



How to Perform Optimal Provisional Stenting in Non-Left Main Bifurcation

I. Sheiban

*Director Interventional Cardiology
Pederzoli Hospital
Pescheria del Grada (Verona)/ Italy*

e-mail: isheiban@gmail.com

BL Intervention is a challenging procedure



BL-PCI : Keys of success

- **Appropriate indication**
- **Keep as simple as possible**
- **Plan you procedure according to complexity of BL**
- **Stepwise approach**
- **Intravascular guidance is highly recommended**
- **Lesion preparation – Stenting – Optimization**

Guidelines for the treatments of Bifurcation Lesion :

Provisional stenting should be the preferred approach for most bifurcation lesions

Exceptions to this rule, where upfront side branch stenting may be preferable:




- ✓ *large SB (≥ 2.75 mm in diameter)*
- ✓ *with a long ostial SB lesion (>5 mm or > 10mm ?)*
- ✓ *anticipated difficulty in accessing an important SB after MV stenting*
- ✓ *and **true** distal LM bifurcations*

2018 ESC/EACTS Guidelines on myocardial revascularization

How important of bifurcation types?

Calculating the SYNTAX score:

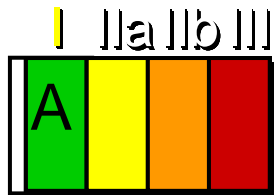
The presence of a bifurcation lesion adds additional points based on the type of bifurcation according to the Medina classification:

- ✓ Medina 1,0,0–0,1,0–1,1,0  +1
- ✓ Medina **1,1,1**–0,0,1–1,0,1–**0,1,1**  +2
- ✓ Bifurcation angle <70°  one additional point

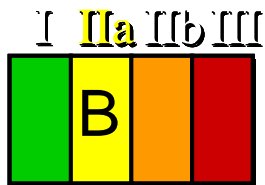
True bifurcation and bifurcation angle may correlate with clinical outcome

2018 ESC/EACTS Guidelines on myocardial revascularization

2011 ACC/AHA/SCAI Guidelines Provisional vs Elective SB stenting



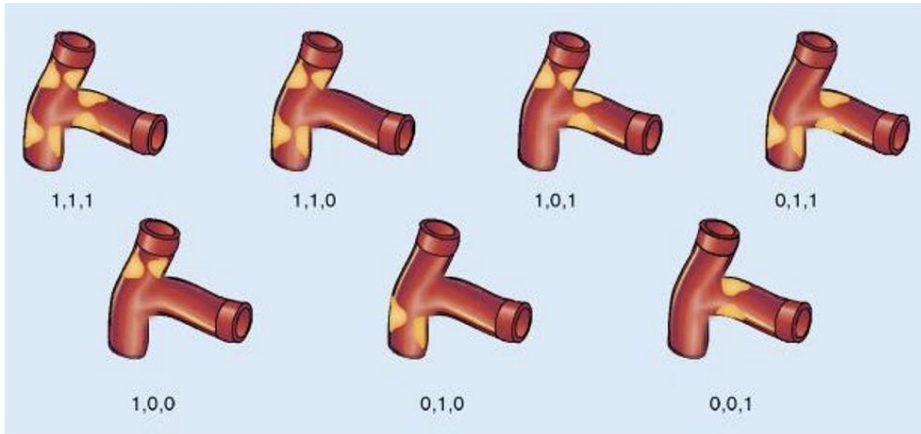
Provisional side-branch stenting should be the initial approach in patients with bifurcation lesions when the side branch is not large and has only mild or moderate foal disease at the ostium



It is reasonable to use elective double stenting in patients with **complex bifurcation morphology** involving a large side branch where the risk of side-branch occlusion is high and the likelihood of successful side branch re access is low

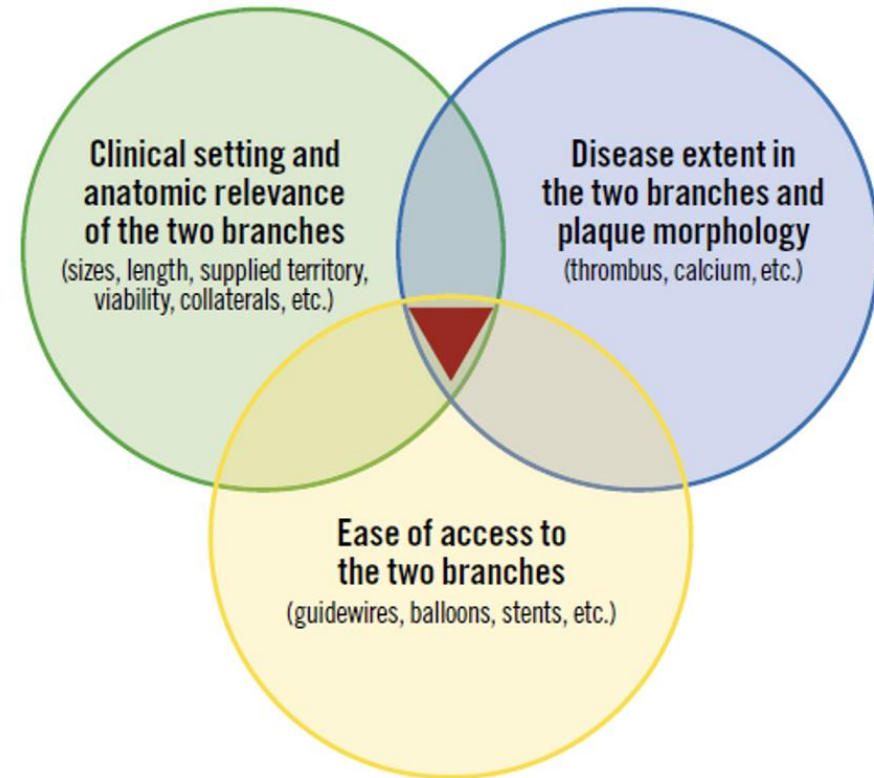
What is Complex Bifurcation Leion ?

The EBC promotes a simple description of bifurcation lesions and recommends routine use of the Medina classification in clinical practice.



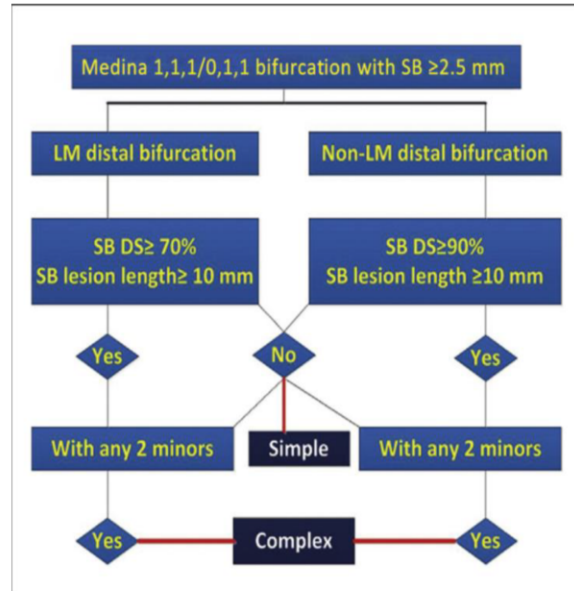
- To describe the type of BL accordingly to MV and SB involvement: it is an excellent classification
- To define the strategy of BL Treatment? Medina classification does not provide the essential elements for Strategy selection (*SB lesion severity and length, SB size and lesion length, SB angle, calcification, tortuosity, thrombus*)

Main determinants of bifurcation PCI complexity



Definition Criteria for Simple and Complex Bifurcation

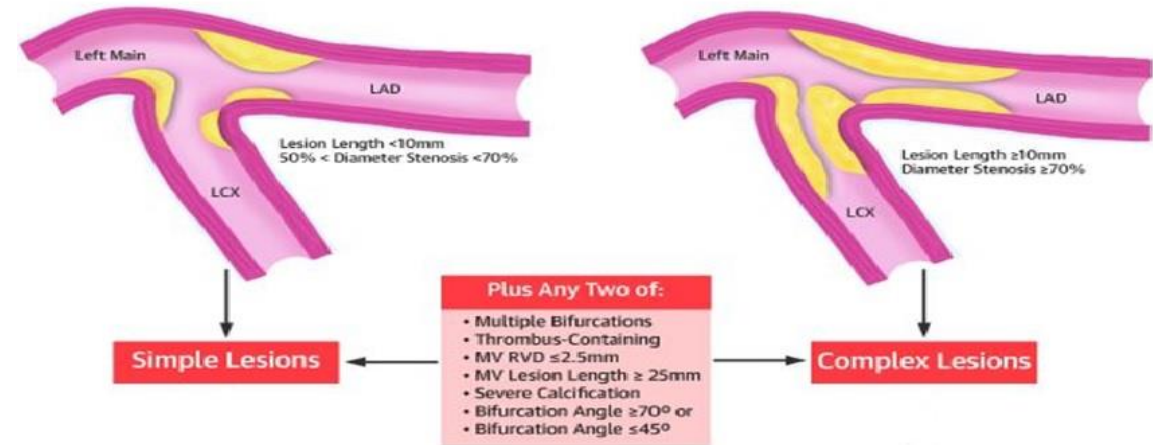
Proposed Definition of Complex Bifurcation



DEFINITION Study

- **Proposed criteria for complex bifurcation**
- **Complex bifurcations represent 30% of bifurcations disease (from population of 3,660)**

