Keynote Lecture on Bifurcation PCI; Concept and Technique?

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# Nothing to disclose







## **Anatomic Diversity of Bifurcation PCI**

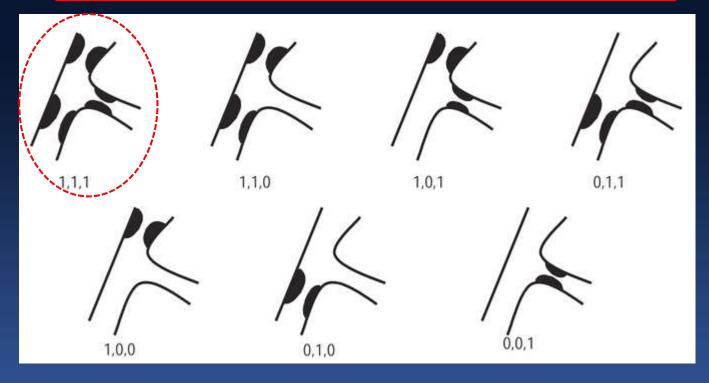
• The approach is dictated by the SB: True vs. Non-true Size of SB Angle from MB Extent and distribution of SB disease >How important the SB is for that patient and for that specific anatomy





## **Anatomic Diversity of Bifurcation PCI**

#### Anatomic concept; the Medina classification

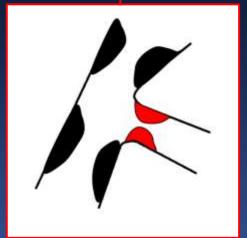


The Medina classification can provide useful information to decide bifurcation PCI strategies. In bifurcation lesions, Medina (1.1.1) lesion is one of the most challenging lesion subsets.

#### Even in the Media (1.1.1) lesion...









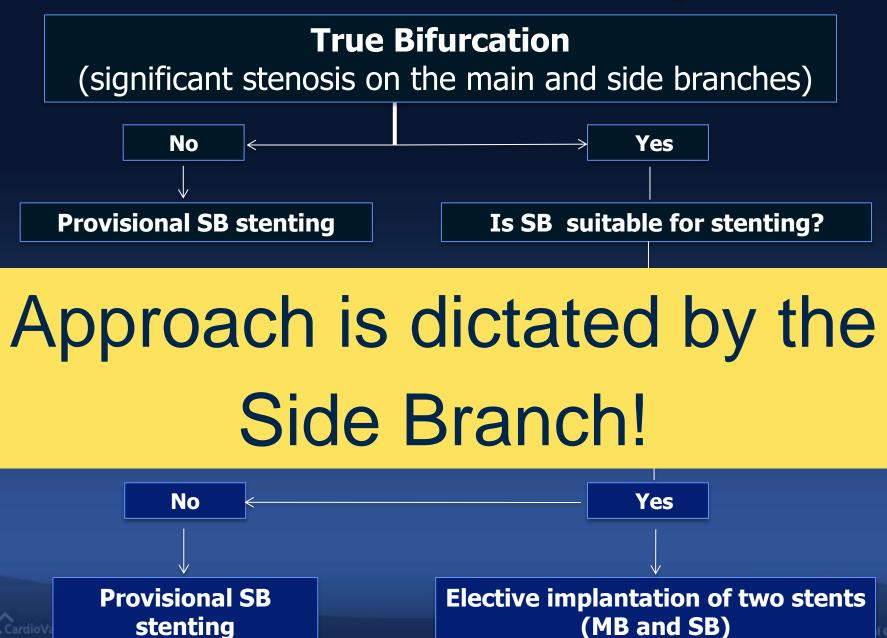
Focal moderate lesion in SB

Focal severe lesion in SB

**Diffuse lesion in SB** 

There are sub-groups which can impact on decision of bifurcation PCI strategies: Anatomic Concept !!!

## **Conventional Concept**



## **Bifurcation PCI** How To Do ? Functional Concept?

 Lots of device and technical Issues.
Lots of bench tests and simulation studies generated lots of hypothesis and concerns.
But, Still lack of <u>functional concept</u> in real practice.

