

FFR-guided Bifurcation Treatment

: Treat-or-Not Treat and Bifurcation Techniques

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Which is the most useful for this side branch?

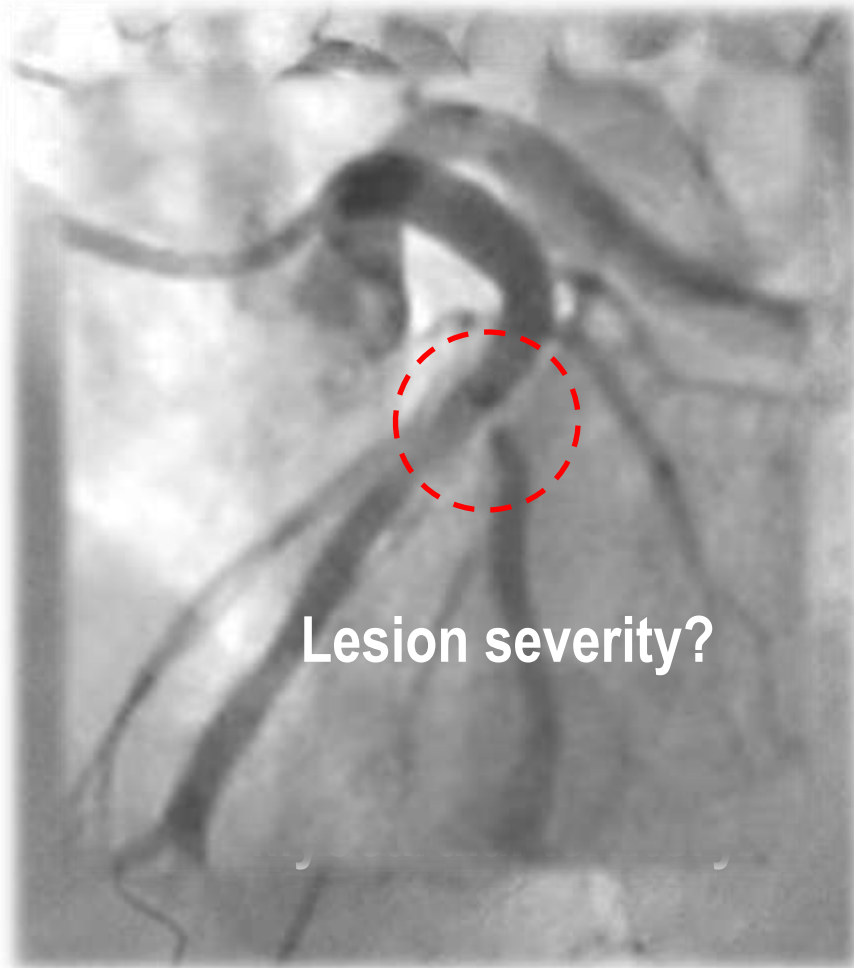


Jailed diagonal branch after LAD stenting

1. Angiography
2. IVUS
3. OCT
4. FFR

Answer) 1. Angiography

Angiographic evaluation for side branch



The 1st step should be the assessment of myocardial territory supplied by the branch. Only the branch that supplies large amount of myocardium deserves any further assessment and intervention.

FFR in bifurcation lesions

- Pre-intervention: Treat-or-Not Treat?
- After main branch stent implantation
- During and After side branch intervention

Why “FFR” for bifurcation lesions?

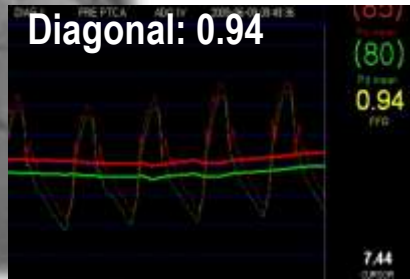
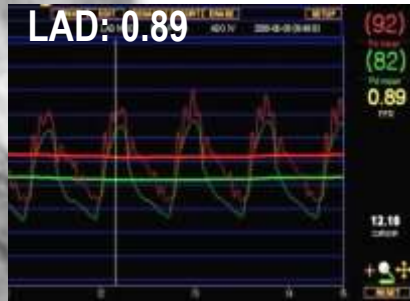
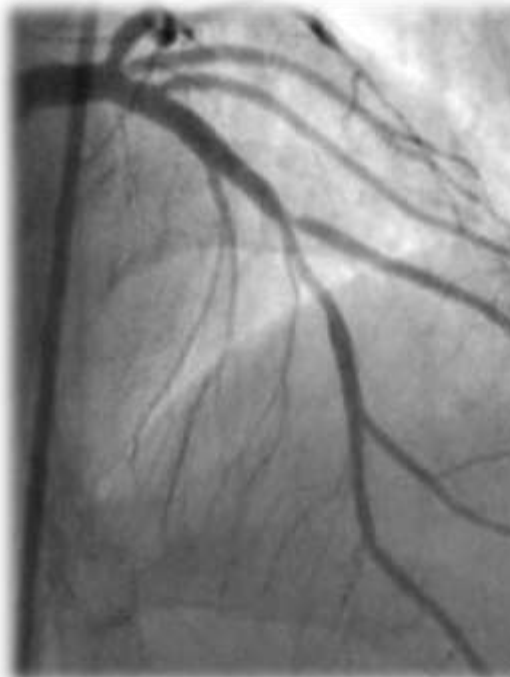
Pitfalls of anatomical evaluation

- **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

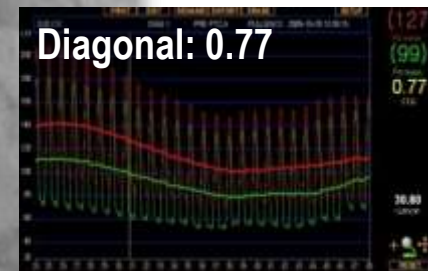
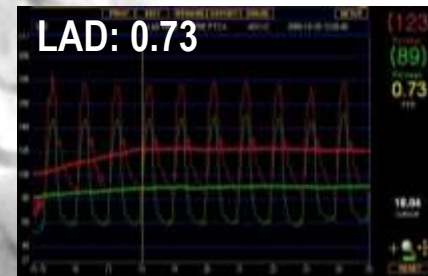
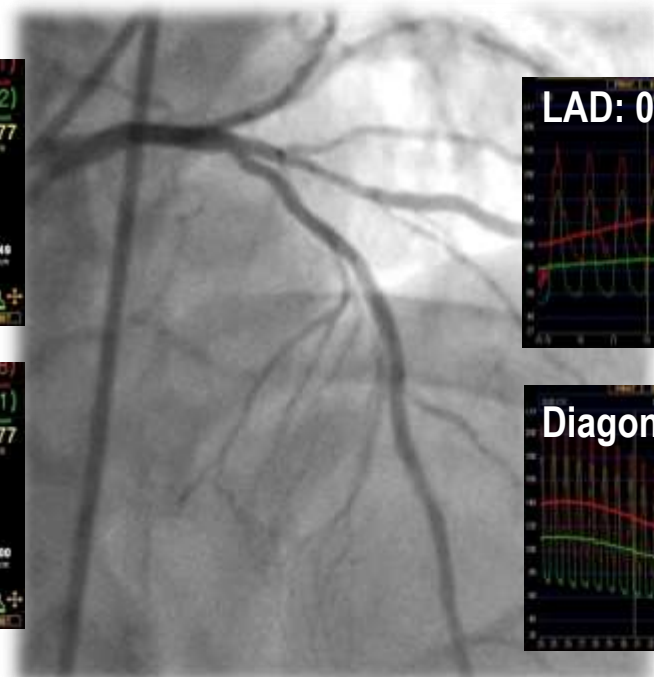
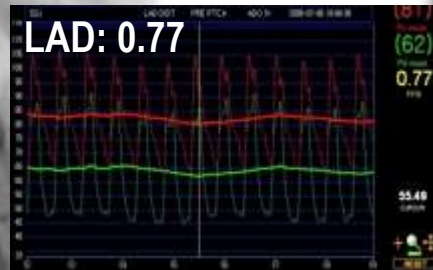
Uniqueness of side branch lesions

- 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.....

