



INSTITUT  
CARDIOVASCULAIRE  
PARIS  
SUD

# Algorithm to choose between one versus two stents in bifurcation lesion

Bernard Chevalier, MD, FESC, FACC, FSCAI

ICPS Massy

France

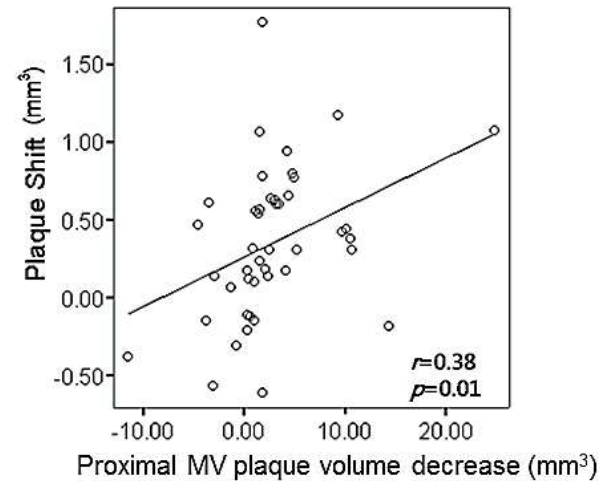
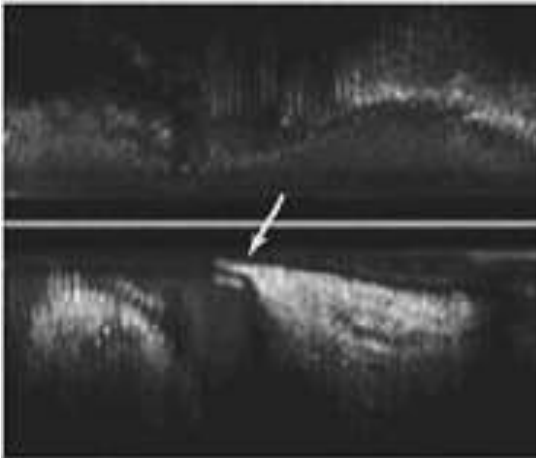
In the last five years , I received research grants or speaker fees or I am/was consultant for: Abbott Vascular, Biotronik, Colibri, Cordis, Daichi-Sankyo, Eli-Lilly, Medtronic, Terumo. I am currently minor shareholder & general director of CERC (CRO)

# Potential benefits of SB treatment

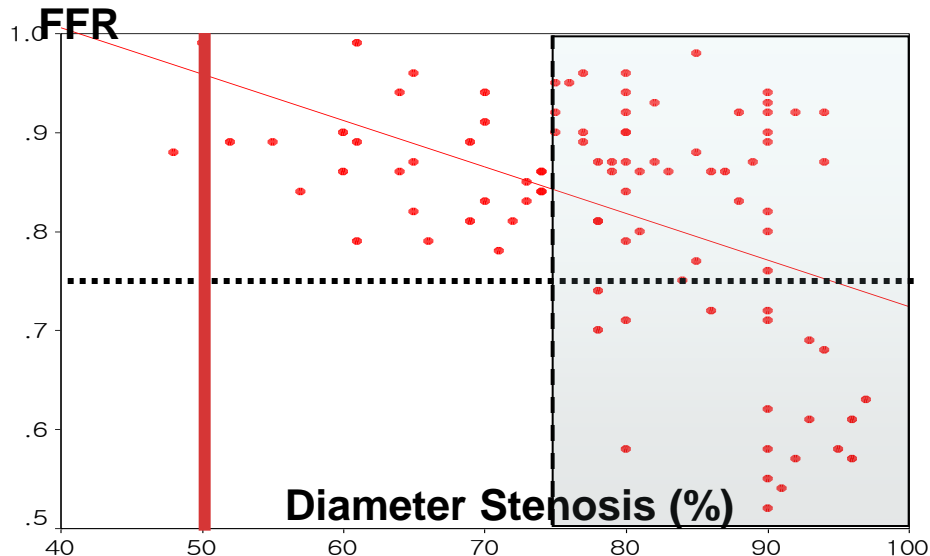
- Avoid peri-procedural occlusion → NonQ MI
- Relief of angina
- Keep access for future interventions

# Can we predict occlusion ?

- Two mechanisms
  - Spiky carena shift (De Lezo Eurointervention 2012)
  - Longitudinal plaque shift from proximal main vessel (Xu Circ CVI 2013)



