How to Perform the Optimal Two Stenting in Non-LM Bifurcation?

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COI Disclosure

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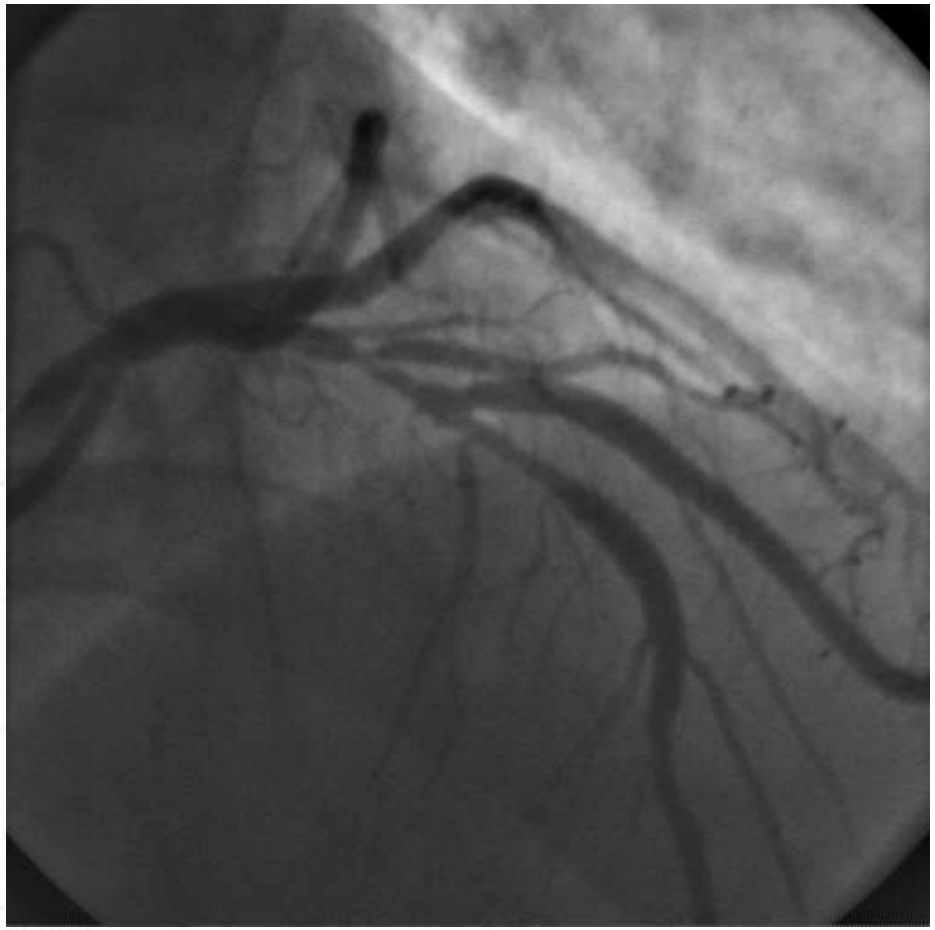
I DO NOT have a financial conflicts of interest to disclose concerning the presentation

LM vs. Non-LM Bifurcation

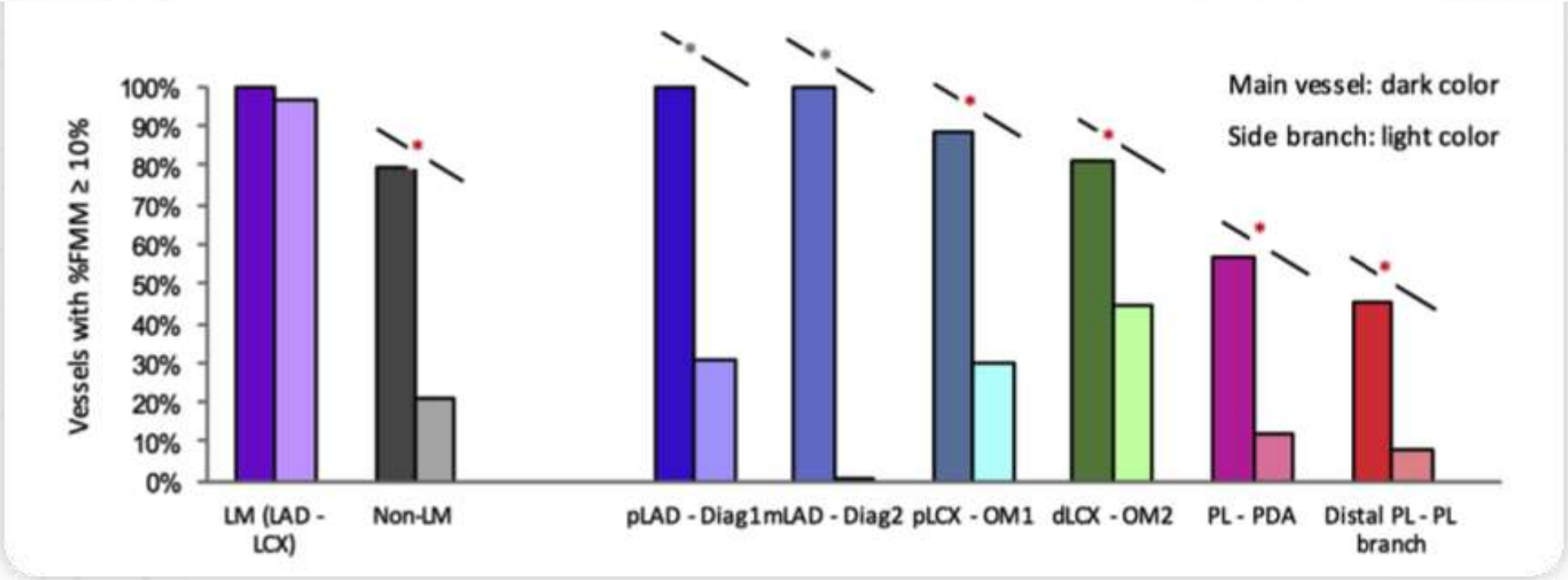
Non-Left Main



Left Main

Difference between LM vs. Non-LM Bifurcation

- Size & Supplying myocardial mass of the SB



Only 1 out of every 5 non-LM SB supplies %Fractional myocardial mass ≥10%

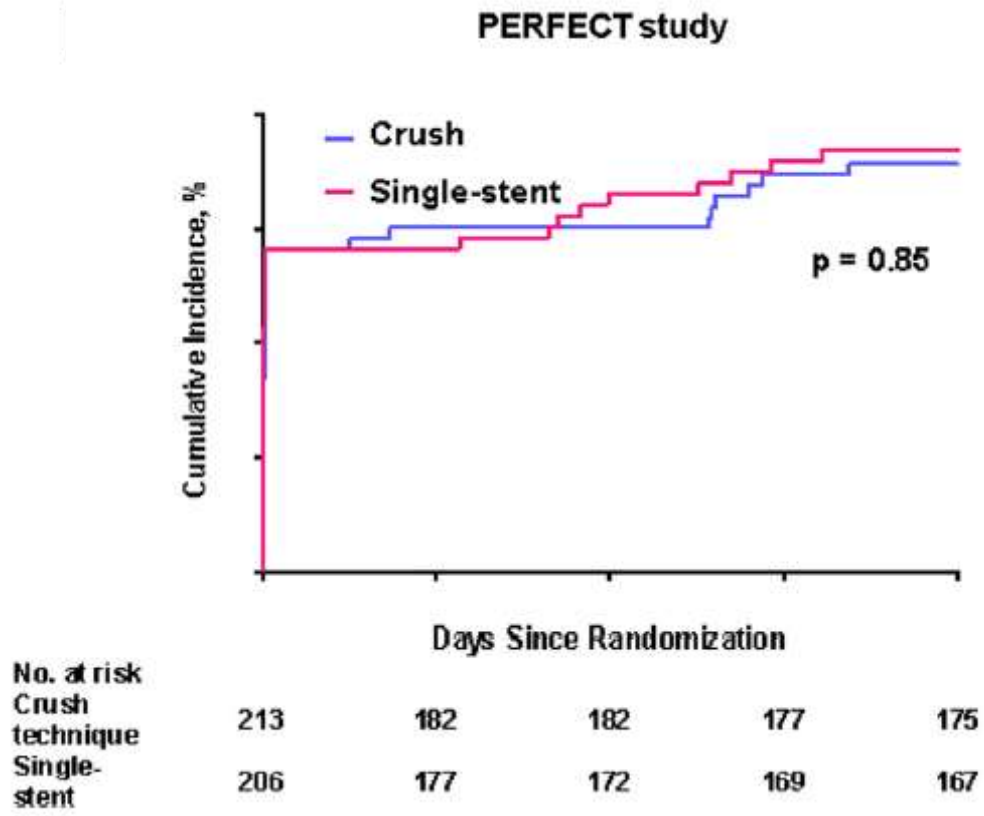
Kim HY et al. JACC Cardiovasc Interv. 2017;10(6):571-581.

1-stent vs. 2-stent Technique in Non-LM Bifurcation

- In Korea, 1-stent and 2-stent technique showed comparable outcome in non-LM bifurcation lesions.

