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# Optimizing the LCx Ostium: Tips and Tricks

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# Disclosure Statement of Financial Interest

Within the past 12 months, I or my spouse/partner have had a financial interest/arrangement or affiliation with the organization(s) listed below.

## **Affiliation/Financial Relationship**

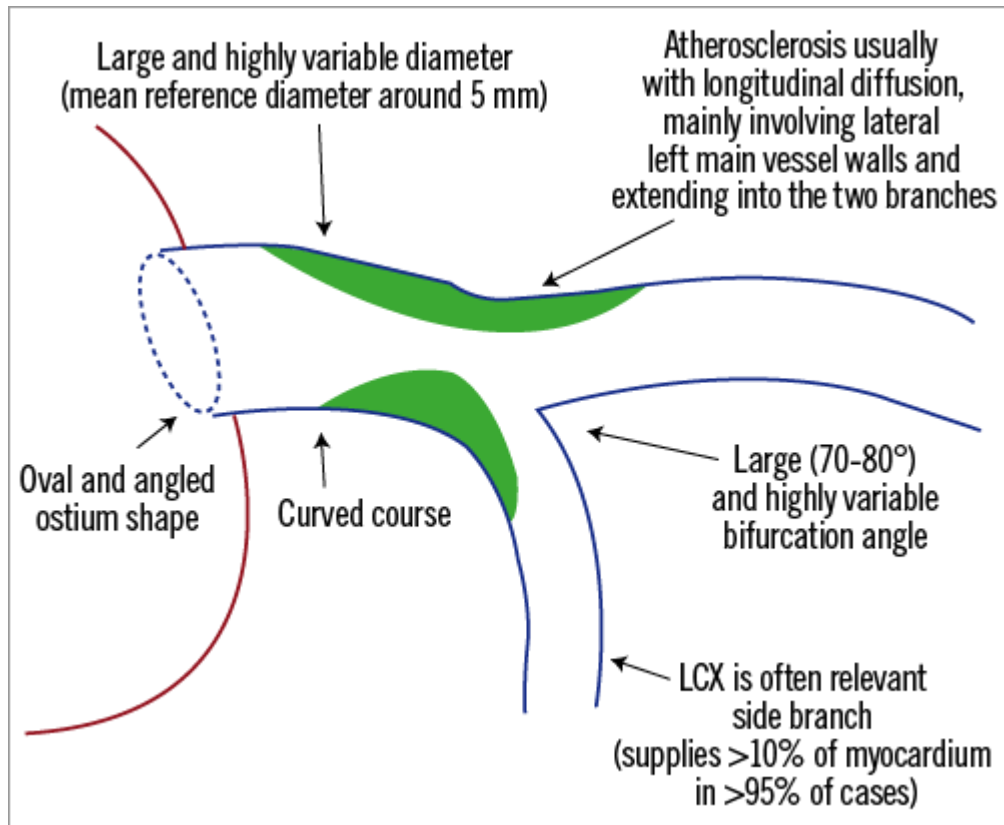
- Grant/Research Support
- Consulting Fees/Honoraria
- Stock shareholder:

## **Company**

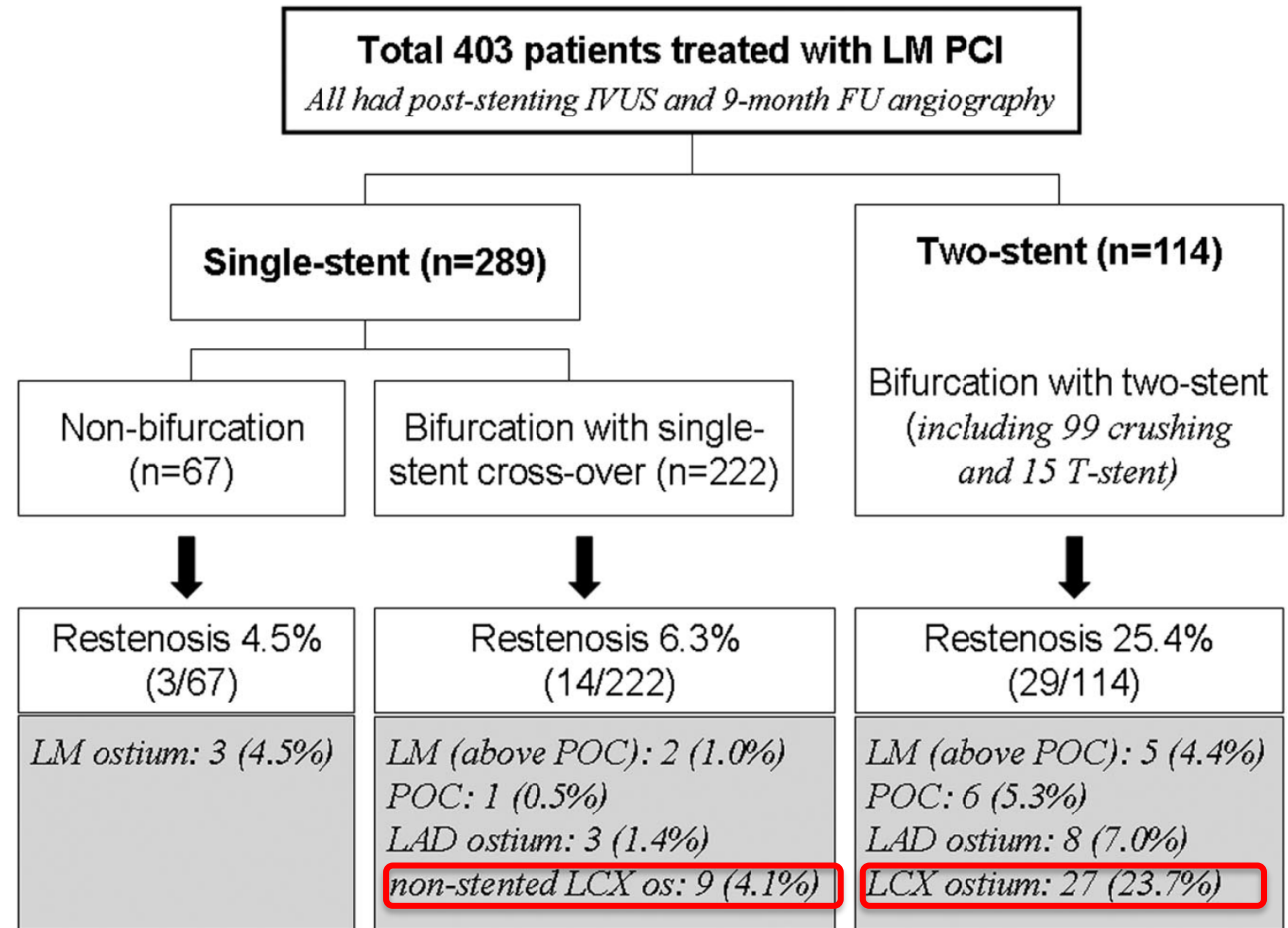
- Abbott Vascular, Boston Scientific, HeartFlow, Inc, MVRx
- Amgen, Abbott Laboratories, Astra-Zeneca, Bayer, Boehringer Ingelheim, GlaxoSmithKline, Berlin Chemie / Menarini, Merck, Pfizer, Roche, Sandoz, Sanofi, Servier Laboratories, Siemens laboratories, Abbott Vascular, Boston Scientific, Biotronik, Biosensors, Cordis,
- CERC

