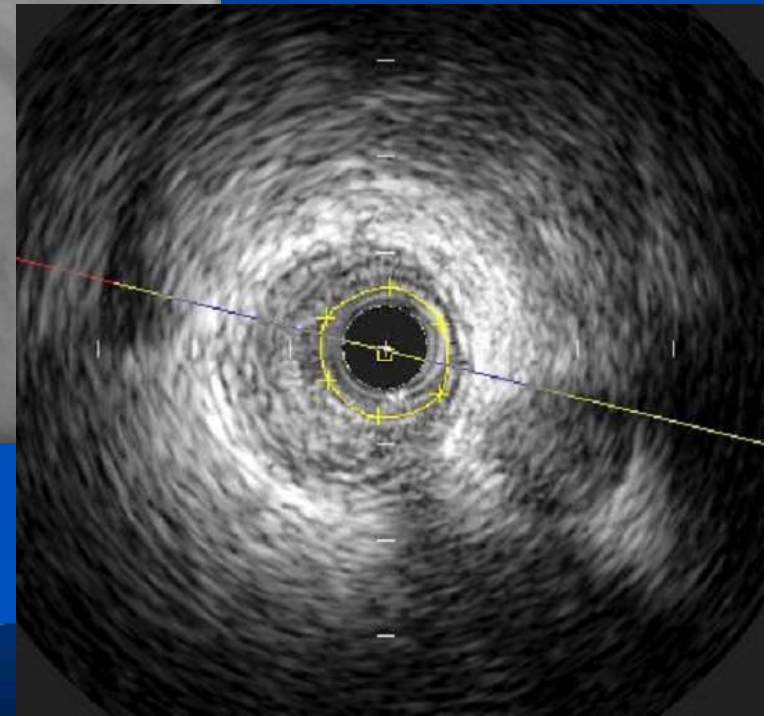
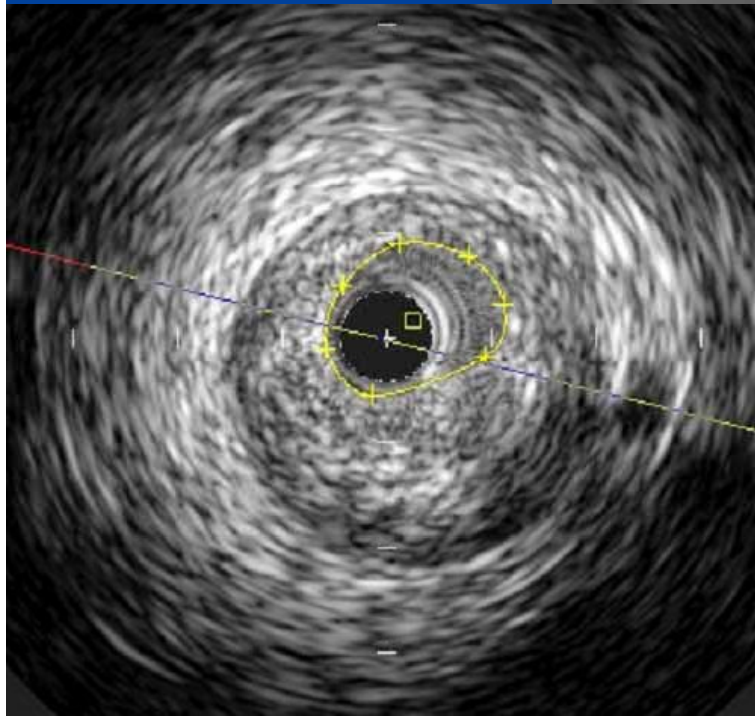
Early termination due to Target HR
Conclusion - Negative

Tandem Lesion IVUS

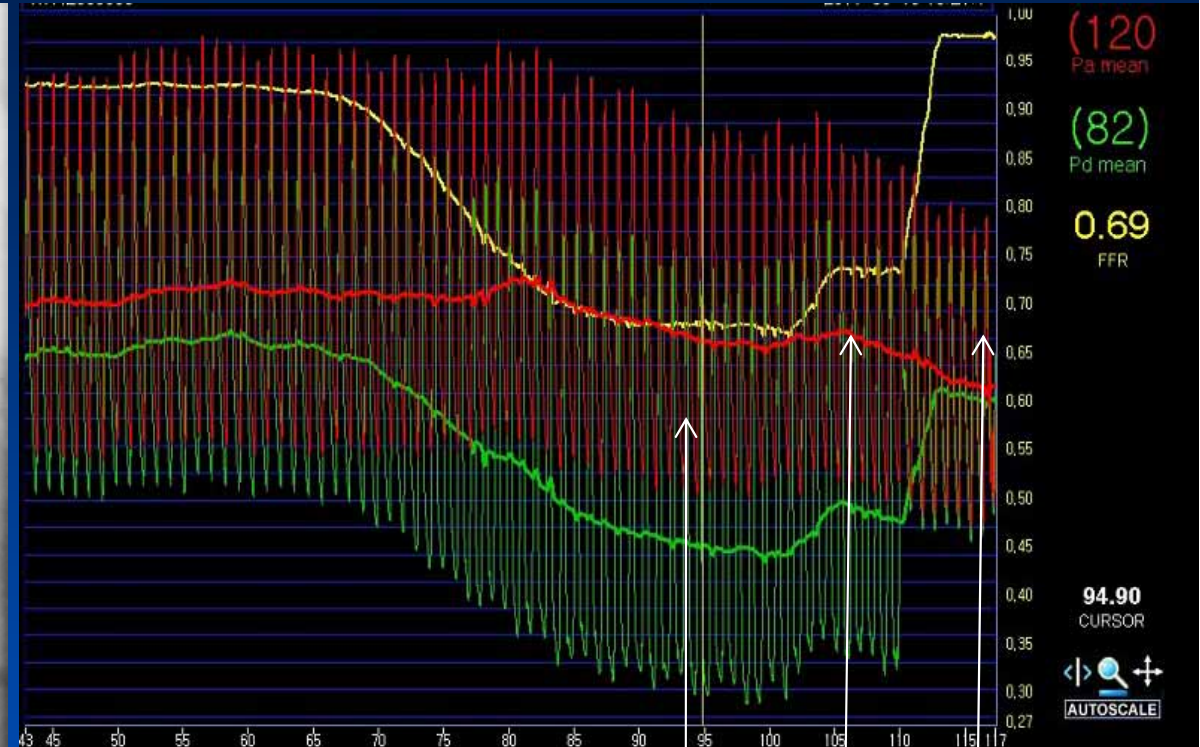
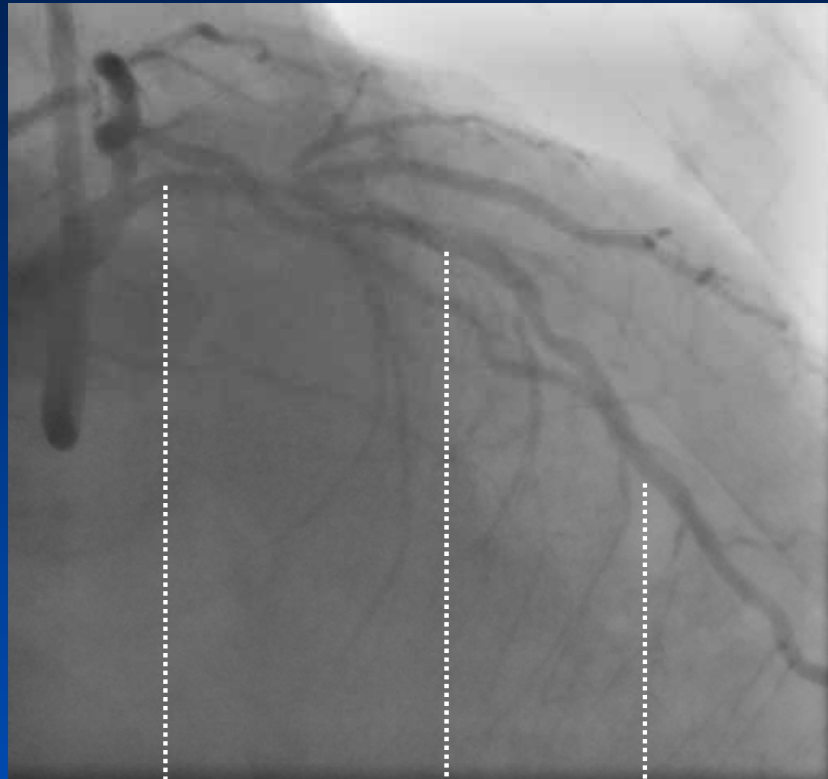


