Advanced Application of a Pressure Wire

: Dobutamine Stress-FFR, Wedge pressure…...

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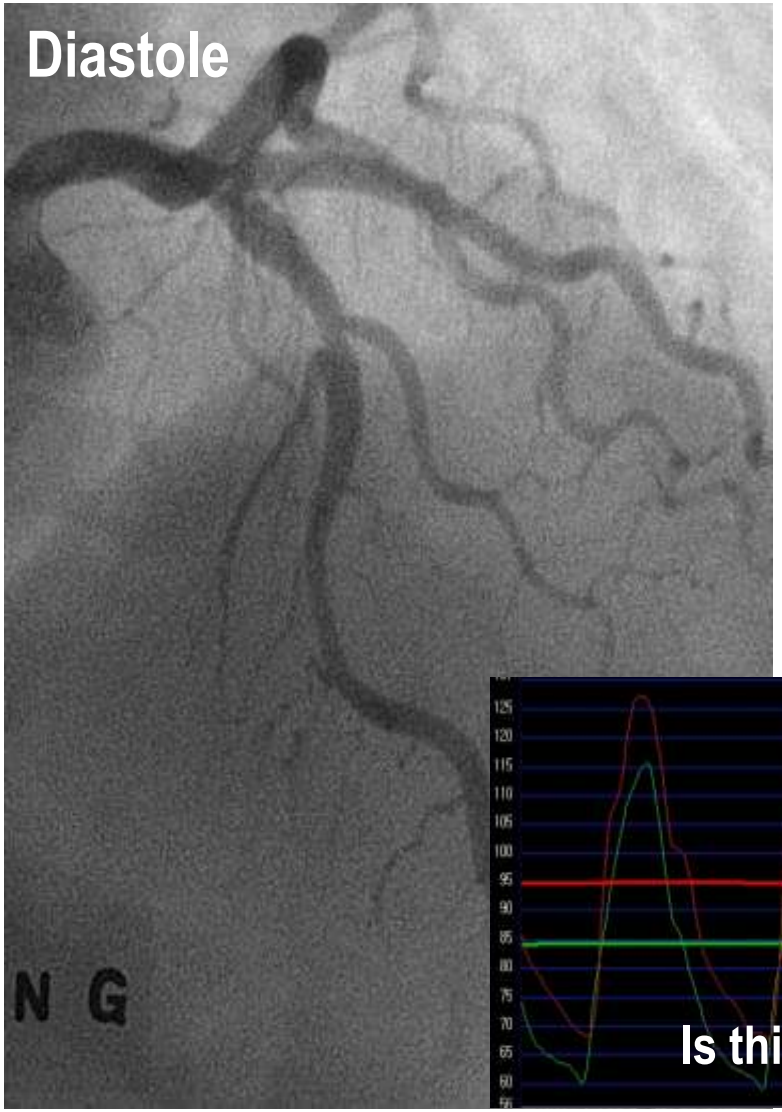
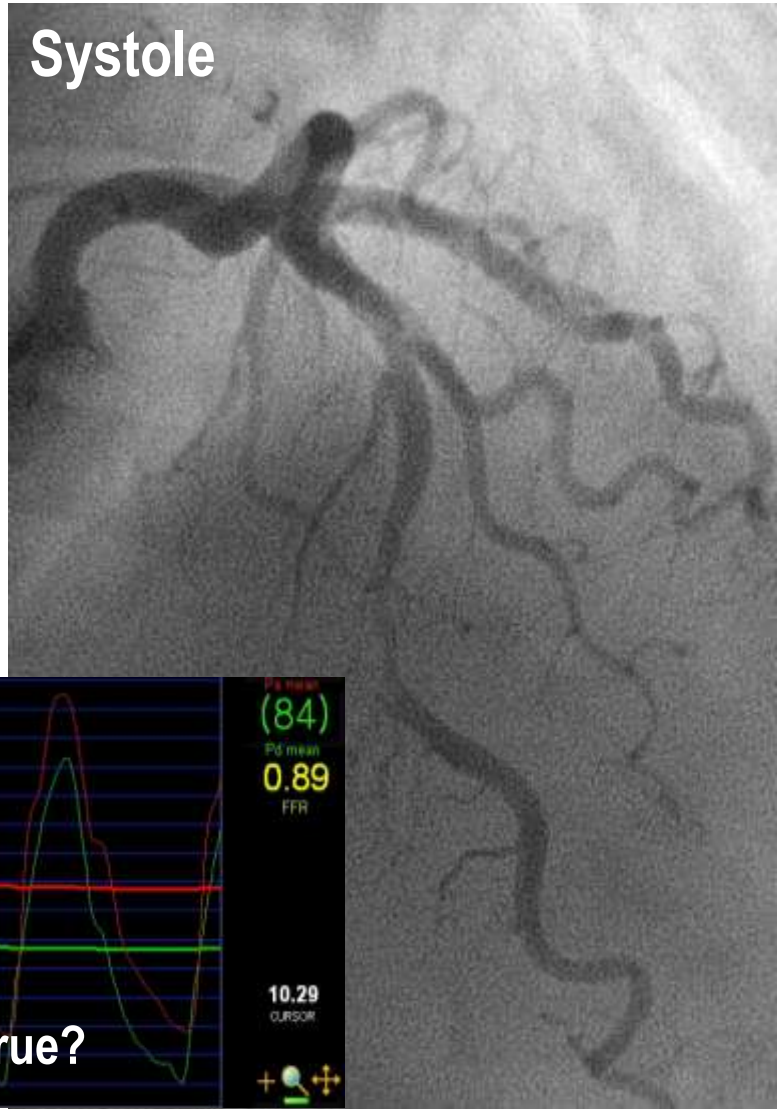
Advanced applications of PW

- **Dobutamine stress FFR**
- Coronary wedge pressure
- Coronary flow reserve
- Index of microcirculatory resistance
- Direct flow measurement, peripheral applications….

F/64 Exertional and resting chest pain

TMT: equivocal





Limitations of FFR for Myocardial bridging

1. Resting FFR does not reflect the true stenosis during exercise due to dynamic nature of stenosis.

: FFR will be lower when measured during exercise.

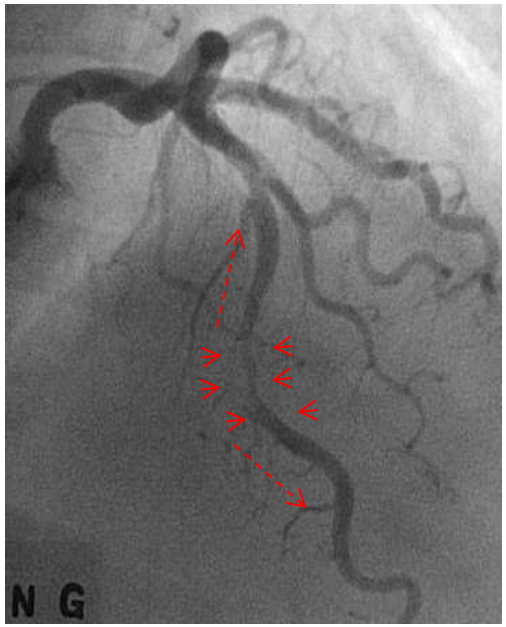
→ Resting FFR underestimates lesion severity.

2. Systolic compression of coronary artery transiently increases intracoronary systolic pressure.

: Mean distal pressure (Pd) becomes higher.