# Q: The weakest link in the left main stenting?

**A: LCX ostium**



**Incidence of angiographic restenosis**  
Data from the Asan Medical Center, Seoul, Korea

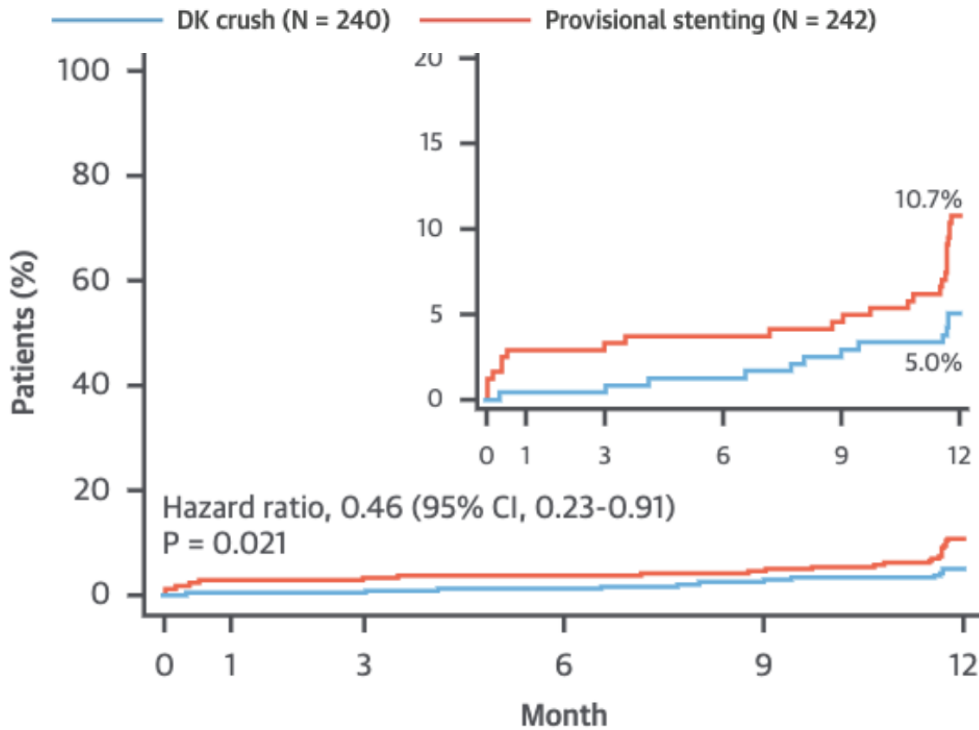


# DKCRUSH-V Randomized Trial

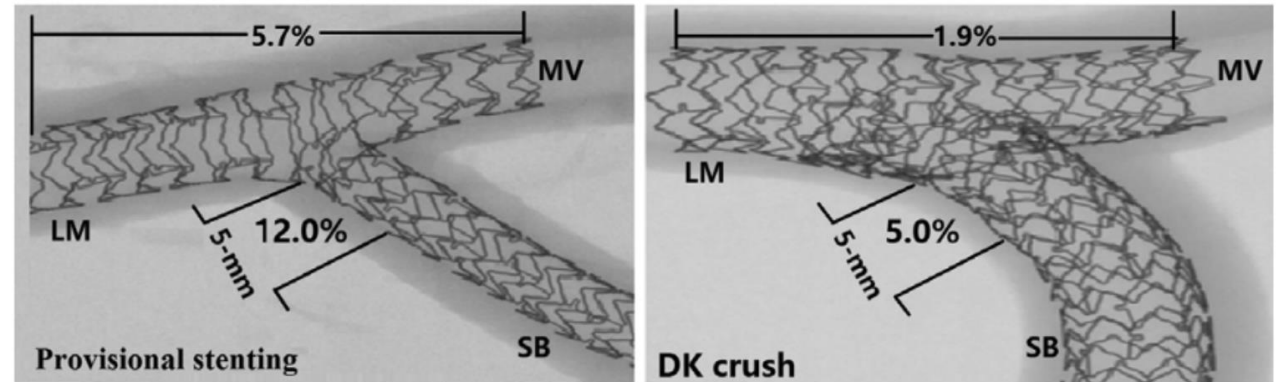
The primary endpoint was the 1-year composite rate of target lesion failure (TLF): cardiac death, target vessel MI, or clinically driven TLR

482 patients from 26 centers in 5 countries with true distal LM bifurcation lesions (Medina 1,1,1 or 0,1,1) randomized to provisional stenting (n = 242) or DK crush stenting (n = 240).

## Target Lesion Failure



## Distribution of ISR



The rates of in-stent restenosis (ISR) in the main vessel (MV) at 13-month angiographic follow-up were comparable with DK crush stent and provisional stenting (PS). The rate of ISR at the ostium of side branch (SB) was 12.0% with PS versus 5.0% with DK crush (p = 0.09). LM = left main.

## Treatment of coronary bifurcation lesions, part I: implanting the first stent in the provisional pathway. The 16<sup>th</sup> expert consensus document of the European Bifurcation Club

Remo Albiero<sup>1\*</sup>, MD; Francesco Burzotta<sup>2</sup>, MD, PhD; Jens Flensted Lassen<sup>3</sup>, MD, PhD; Thierry Lefèvre<sup>4</sup>, MD; Adrian P. Banning<sup>5</sup>, MD, PhD; Yiannis S. Chatzizisis<sup>6</sup>, MD, PhD; Thomas W. Johnson<sup>7</sup>, MD; Mirosław Ferenc<sup>8</sup>, MD, PhD; Manuel Pan<sup>9</sup>, MD, PhD; Olivier Darremont<sup>10</sup>, MD; David Hildick-Smith<sup>11</sup>, MD; Alaide Chieffo<sup>12</sup>, MD; Yves Louvard<sup>4</sup>, MD; Goran Stankovic<sup>13</sup>, MD

Albiero R, et al. EuroIntervention. 2022 Aug 5;18(5):e362-e376.

Lassen JF, et al. EuroIntervention. 2022 Aug 19;18(6):457-470.

## Treatment of coronary bifurcation lesions, part II: implanting two stents. The 16<sup>th</sup> expert consensus document of the European Bifurcation Club

Jens Flensted Lassen<sup>1\*</sup>, MD, PhD; Remo Albiero<sup>2</sup>, MD; Thomas W. Johnson<sup>3</sup>, MD; Francesco Burzotta<sup>4</sup>, MD, PhD; Thierry Lefèvre<sup>5</sup>, MD; Tinen L. Iles<sup>6</sup>, PhD; Manuel Pan<sup>7</sup>, MD, PhD; Adrian P. Banning<sup>8</sup>, MD, PhD; Yiannis S. Chatzizisis<sup>9</sup>, MD, PhD; Mirosław Ferenc<sup>10</sup>, MD, PhD; Vladimir Dzavik<sup>11</sup>, MD; Dejan Milasinovic<sup>12</sup>, MD; Olivier Darremont<sup>13</sup>, MD; David Hildick-Smith<sup>14</sup>, MD; Yves Louvard<sup>5</sup>, MD; Goran Stankovic<sup>12</sup>, MD, PhD

## 3-stage approach (ABC) to deployment of the first stent:

- **Stage A:** wiring of the MV and SB,
- **Stage B:** MV and SB preparation
- **Stage C:** stent implantation and optimisation.