MLA : 1.86 mm²

MLA : 2.01 mm²



“ Delta of FFR ”



1.0

0.76

0.69

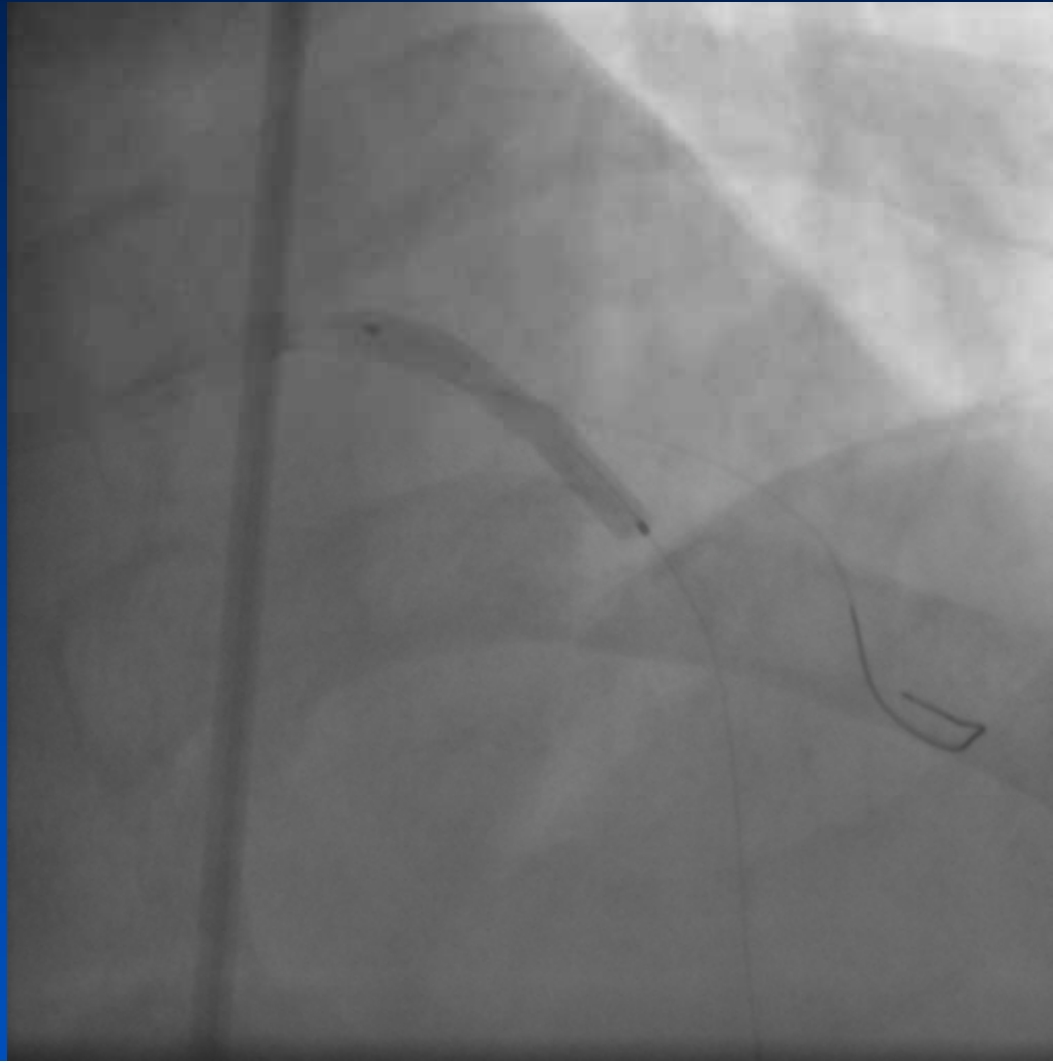
$\Delta FFR1 = 0.24$

$\Delta FFR2 = 0.07$

$\Delta FFR1$

$\Delta FFR2$

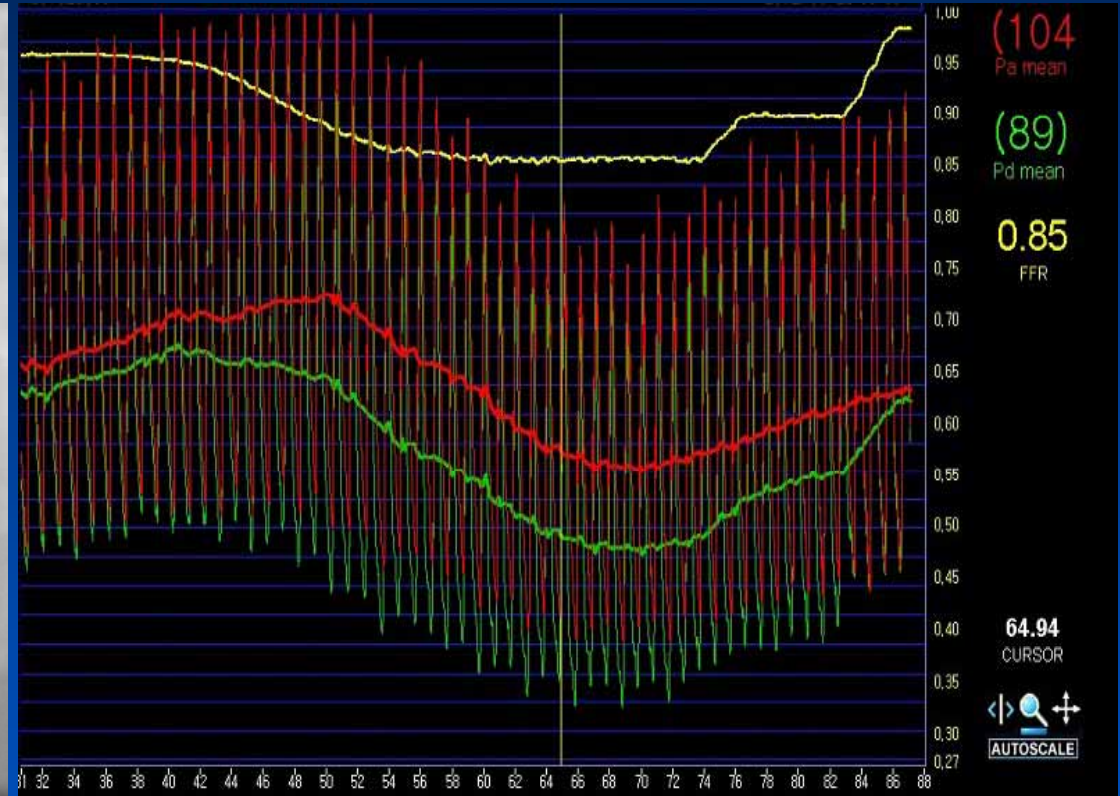
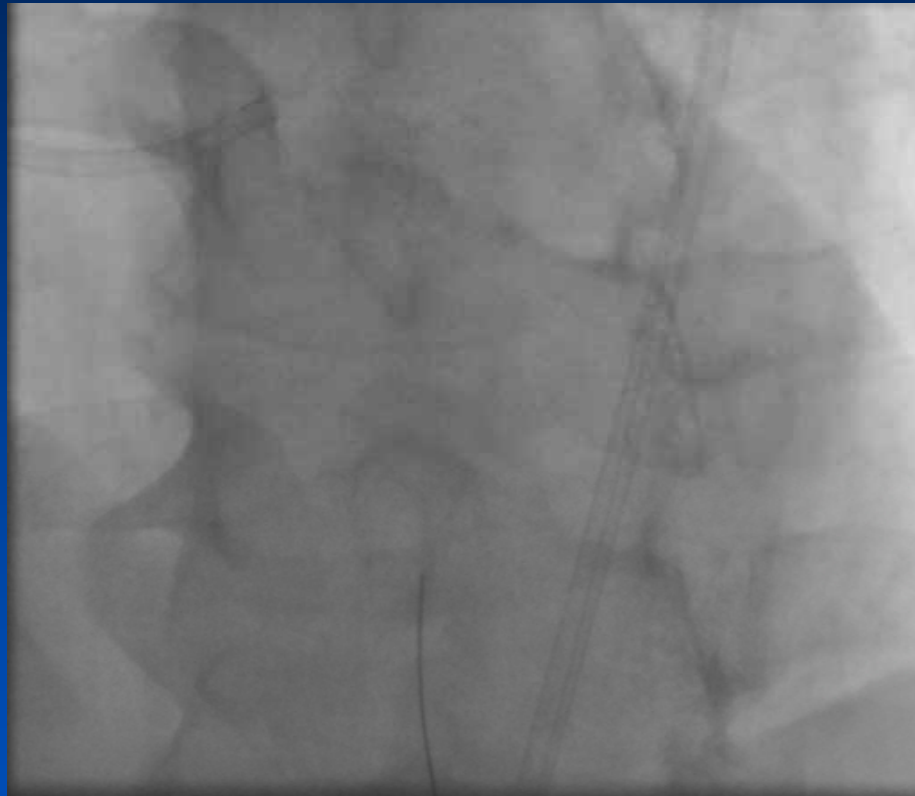
Stenting Proximal First !