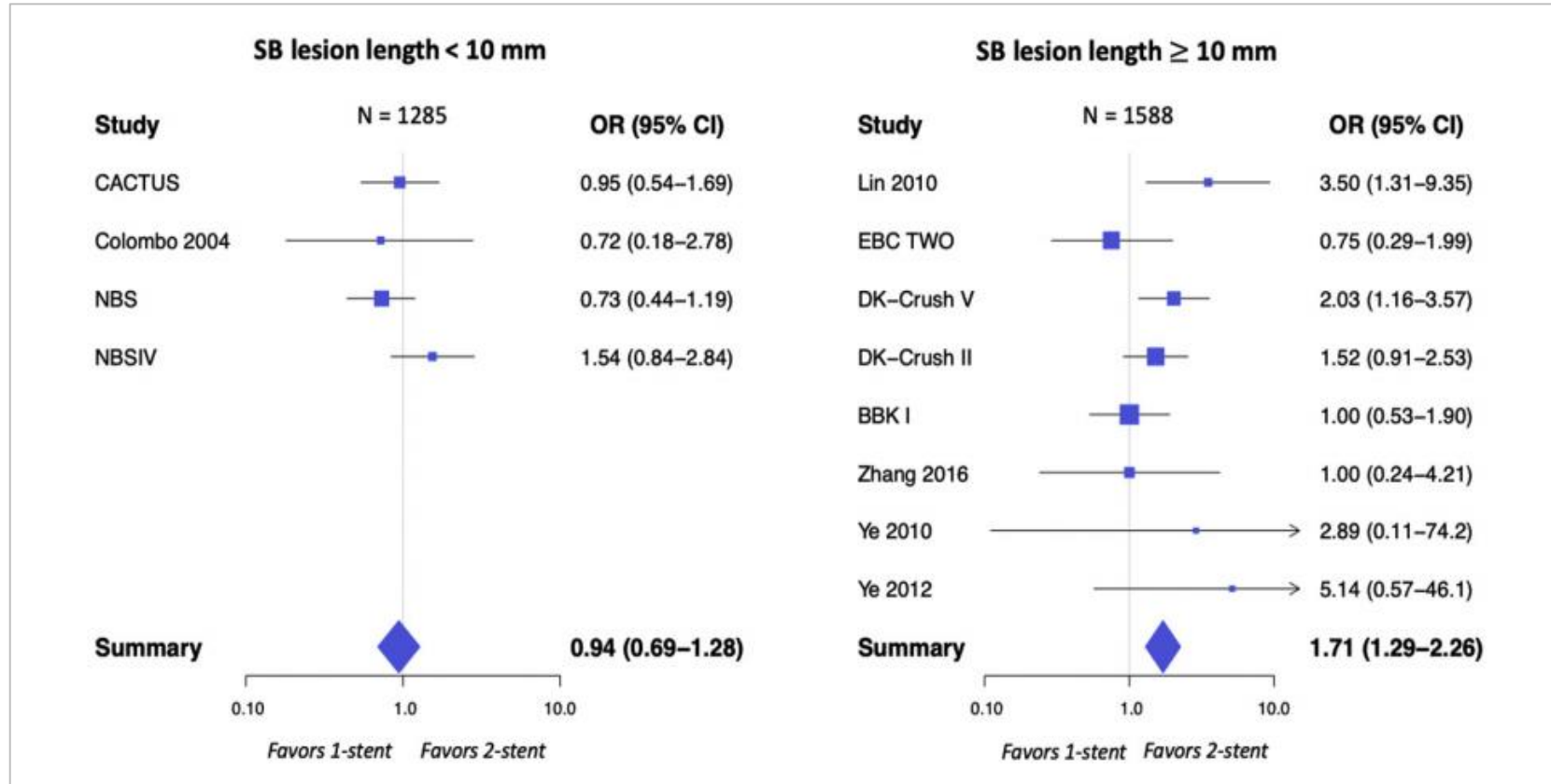
- Minor 1 Moderate to severe calcification
- Minor 2 Multiple lesions
- Minor 3 Bifurcation angle $<45^\circ$ or $>70^\circ$
- Minor 4 Main vessel RVD <2.5 mm
- Minor 5 Thrombus-containing lesions
- Minor 6 MV lesion length ≥ 25 mm



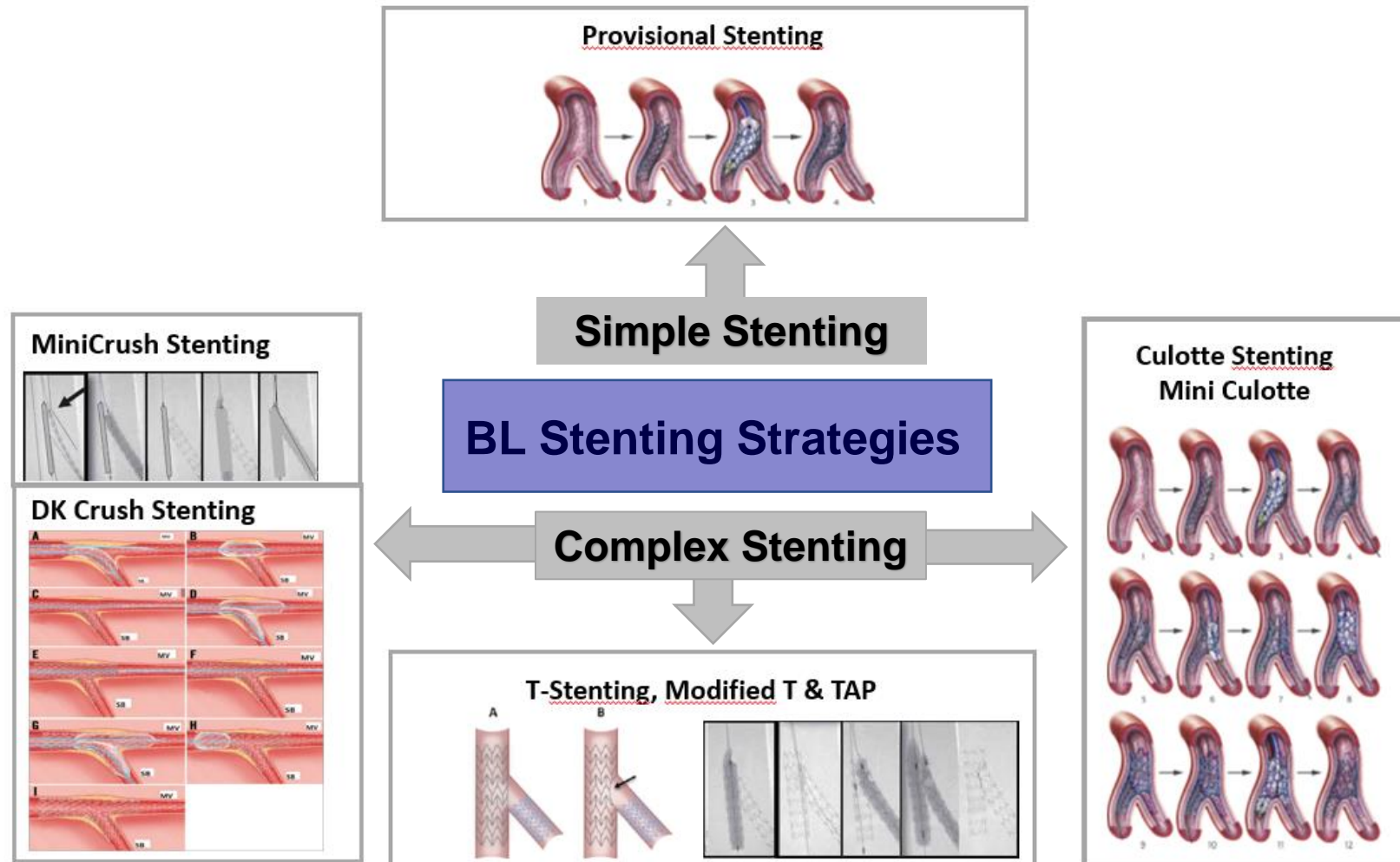
Clinical Outcomes Following Coronary Bifurcation PCI Techniques



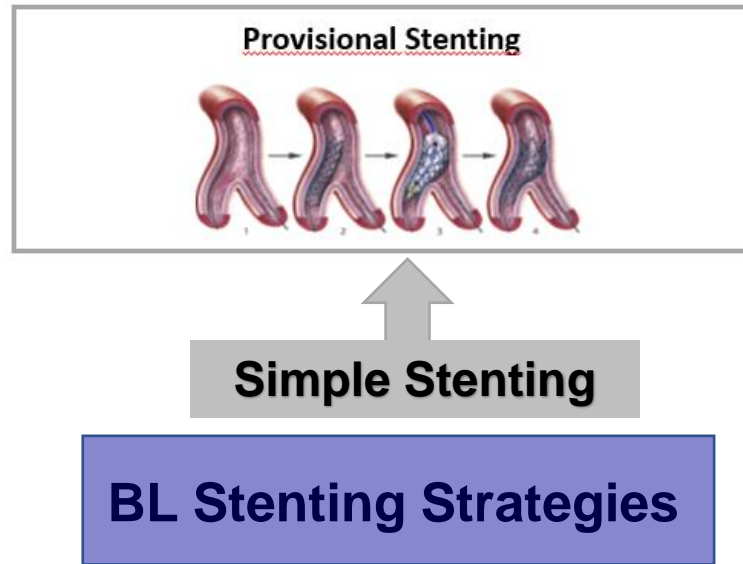
A Systematic Review and Network Meta-Analysis Comprising 5,711 Patients