# How to improve outcome in LCX ostium?

Success depends upon previous preparation, and without such preparation there is sure to be failure.

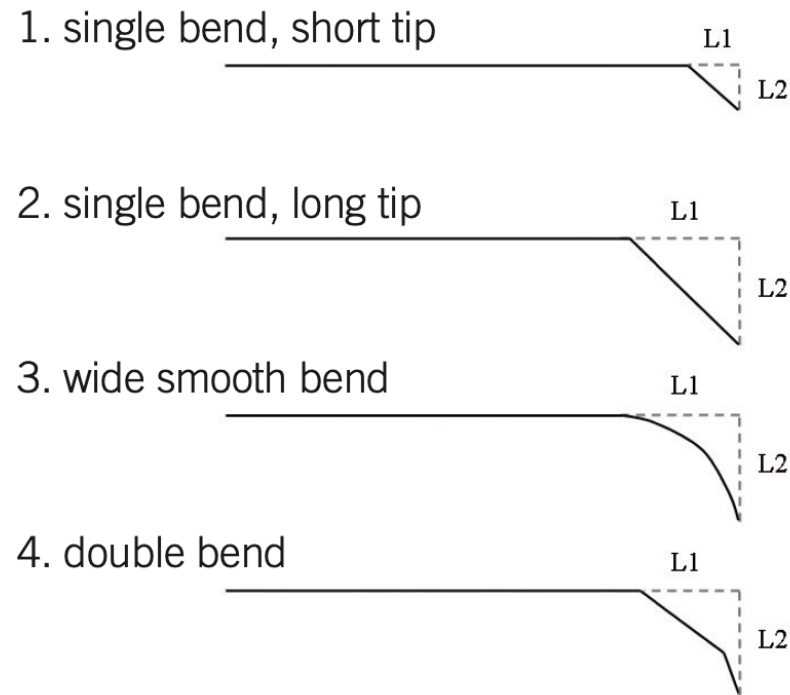
Internetpoem.com



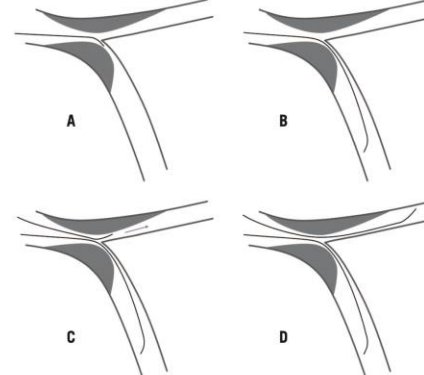
Confucius

# Stage A – MV and SB wiring

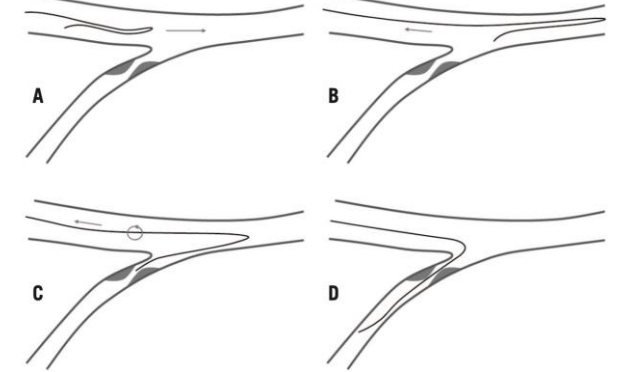
## *Guidewire selection, shaping and wiring techniques plus operator's experience and creativity*



