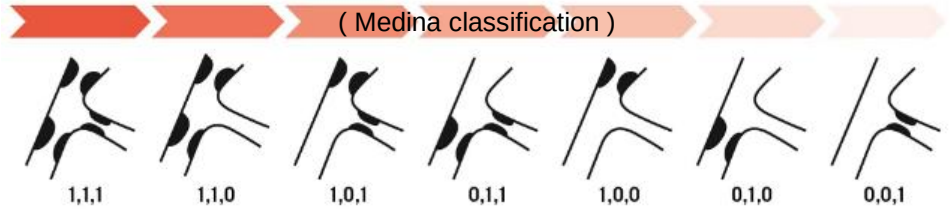
Treatment strategies for coronary bifurcation lesion

Kim sung-wook, RT

Seoul national Univ. Bundang hospital

Bifurcation lesion



- ✓ **Approximately 15~20% in PCI**
- ✓ **Need to record several views from various angle**
- ✓ **Variability in stenosis assessment**
- ✓ **Wide variation of SB take-off angle**

- ✓ **Side branch stenosis is unique and complex**
  - **Various size, amount of myocardium**
  - **Underlying plaque – eccentric**
  - **Remodeling – negative (Ostium)**
  - **Not physiologic**
  - **Complex mechanisms of side branch jailing**

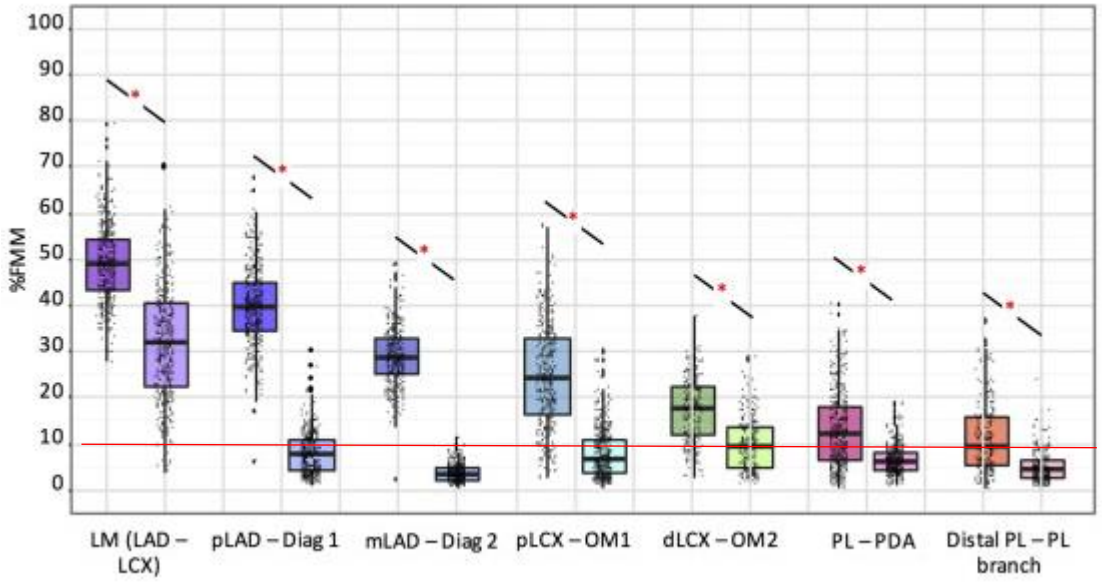
(Carina shift, Plaque shift, stent strut, thrombus…)

SB is “Relevant” if ?

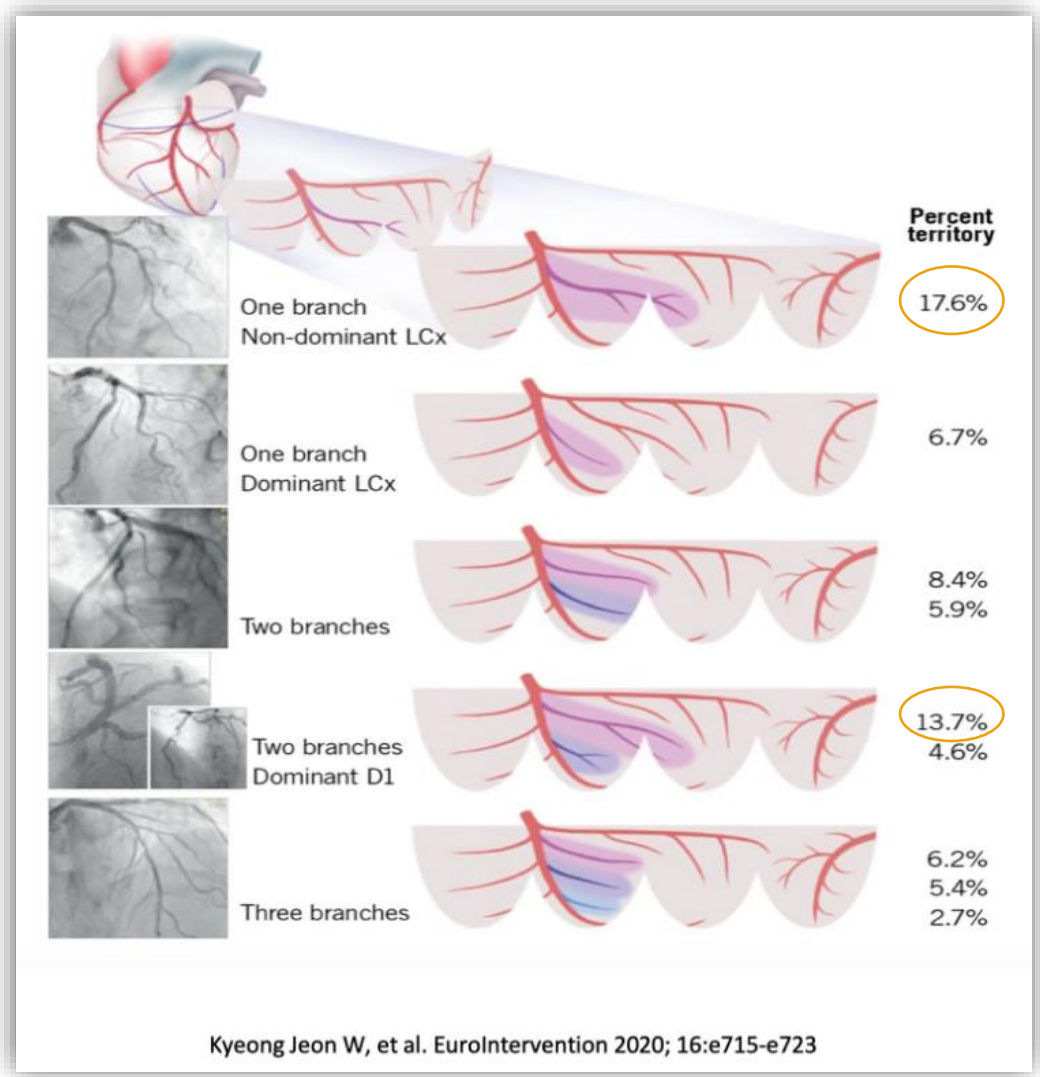
Bif-ARC consensus :

- ✓ Reference vessel diameter is ≥ 2.0 mm
- ✓ Significant territory (> 10 %) of the myocardium

(an SB length ≥ 73 mm is assumed to supply ≥ 10% myocardial mass)



Hyung Yoon Kim , JACC Cardiology interventions, Vol.10. No. 6. 2017



Ten-Year Trends in Coronary Bifurcation PCI

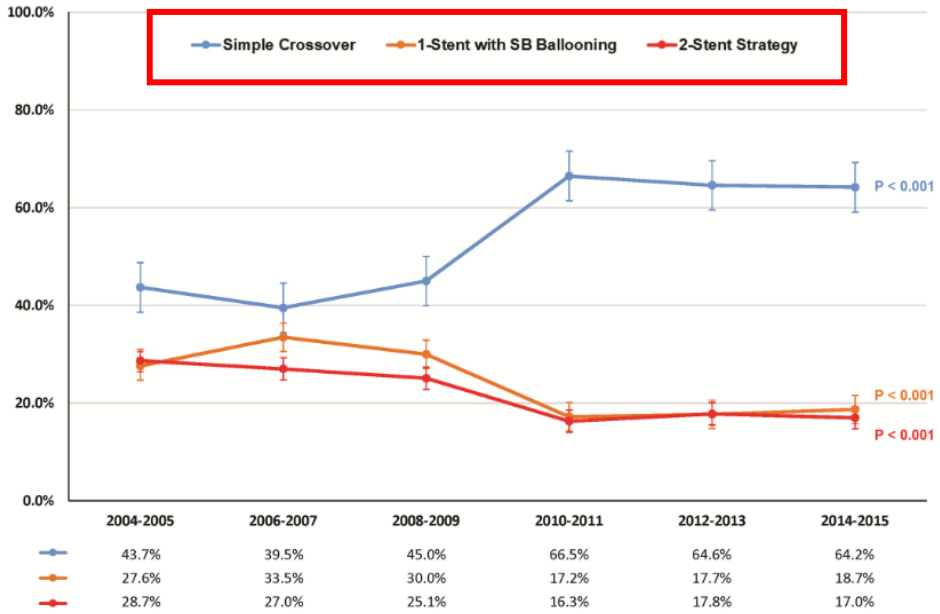
JAHA
Journal of the American Heart Association