PERFECT RCT

Primary endpoint
: Death, MI, or TVR at 1 year

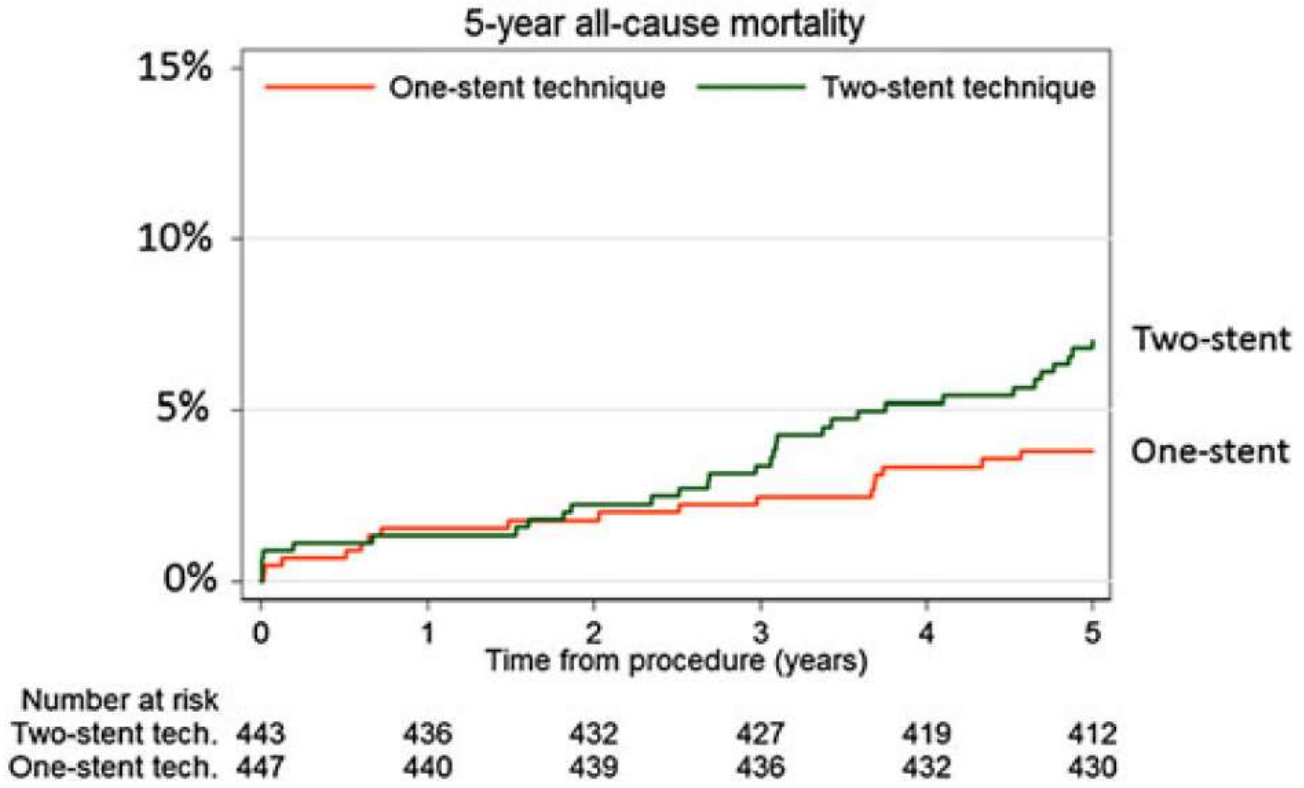


Kim YH et al. JACC Cardiovasc Interv. 2015;8(4):550-60.

1-stent vs. 2-stent Technique in Non-LM Bifurcation

- In Europe, single-stent approach was associated with lower long-term mortality than a systematic 2-stenting technique.

Patient-level pooled analysis of the Nordic Bifurcation Study & the British Bifurcation Coronary Study



Behan MW et al. Eur Heart J. 2016;37(24):1923-8.

2018 ESC Guideline Recommendations

- A single stent strategy with cross-over technique is recommended
- Never compromise the main vessel !
- Optimize side branch patency

Recommendations	Class[a]	Level[b]
Stent implantation in the main vessel only, followed by provisional balloon angioplasty with or without stenting of the side branch, is recommended for PCI of bifurcation lesions.[654–658]	I	A

Neumann FJ et al. Eur Heart J. 2019;40(2):87-165.

2018 ESC Guideline Recommendations

- Exceptions : “Upfront SB stenting may be preferable” when,
  - **Large SB** diameter ≥ 2.75 mm with a long ostial lesion (> 5 mm)
  - Anticipated difficulty in accessing SB after stenting MV

  ➔ **High risk of acute side branch occlusion**

Neumann FJ et al. Eur Heart J. 2019;40(2):87-165.

When do we Need 2-stent in Non-LM Bifurcation?

- **Upfront 2-stent for Large SB with high occlusion risk**
  - 20% of non-LM bifurcation with large size of SB vessel
  - Significant ostial lesion of SB vessel

- **Urgent situations during PCI with 1-stent technique**
  - Large SB dissection
  - Persistent intra-procedural angina
  - Electrocardiographic changes
  - TIMI flow grade <3

Which Technique is Best, Crush? Culotte? T? TAP?

- **Stenting techniques do not matter.**

- Achieving the optimal result is important, regardless of techniques.

- Angiography only can not discriminate optimal vs. suboptimal result.

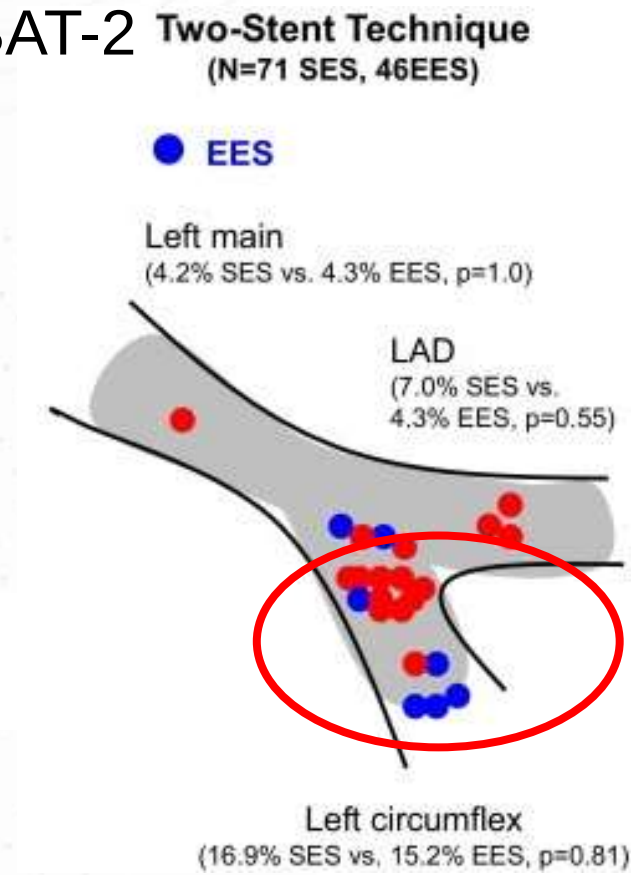
- Intracoronary Imaging-based optimization is essential.

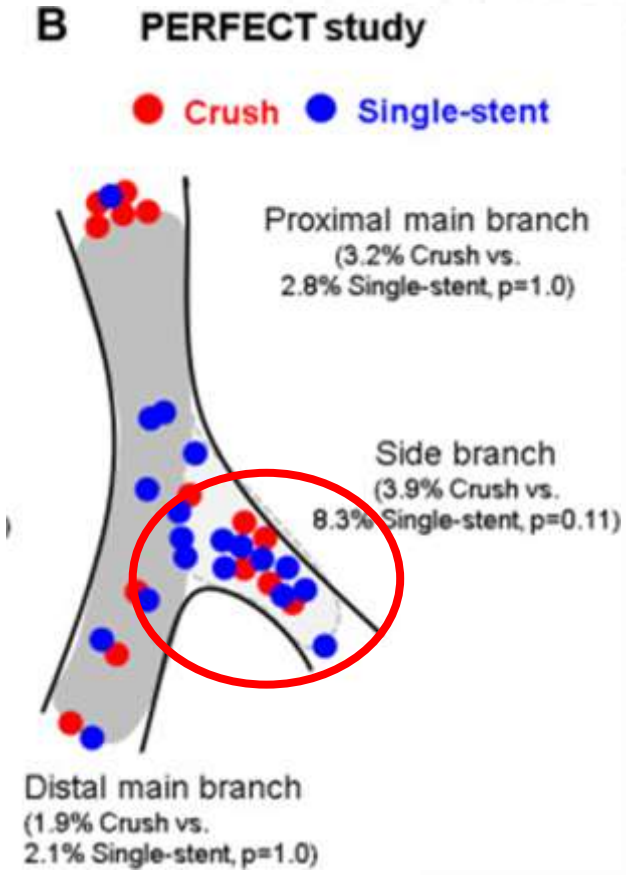
Upfront 2-stent with Crush Technique for non-LM Bifurcation in AMC

