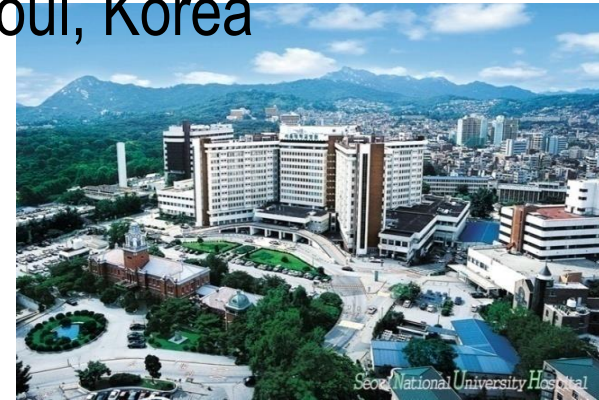


Smart PCI with Advanced Co-registration System

Bon-Kwon Koo, MD, PhD

Seoul National University Hospital, Seoul, Korea

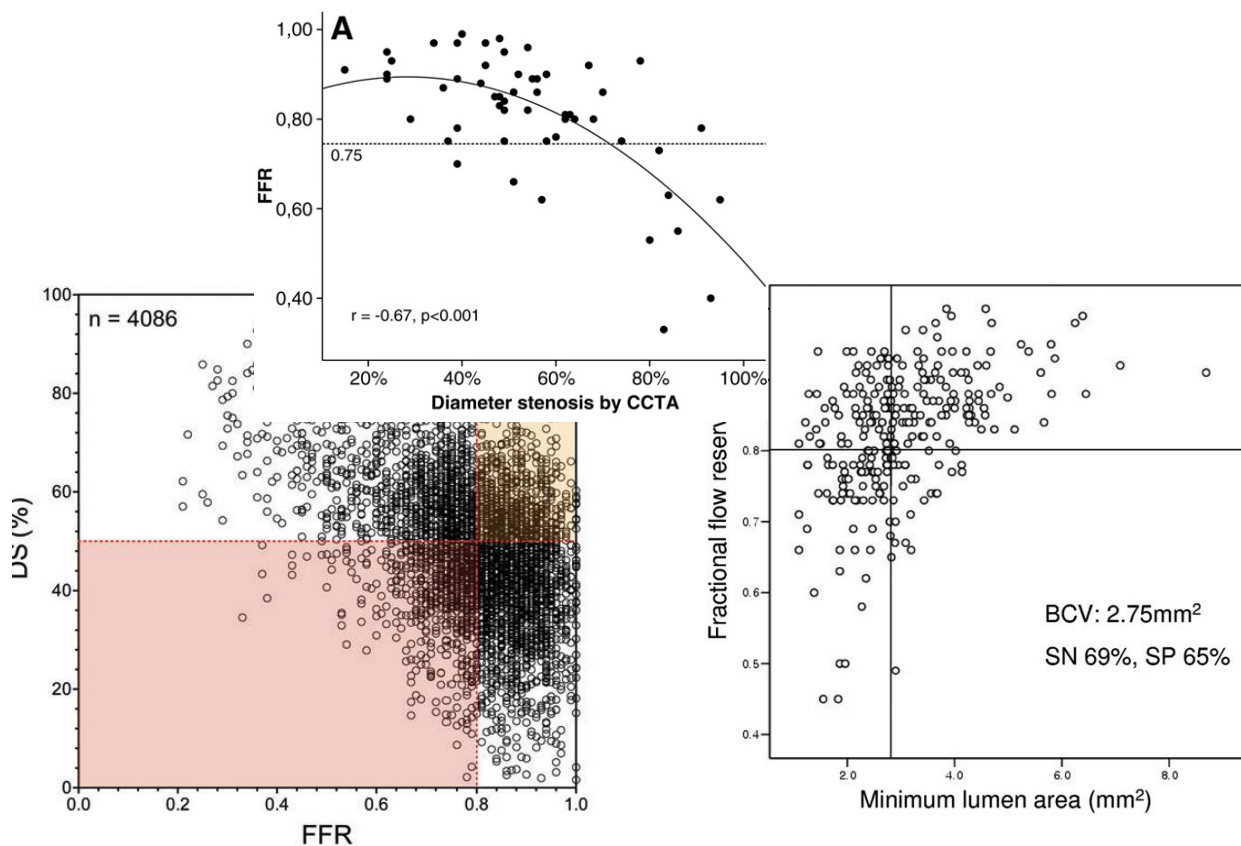
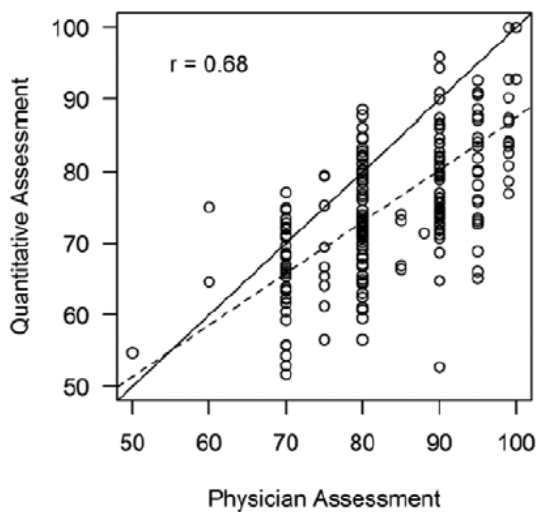


Smart way of living

- **Discordance**
- **Integration**
- **Co-registration**

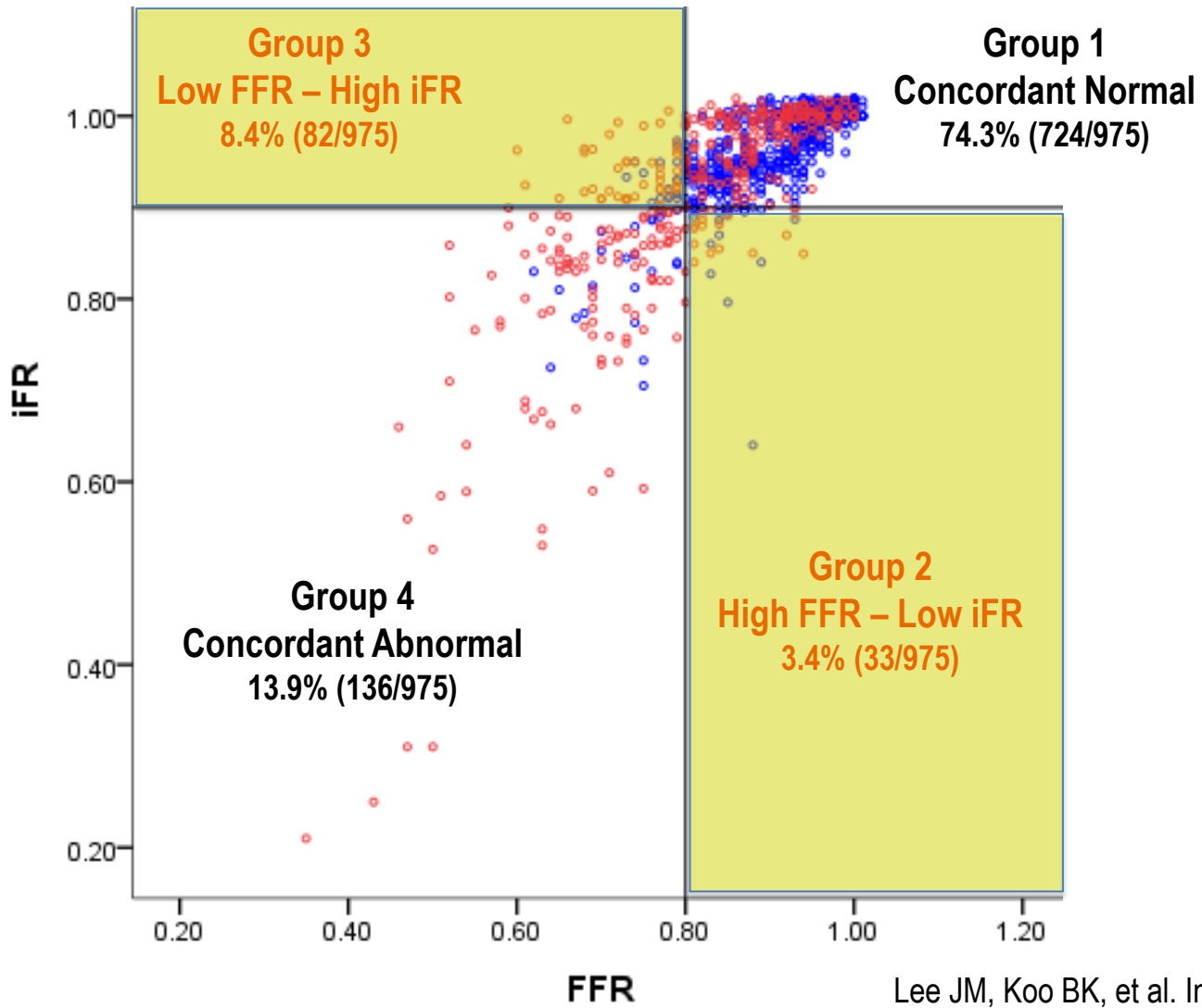


Discordance is everywhere...



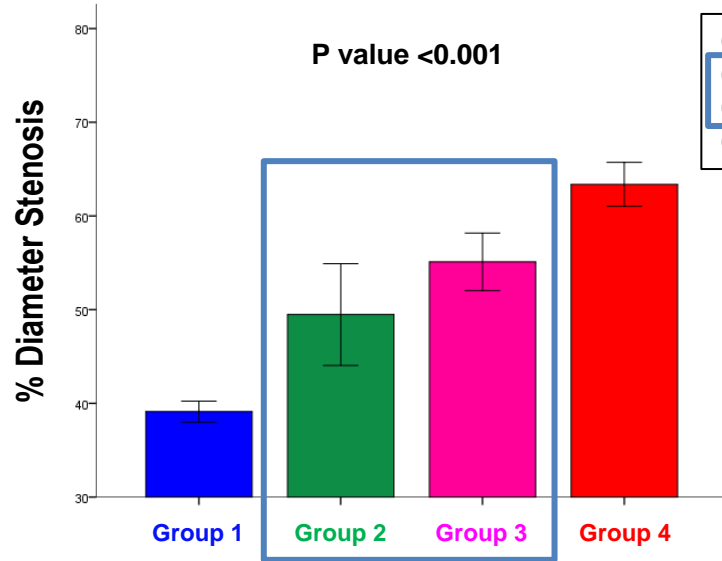
...and generally interpreted in terms of “superiority and inferiority concept”.