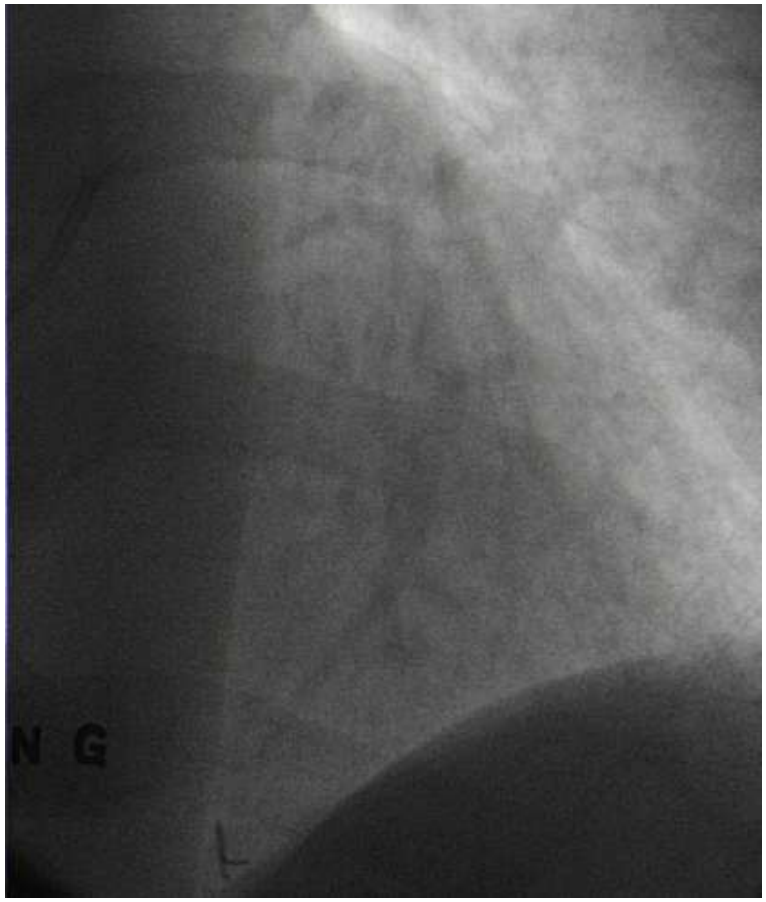
→ FFF (Pd/Pa) becomes higher due to high Pd.

→ FFR underestimates lesion severity.



FFR for bridging: 1. Simulate exercise condition

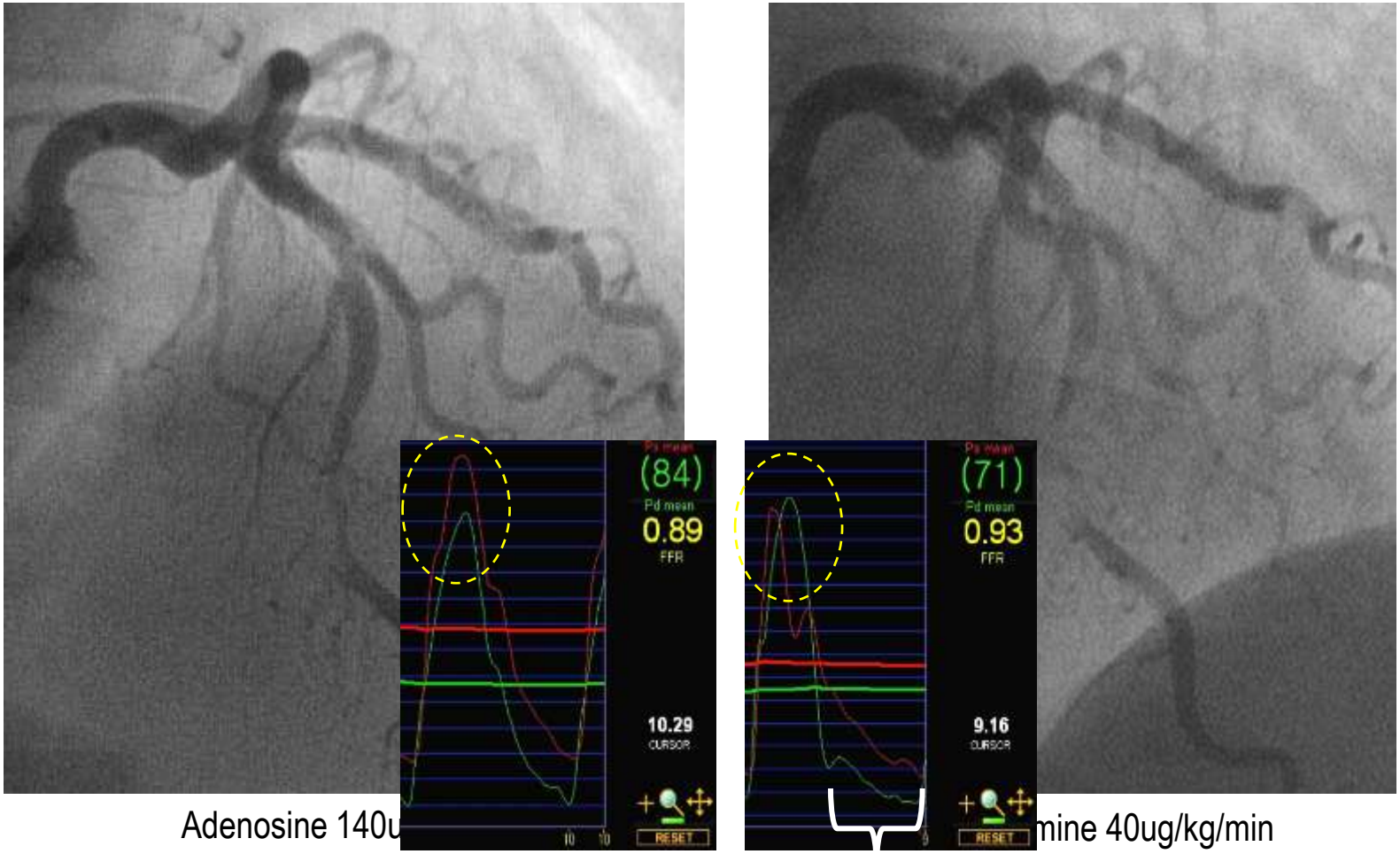
Resting systole



Dobutamine 40ug/kg/min

FFR for bridging:

1. Simulate exercise condition
2. Eliminate the influence of systolic overshooting



Adenosine 140u mine 40ug/kg/min
e 140ug/kg/min

Diastolic FFR: 0.85

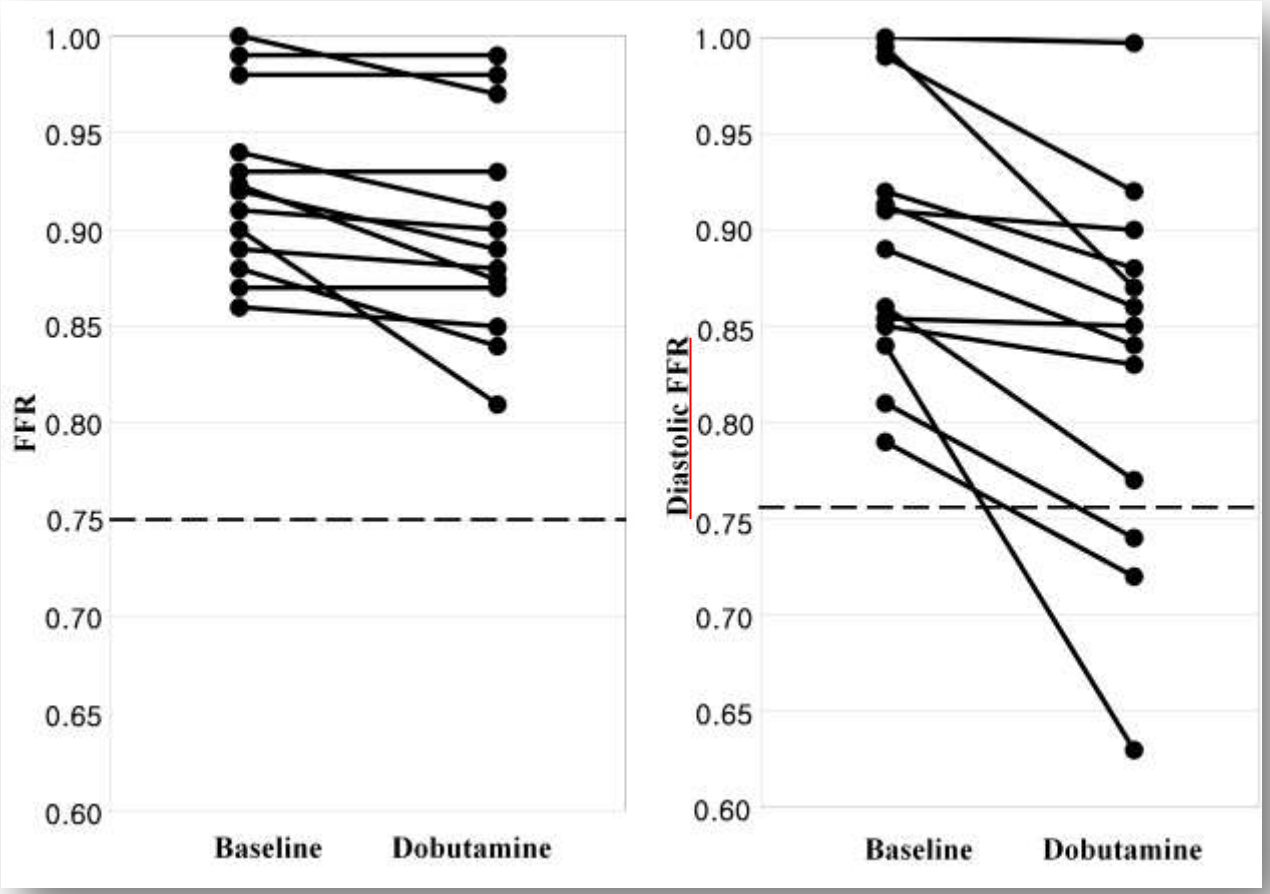
ELSEVIER

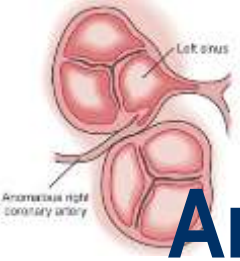
Canadian Journal of Cardiology 27 (2011) 596–600

Clinical Research

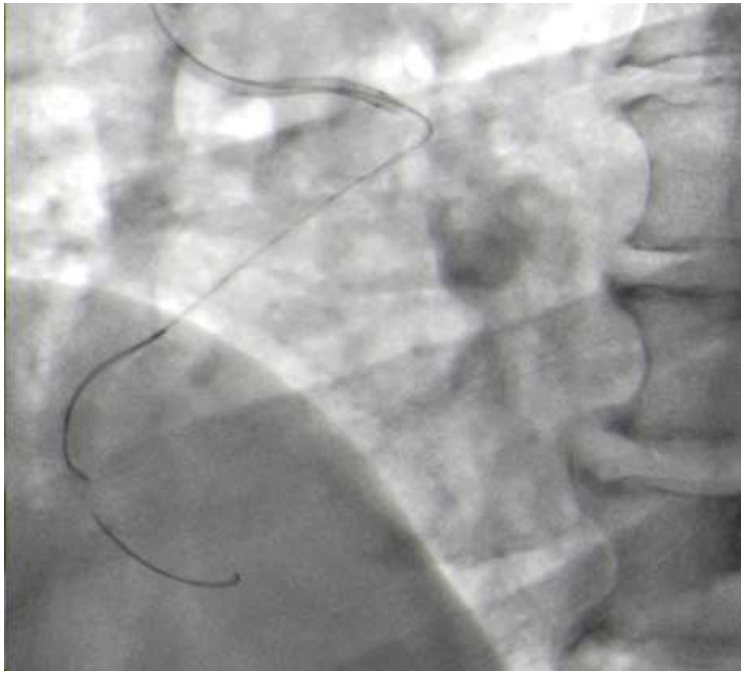
Physiologic Evaluation of Myocardial Bridging: A New Analysis for an Old Disease

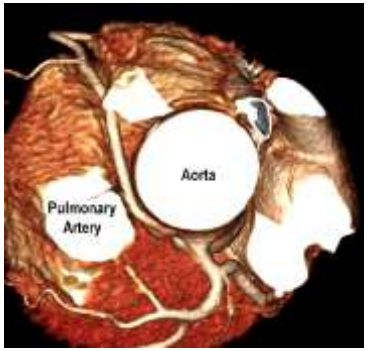
Kyungil Park, MD, Tae-Jin Youn, MD, PhD, Kyung-Woo Park, MD, PhD, Sang-Hoon Na, MD, PhD, Hae-Young Lee, MD, PhD, Hyun-Jae Kang, MD, PhD, Woo-Young Chung, MD, PhD, Bon-Kwon Koo, MD, PhD, In-Ho Chae, MD, PhD, Dong-Ju Choi, MD, PhD, Hyo-Soo Kim, MD, PhD,

