IMR in Stable Patients

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Indications for IMR in Stable Patients

- To evaluate the etiology of chest pain/abnormal stress test in a patient with angiographically appearing normal coronaries
- To assess for the likelihood of peri-PCI myocardial infarction
- Research purposes

Case Example (April 13,2015):

- 72 year old retired naval officer
- HTN and dyslipidemia
- PCI of proximal LAD in 2006
- Some relief of angina
- Recent worsening angina
- Multiple stress tests (mild apical ischemia) and coronary angiograms


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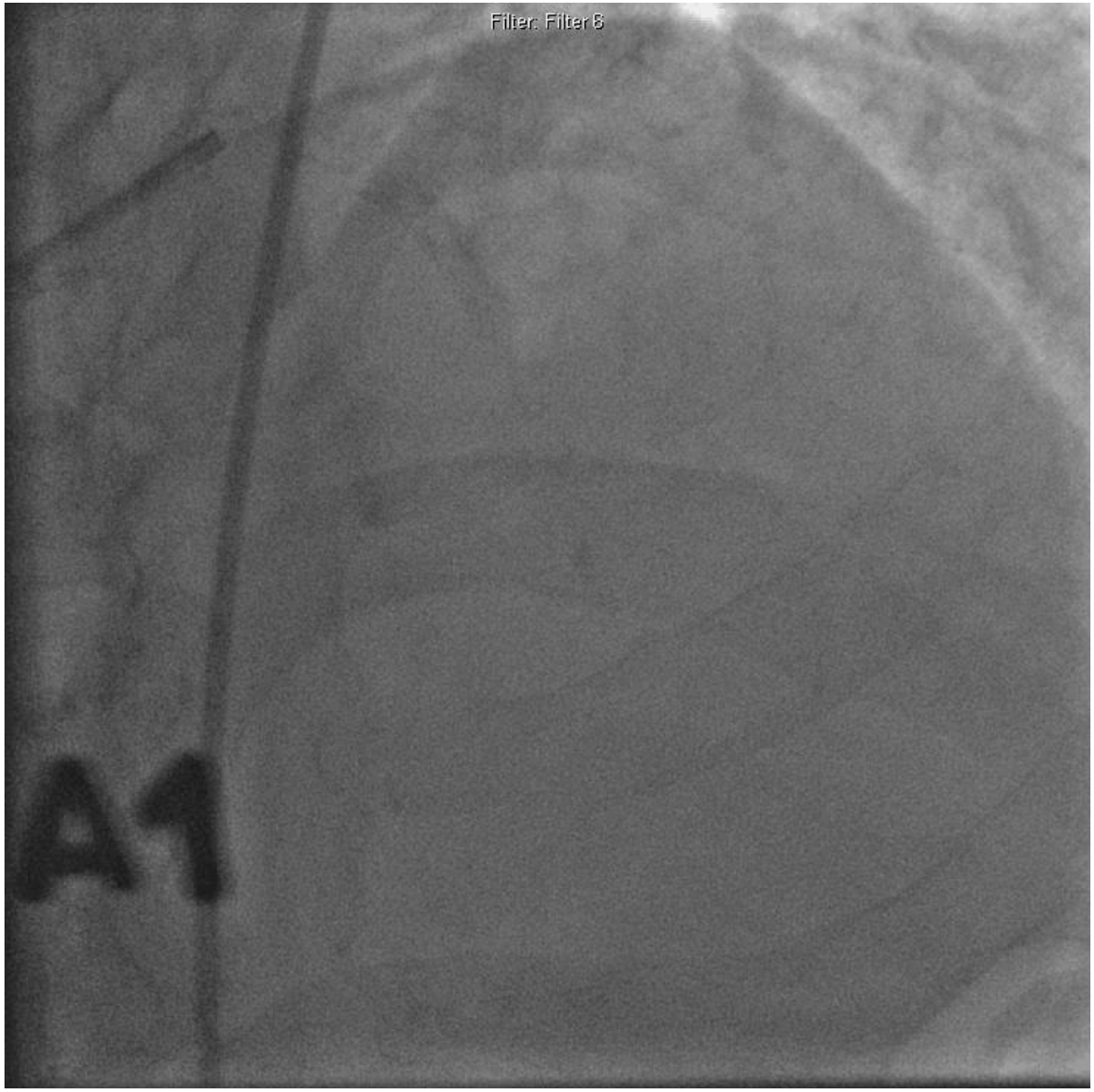
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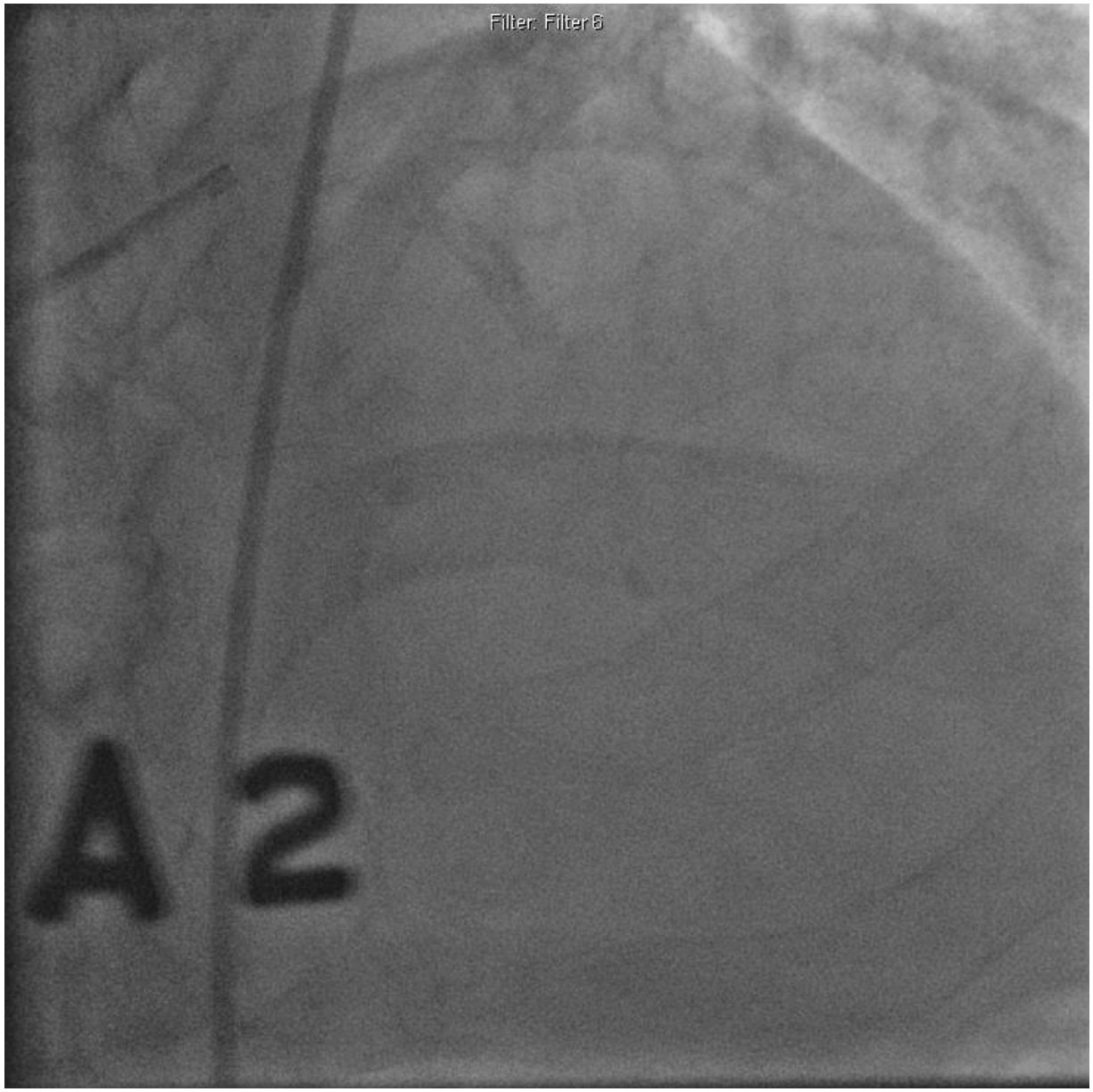