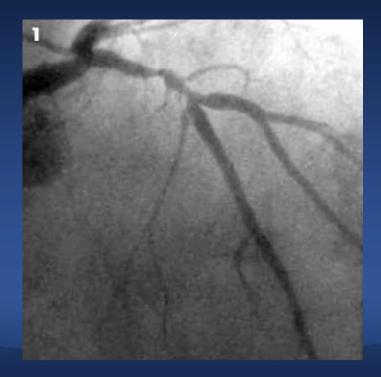






## Non-LM Bifurcation PCI How To Do ?

 1. 1 stent cross over, with/without provisional stenting of SB
2. Planned 2 stent strategy









#### Meta-Analysis of 12 Major Studies, 6961 Pts *Provisional Single-Stenting is Better !*

**DES Thrombosis Myocardial Infarction** С А Study Year DDS SDS **DDS** better SDS better Weight' RR (random) 95% Cl DDS SDS **DDS** better RR (random) 95% CI Study Year SDS better Weight\* RANDOMIZED, CONTROLLED TRIALS RANDOMIZED, CONTROLLED TRIALS NORDIC 2008 1/196 2/199 5.37% 0.50 (0.04-5.55) NORDIC 2008 39/196 20/199 16.86% 1.97 (1.19-3.26) Ferenc et al. 2008 2/101 1/101 5.40% 2.00(0.18-21.71) 1.80% 2.00 (0.18-21.71) Ferenc et al. 2008 2/101 1/101 CACTUS 9.73% 2009 3/177 2/173 1.45(0.24-8.66) CACTUS 13.48% 1.28 (0.65-2.35) 2009 19/177 15/173 BBC-ONE 2010 5/249 1/249 6.71% 4.97 (0.58-42.31) BBC-ONE 9/248 11.76% 3.09 (1.49-6.43) 2010 28/249 DK-CRUSH-II 2011 4/185 1/185 6.45% 4.00 (0.45-35.44) 5.59% 1.50 (0.43-5.22) DK-CRUSH-II 2011 8/185 4/185 META-ANALYSIS 15/908 7/906 2.01 (0.77-5.23) META-ANALYSIS 94/908 49/906 1.88 (1.35-2.62) Cochrane Q: 2.48 (p: 0.651) IP: 0% Cochrane Q: 3.59 (p: 0.453) IP: 0% NONRANDOMIZED, **OBSERVATIONAL STUDIES** NONRANDOMIZED. **BSERVATIONAL STUDIES** 3.54% Ge et al. 2007 3/57 0/117 14.24 (0.74-271.13) Ge et al 2007 13/57 5/117 8.04% 5.33 (1.99-14.24) Di Mario et al. 4/109 D/38 3.66% 3.19 (0.17-57.92) 2007 Di Mario et al 2/38 4.01% 1.22 (0.26-5.62) 2007 7/109 4/263 1.07 (0.12-9.47) ARTS II 2007 1/61 6.50% ARTS II 2007 3/61 16/263 5.94% 0.80 (0.24-2.68) COBIS 9/1376 13.17% 1.04 (0.22-4.82) 2010 2/292 COBIS 2010 5/292 15/1376 7.78% 1.57 (0.57-4.28) J-CYPHER 2011 3/263 10/1870 18.64% 2.13 (0.59-7.70) 9.77% 1.09 (0.46-2.55) J-CYPHER 2011 6/263 39/1870 J-PMS 2011 4/37 2/263 11.12% 14.21 (2.69-74.92) J-PMS 2011 5/37 6/263 8.48% 5.92 (1.90-18.44) Assali et al. 2011 2/141 3/260 9.72% 1.23(0.21-7.27) 2011 7/141 10/260 8.49% 1.29 (0.50-3.32) Assali et al. 27/4187 META-ANALYSIS 19/960 2.55 (1.13-5.78) META-ANALYSIS 43/960 93/4187 1.85 (1.03-3.32) Cochrane Q: 8.06 (p: 0.234) F: 25.57% Cochrane Q: 12.79 (p: 0.041) P. 53.11% META-ANALYSIS 34/1868 35/5093 100% 2.31 (1.33-4.03) META-ANALYSIS 140/1727 142/5093 100% 1.86 (1.34-2.60) Cochrane Q: 10.65 (p: 0.473) P. 0% Cochrane Q: 16.34 (p: 0.129) P. 32.69% 0.01 0.1 10 100 1000 0.01 0.1 10 100 1000 RR (LOG SCALE) RR (LOG SCALE)