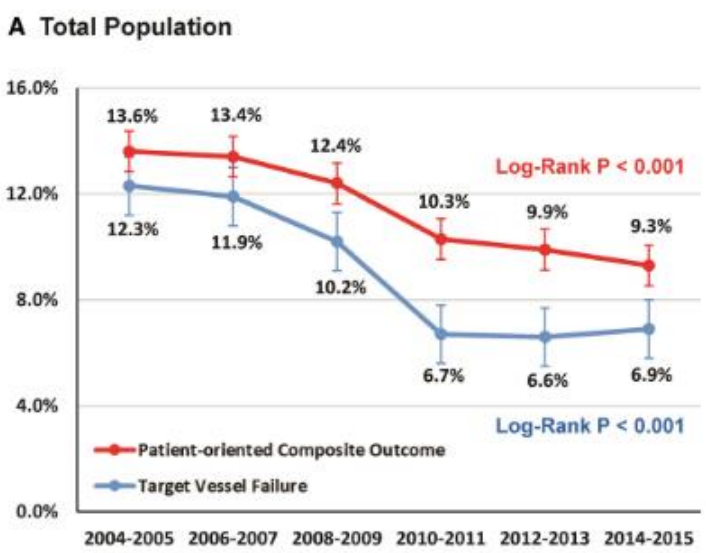
Ten-Year Trends in Coronary Bifurcation Percutaneous Coronary Intervention: Prognostic Effects of Patient and Lesion Characteristics, Devices, and Techniques

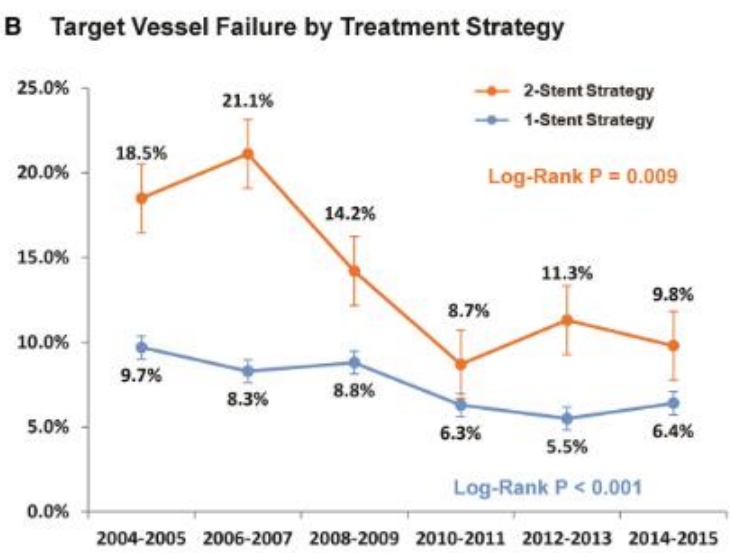
Joo Myung Lee, Seung Hun Lee, Juwon Kim, Ki Hong Choi, Taek Kyu Park, Jeong Hoon Yang, Young Bin Song, Joo-Yong Hahn,

5498 patients who underwent bifurcation PCI from 2004 to 2015

clinical outcomes 2 years after the index procedure (COBIS II, III)



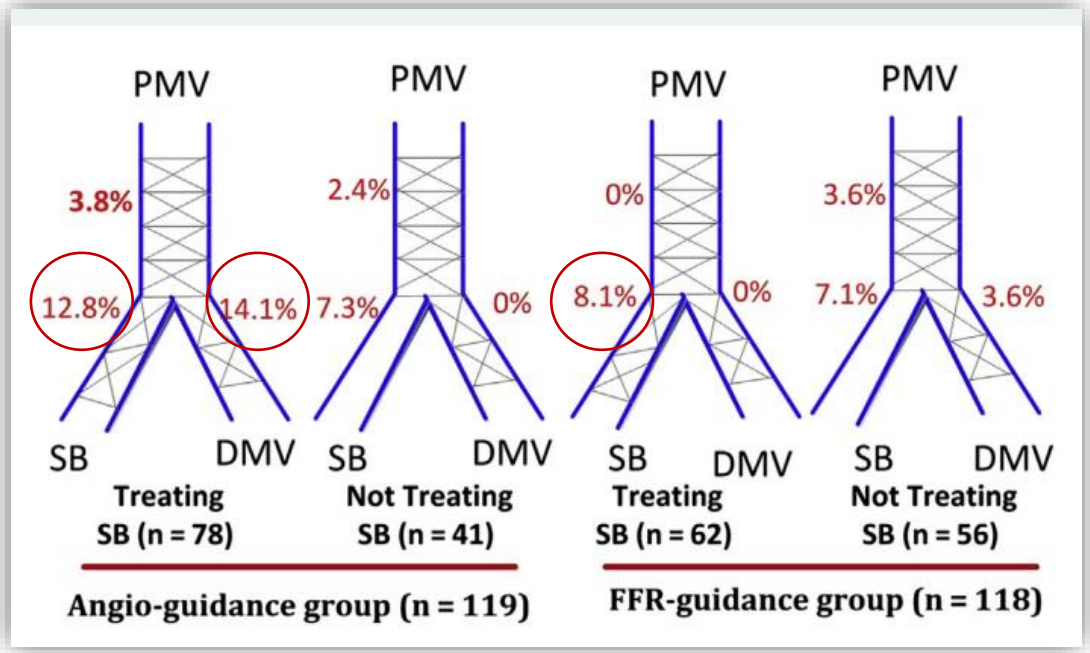




J Am Heart Assoc. 2021 Sep 21;10(18):e021632.

Aggressive procedure – more clinical events

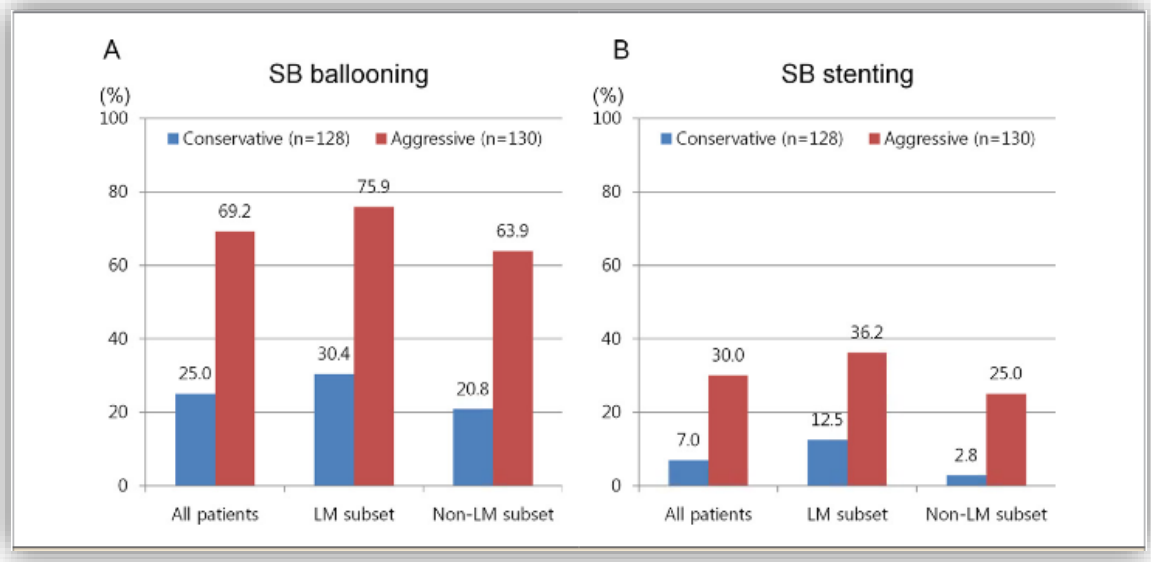
The DKCRUSH-VI Trial (Double Kissing Crush Versus Provisional Stenting Technique for Treatment of Coronary Bifurcation Lesions VI)