Bifurcation Stenting Strategies Mostly Used in Daily Clinical Practice



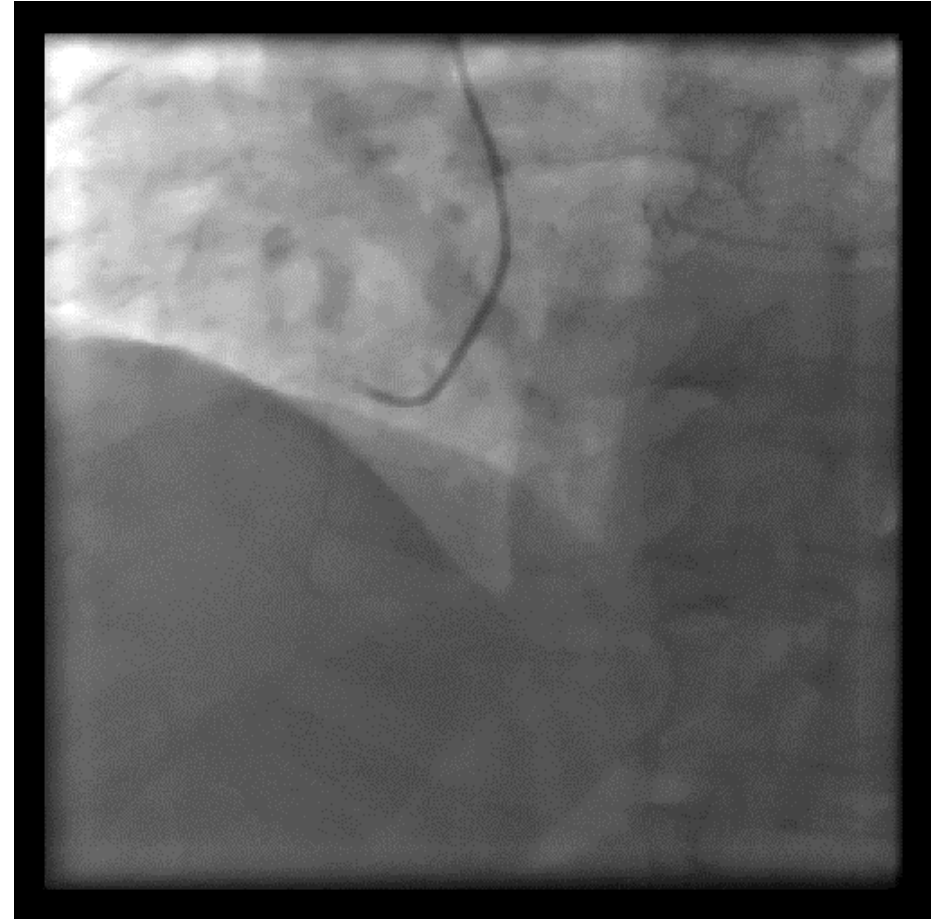
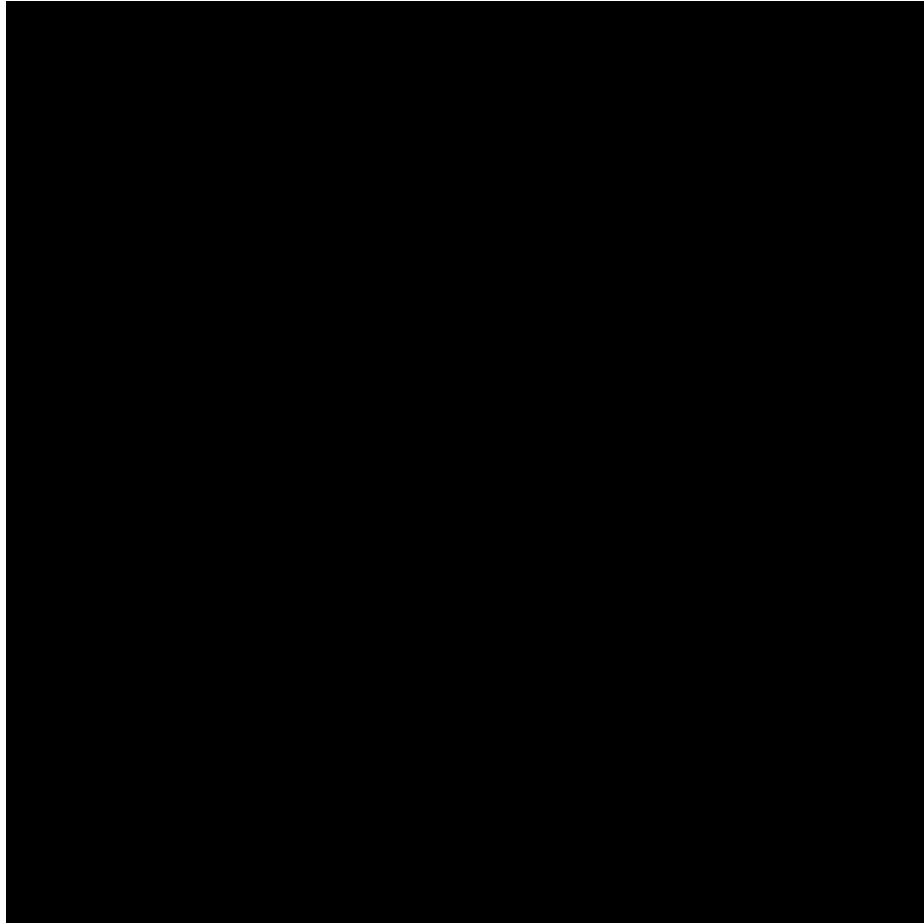
Bifurcation Stenting Strategies Mostly Used in Daily Clinical Practice



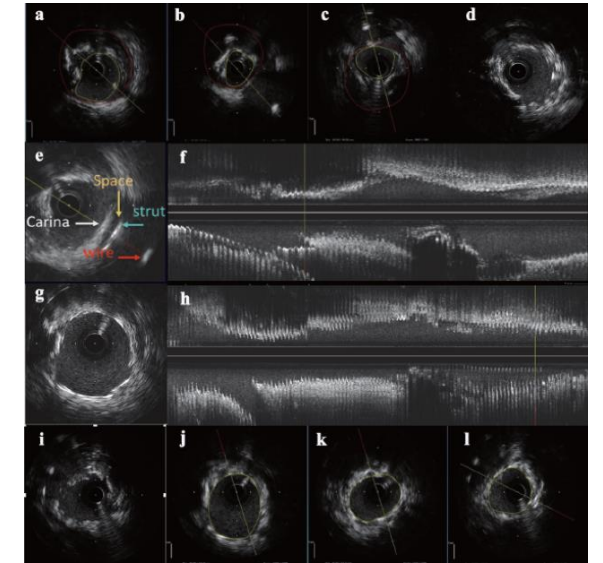
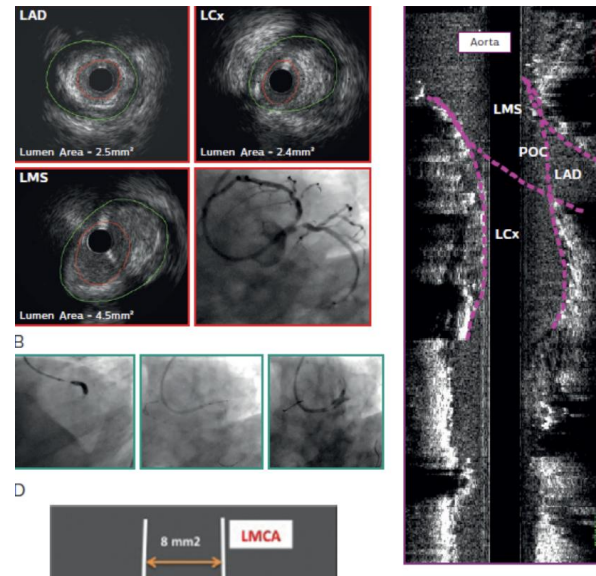
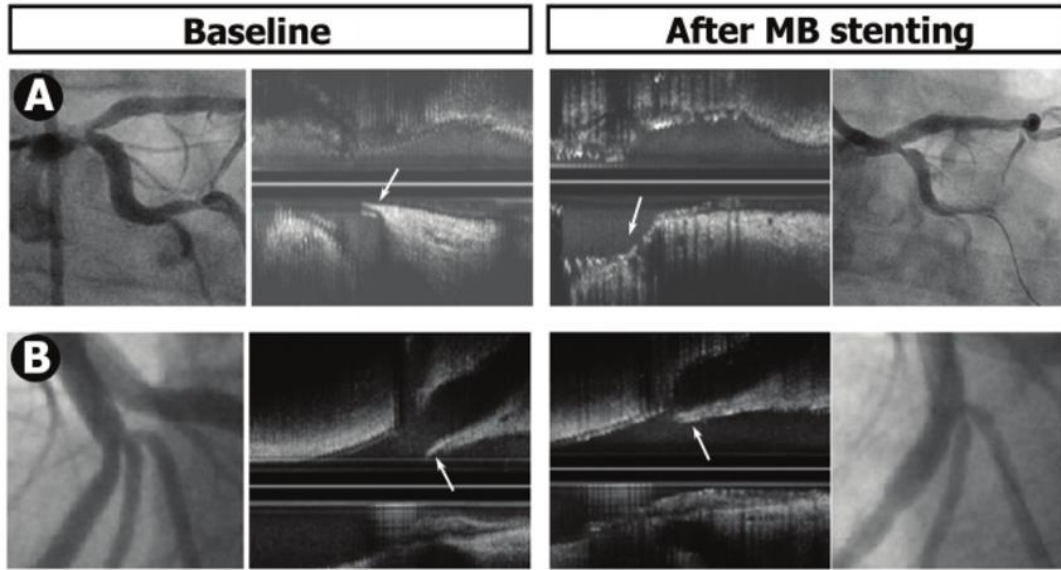
LA , 65 yrs Male

Unstable angina

**LAD – I Diag Bifurcation Lesion
Medina 1,,1,1**



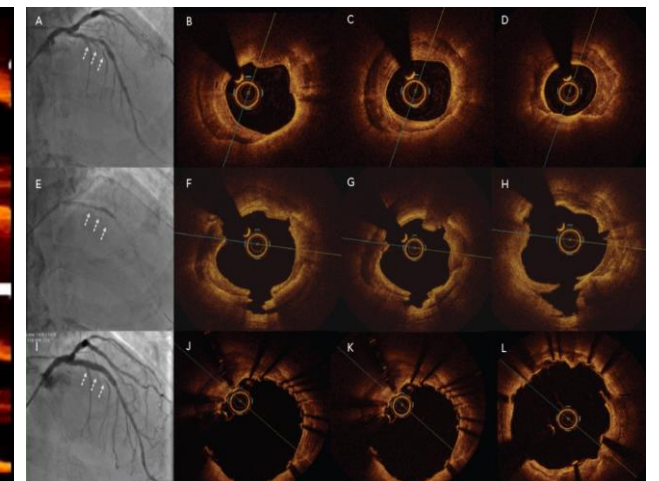
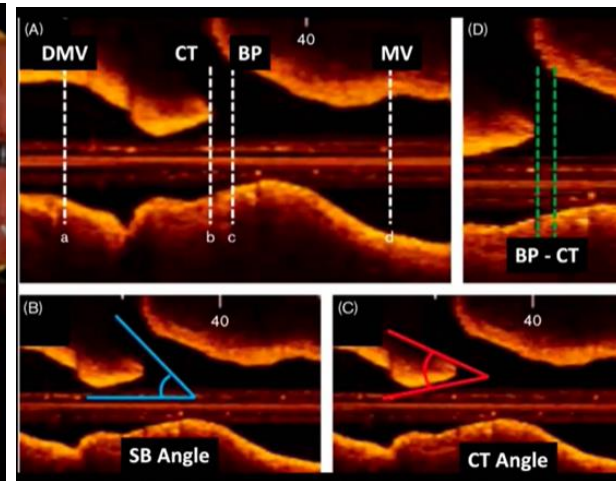
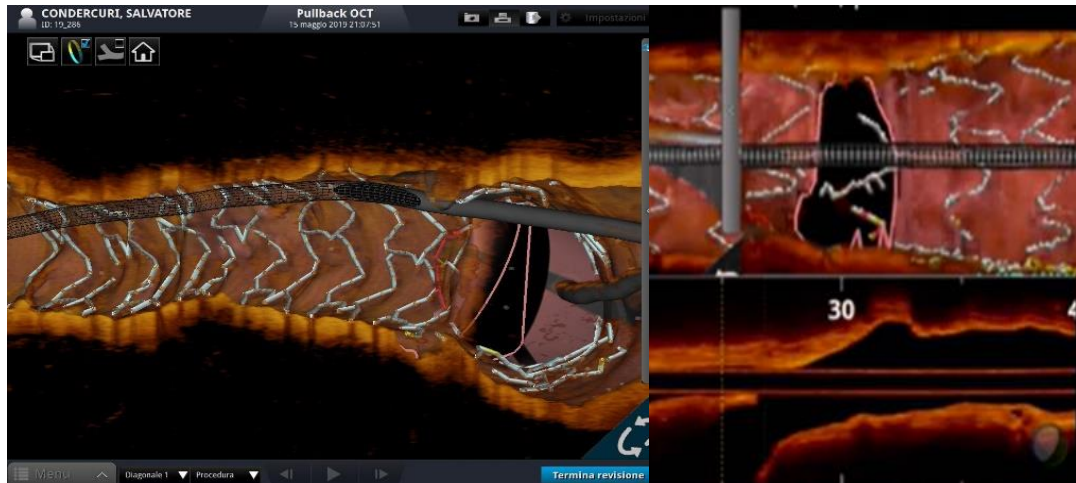
Intravascular Guidance in LM Interventions