Single-stent

Two-stent

Single-stent

**Two-stent** 

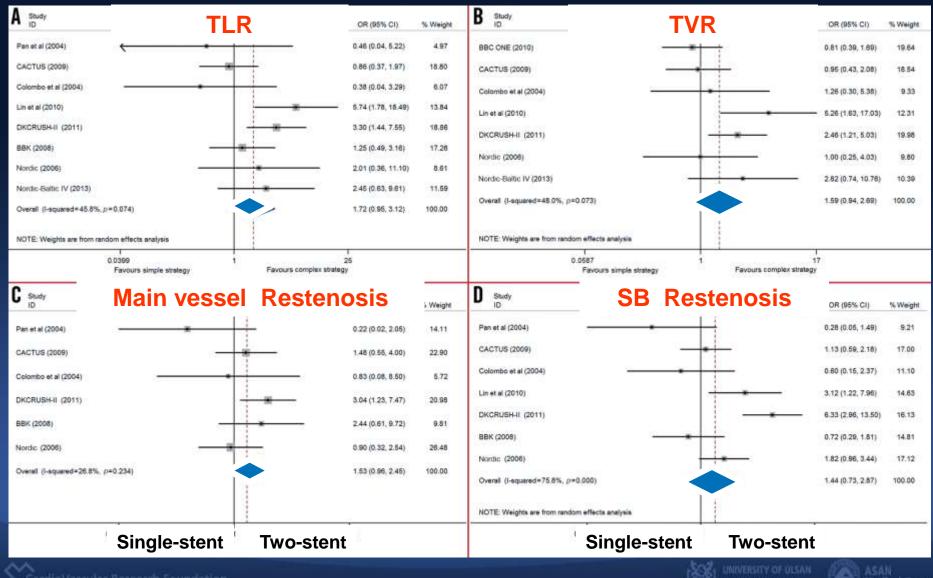


Zimarino et al. J Am Coll Cardiol Intv 2013;6:687-95





#### Another Meta-Analysis of 9 RCT, 2569 Patients 2 Stent Techniques Are Also Good !



Gao et al. EuroIntervention. 2014;10(5):561-9

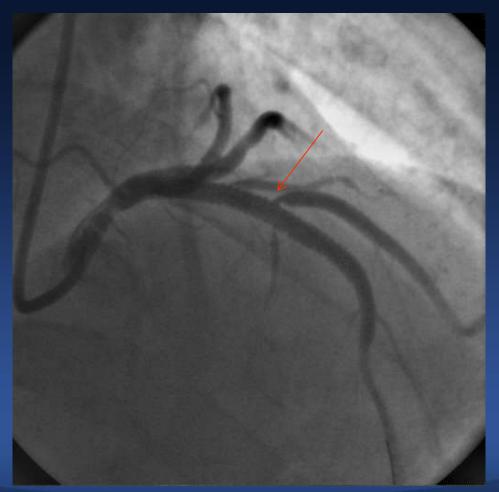
## **Non-LM Bifurcation PCI** *How To Do ?*

- Both strategy, (1 or any 2 stent techniques) would be good in clinical outcomes in the era of 2<sup>nd</sup> DES.
- But, Less is More ! Less invasive (one stent) strategy would be preferred.





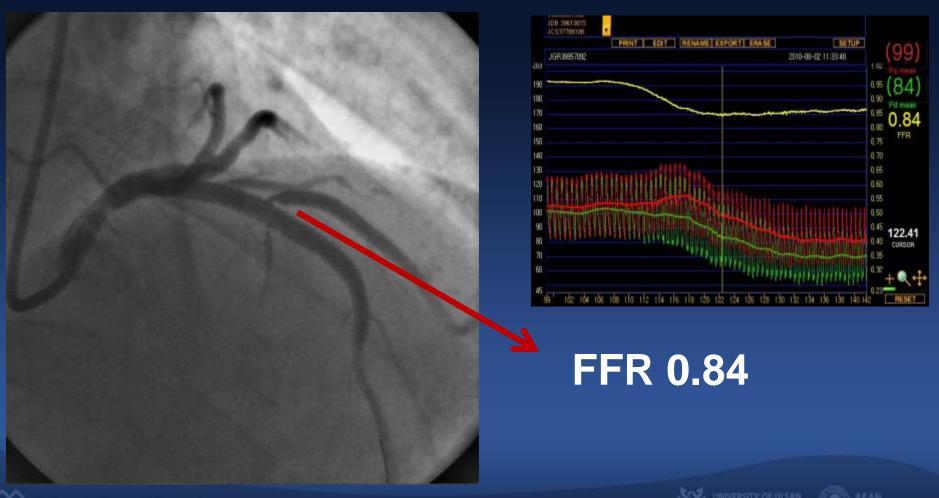
Side Branch Jailing After Main Branch Stenting To Treat or Not To Treat ?