# Can we predict angina relief?

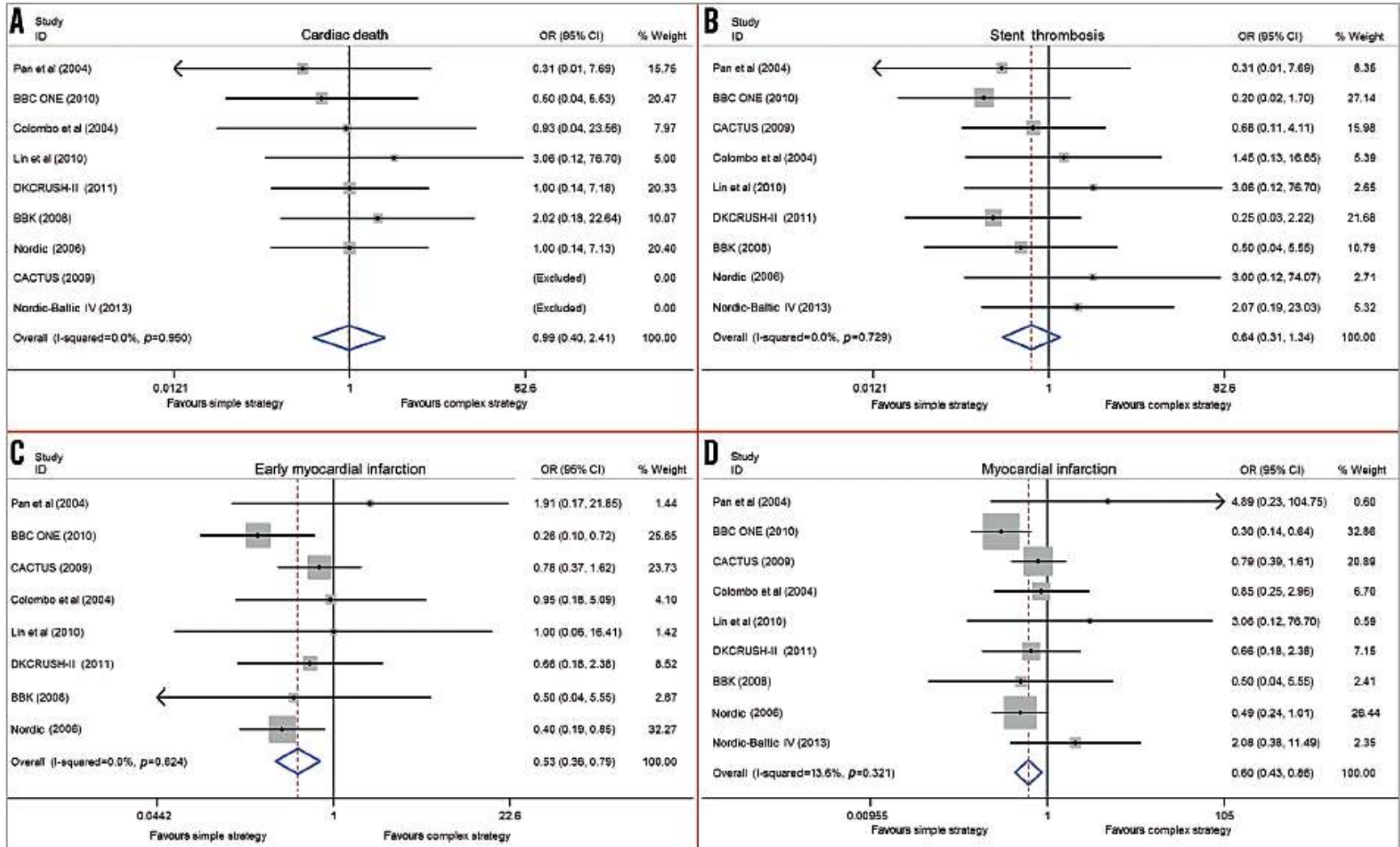


**The angio cut-off value for (jailed) side branches is 75% DS**

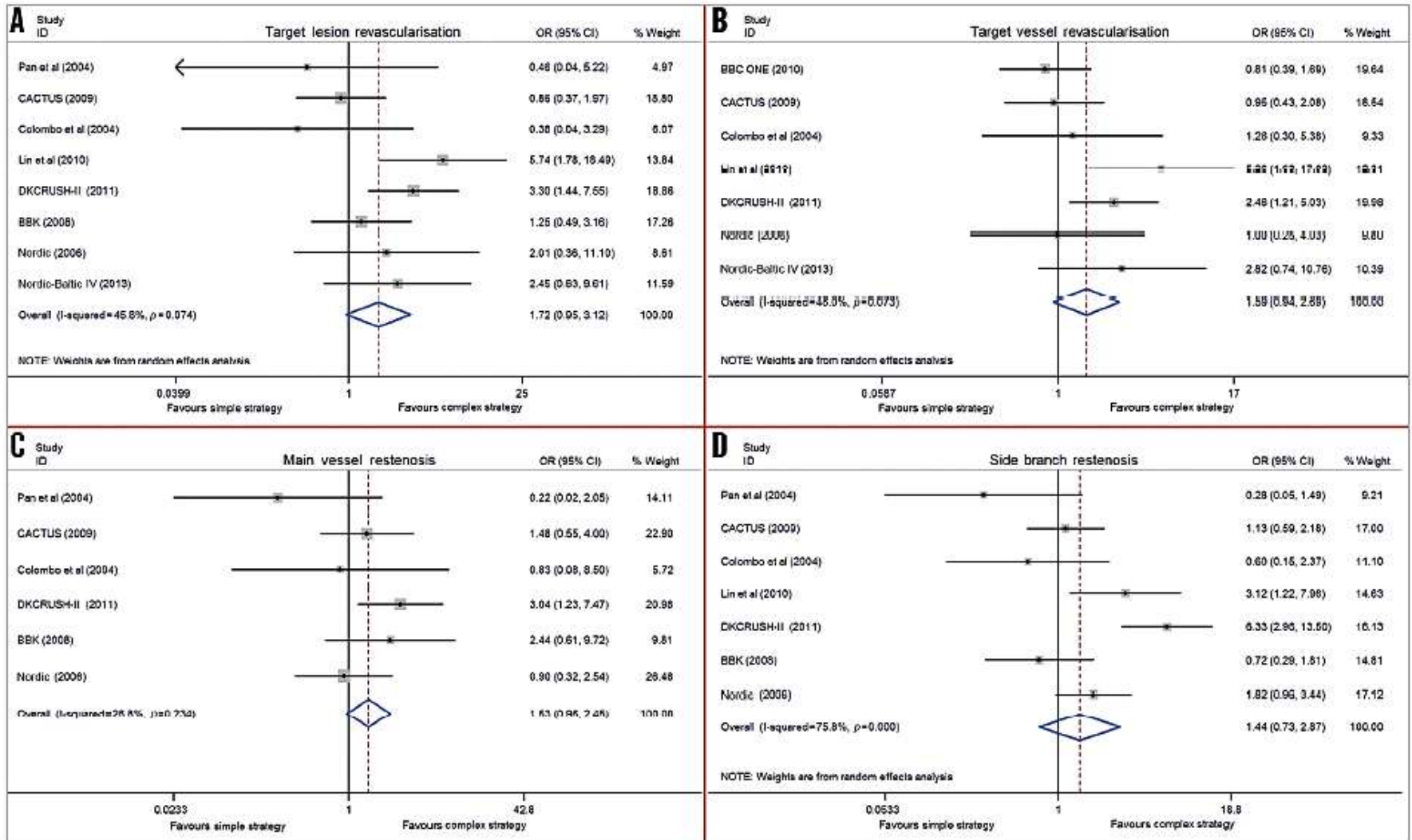
- DS < 75%: high NPV
- Reason:
  - radiographic artefact (white halo)
  - small branches, small myocardial mass, low flow
- Most likely idem with non-jailed SB
- Oedema ? Like at day one after IMA implantations