AMC Data - I

- Side Branch Ostium is the Achilles Heel of Two-Stent Technique

PRECOMBAT-2

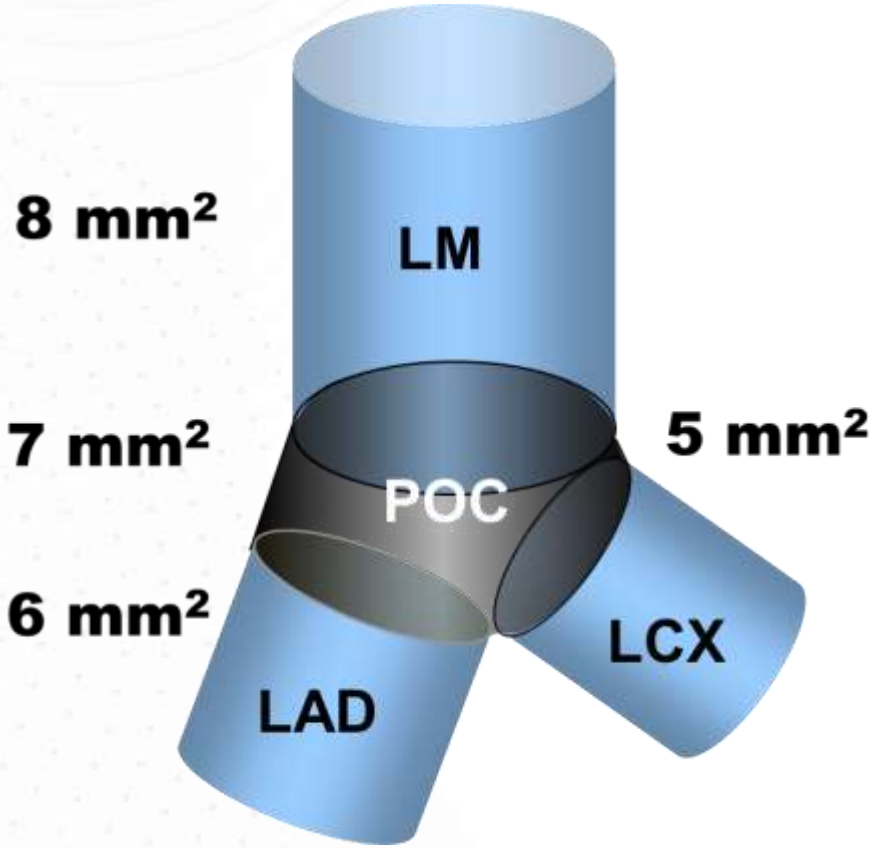


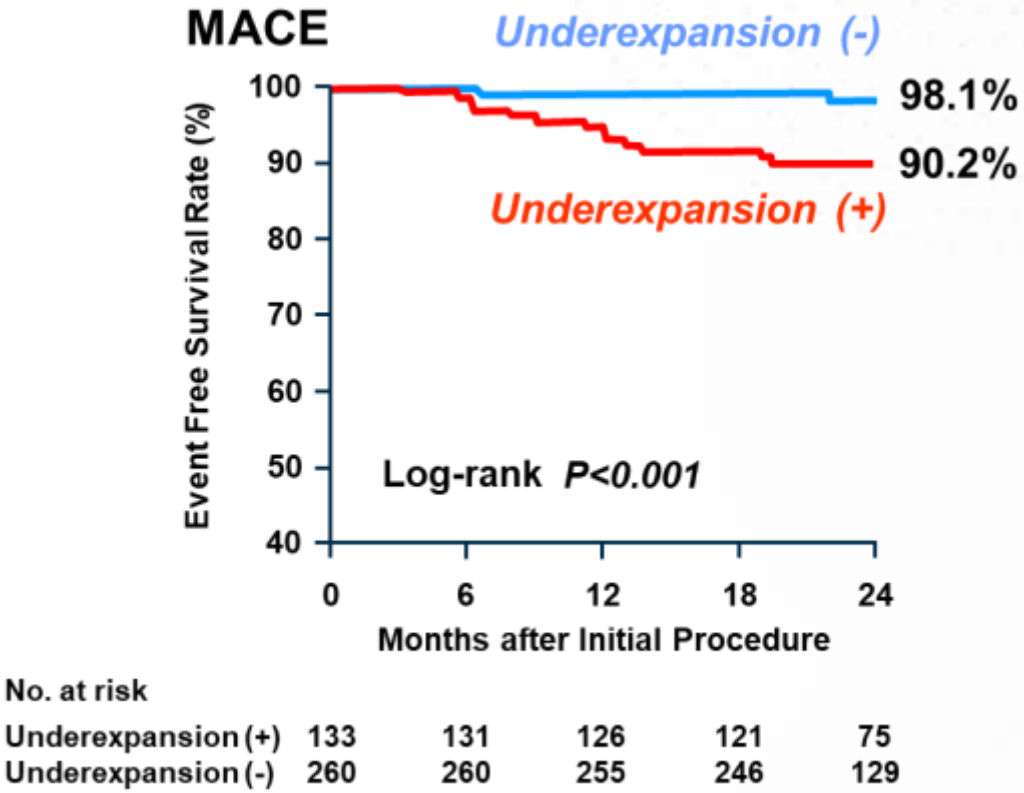


Kim YH et al. JACC Cardiovasc Interv. 2012;5:708-17, Kim YH et al. JACC Cardiovasc Interv. 2015;8:550-560.

AMC Data - II

- Bigger MSA was associated with Better Clinical Outcome.

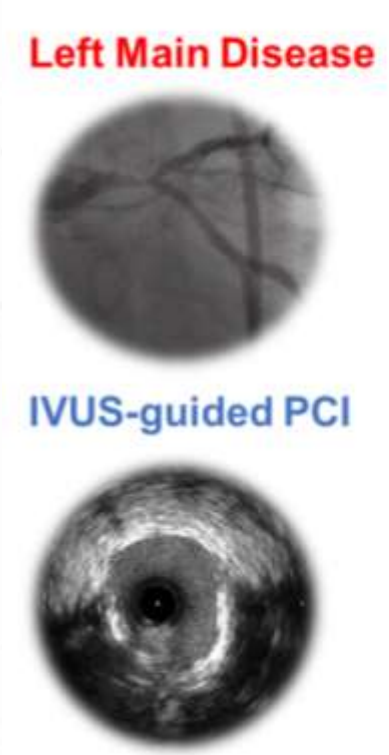




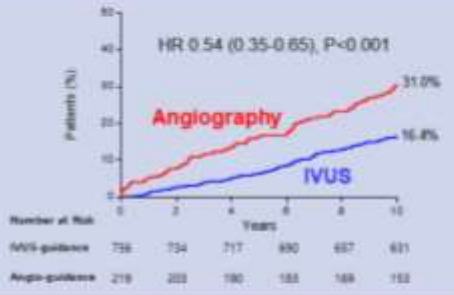
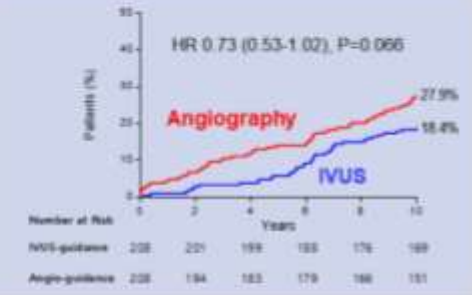
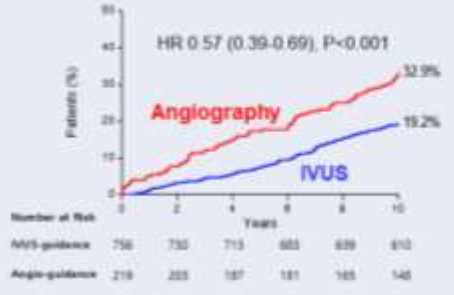
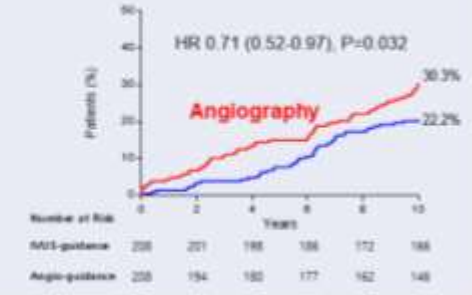
Kang SJ et al. Circ Cardiovasc Interv 2011;4:562-9.

AMC Data – III

- Intravascular imaging was associated with long-term clinical benefits.
- It enabled to gain bigger MSA with better safety, with detecting acute complications.



10-Year Follow-up

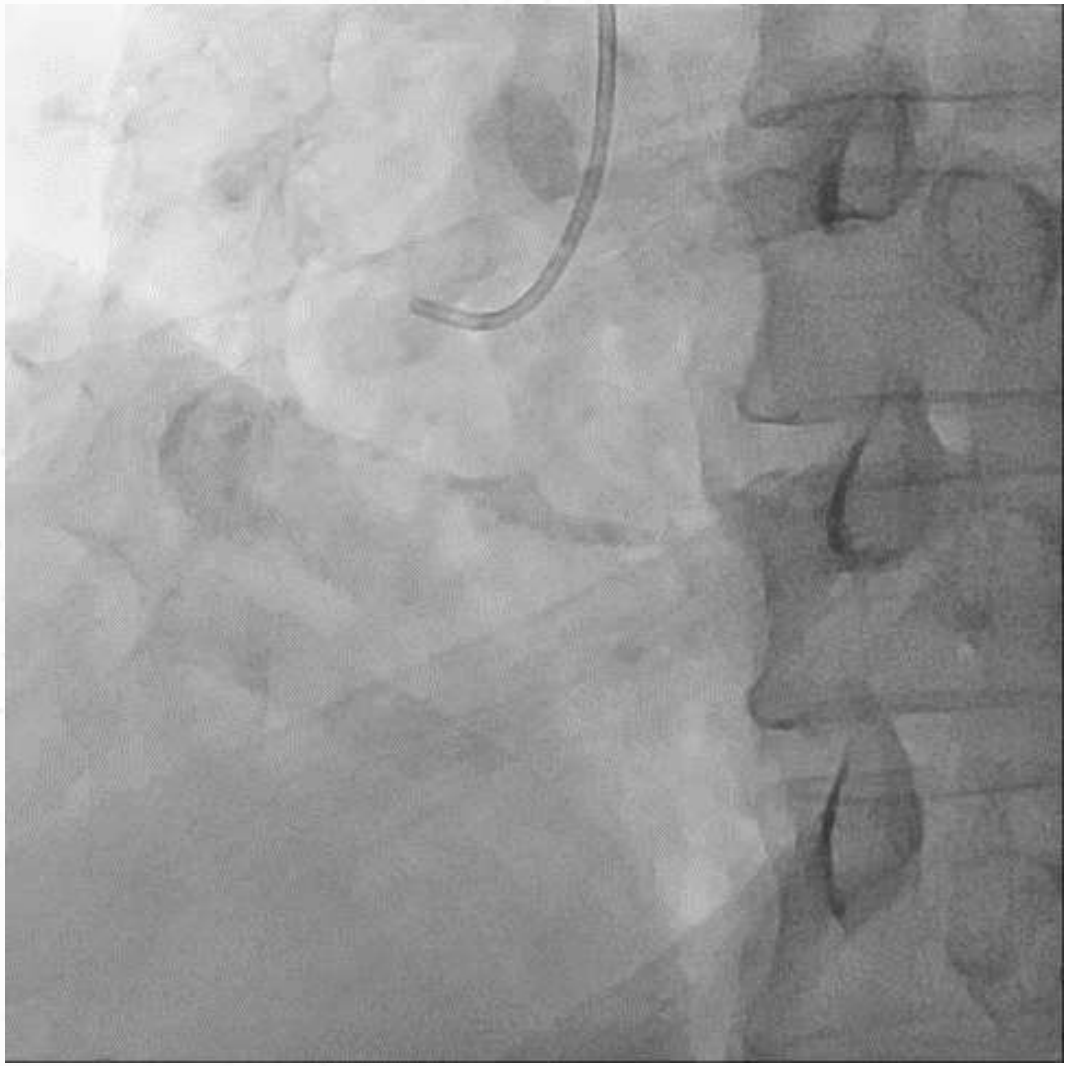
	Overall Population	After Propensity-score Matching
All-cause death		
Composite of all-cause death, Q-wave MI, or stroke		