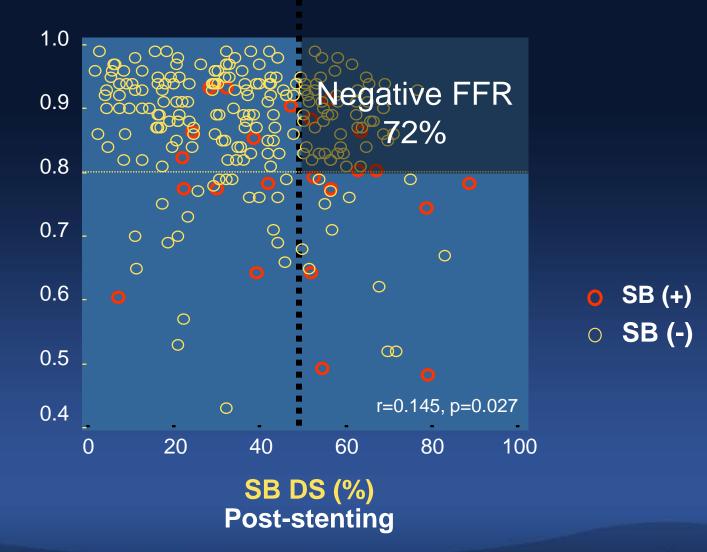


#### Side Branch Jailing After Main Branch Stenting To Treat or Not To Treat ?



#### Side Branch FFR After Main Vessel Stenting (n=232)

**SB FFR** Post-stentin



Ahn JM et al, JACC Cardiovasc Interv. 2011 Feb;5(2):155-61



Leave It Alone; Why It Is OK ?

Negative FFR means *Excellent Prognosis (0.6%/year, Cardiac Death and MI)*, even in the presence of any angiographically proven disease.
Reutine Kiesing Palloop Inflation Is Not Always Cood

2. Routine Kissing Balloon Inflation Is Not Always Good due to Lack of Evidence of Clinical Benefit.

Shaw LJ, J Nucl Cardiol 2004;11:171-85 ,Prognostic value of gated myocardial perfusion SPECT. Very large meta-analysis (n=39,173)



## When ? 2 Stents Are Needed

<i>1 Stent</i>	Normal Side Branch, Whatever Size Is,
Provisional	(Medina 1.1.0., 1.0.0), or
(>70%)	Focal Diseased Side Branch
<i>2 Stent Technique</i>	Large SB (≥ 2.5 mm) → Large amount of myocardium Diffusely Diseased Side Branch (Medina 1.1.1., 1.0.1)



## Many Factors Influencing 2 Stent Techniques

• MB and SB size

- Bifurcation angle
- Plaque distribution and location
- Operator experience and expertise (most comfortable techniques)







## *Many Different* 2 Stent Techniques

- T-stent, modified T-stent or TAP
- Mini-crush (or step crush), DKCRUSH
- Culotte
- V-stent
- Y-stent (SKS-simultaneous kissing stents)
- Dedicated Bifurcation Stent



