

Bifurcation PCI at the Crossroads: New Physiology-Guided Decision-Making 2021

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Why “Physiology” for bifurcation lesions?

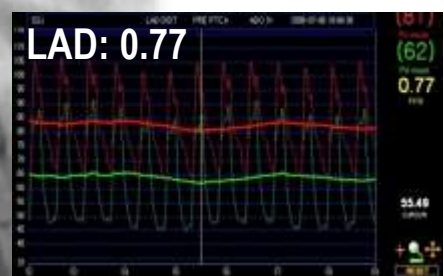
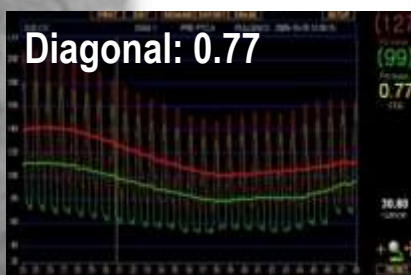
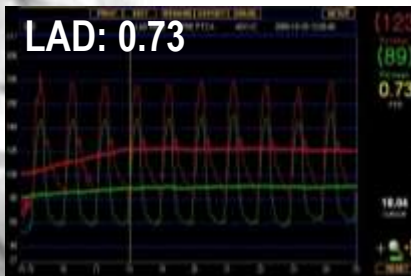
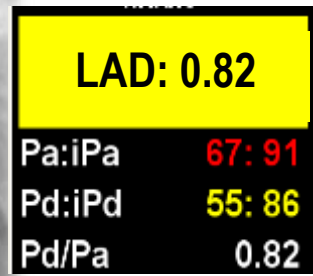
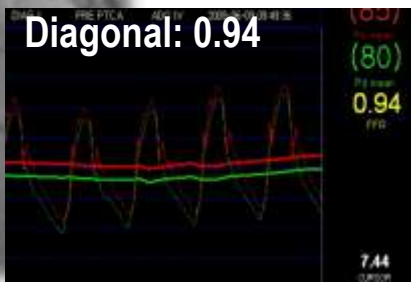
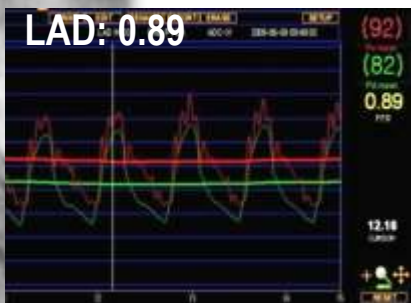
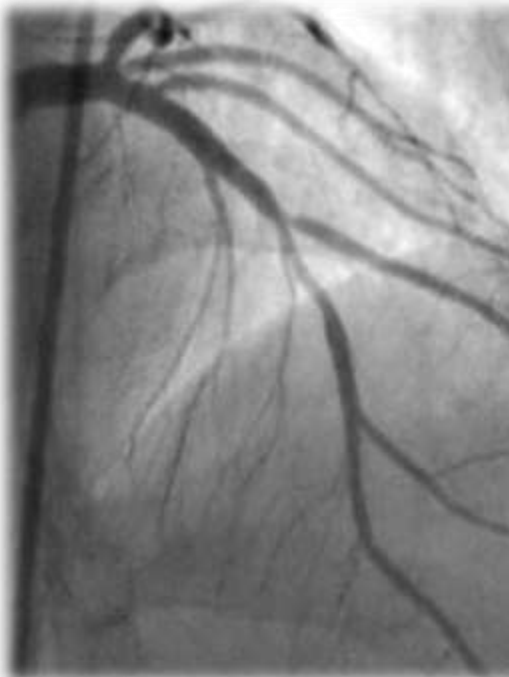
Pitfalls of anatomical evaluation

- **Angiography**
 - Single directional assessment
 - Variability in stenosis assessment
 - No validated criteria for intervention
 - Not physiologic
- **IVUS/OCT**
 - Difficult to perform in tight stenosis
 - No validated criteria for intervention
 - Not physiologic

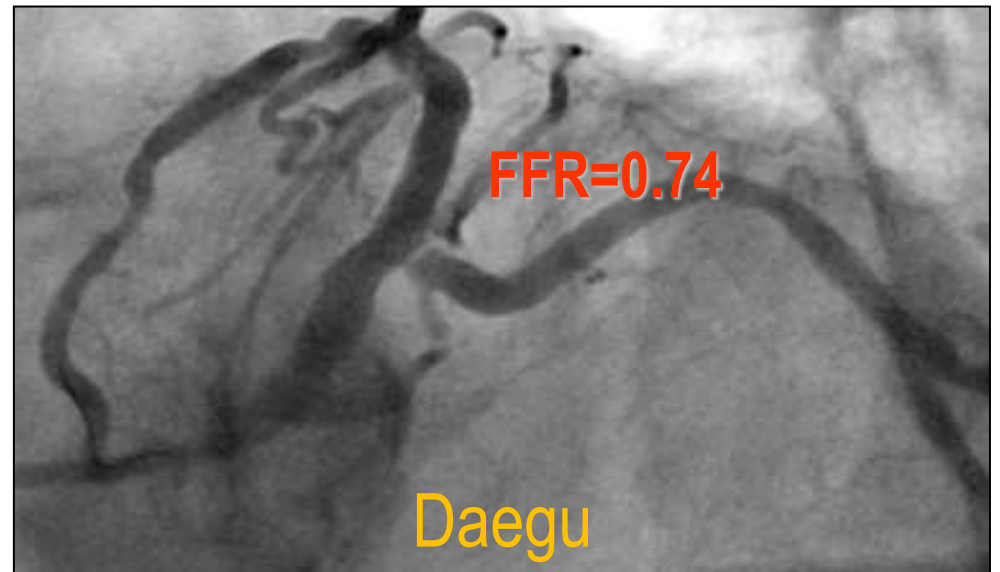
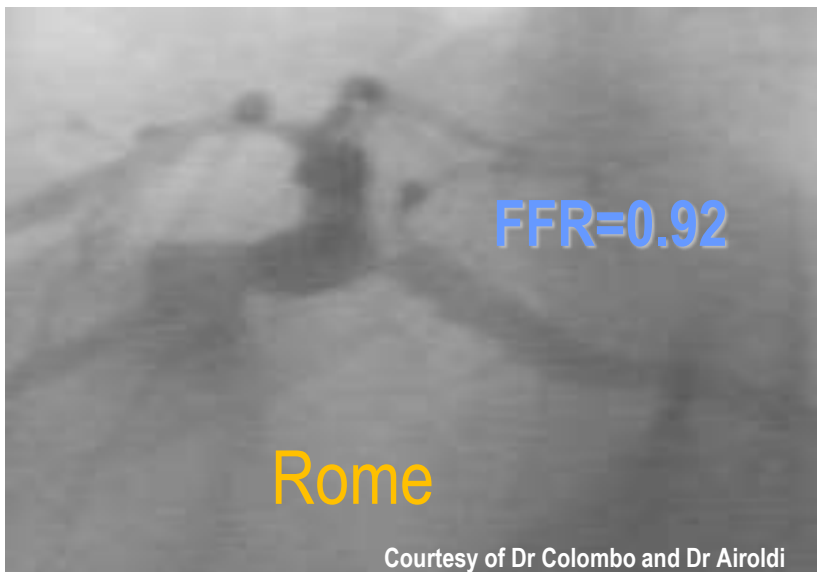
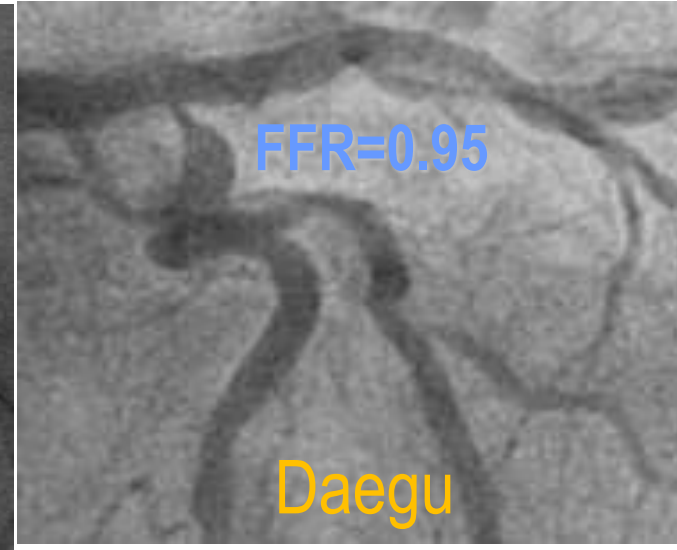
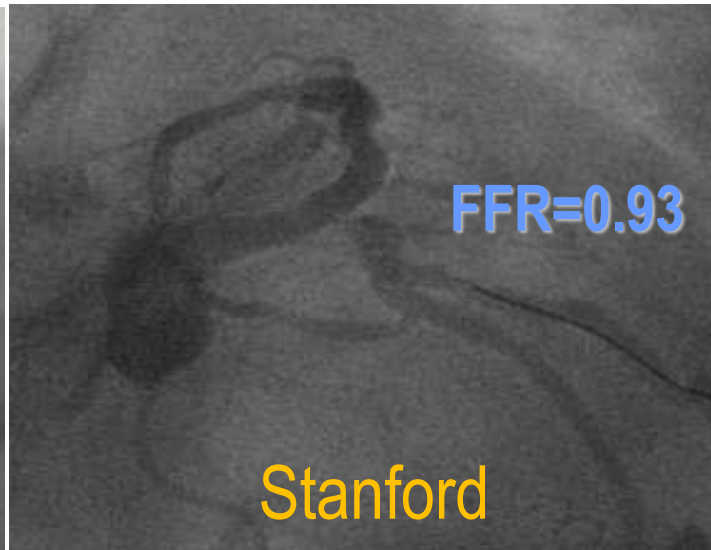
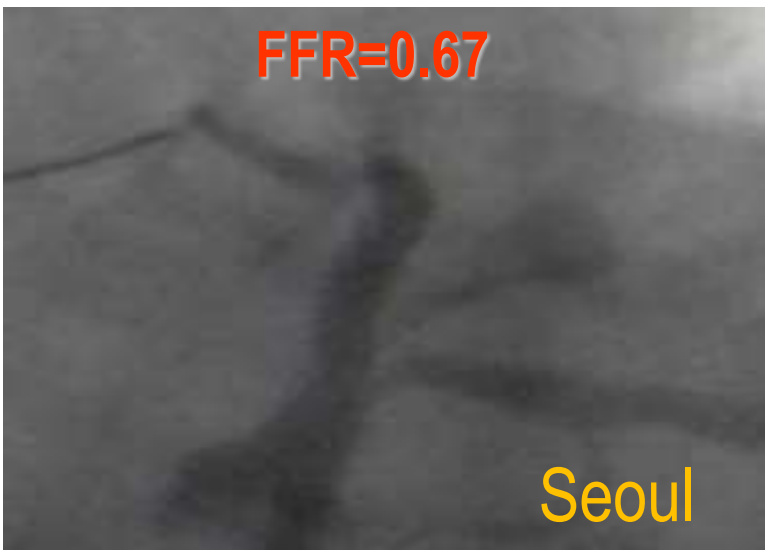
Uniqueness of side branch lesions