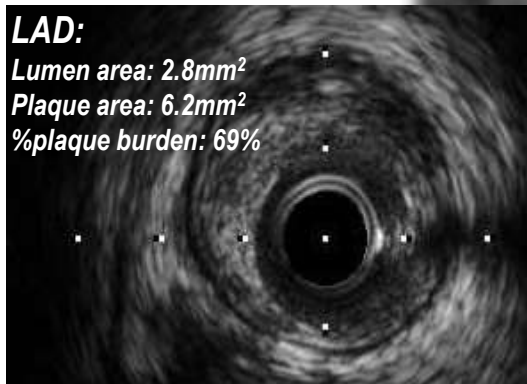
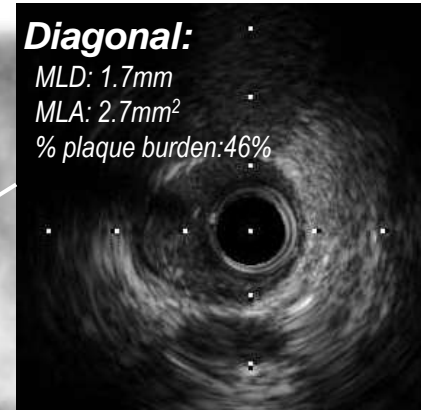
Bifurcation lesion?



- *Treat-or-Not Treat?*
- *How to Treat?*

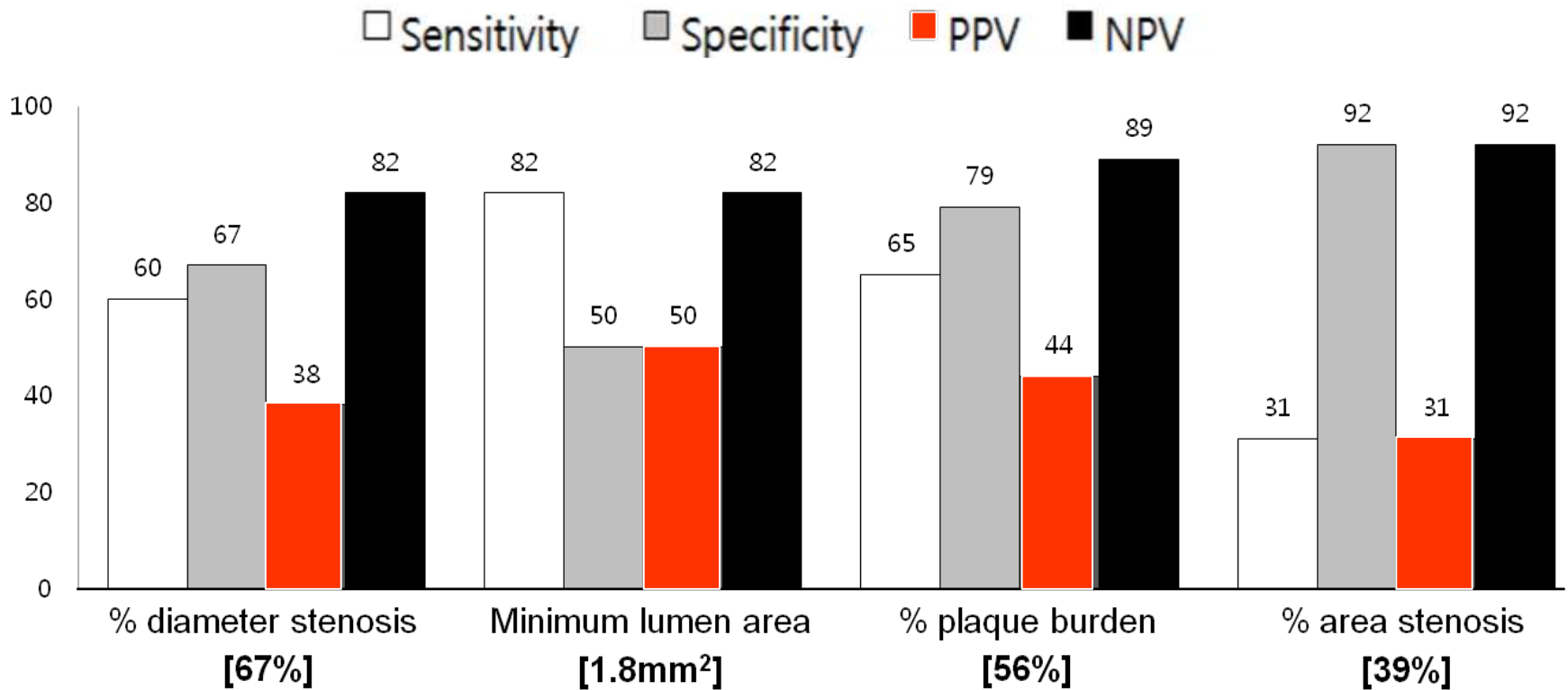


Role of IVUS? OCT?



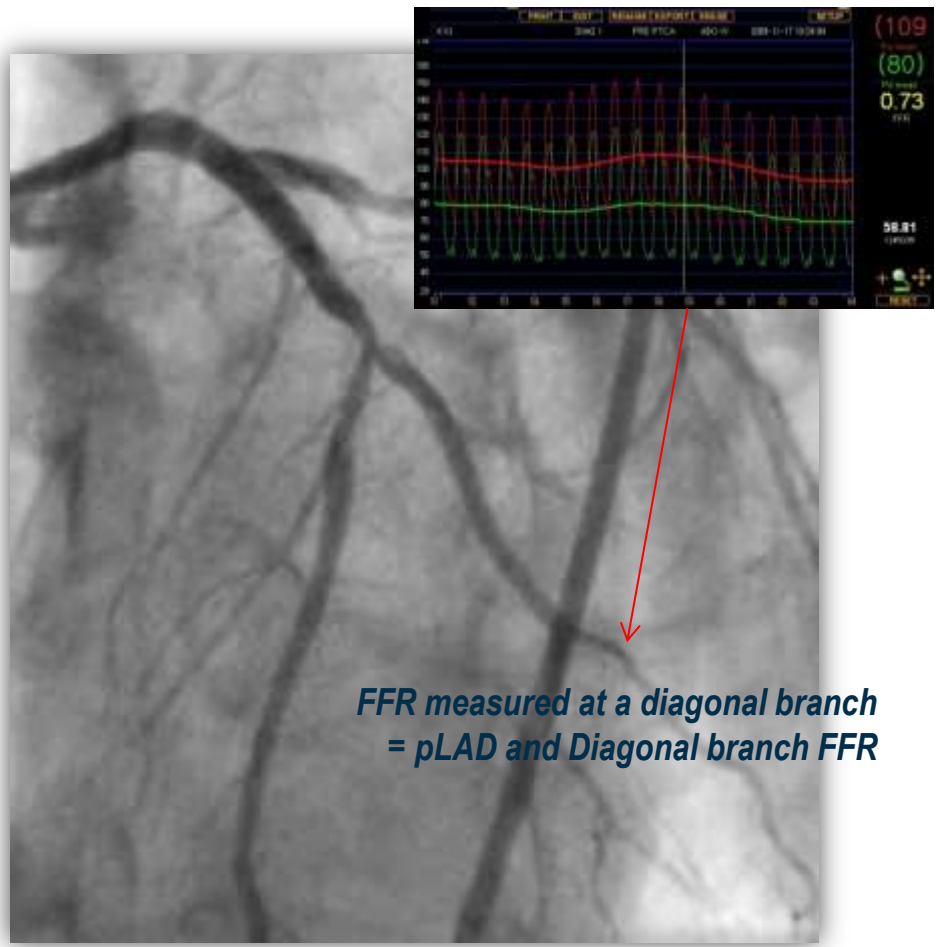
Why FFR?