# Is second stent the solution?

# Safety

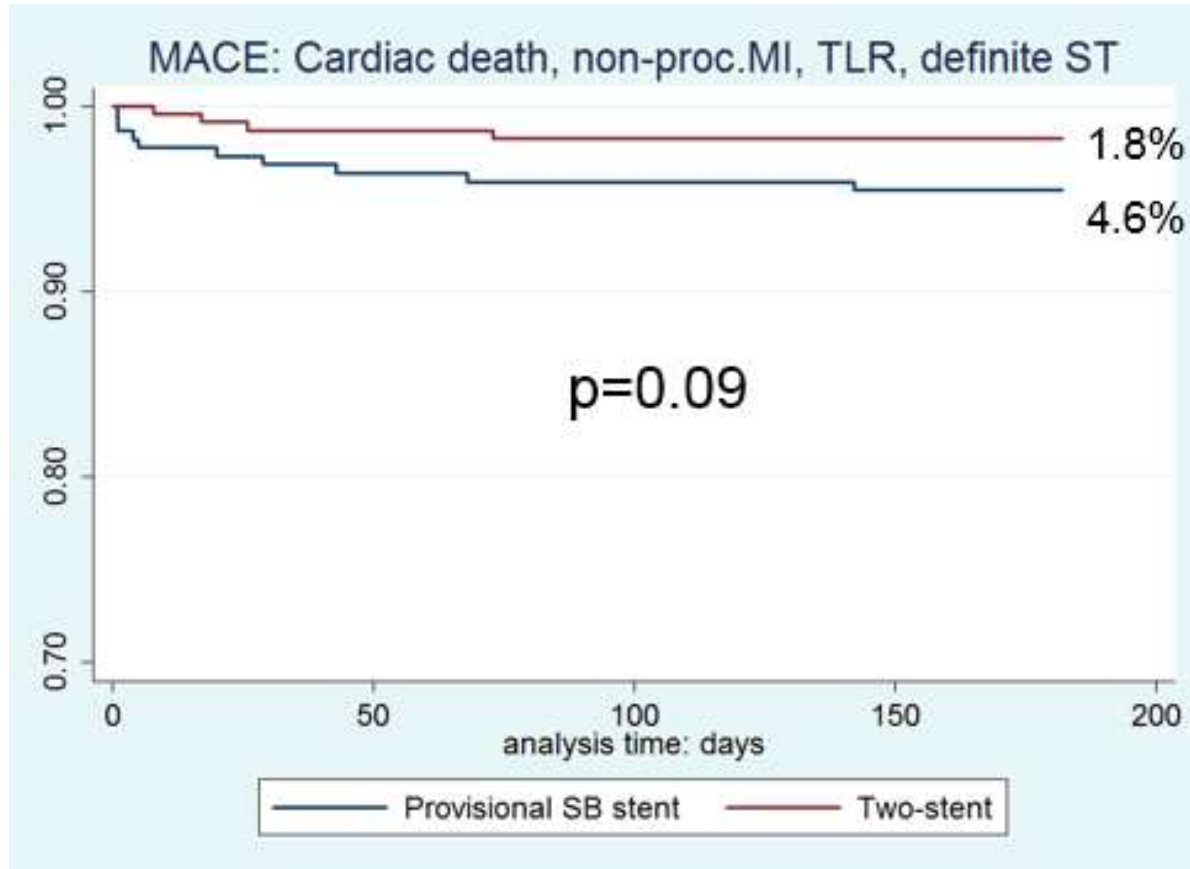


# Efficacy





# Nordic IV: 1,1,1 with SB > 2.75 mm



# Some answer @ EuroPCR 2015?

## EBC II trial



*Location: Room 252A*

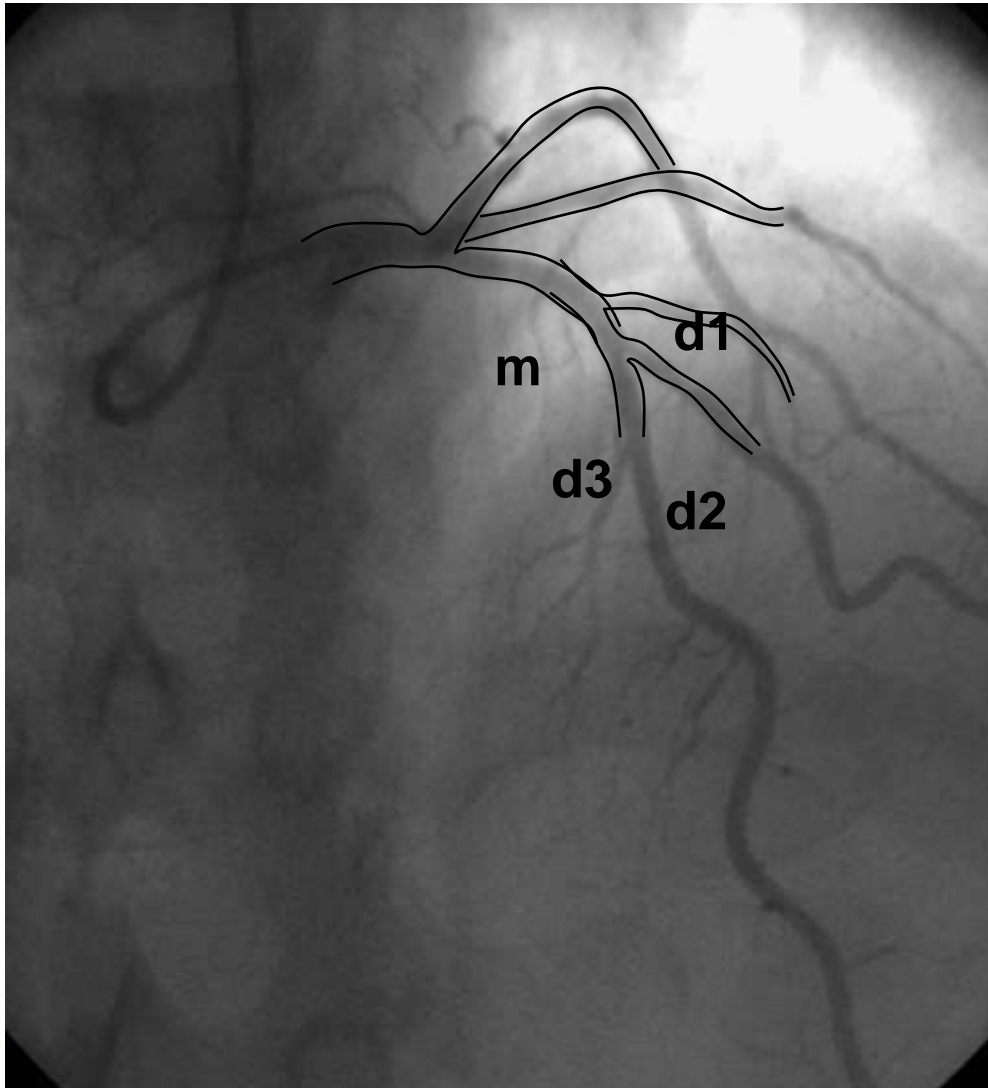
*Session type: Hot line*

*Topic: PCI*

13:47-13:54 • **A European bifurcation coronary study: a randomised comparison of provisional T-stenting versus a systematic 2-stent strategy in large calibre true bifurcations** *D. Hildick-Smith*

# Bifurcation lesion analysis

# Structure-function scaling laws of vascular trees



$$D_{\text{mother}}^3 = D_{\text{daughter 1}}^3 + D_{\text{daughter 2}}^3 + \dots$$

*Murray's law*

$$D_{\text{mother}} = 0.67^* (D_{\text{daughter 1}} + D_{\text{daughter 2}} + \dots)$$

*G. Finet*

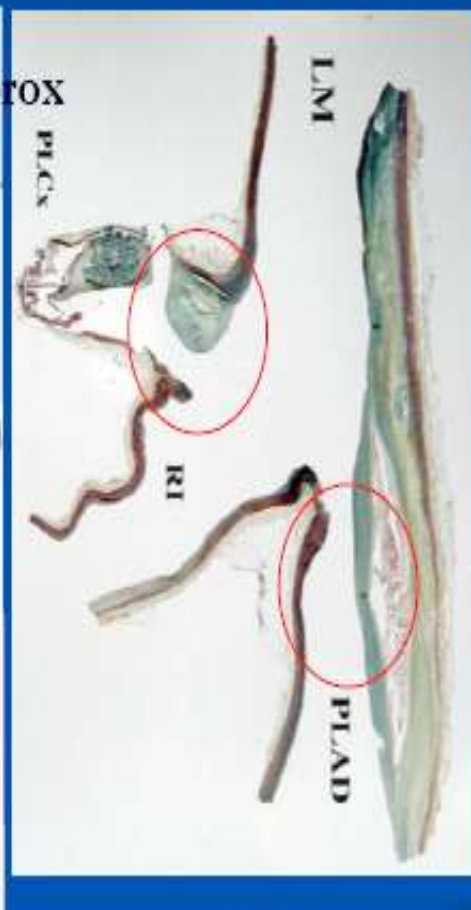
## Side Branch Lesion is Short

	Bestent <sup>1</sup>	TULIPE <sup>2</sup>	Sirolimus <sub>3</sub>	Sirolimus <sub>4</sub>
Patients (n)	105	187	85	47
Reference (mm)	2.7±0.4	2.3±0.5	2.1±0.3	2.1±0.5
Lesion length (mm)	5.6±4.2	3.7±3.3	5.3±4.2	4.5±3.0
Stenosis SB (%)	49±37	52±17	52±19	42±23

<sup>1</sup> Gobeil et al, Am J Cardiol 2001, <sup>2</sup> Lefèvre et al, Am J Cardiol 2003 (abst. supp.)

<sup>3</sup> Colombo et al, Circulation 2004; 109: 1244-9, Sengotuel et al, JACC 2004 (abst.supp.)

# Lumen vs Plaque



# Practical key points

- Pre-intervention assessment:
  - Diameters
  - Angle
  - Plaque distribution (taking into account limitations of 2D angio imaging)
  - Decide which one is the distal side branch
- Mandatory to include these parameters as well as the global context of the patient in strategy making process

# Strengths of Provisional Approach

More simple

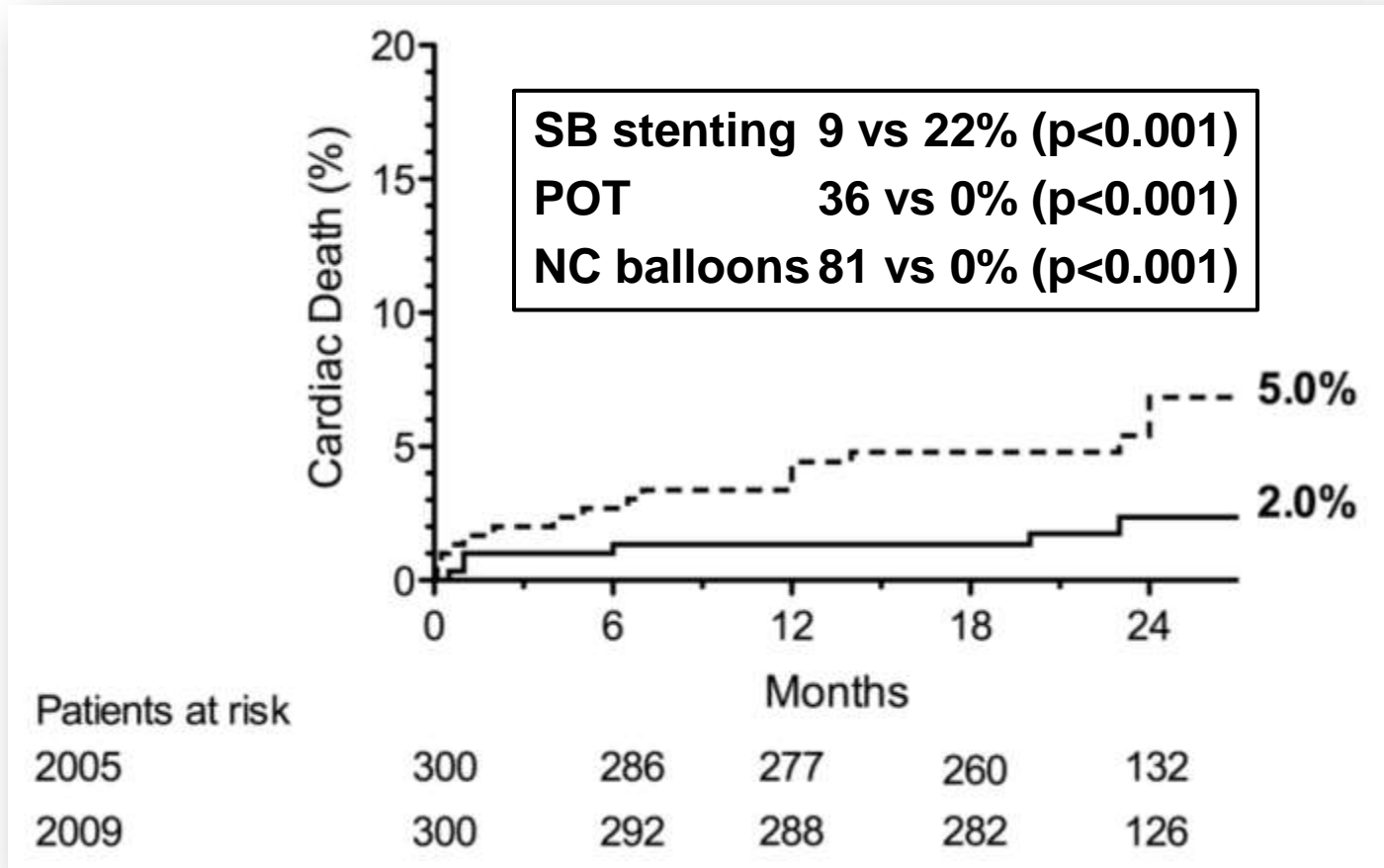
Appropriate technique provide good results