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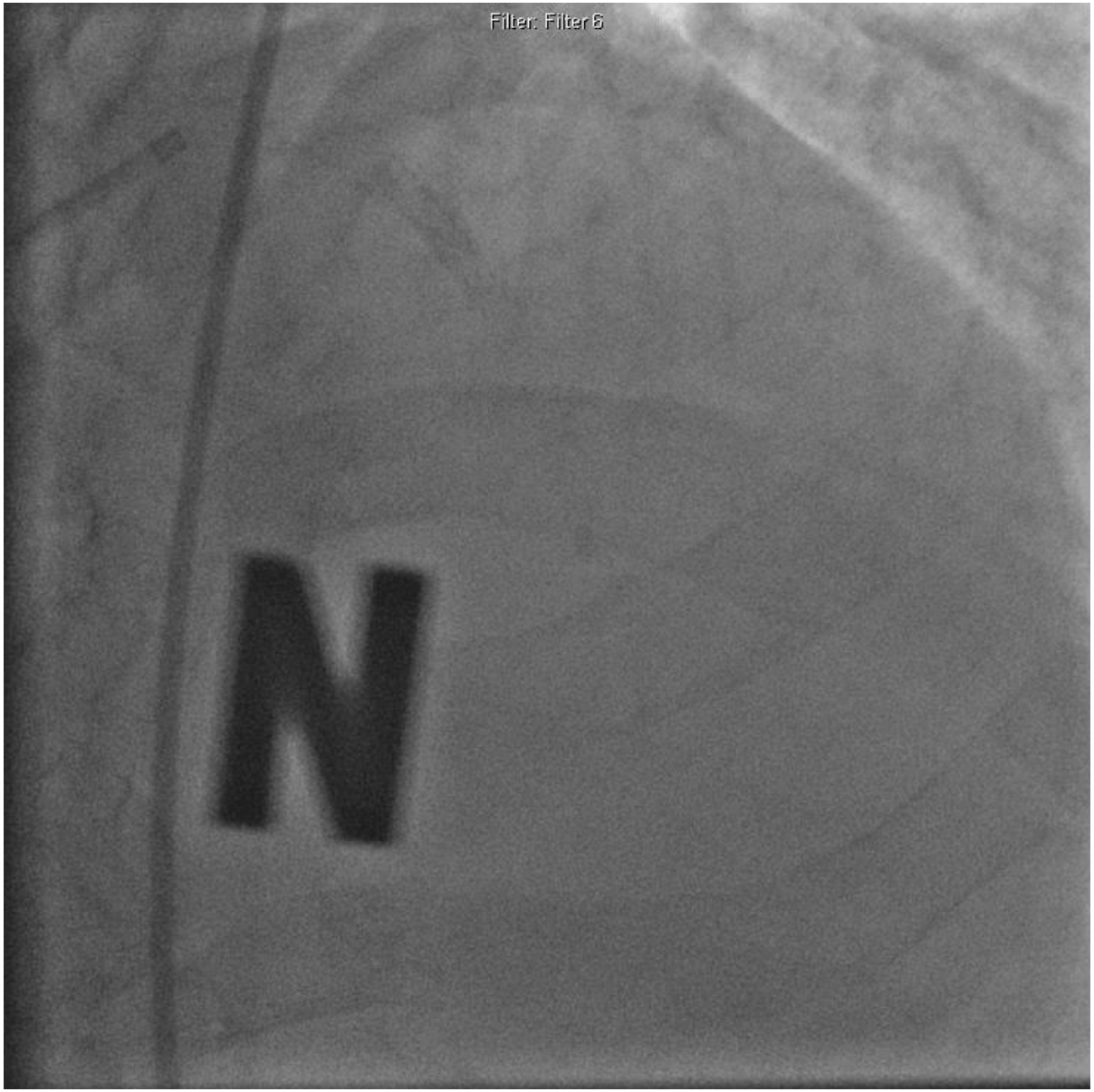
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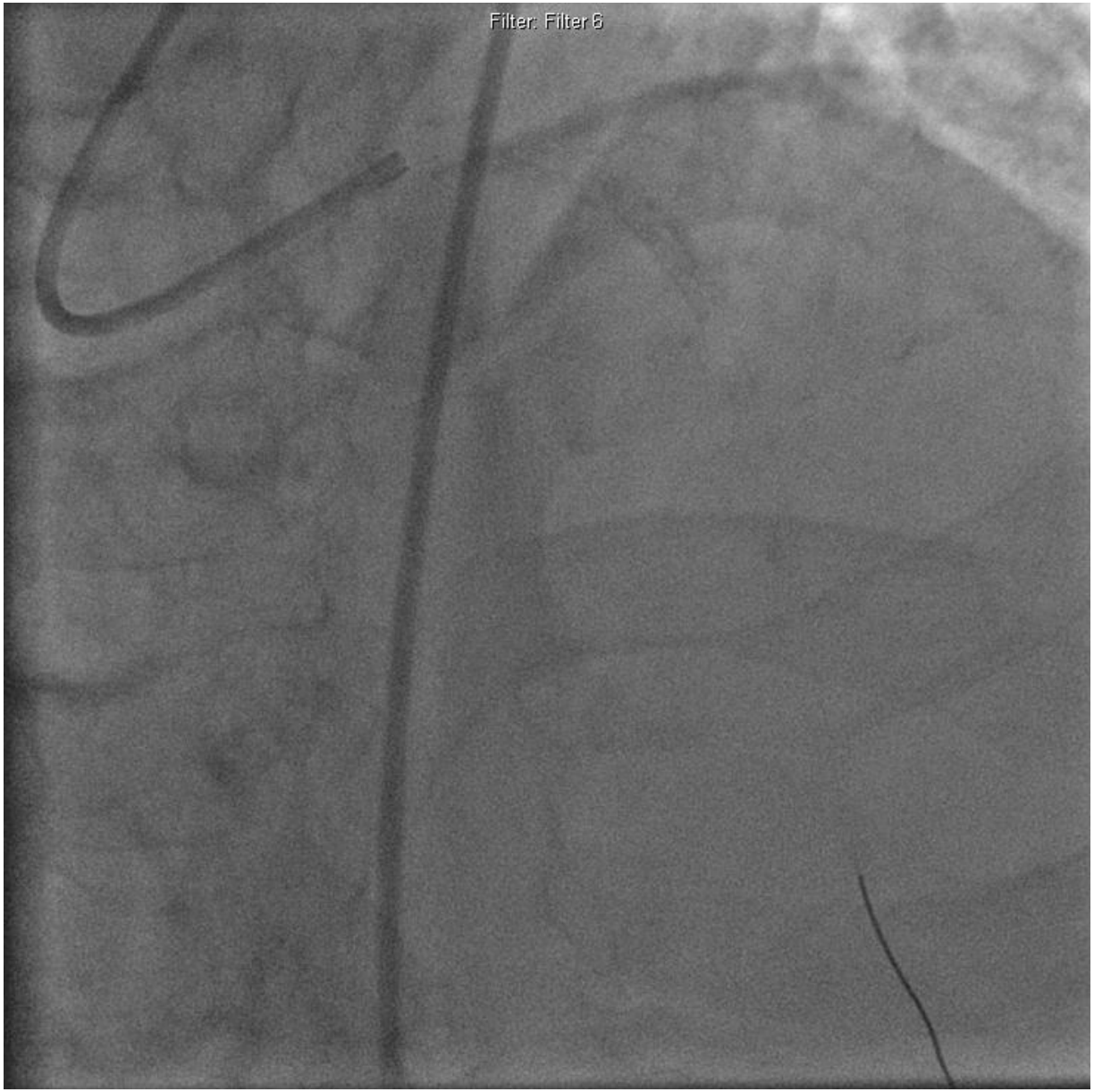
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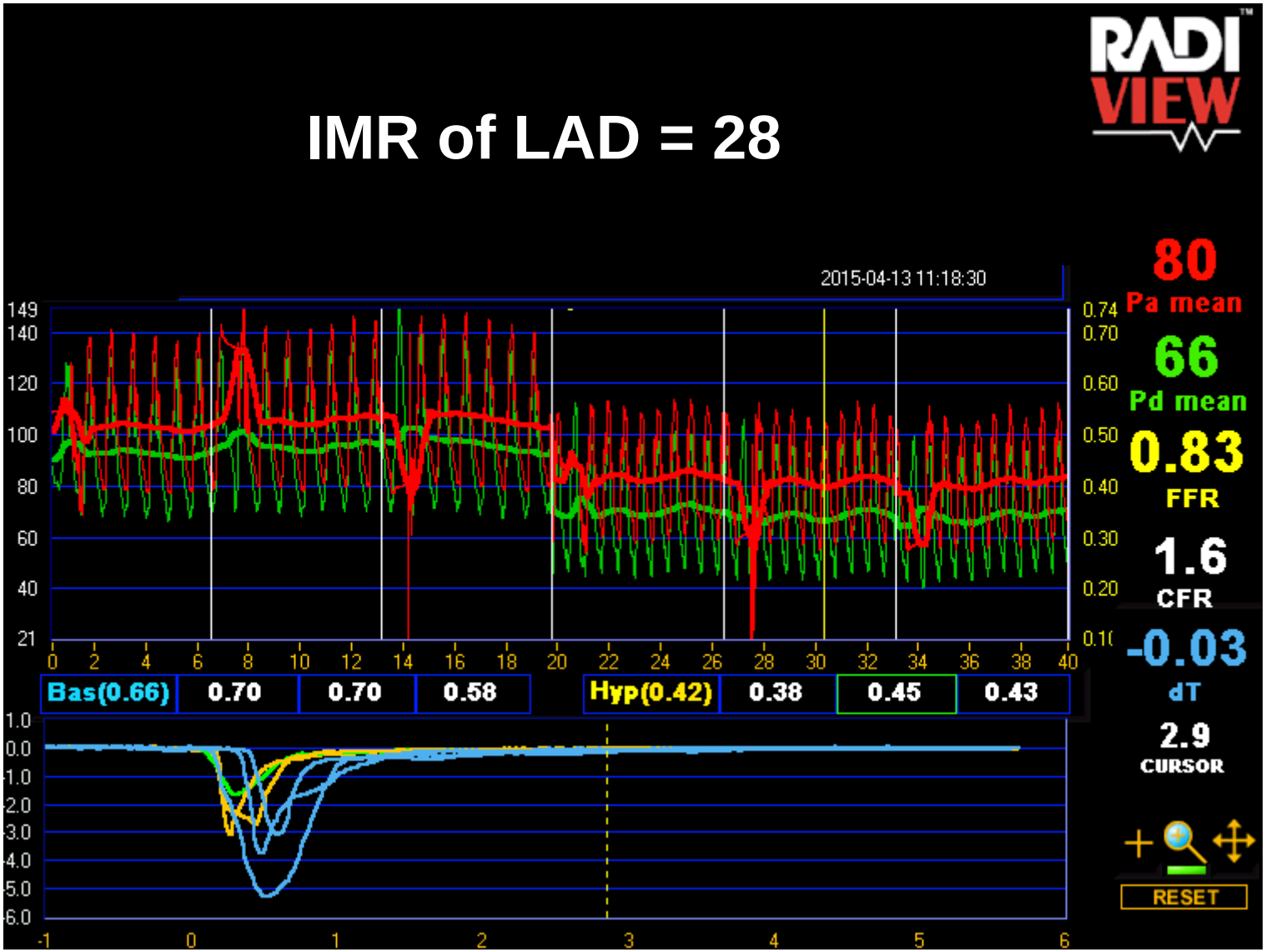
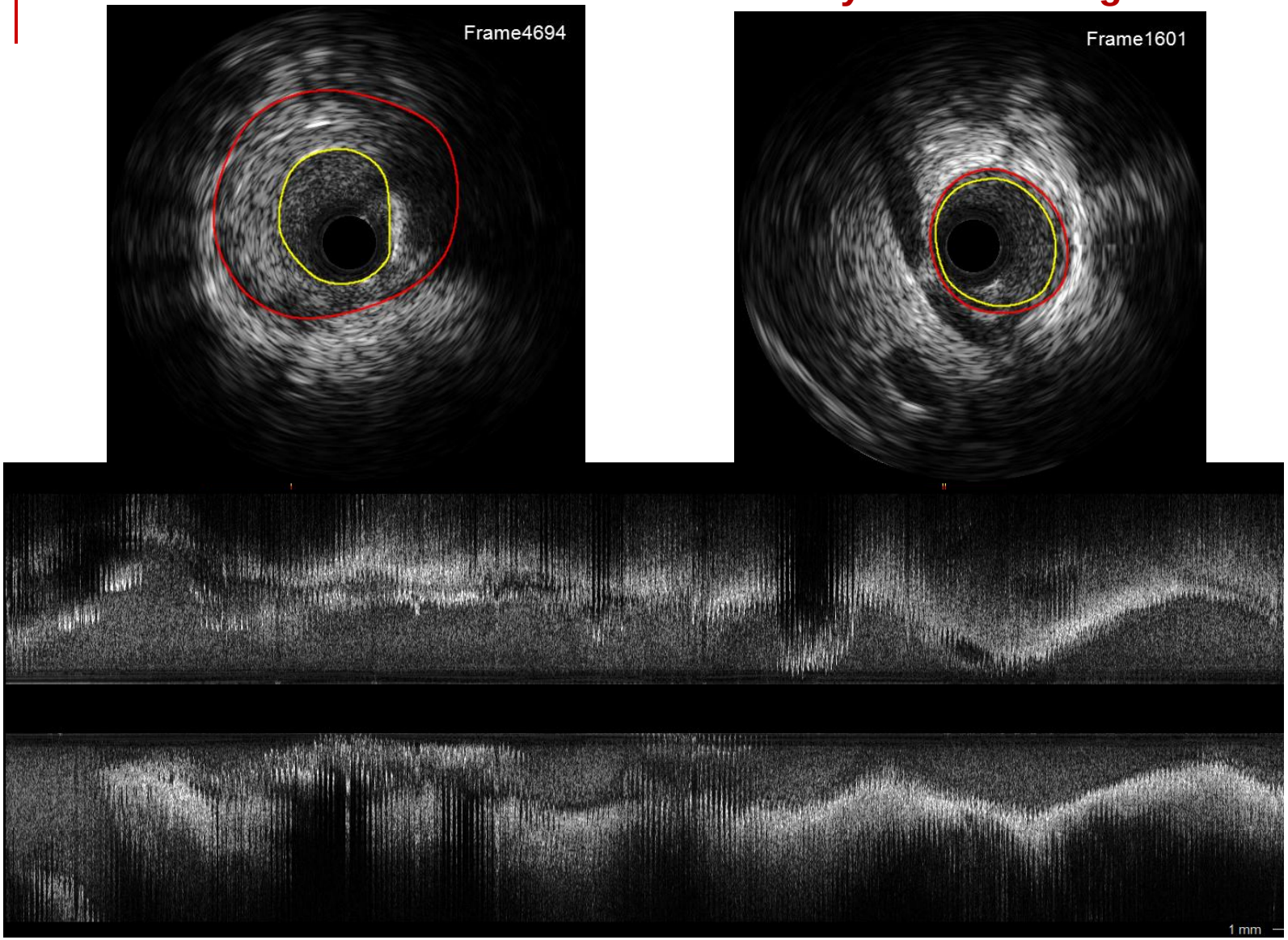
IMR of LAD = 28