Diagnostic accuracy of anatomic parameters in pure SB ostial lesions



Koh JS, Koo BK, et al., JACC Intv, 2012

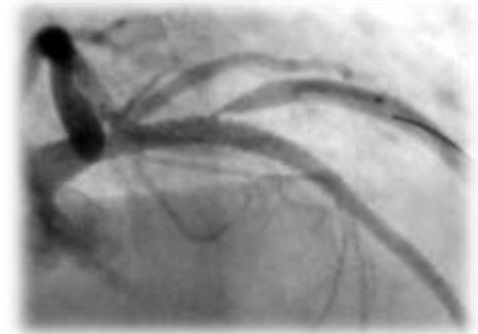
Prediction of jailed SB FFR?



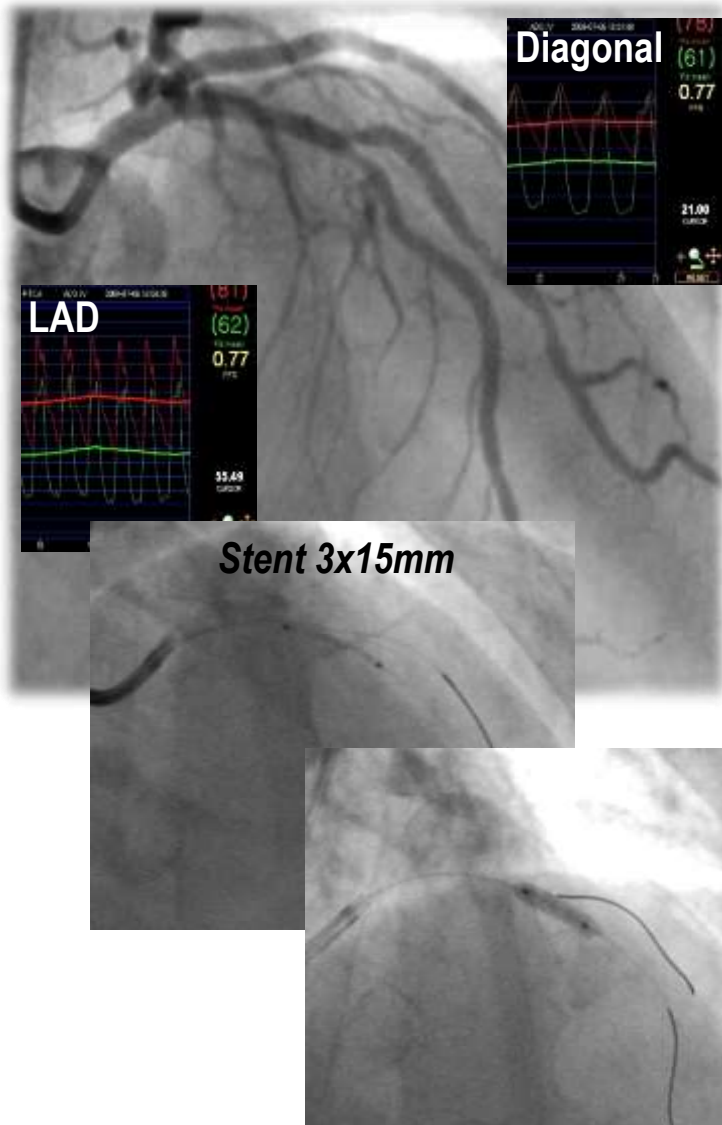
Pre-intervention side branch FFR is not that helpful to predict jailed side branch FFR.

FFR in bifurcation lesions

- Pre-intervention
- After main branch stent implantation
- During and After side branch intervention

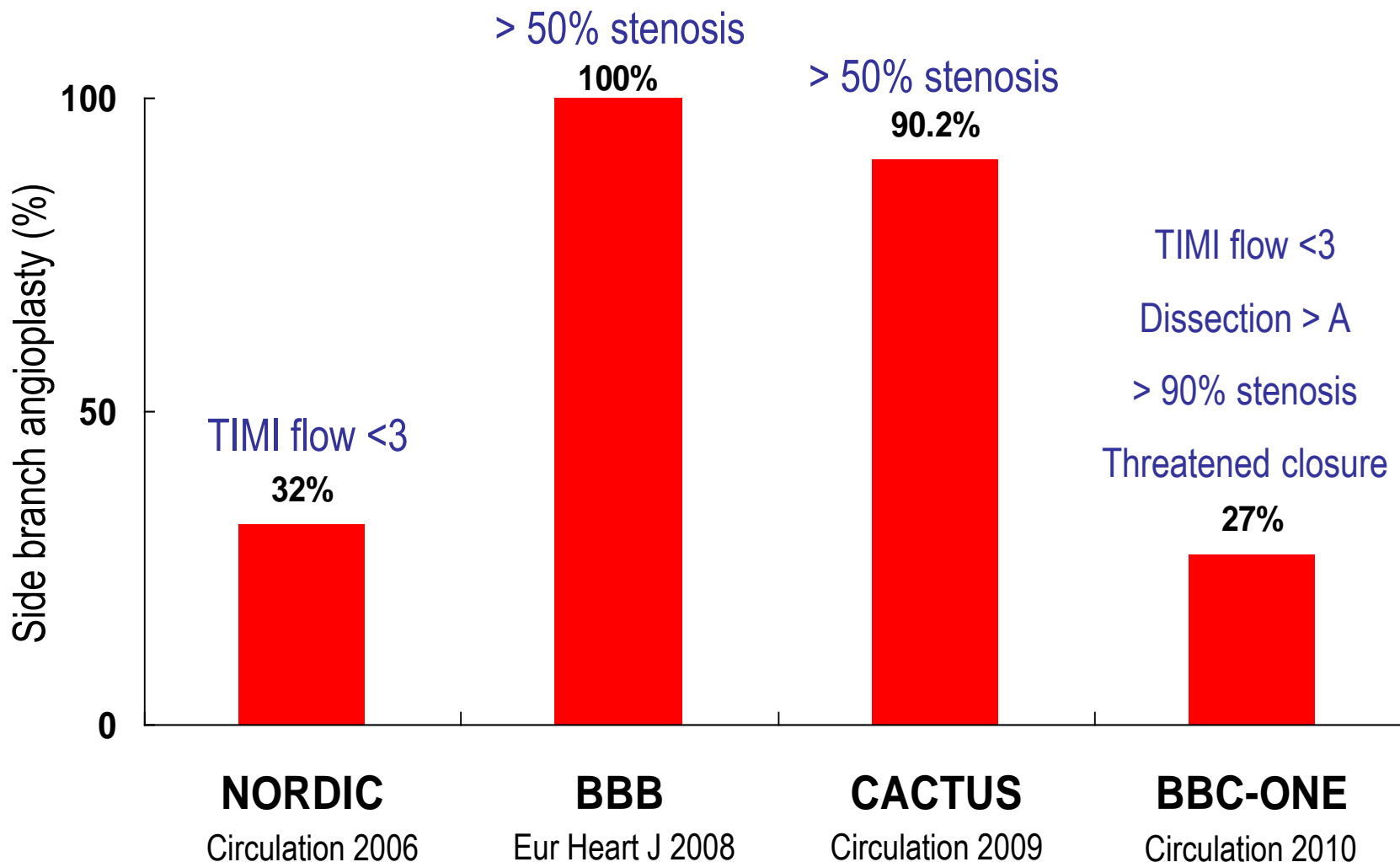


Treat-or-Not Treat?