If there is only one truth, discordance has no meaning...

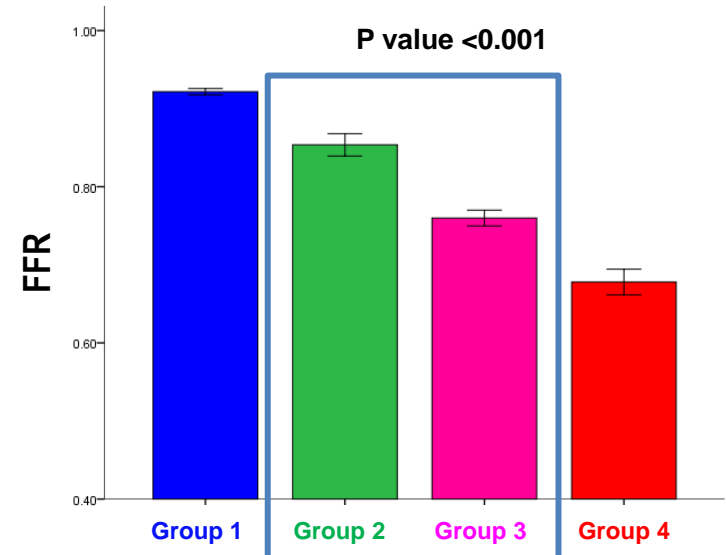
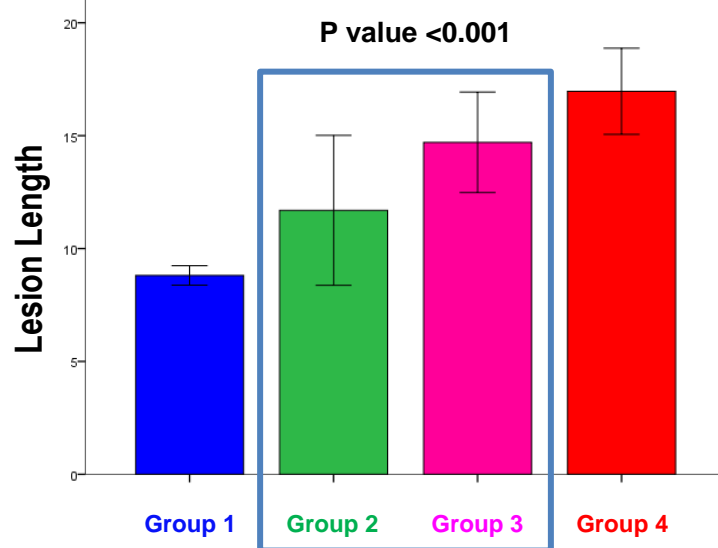
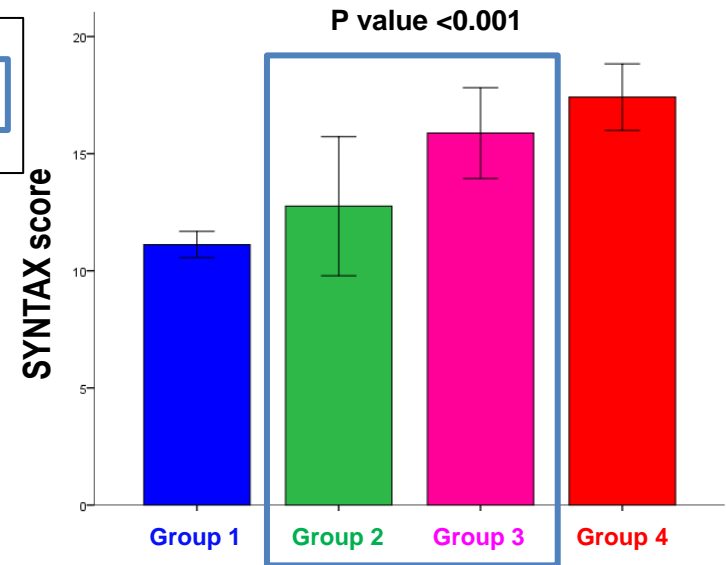


Lee JM, Koo BK, et al. Int J Cardiol 2017
Lee JM, Koo BK, et al. Eur Heart J 2018

Clinical relevance of iFR/FFR discordance



Group 1: Both high
 Group 2: High FFR & Low iFR
 Group 3: Low FFR & High iFR
 Group 4: Both low



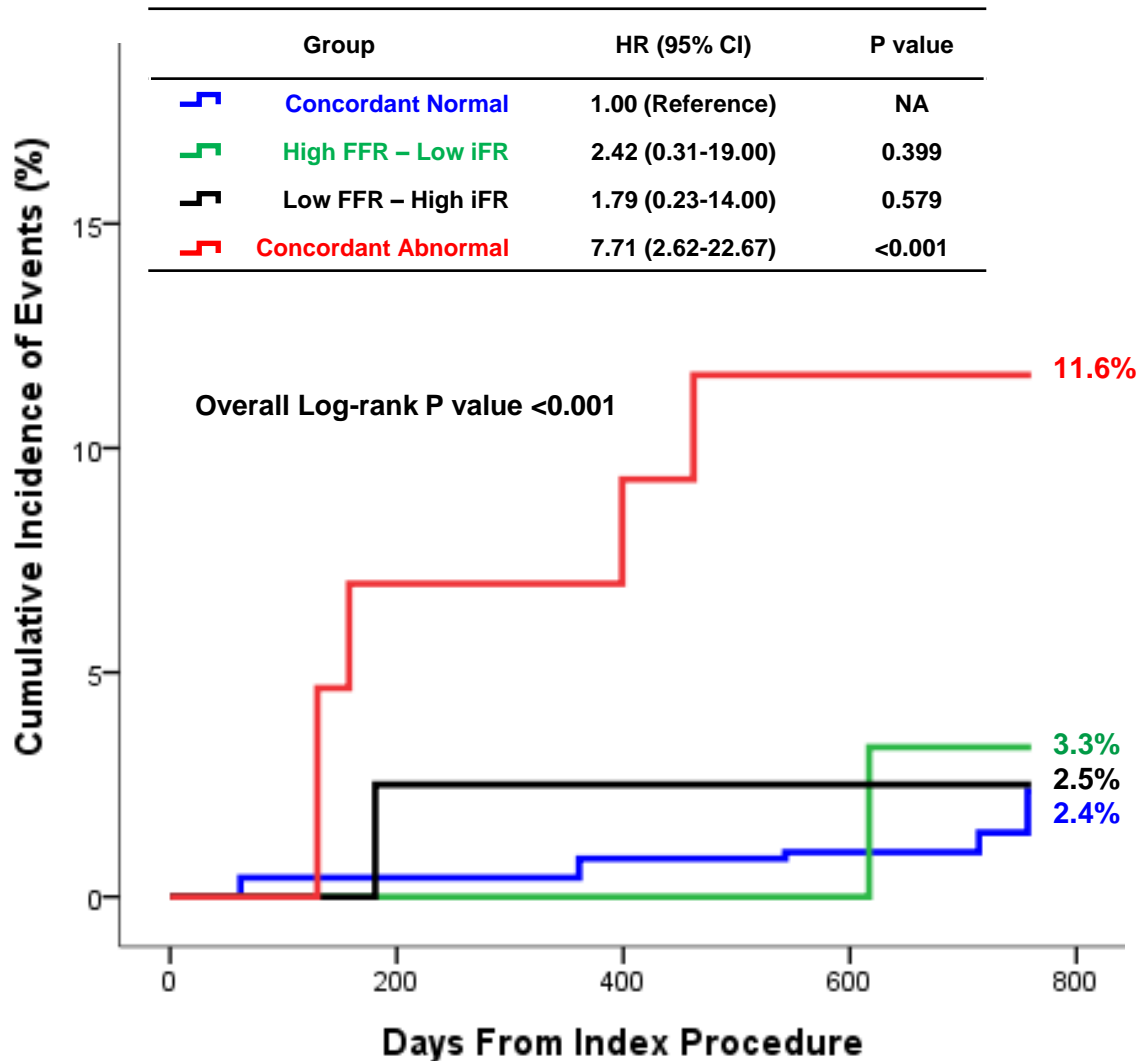
Lee JM, Koo BK, et al. Int J Cardiol 2017

Independent Predictors of iFR/FFR Discordance

Low iFR among High FFR lesions		
	OR (95% CI)	P value
Female	2.1 (1.01-4.47)	0.046
Diabetes mellitus	2.14 (1.02-4.49)	0.045
Reference diameter	0.41 (0.23-0.75)	0.003
% Diameter stenosis	1.03 (1.00-1.05)	0.024
High iFR among Low FFR lesions		
	OR (95% CI)	P value
Male	3.25 (1.32-8.00)	0.011
Diabetes mellitus	0.47 (0.25-0.90)	0.022
% Diameter stenosis	0.96 (0.94-0.98)	<0.001

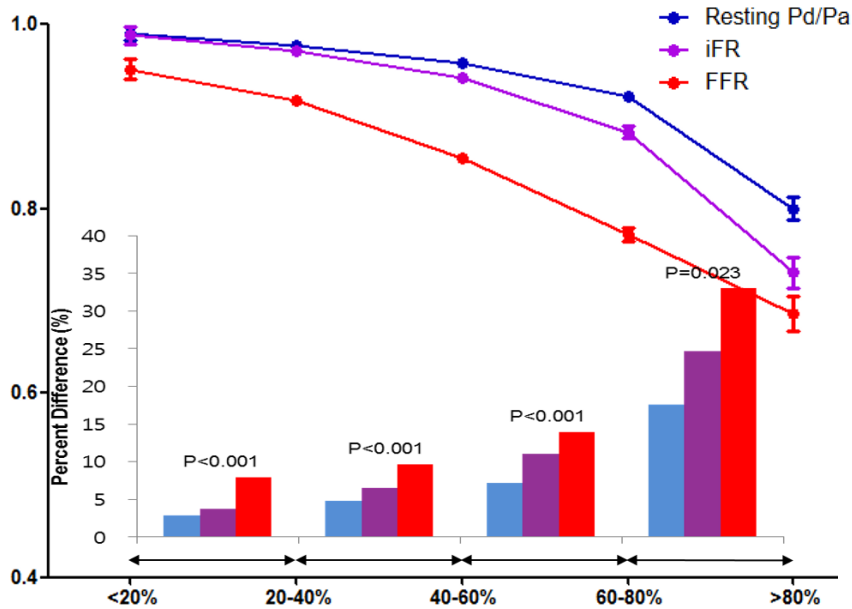
Lee JM, Koo BK, et al. Int J Cardiol 2017