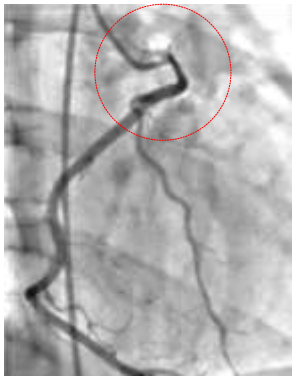


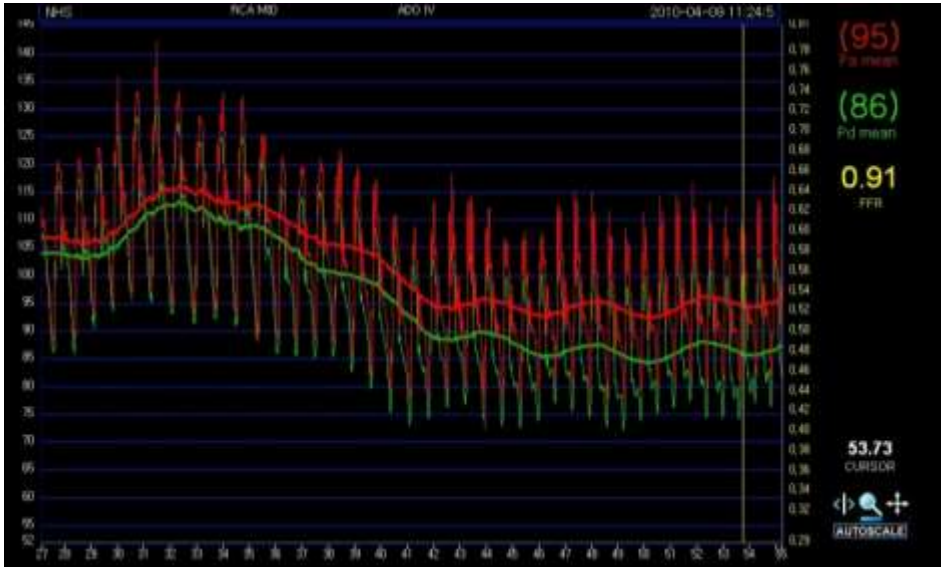


Anomalous RCA from Left coronary sinus



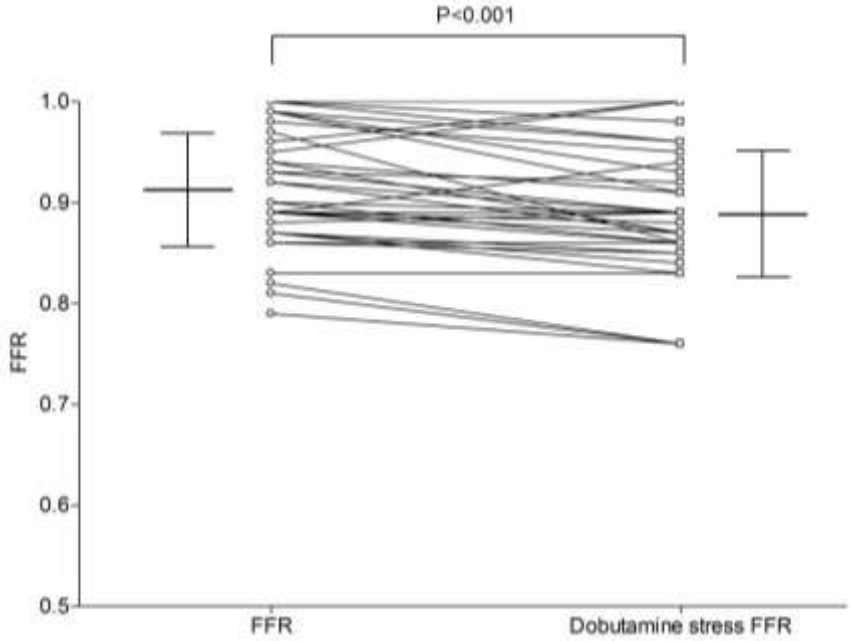


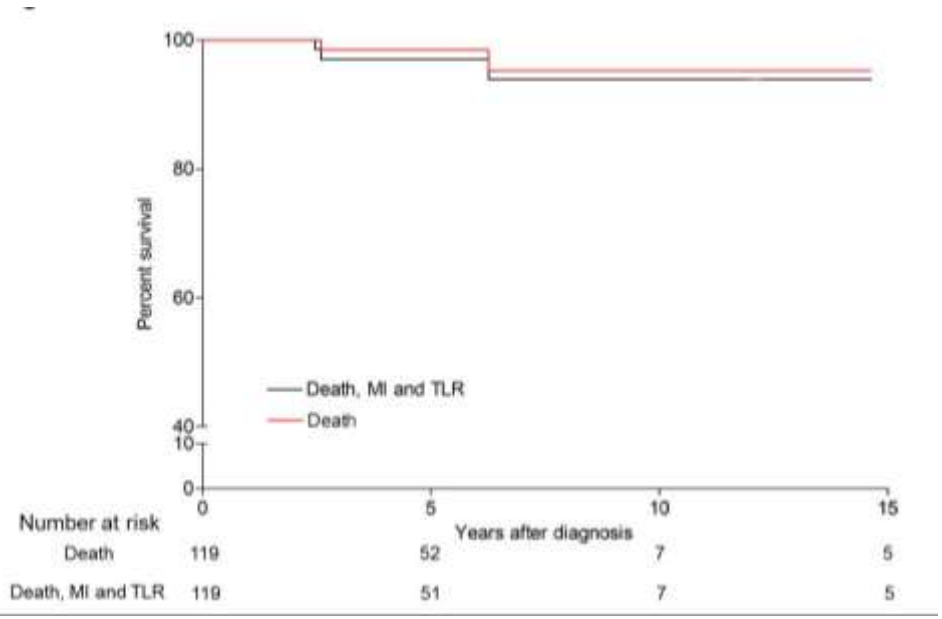




Dobutamine + Atropine + Adenosine

Physiological and clinical relevance of anomalous RCA from left sinus found in adults





Lee SE….. Koo BK Under review

Advanced applications of PW

- Dobutamine stress FFR
- **Coronary wedge pressure**
- Coronary flow reserve
- Index of microcirculatory resistance
- Direct flow measurement, peripheral applications….

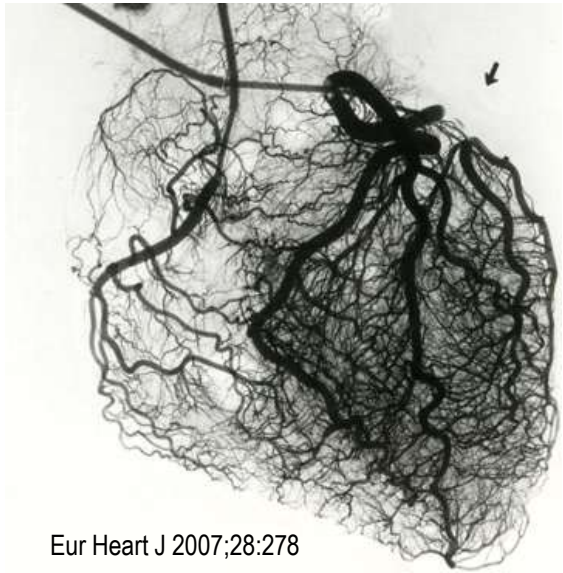
Assessing collateral recruitability using coronary wedge pressure

Collateral flow index (CFI)

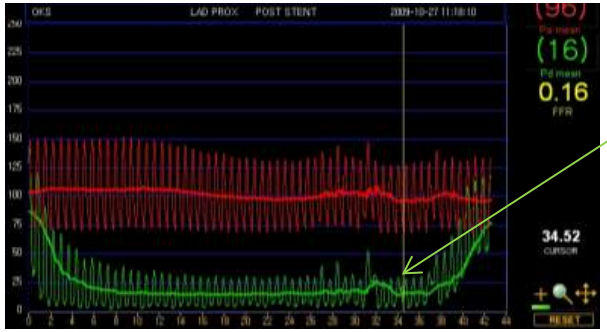
$$= Q_{coll}/Q_{normal} = FFR_{myo} - FFR_{cor}$$

$$= \frac{P_d - P_v}{P_a - P_v} - \frac{P_d - P_w}{P_a - P_w} = \frac{(P_w - P_v)(P_a - P_d)}{(P_a - P_v)(P_a - P_w)}$$