Side branch angioplasty ?

Different criteria from different studies.....



FFR-guided concept for Side branch

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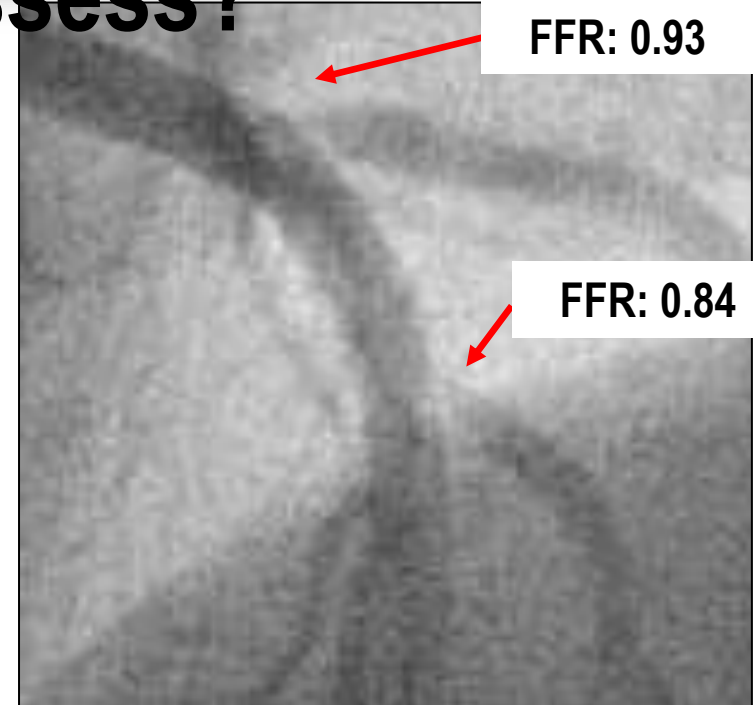
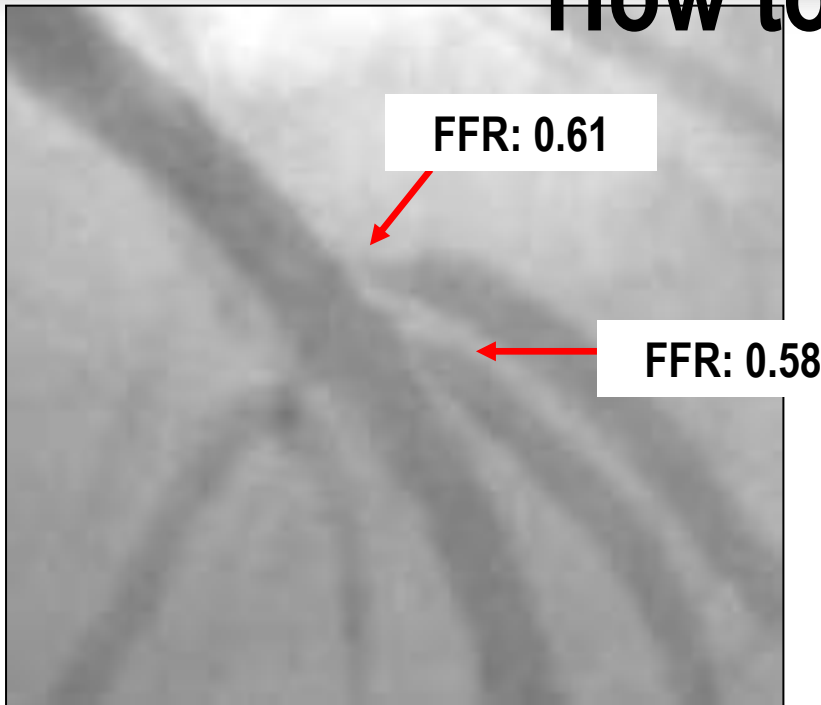
Vol. 46, No. 4, 2005
ISSN 0735-1097/05/\$30.00
doi:10.1016/j.jacc.2005.04.054

Physiologic Assessment of Jailed Side Branch Lesions Using Fractional Flow Reserve

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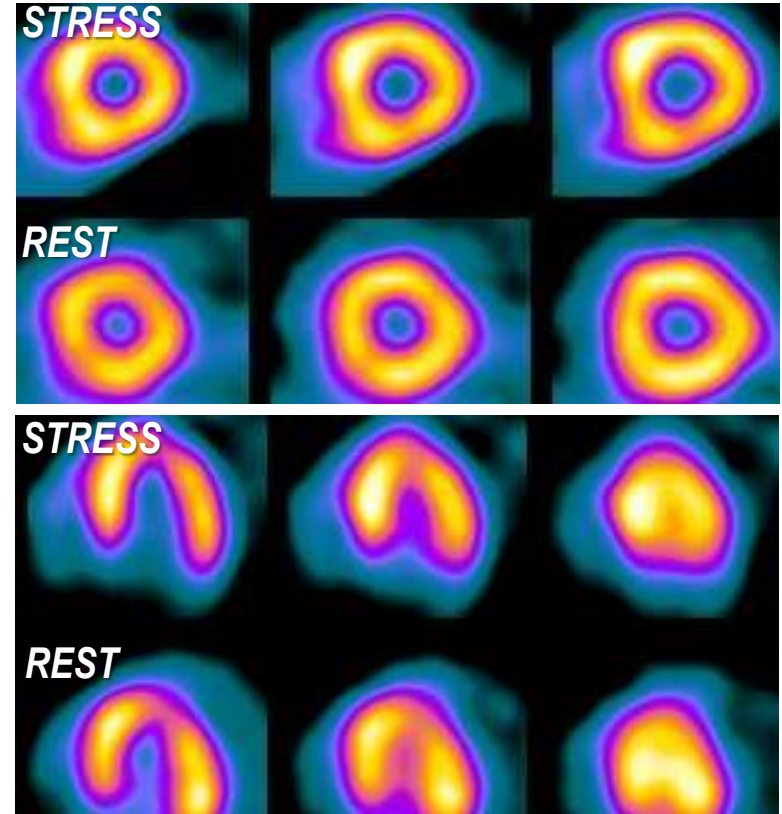
How to Assess?