Clinical outcomes according to FFR/iFR classification

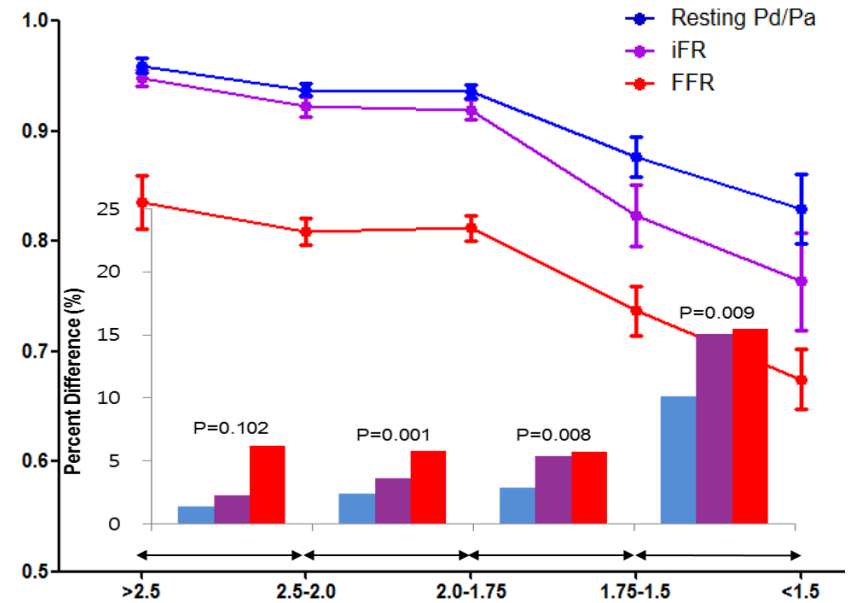


Similarity and Difference between Resting and Hyperemic indexes

Stenosis severity vs. Pressure indexes



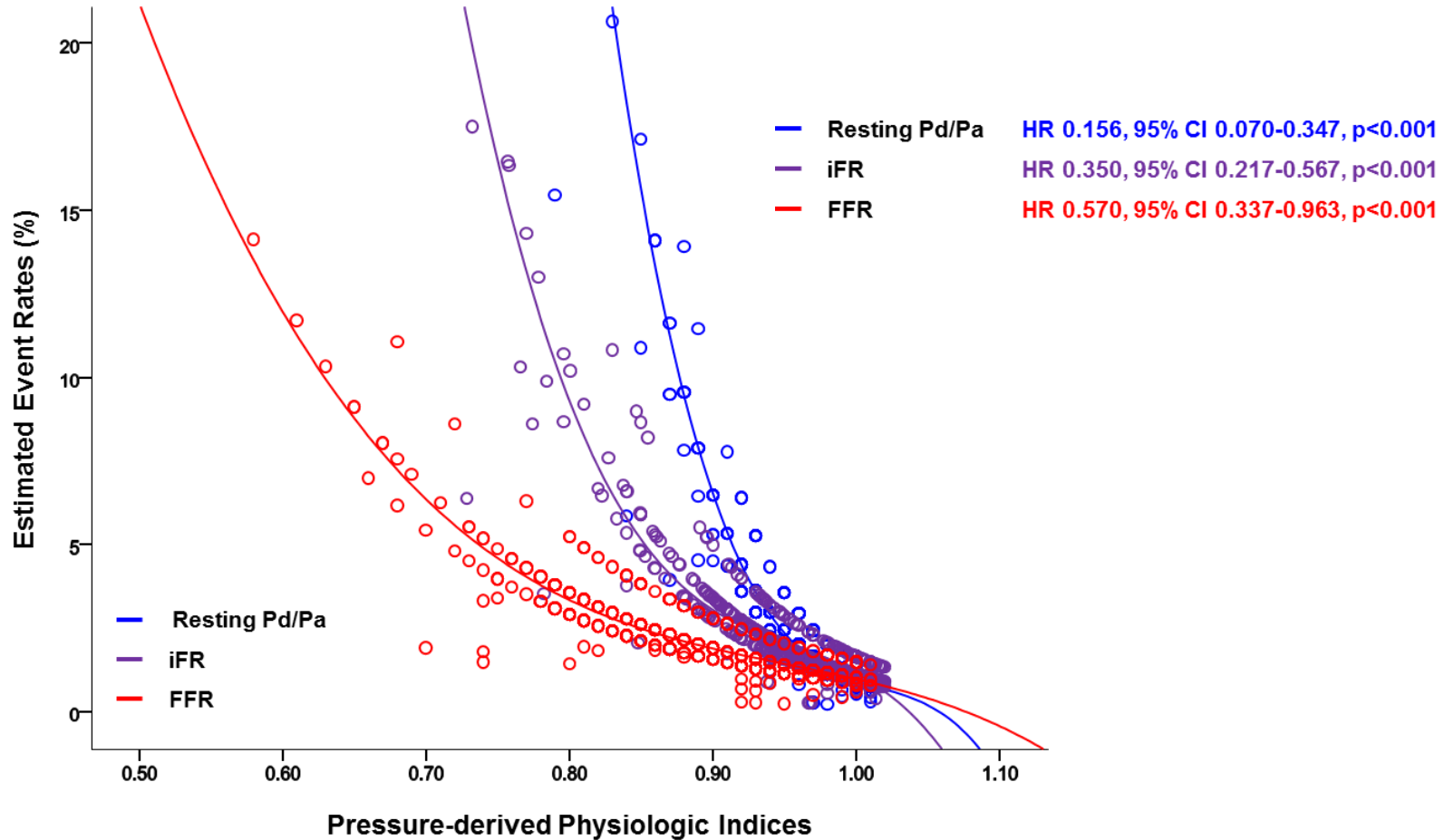
Angiographic % diameter stenosis



Hyperemic Stenosis Resistance

Lee JM,, Koo BK, J Am Coll Cardiol 2017

Association with Clinical outcomes



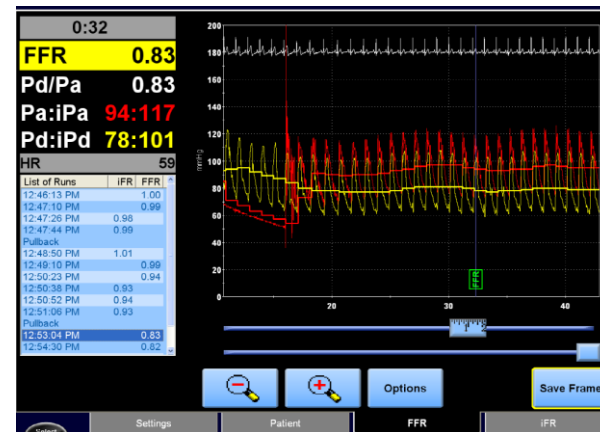
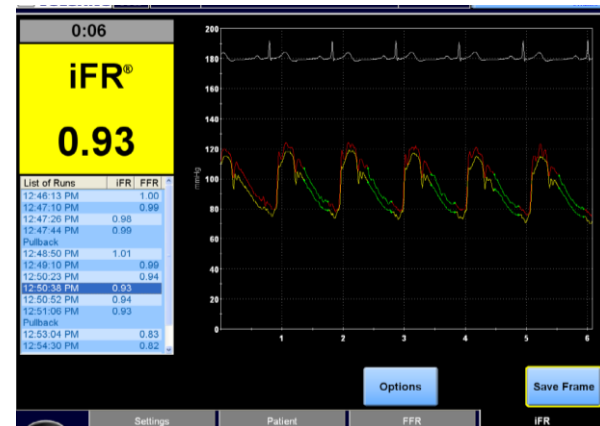
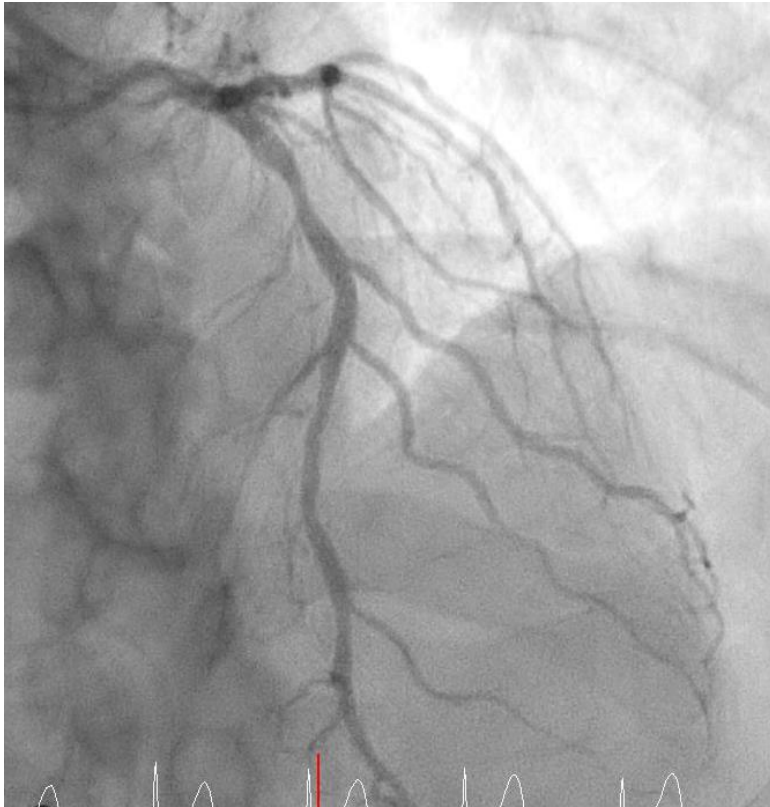
Lee JM, Koo BK, et al. Circulation 2017