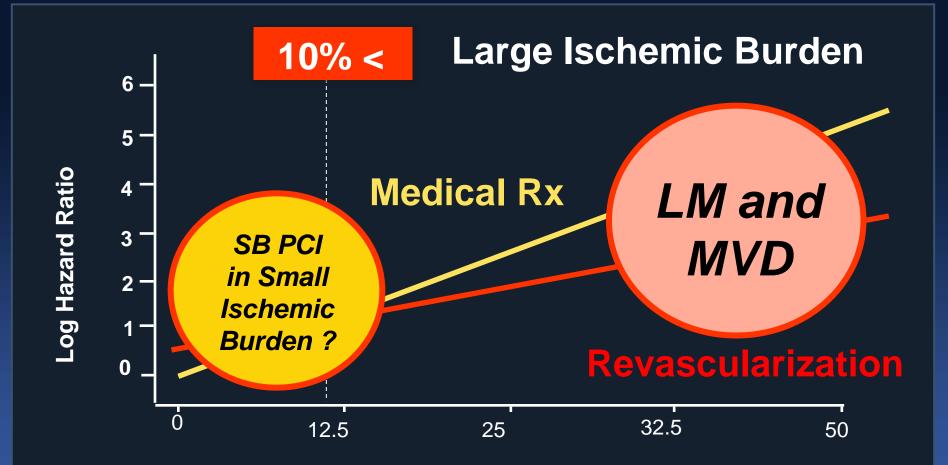
## Why Not, Any Different Outcomes ? with Different 2 Stent Techniques

- Different Indications,
- Very Limited Data,
- Small Ischemic Myocardium of SB Can Not Make an Any Hard Endpoint Difference (Death and MI). Only Difference would be in Soft End Point (TLR).





#### Survival Benefit of Revascularization, Where Is It, Side Branch PCI ?



#### **Total Myocardium Ischemic Burden (%)**

CardioVascular Research Foundation

Hachamovitch R, Circulation. 2003;107:2900-2906

What Really Matters in Non-LM Bifurcation PCI ? Conceptual Key Message

#### FFR Guided or FFR-Trained Concept Is Crucial for Bifurcation PCI !

by the Status of MB rather than Angiographic Appearance of the SB.

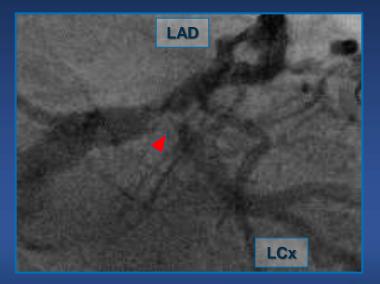






## LM Bifurcation PCI How To Do ?

 1 stent cross over, with provisional stenting of SB
2 Planned 2 stent strategy









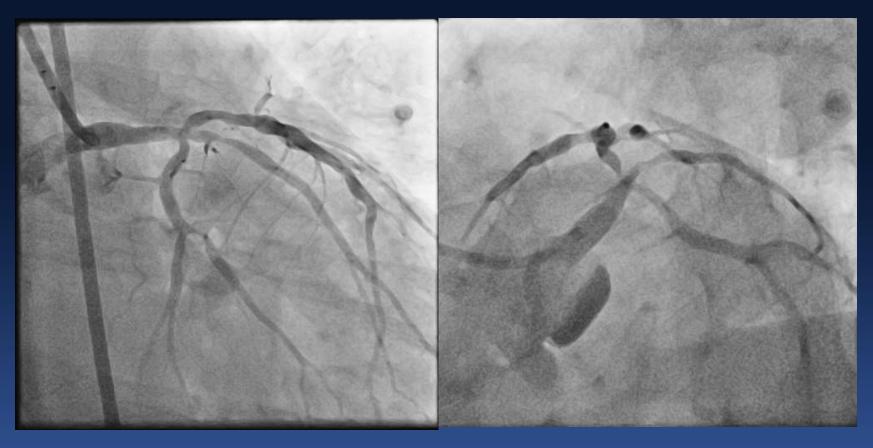
## When ? 1 vs. 2 Stents Conventional Concept for distal LM bifurcation

Provisional Stenting (>70%) Normal LCX (Medina 1.1.0., 1.0.0) Normal or Diminutive LCX Small LCX with < 2.5 mm in diameter Focal disease in distal LCX

2 Stent Technique Diseased LCX (Medina 1.1.1., 1.0.1) Large LCX with ≥ 2.5 mm in diameter Diseased left dominant coronary system Concomitant diffuse disease in distal LCX