***In Jailed side branch lesions,
Angiographic severity \neq Presence of ischemia***



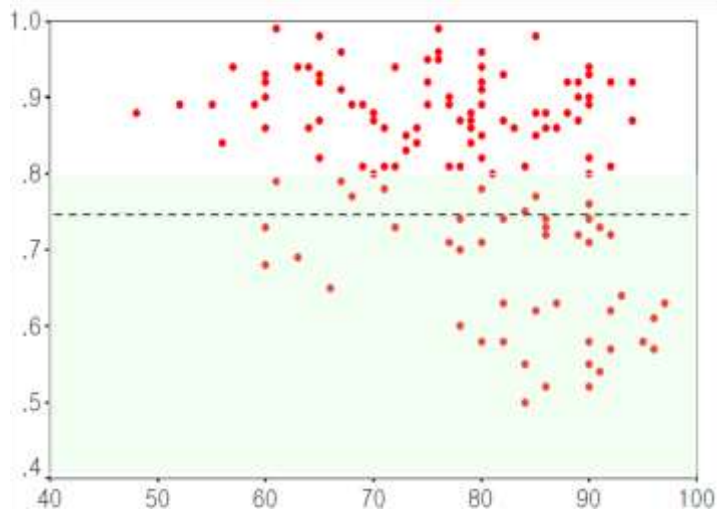
Jailed Diagonal branch FFR 0.81



No perfusion defect

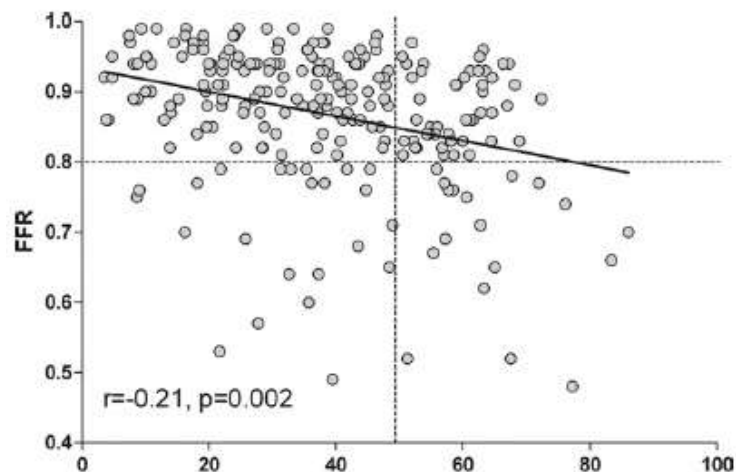
Anatomical severity ≠ Functional significance

FFR vs. % diameter stenosis in Jailed side branches

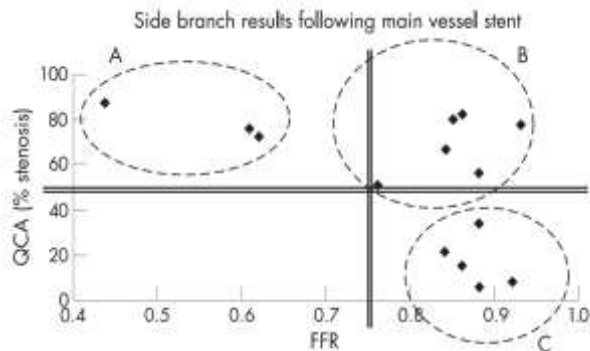


% diameter stenosis

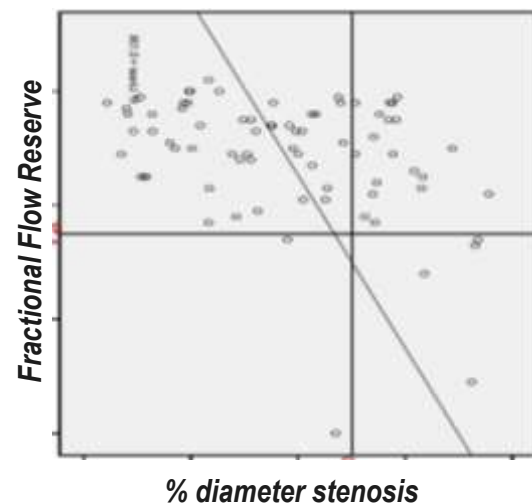
Park SH & Koo BK J Geriatr Cardiol 2012



Ahn JM, et al. JACC intv 2012



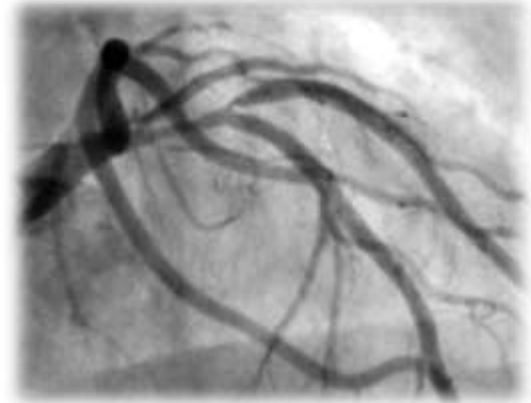
Bellenger, et al. Heart 2007



% diameter stenosis
Kumsars I, et al. Eurointervention 2011

FFR in bifurcation lesions

- Pre-intervention
- After main branch stent implantation
- During and After side branch intervention



Angiographic vs. FFR changes during PCI



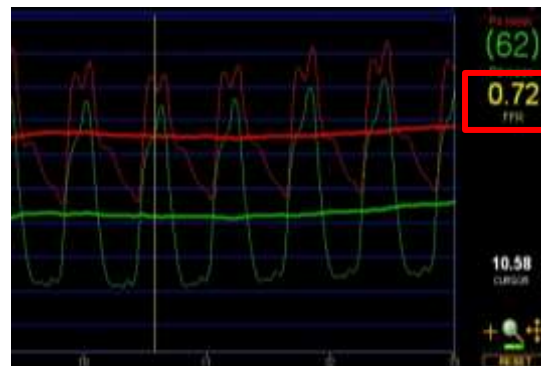
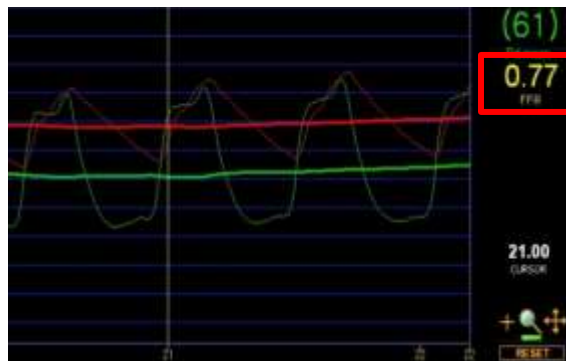
Before PCI