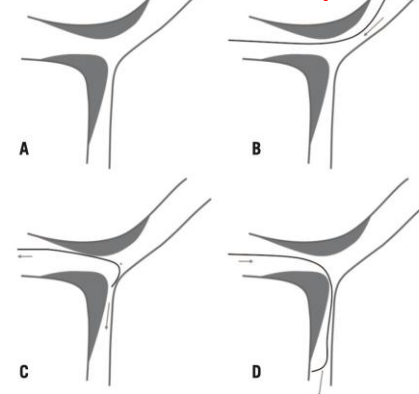
Standard technique



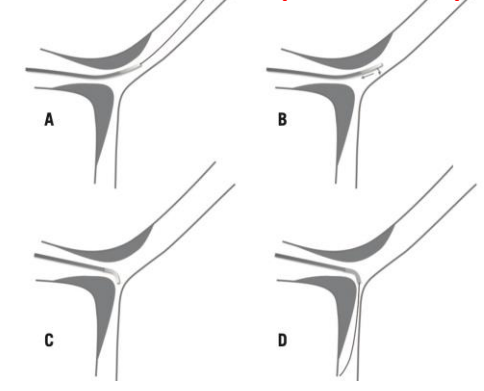
Reverse wire technique



Pullback technique



Deflectable-tip technique



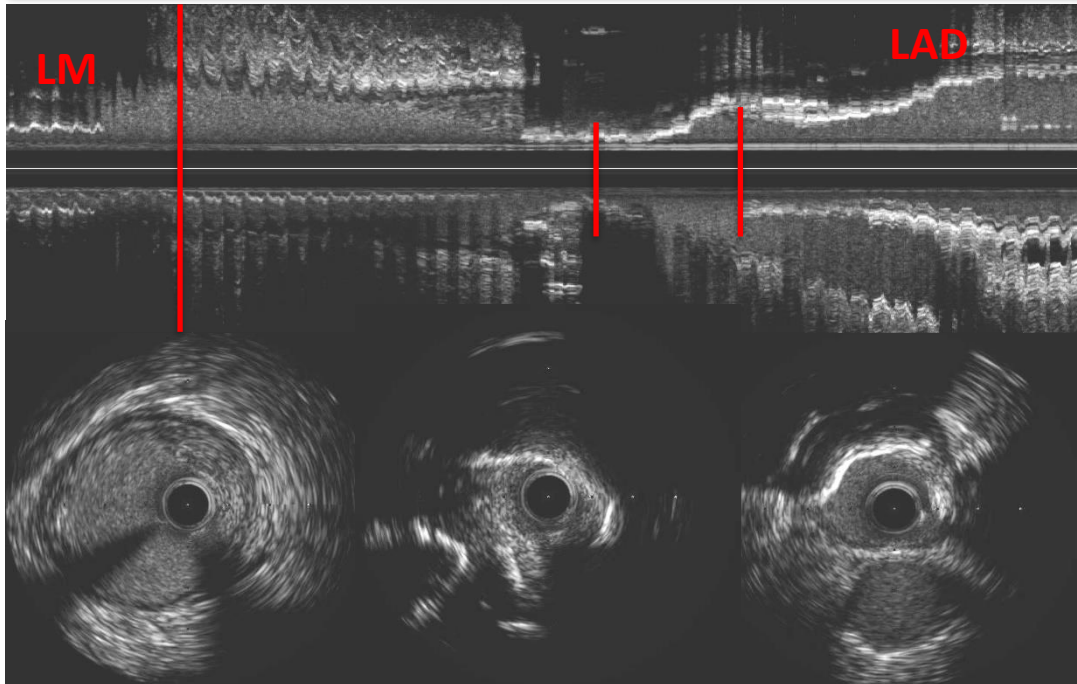
Microcatheter-facilitated technique

Balloon backstop technique and others

# Stage B – MV and SB preparation

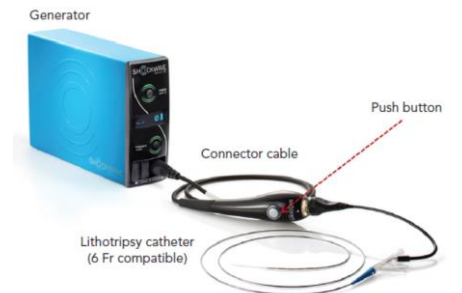
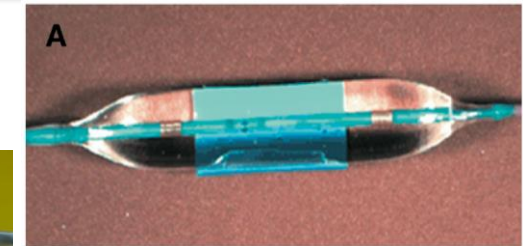
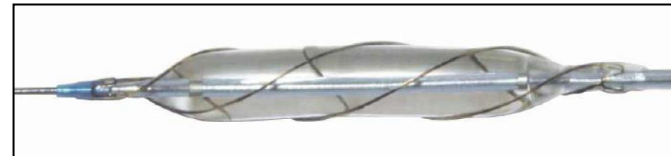
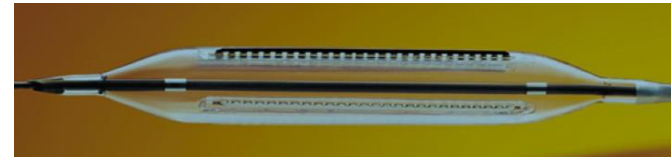
## Imaging:

- True lumen/vessel measurements, lesion length
- Plaque burden, morphology and distribution
- Bifurcation angle



## Guidance:

- Plaque modification?
- Balloon/stent sizing

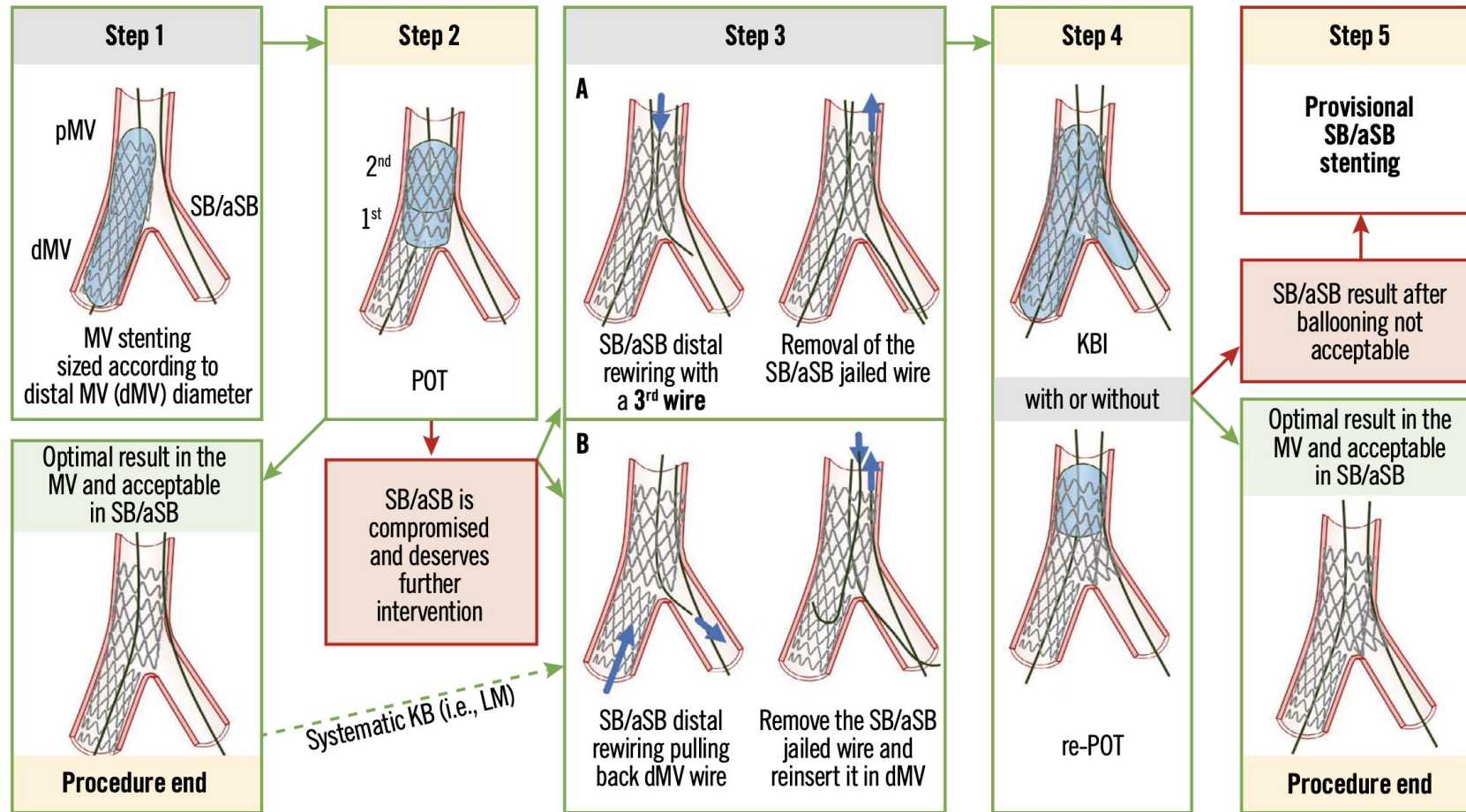


**Mandatory preparation of LCX:**

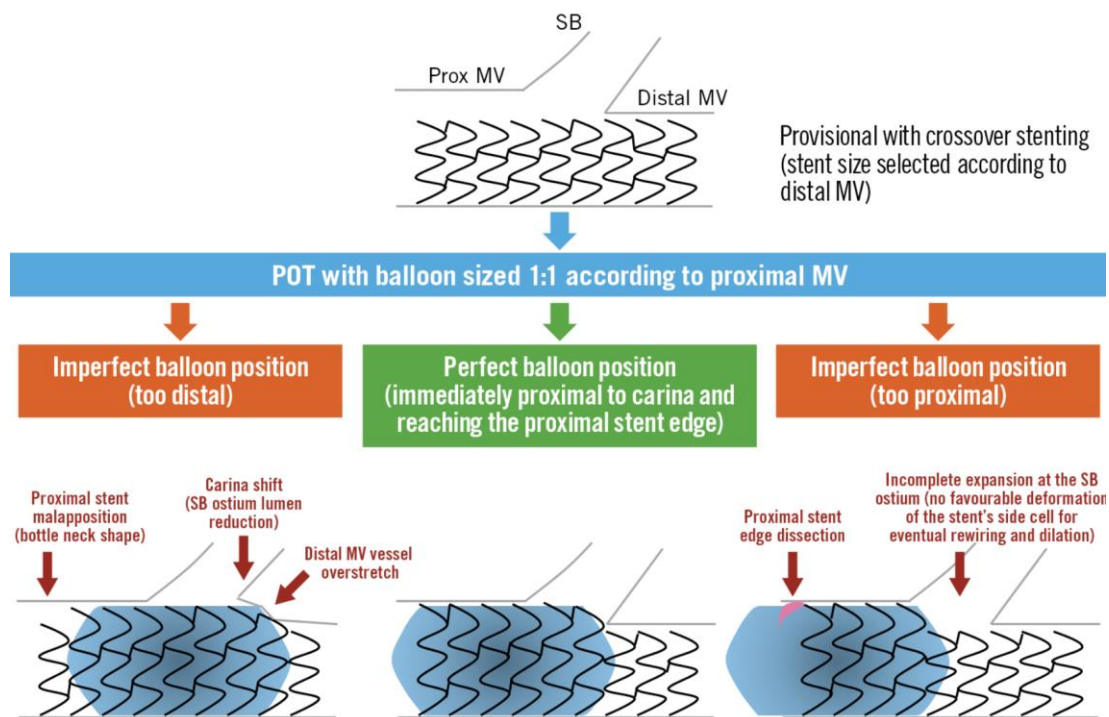
Severe stenosis, calcified, angulated lesion