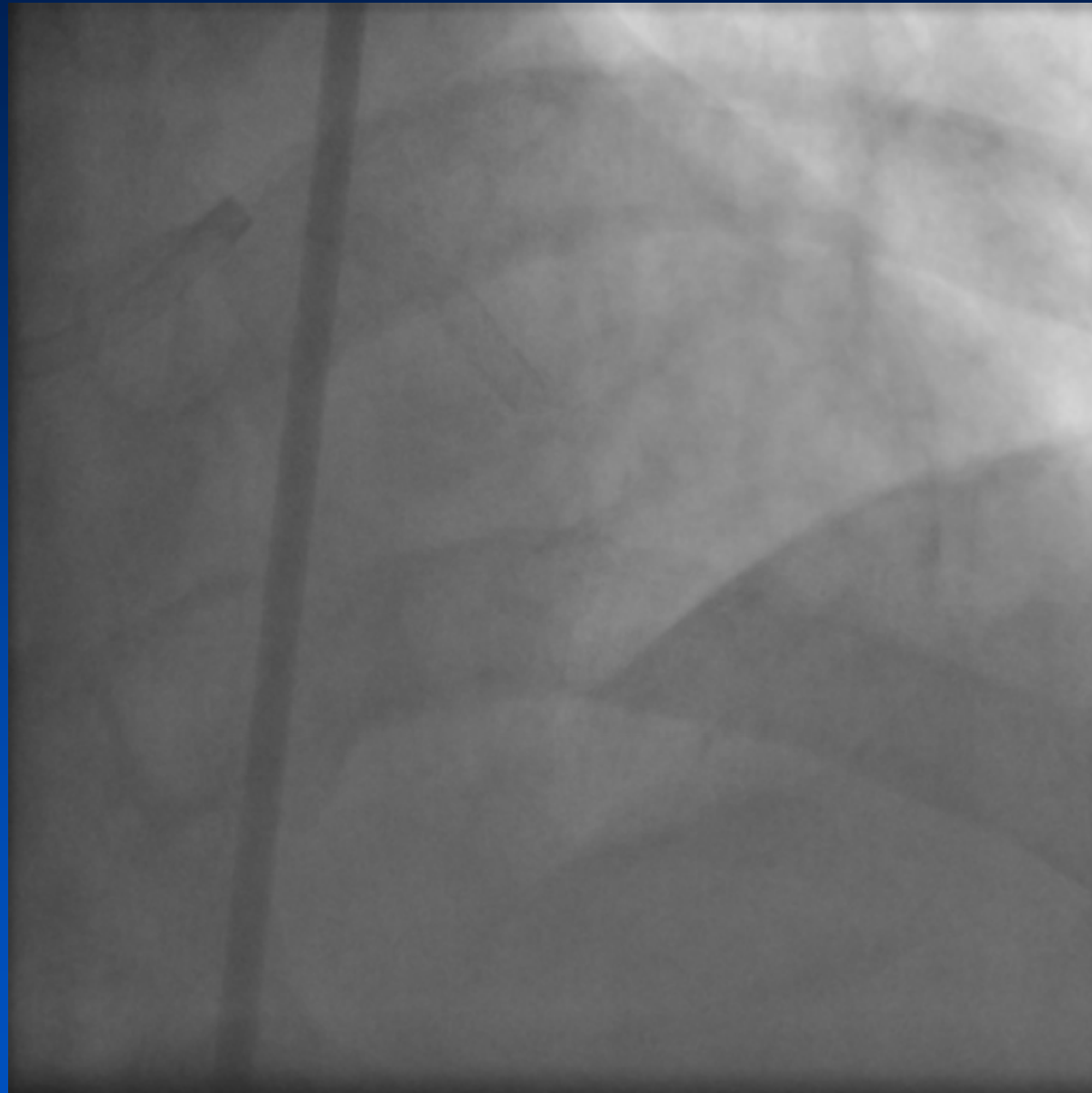
3.5 X 23 stent

Proximal Lesion Stent First, FFR 0.85

Post PCI - N/S 100cc + Denosin 180mg mix I.V. infusion 287cc/hr



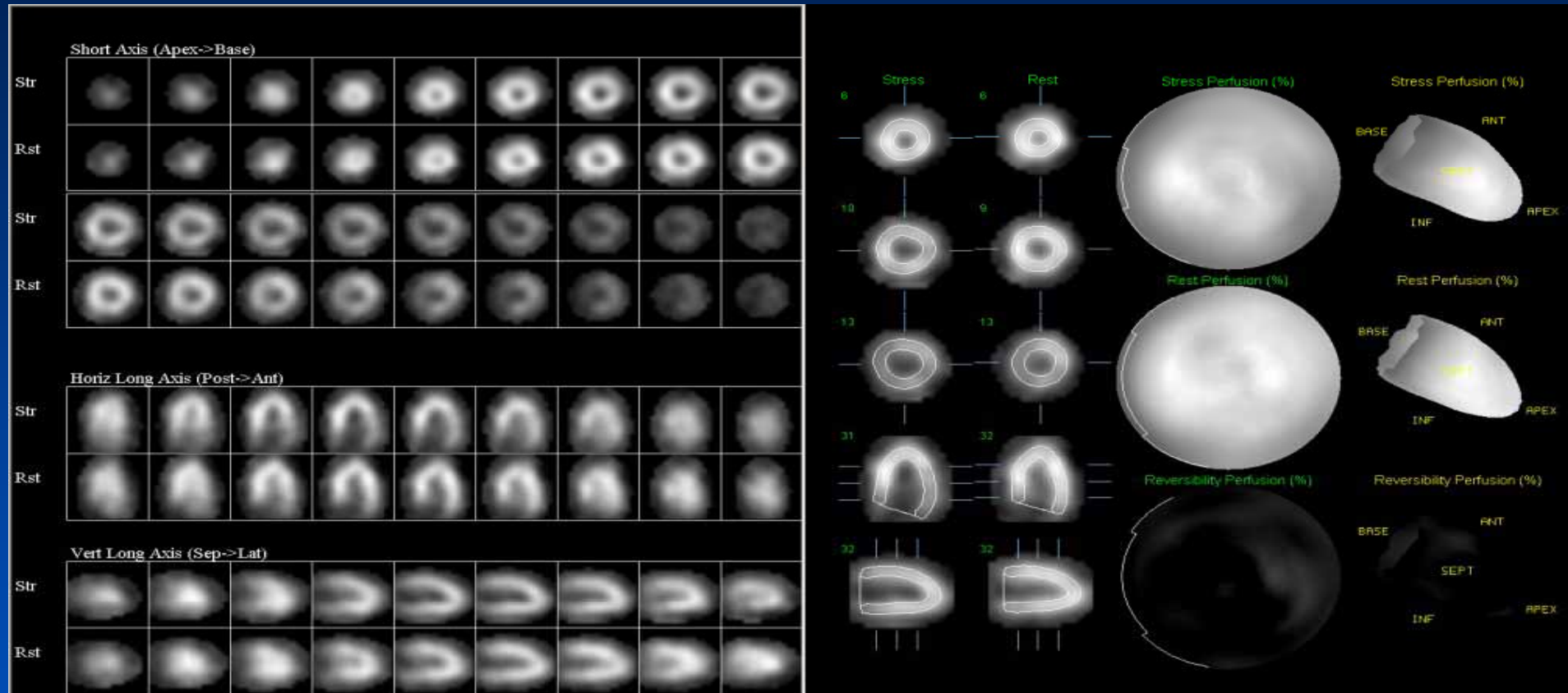
Final



Tandem Lesion

- 63 Years-Old Male
- Chief Complaint – dyspnea on exercise
- Risk Factors
 - DM , HTN