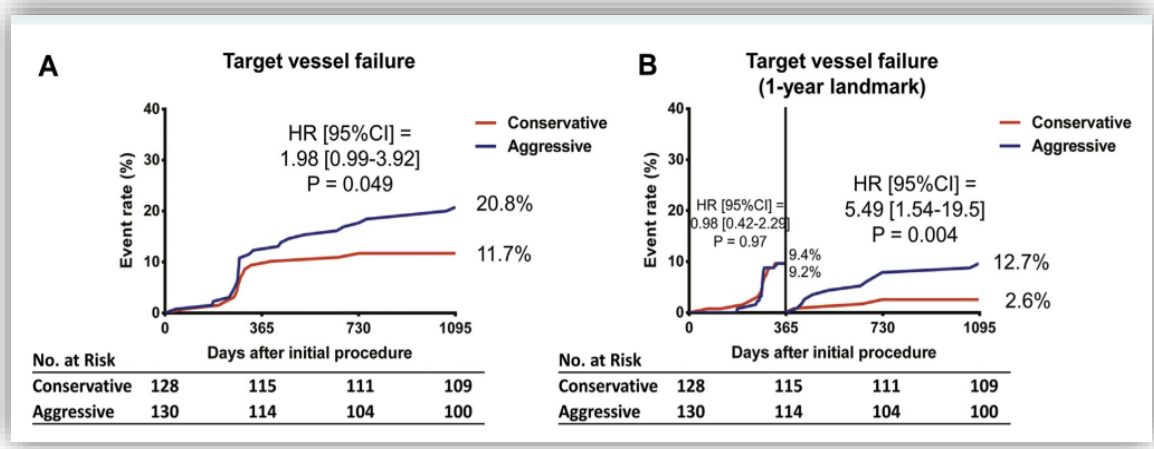


Distribution of Restenosis 13 months after stenting

Shao-Liang Chen. et al. JACC: CARDIOVASCULAR INTERVENTIONS VOL. 8, NO. 4, 2015

3-Year Outcomes of the SMART-STRATEGY Randomized Trial



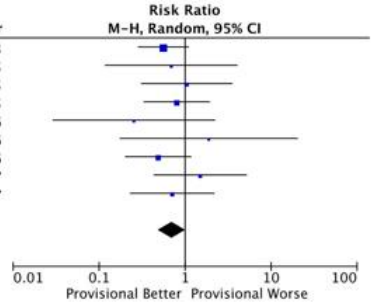


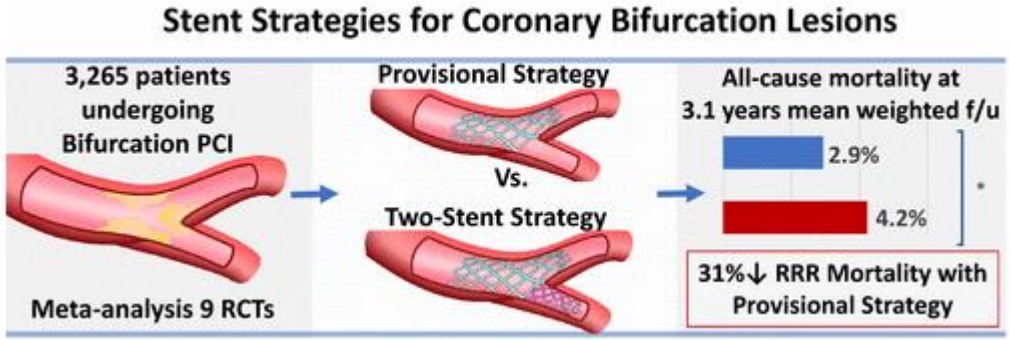
Y B song et al.JACC: CARDIOVASCULAR INTERVENTIONS VOL. 9, NO. 6, 2016

Provisional VS Upfront Two-stent

Study or Subgroup	Provisional One Stent Events	Total	Two-Stent Events	Total	Weight	Risk Ratio M-H, Random, 95% CI	Year
NORDIC 2013	12	207	21	202	28.8%	0.56 [0.28, 1.10]	2013
PERFECT 2015	2	206	3	213	4.2%	0.69 [0.12, 4.08]	2015
Nordi-Baltic Bifurcation IV 2015	5	218	5	228	8.9%	1.05 [0.31, 3.56]	2015
BBK1 2015	8	101	10	101	17.0%	0.80 [0.33, 1.94]	2015
SMART-STRATEGY 2016	1	128	4	130	2.8%	0.25 [0.03, 2.24]	2016
EBC Two	2	103	1	97	2.4%	1.88 [0.17, 20.44]	2016
BBC 1	7	245	14	238	16.9%	0.49 [0.20, 1.18]	2016
DK Crush II 5 year follow up 2017	6	183	4	183	8.6%	1.50 [0.43, 5.23]	2017
DK Crush V 2017	5	242	7	240	10.4%	0.71 [0.23, 2.20]	2017
Total (95% CI)		**1633**		**1632**	**100.0%**	**0.69 [0.48, 1.00]**	
Total events	48		69				

Heterogeneity: Tau² = 0.00; Chi² = 4.50, df = 8 (P = 0.81); I² = 0%
Test for overall effect: Z = 1.95 (P = 0.05)



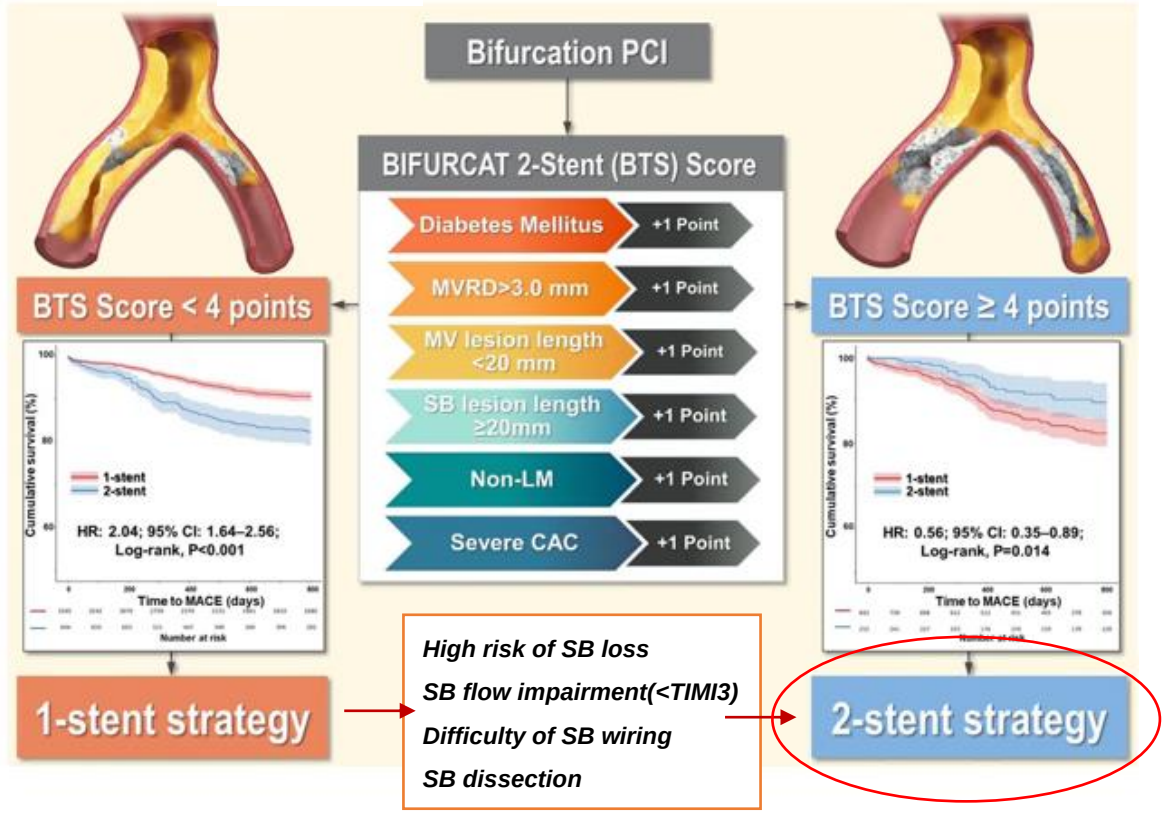


Thomas J. Ford et al. J Am Heart Assoc. 2018 Jun 5; 7(11): e008730.

A novel scoring system devised by an international large-scale coronary bifurcation registry to guide the optimal choice between the 1- and 2-stent strategy: the BIFURCAT Two-Stent (BTS) score

ESC European Society of Cardiology

RAIN and COBIS bifurcation registries



Jang A Y et al.European Heart Journal (2023) 44 (Suppl 2)

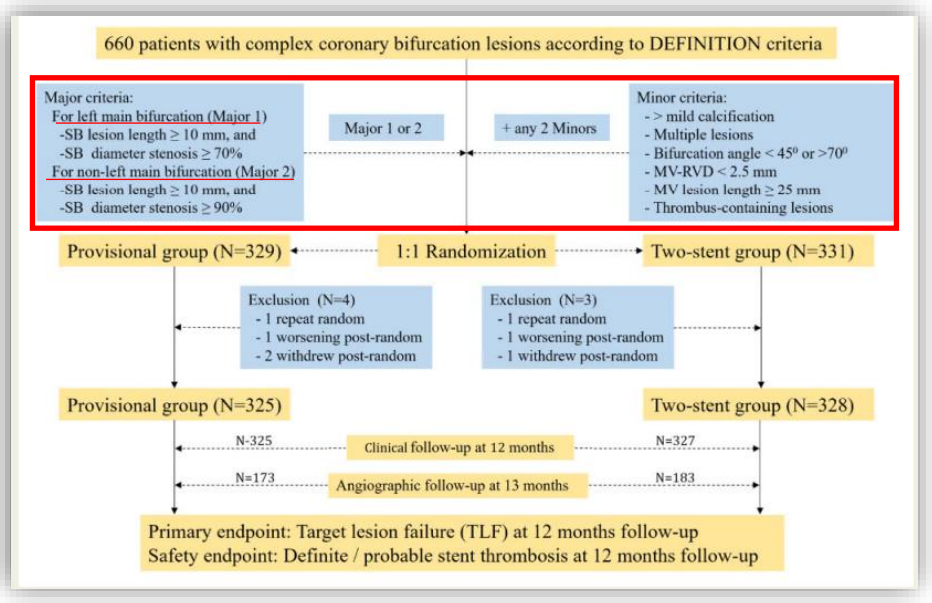
Provisional VS Upfront Two-stent in Complex BL