After MB stenting



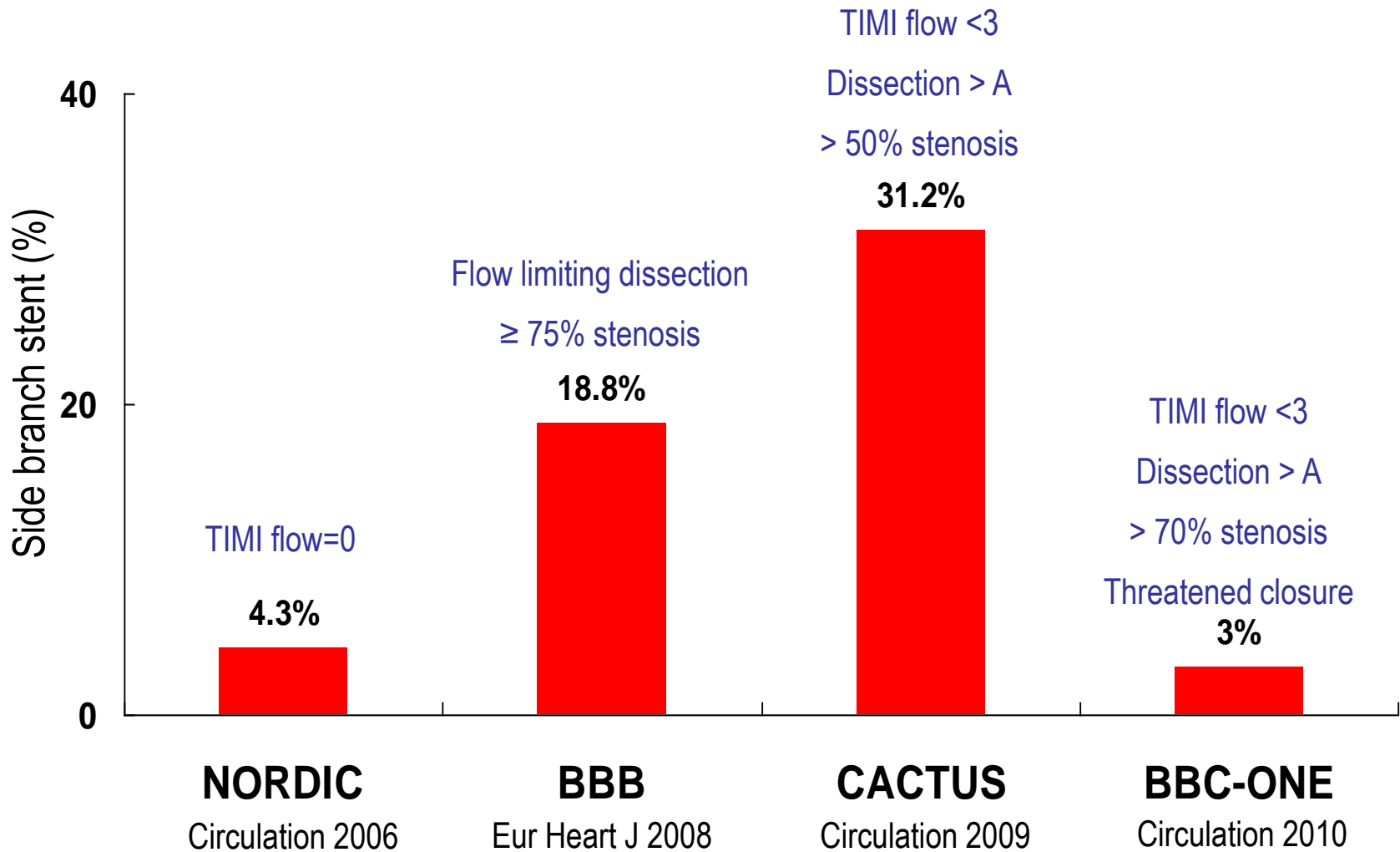
After kissing balloon



SB stent
implantation?

Side branch stenting ?

Different criteria from different studies.....



Angiographic vs. FFR changes during PCI



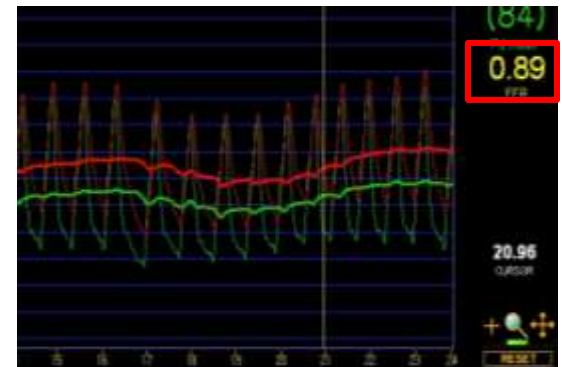
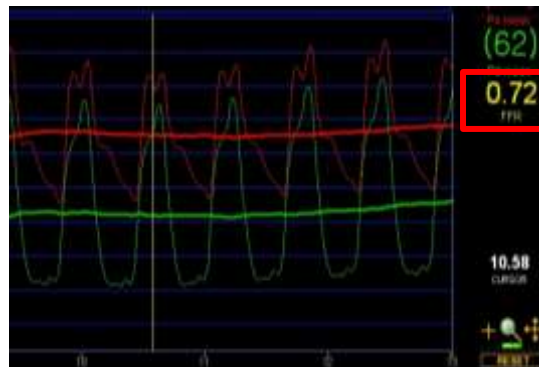
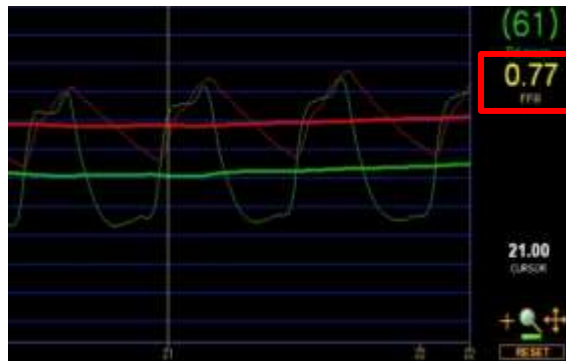
Before PCI