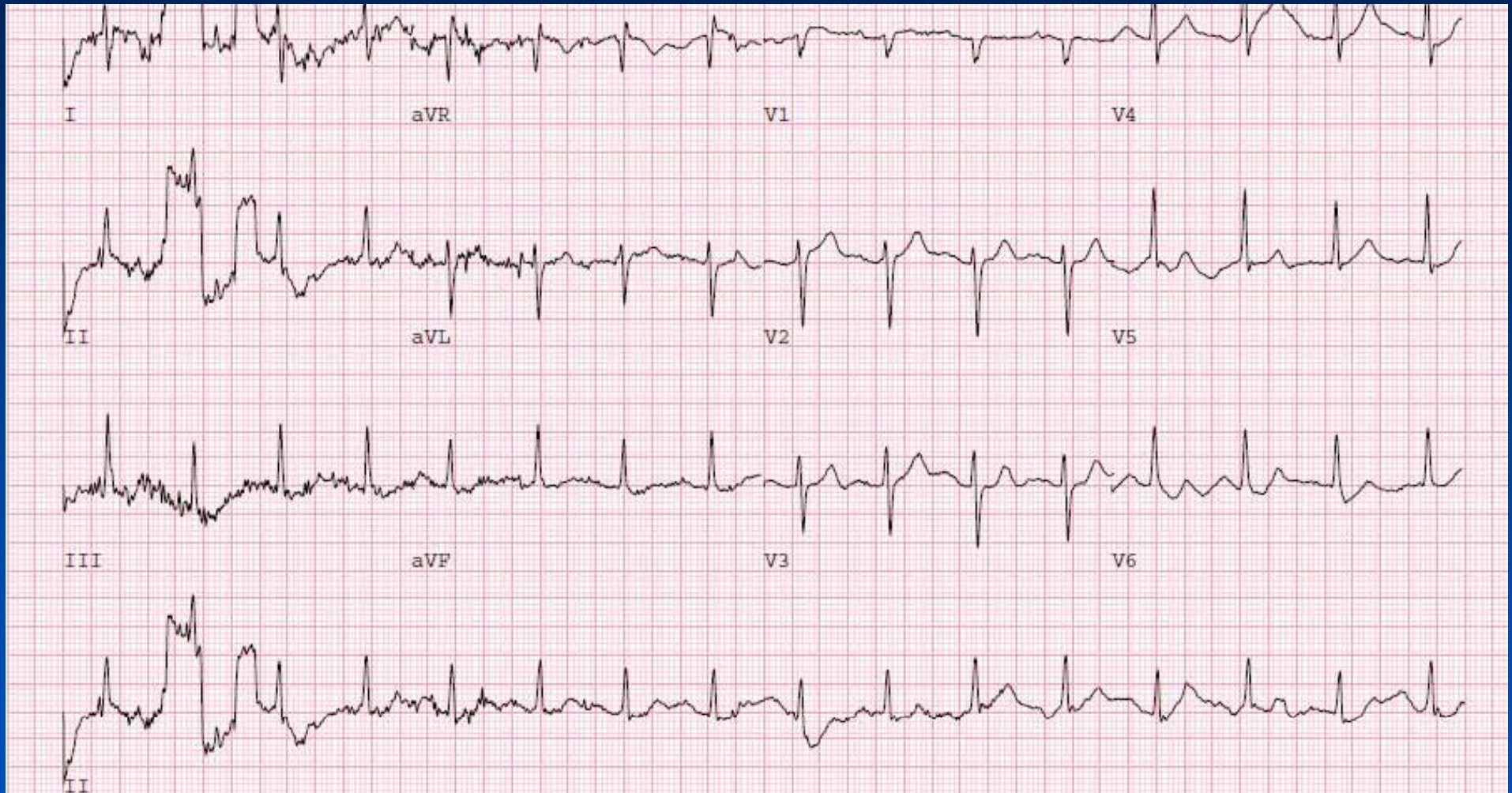
Tandem Lesion Thallium SPECT



Abnormal gated myocardial perfusion TI-201 SPECT after adenosine stress showing
Reversible medium sized mild-to-moderately decreased perfusion in mid-basal anterolateral and basal inferolateral wall