Minimise caging (better rheology)



# Provisional SB stenting ICPS (2009 vs 2005)

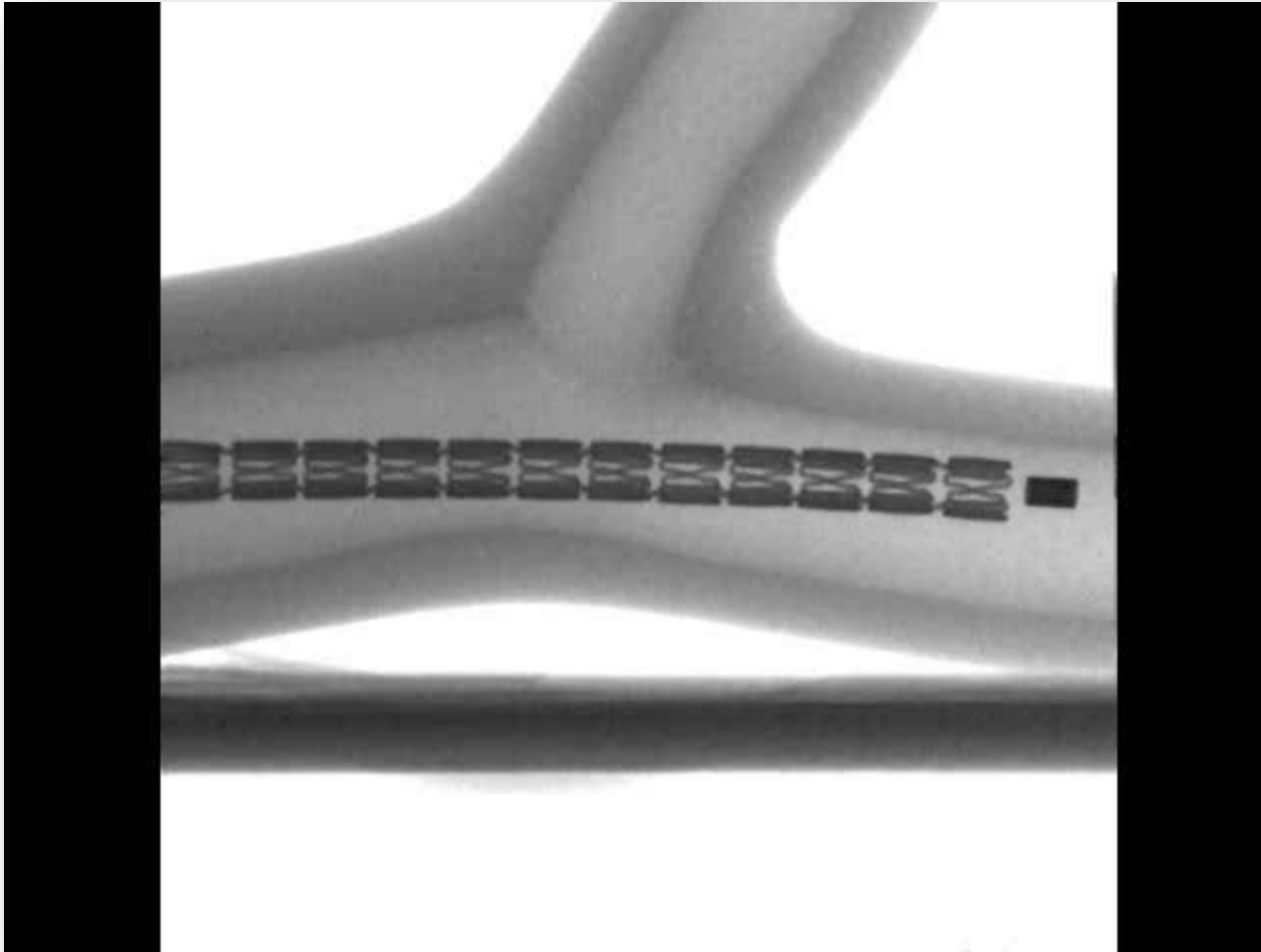
## 2-years Outcome



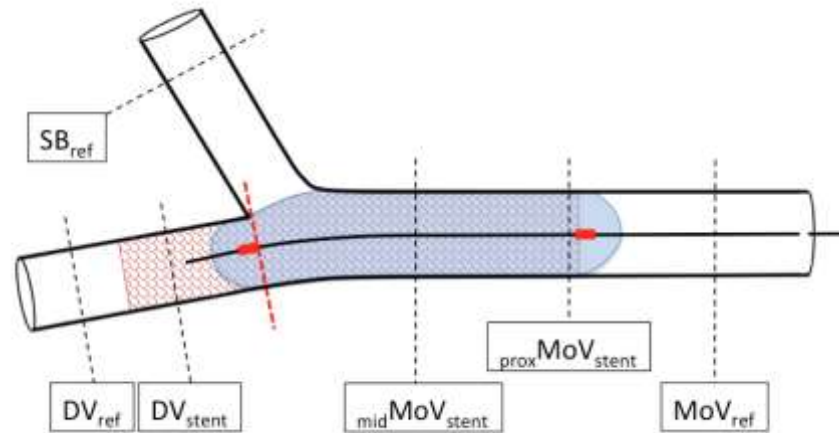
# Key points for one stent

- No SB predil
- POT

# Proximal Optimisation Technique



*Kissing balloon post dilatation + POT (Kaname<sup>R</sup>)*



NC Balloon

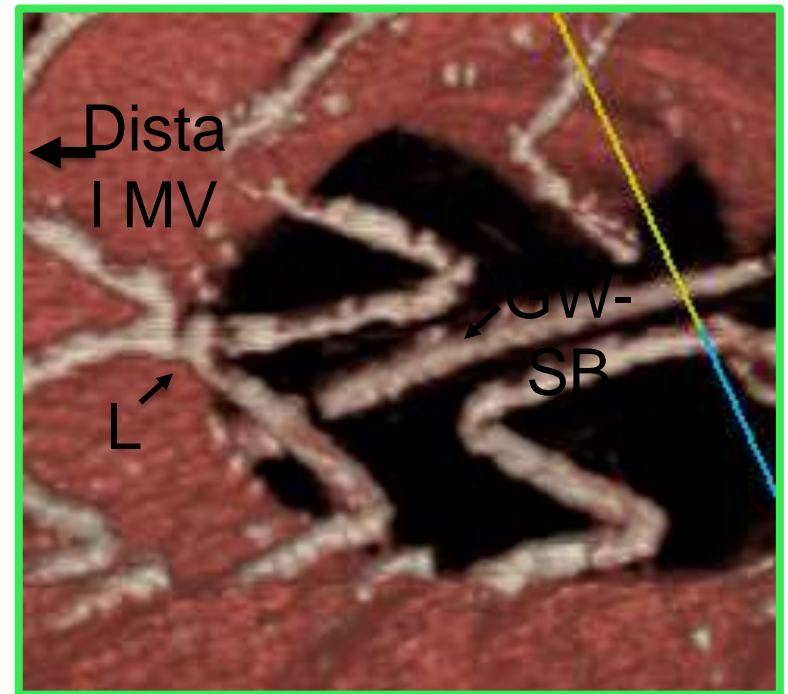
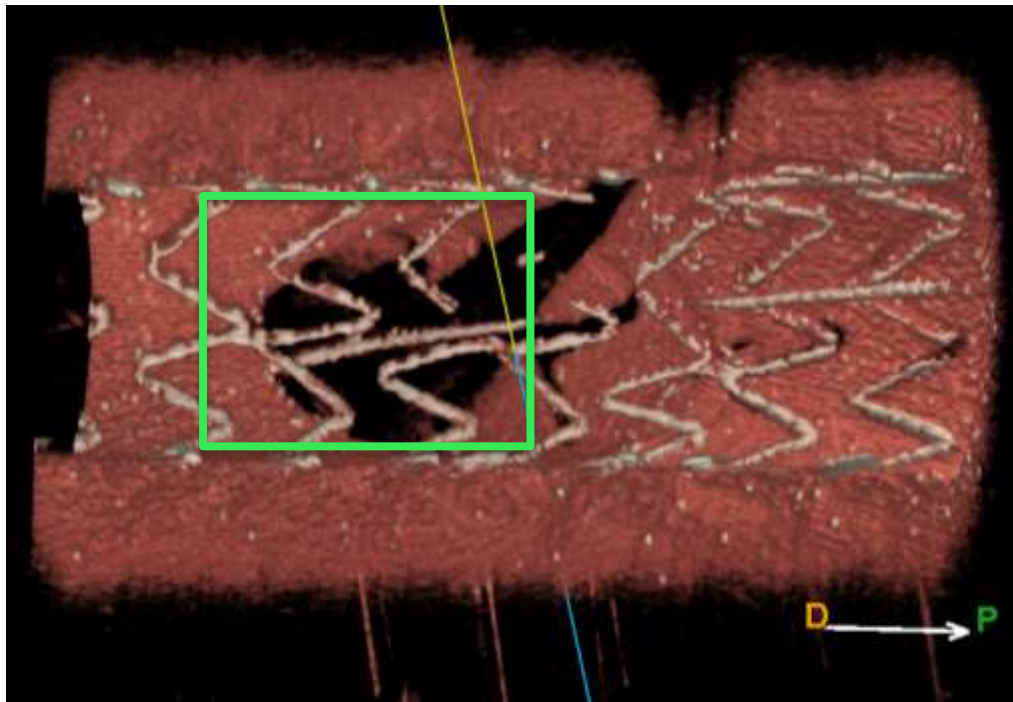
Sized to proximal reference (1:1)