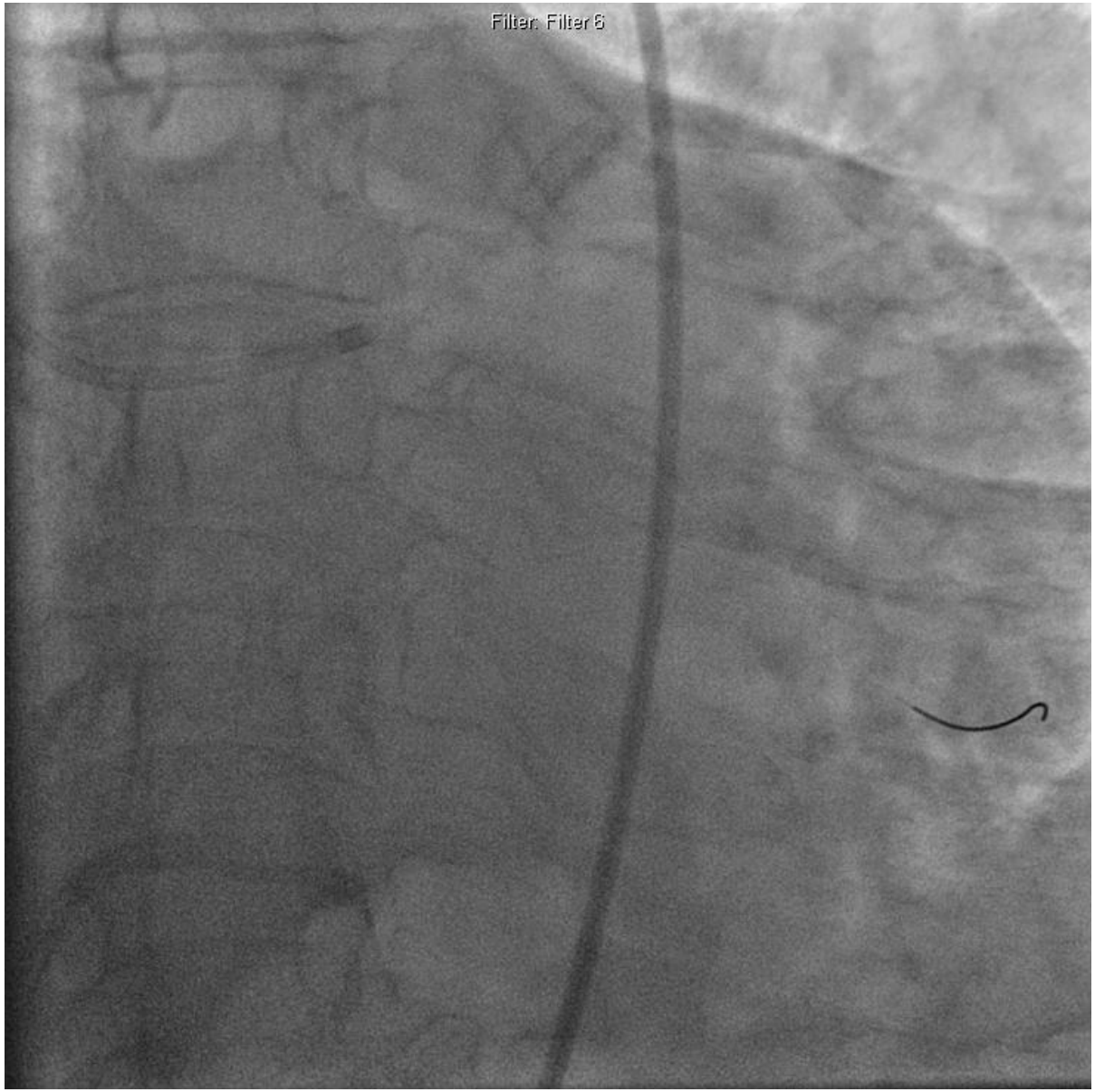

RADI VIEW
2015-04-13 11:18:30
80
Pa mean
66
Pd mean
0.83
FFR
1.6
CFR
-0.03
dT
2.9
CURSOR
RESET
Bas(0.66) 0.70 0.70 0.58
Hyp(0.42) 0.38 0.45 0.43

MSA = 4.3 mm2

Myocardial Bridge



IVUS of LAD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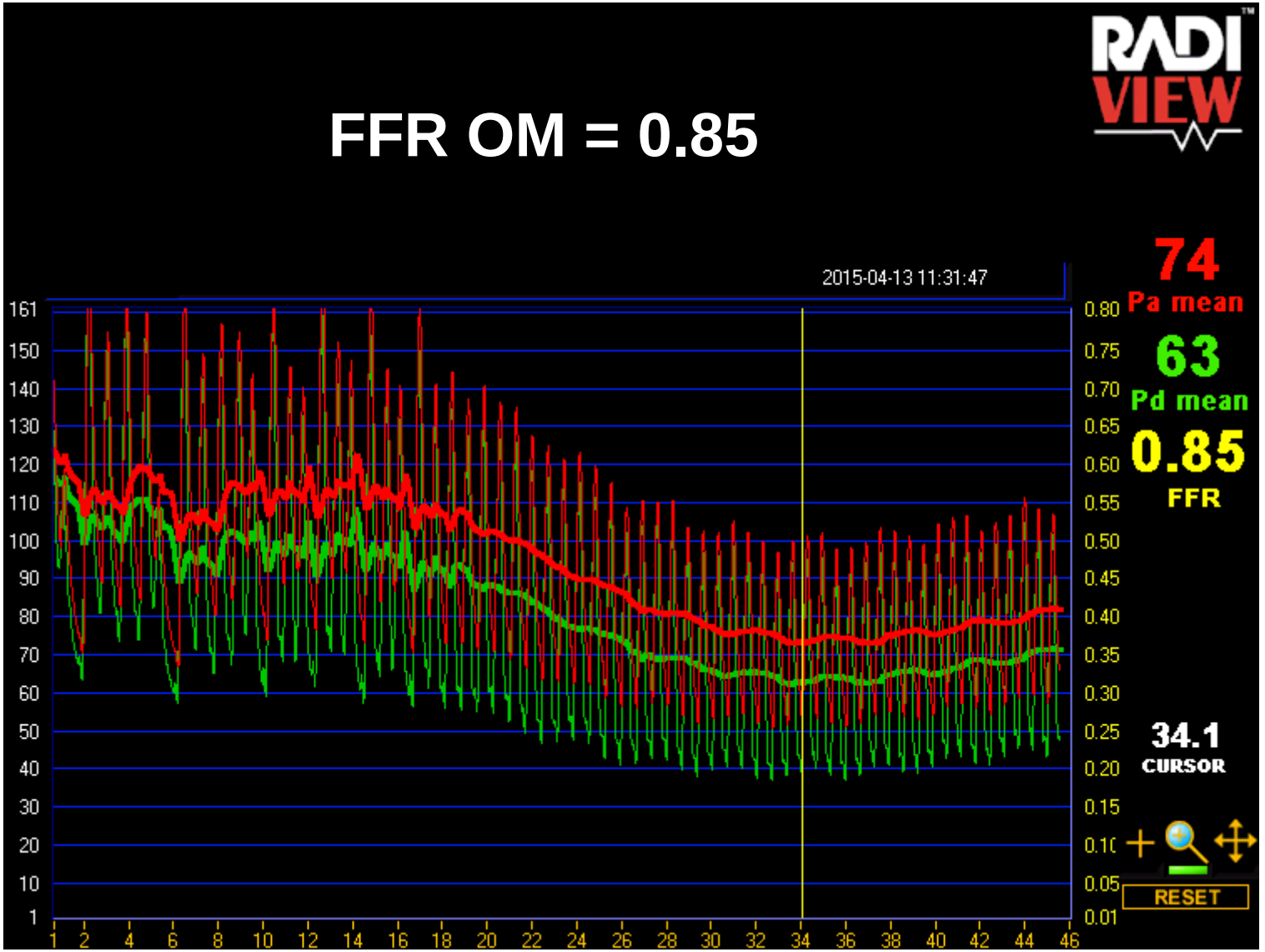
FFR OM = 0.85