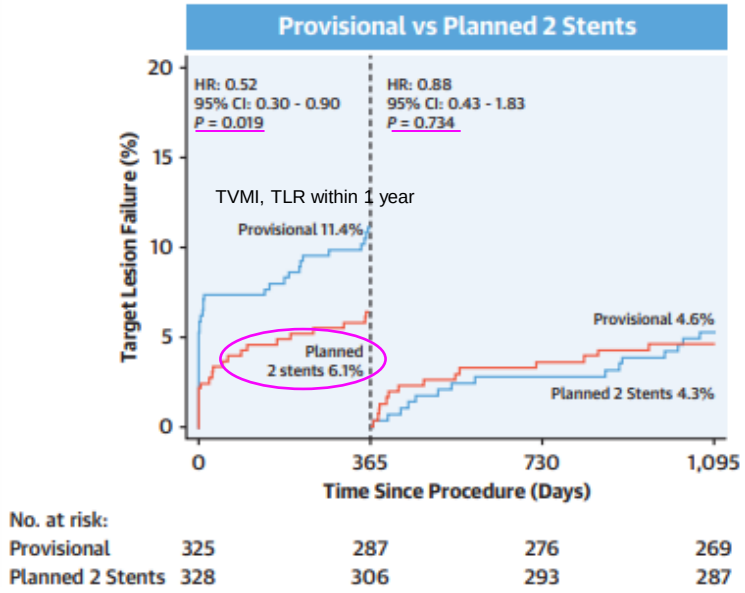
DEFINITION II trial

3-Year Outcomes After 2-Stent With Provisional Stenting for Complex Bifurcation Lesions Defined by DEFINITION Criteria

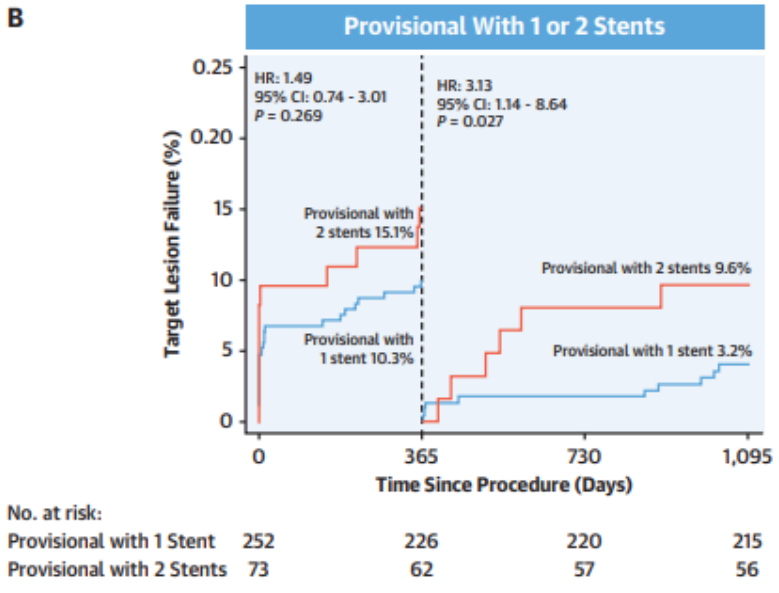
Jing Kan, MBBS,[a,*] Jun-Jie Zhang, PhD,[a,*] Imad Sheiban, MD,[b] Teguh Santoso, MD,[c] Muhammad Munawar, MD,[d]

N=660, Medina (1, 1, 1) or (0, 1, 1) SB >2.5 mm, Complex bifurcation lesion





B



JACC: CARDIOVASCULAR INTERVENTIONS VOL. 15, NO. 13, 2022

Comparison of two-stent strategies

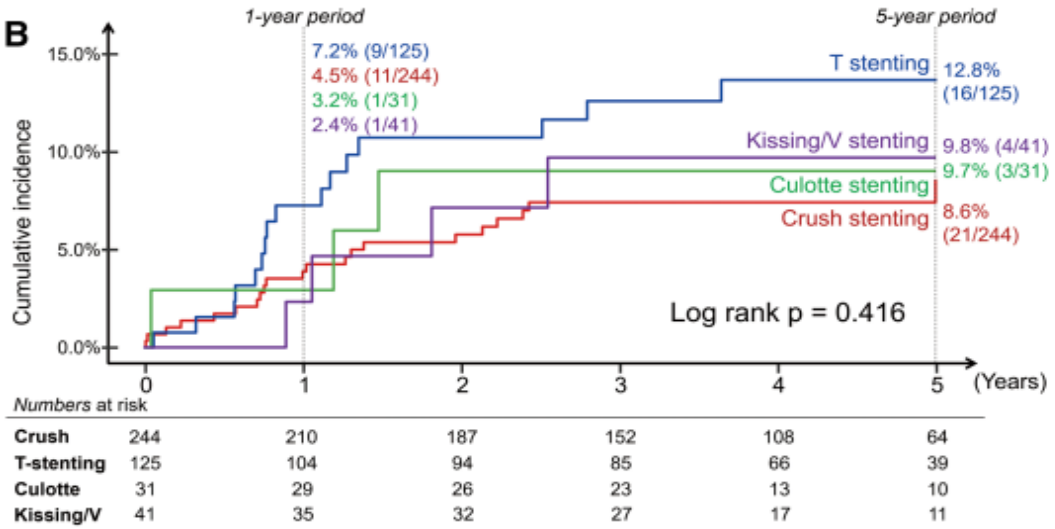
"Outcome was not affected

by technical factors of 2-stenting treatment"

Stenting technique

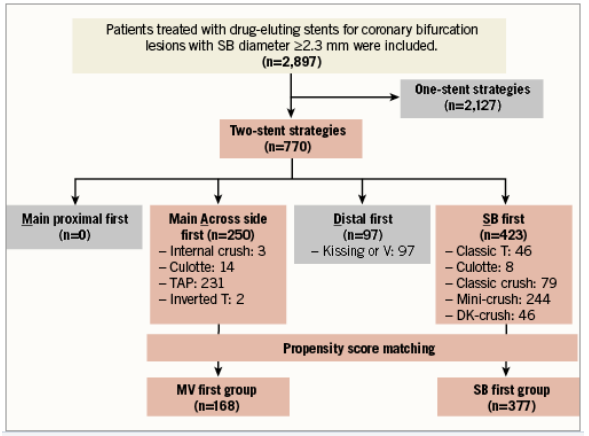
- Crush stenting (n=244)
- T stenting (n=125)
- Culotte stenting (n=31)
- Kissing or V-stenting (n=41)
- Others (n=13)

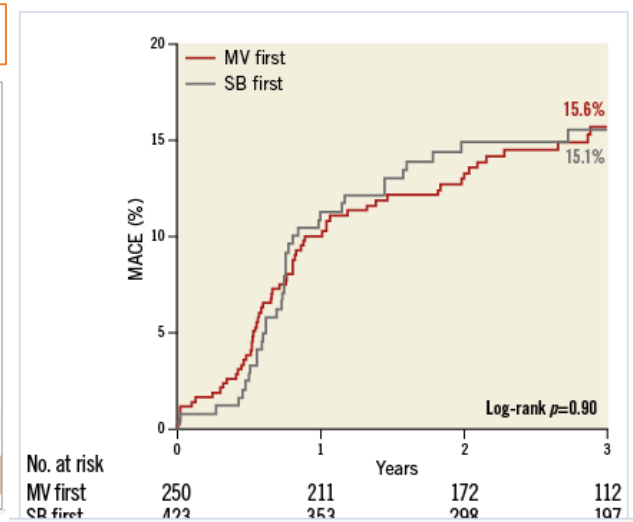
N=2648 (2010 ~2014) 21 centers, 2stent (17%), COBIS III



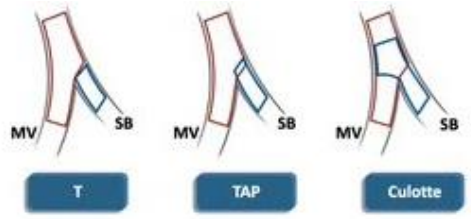
Cumulative incidence of target lesion failure (TLF) for 5 years

"More severe lesion First"