Distal marker at carena level.

# Key points for one stent

- No SB predil
- POT
- Distal cell recrossing

3D-OFDI with Stent enhancement enable us to verify recrossing wire position.



### Abbreviation

MV: Main Vessel

SB: Side Branch

GW: Guidewire

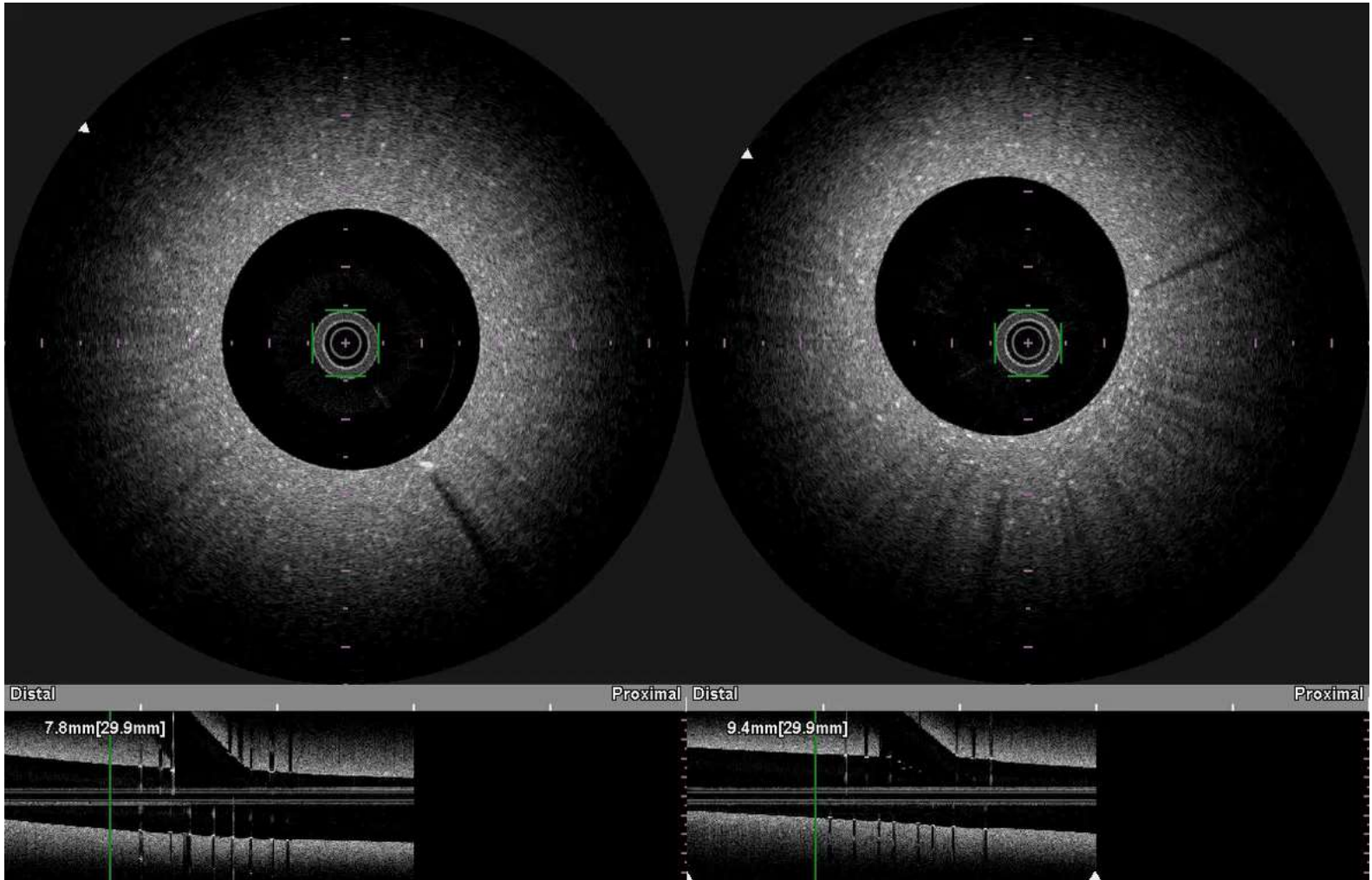
L: Link between cell

OFDI image from Internal bench test.

Courtesy of Terumo

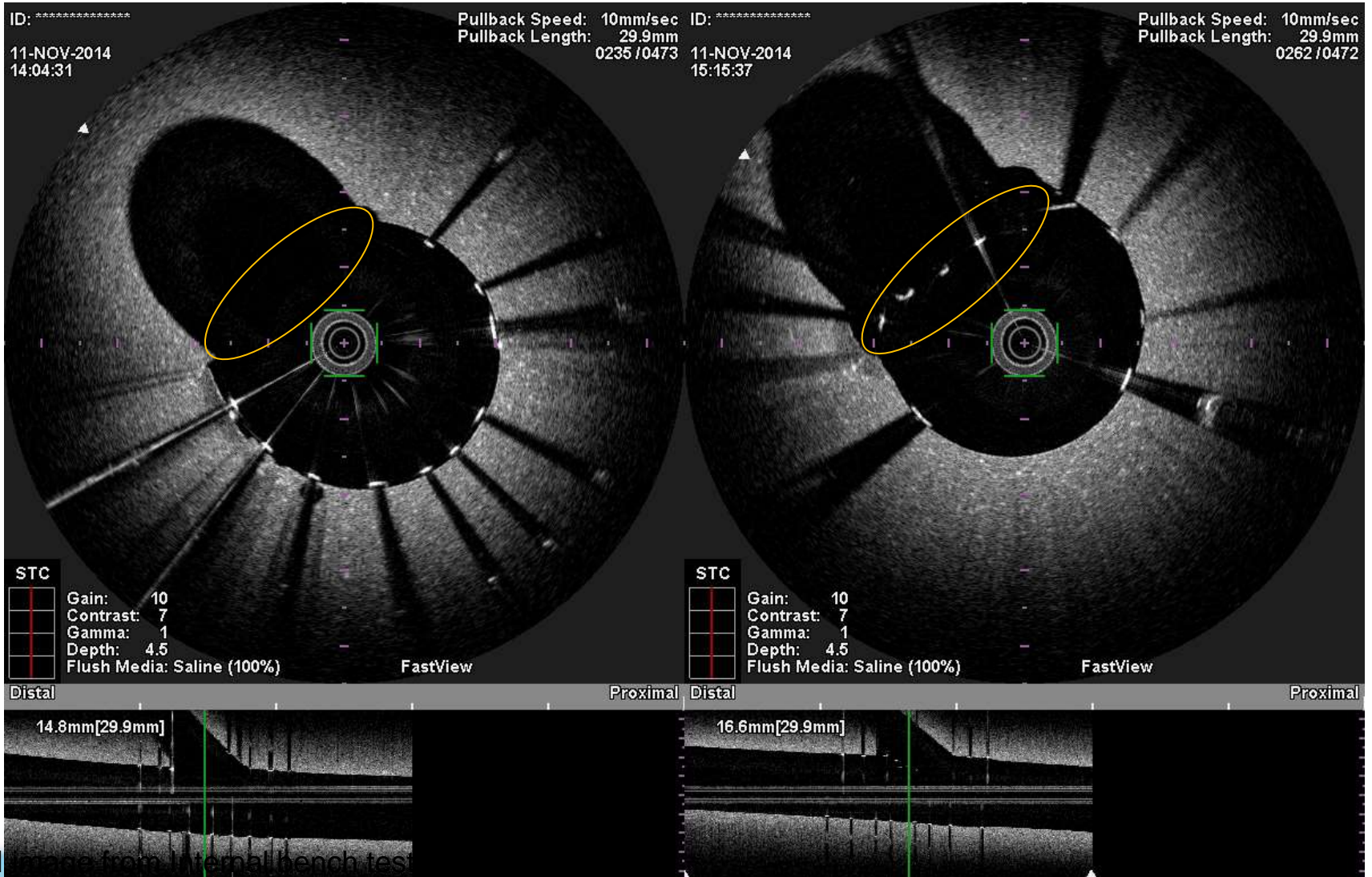
Recrossing wire through **distal** cell.