RADI VIEW
2015-04-13 11:31:47
74
Pa mean
63
Pd mean
0.85
FFR
34.1
CURSOR
RESET
161 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 1
0.80 0.75 0.70 0.65 0.60 0.55 0.50 0.45 0.40 0.35 0.30 0.25 0.20 0.15 0.10 0.05 0.01
1 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46

Case Summary:

- No significant endothelial dysfunction/spasm
- Moderate restenosis of the LAD stent with mild diffuse epicardial atherosclerosis, which is not functionally significant
- Short mild bridging which is not significant
- Evidence for microvascular dysfunction
- Moderate OM disease which is not functionally significant
- Treatment plan: Augment medical therapy (statin, ACE I, carvedilol, calcium blocker, nitrate)

Chest Pain and “Normal Coronaries”

- 139 patients referred for coronary angiography because of symptoms and/or abnormal stress test and found to have “normal” appearing coronaries

- FFR, IMR, CFR, IVUS and acetylcholine challenge were performed down the LAD

Lee BK, et al. Circulation 2015;131:1054-60.

Chest Pain and “Normal Coronaries”

Patient Characteristic	n=139
Age (years)	54 ±11
Female	77%
Hypertension	53%
Diabetes	23%
Dyslipidemia	63%
Tobacco Use	8%

Lee BK, et al. Circulation 2015;131:1054-60.

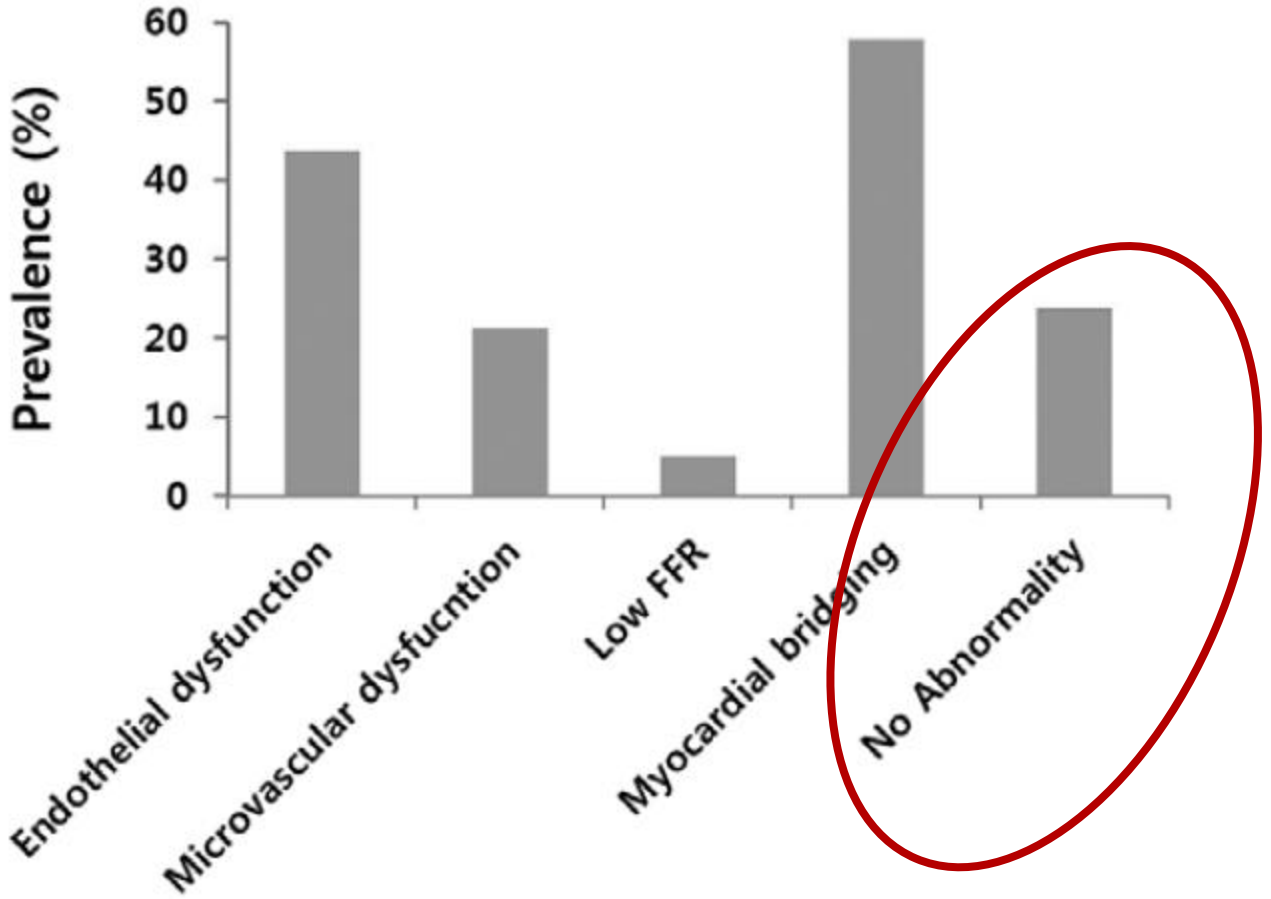
Chest Pain and "Normal Coronaries"

- The mean IMR was 19.6 ±9.1
- Microvascular dysfunction was present in 21% (defined as IMR ≥ 25)
- Patients with microvascular dysfunction were older and more often hypertensive and diabetic

Lee BK, et al. Circulation 2015;131:1054-60.