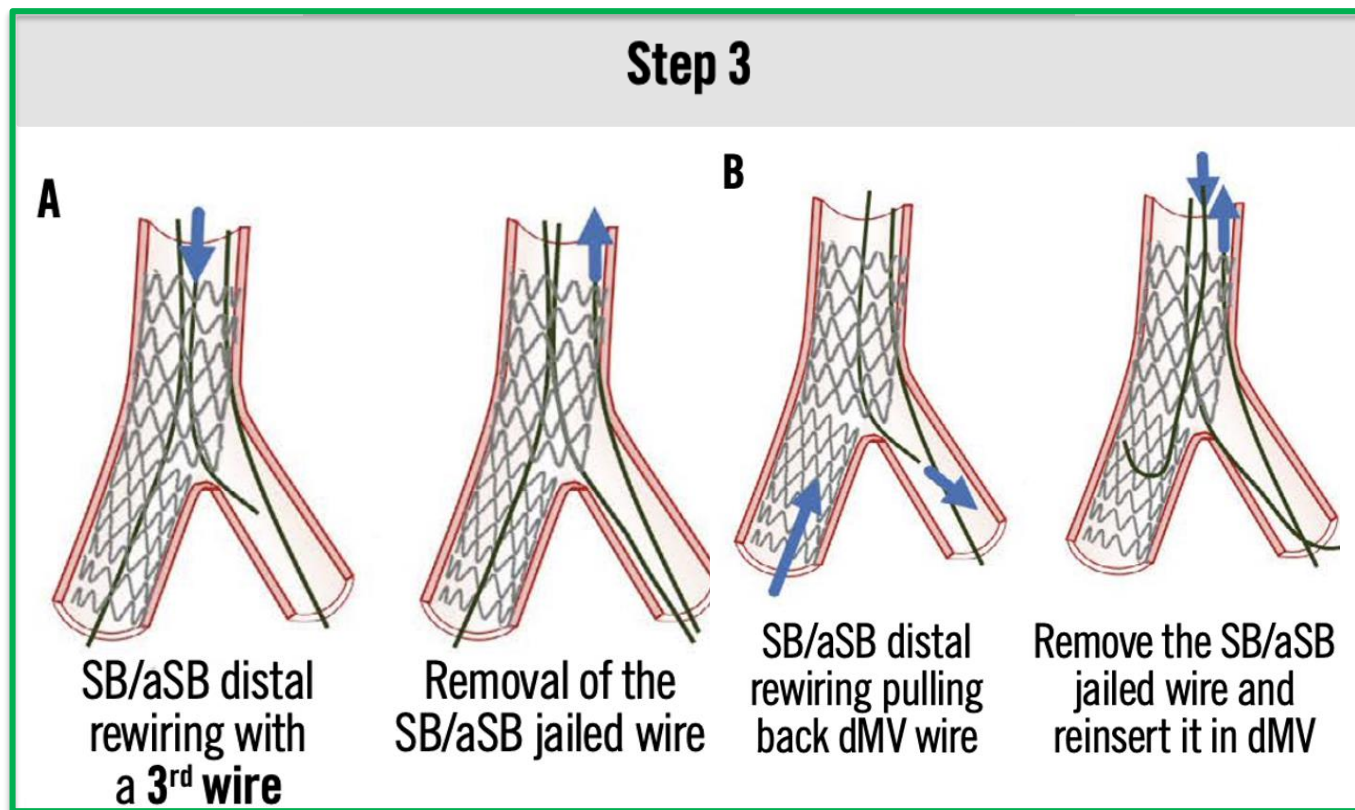
# Stage C – Stent implantation and optimisation (PS strategy)



# POT



# Rewiring

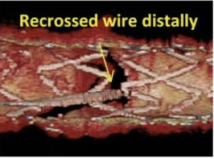
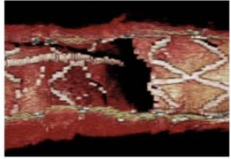
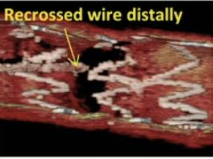
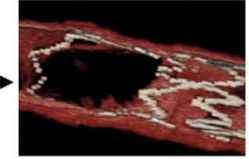
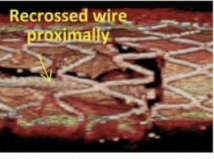



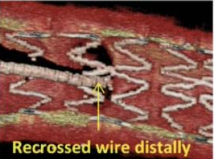
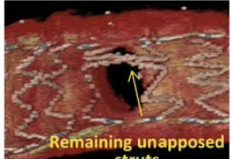
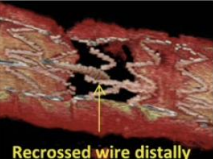
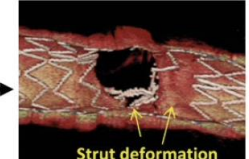
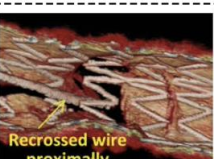
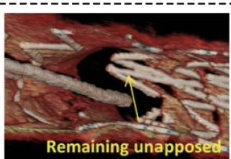
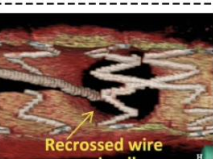
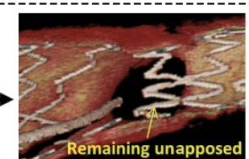