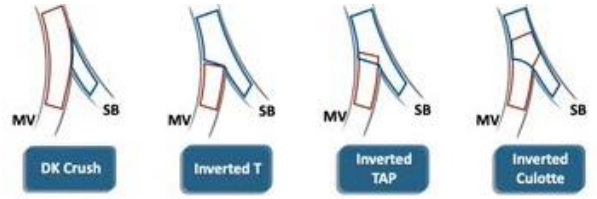




2 stent : MV first



2 stent : SV first



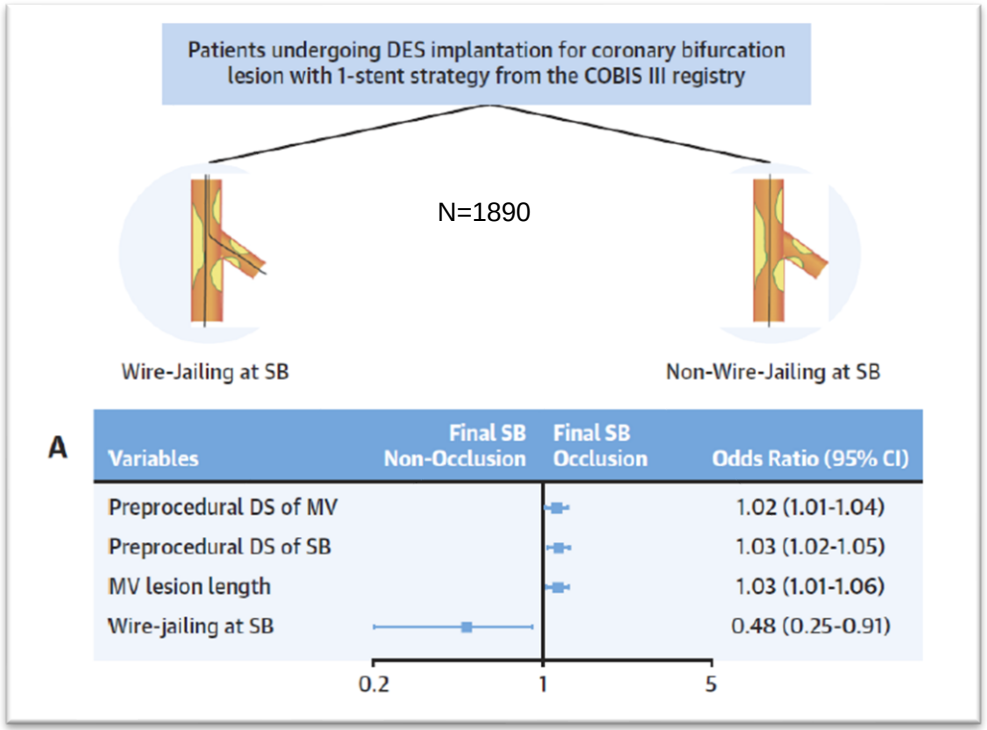
Jeehoon Kang , Circulation Journal Vol.85, November 2021

Taek Kyu Park et al. Eurointervention. Vol.13 Nov.7, Sep20. 2017

Effect of wire-jailing at SB in 1stent strategy

Favorable outcomes of the 1-stent strategy for coronary bifurcation lesions, SB occlusion lead to serious adverse clinical events.

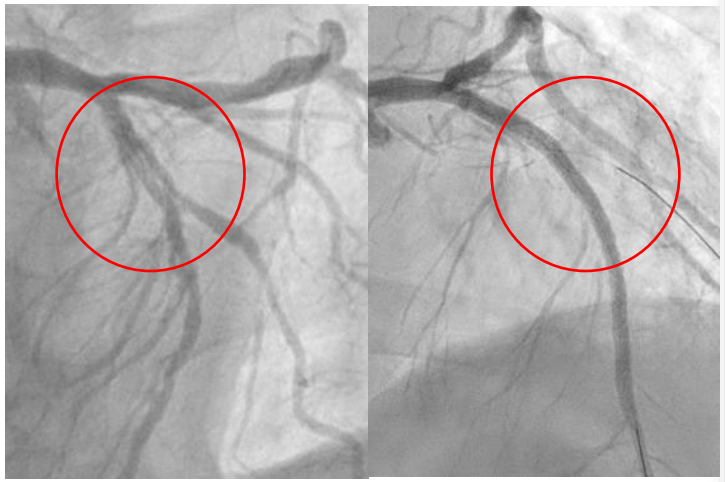
But not with overall bifurcation lesions..

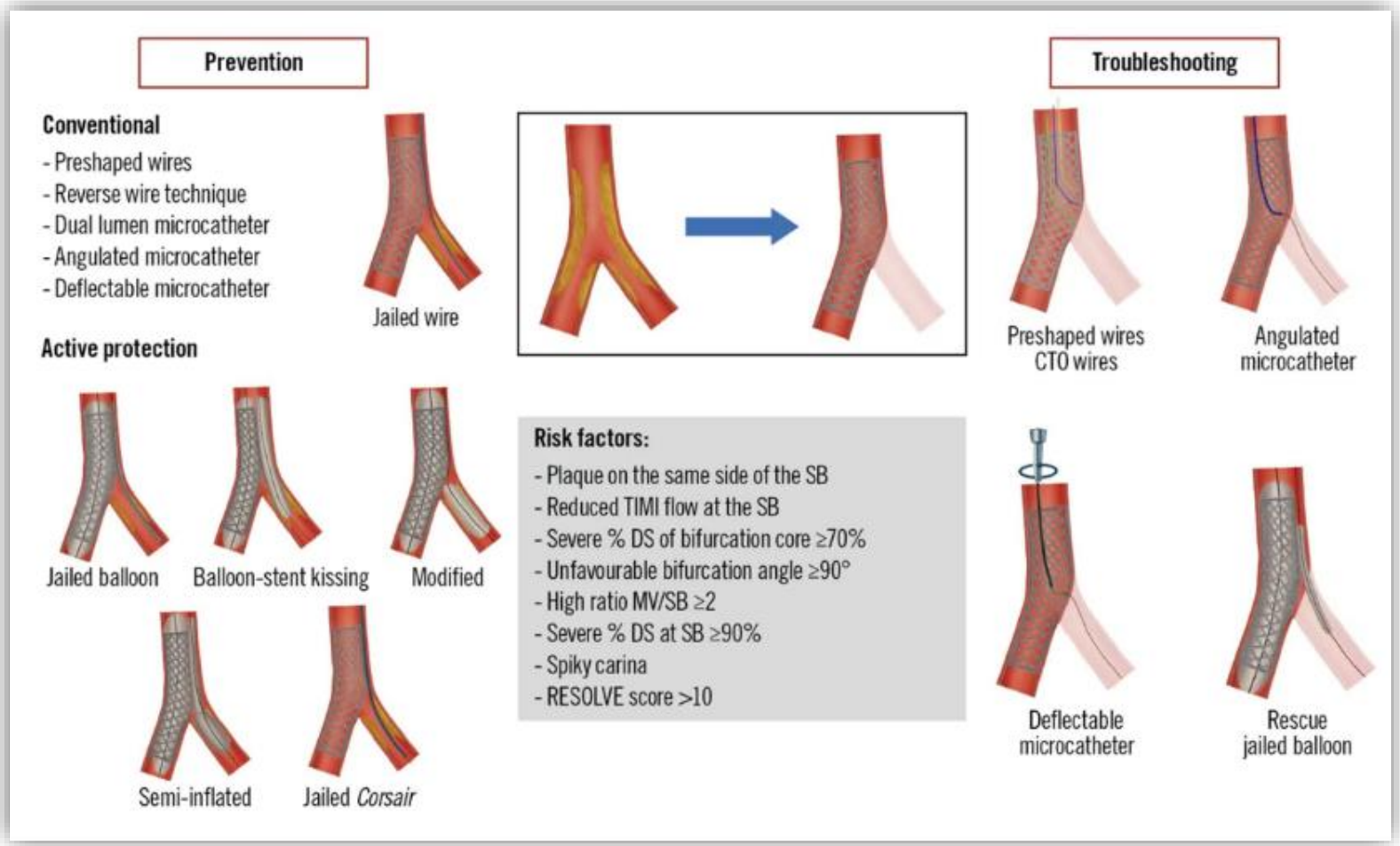


Yeon-Jik Choi et al. J Am coll Cardiol intv. 2022:15;443-455

Preserving SB access during provisional stenting

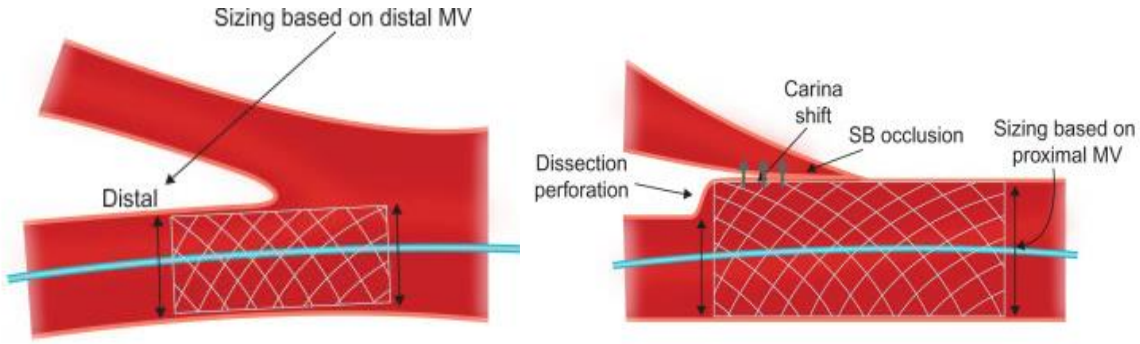
- ✓ *Protect from closure*
- ✓ *Keep SB open – dissection, POT*
- ✓ *Make recrossing easier with less contrast*
- ✓ *Modify the angle of take off*