$$= \frac{(P_w - P_v)}{(P_a - P_v)}$$



Eur Heart J 2007;28:278

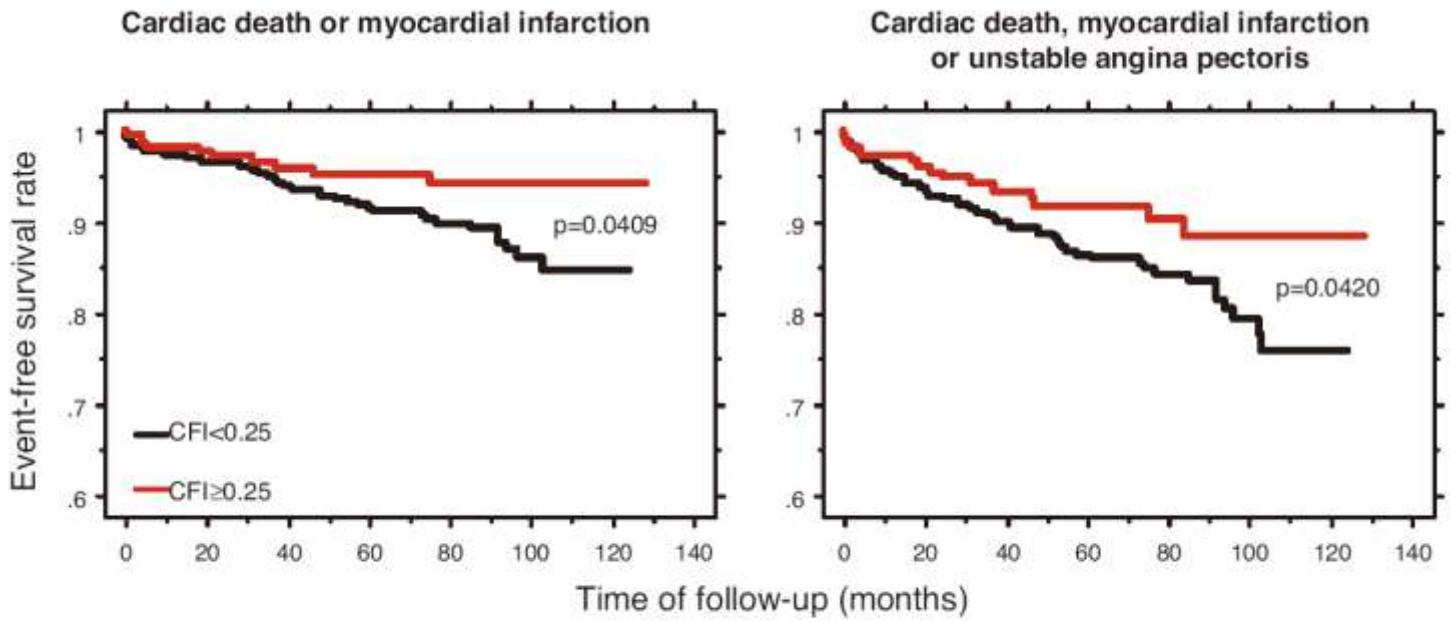


Pw=coronary wedge pressure

Beneficial Effect of Recruitable Collaterals

A 10-Year Follow-Up Study in Patients With Stable Coronary Artery Disease Undergoing Quantitative Collateral Measurements

Pascal Meier, MD*; Steffen Gloekler, MD*; Rainer Zbinden, MD*; Sarah Beckh, BS; Stefano F. de Marchi, MD; Stephan Zbinden, MD; Kerstin Wustmann, MD; Michael Billinger, MD; Rolf Vogel, MD, PhD; Stéphane Cook, MD; Peter Wenaweser, MD; Mario Togni, MD; Stephan Windecker, MD; Bernhard Meier, MD; Christian Seiler, MD