J Suarez de Lezo et al ; EuroIntervention 2012;7:1147-1154

AP Banning - GL De Maria RadcliffeCardiology 2017

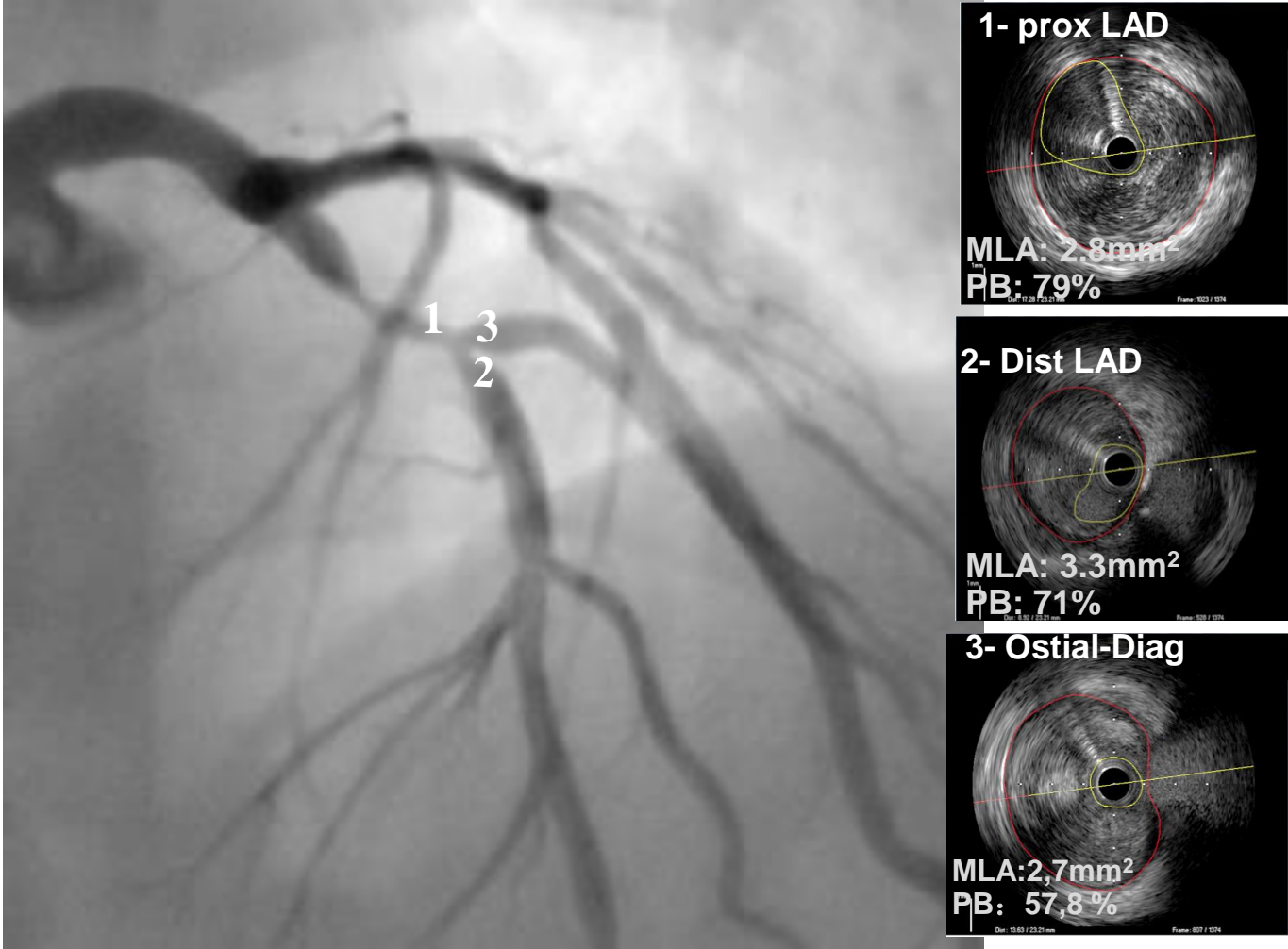
Xiao-Fei Gao et al; US Cardiology Review 2020



LA , 65 yrs Male

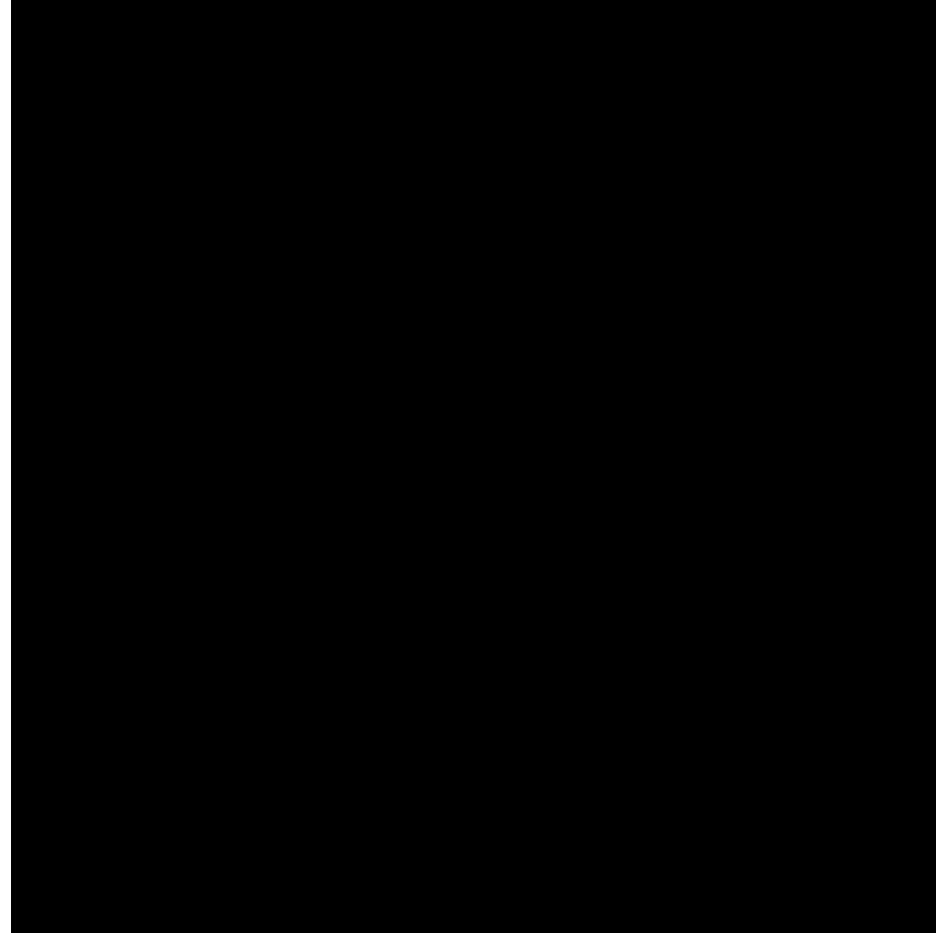
Unstable angina

LAD – I Diag Bifurcation Lesion
Medina 1,,1,1



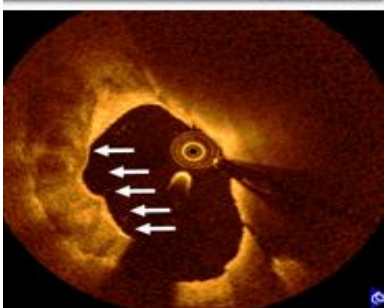
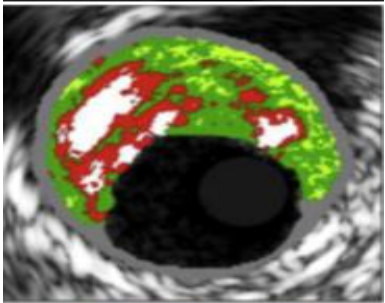
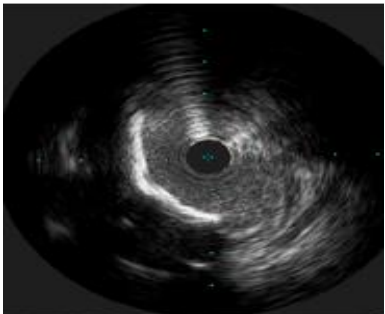
Step 1: Wiring and Predilatation / Lesion preparation

Wire both branches and lesion preparation


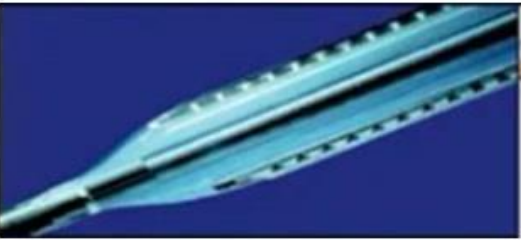
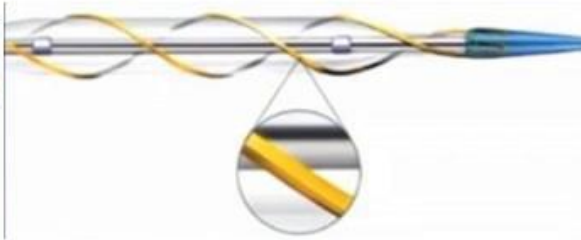