#### Case 1, 55/M Effort Chest Pain



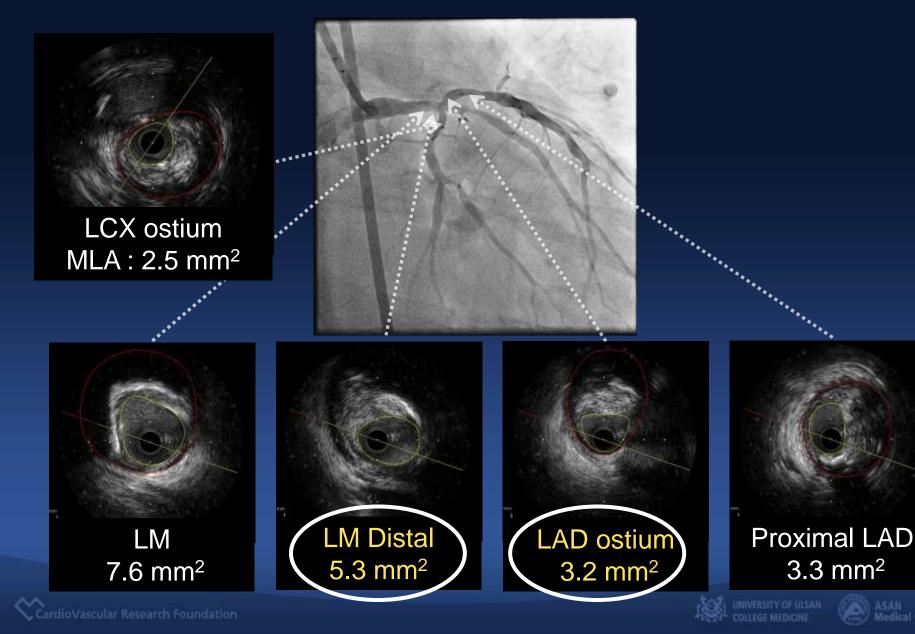
#### Is the Lesion Functionally Significant? How to Treat?