Chest Pain and “Normal Coronaries”

77% of patients had at least one occult coronary circulatory abnormality



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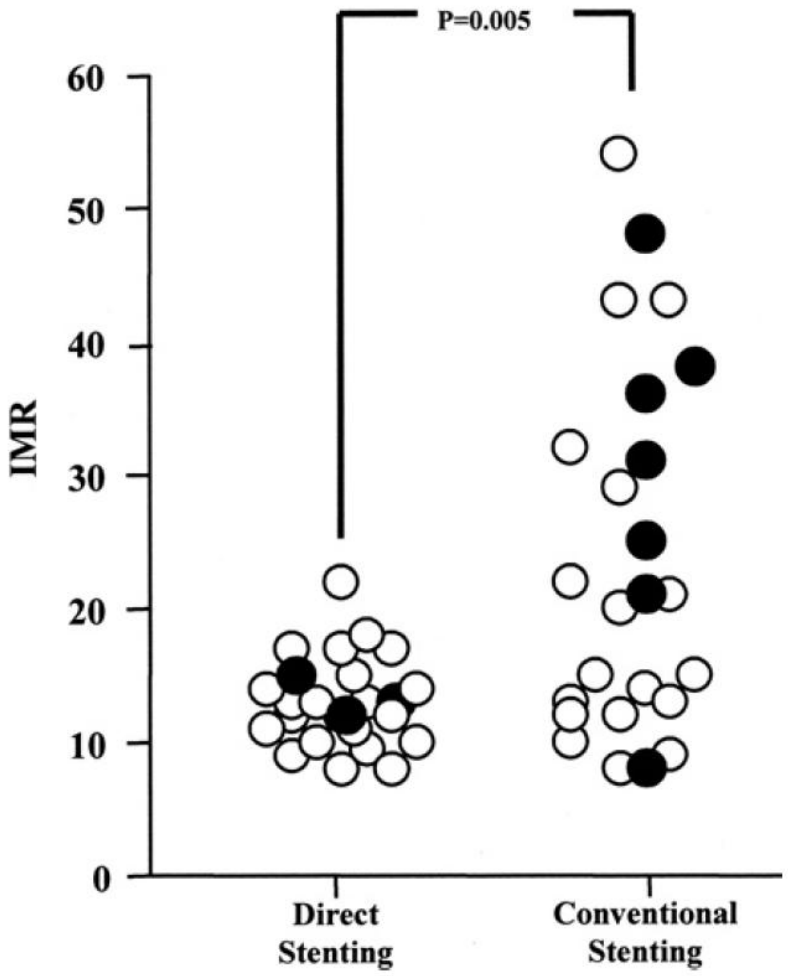
IMR after PCI in Stable Patients

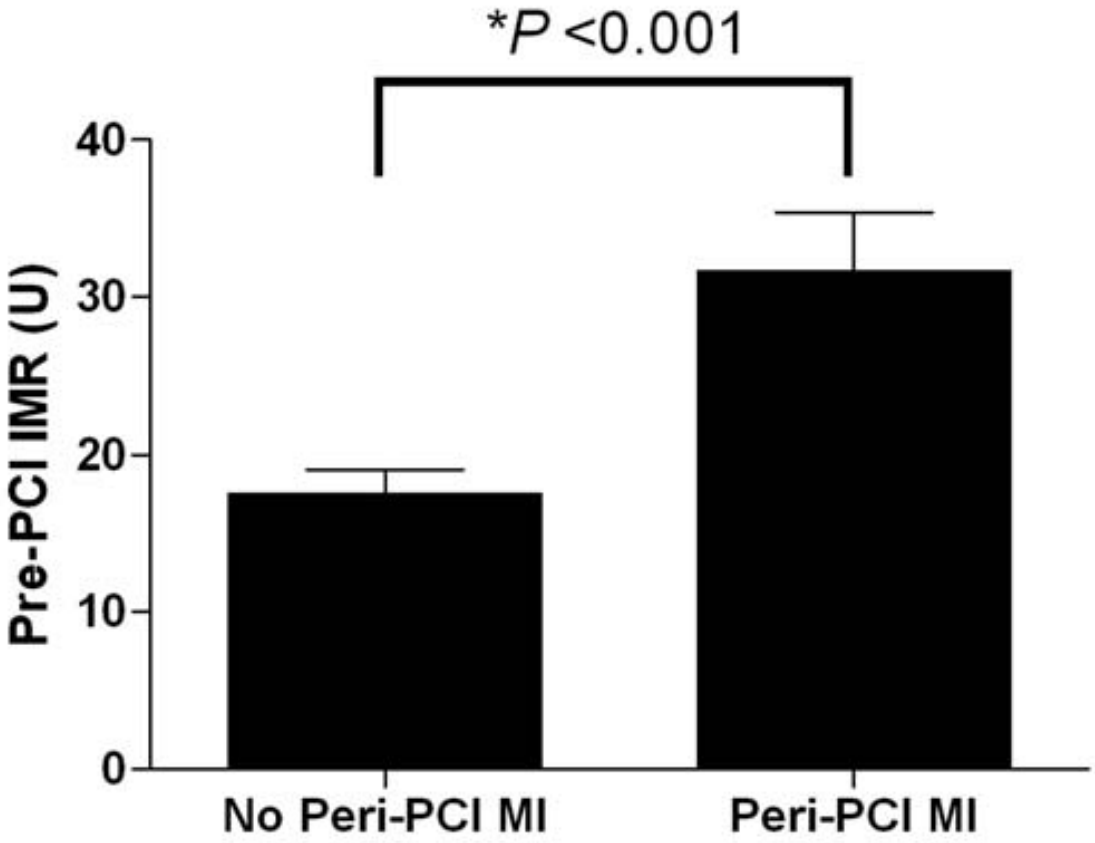
- **50 patients randomized to conventional stenting with predilatation versus direct stenting**
- **IMR measured after PCI and correlated with troponin release**
- **In the 10 patients with elevated Tn post PCI, IMR was 24.7 ±13.3 vs. 16.9 ±10.2, p=0.04.**



Cuisset, et al. J Am Coll Cardiol;2008:51:1060

IMR *Before* PCI in Stable Patients

IMR measured before PCI in 50 stable patients undergoing LAD PCI



Ng, et al. Circ Cardiovasc Interv 2012;5:515-22.