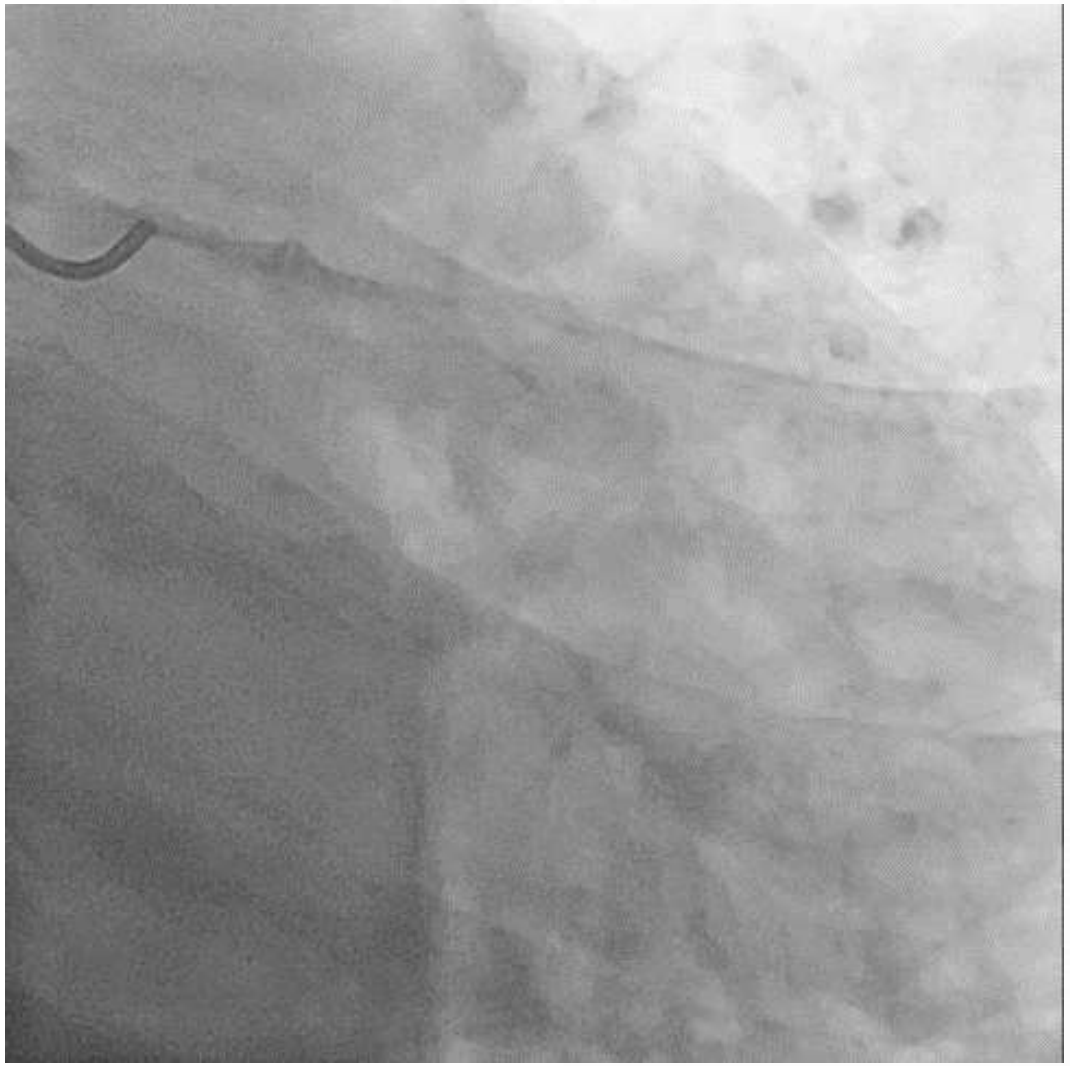
Kang DY et al, Circ Cardiovasc Interv. 2021.

Preparation

- Usually Radial Approach (7Fr)
- Mandatory intracoronary imaging (IVUS or OCT)
- Antiplatelet agent loaded
- Planned same-day discharge in major cases