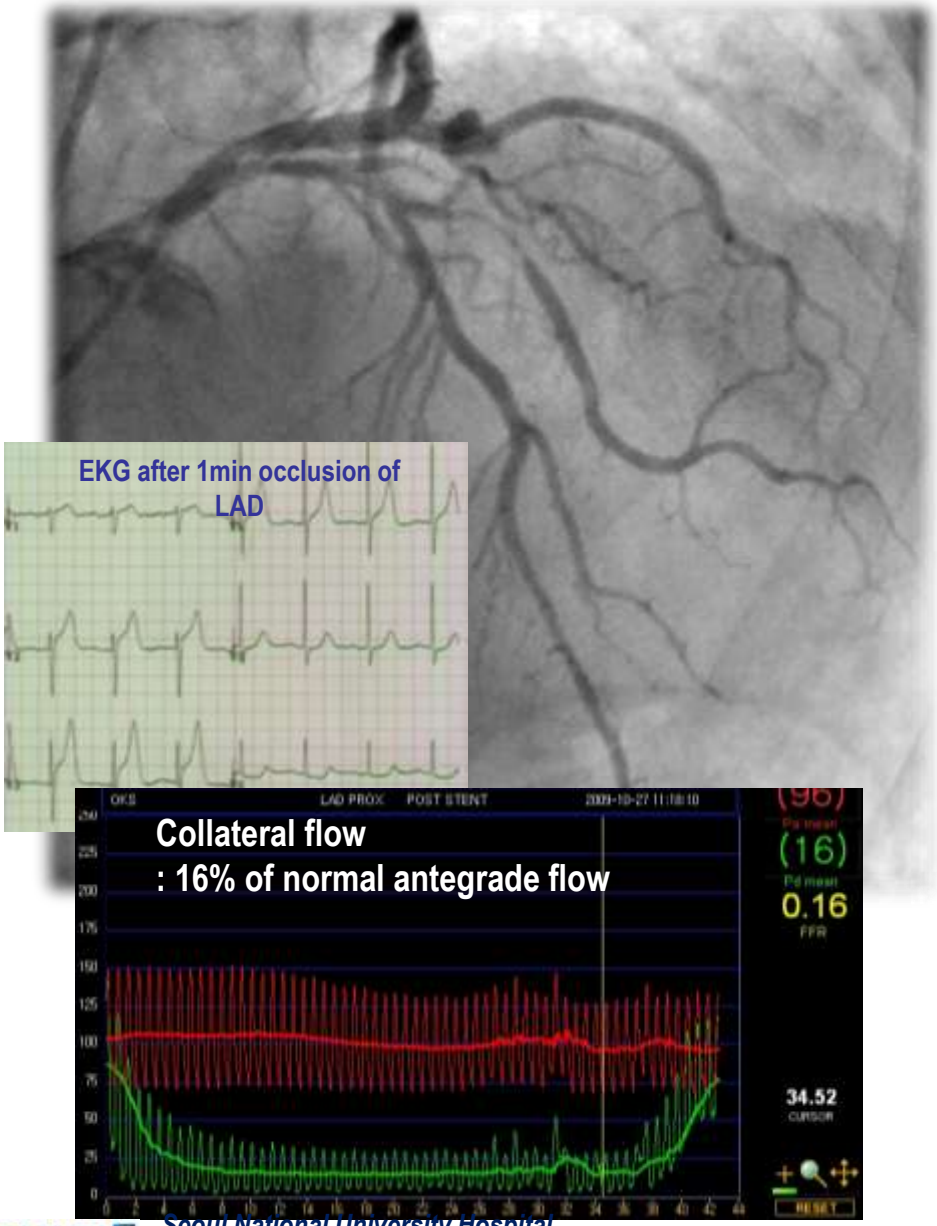


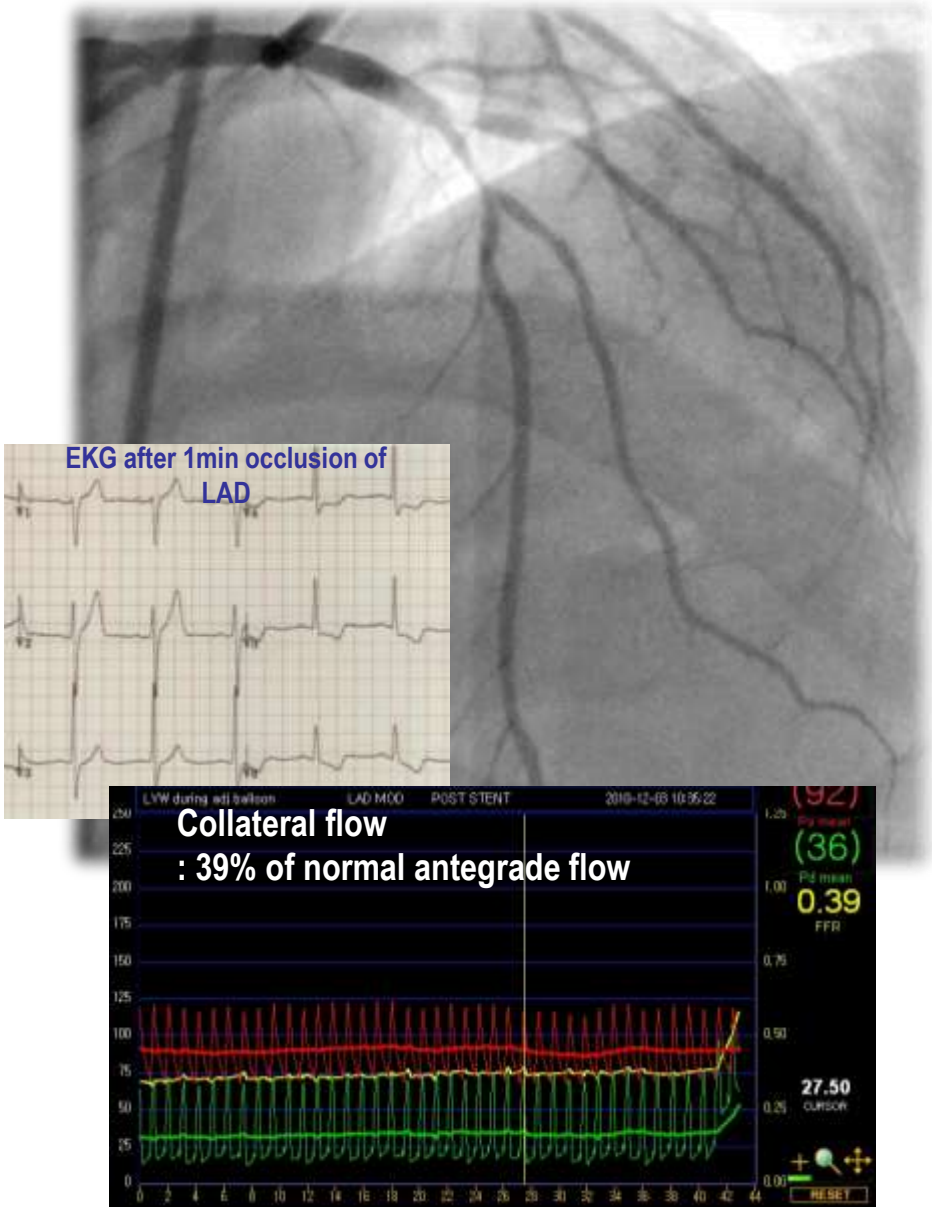
N at risk

225	177	163	120	79	42	15	CFI≥0.25:	225	153	121	93	55	26	10
586	409	337	270	173	77	7	CFI<0.25:	586	346	270	207	126	58	4

Meier, Circulation 2007

Same LAD?


EKG after 1min occlusion of LAD
Collateral flow
: 16% of normal antegrade flow
(16)
0.16
FFR
34.52
CURSOR


EKG after 1min occlusion of LAD
Collateral flow
: 39% of normal antegrade flow
(36)
0.39
FFR
27.50
CURSOR

Difference in collateral recruitability
- LAD vs. Diagonals -

	LAD	Diagonal	P value
Pre-intervention FFR	0.67±0.10	0.71±0.11	0.02
Pw, mmHg	**21.0±6.5**	**26.7±9.4**	**<0.0001**
Pw/Pa	**0.22±0.07**	**0.27±0.08**	**0.001**

Pw: coronary wedge pressure
Pa: aortic pressure

Koo BK, et al., JACC Intv, 2012

Advanced applications of PW

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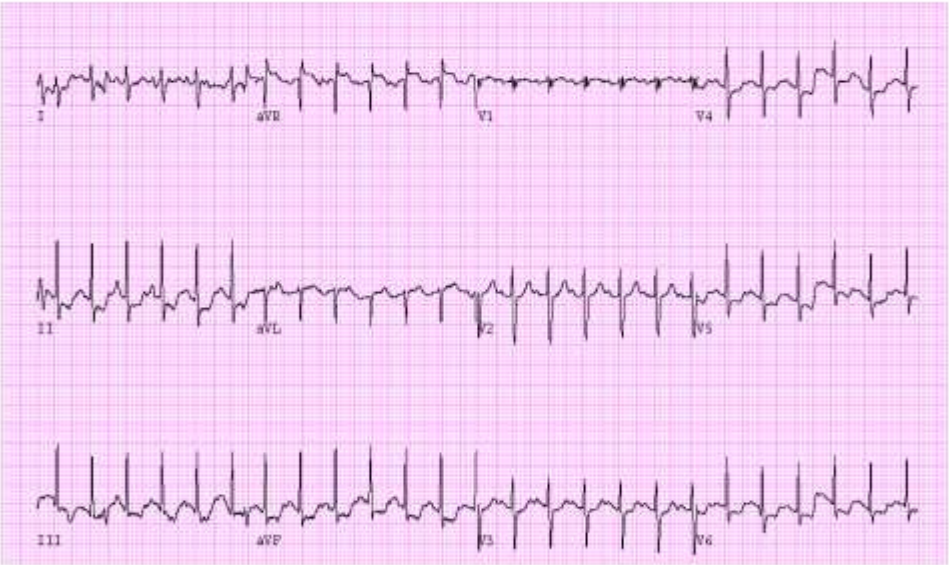
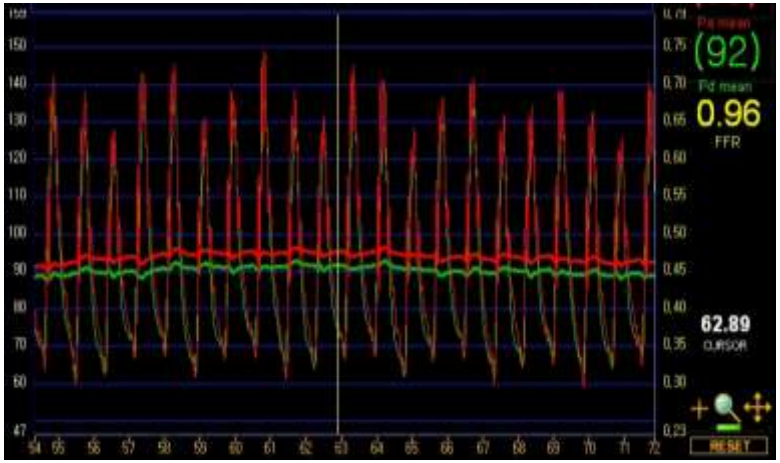
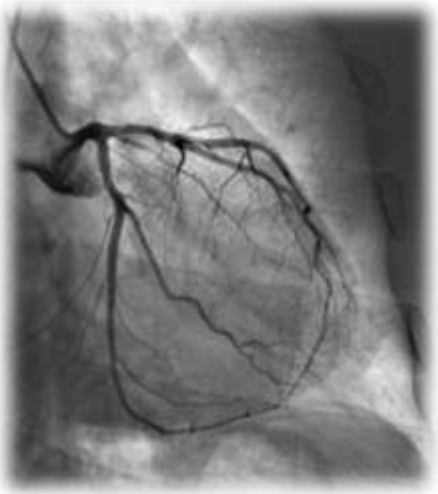
- **Coronary flow reserve**
- **Index of microcirculatory resistance**
- Direct flow measurement, peripheral applications….

False positive TMT?