Recrossing wire through **proximal** cell.



# Recrossing wire through distal cell.

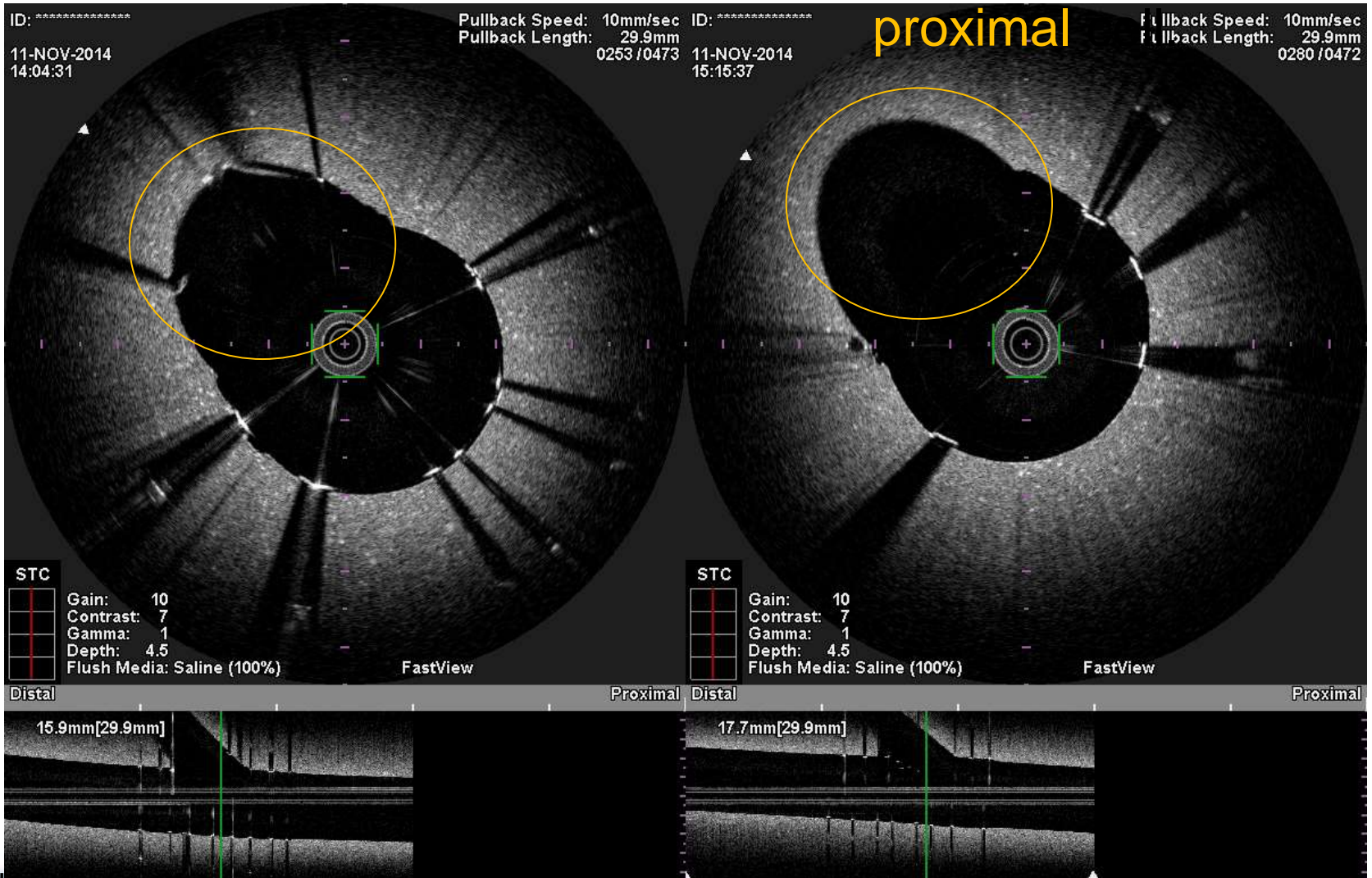
# Recrossing wire through proximal cell.





# Recrossing wire through distal cell.

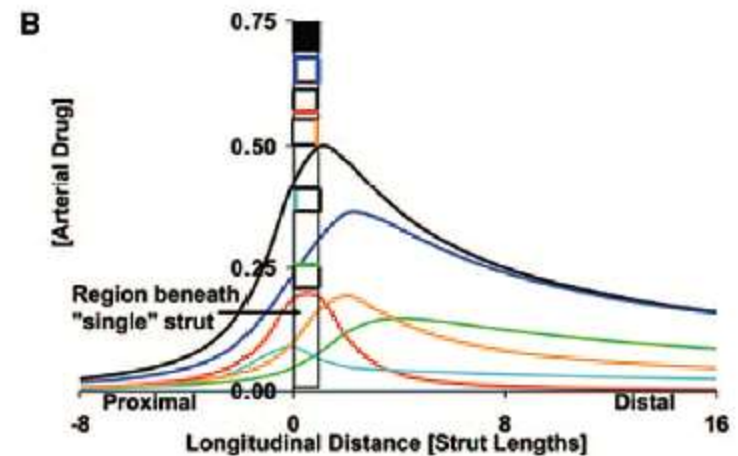
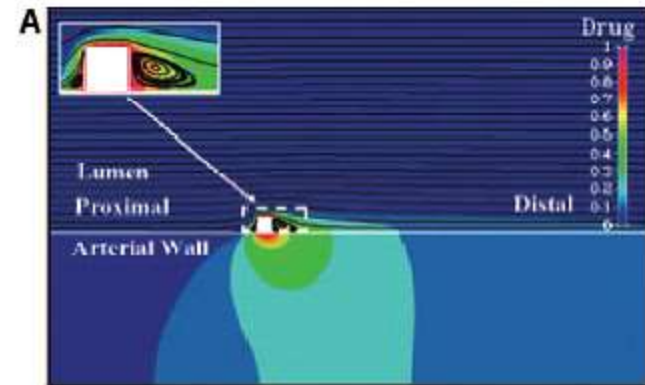
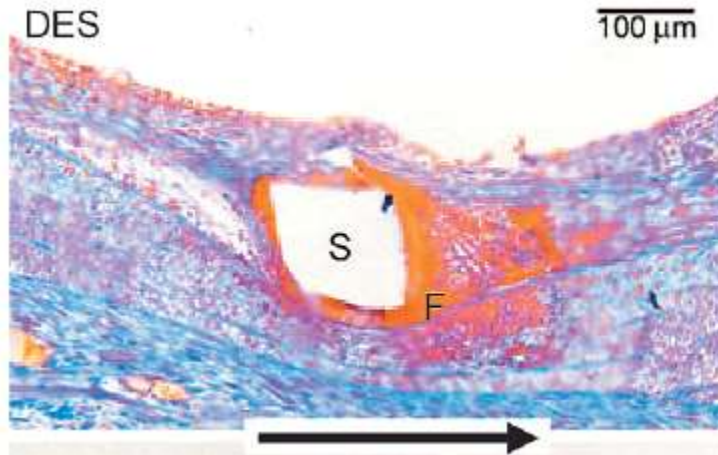
# Recrossing wire through proximal