- Various size, various amount of myocardium
- Side branch stenosis is **unique and complex**
 - Underlying plaque → **Eccentric**
 - Remodeling → **Negative remodeling**
 - Complex mechanisms of side branch jailing
Carina shift, plaque shift, stent struts, thrombus.....

Bifurcation lesion?



Functionally significant stenosis?



Physiologic Assessment in Coronary Bifurcations

KBC-JBC-EBC consensus

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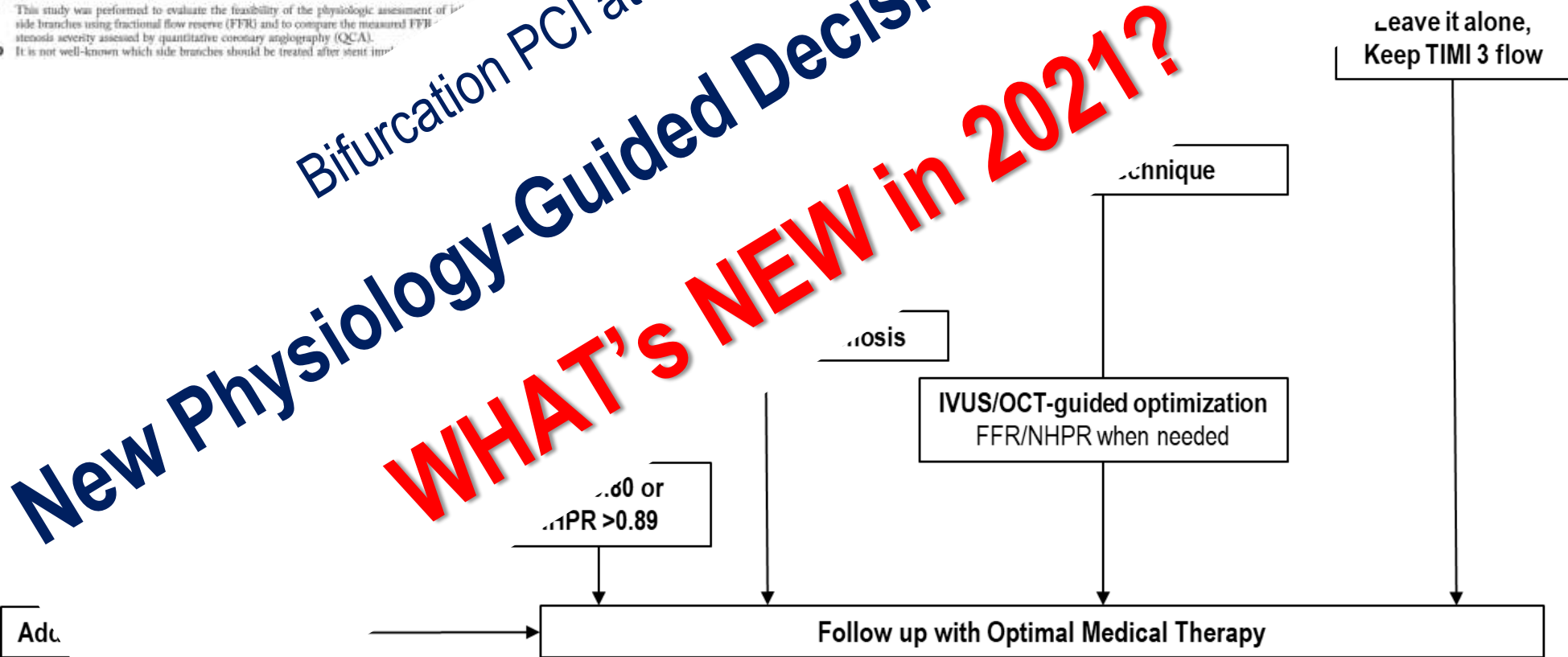
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Physiologic Assessment of Jailed Side Branch Lesions Using Fractional Flow Reserve

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OBJECTIVES This study was performed to evaluate the feasibility of the physiologic assessment of jailed side branches using fractional flow reserve (FFR) and to compare the measured FFR stenosis severity assessed by quantitative coronary angiography (QCA).
BACKGROUND It is not well-known which side branches should be treated after stent implantation.

Bifurcation PCI at the Crossroads:

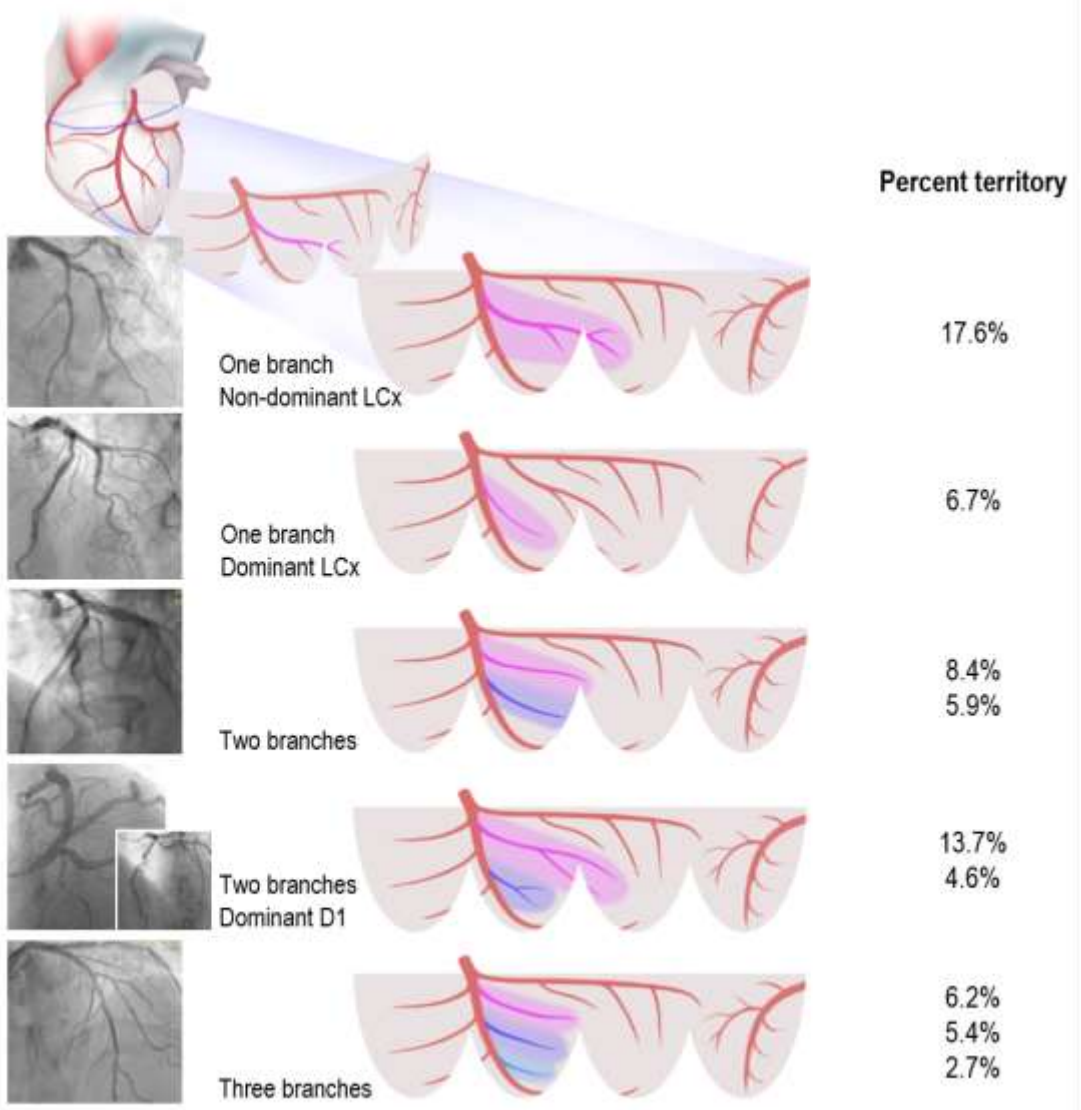
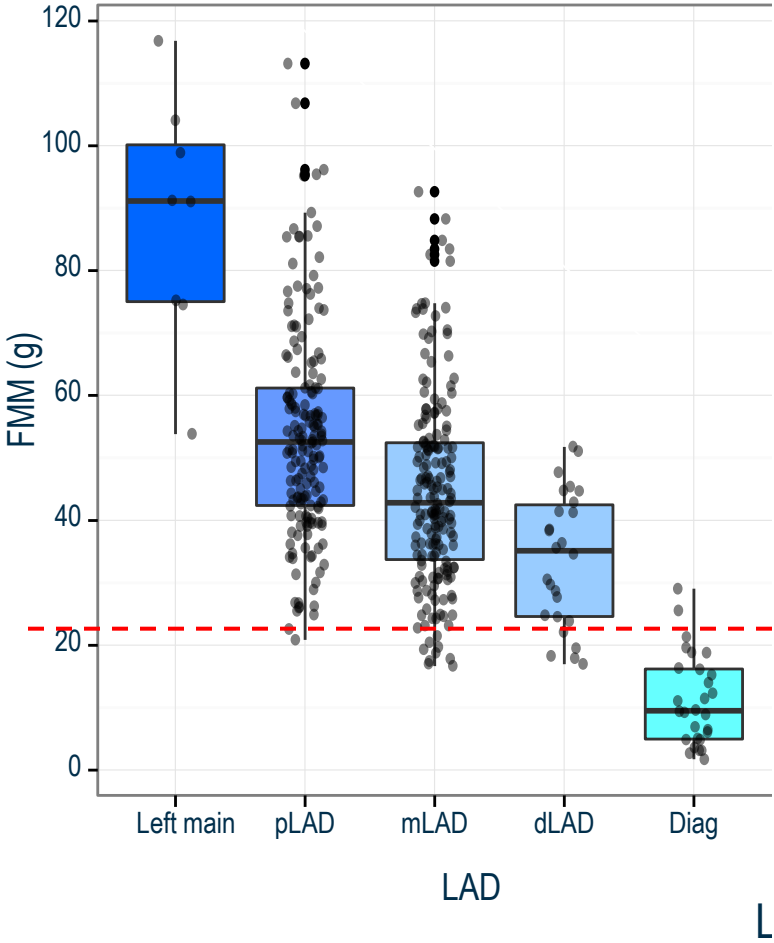


WHAT'S NEW in 2021?

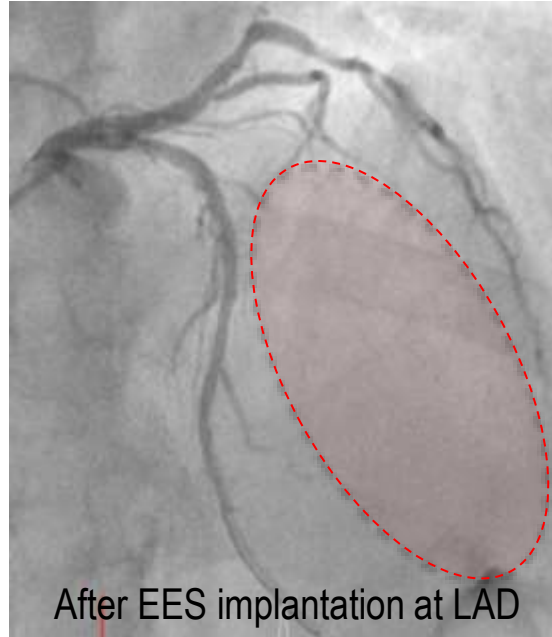
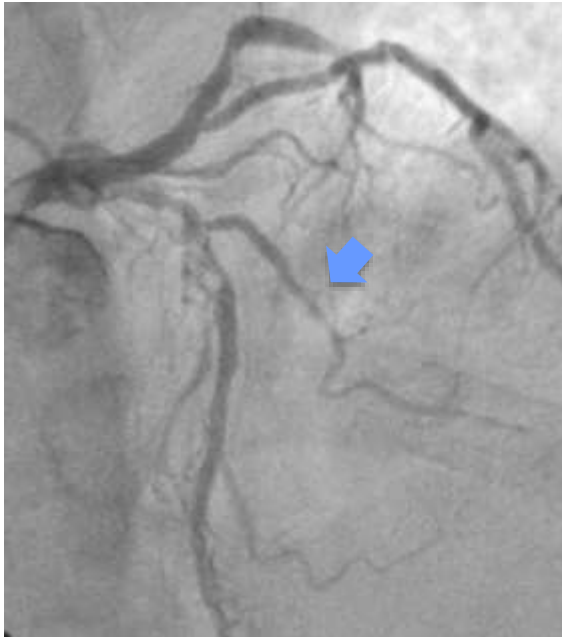
New Physiology-Guided Decision-Making 2021

- **More focus on clinical relevance**
 - Myocardial territory, ischemic territory
 - Clinical relevance of side branches
- **Application of non-hyperemic pressure ratios**
- **New technique and technology**
 - Physiology-guided DCB treatment
 - Image-based physiologic assessment

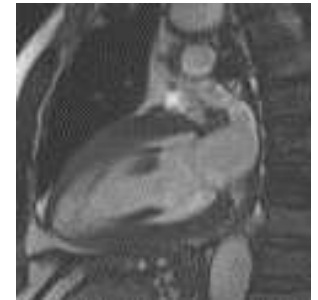
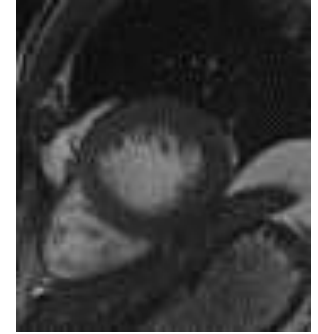
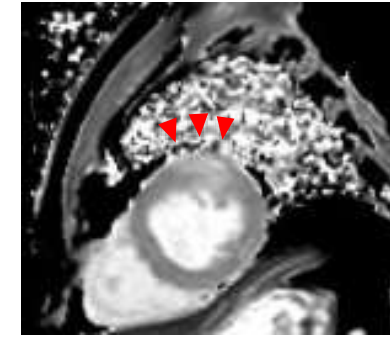
Myocardial territory: Main vs. Side branches



Myocardial vs. Ischemic territory



After EES implantation at LAD

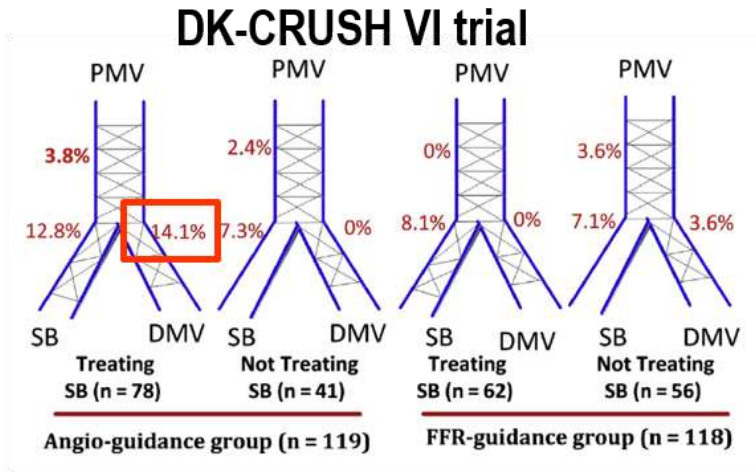


Stroke Volume:	74.55 ml
Ejection Fraction:	52.18%
Total Myocardial Mass	143.10 g
Total Enhanced Mass	10.51 g
Enhanced/Total mass	7.30%