Lee JM, Koo BK, et al. JACC 2017

Summary: Part I

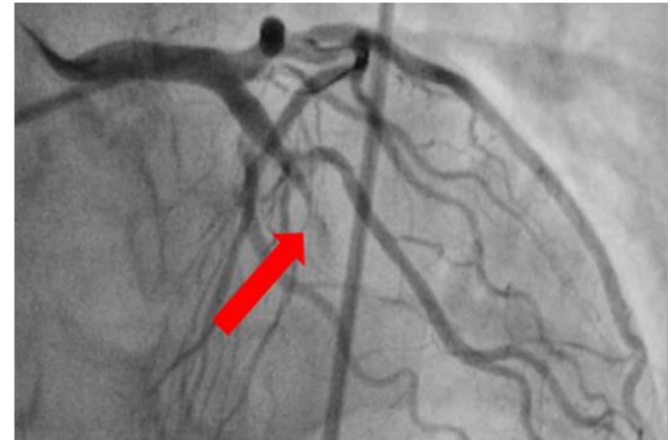
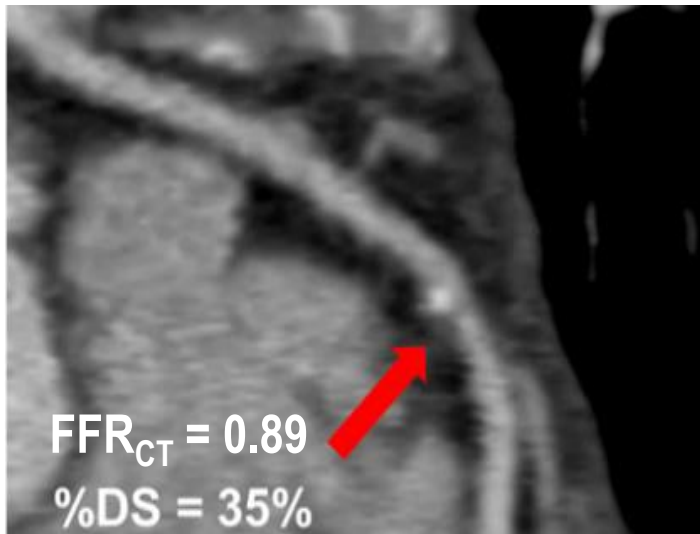
- Resting pressure index represents the degree of exhausted flow reserve and hyperemic index, reduced hyperemic flow due to stenosis.
- Both resting and hyperemic indexes are the surrogates of coronary stenosis severity and have similar prognostic implications.
- Integrated use will maximize the benefit of invasive physiologic assessment.

Do we need “INTEGRATION” of image and physiology?



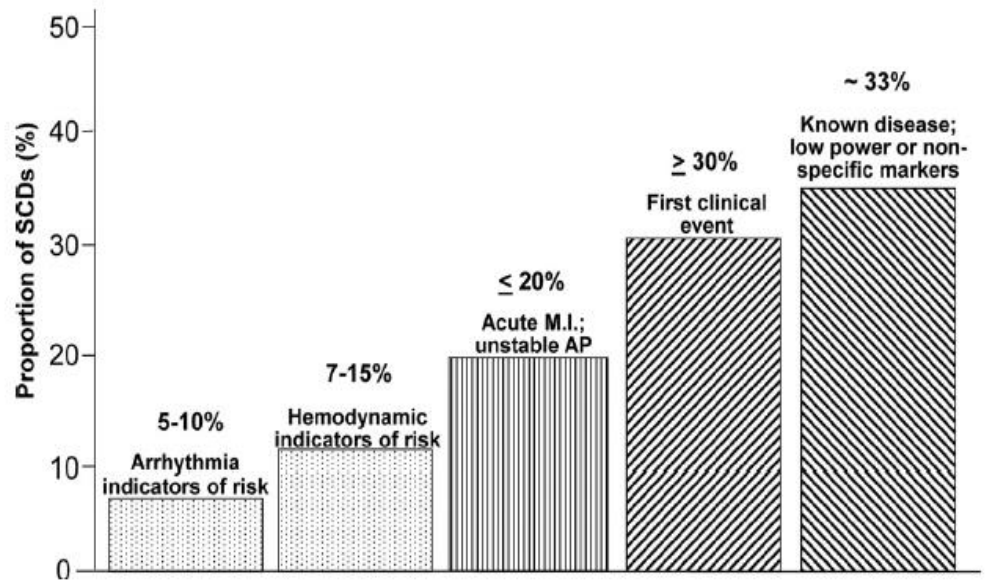
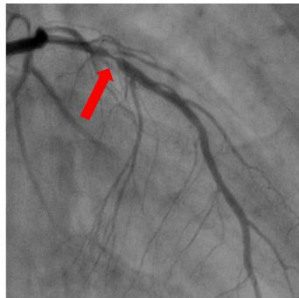
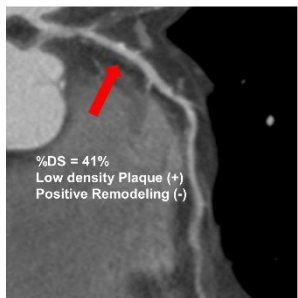
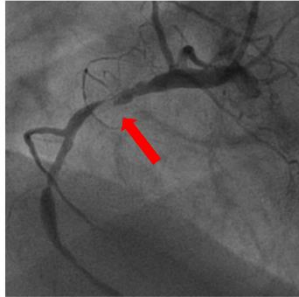
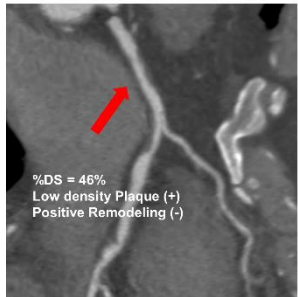
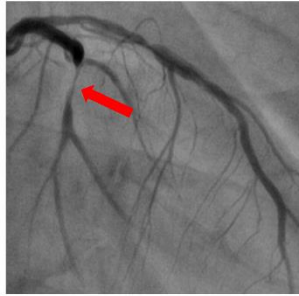
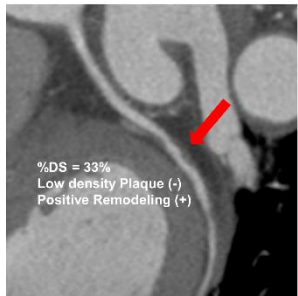
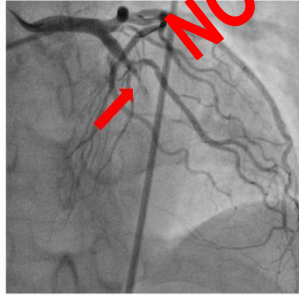
Both iFR and FFR are negative. Everything will be fine, so let's finish the procedure and just do medical treatment....

Will everything be fine?



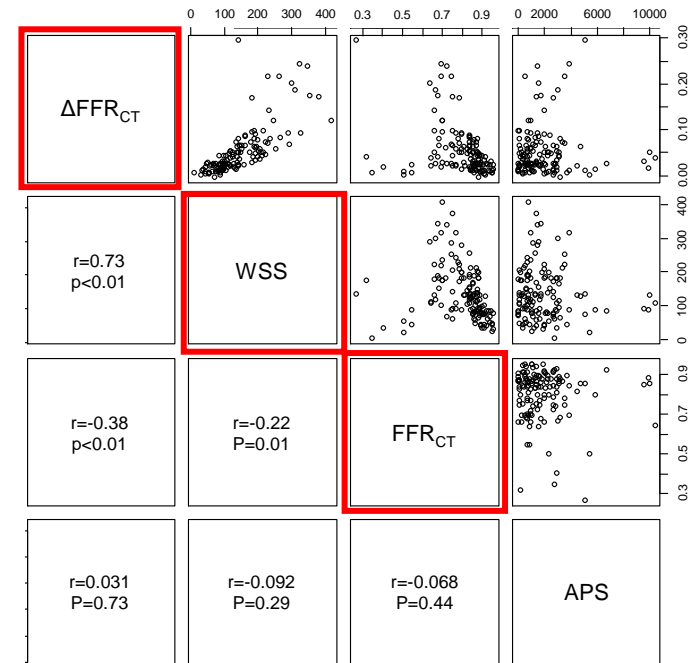
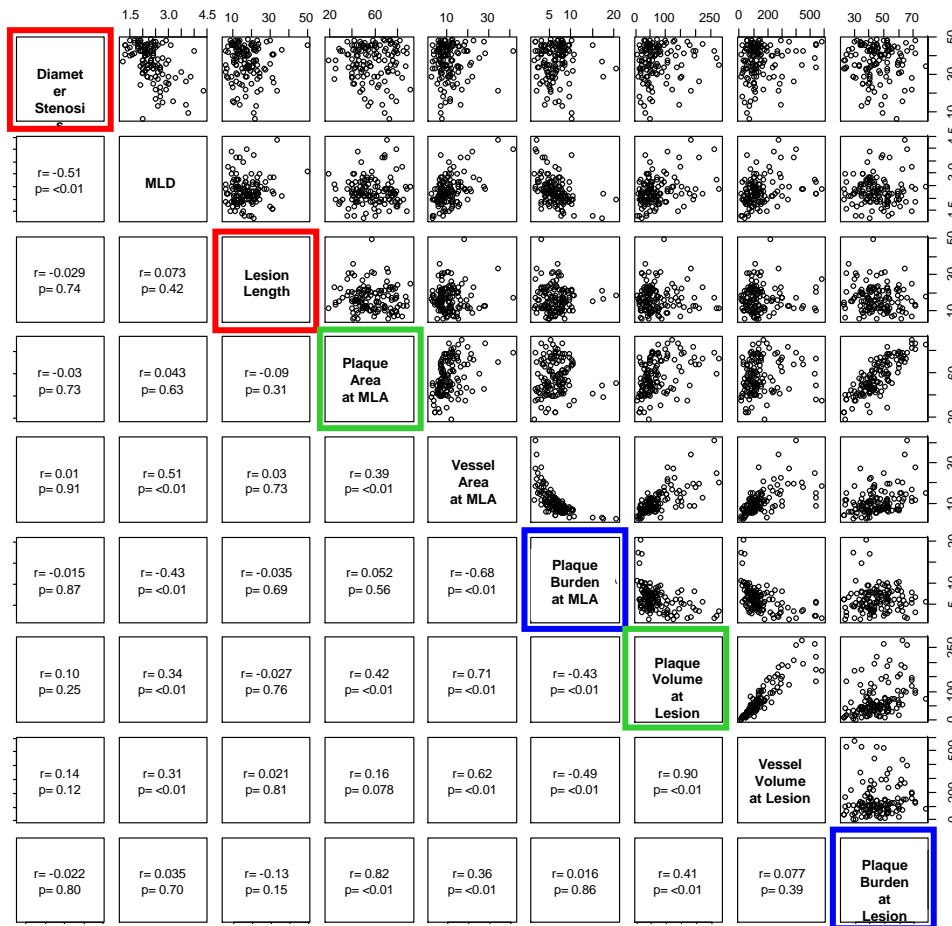
Acute fatal cardiovascular event occurs from non-obstructive lesions

It's just one case....