# Elution from MB to SB

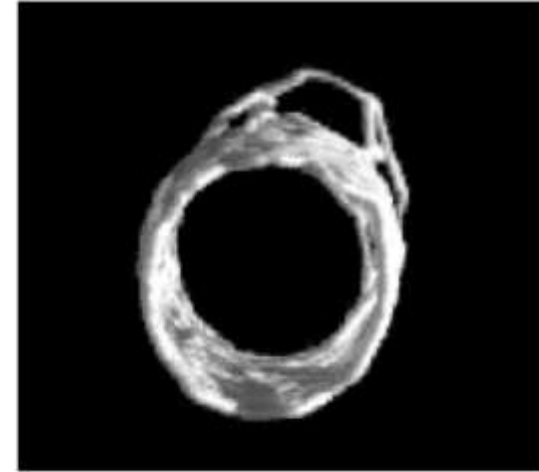
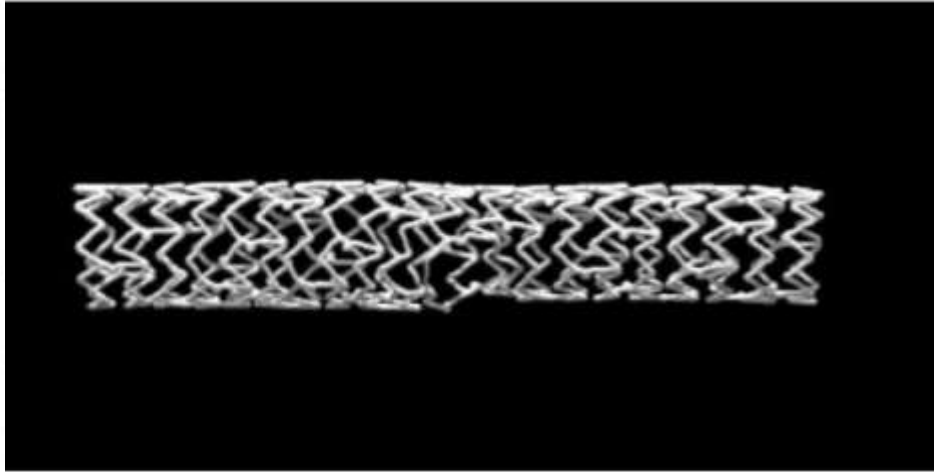
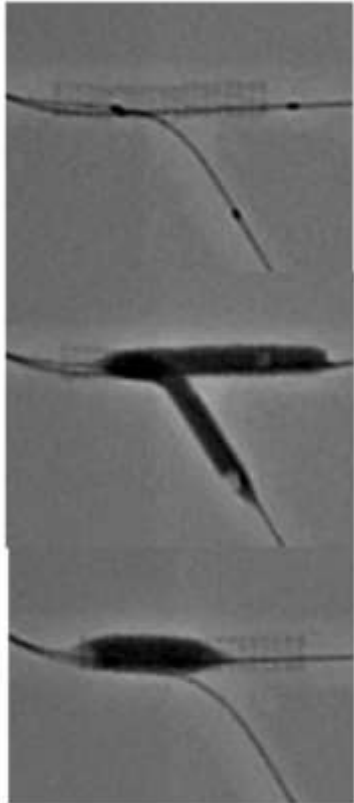
## Strut Position, Blood Flow, and Drug Deposition Implications for Single and Overlapping Drug-Eluting Stents

Brinda Balakrishnan, SB\*; Abraham R. Tzafiriri, PhD\*; Philip Seifert, MS; Adam Groothuis, MS;  
Campbell Rogers, MD; Elazer R. Edelman, MD, PhD



# Key points

- No SB predil
- POT
- Distal cell recrossing
- Modern KBT



NC Balloon

Short overlapping

Asymmetrical inflation:

12 atm SB then ↘ 4 atm puis 12 atm MB.

# EU Guidelines

has not yet been established. Variables to be considered are plaque distribution, size and downstream territory of each vessel (main and side branch), and the bifurcation angle. Stent implantation in the main vessel only, followed by provisional angioplasty with or without stenting of the side branch, seems preferable compared with routine stenting of both vessels. FFR data from side

# US guidelines : bifurcation

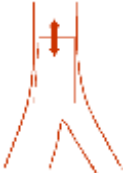



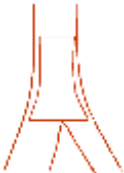

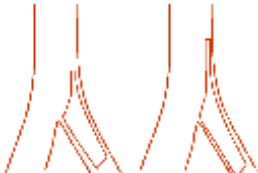

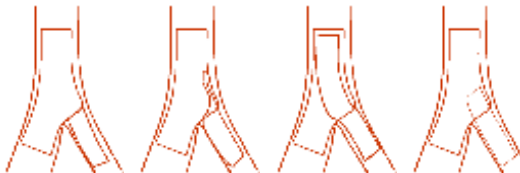
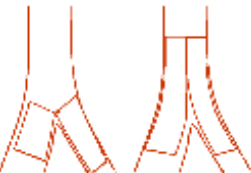

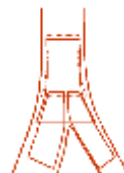
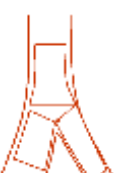
## **CLASS I**

1. 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 focal disease at the ostium (726–729).  
*(Level of Evidence: A)*

## **CLASS IIa**

1. 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 reaccess is low (730–733). *(Level of Evidence: B)*

When to start with 2 stent  
technique ?

	<b>M</b> Main prox. first	<b>A</b> Main Accross side first	<b>D</b> Distal first	<b>S</b> Side branch first
<b>1<sup>st</sup> stent</b>	 PM stenting	 MB stenting across SB	 DM stenting    Provisional SKS	 SB ostial stenting
<b>After balloon</b>	 Skirt	 MB stenting + SB balloon    MB stenting + kissing		 SB minicrush    SB crush
<b>2 stents</b>	 Skirt + DM    Skirt + SB	 Elective T stenting    Internal crush    Culotte    TAP	 V stenting    SKS	 Syst. T Stenting    Minicrush    Crush
<b>3 stents</b>	 Extended V		 Trouser legs and seat	