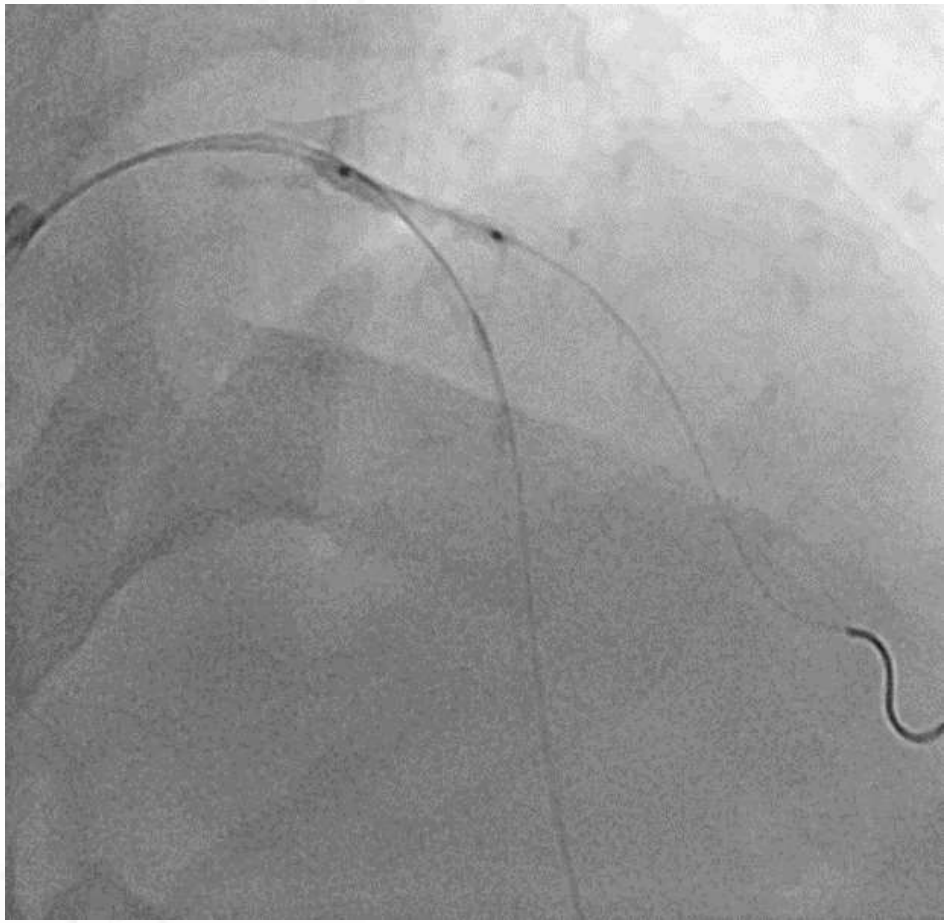
73/M, Stable Angina, DM/HT

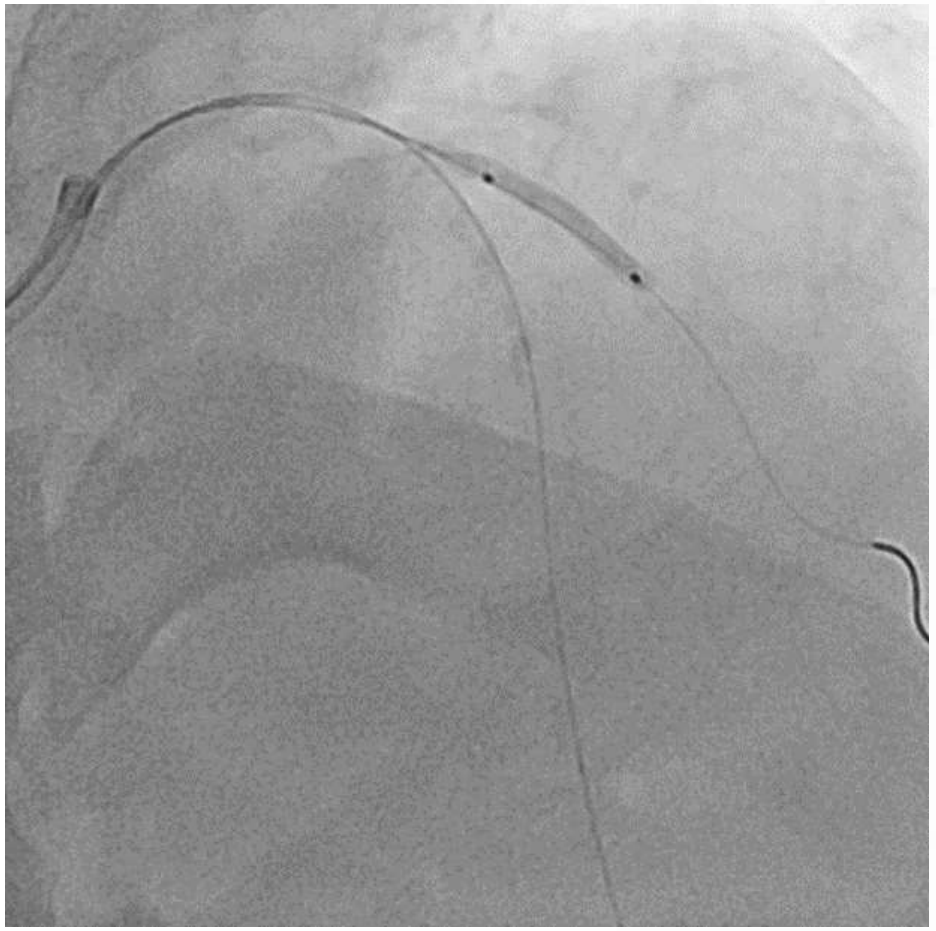




73/M, Stable Angina, DM/HT

Aggressive Pre-Lesion Modification with NC Balloons



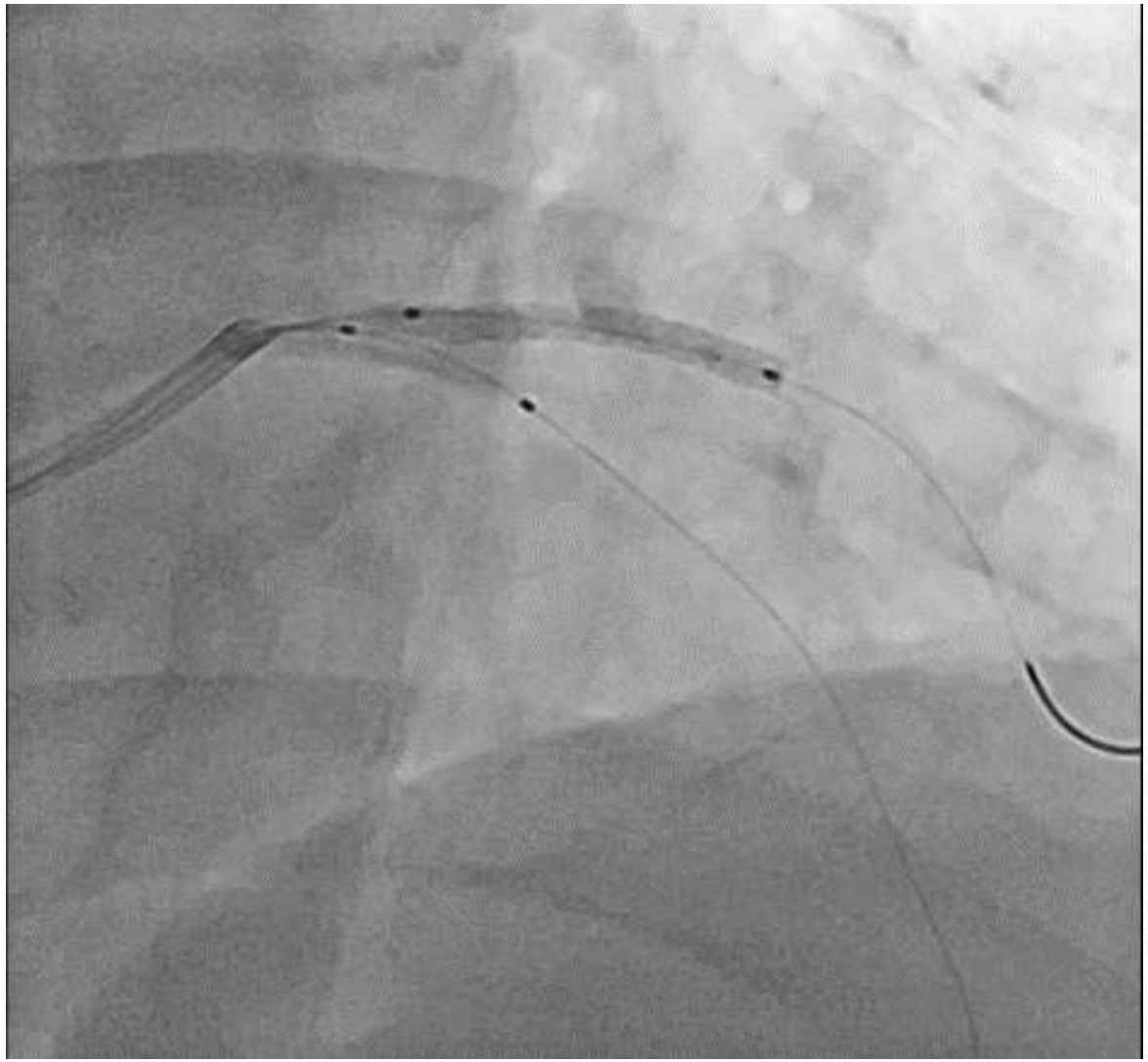


2.75 mm NC Balloon at SB

SB stenting with Higher-pressure at Proximal side

- Minimal Protrusion preferred
- Multiple Projection !!

- LAO Cranial for Diagonal branch



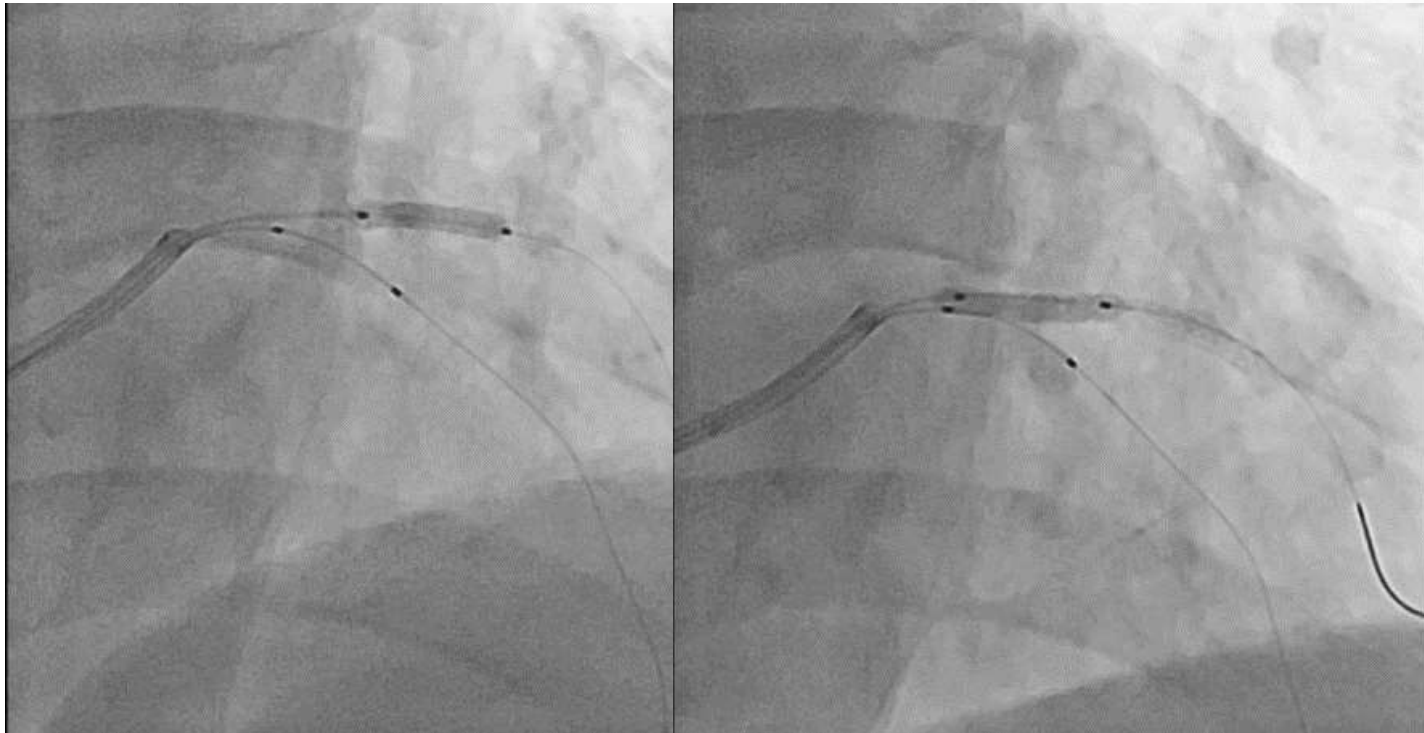
Xience Sierra 2.75 x 23 mm upto 16 atm

Crush Balloon : 3.5 x 15 mm NC

Aggressive SB Proximal Optimization Before Crushing

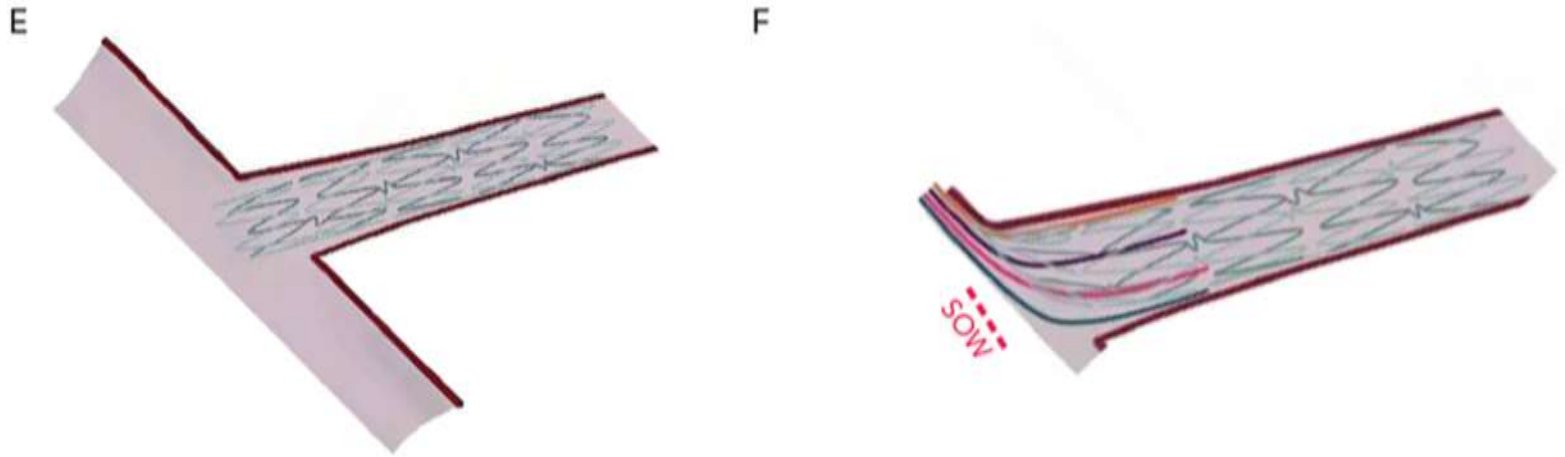
- Open SB Ostium with NC Balloon as wide as possible
  - Larger SB space for wiring
  - Easy re-wiring & balloon introduction
  - Minimize the risk of abluminal wiring
  - Minimize the risk of stent gap