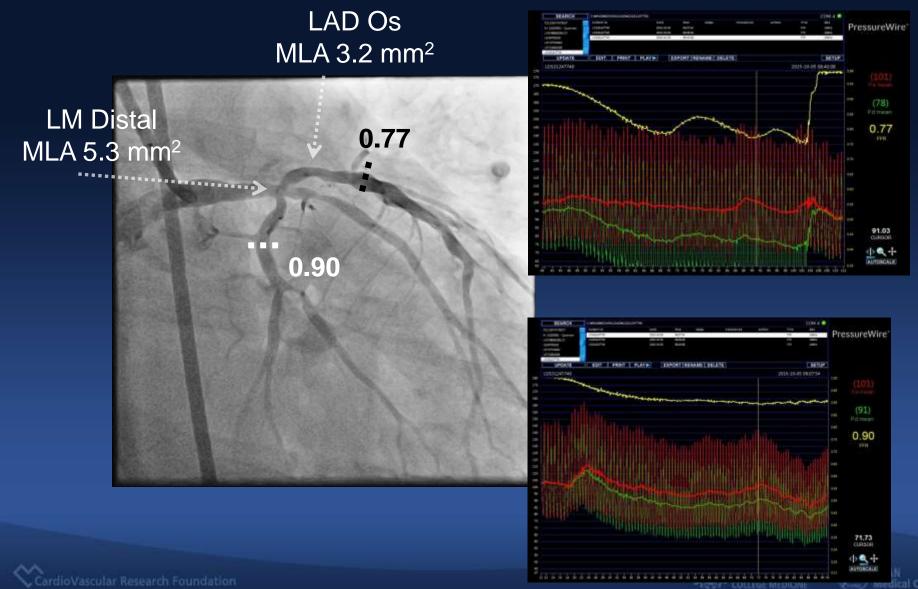


## **IVUS**



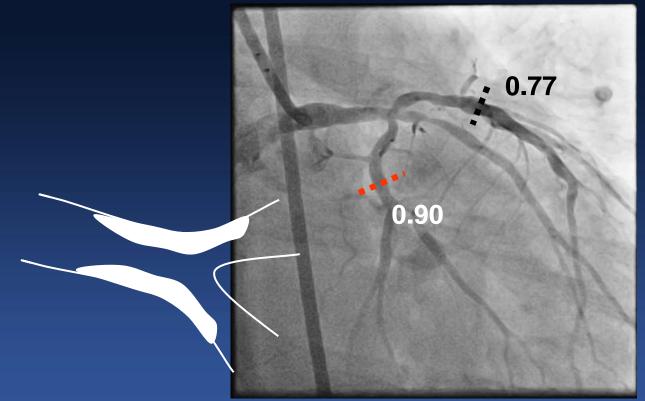
ASAN Medical Center

## **IVUS vs. FFR**



COLLEGE MEDICI

## How To Treat ? 1 or 2 Stent ? for distal LM bifurcation

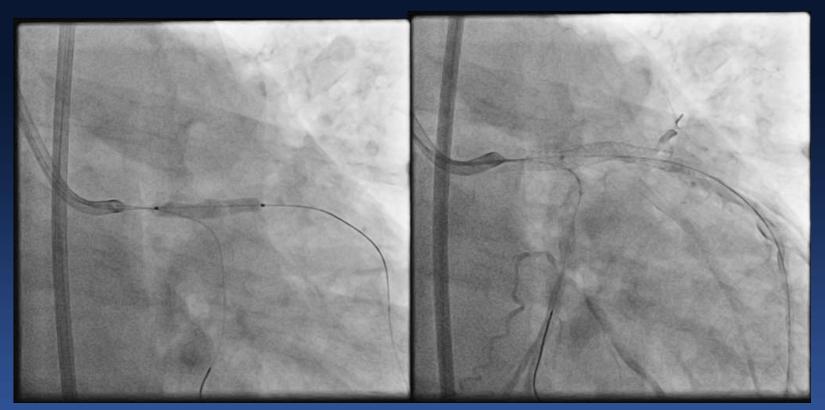








## Single Stent Crossover



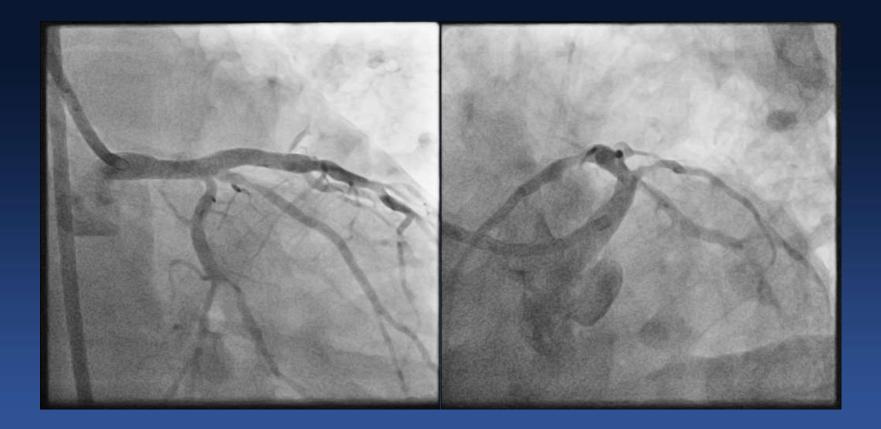
XIENCE Alpine 4.0mm x 30mm







## Final Angiogram

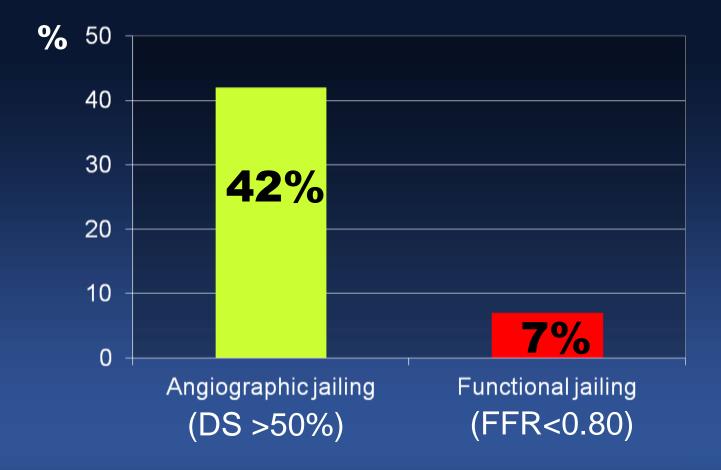








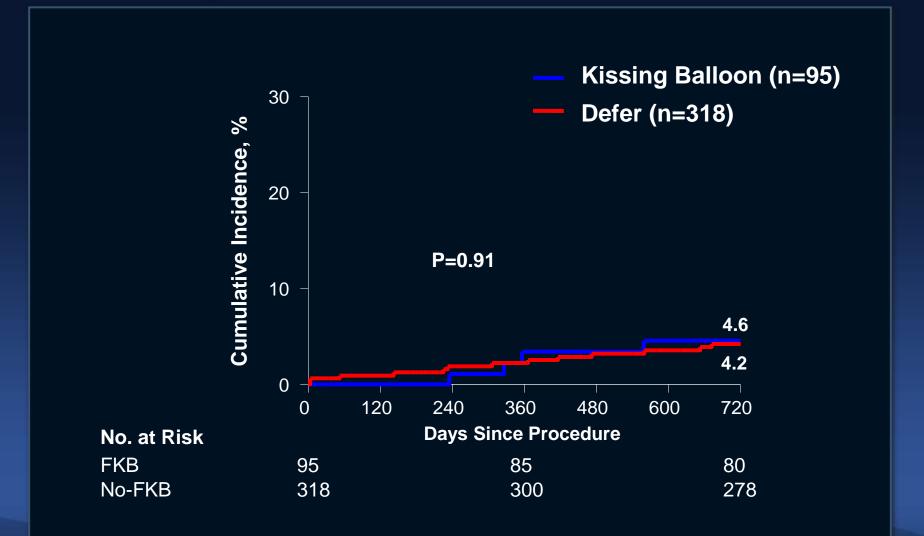
#### *Functionally Significant LCX Jailing* After Stent Crossover for LM Bifurcation



Kang SJ, Catheterization and Cardiovascular Interventions. 2014;83(4):545-52.



#### Death or MI at 2 Years Jailing LCX Defer Is Safe and Good !



AMC Data, 2016



# 2 Stent Techniques for distal LM bifurcation

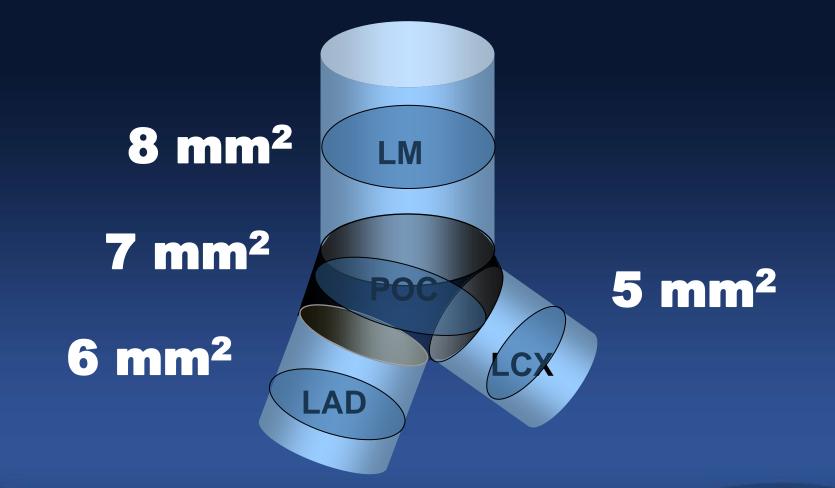
- T-stent, modified T-stent or TAP
- Mini-crush (or step crush)
- Culotte
- V-stent
- Y-stent (SKS-simultaneous kissing stents)







#### Effective Stent Area (Rule of 5,6,7,8 mm<sup>2</sup>) Restenosis Rate < 5% and TLR < 2%



CardioVascular Research Foundation

Kang et al. Circ Cardiovasc Interv 2011;4:1168-74





## **Bifurcation PCI** How To Do ? **for distal LM bifurcation**

- Both strategy (1 or any 2 stent techniques) would be OK in the era of 2<sup>nd</sup> DES. Side branch treatment with FFR guided or FFR trained concept can make a good clinical outcomes.
- Whatever you used 2 stent technique, IVUS optimization (effective stent area, 5.6.7.8 mm<sup>2</sup>) can make a good clinical outcomes.





# What Really Matters in Bifurcation PCI ?

## It's a Matter of Concept rather than Technique !