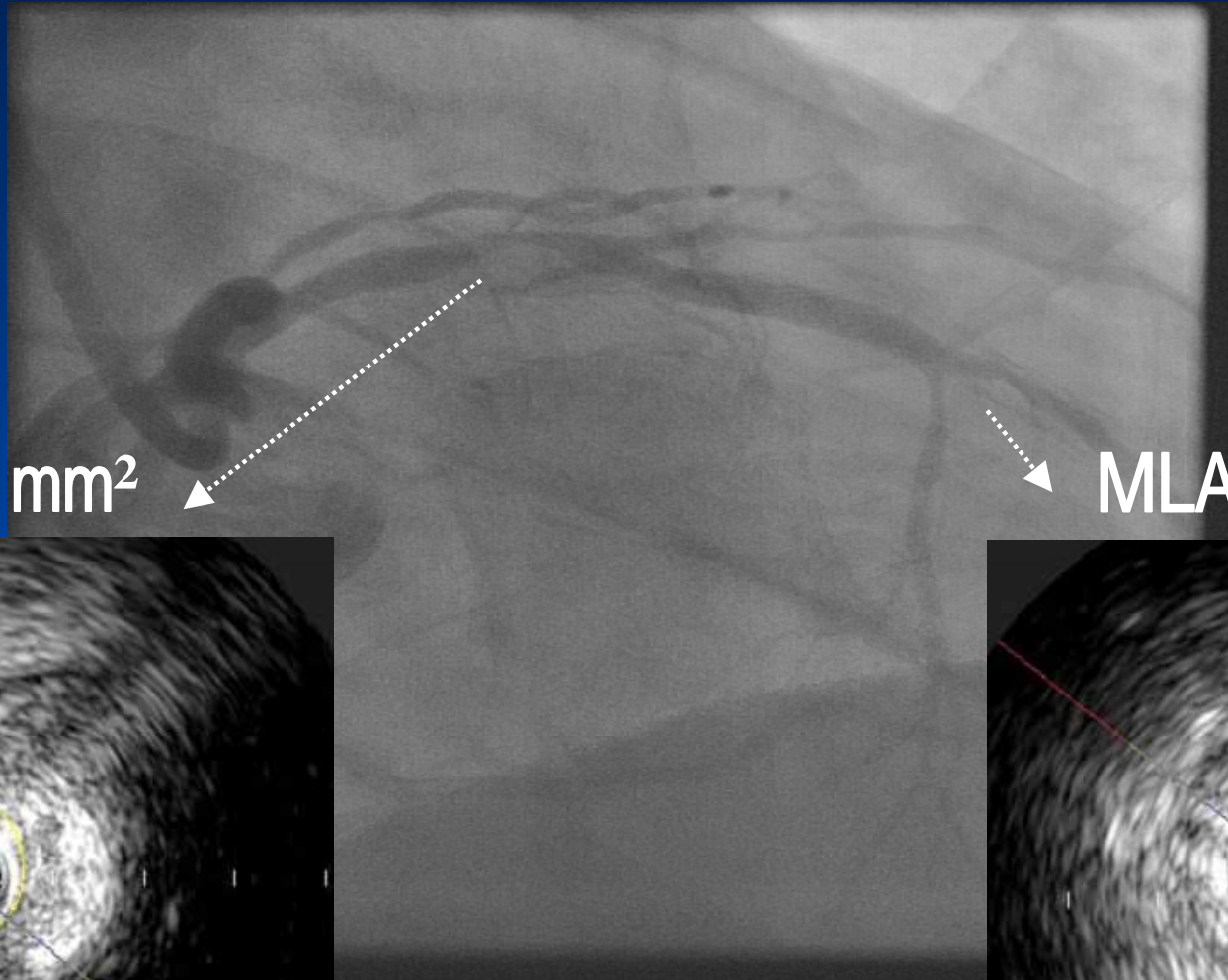
Tandem Lesion

Treadmill Test – Stage 3



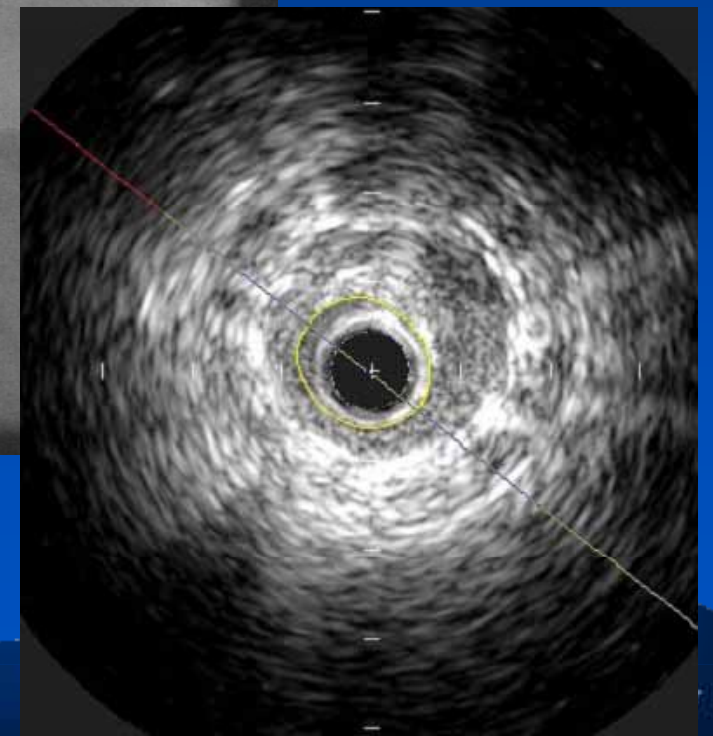
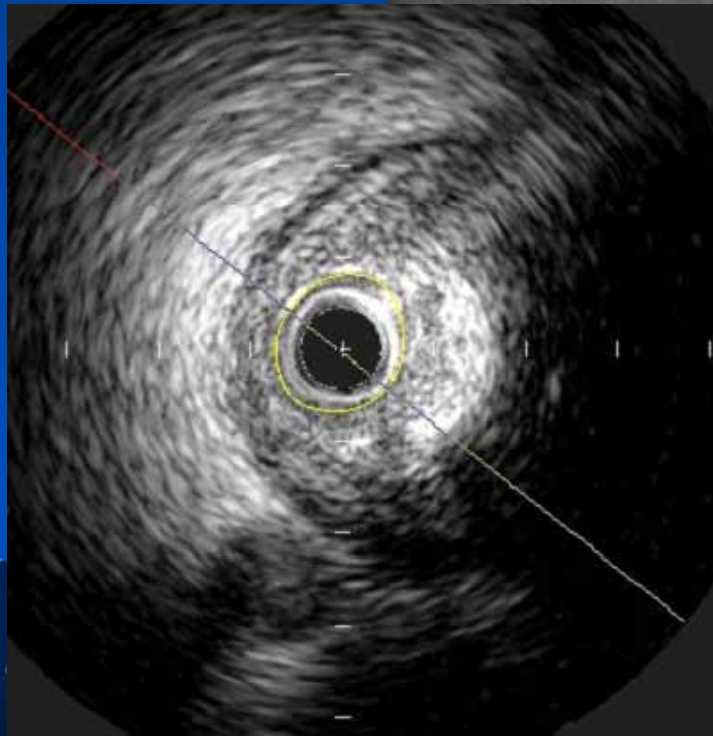
Early termination due to Dyspnea / Fatigue (leg)
Conclusion - Negative