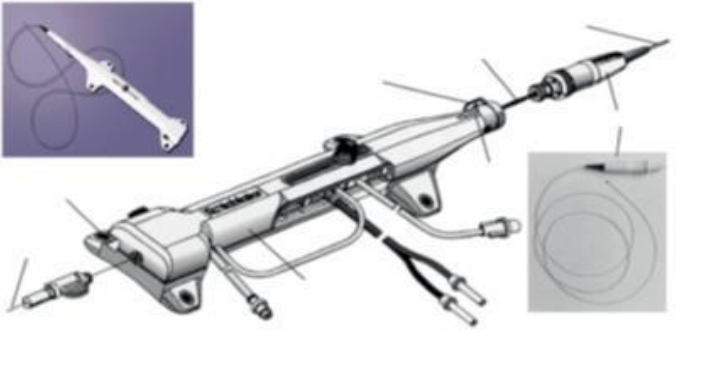




Lesion characteristics and lesion Preparation have a key role in procedural success and favorable outcome

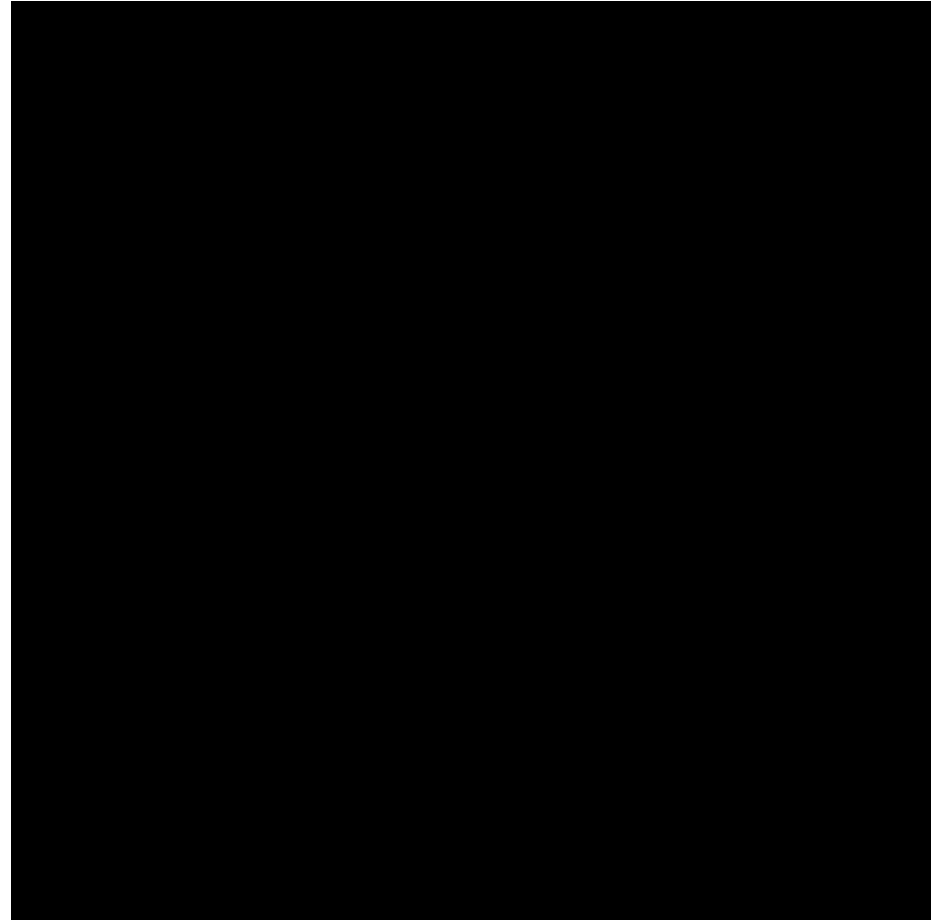
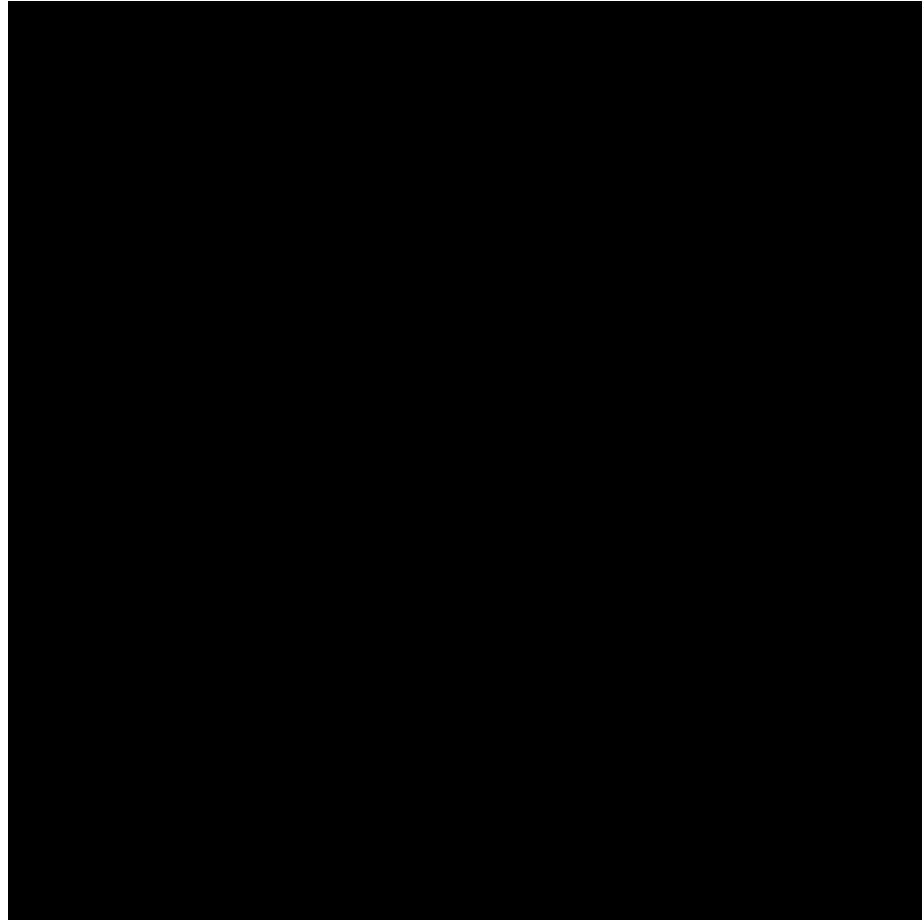
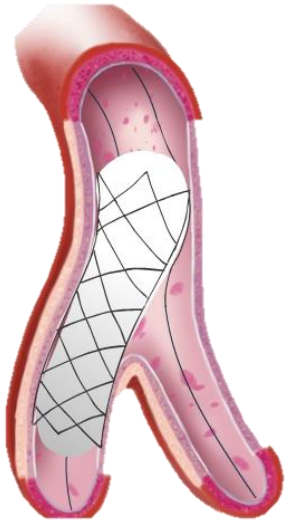
Intravascular imaging



Tools for the management of coronary calcified lesions

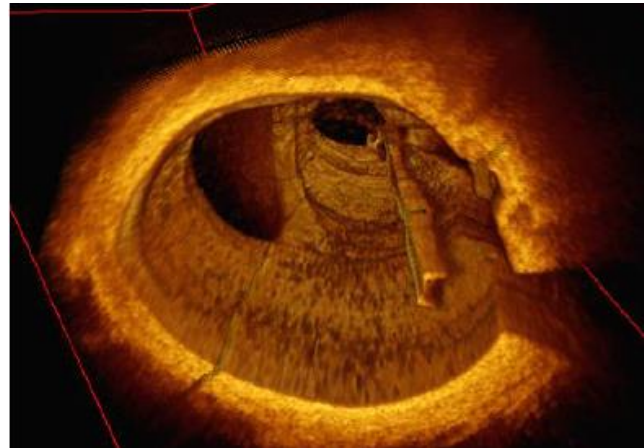
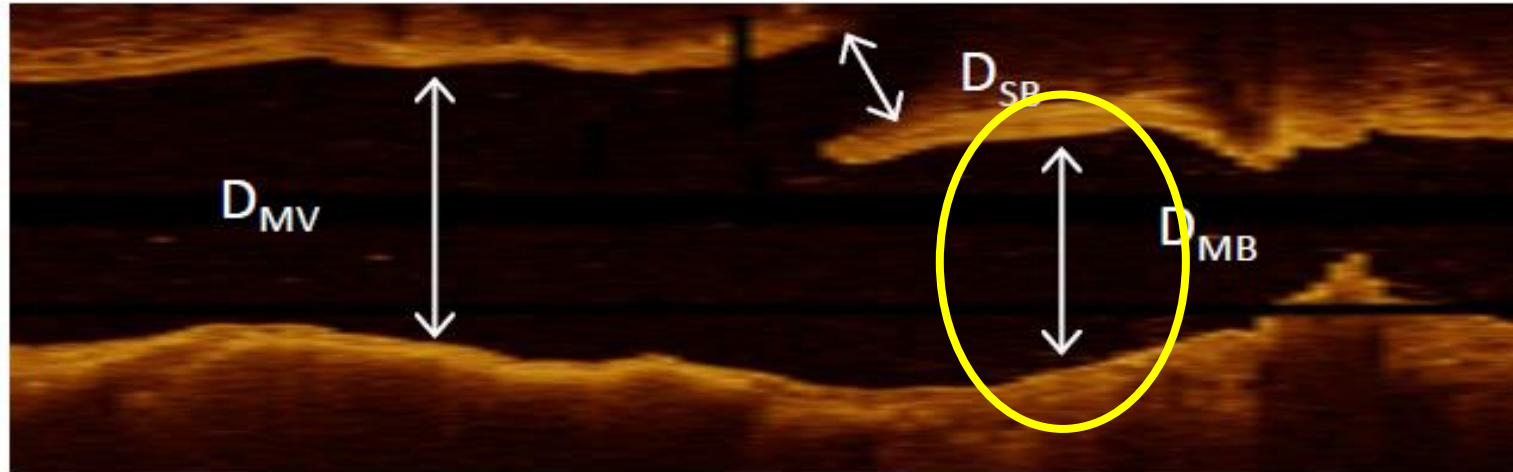
<p>NC Balloons</p> 	<p>Cutting Balloon</p> 	<p>Angiosculpt</p> 	<p>ShockWave Lithoplasty</p>  <p>Dilate to reference vessel diameter 6 ATM</p> <p>Lithoplasty®</p>	
<p>Rotational-Ablation Atherectomy</p> 		<p>Orbital Atherectomy</p> 		<p>Laser</p> 