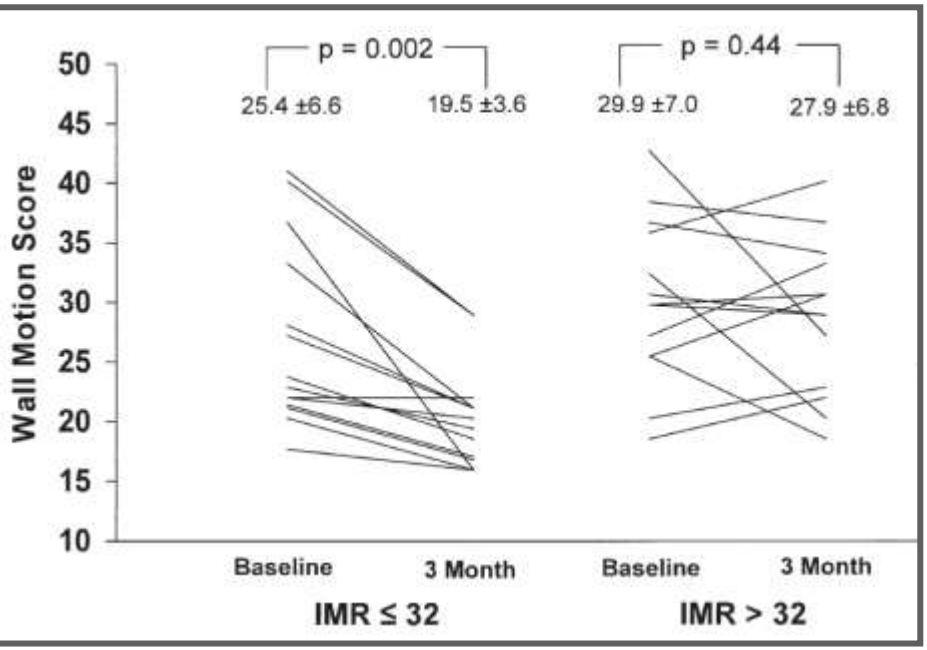


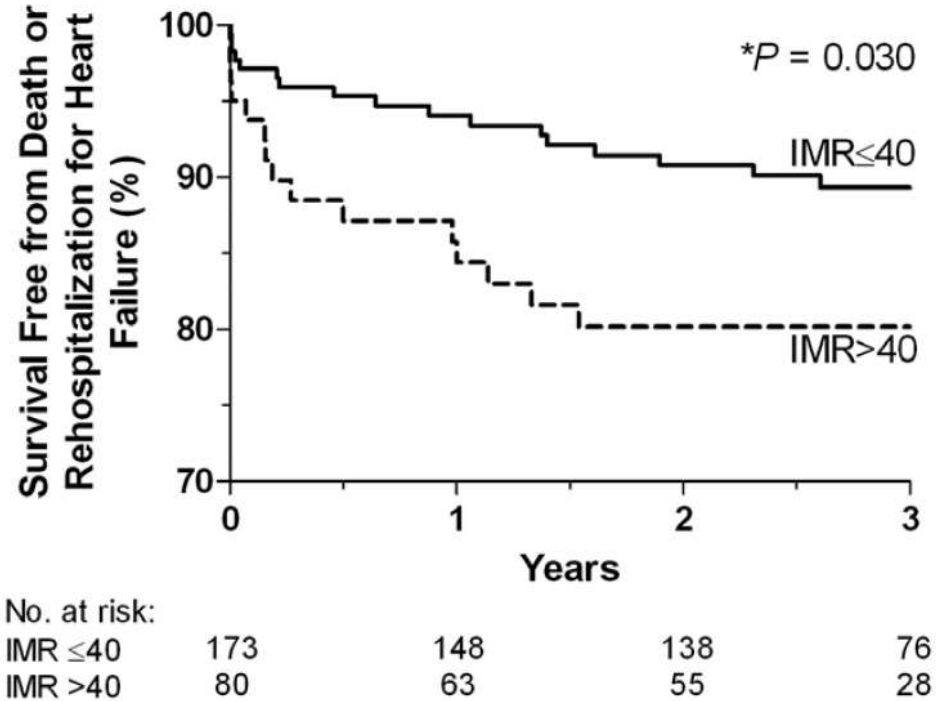


Assessment for microvascular disease : CFR and IMR

CFR=1.4, IMR=93x0.42=39

IMR in AMI: Prognostic implications

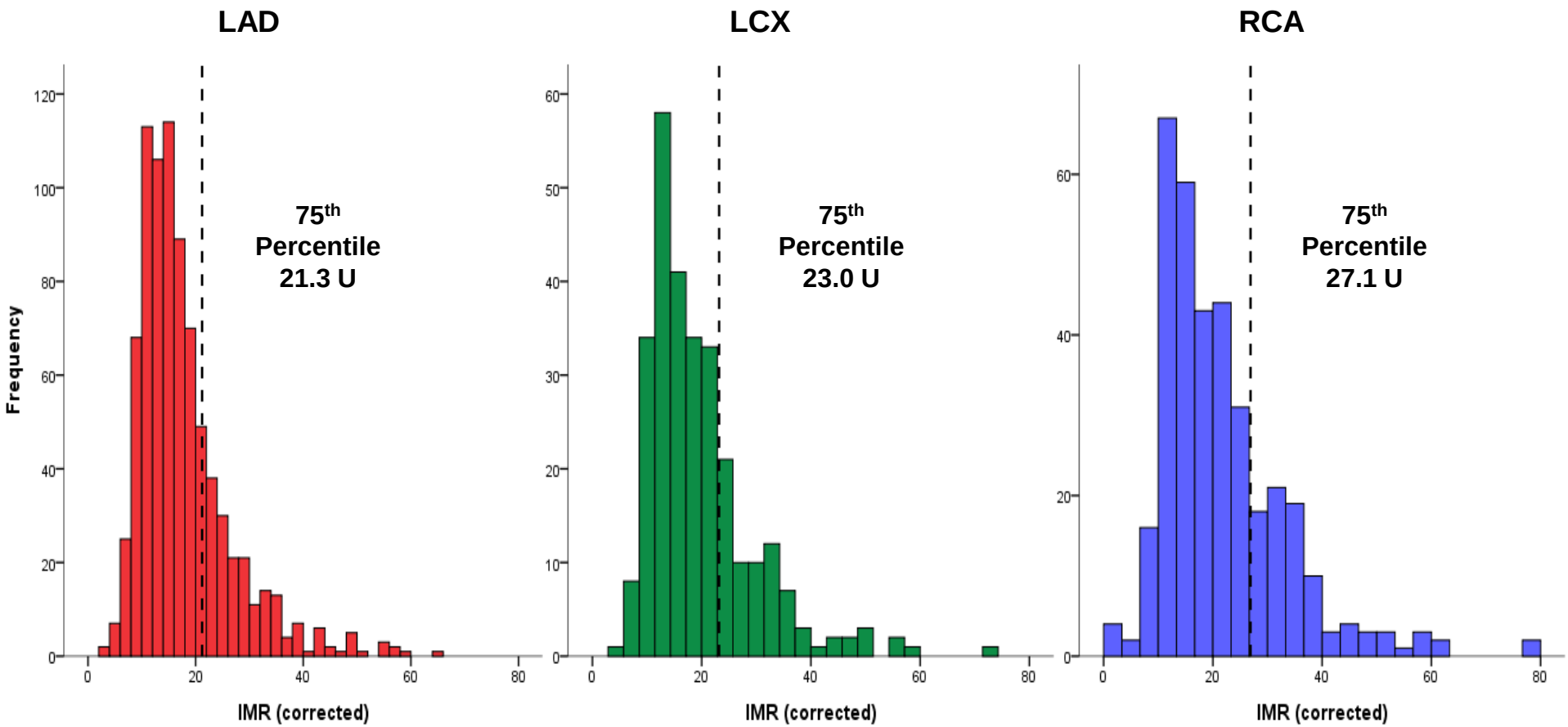




JACC 2008

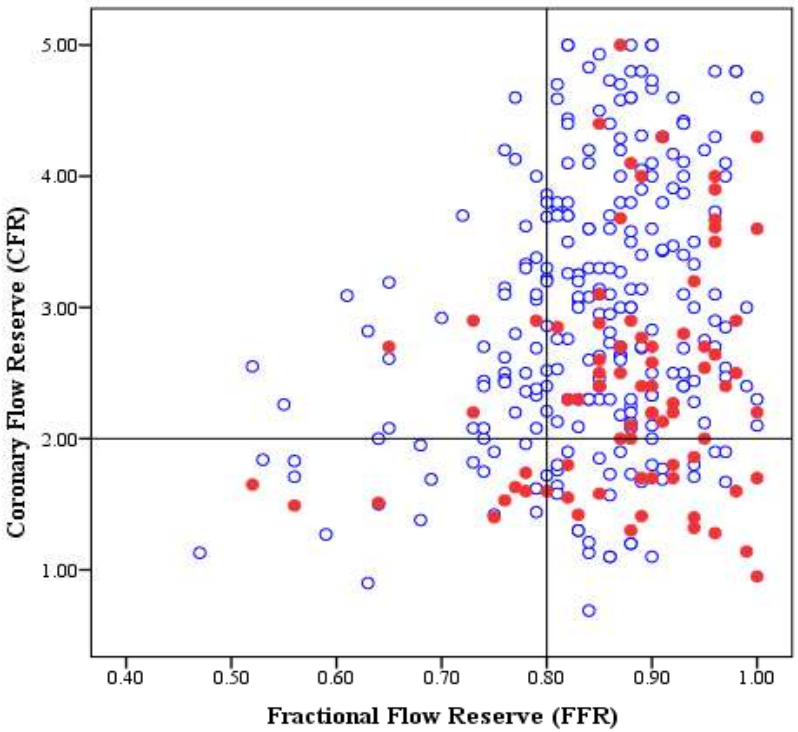
Fearon, et al. Circulation 2013

International IMR registry (n=1452)

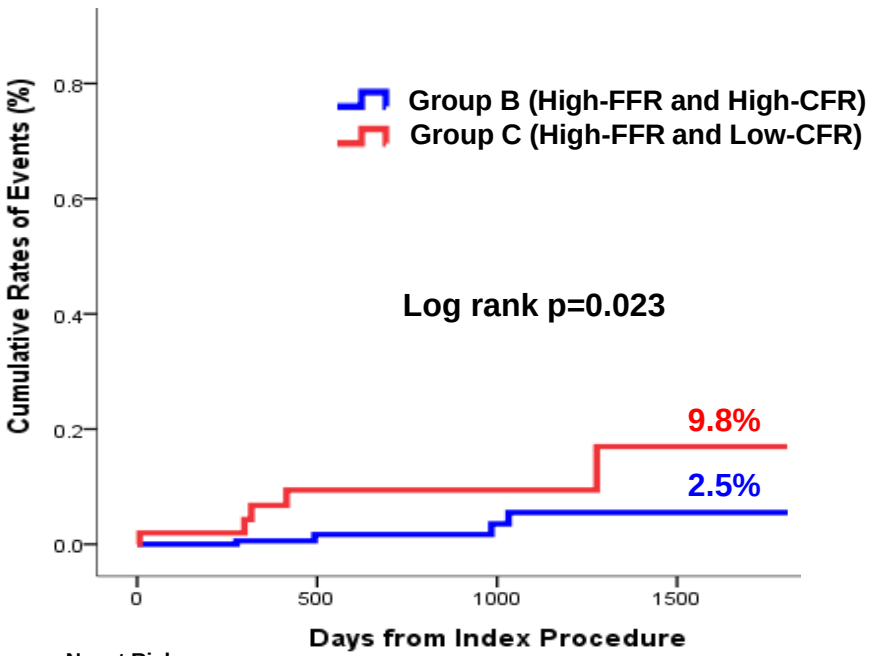


Lee JM….. Koo BK ESC 2015

Korean CFR registry
(334 patients, 663 vessels)



Patients with FFR>0.80, Stratified by CFR