Tandem Lesion IVUS

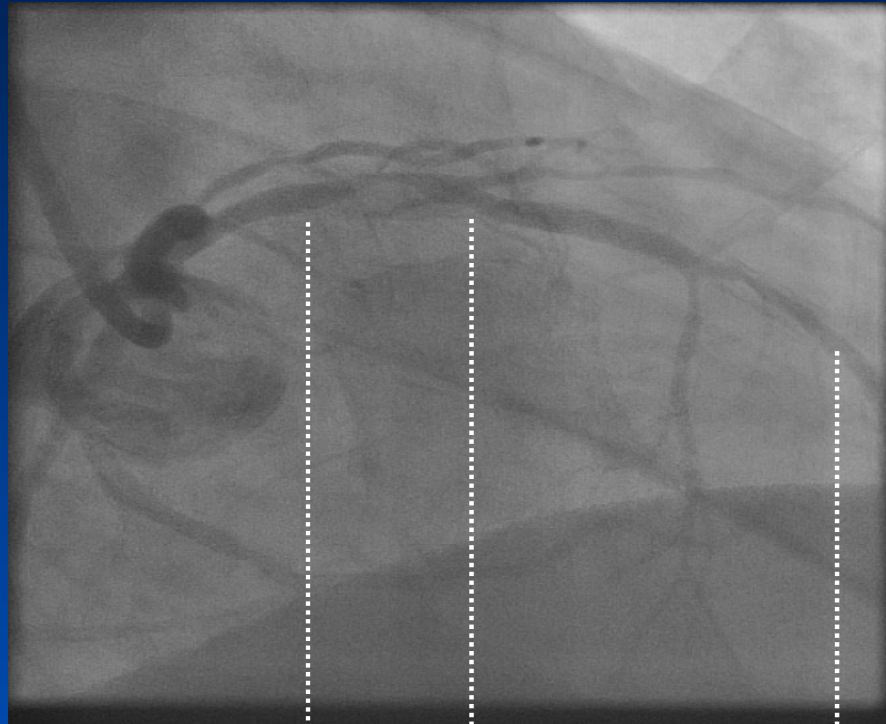


MLA : 1.6 mm²

MLA : 1.61 mm²



“ Delta of FFR ”



1.0

0.70

0.59

0.59

0.70

1.0

$\Delta FFR1 = 0.30$

$\Delta FFR2 = 0.11$

$\Delta FFR1$

$\Delta FFR2$

Stenting proximal First !