Step 2 : Stenting MV with jailed SB wire



LAD prox-LAD dist 3.0/23 mm DES @ 16 atm

Anatomy of Bifurcation : Select stent size accordingly to distal MV diameter

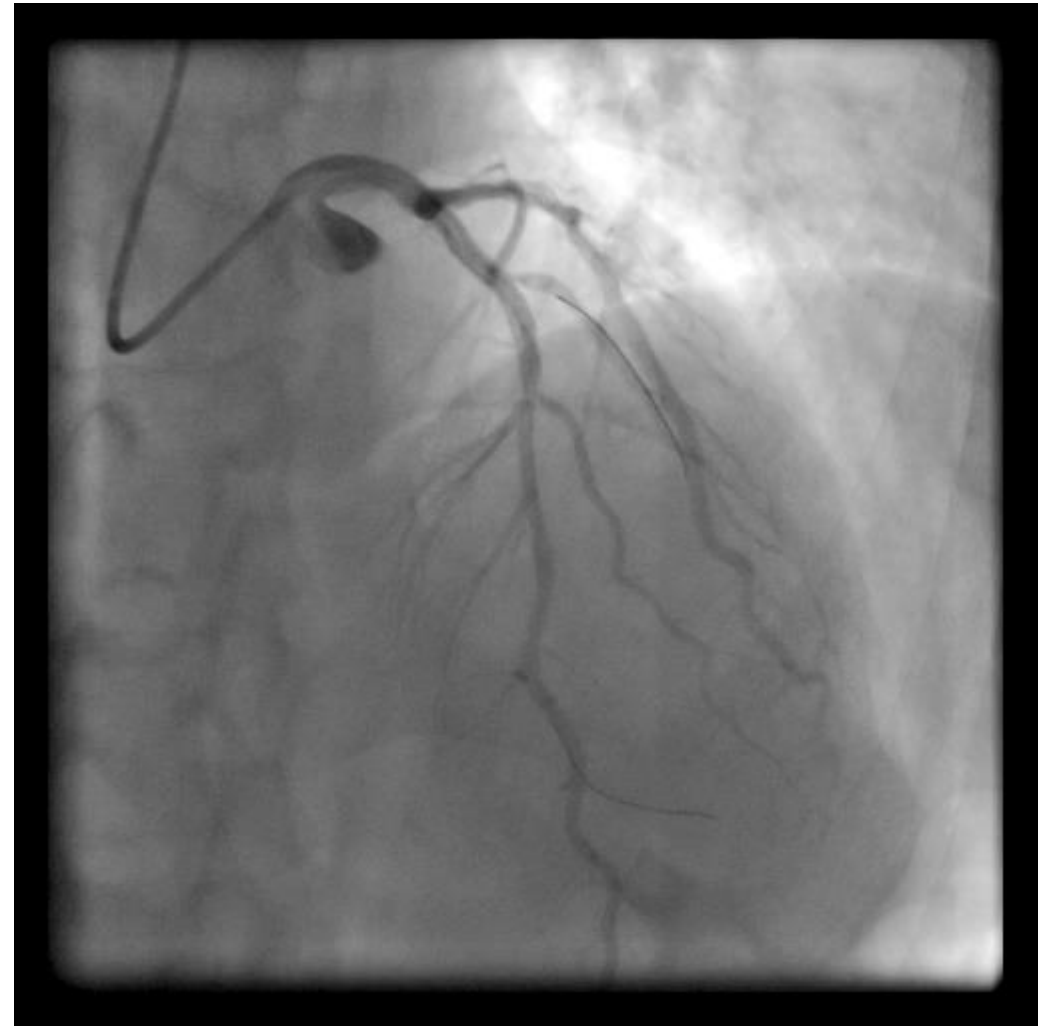
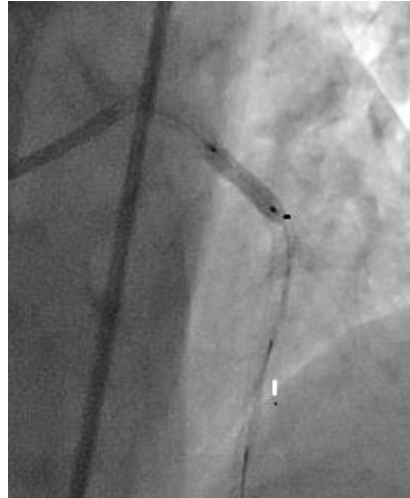
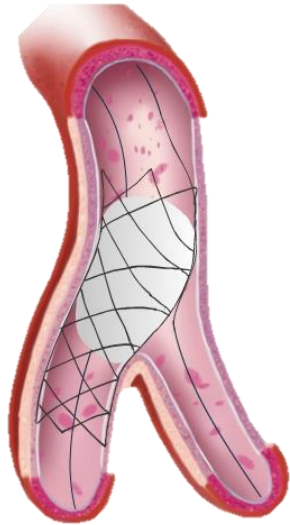


	Principle	Relation	Ratio D_m/D_d for $D_{d1} \sim D_{d2}$
Murray's law	Minimum Work	$D_m^3 = D_{d1}^3 + D_{d2}^3$	1.26
HK: Huo-Kassab	Minimum Energy	$D_m^{7/3} = D_{d1}^{7/3} + D_{d2}^{7/3}$	1.35
Flow conservation	$Q_m = Q_{d1} + Q_{d2}$	$D_m^2 = D_{d1}^2 + D_{d2}^2$	1.4
Finet	Measurement	$D_m = 0.678 (D_{d1} + D_{d2})$	1.36

The larger the SB, the larger the change in MV diameter throughout the bifurcation

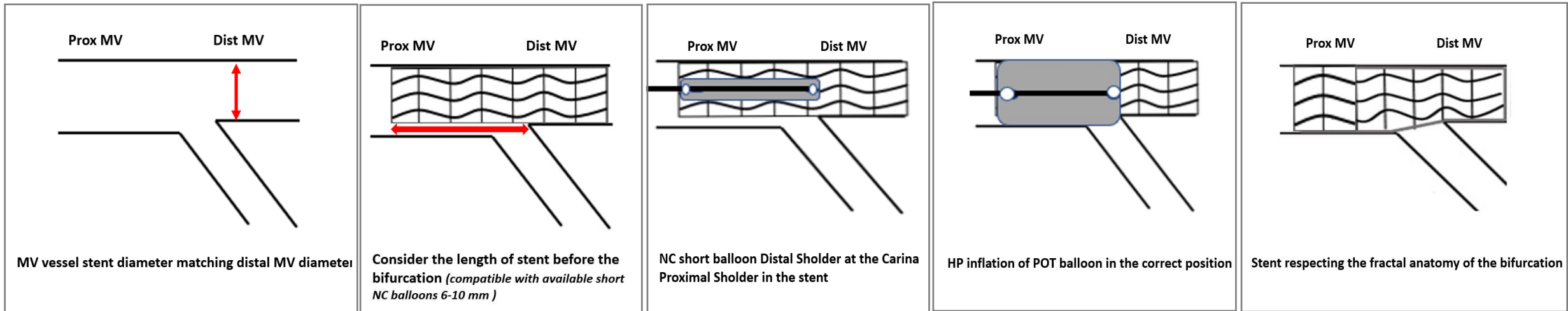
Step 3 : Post-dilatation and Optimization

POT



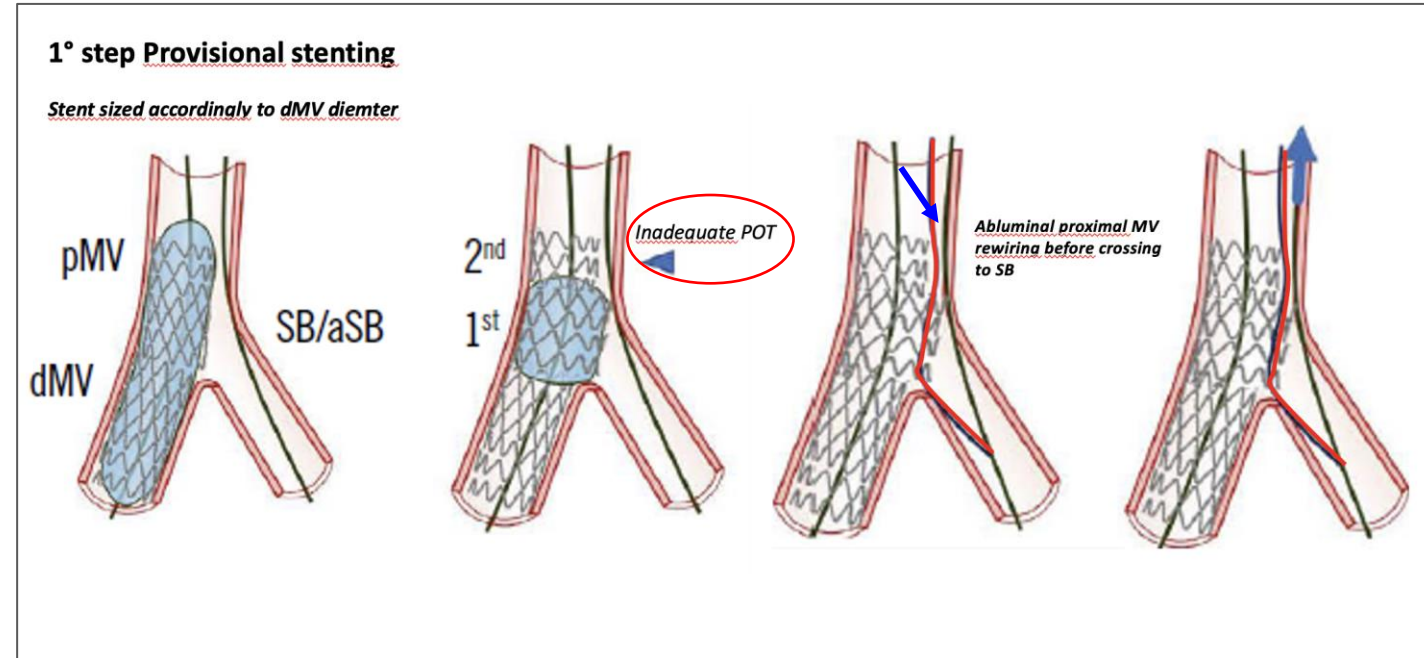
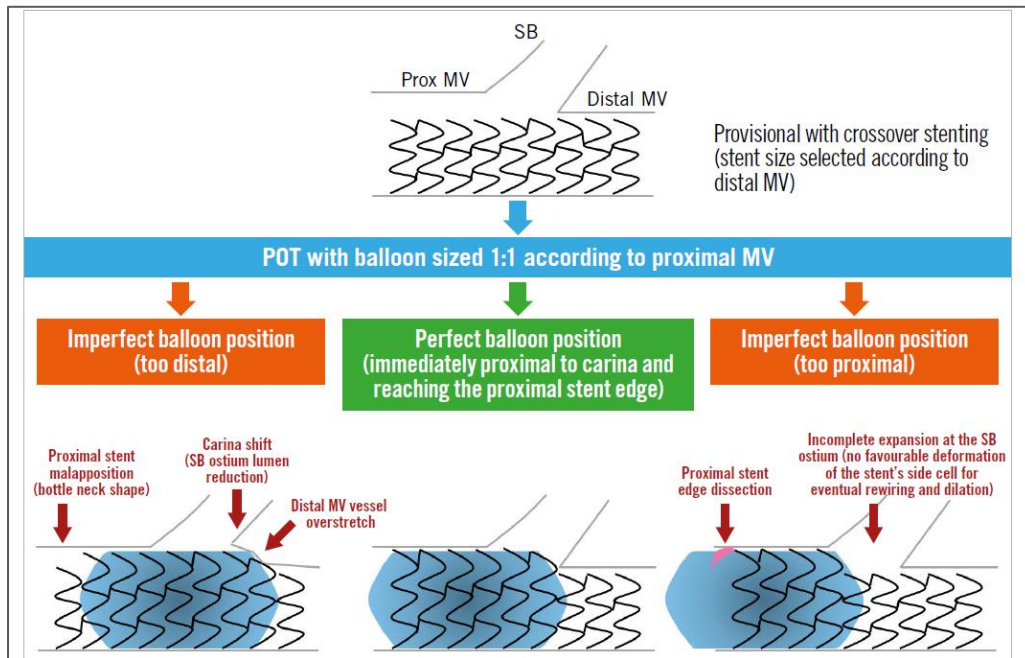
PROXIMAL OPTIMISATION TECHNIQUE (POT)