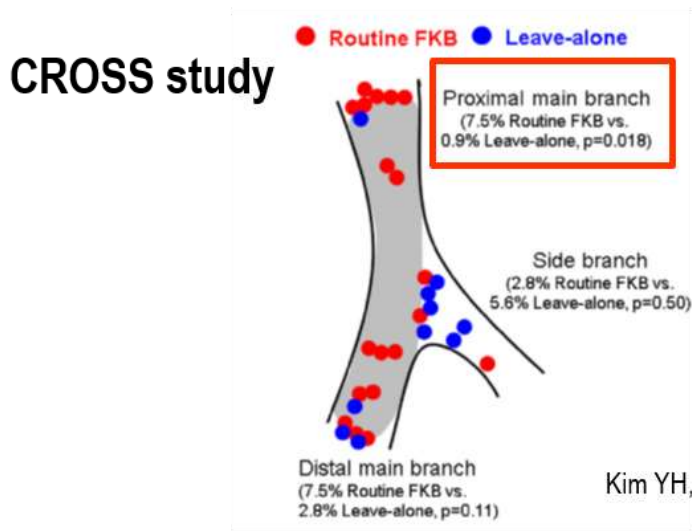
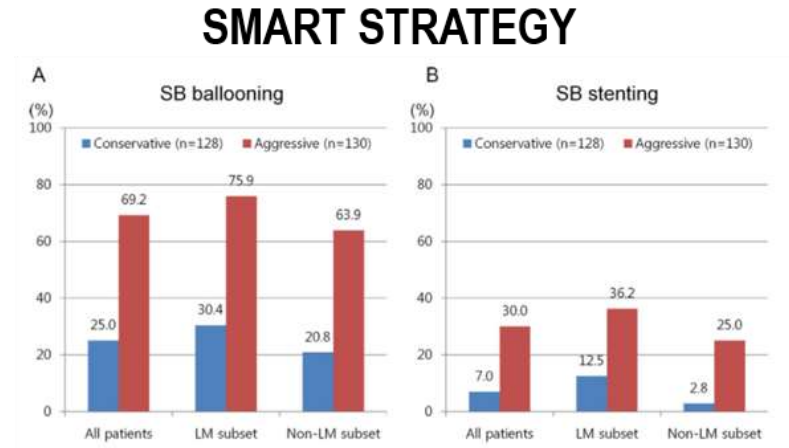
MPI in severe disease in all diagonal branches:

- Average % ischemia: $8.4 \pm 3.3\%$
- % ischemia $\geq 10\%$: 35%

More side branch intervention, More main branch events

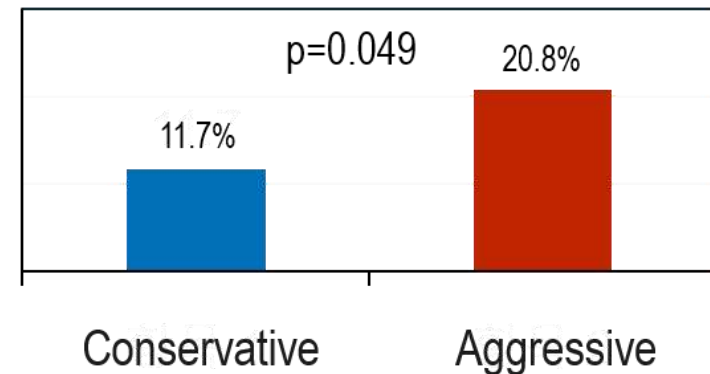


Chen SL, et al. JACC interv 2015



Kim YH, et al. JACC interv 2015

Target vessel failure at 3 years

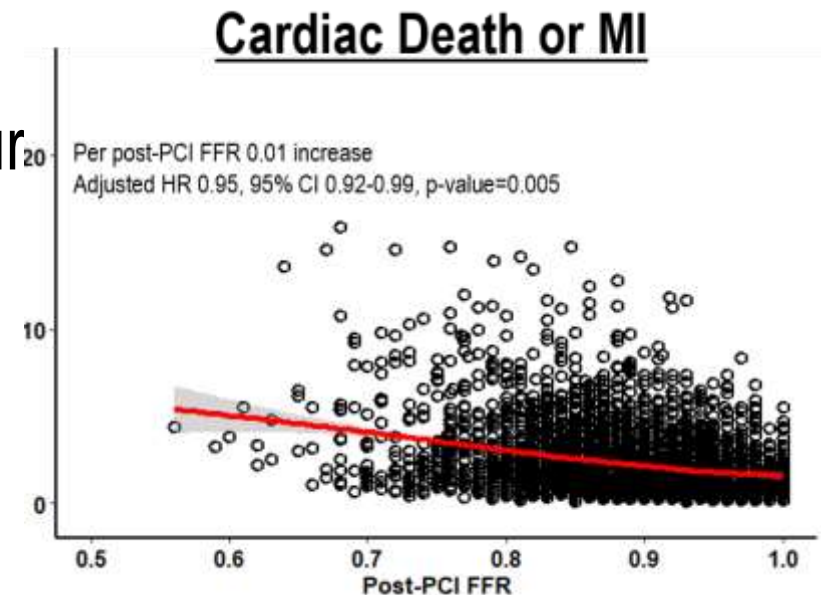


Gwon HC, et al. JACC interv 2016

New Physiology-Guided Decision-Making 2021

- **More focus on clinical relevance**

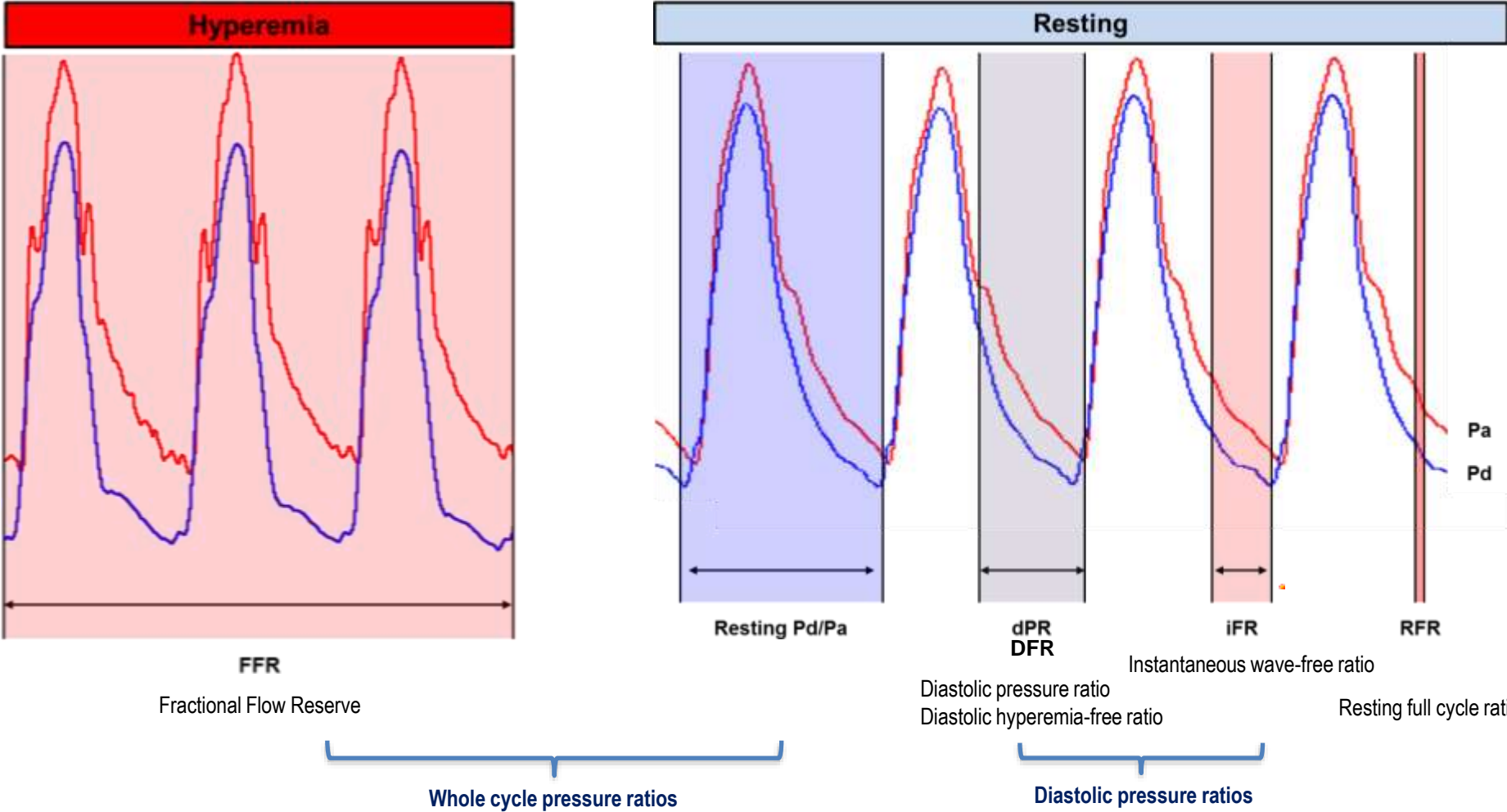
- Side branch myocardial territory is generally small and its ischemic territory is even smaller.
- Selection of right target is more important than how to assess and how to revascularize.
- Pay attention to maintain the procedure a main branch.