2.75 x 15 mm NC upto 24 atm

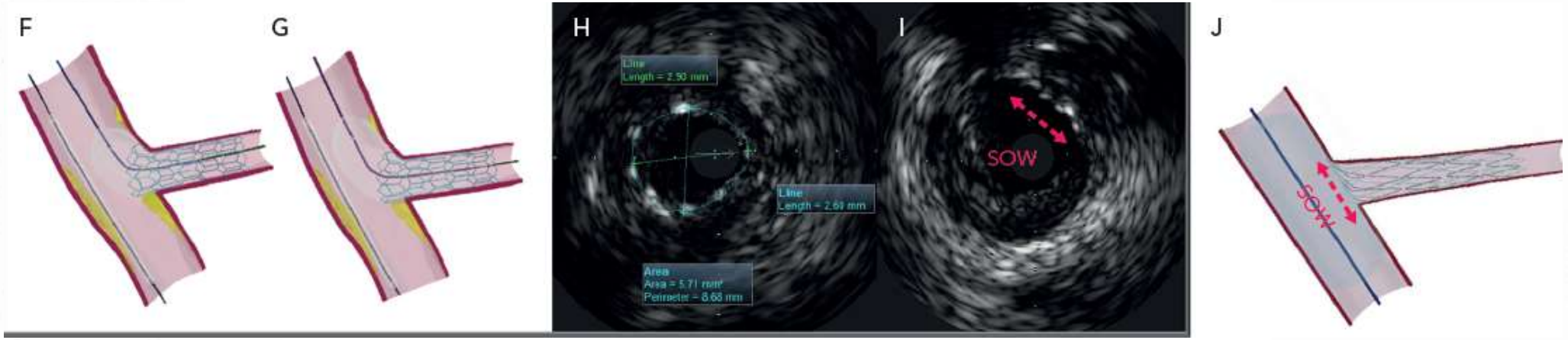


Aggressive SB Proximal Optimization Before Crushing

- Conventional Crush

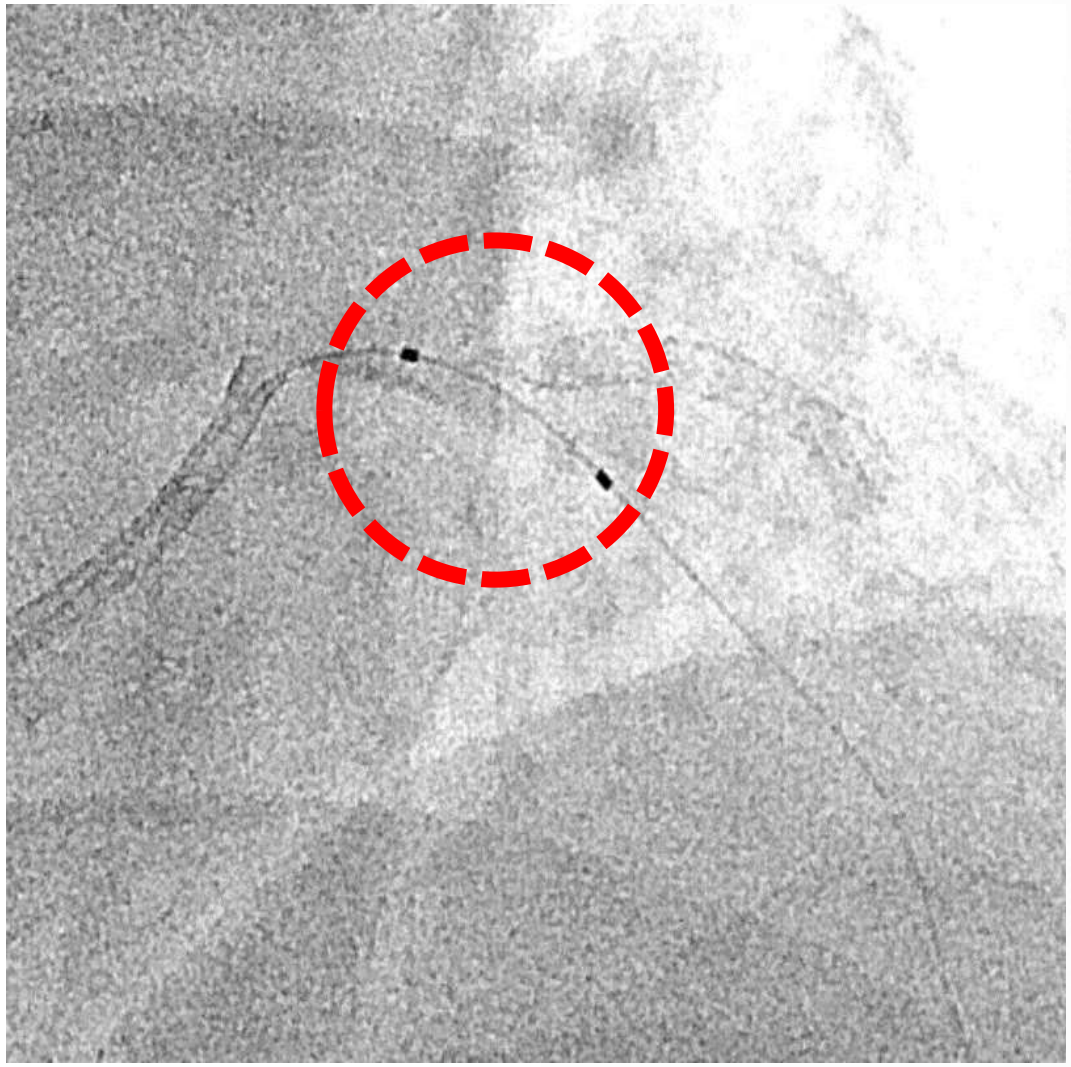


- Proximal Side Optimization



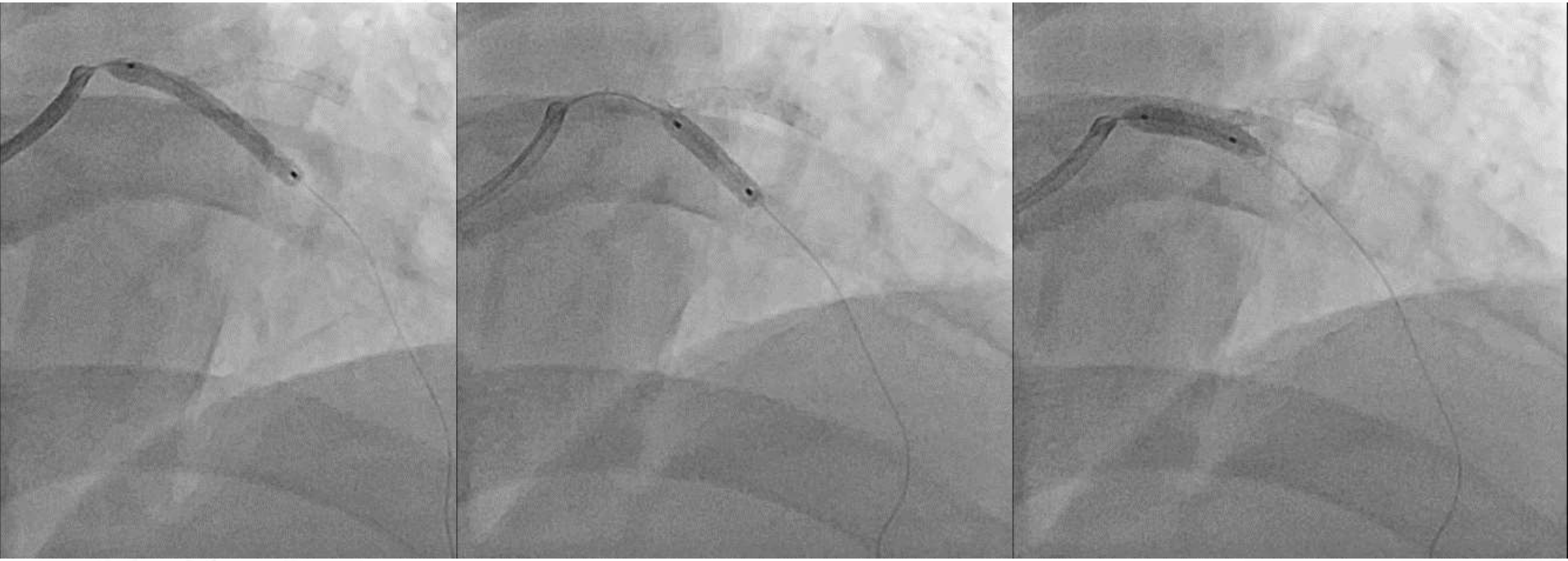
Francesco Lavarra. US Cardiology Review 2020;14:e02.