IMR *Before* PCI in Stable Patients

IMR measured before LAD PCI in 50 stable patients

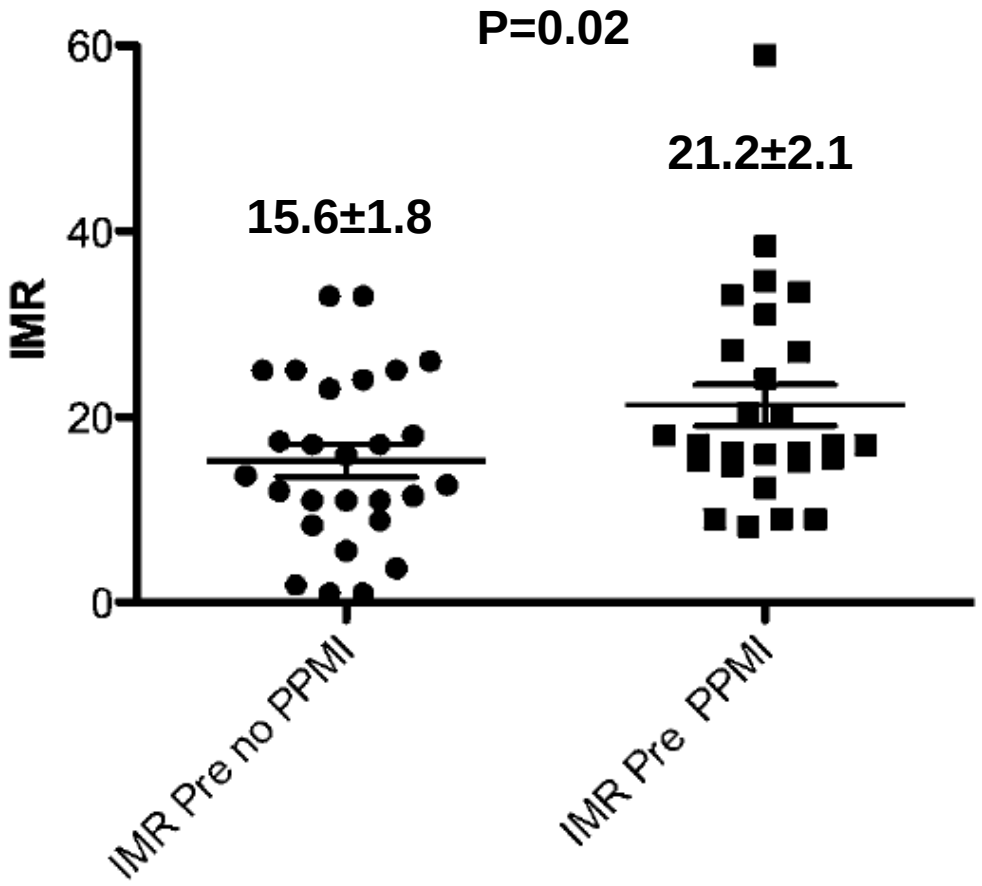
Multivariable Regression Analysis

Variable	*P*	Odds ratio	95% Confidence interval
IMR	0.002	1.25	1.08 – 1.43
Beta-blocker	0.064	13.97	0.97 – 200.56
Post-dilation	0.072	0.09	0.01 – 1.24
Total inflation time	0.115	1.01	0.99 – 1.03
Stent length	0.35	1.08	0.92 – 1.27

Ng, et al. Circ Cardiovasc Interv 2012;5:515-22.

IMR *Before* PCI in Stable Patients

IMR measured before PCI in 54 stable patients



Layland, et al. Heart 2012;98:1492-7.

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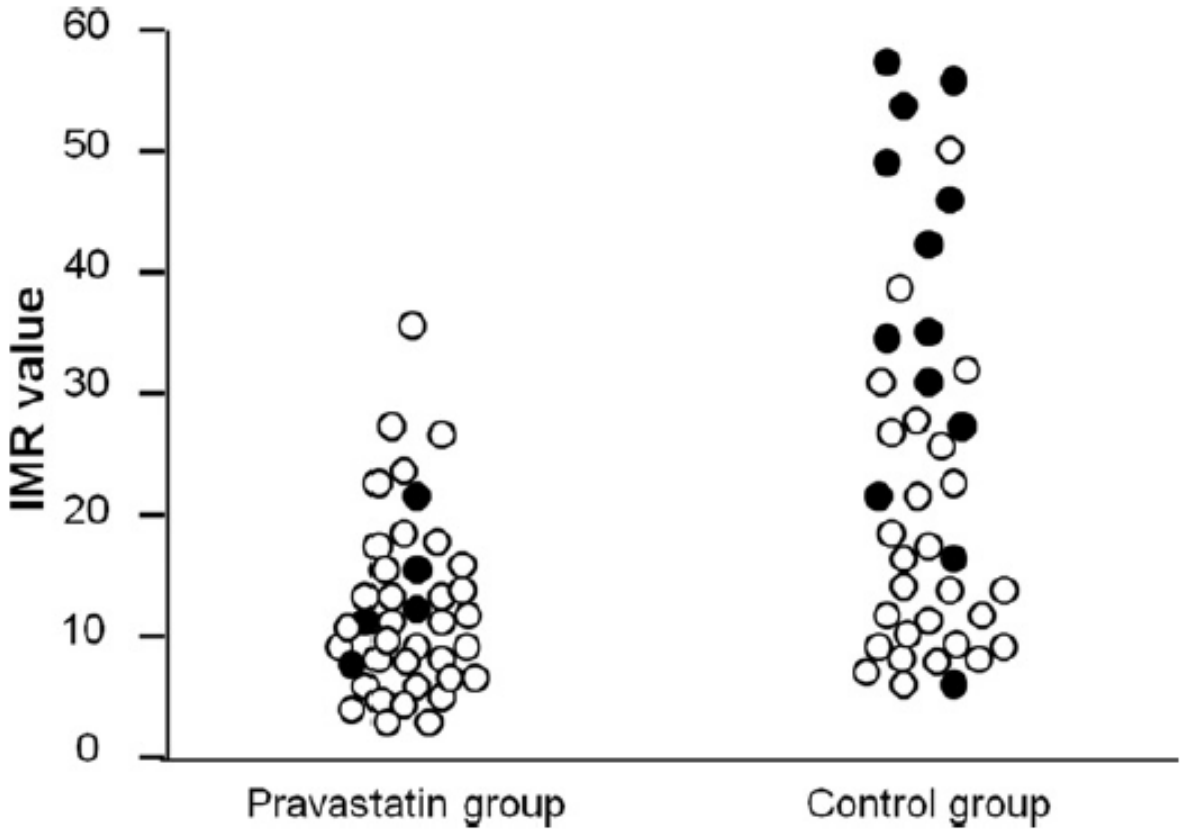
IMR post Statin Therapy

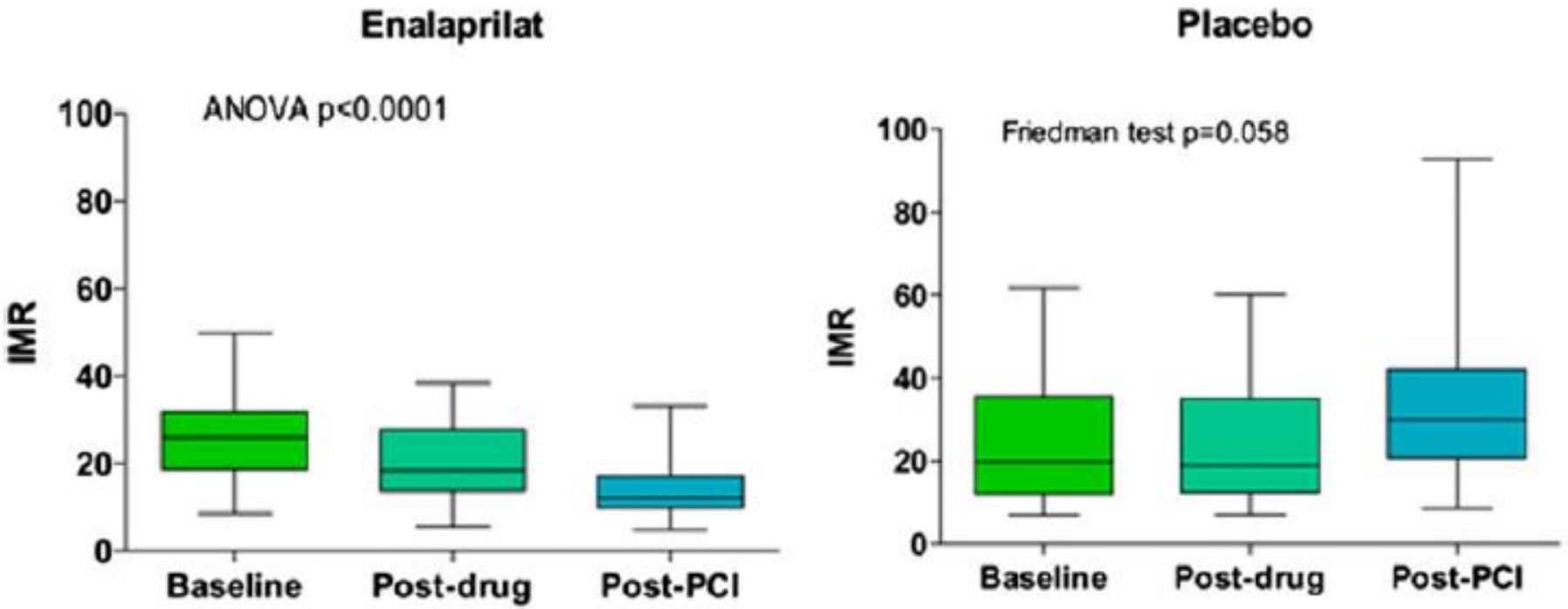
IMR measured after PCI in 80 patients randomized to either 1 month pretreatment with pravastatin or placebo



Fujii, et al. J Am Coll Cardiol Intv 2011; 4:513-20.