# Impact of guidewire recrossing point into stent jailed side branch

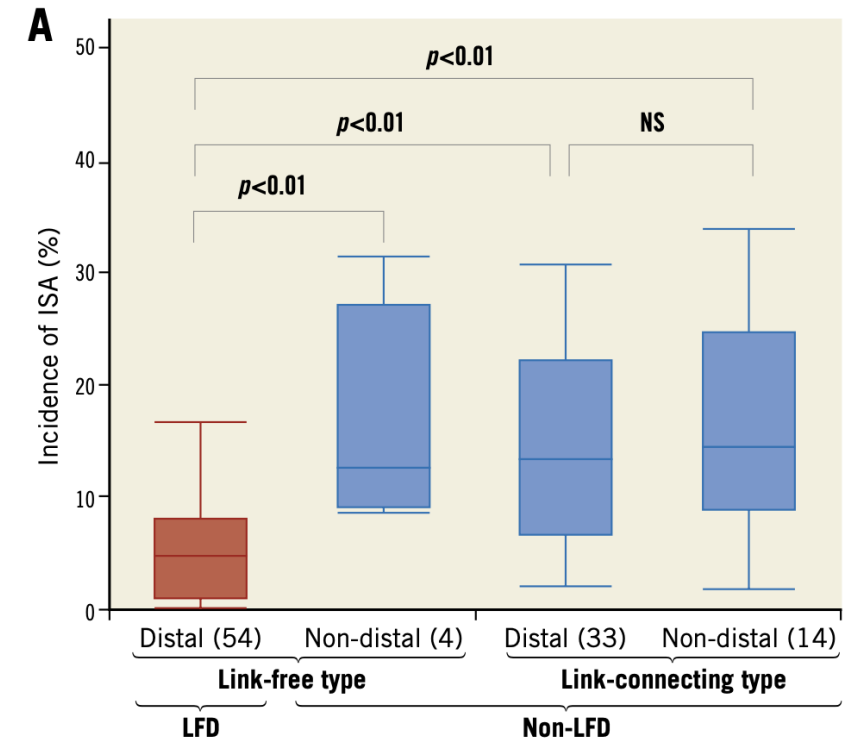
N=105, off-line 3D-OCT at the corelab

Link-free type: no stent link at the carina

Link-connecting type: a stent link connecting to the carina

Jailing configuration	Recross position	Parallel type		Perpendicular type		Group
		Guidewire recrossing	After kissing ballooning	Guidewire recrossing	After kissing ballooning	
"Link-free type" No link at carina	Distal					LFD
	Proximal					
"Link-connecting type" Presence of link at carina	Distal					Non-LFD
	Proximal					

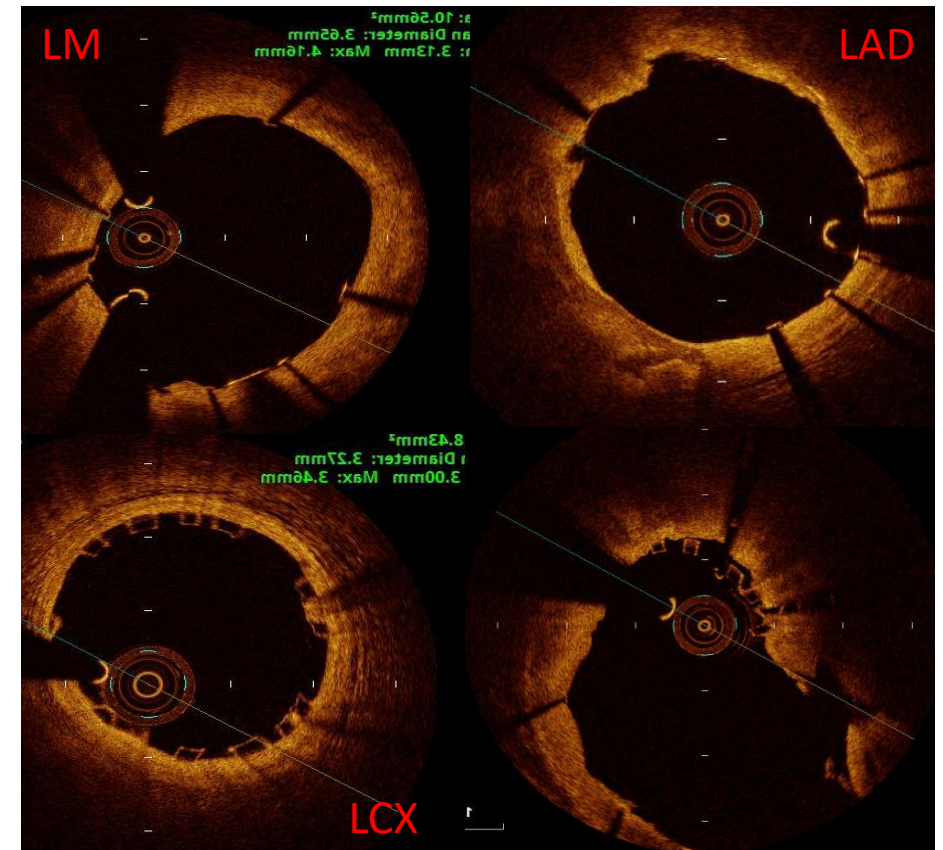
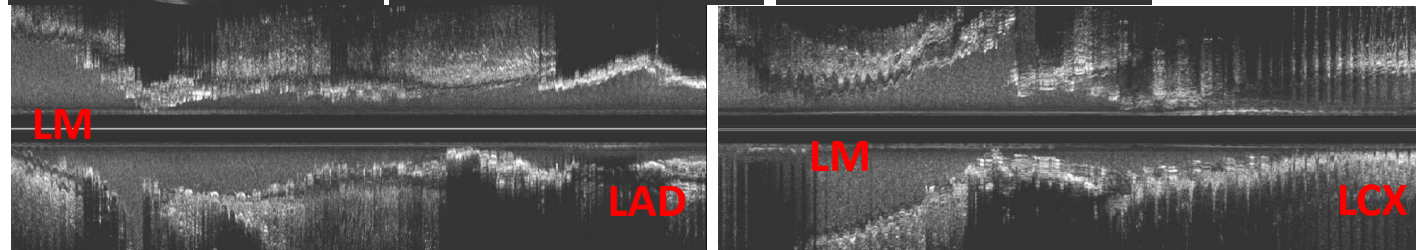
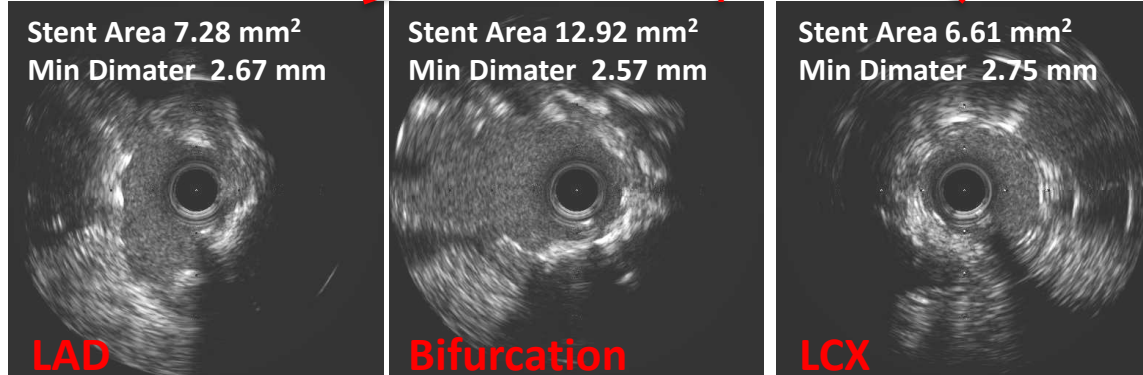
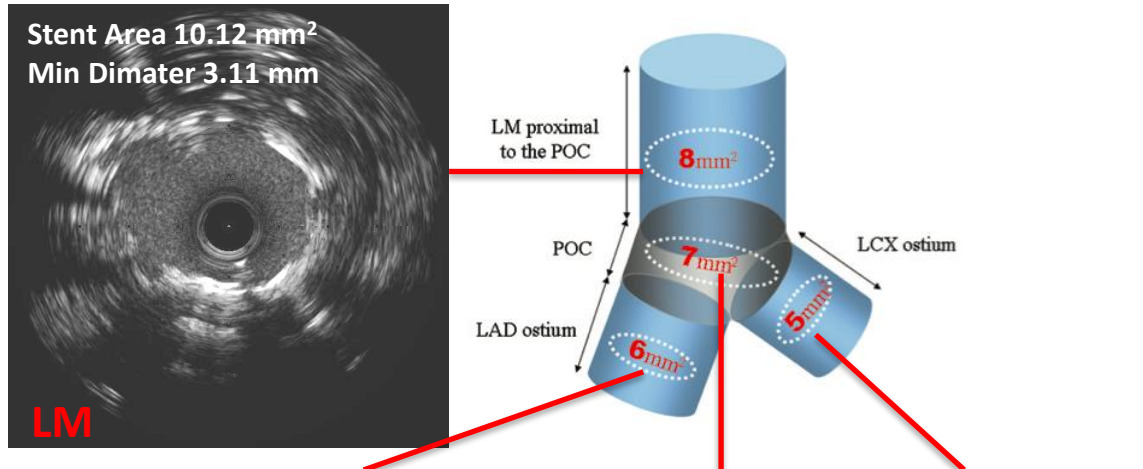
Incidence of incomplete stent apposition in LCX ostium