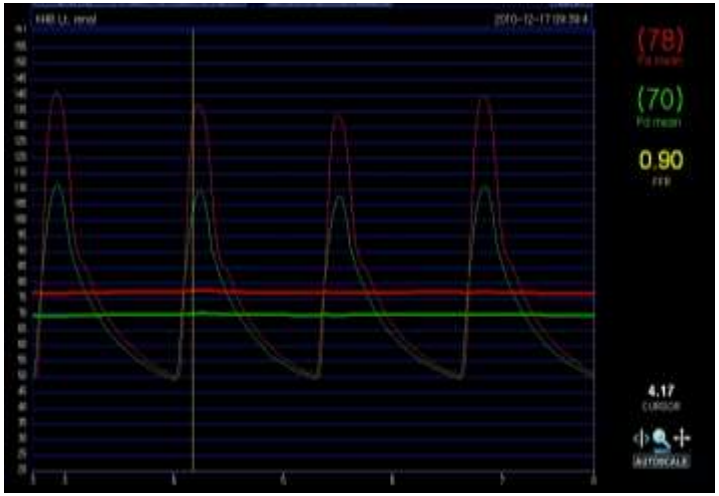


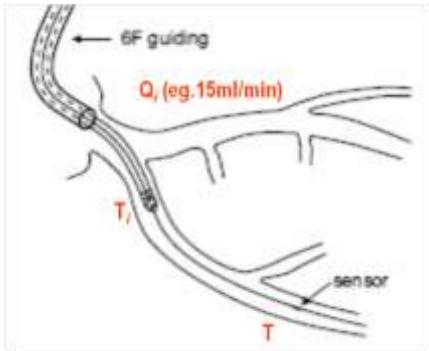
No. at Risk				
CFR≤2	51	28	17	8
CFR>2	199	85	49	17

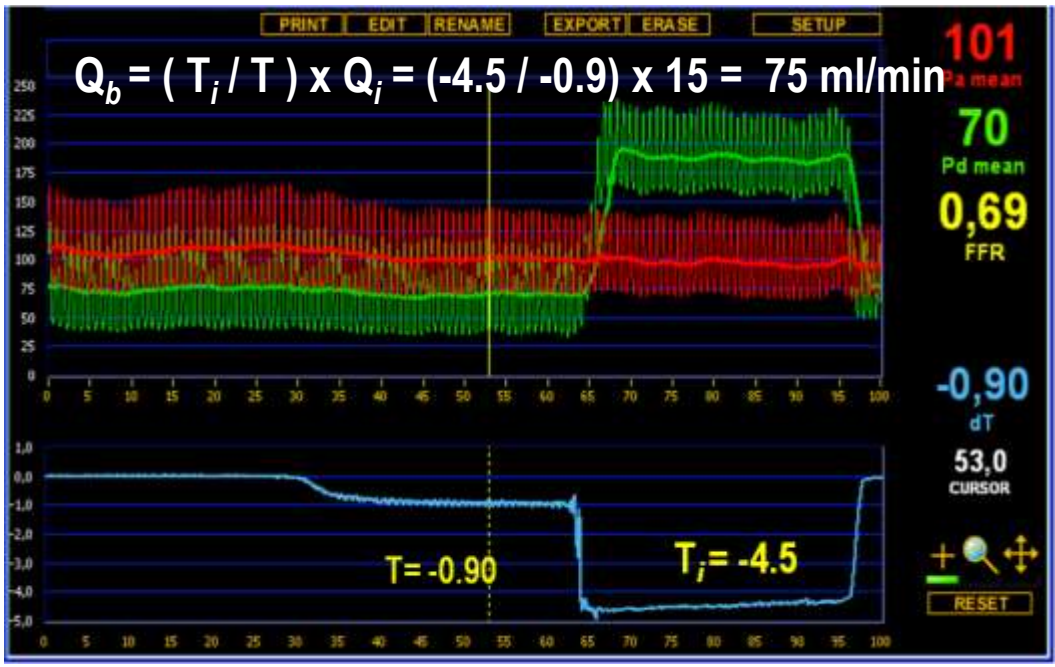
Lee JM….. Koo BK KSIC 2015

Non-coronary applications

Direct flow measurement







Wilbert Aarnoudse, ETP course, April 2007, Nice

General Application of FFR

- Intermediate lesion
- Ambiguous lesion
- Left main, Bifurcation lesions
- Multiple lesions, Diffuse disease
- Multi-vessel disease

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