Balloon Crush with High-pressure



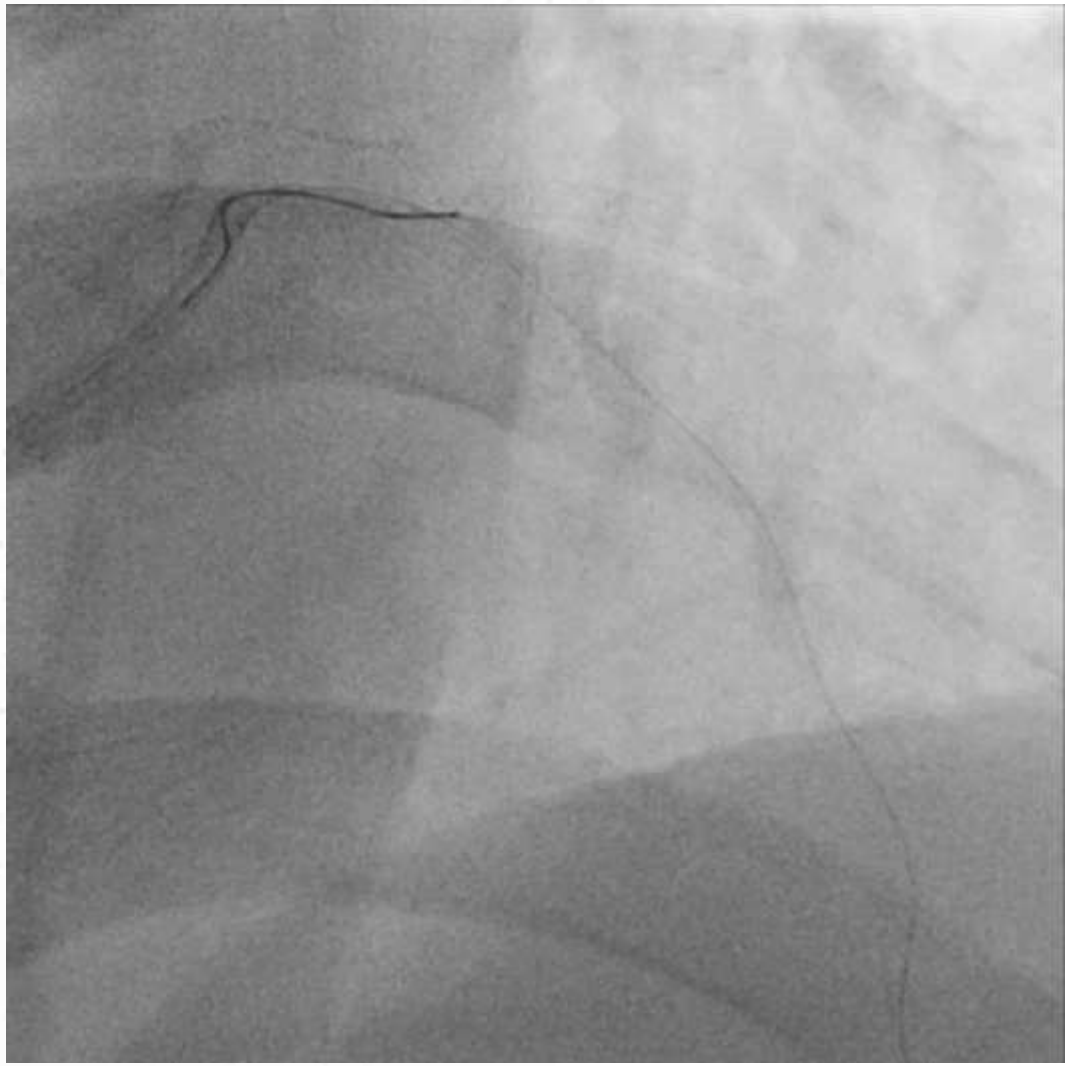
3.5 x 15 mm NC upto 18 atm

MB stenting & Optimization with NC Balloon

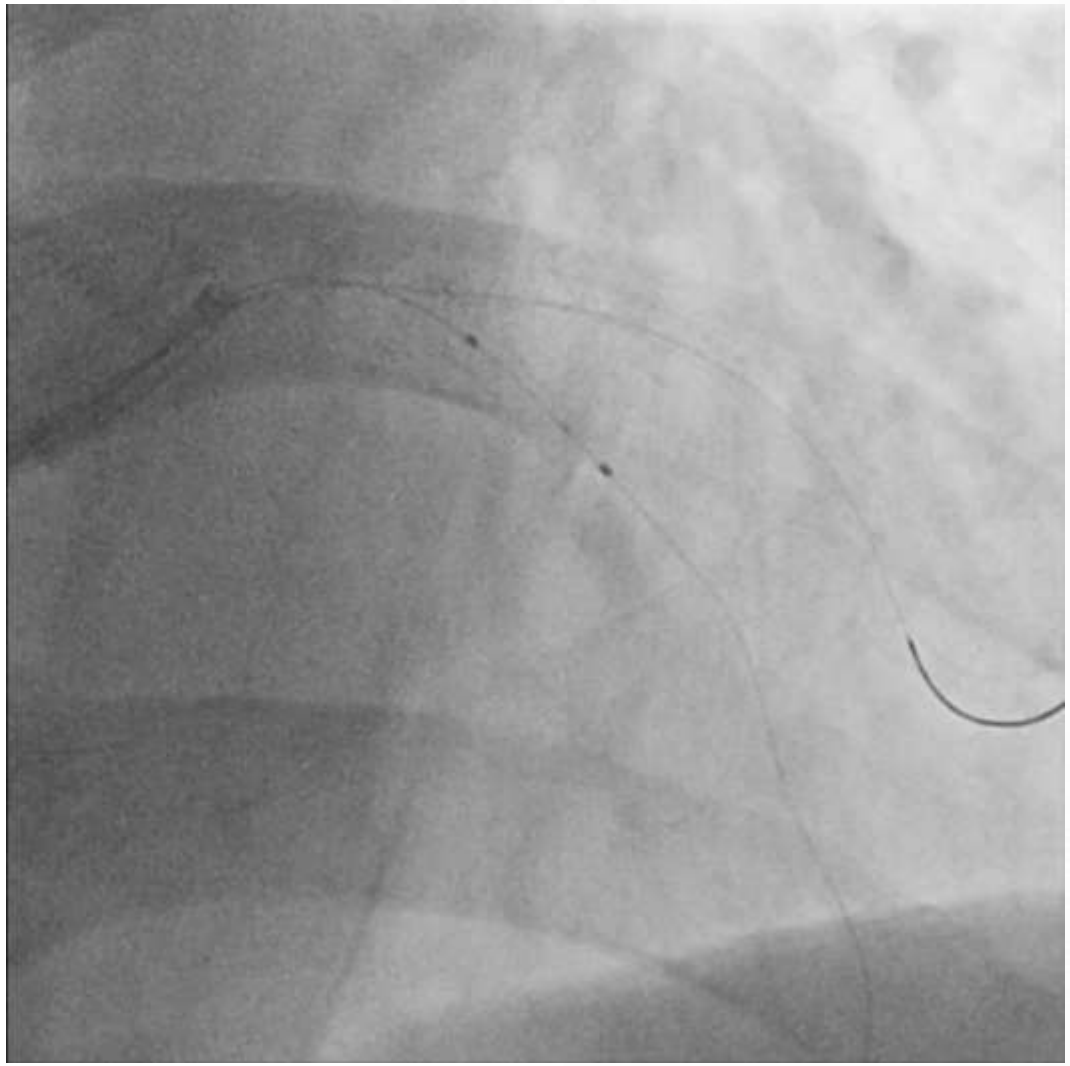


3.25 x 28 mm Xience at nominal pressure
Followed by 3.5 x 15 mm NC Balloon upto 26 atm