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- **New technique and technology**
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 - Image-based physiologic assessment

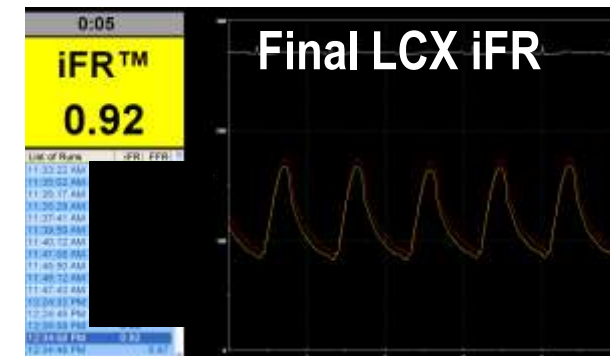
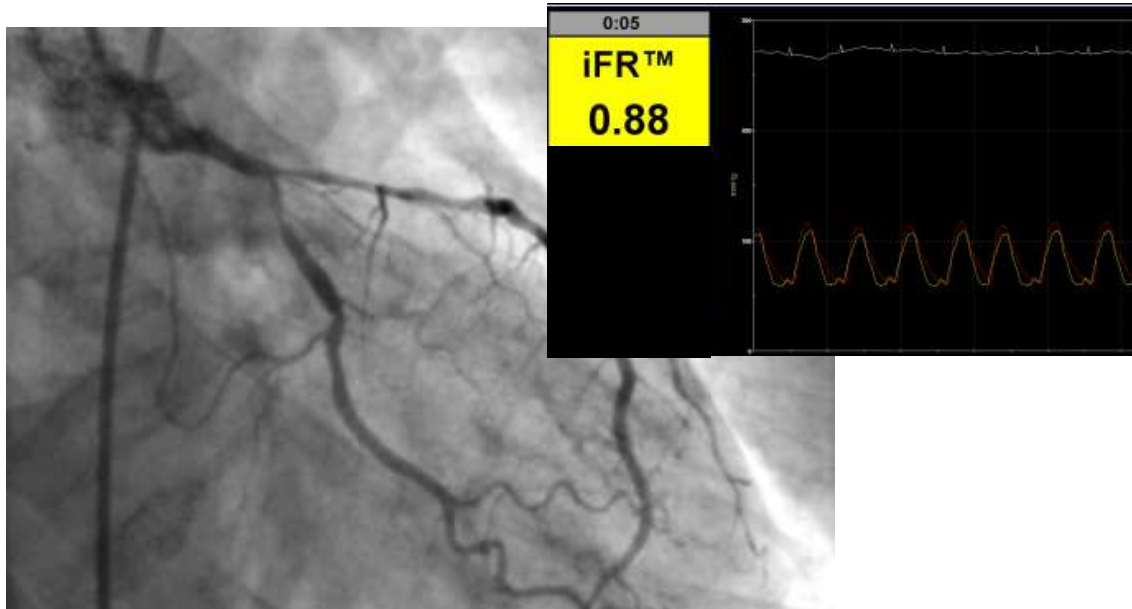
FFR vs. Non-hyperemic pressure ratios (NHPR)



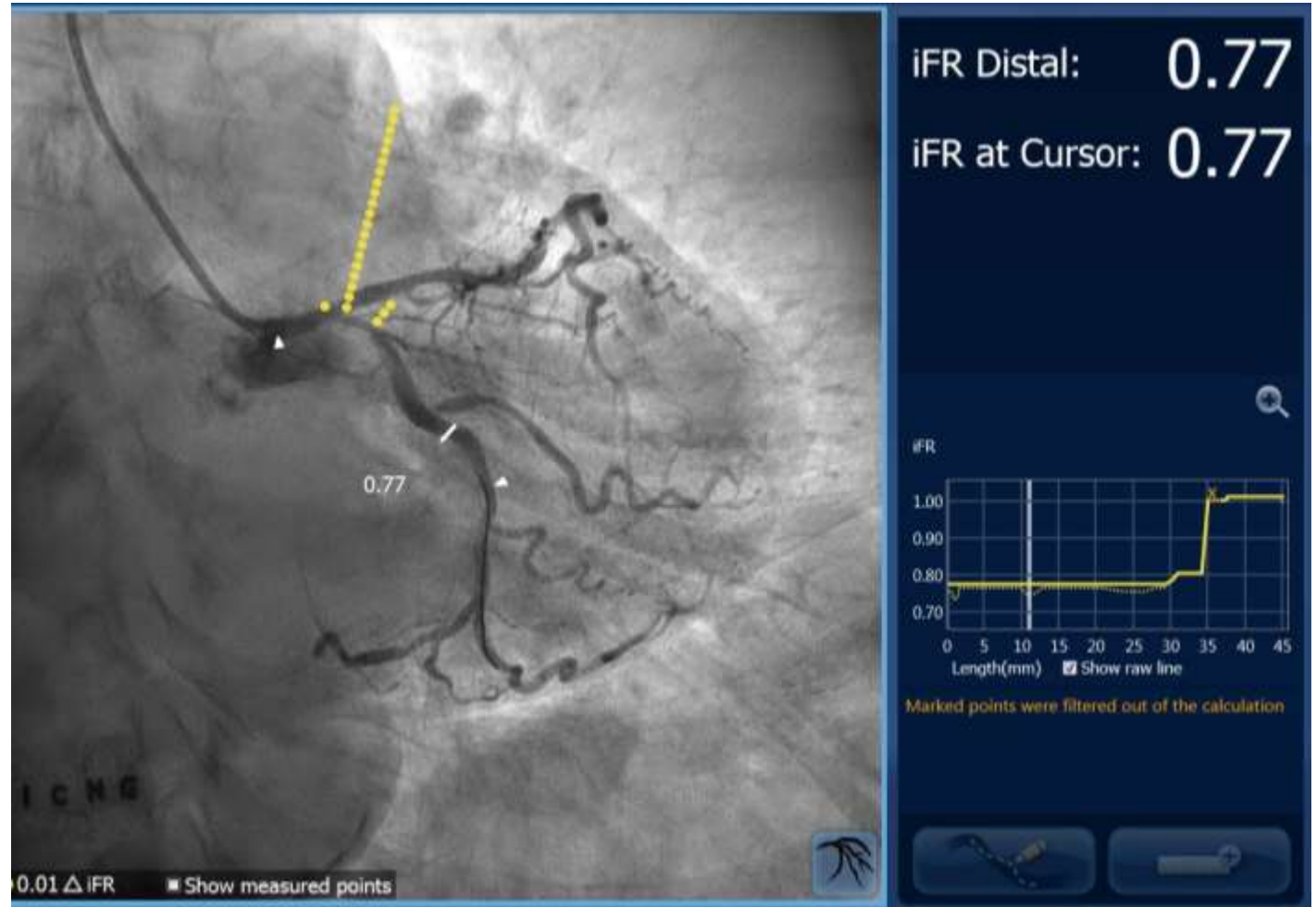
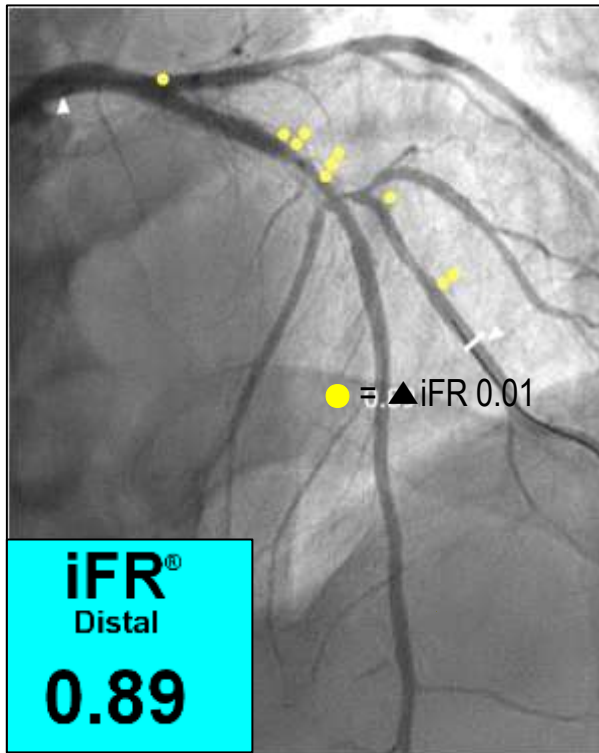
Application of NHPR in complex PCI