IMR post ACE Inhibitor Therapy

40 patients randomized to IC enalaprilat or placebo prior to PCI



Mangiacapra, et al. J Am Coll Cardiol 2013; 61:615-21.

IMR post ACE Inhibitor Therapy

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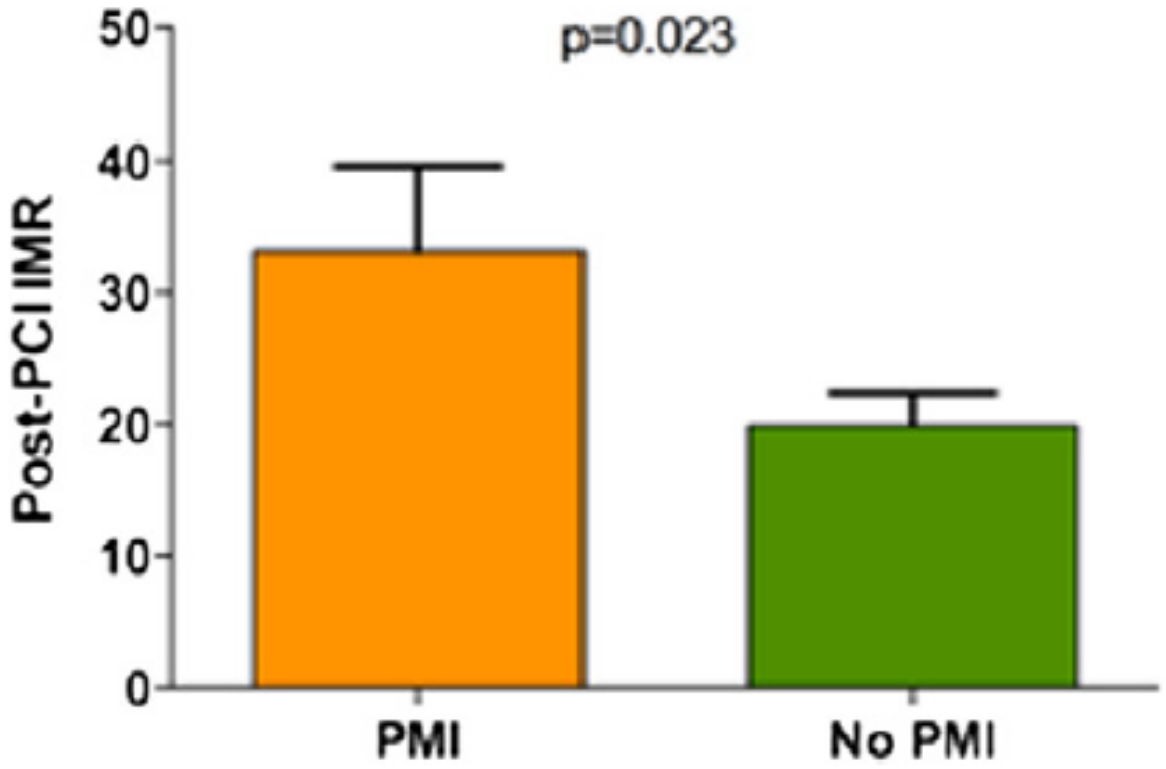
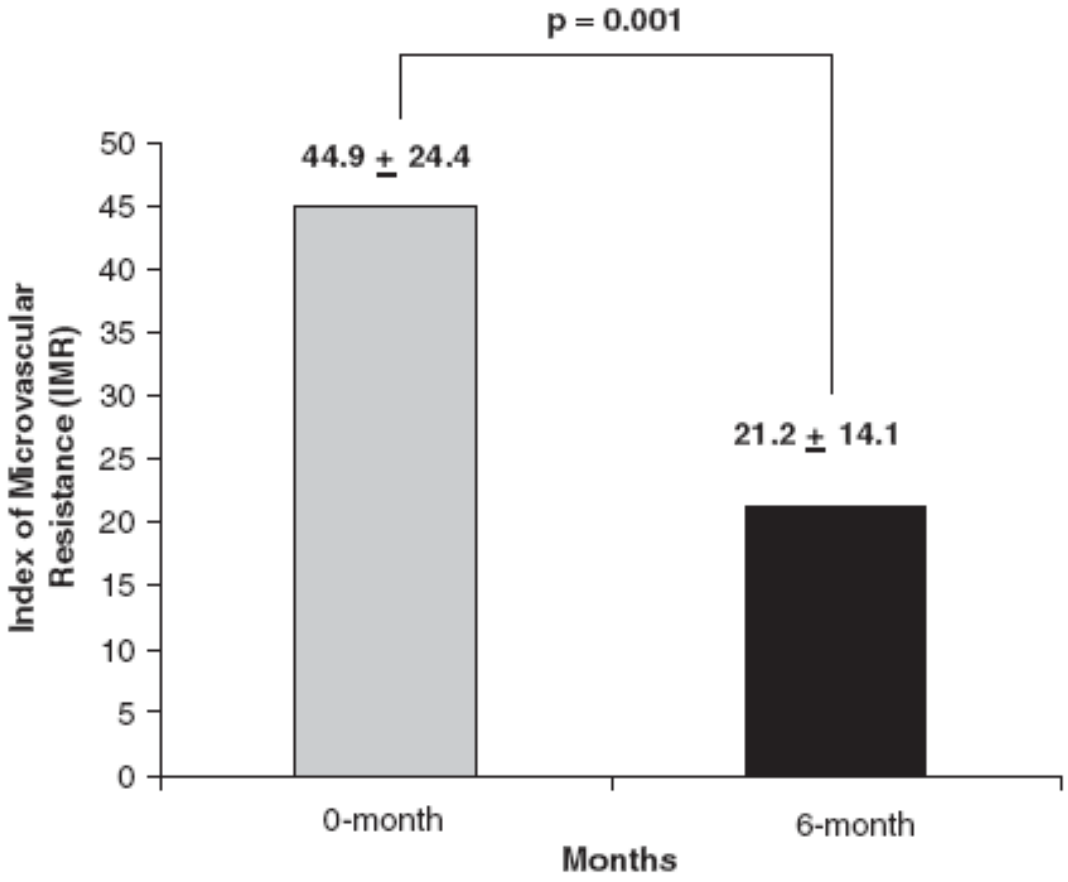


Mangiacapra, et al. J Am Coll Cardiol 2013; 61:615-21.

IMR post Stem Cell Therapy

IMR measured in 15 patients with ischemic cardiomyopathy before and 6 months after intracoronary stem cell delivery



Tayyareci, et al. Angiology 2008;59:145

Conclusions:

- Measurement of FFR and IMR can help to diagnose the etiology of chest pain/abnormal stress test in patient with angiographically normal appearing coronaries.
- IMR measured at the time of PCI can predict peri-procedural myocardial infarction.
- IMR is a useful research tool for evaluating the efficacy of various therapies.