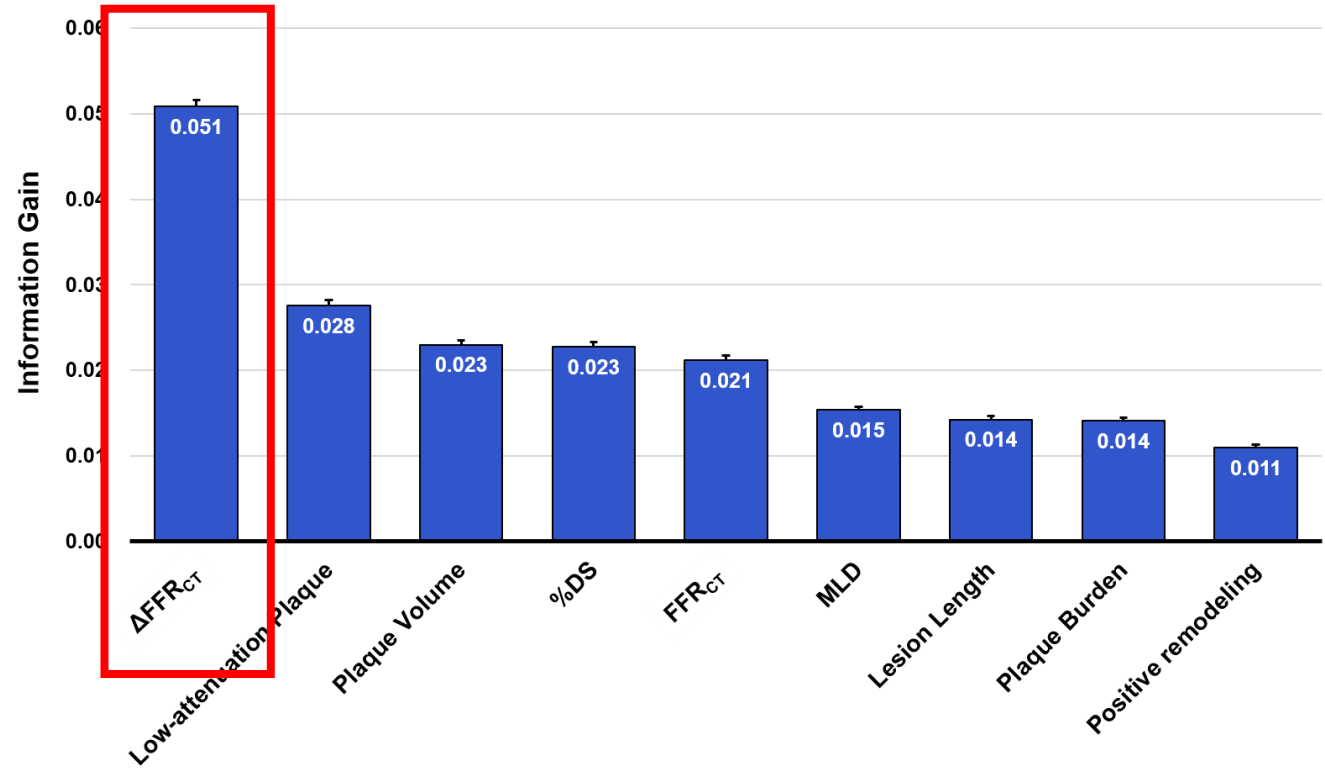
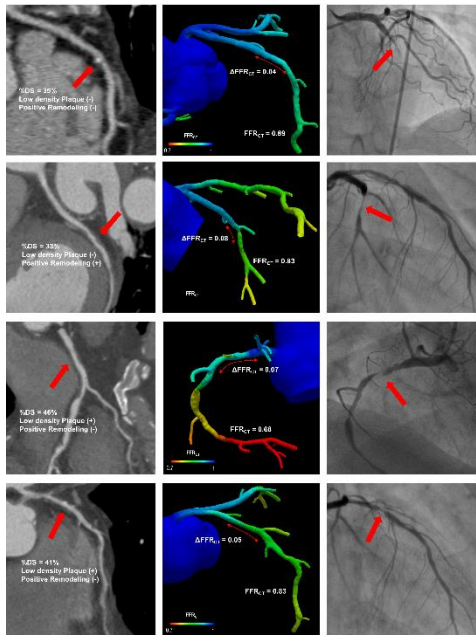
Myerburg RJ Circulation 2012;125:1043-1052

Association, concordance and discordance..... Which is the best metric for ACS prediction?



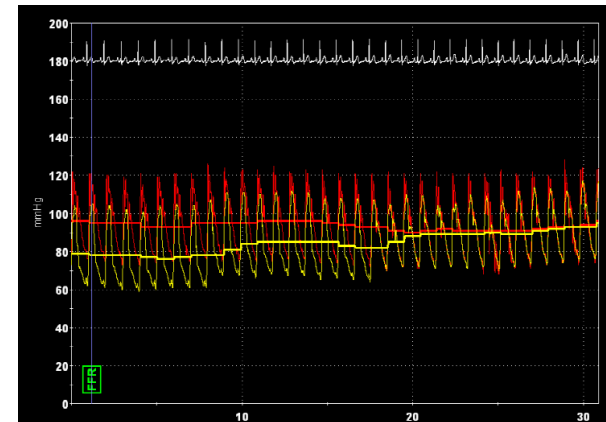
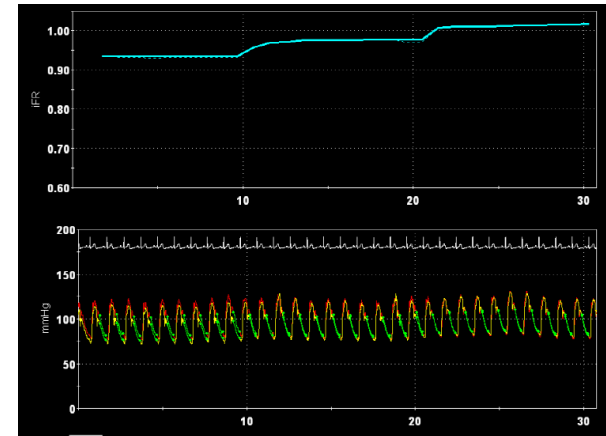
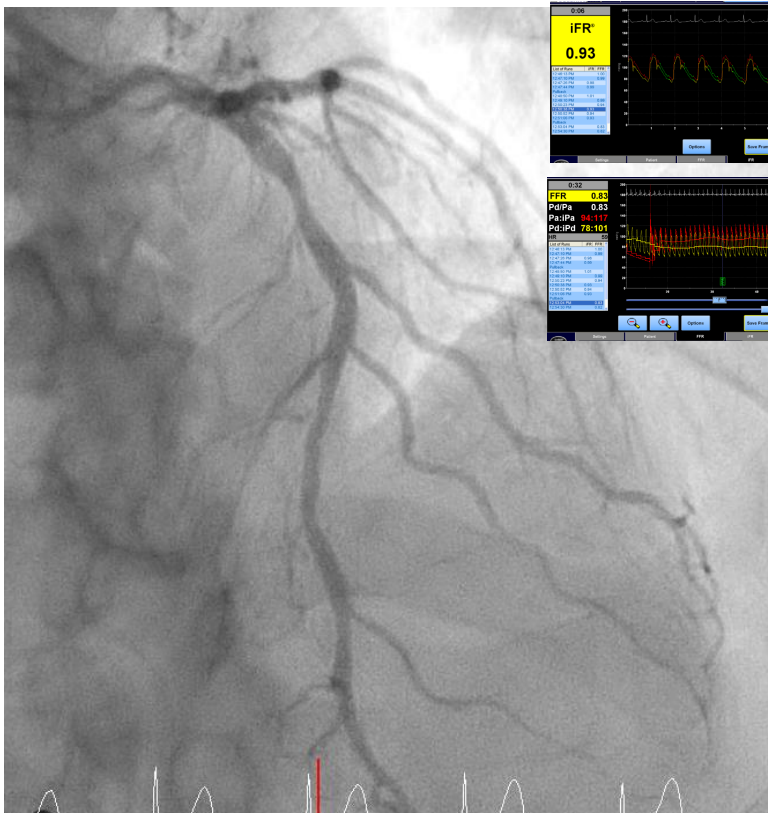
Park JS, Koo BK, et al. Eur Radiol 2019