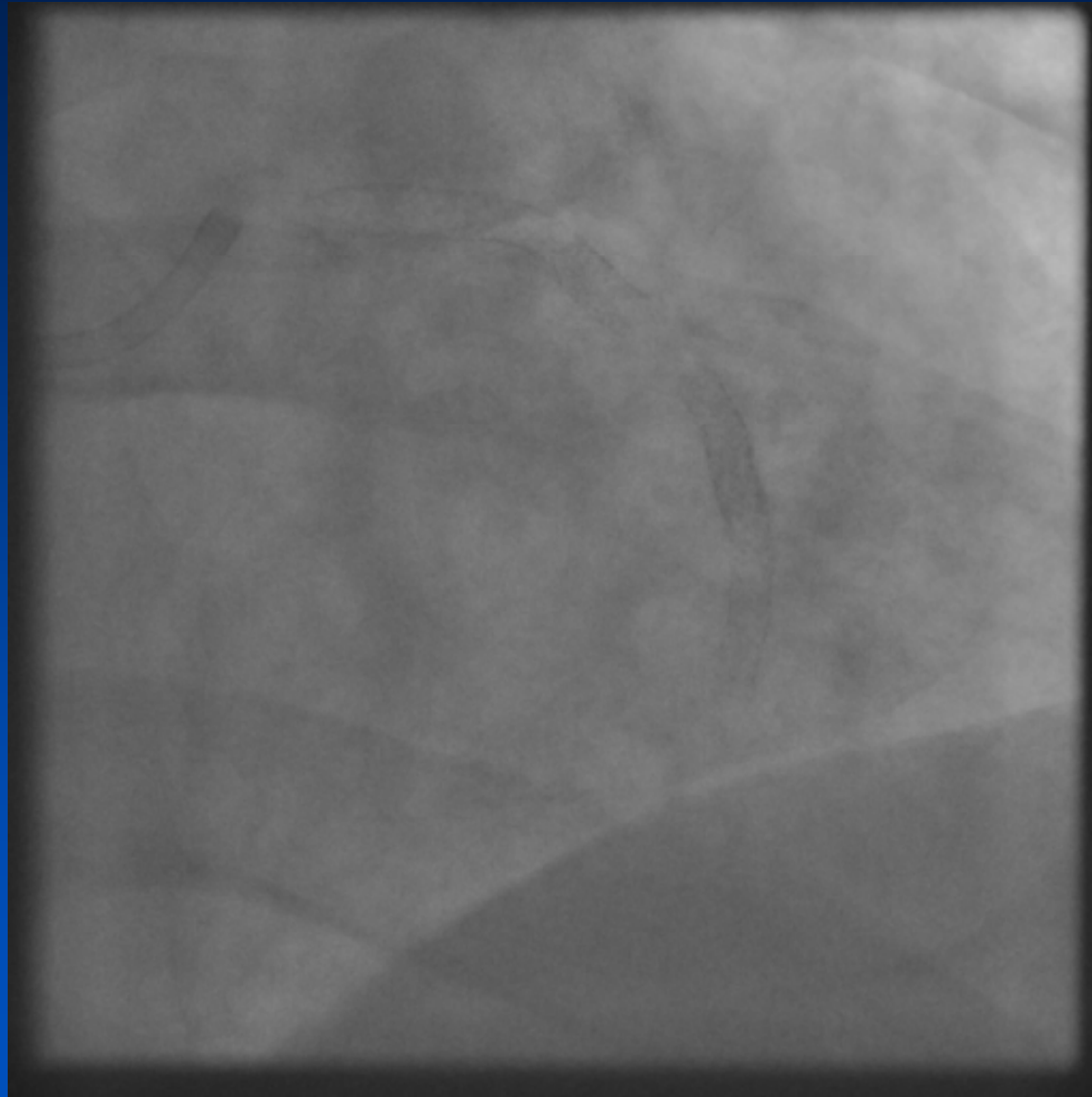
3.5 X 28 stent

Proximal Lesion Stent First, FFR again, 0.76



FFR 0.76

Stenting



1 more stent 2.75 X 28

Tandem Lesion final FFR

Post PCI - N/S 100cc + Denosin 180mg mix I.V. infusion 287cc/hr

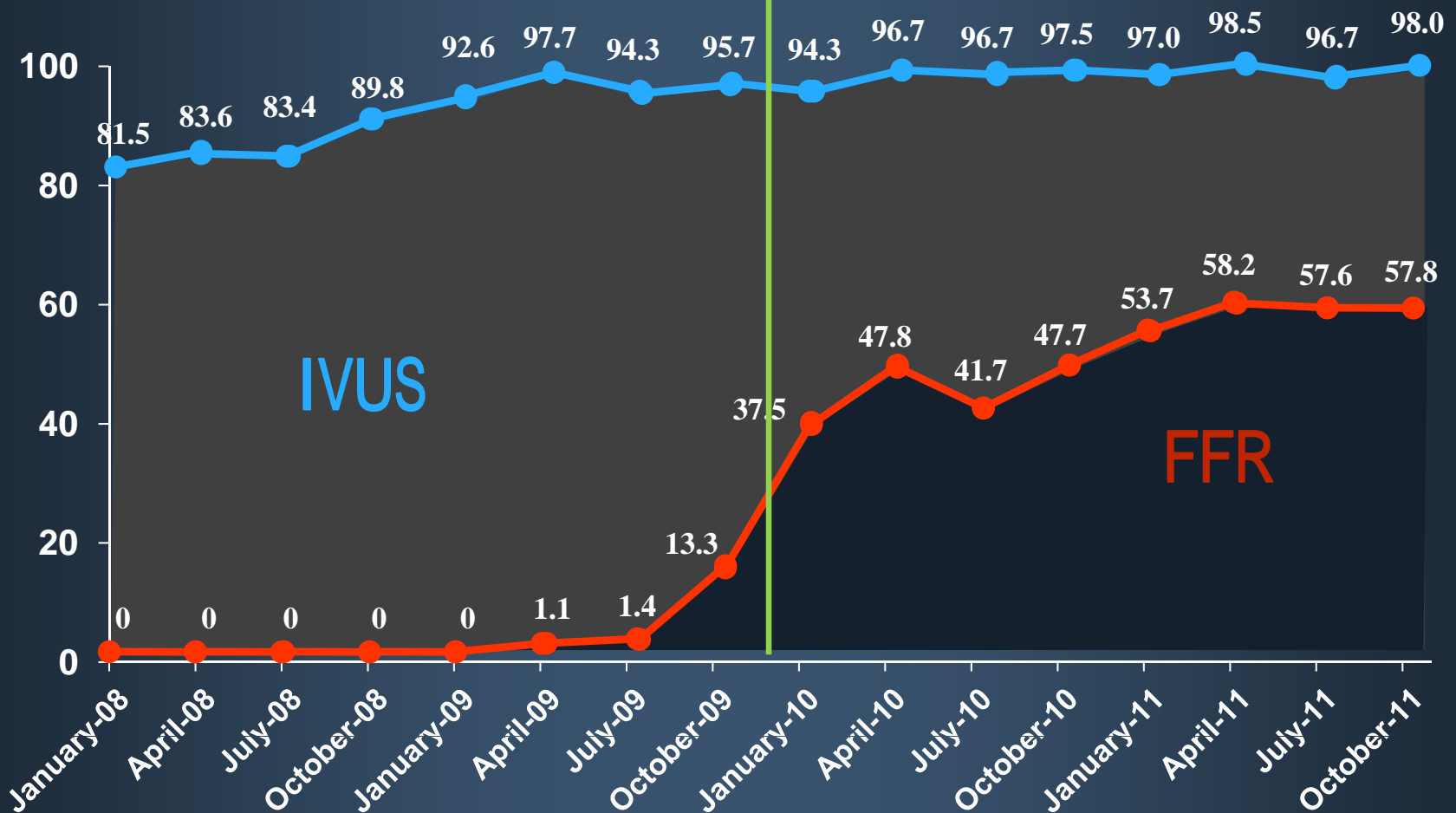


Integrated Use of FFR and IVUS

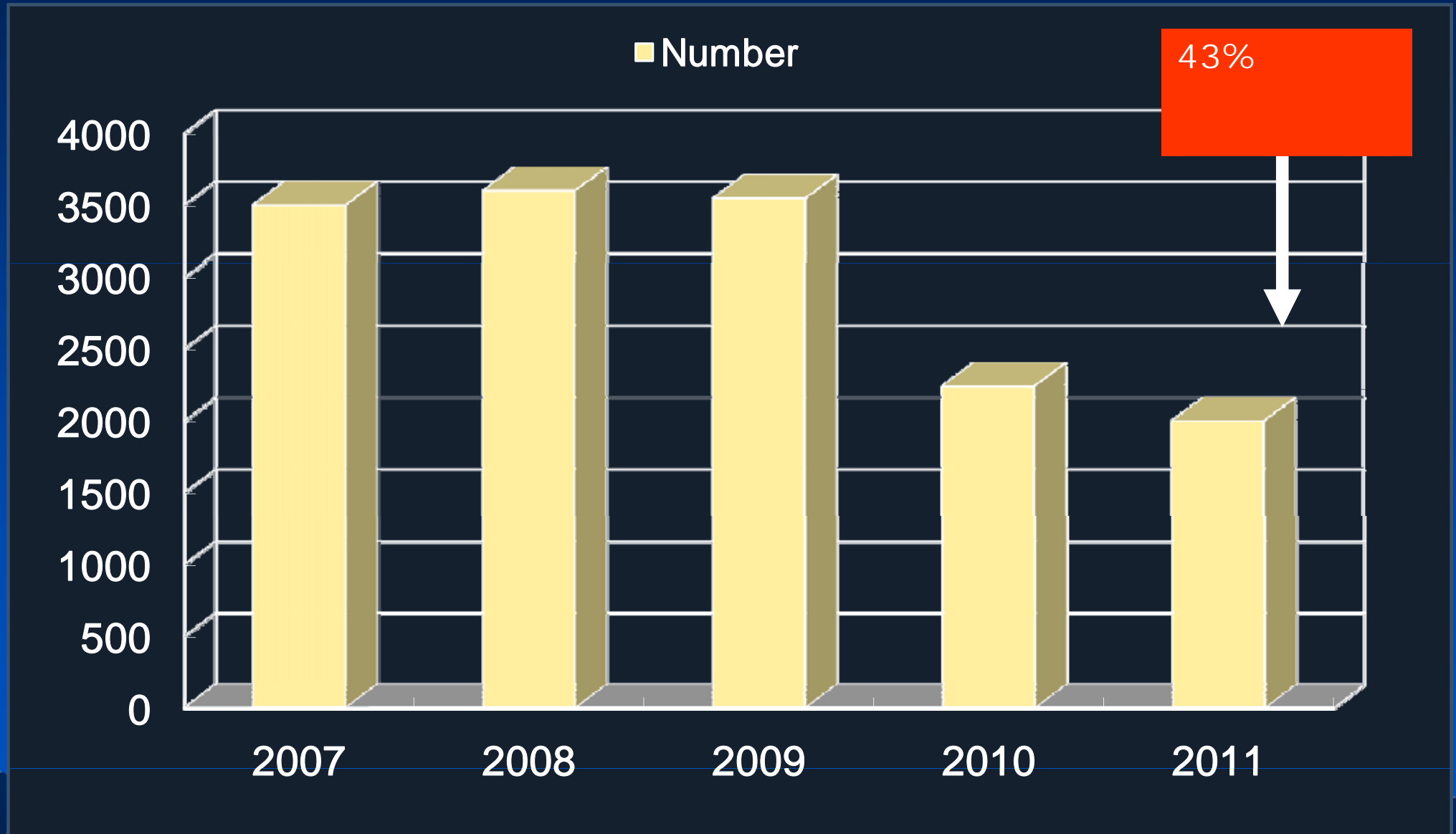
(AMC data, n=5097)

Before Routine Use of FFR
(N=2699)

After Routine Use of FFR
(N=2398)



Number of Stent Decreased



Validation of Functional State of Coronary Tandem Lesions Using Computational Flow Dynamics

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Duk-Woo Park, MD, PhD^a, Seung-Whan Lee, MD, PhD^a, Young-Hak Kim, MD, PhD^a,
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FFR Guided **Spot** Stenting
Using “**Rule of Big Delta**”

Conclusion

“Fewer Stents, Better Outcomes”
By Integrated Use of FFR



**Thank you very much for
your attention !**