Re-wiring & Balloon Passing



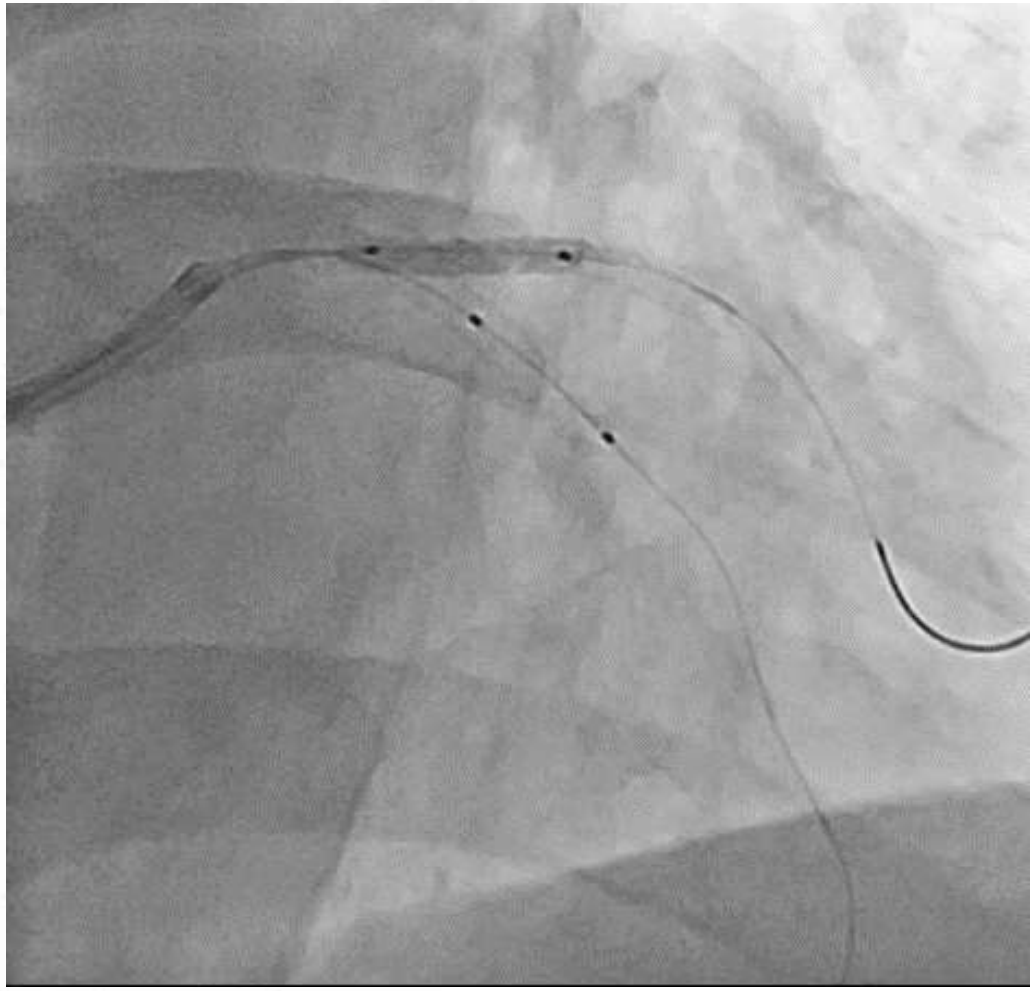
Used BMW wire



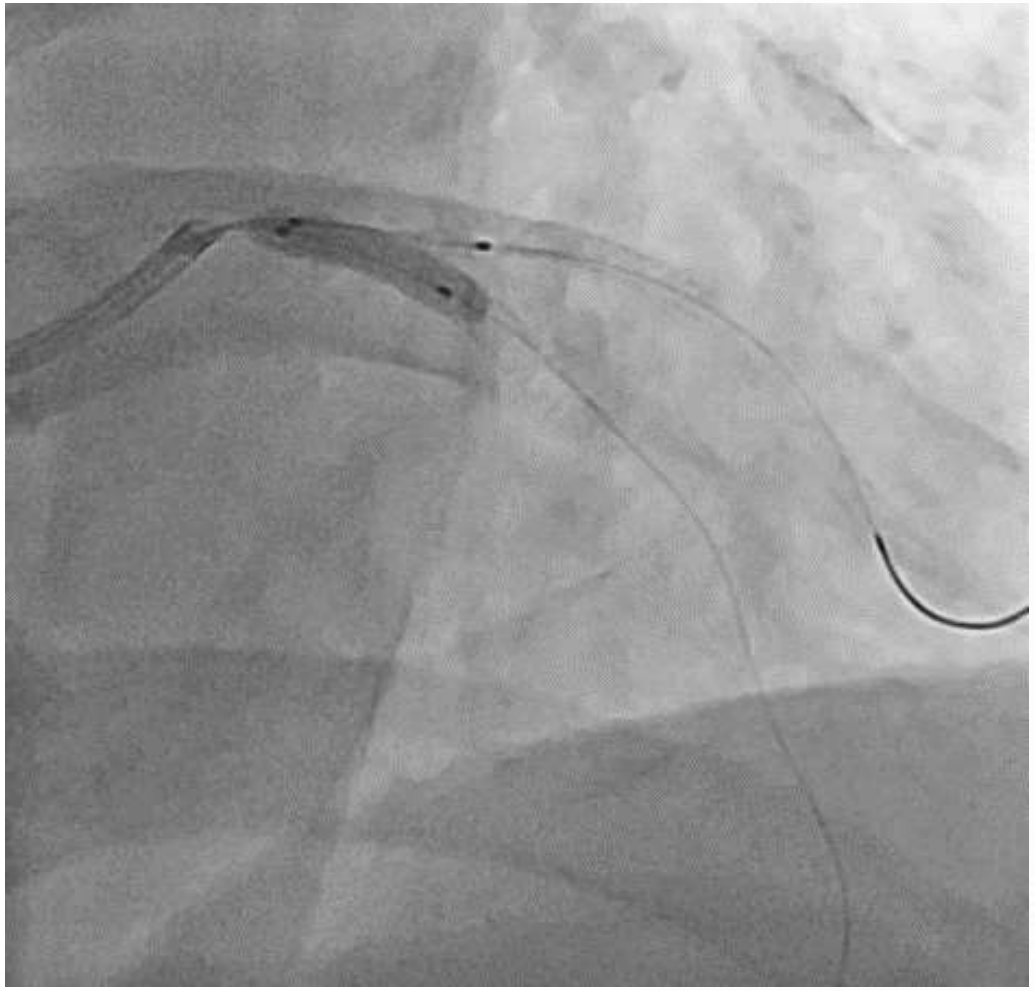
Used 2.75 mm NC balloon

Sequential High-pressure Balloon Inflation

: To Obtain Sufficient Stent Cross-sectional Area



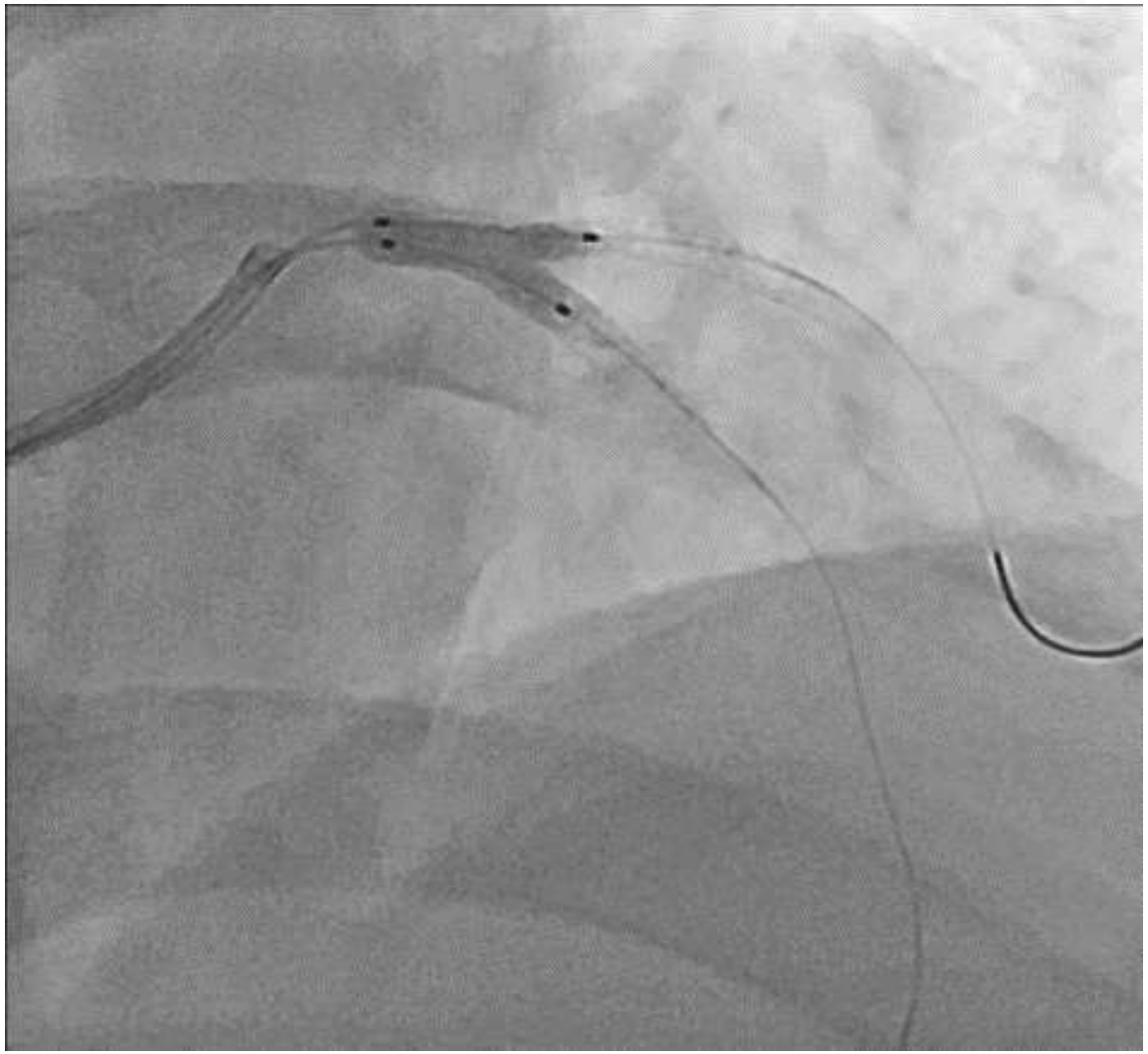
2.75 x 15 mm NC balloon upto 24 atm



3.5 x 15 mm NC balloon upto 28 atm

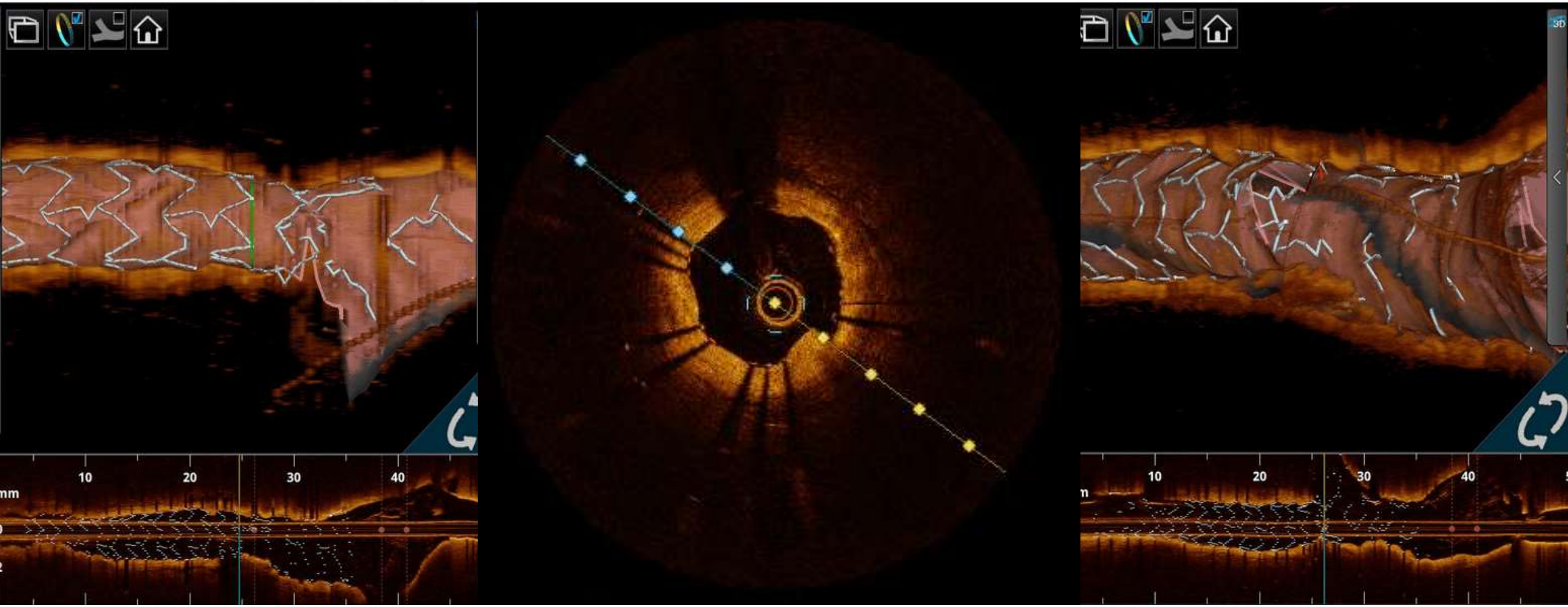
Final Kissing Balloon (No High Pressure Needed)

: To put the carina in the right place



2.75 & 3.5 mm NC at 8 atm

Imaging Surveillance & Further Optimization if needed



Imaging Optimization Criteria for non-LM Bifurcation

- Quantitative Criteria
  - To achieve larger post-stenting MSA
  - No universal cutoff value because of the various vessel size

- Qualitative Criteria
  - Complete scaffolding and coverage of the SB ostium
  - Good stent strut apposition to MV wall
  - Little to no stent struts just above or near the side branch ostium

Hong MK, et al. *J Interven Cardiol* 2010;23:54-59

Final Angiography

Summary : Two-stent in non-LM Bifurcation

- Avoid two-stent in most non-LM Bifurcation as possible.
- Intracoronary imaging is the key for the successful 2-stent technique.
- Achieve optimal imaging criteria (larger MSA, good stent apposition, minimal stent struts near SB ostium) should be achieved.
- Final imaging surveillance and correcting suboptimal results guarantee favorable long-term outcomes.