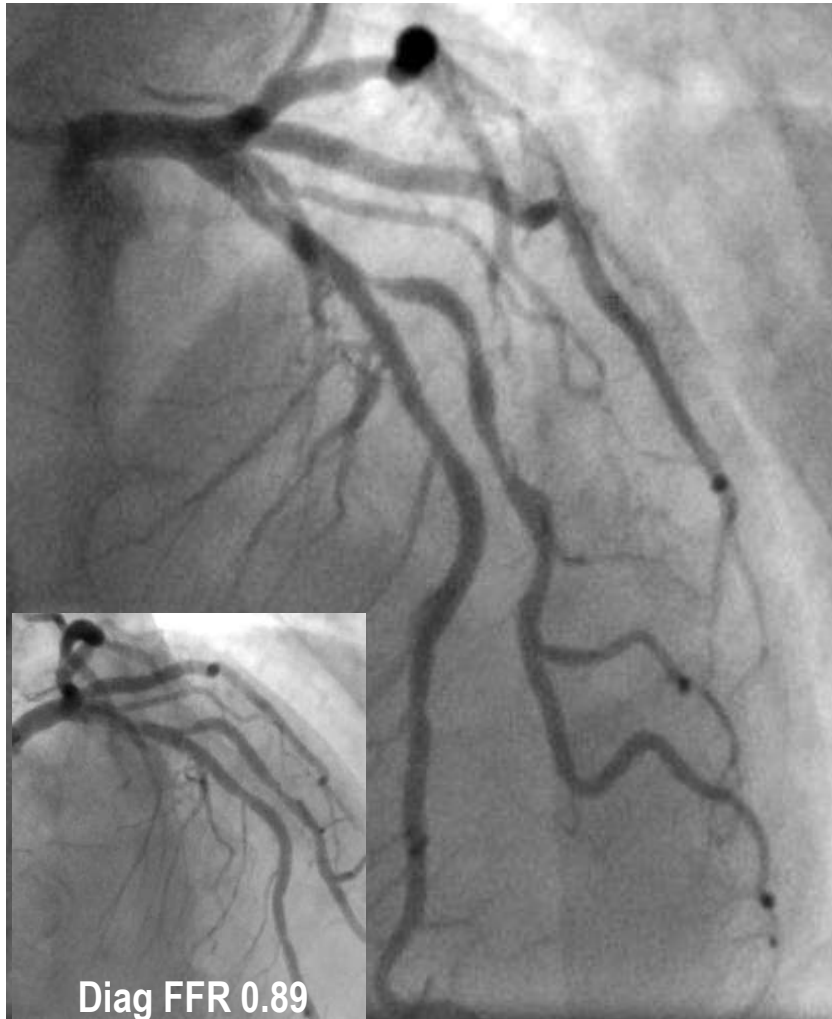
After MB stenting



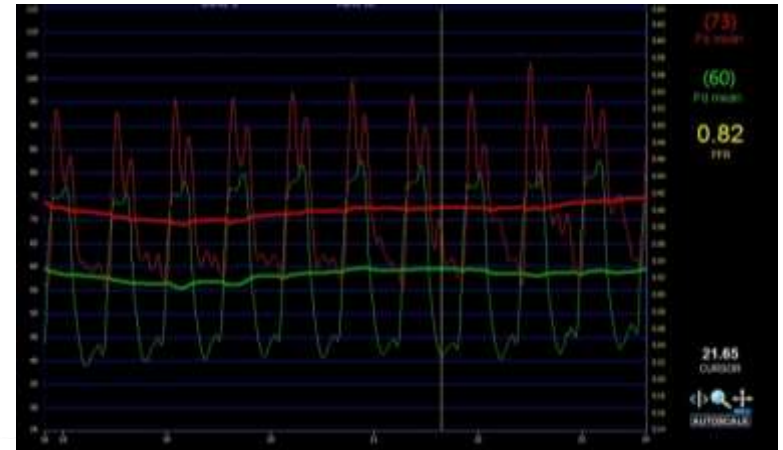
After kissing balloon



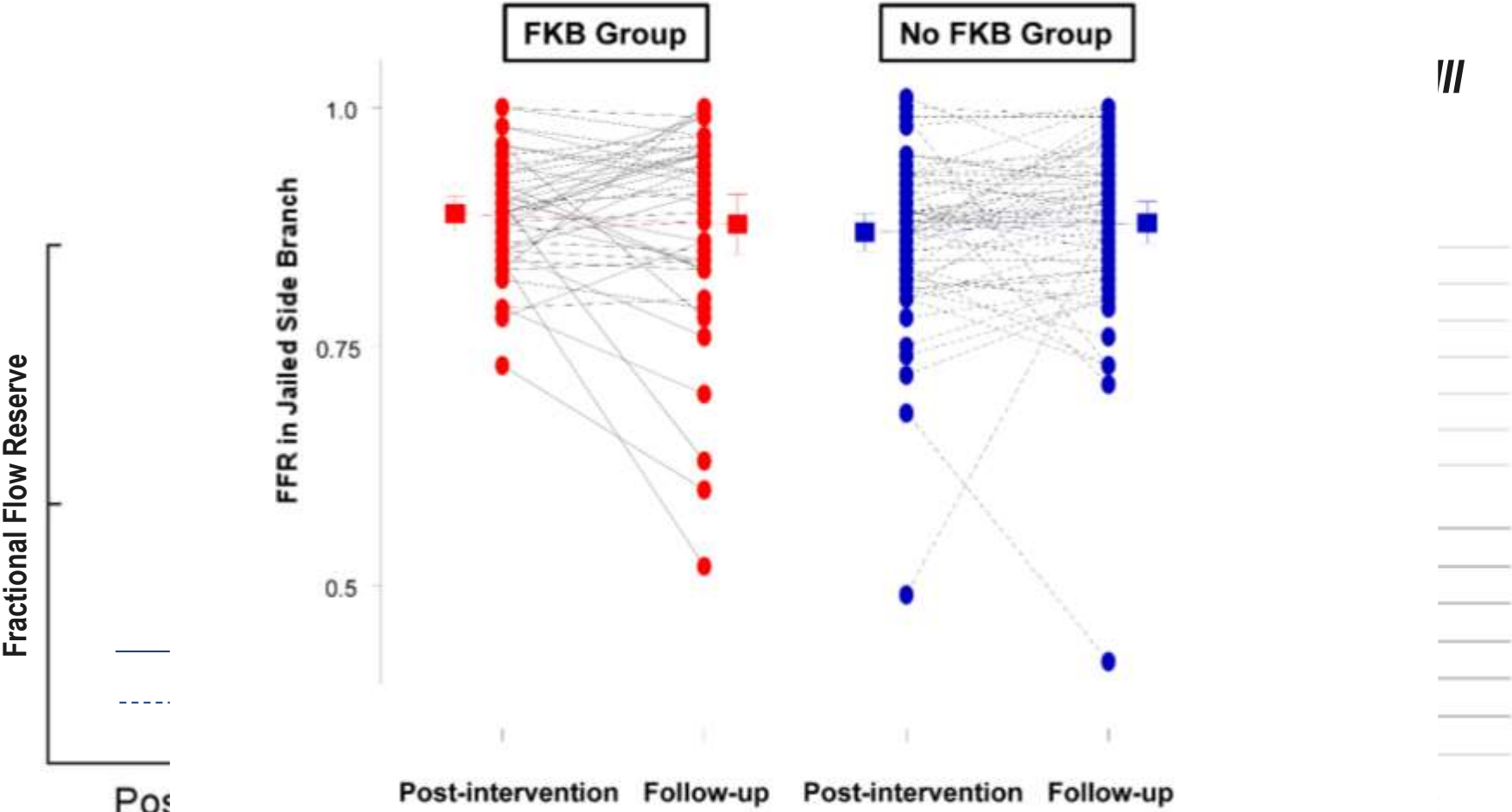
Functional outcome of Jailed side branches



11 month Follow- Up



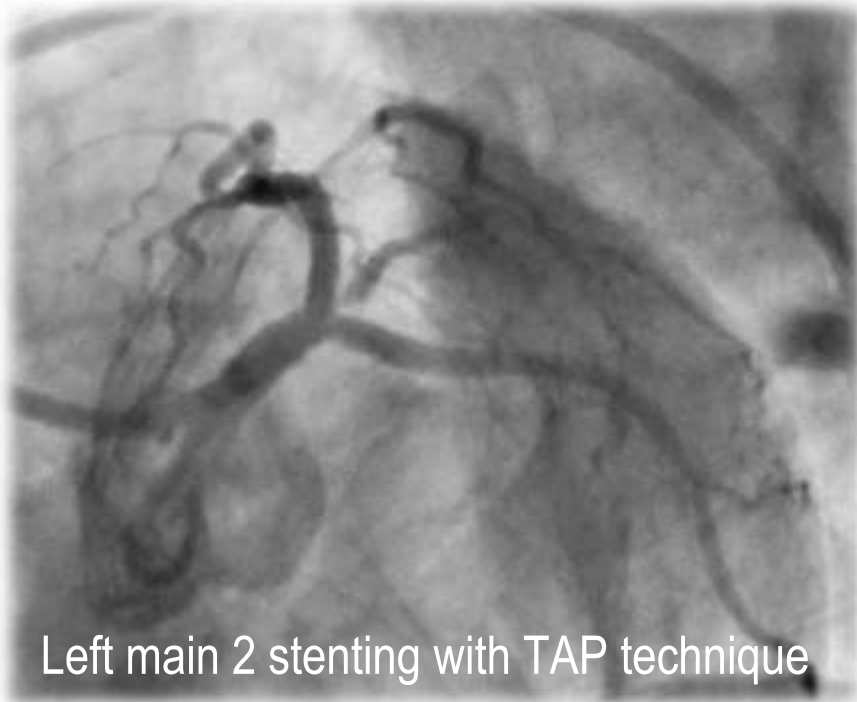
Functional outcome of Jailed side branches