Importance of Individual Lesion Characteristic Assessed by Information Gain



Park JS, Koo BK, et al. Eur Radiol 2019

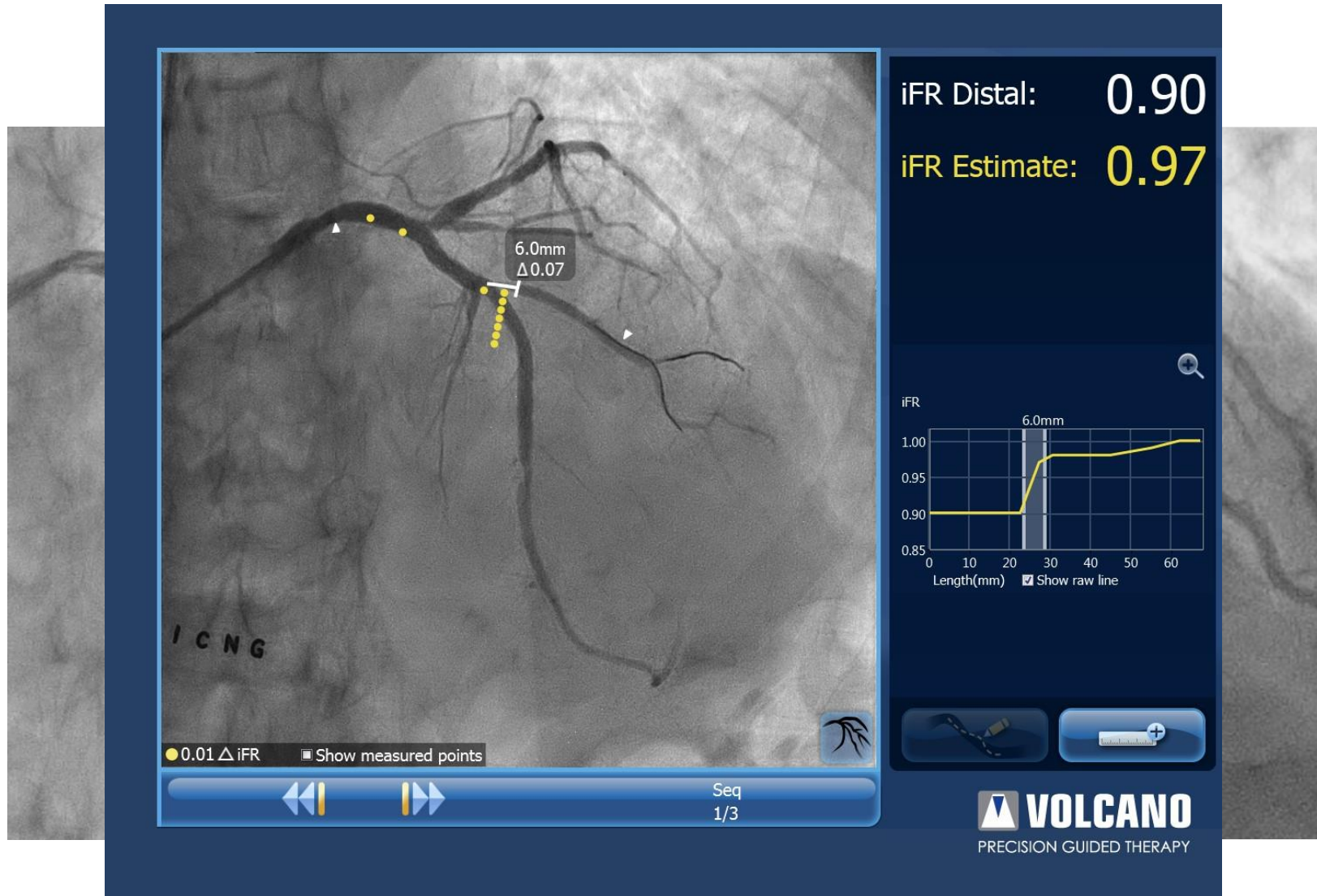
Do we need “INTEGRATION” of image and physiology?



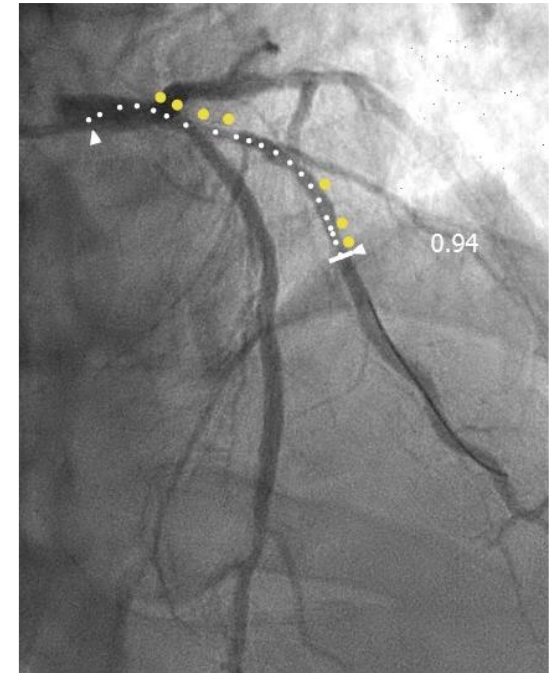
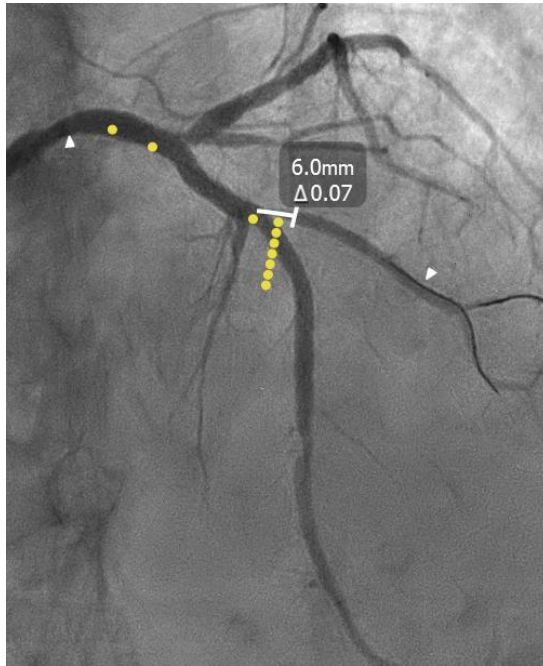
Both iFR and FFR are negative. Everything will be fine, so let's finish the procedure and just do medical treatment....

I did the iFR pullback (iFR-scout) and FFR pullback tracing. But where is where?

iFR Co-registration with SyncVision® technology

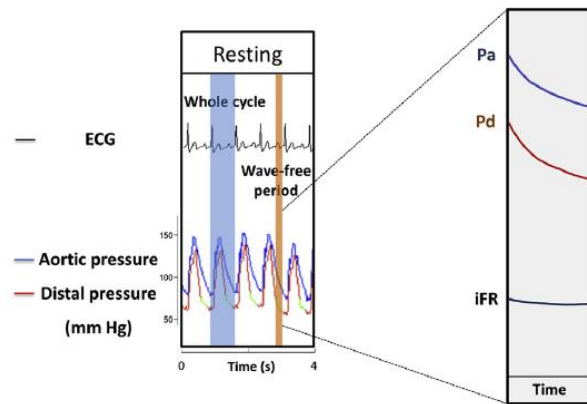


iFR Co-registration with SyncVision[®] technology

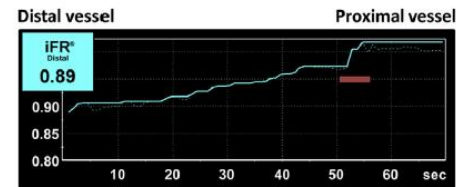


Pre-PCI treatment planning with iFR Co-registration system

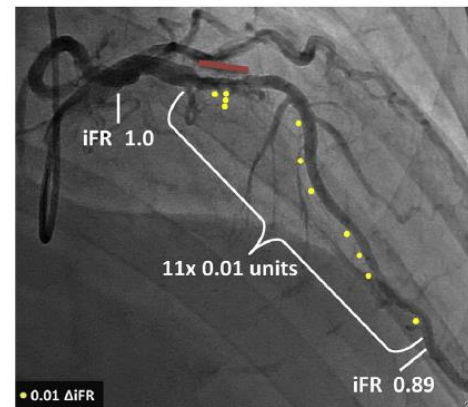
A iFR is Calculated as the Ratio of Pd to Pa on a Beat-by-beat Basis



B iFR Pullback for Quantification of Lesion Severity



C Procedural Planning and the Prediction of Post-PCI iFR Outcome



Using iFR pullback data, the operators planned the procedure and predicted and registered iFR outcome into an electronic case report form before starting PCI. iFR was predicted by summation of iFR gradient and iFR measured at the distal coronary artery before treatment procedure (B, C: red bar).

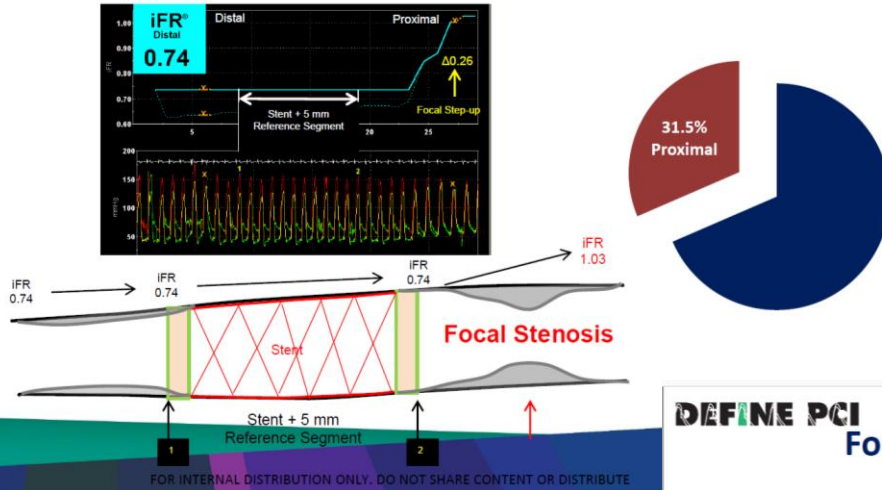
Kikuta et al. JACC interv 2018

Residual focal pressure gradient after PCI

DEFINE PCI

Focal Residual Pressure Gradient Prox to stent

'Physiologic miss' occurred in 31.5% of focal lesions proximally

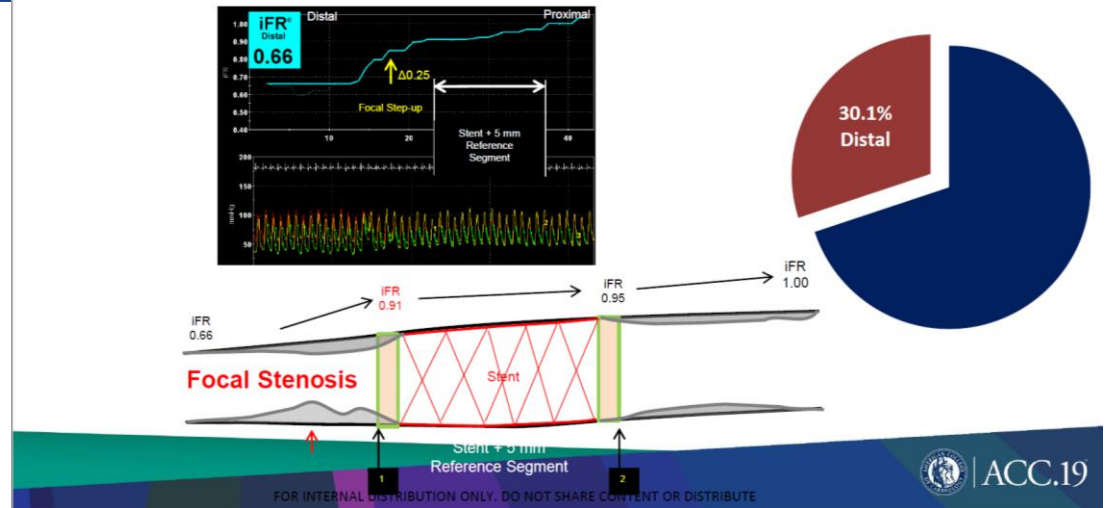


Significant epicardial residual ischemia after angiographically successful PCI is not uncommon, occurring in nearly 25% of patients in the present study. Post-PCI angiography poorly correlated with physiologic measures.