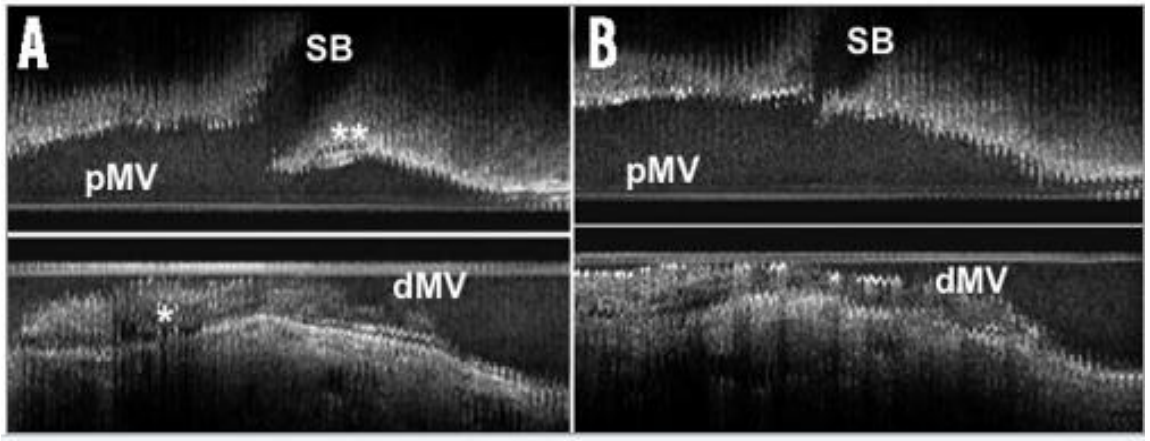




Manuel Pan et al. EuroIntervention 2023;19:26-36.

Mechanism of SB lumen loss

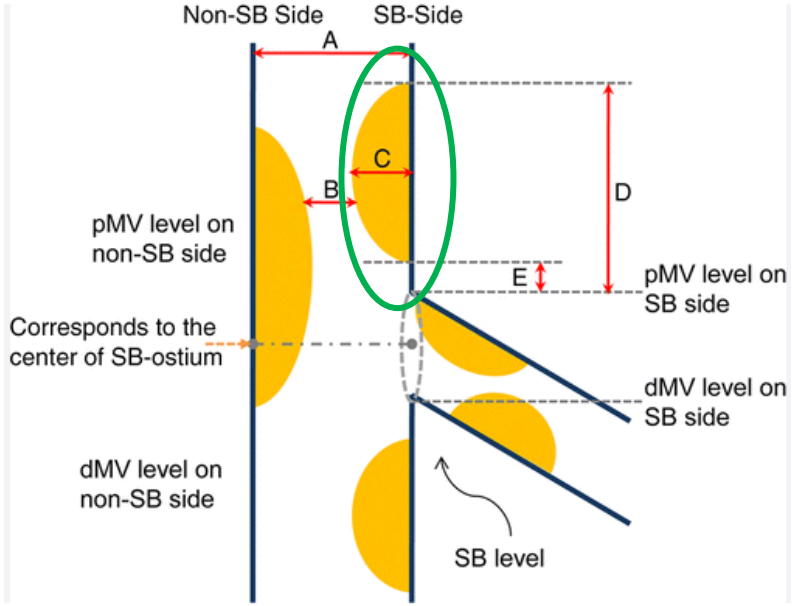




courtesy of B.K. Koo

- CT angiography study (N=65)
  - Bifurcation with MV > 2.5 mm, SB > 2.0 mm

Predictors of SB occlusion	Odds ratio	P-value
Plaque thickness in C region > 2.7 mm	5.59 [1.28-24.4]	0.022
SB diameter stenosis > 40%	6.23 [1.37-28.4]	0.018



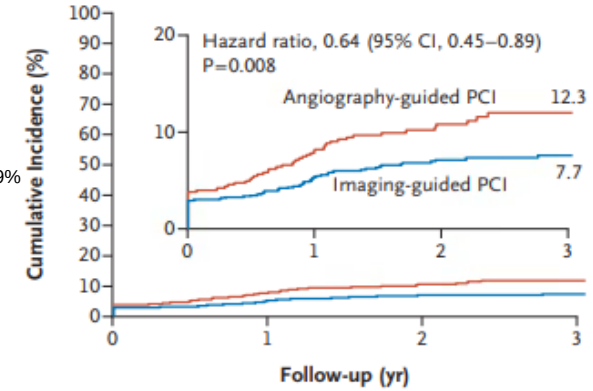
Radiology. Cho YS, Feb 27 2014, VOL. 271, NO. 3

Imaging guidance in bifurcation lesion

The NEW ENGLAND JOURNAL of MEDICINE

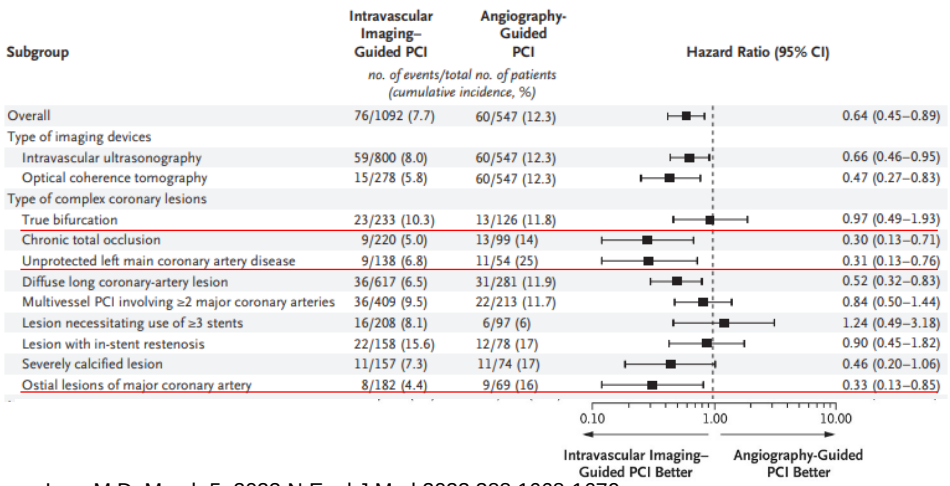
RENOVATE-COMPLEX-PCI ClinicalTrials

Bifurcation
True bifurcation : 21.9%
LM : 11.7%
Ostial lesion : 15.3%



No. at Risk

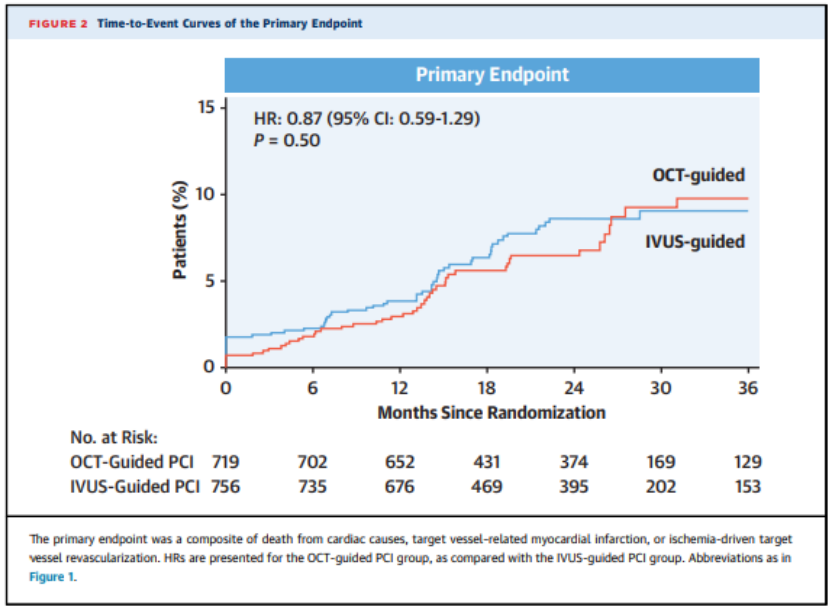
Angiography-guided PCI	547	496	280	120
Imaging-guided PCI	1092	1023	591	255