F/57, crescendo angina

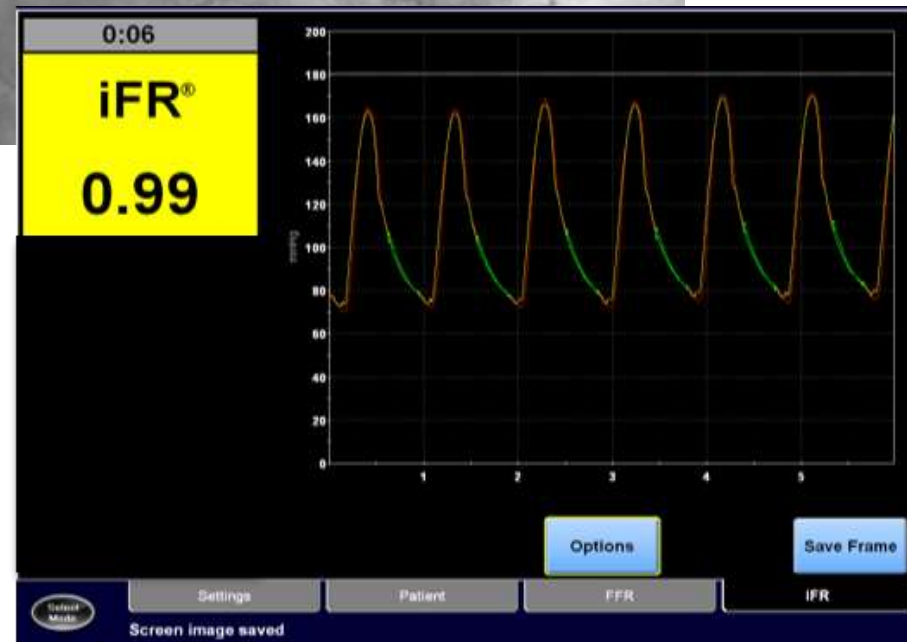
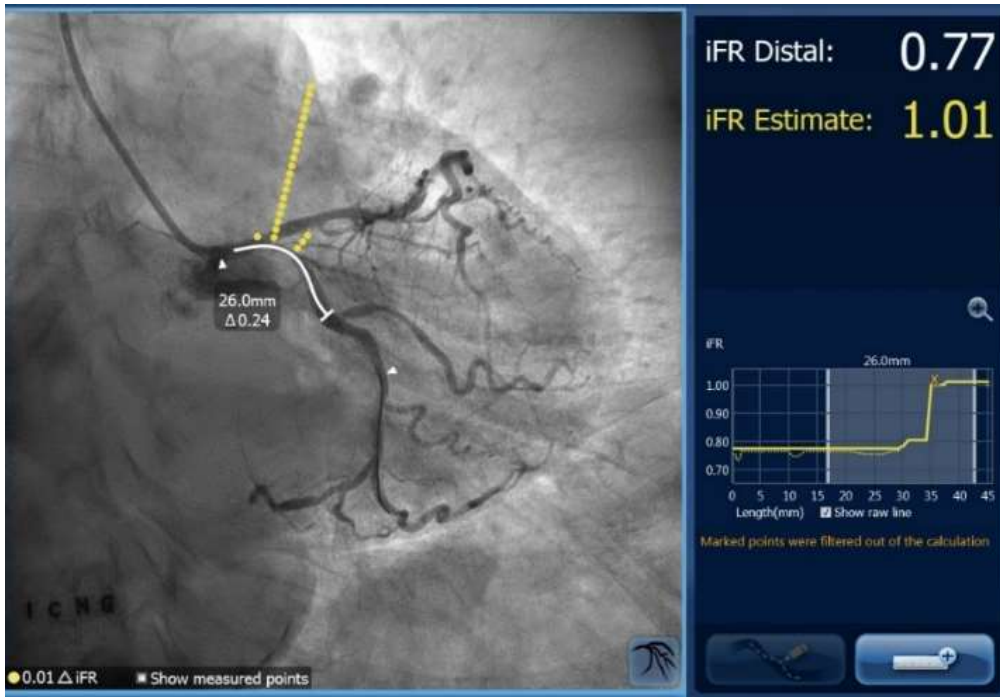
CAG: distal LM, pLAD, mLAD, pLCX disease



Co-registration of imaging and physiology



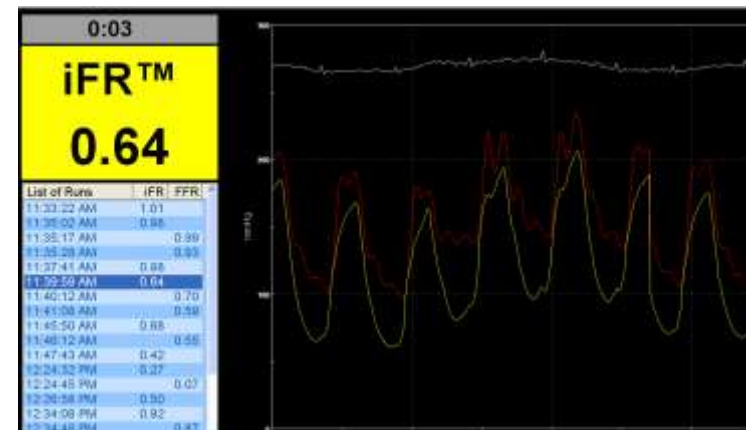
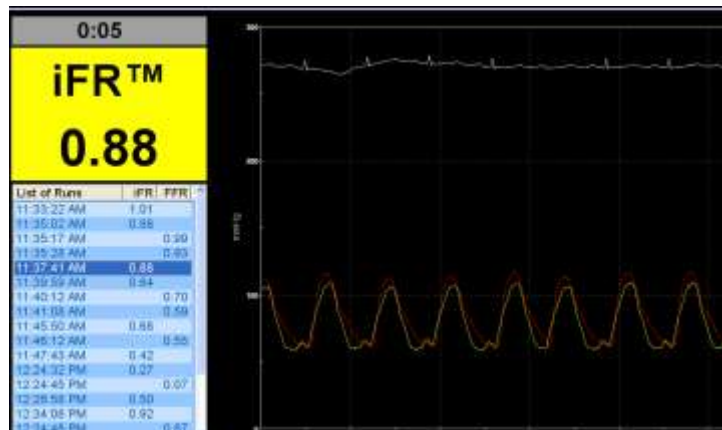
Prediction of post-PCI physiology



- Estimated post-PCI LCX iFR ~ 1.0

New Physiology-Guided Decision-Making 2021

- **Application of non-hyperemic pressure ratios**
 - NHPR is more convenient to use and less influenced by other lesions.
 - Co-registration enables prediction of post-PCI physiologic result.
 - More studies are needed to validate their value in bifurcation PCI.
 - NHPR should be measured in true resting status.