DEFINE PCI

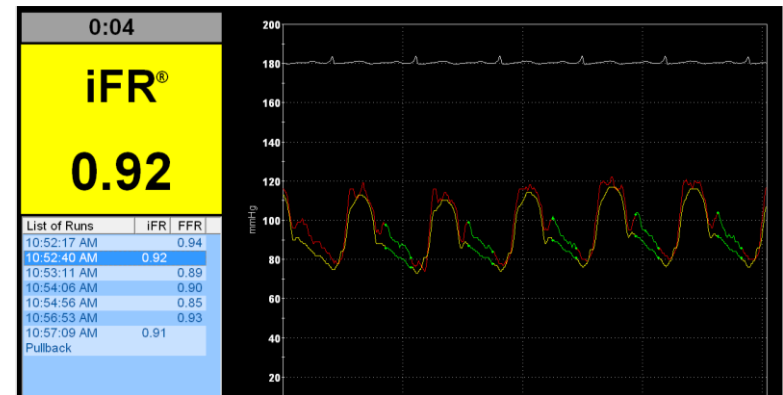
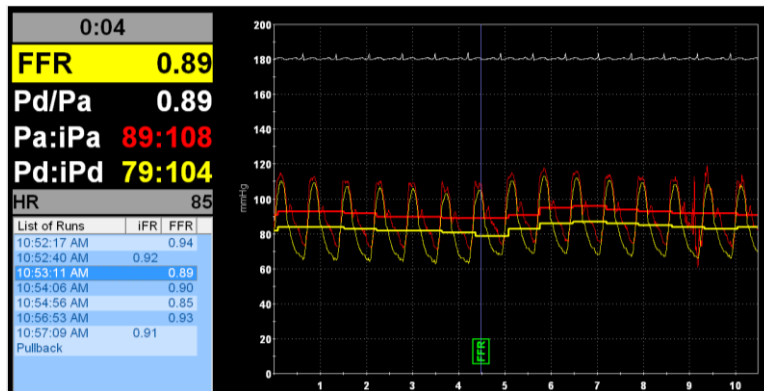
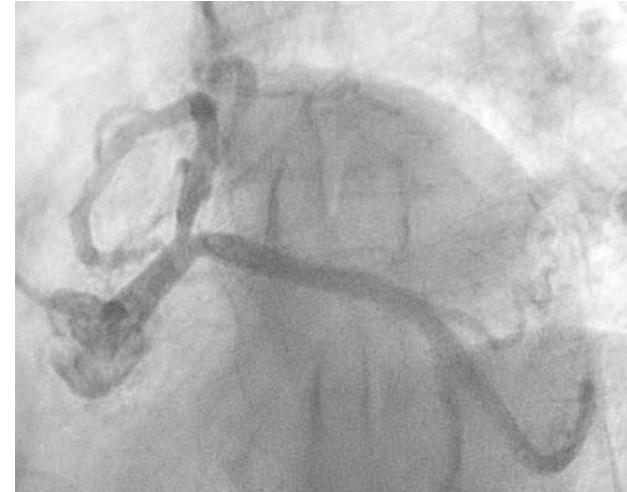
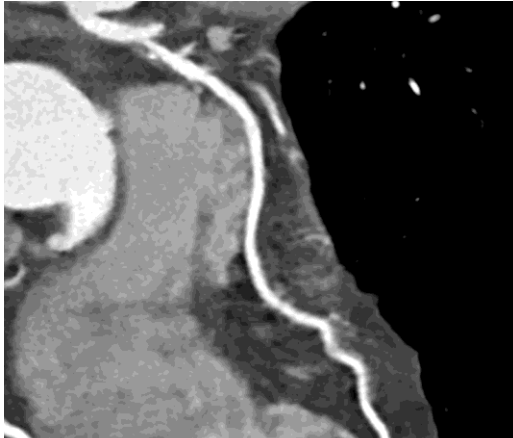
Focal Residual Pressure Gradient Distal to stent

'Physiologic miss' occurred in 30.1% of focal lesions distally



Male, 67

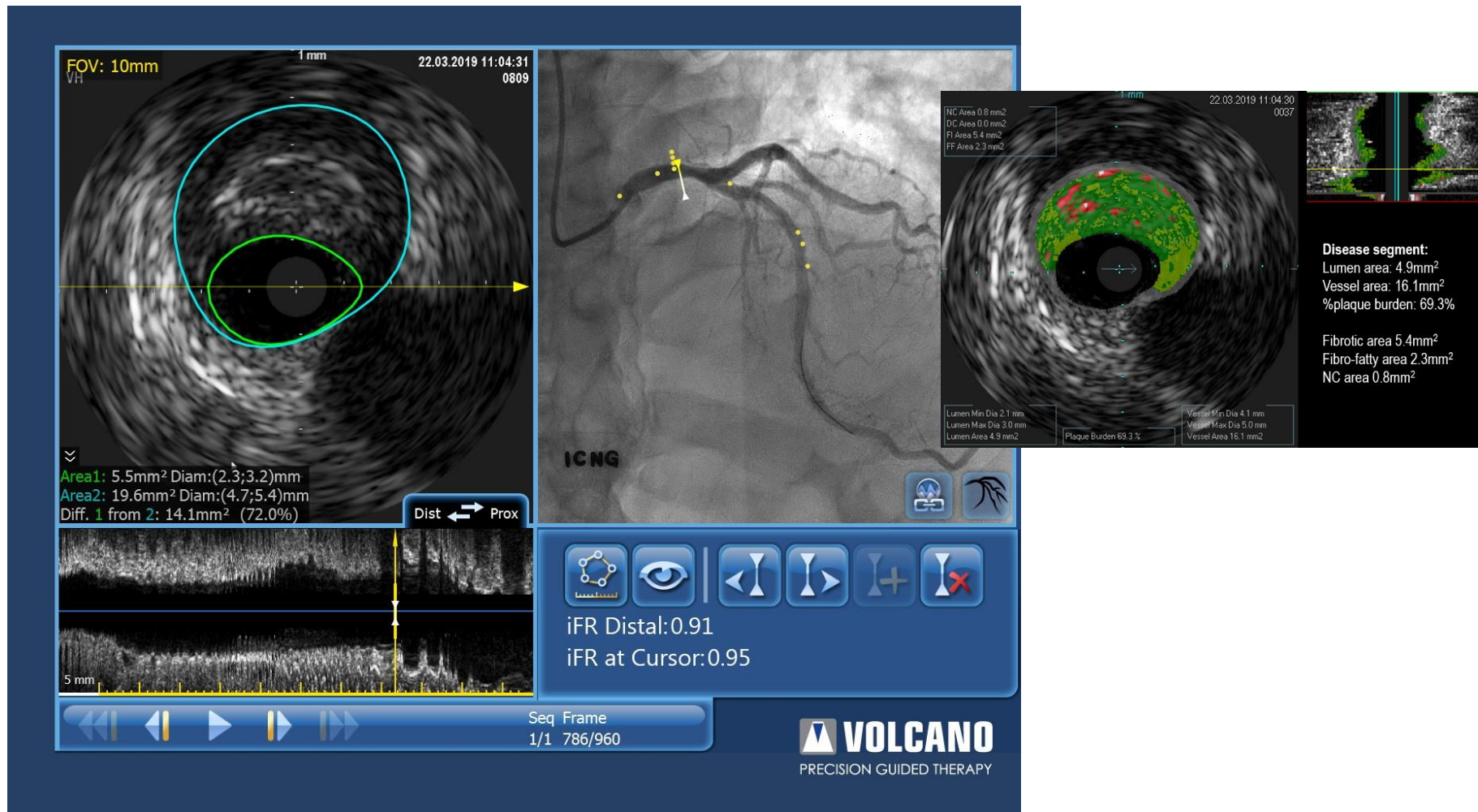
Anatomical and functional assessment



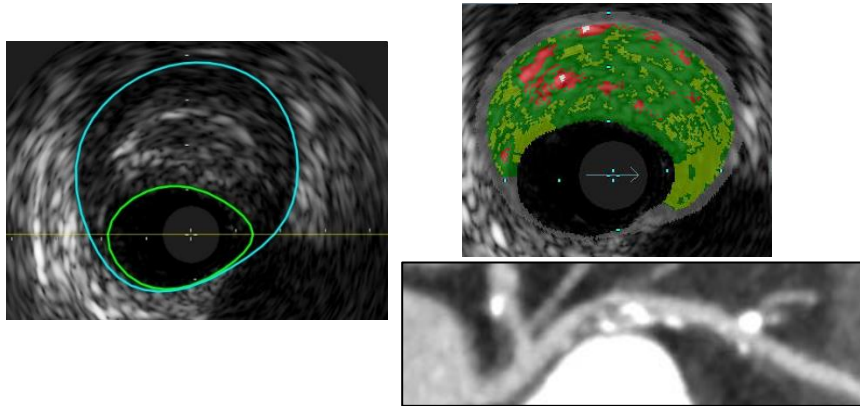
Both iFR and FFR are negative. Everything will be fine, so let's finish the procedure and just do medical treatment....