- **MV stent length proximally to Bifurcation should be $> 6-10$ mm since POT balloon should stay completely within the stent (Short balloons available : 6 to 10 mm length)**
- **Diameter ratio NC balloon / proximal MV reference segment should be 1 to 1**
- **Positioning the balloon for POT is crucial**
- **In the majority of balloons distal marker matches the distal shoulder of the balloon but it might vary between manufacturers**
- *Some awareness from bench data of the hazards of distal POT and its potential to cause SB distortion.*



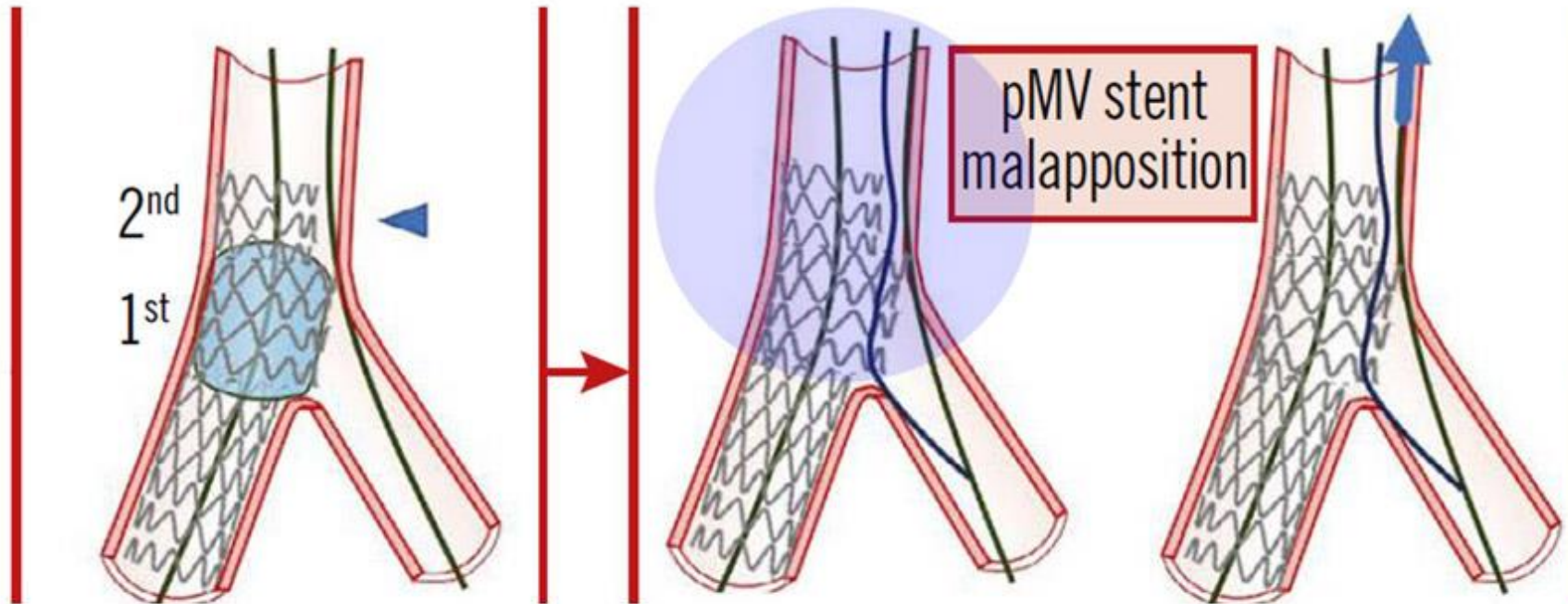
OPTIMAL POT

Provisional Stenting :Main Pitfall: Inadequate POT



Provisional Stenting :Main Pitfall: Inadequate POT

Inadequate POT



proximal main vessel malapposition + abluminal SB rewiring

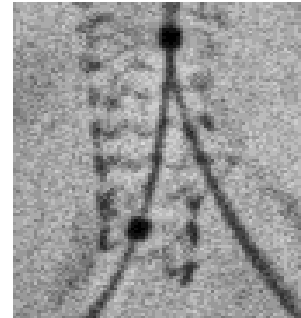
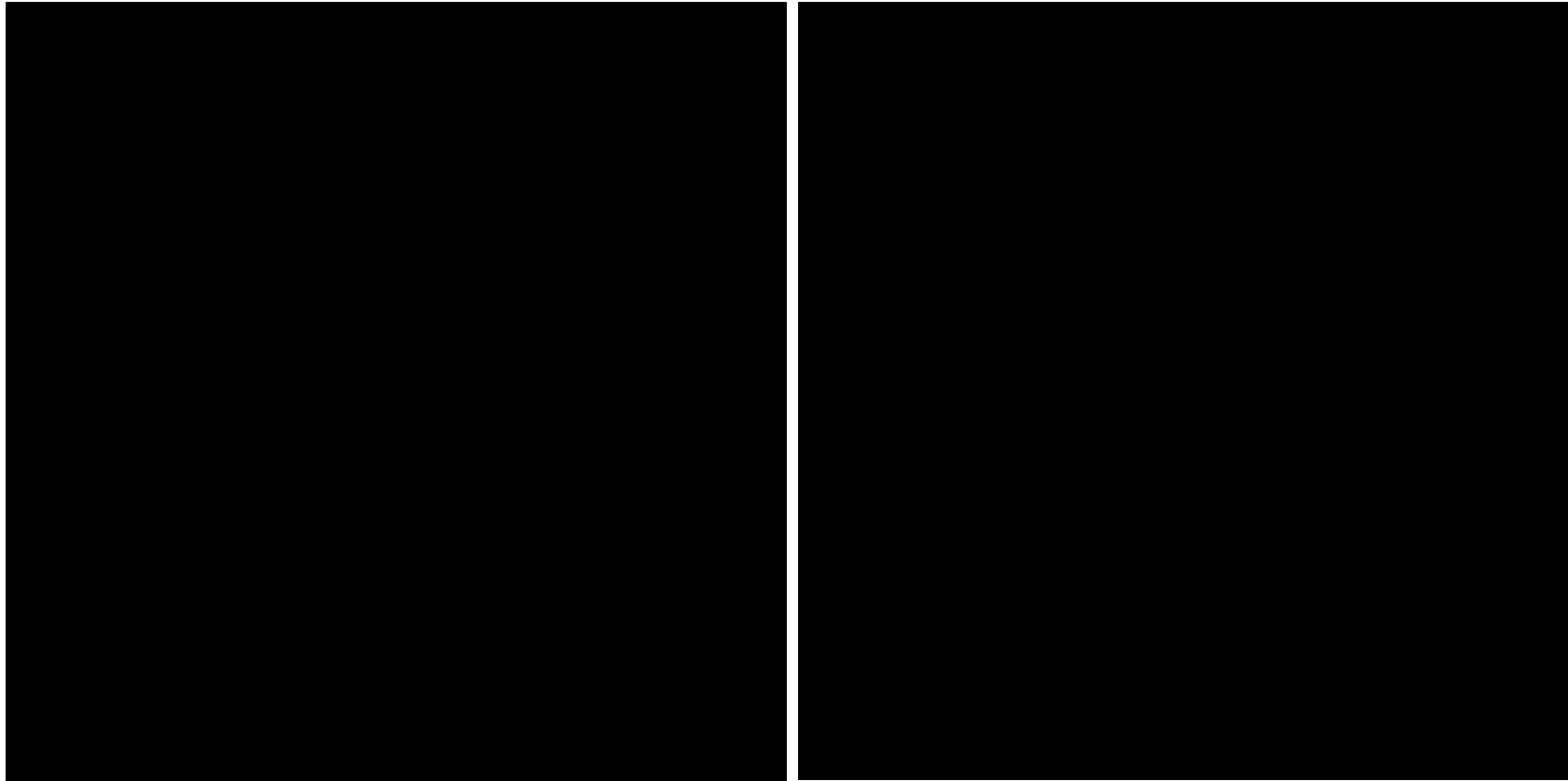
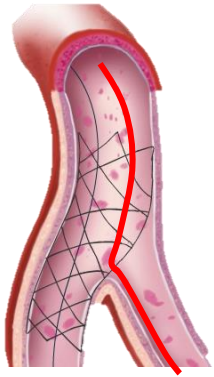
adapted from EuroIntervention. 2022 May 15;EIJ-D-22-00165

Courtesy of Dejan Milasinovic @MilasinD18. Source: PCRONline.com

Step 4 :