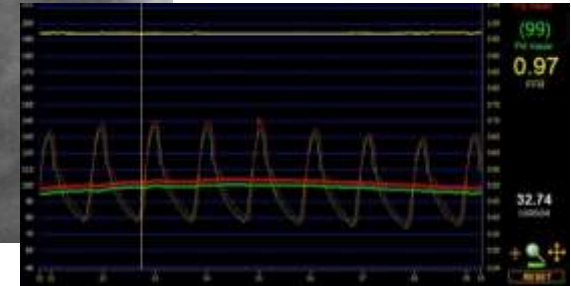
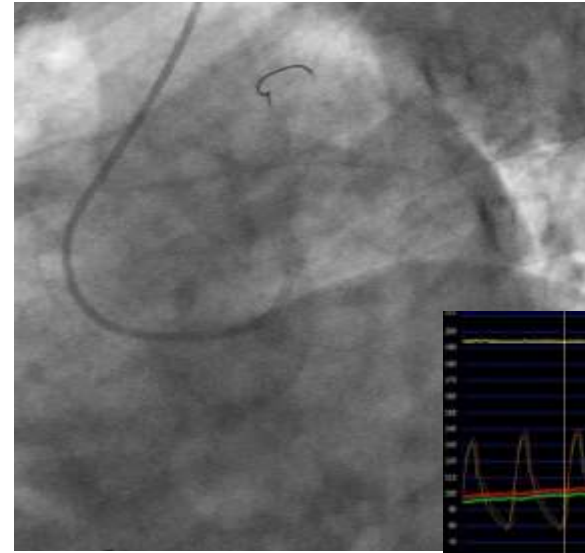
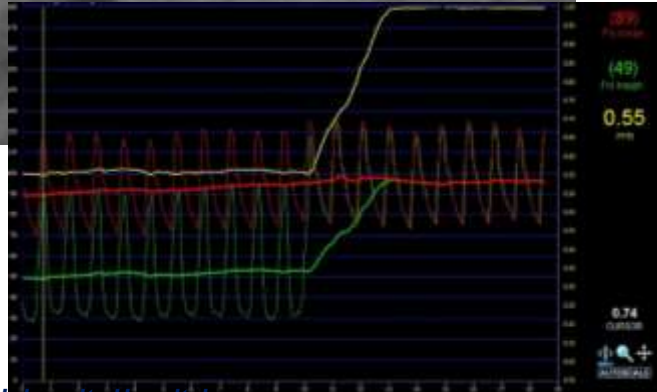
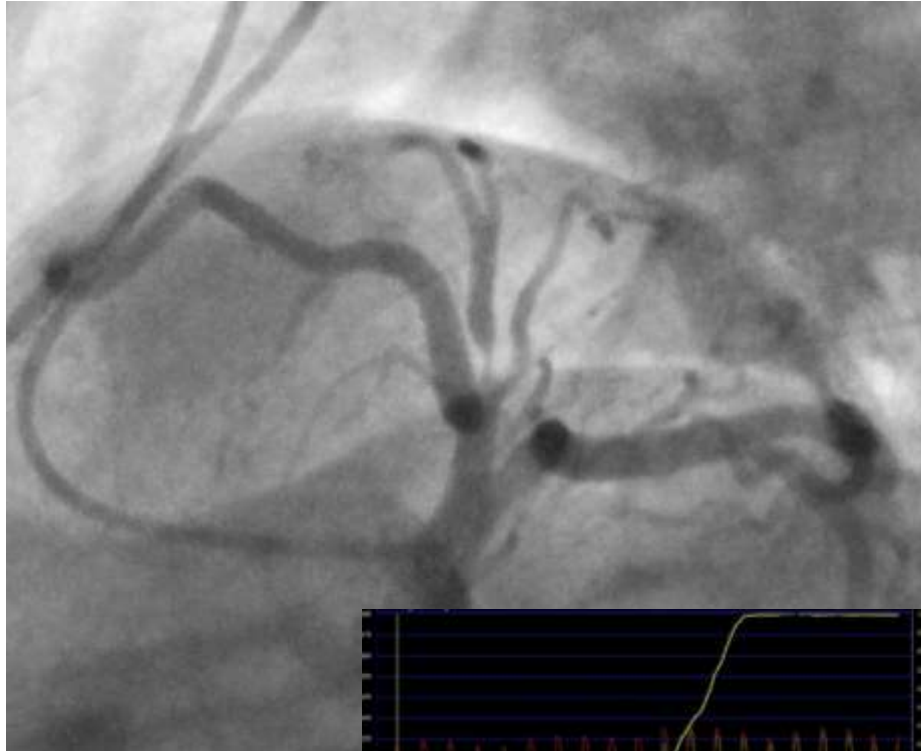


New Physiology-Guided Decision-Making 2021

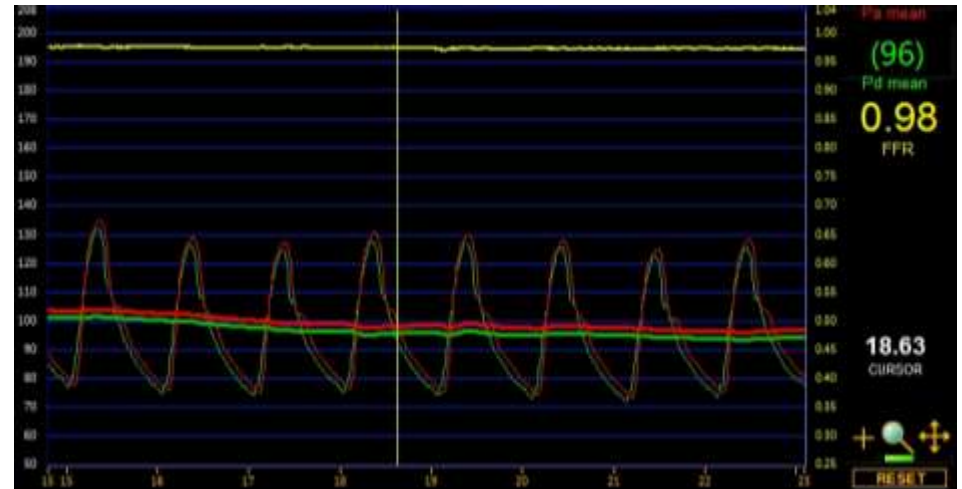
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Physiology-guided DCB treatment