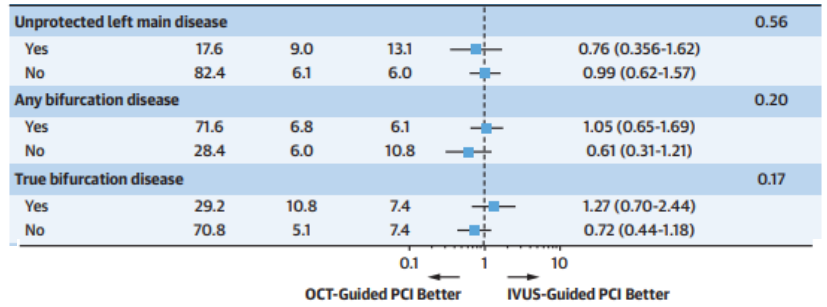


Joo Myung Lee, M.D, March 5, 2023 N Engl J Med 2023;388:1668-1679

Circulation

Main subgroup analysis of complex coronary artery lesions in the OCTIVUS





Kang et. JACC VOL. 83, JANUARY 23, 2024:401 – 413

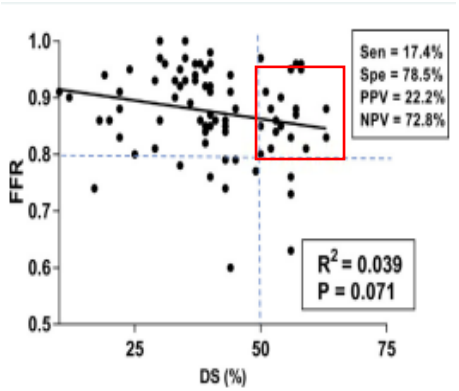
FFR in bifurcation lesion

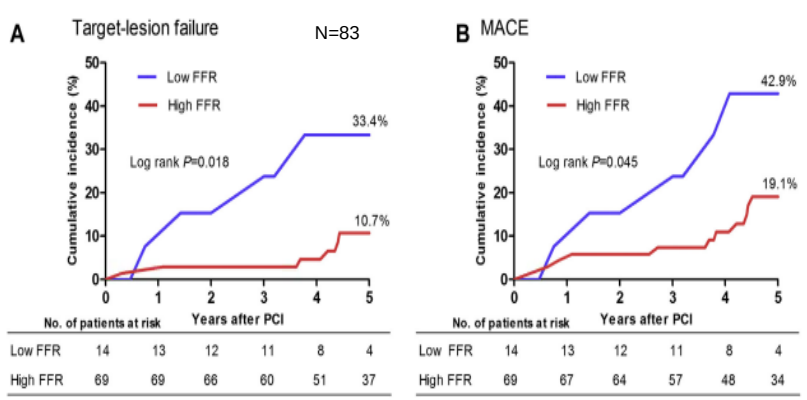
Table 1. FFR during bifurcation intervention.

	FFR is useful	FFR is generally not recommended
Pre-intervention	To assess the functional significance of MB To assess the functional significance of pure SB stenosis	Small SB To determine functional significance of SB when there is a significant MB stenosis SB FFR to predict the functional significance of jailed SB
Post MB stenting	To assess the functional significance of jailed SB and to predict the outcomes	Small SB Long diffuse, highly angulated or calcified SB SB slow flow
Post SB angioplasty	To assess SB procedural success and to predict the outcomes after KBI	SB slow flow SB severe dissection
Post SB stenting	To evaluate residual ischaemia	To predict procedural outcomes of complex two stenting

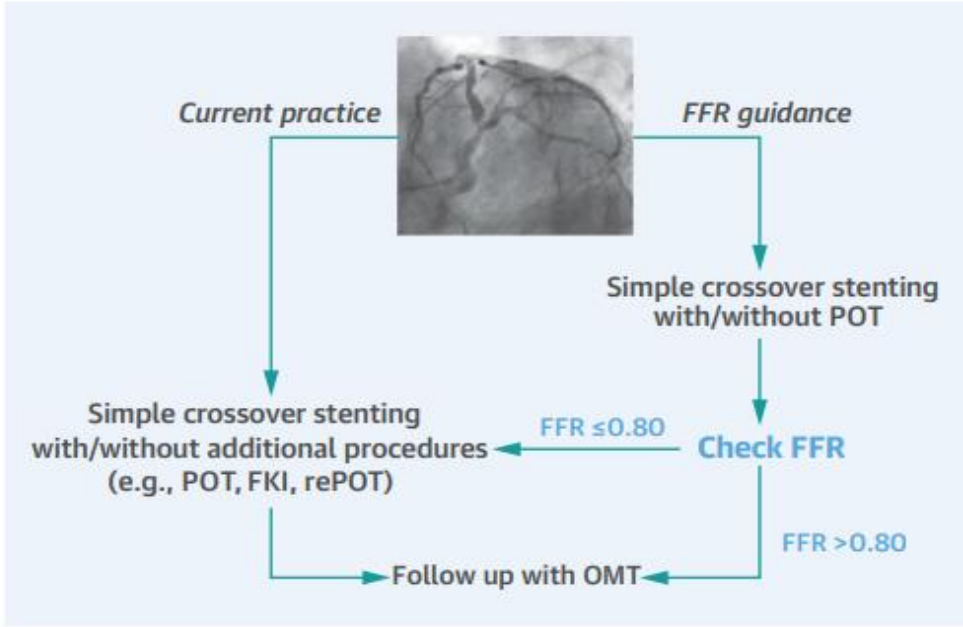
FFR: fractional flow reserve; KBI: kissing balloon inflation; MB: main branch; SB: side branch

J M Lee. Et al. EuroIntervention 2015;11:V59-V63



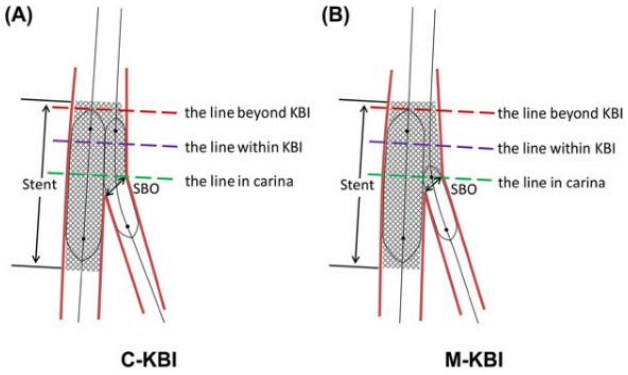


FFR guidance of LM Simple Crossover Stenting

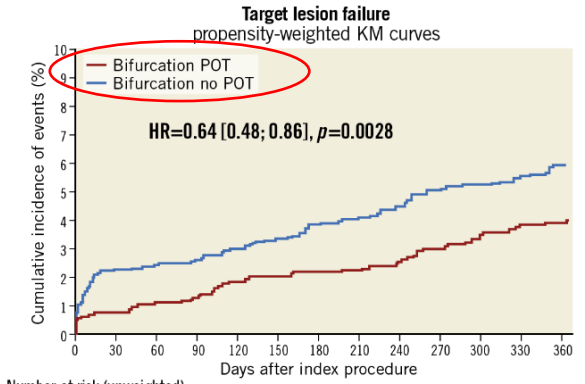


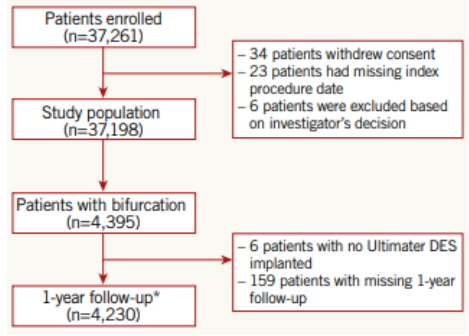
Lee, C.H. et al. J Am Coll Cardiol Intv. 2019;12(9):847-55.

Kissing balloon and POT



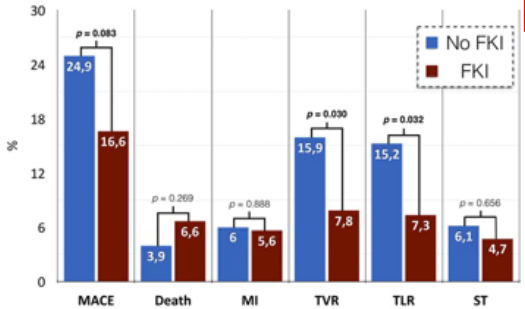
Jia Liu MD. J Interv Cardiol.2018;31:755–764



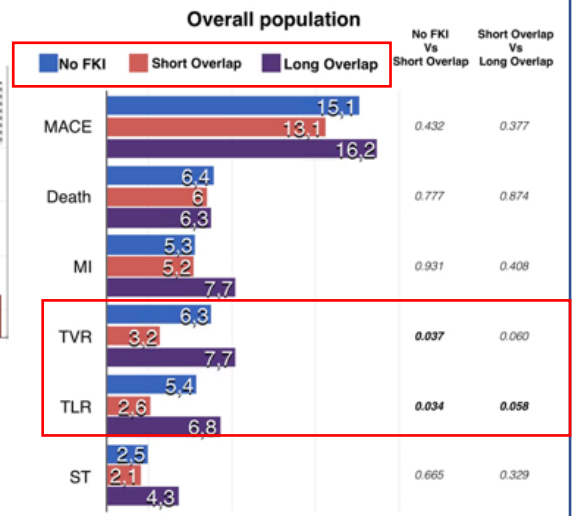


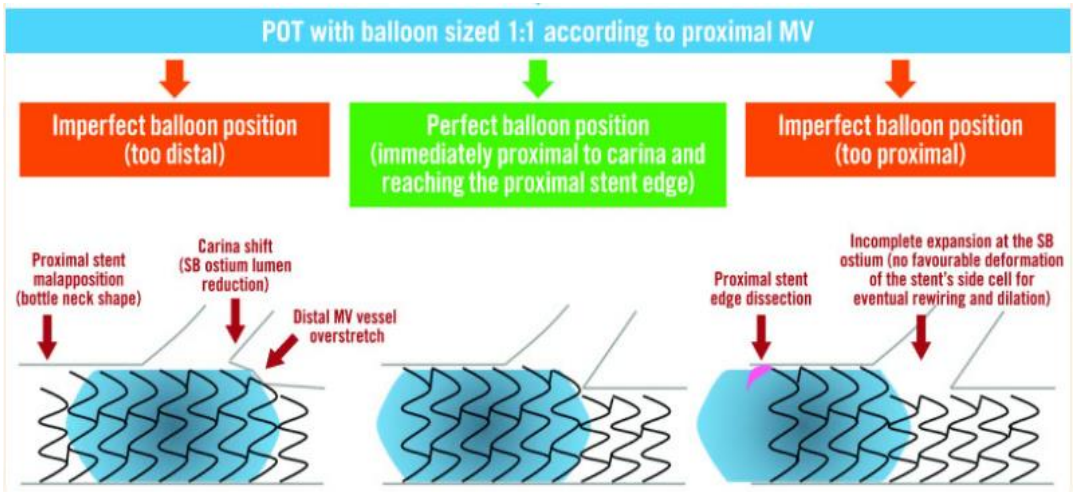
Bernard Chevalier. EuroIntervention 2021;17:e910-e918