Male, 67

IVUS/iFR co-registration + VH



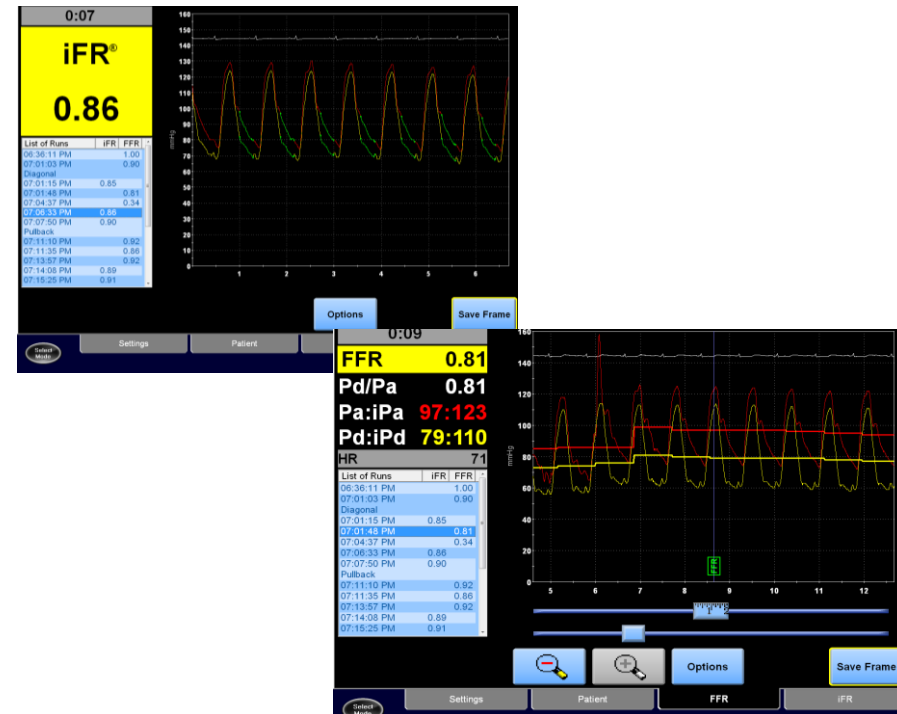
Imaging



- %DS, %AS, MLD, MLA,....
- Mixed plaque, Plaque burden
- Spotty calcification, TcFA
- Positive remodeling,



Physiology



We can enjoy PROSPECT, FAME and FLAIR!



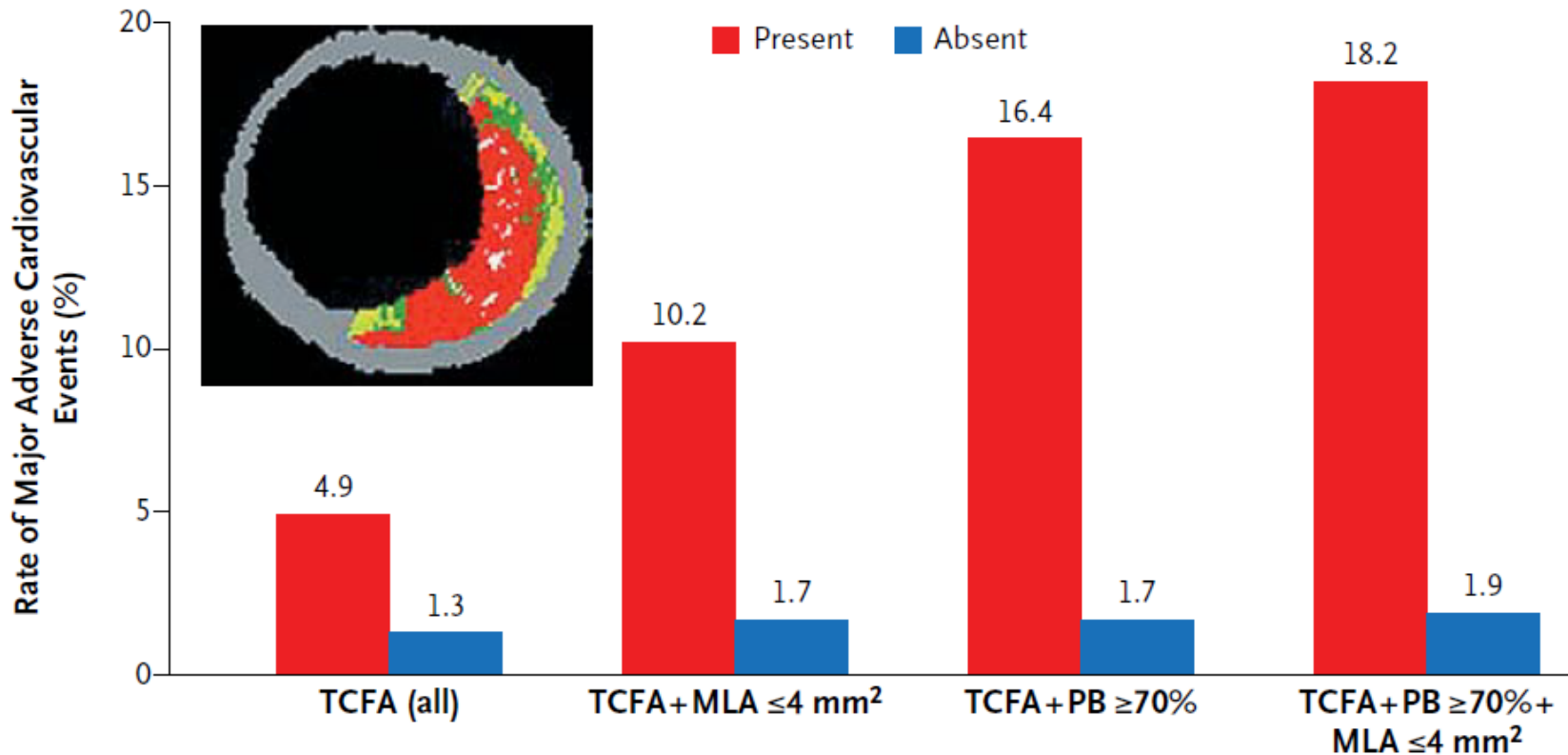
PROSPECT
FOR SUCCESS

Intentional Curious Aware



Value of invasive/non-invasive imaging

Anatomical severity + Plaque character

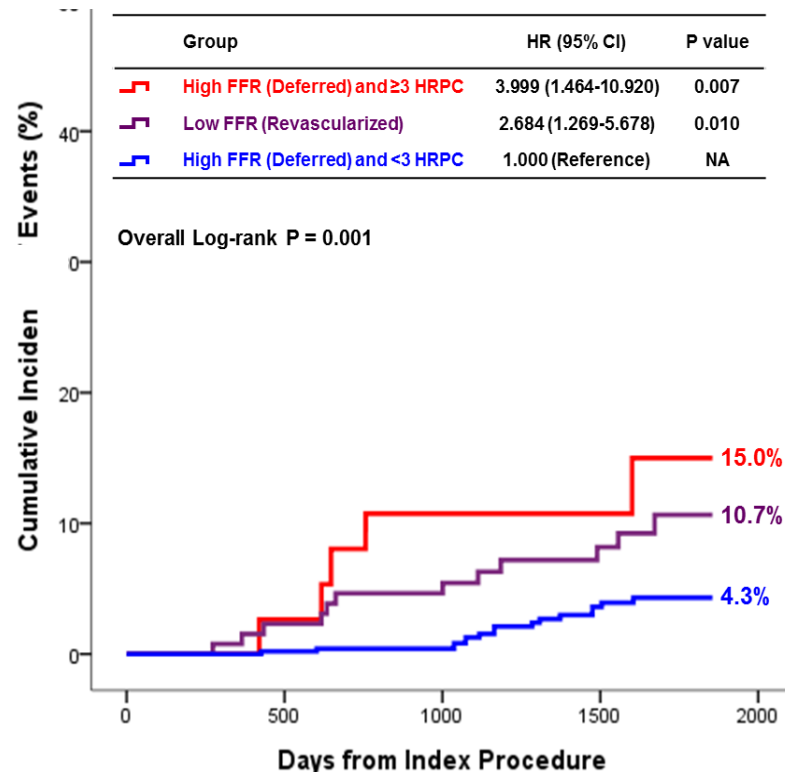
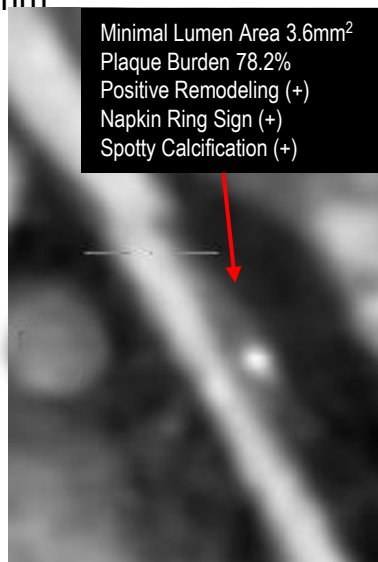


Lesion hazard ratio (95% CI)	3.90 (2.25–6.76)	6.55 (3.43–12.51)	10.83 (5.55–21.10)	11.05 (4.39–27.82)
P value	<0.001	<0.001	<0.001	<0.001
Prevalence (%)	46.7	15.9	10.1	4.2

Clinical relevance of integration/co-registration of anatomy, plaque character and physiology

High Risk Plaque Characteristics (HRPC)

- Minimum lumen area 4mm^2
- Plaque burden $\geq 70\%$
- Low attenuating plaque
- Positive remodeling
- Napkin-ring sign
- Spotty calcification



Lee JM, Koo BK, et al. JACC 2019, in press

Summary: Part II

- Co-registration of imaging and physiologic information is feasible with SyncVision[®] technology.
- Co-registration of angiogram and coronary hemodynamics enables pre-PCI treatment planning and risk prediction for future events.
- Integrated use of information on anatomy, plaque character and coronary hemodynamics will maximize the benefit of invasive imaging and physiologic assessment.



The Philips CoreVision
advanced imaging solution
Overcome uncertainty. Treat Confidently.

Smart way of living

innovation + you

IMAGESHIELD

PHILIPS

- **Discordance**
 - Understand the meaning of natural discordance
- **Integration**
 - Integrate the discordance to make the best out of it
- **Co-registration**
 - Register all information together precisely to be used easily in daily practice