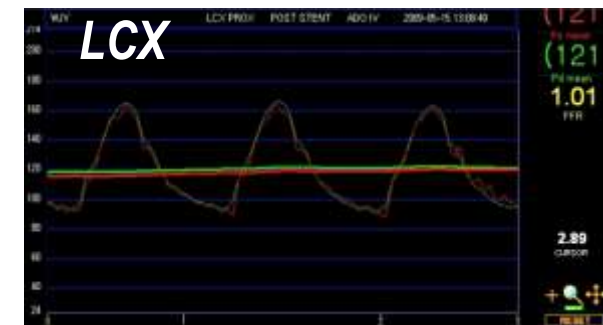
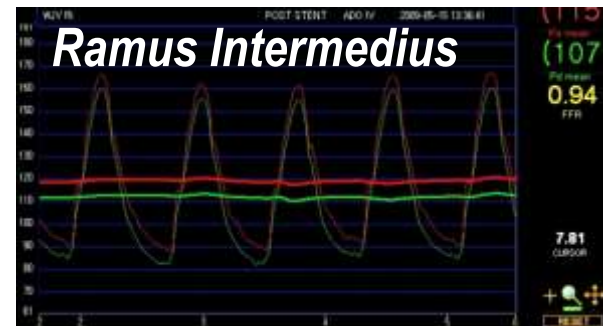
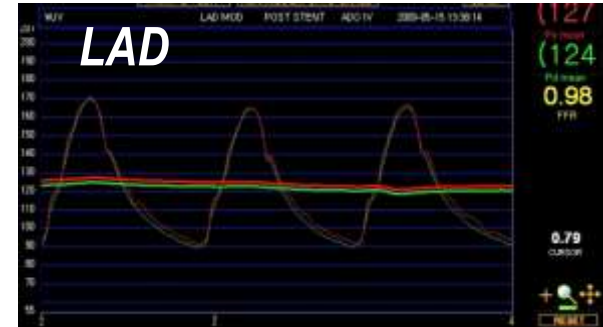
Lee JM..... Koo BK, Eurointervention 2015

1 2011

FFR after complex Left main stenting



**Functionally complete
revascularization**



FFR-guided vs. Angio-guided SB intervention

- **Nine months clinical outcomes**

| | FFR-guided group | Angio-guided group | P |
|-----------------|------------------|--------------------|-------------|
| | N=108* | N=108** | |
| Side branch PCI | 30% | 45% | 0.02 |
| TVR | 5 (4.6%) | 4 (3.7%) | 0.7 |
| MI | 0 | 0 | 1 |
| Cardiac death | 0 | 0 | 1 |

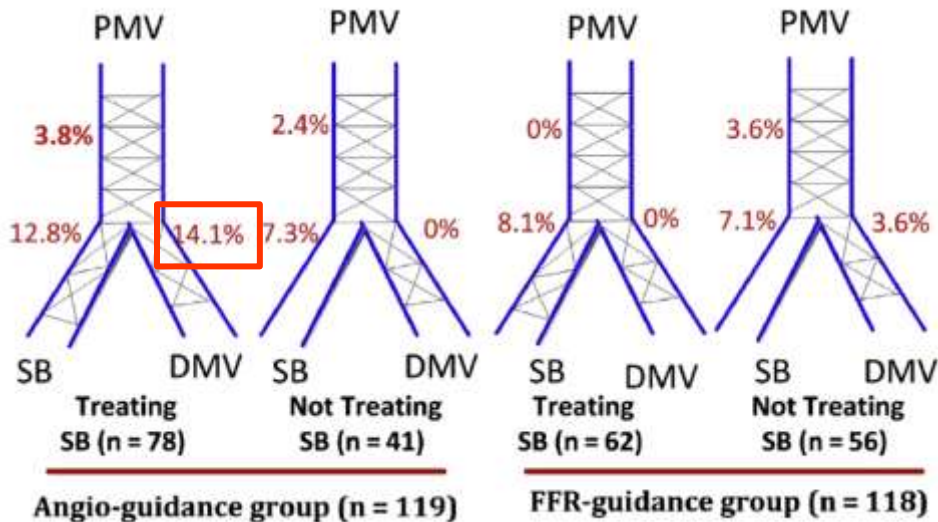
* 1 non-cardiac death, 1 follow-up loss, ** 2 follow-up loss

Koo BK, et al. Eur Heart J 2008;29:726-32

More intervention, More clinical event

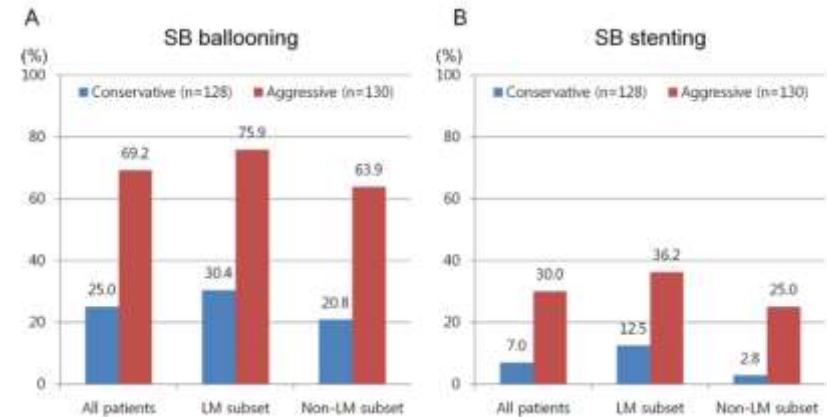
DK-CRUSH VI trial

Distribution of restenosis

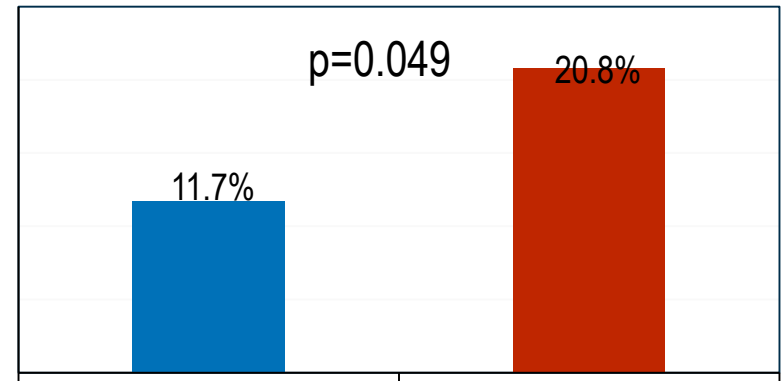


Chen SL, et al. JACC interv 2015

SMART STRATEGY



Target vessel failure at 3 years



Conservative

Aggressive

Gwon HC, et al. JACC interv 2016

FFR in Bifurcation lesion

- Bifurcation lesion is unique and different from the other stenoses.
- Anatomical evaluations (QCA, IVUS, OCT.....) have pitfalls in the evaluation of bifurcation lesions and cannot tell the functional significance.
- FFR is useful in bifurcation lesions from the beginning till the end of bifurcation PCI and its use can reduce unnecessary complex interventions and their complications.