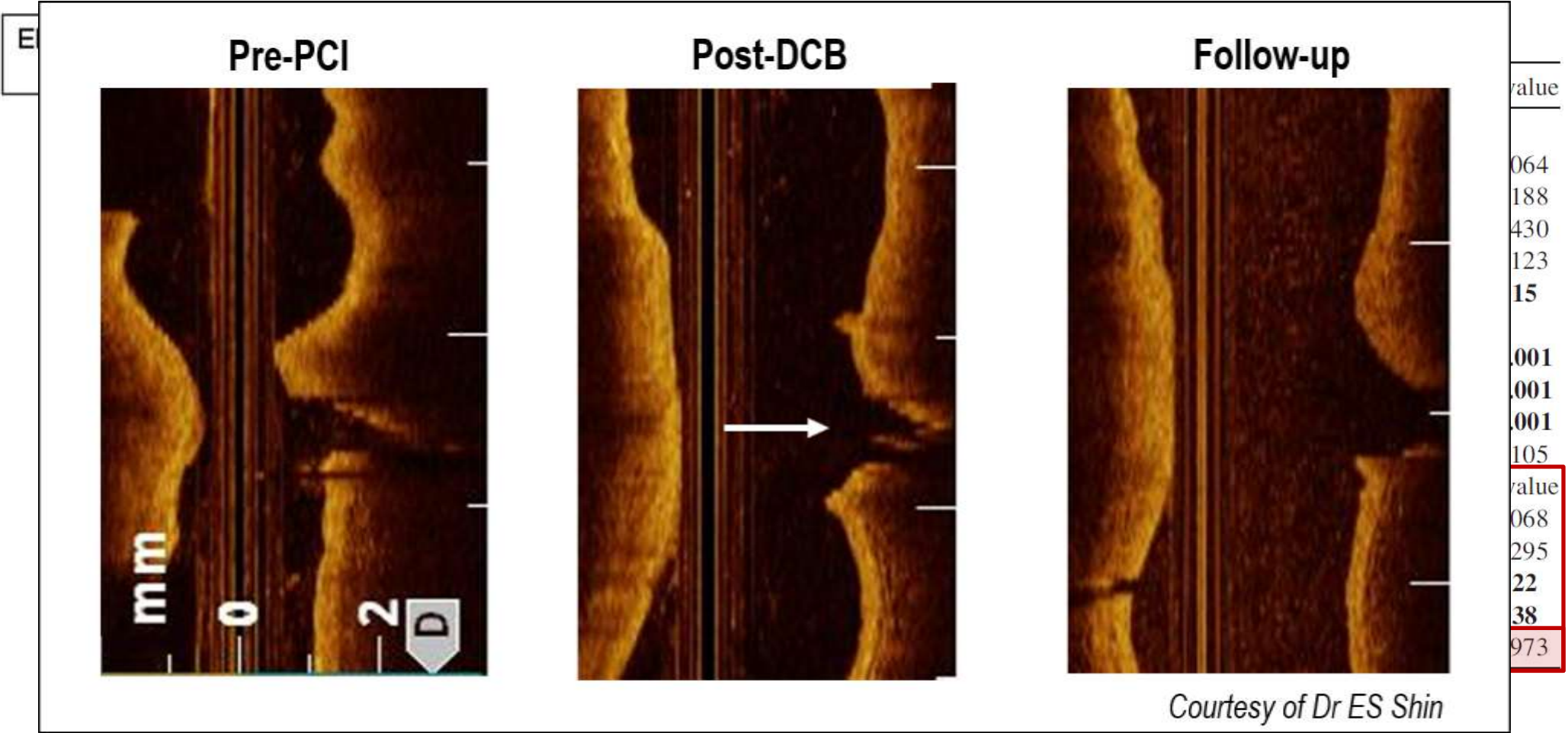
F/59 Stable angina



After DCB treatment



Physiology-guided DCB treatment



Shin ES et al. Cath Cardiovasc Interv. 2015

Image-based physiologic assessment

CT-derived FFR

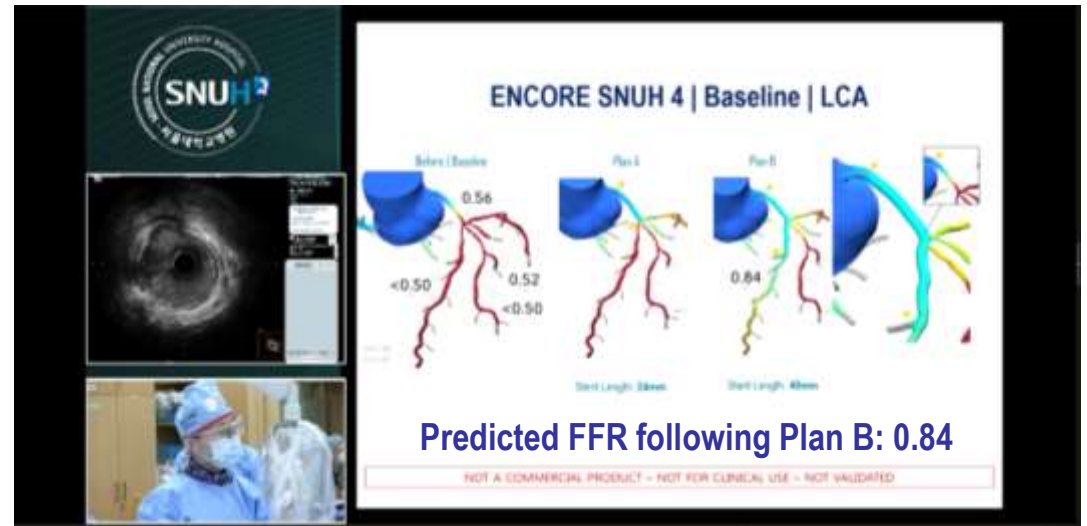
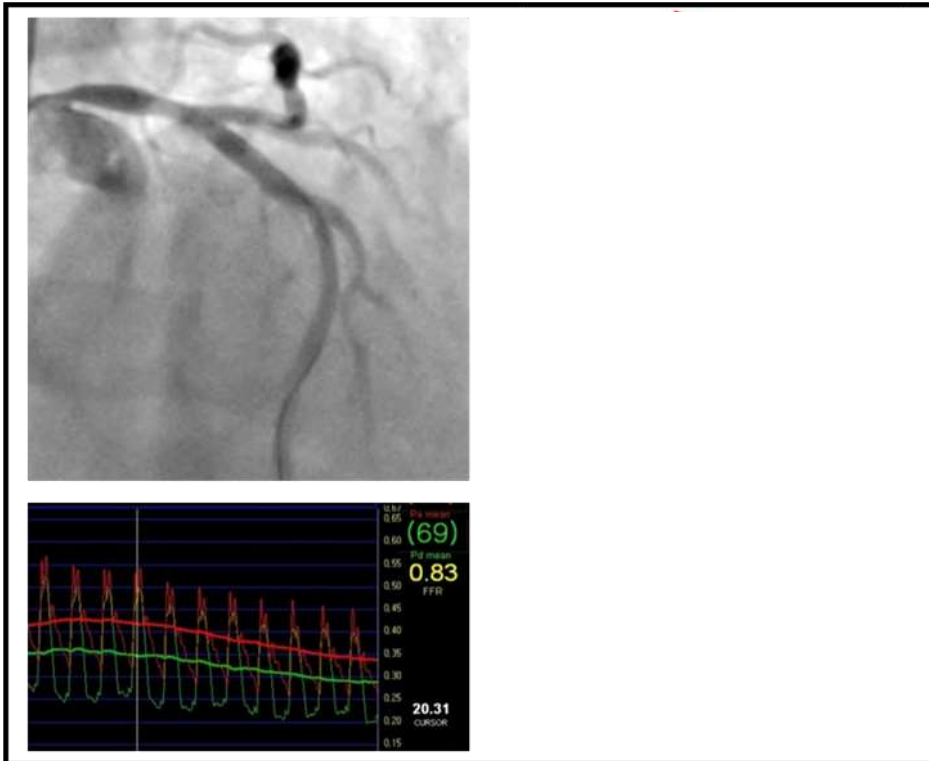
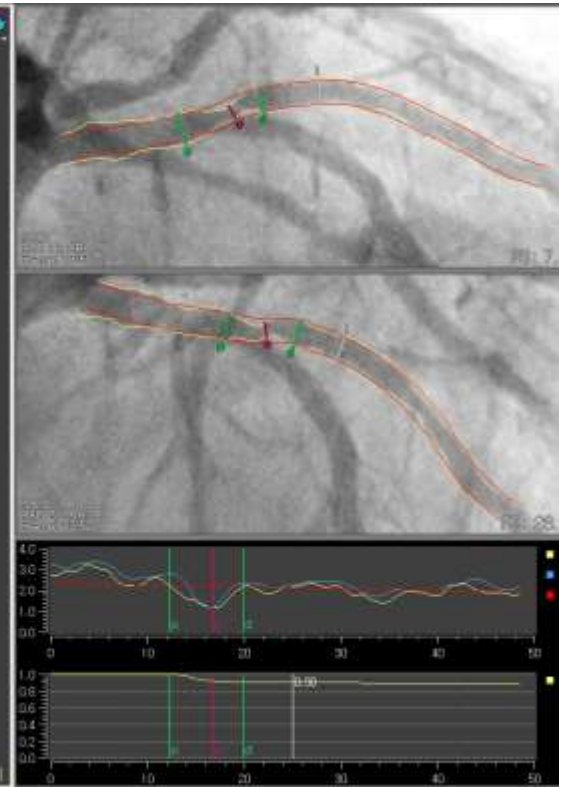
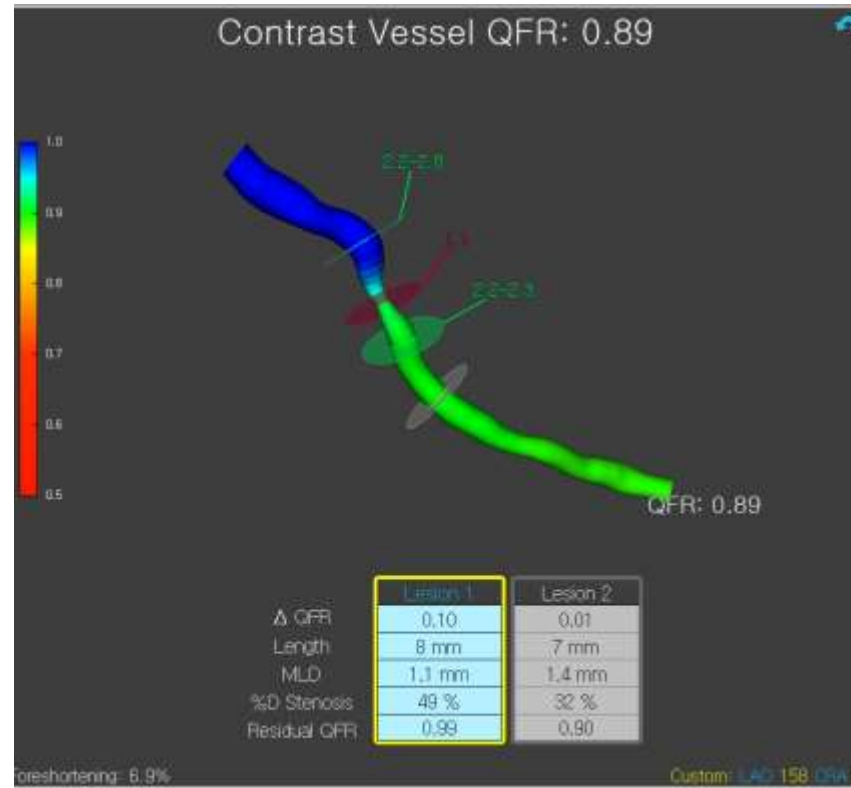
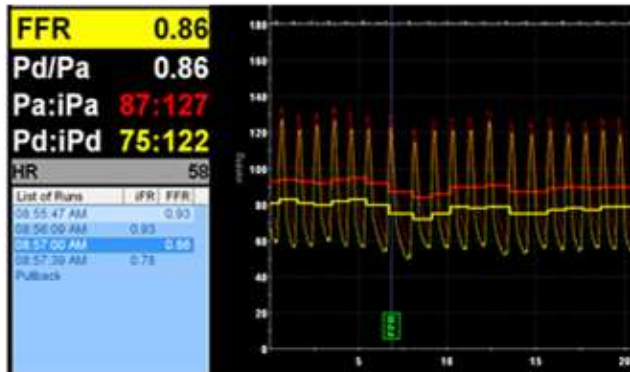


Image-based physiologic assessment

Angio-derived FFR



New Physiology-Guided Decision-Making 2021

- **New technique and technology**
 - Physiology-guided DCB treatment is a promising option for bifurcation lesions, especially for side branches.
 - Imaging-based physiologic assessment can be helpful in estimating the functional status of coronary stenosis and predicting the procedural outcomes without invasive procedures.
 - Further studies are needed.

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- **More focus on clinical relevance**
 - Myocardial territory, ischemic territory
 - Clinical relevance of side branches
- **Application of non-hyperemic pressure ratios**
- **New technique and technology**
 - Physiology-guided DCB application
 - Image-based physiologic assessment