RAIN registry (BiF, 25.9% LM)



2742 patients with BiF or ULM treated with ultrathin stents —> **FKI** reduced restenosis when performed with short overlap irrespective from use of POT and in patients treated with a 2-stent strategy



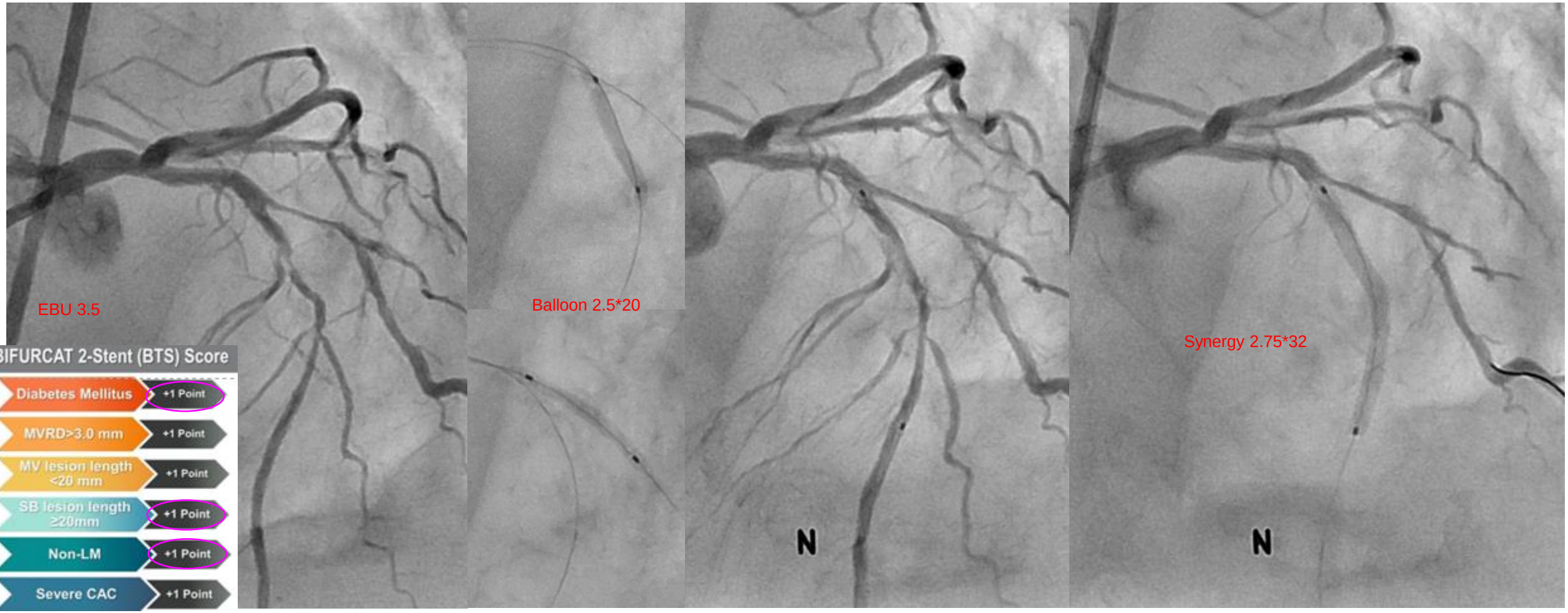


Luca Gaido. Circulation: Cardiovascular Intervention. Volume: 13, Issue: 3

EuroIntervention. 2022 Jul; 18(4): e273–e291.

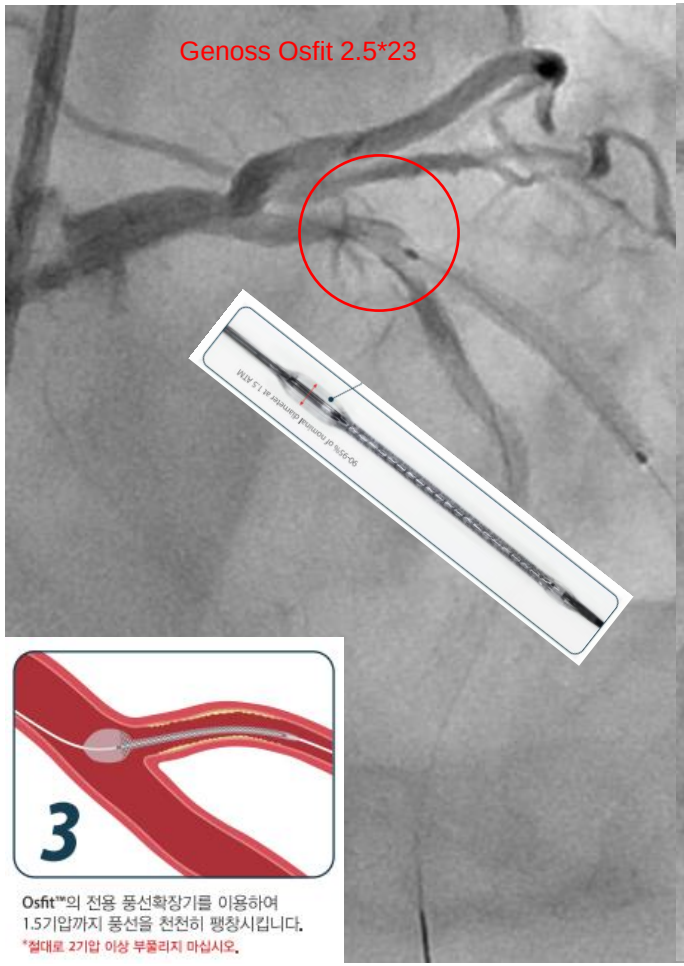
CASE

F/81, NSTEMI, DM

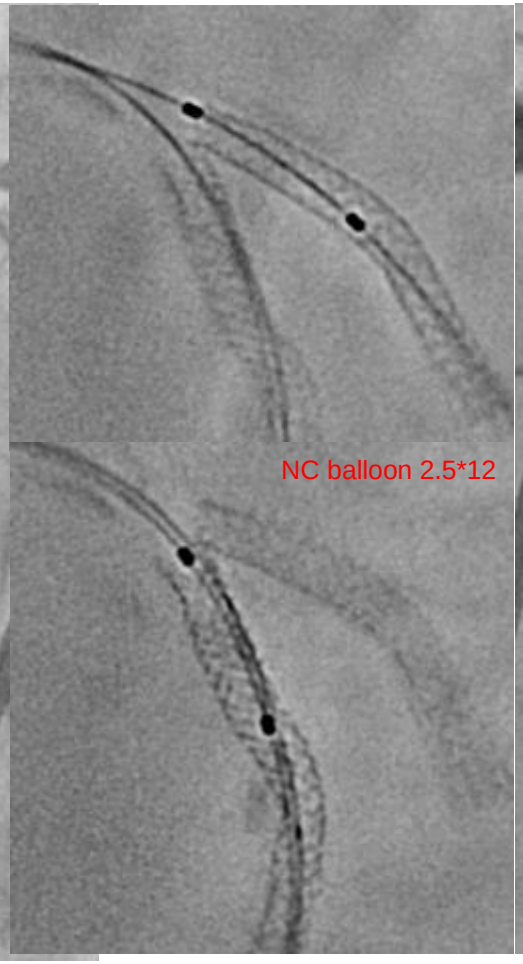


High risk of SB loss

CASE


Genoss Osfit 2.5*23
3
Osfit™의 전용 풍선확장기를 이용하여
1.5기압까지 풍선을 천천히 팽창시킵니다.
*절대로 2기압 이상 부풀리지 마십시오.


N


NC balloon 2.5*12


N

Conclusion

- ✓ 어떤 것이 의미 있는 Side branch일지 잘 판단하자.
- ✓ KISS(Keep It Simple and Safe) : Stepwise provisional approach가 기본 !!!
- ✓ 필요하다면 2 stent를 주저하지 말자. 단, 시작했으면 충분히 넓혀주자. (특히 MV)
- ✓ Imaging and physiology 를 적절히 활용하면 환자 예후를 좋게 하는데 도움이 된다.

Thank you for your attention.

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