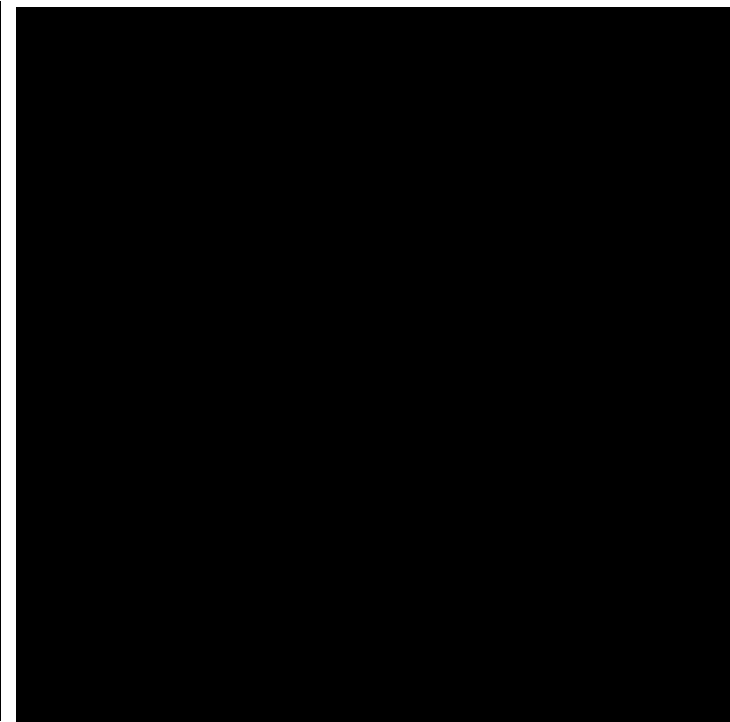
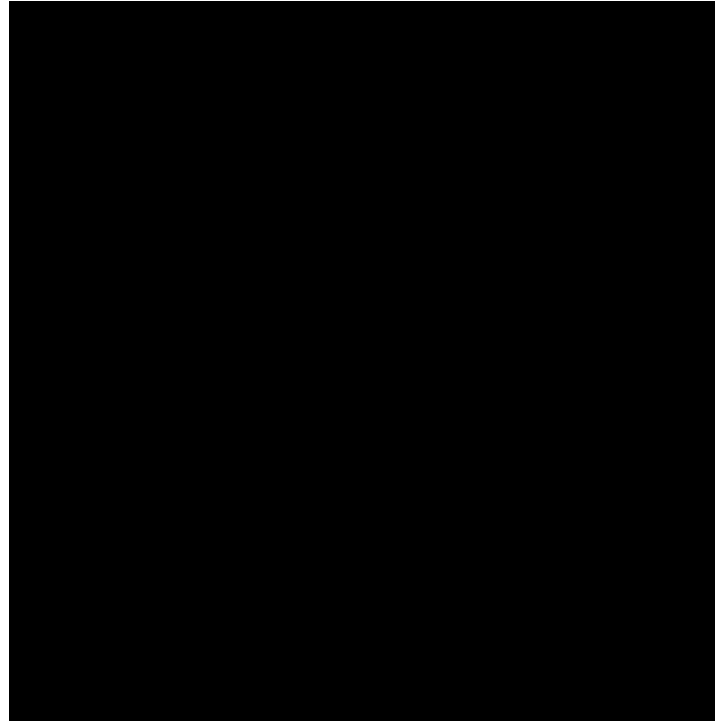
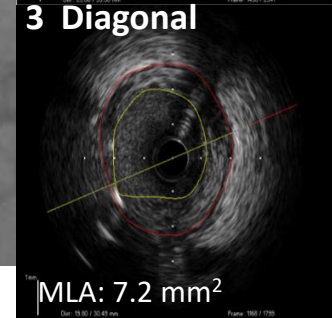
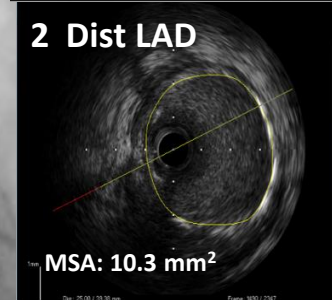
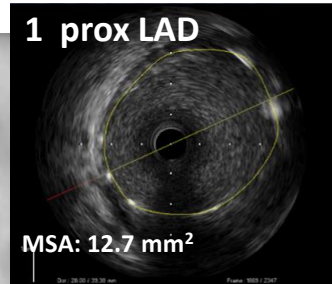
Compromise on SB (plaque shifting / carina shifting / dissection)

Wire Exchange with distal rewiring to SB – KBI and re-POT

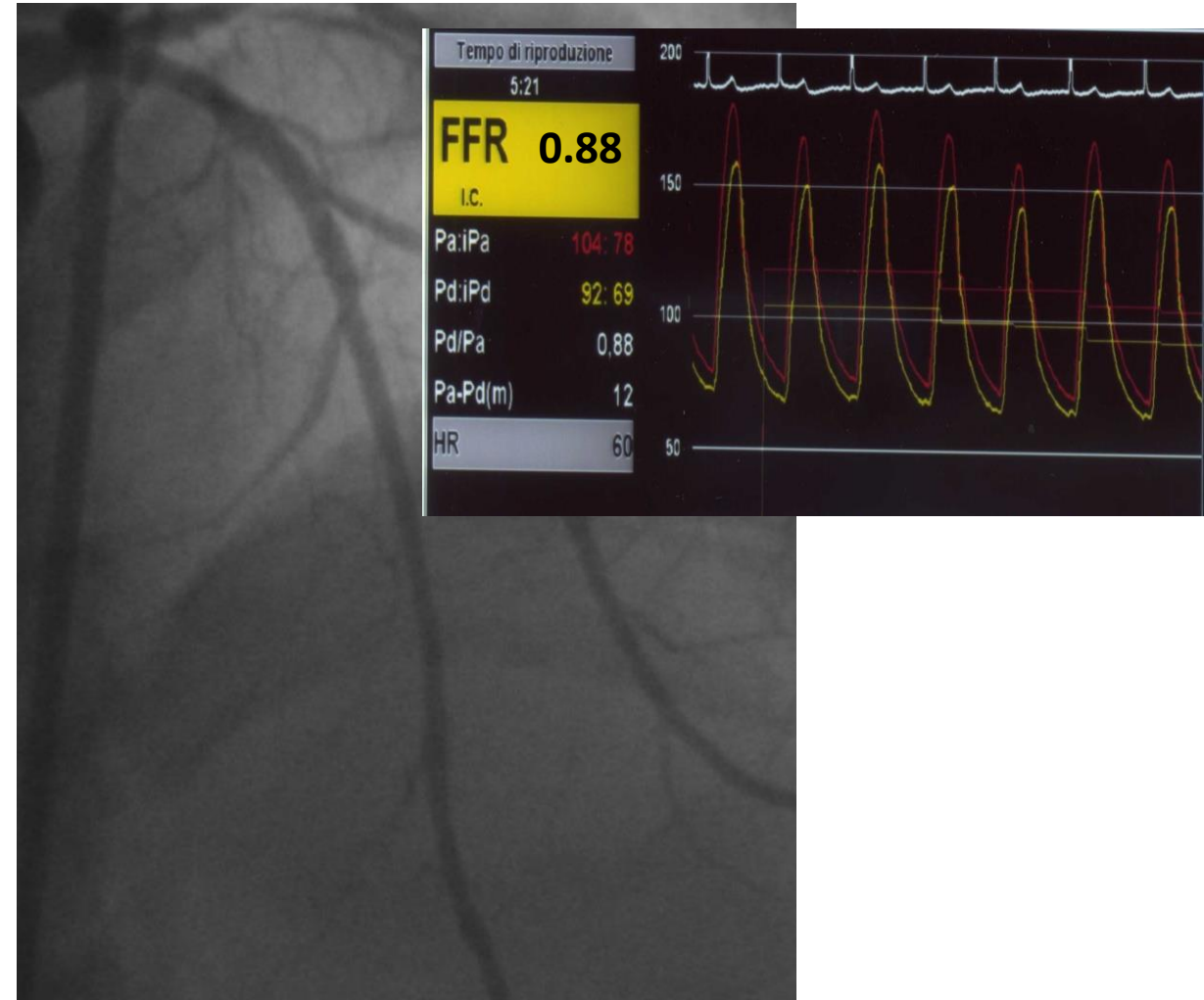


Step 5

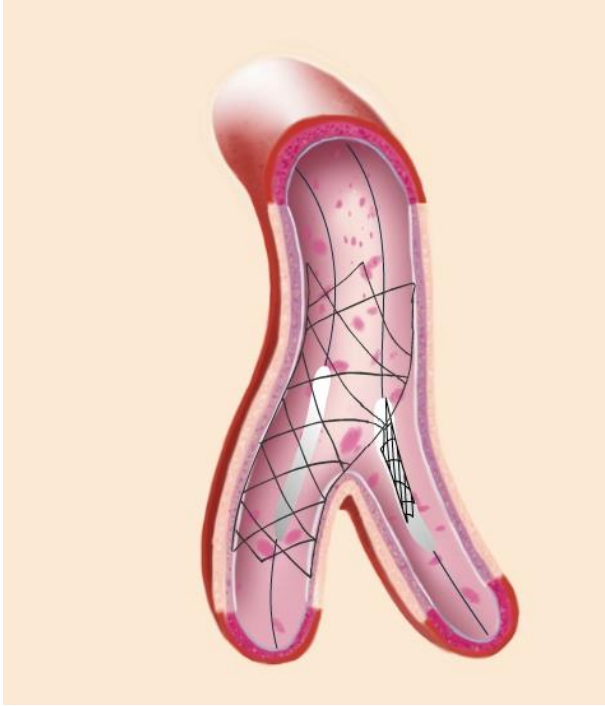
Finl angio and IVUS



Still having some doubt on IVUS , use FFR for a functional evaluation



If SB cannot be fixed with only balloon : Bail-out stenting to SB (TAP/ Culotte)



Take-home Message :

- ***Start your procedure with adequate strategy selection***
- ***Provisional Stenting in non-Left Main BL is safe and effective and can be considered as 1° option when bifurcation lesion is defined simple (75-80% of case)***
- ***In all strategies (simple or complex) no doubt about the need for :***
 - ✓ ***Good experience***
 - ✓ ***Stepwise approach***
 - ✓ ***Planning the procedure accordingly to lesion characteristics and complexity***
 - ✓ ***Lesion preparation for a good stent expansion and apposition***
 - ✓ ***Optimization (which is mandatory and associated with a better outcome)***