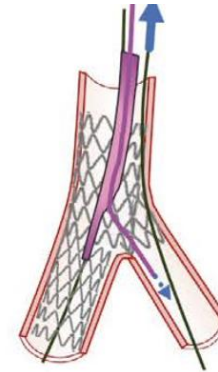
# Stage C – Stent implantation and optimisation

Postintervention imaging and postdilatation if needed



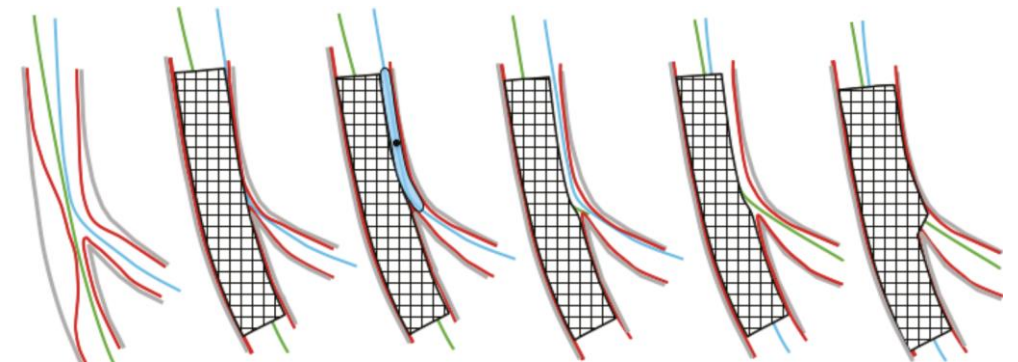
# Pitfalls and troubleshooting: LCX occlusion

- POT before SB rewiring attempt;
- Rewiring with a 3rd wire preferably assisted by a dual lumen microcatheter or another single lumen angulated or with deflectable tip microcatheter;
- Dedicated CTO wires
- Low-profile balloon on the jail wire and dilate the SB (rescue balloon jailing technique)
- If a low-profile balloon cannot cross, try to pass a Corsair Pro (Asahi Intecc) microcatheter and, if successful, retry the low-profile balloon



Intraluminal rewiring of the SB/aSB (assisted by a dual lumen microcatheter)

Rescue balloon jailing technique





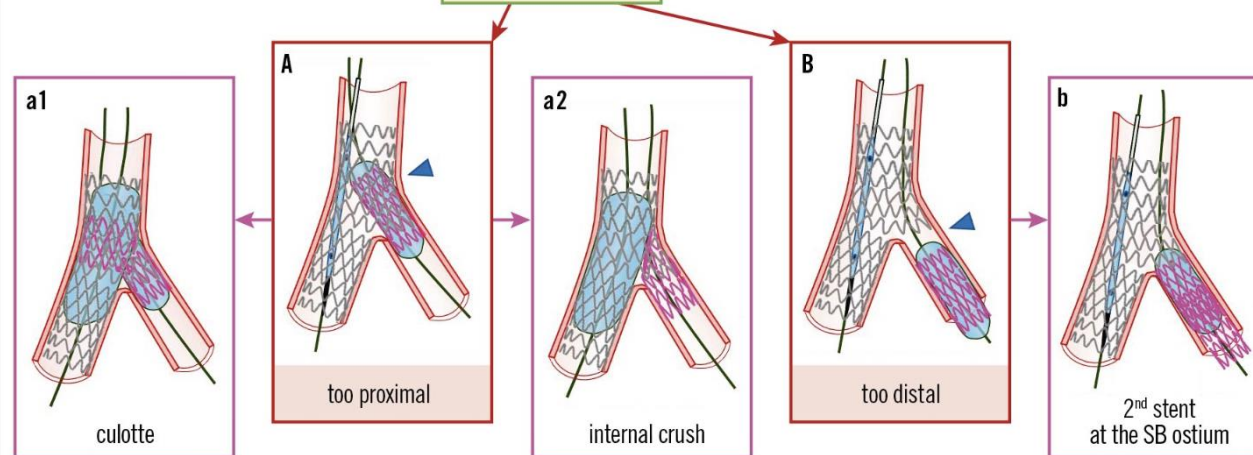
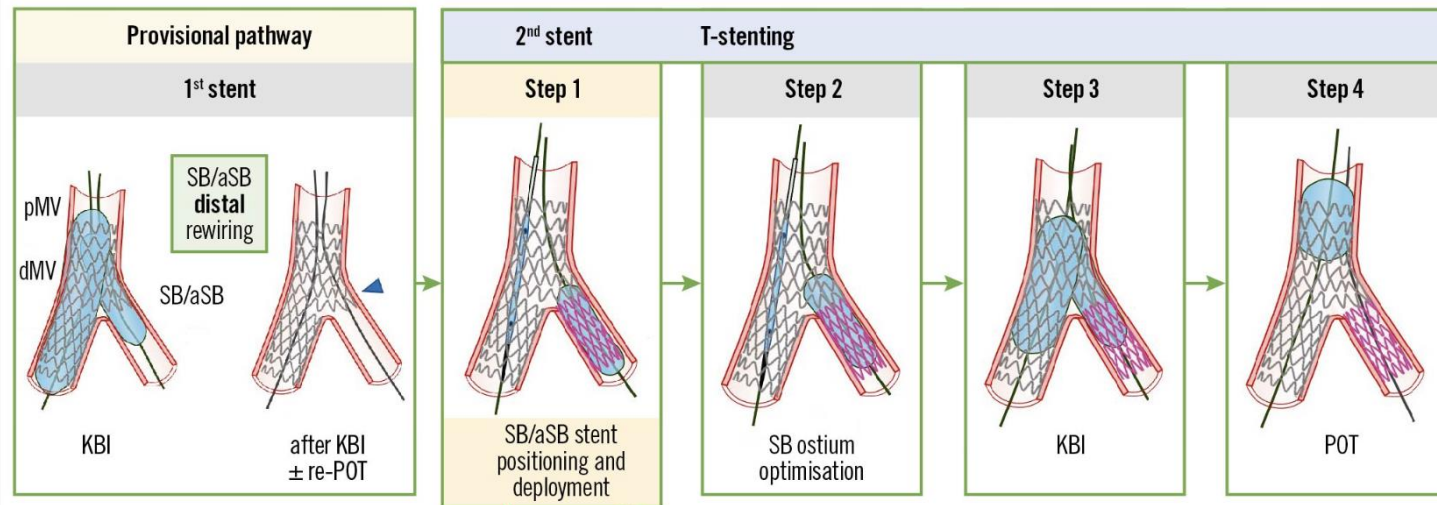
# Pitfalls and troubleshooting: Difficulty removing the jailed wire

Entrapped guidewire: advance a balloon (inflate if needed) or microcatheter over it as far distally as possible before retracting it

Fracture of the jailed wire:

- Solutions: from simply leaving the segment of wire in place to surgery for removal, but first trying to remove the wire percutaneously using: a snare loop to remove a distal fractured wire especially if it is floating in the aorta or the tangling technique with the help of 2-3 workhorse wires acting as rescue wires.
- Prevention:
  - Polymer-coated wires seemed to be more resistant to retrieval damage than non-polymer-coated wires
  - Optimal plaque modification with NC balloon dilatation, cutting/ scoring balloons or rotational/ orbital atherectomy in calcified lesions
  - Short length of the jailed wire
  - Lower pressures during the MV stent deployment in calcific bifurcations
  - Avoid jailing the wire in multiple overlapping stents
  - Avoid oversized stent and/or high-pressure post-dilatation after stenting

# Stage C – Stent implantation and optimisation (two-stent strategy, bail-out or upfront)

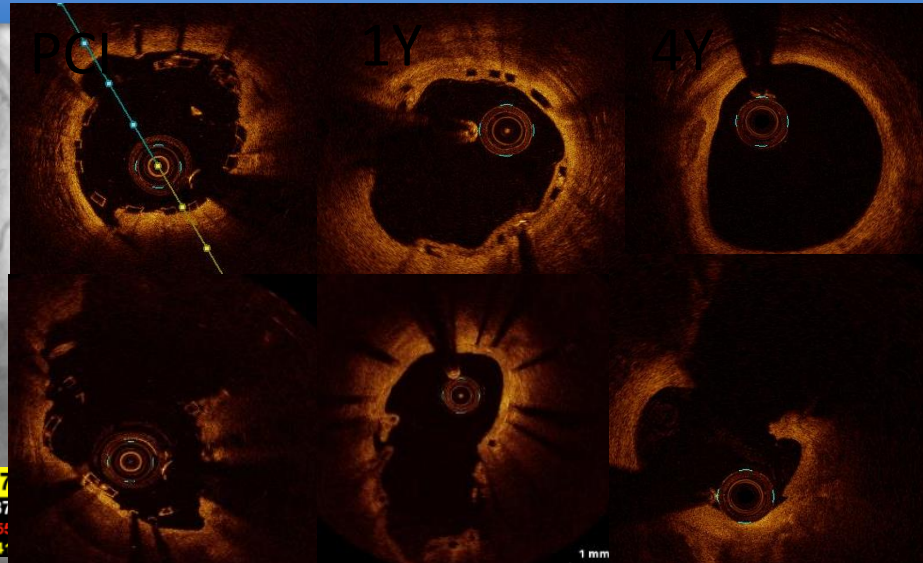


In the presence of significant SB flow limitation or poor angiographic results in an SB supplying a significant myocardial territory, subsequent SB stenting can be performed (T, T and protrusion [TAP] or culotte), with systematic final kissing balloon inflation (KBI) and a finalising POT

# New personalized treatment for the LM lesions (Synergy DES + BVS)

- Pilot study (2012-2015) Pilot, prospective, consecutive, one center registry analyzing feasibility of IVUS-guided and OCT-optimized two stent technique (Mini-crush or T-stent strategy) using everolimus-eluting platinum chromium coronary stent with bioabsorbable polymer coating (Synergy) in LM/LAD and bioresorbable vascular scaffold (Abbsorb) in Cx for the treatment of distal ULMCA true bifurcation stenosis
- Pilot II (2021, ongoing) IVUS-guided and OCT-optimized two stent technique using: DES in LM/LAD and resorbable magnesium scaffold (Magmaris) in Cx for the treatment of distal ULMCA true bifurcation stenosis

5-year cardiovascular mortality in Pilot study = 0%



Cumulative events at 4 years	All patients (n=46)
Death, n (%)	0 (0.0)
Cardiovascular death, n (%)	0 (0.0)
Myocardial infarction, n (%)	1 (2.2)
Stroke, n (%)	0 (0.0)
TLR, n (%)	9 (19.6)
LM-LAD DES restenosis	1 (2.2)
LCX BVS restenosis	7 (15.2)
LCX BVS stent thrombosis	1 (2.2)
Stent thrombosis	1 (2.2)
MACE (death, myocardial infarction, stroke, TLR)	9 (19.6)

# Predictors of MACE at 4 years

MACE (death, myocardial infarction, stroke, TLR)

Variable	MACE +	MACE -	Hazard ratio (95% CI)	p value
<b>Total cholesterol</b>	<b>4.8 ± 1.2</b>	<b>3.9 ± 0.8</b>	<b>2.839 (1.169-6.897)</b>	<b>0.021</b>
<b>Low density lipoprotein</b>	<b>3.0 ± 1.0</b>	<b>2.1 ± 0.7</b>	<b>3.918 (1.396-10.996)</b>	<b>0.009</b>
<b>Side branch plaque modification with cutting balloon</b>	<b>4 (44.4%)</b>	<b>32 (86.5%)</b>	<b>0.125 (0.025-0.630)</b>	<b>0.012</b>
<b>Absorb scaffold diameter ≤ 2.5 mm at the LCX ostium</b>	<b>4 (44.4%)</b>	<b>5 (13.5%)</b>	<b>5.120 (1.016-25.813)</b>	<b>0.048</b>
<b>No post intervention IVUS MB</b>	<b>4 (44.4%)</b>	<b>2 (5.4%)</b>	<b>14.000 (2.014-97.311)</b>	<b>0.008</b>
<b>No post intervention IVUS SB</b>	<b>4 (44.4%)</b>	<b>2 (5.4%)</b>	<b>14.000 (2.014-97.311)</b>	<b>0.009</b>

## **MACE was not predicted by:**

Clinical: Age, Gender, Hypertension, Dyslipidemia, Diabetes, Smoking, Family history, Prior MI, Prior PCI, HF, PAD, EF

Angiographic: Syntax score

Procedural: Pre-IVUS, Pre-OCT, CB in the MB, CB MB diameter, CB SB diameter, Stenting technique, LM DES diameter, Absorb diameter, LM DES length (p=0.068), Absorb length, FKPD, Post-OCT

Univariate logistic regression was used to determine the predictors of MACE.