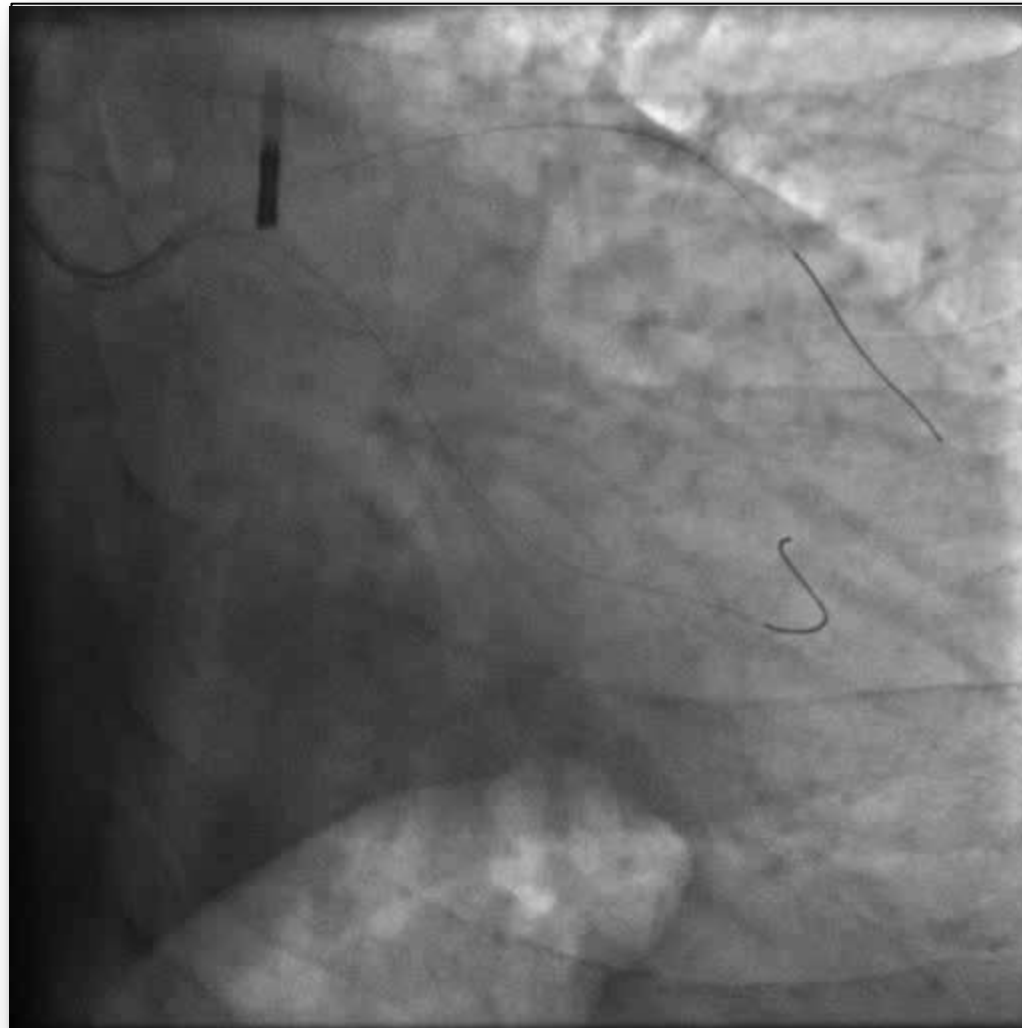
**Never**

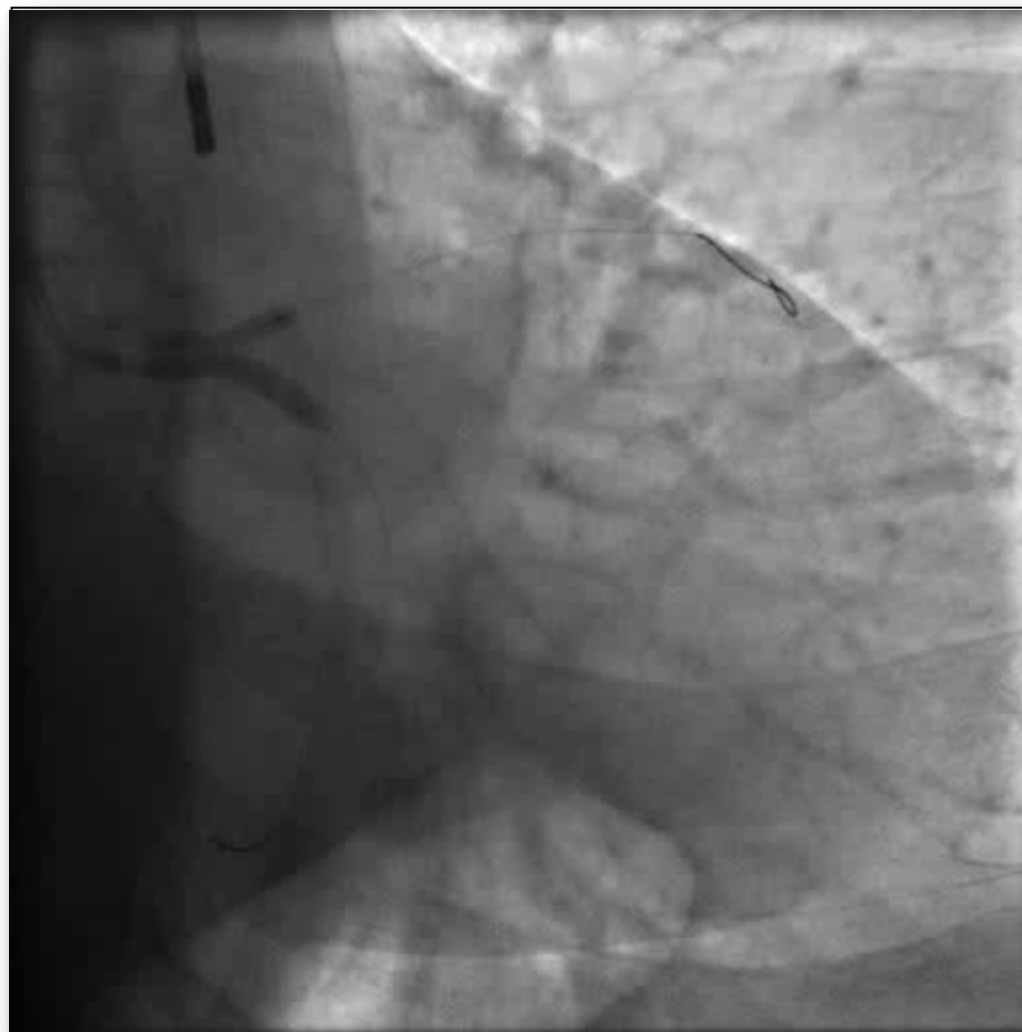
**Combination of 3 criteria**

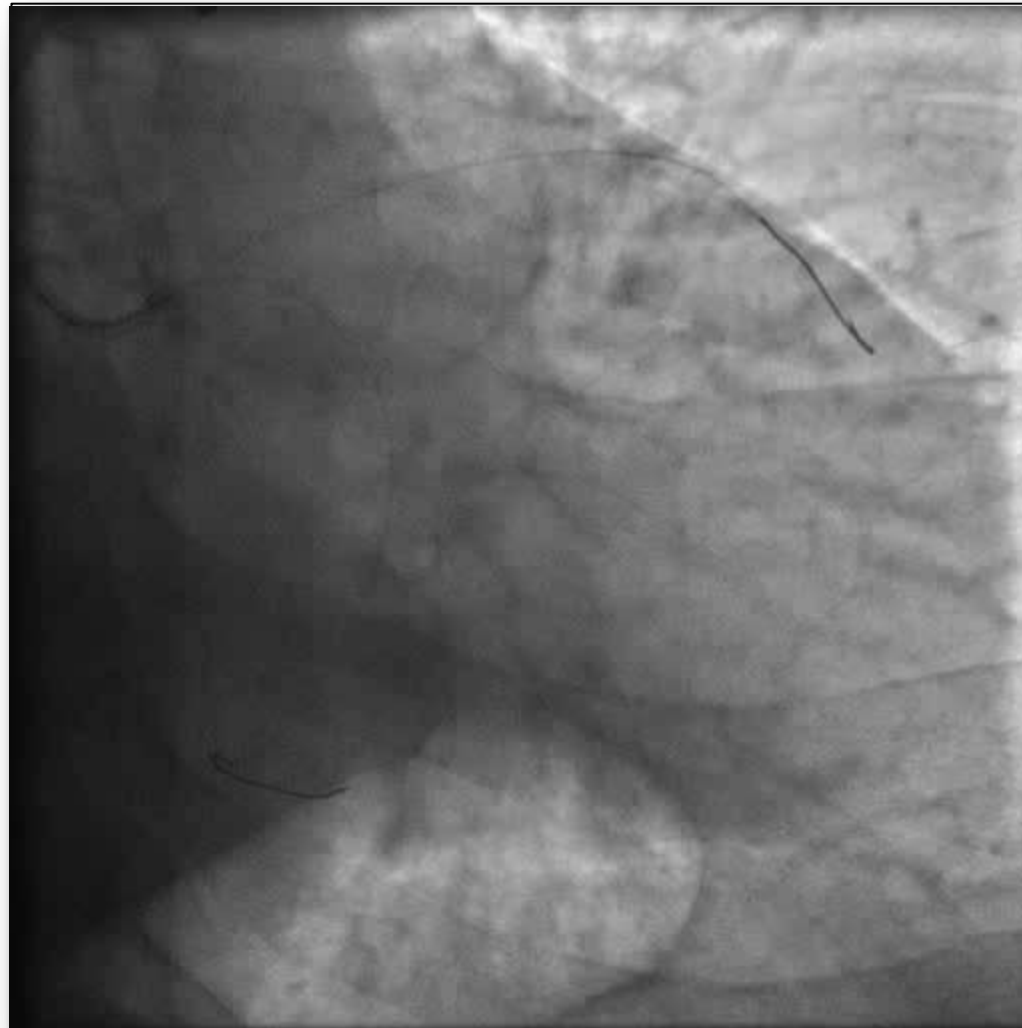
- XX1 Medina
- SB lesion length > 5 mm
- SB supplying a significant myocardium area with a diameter compatible for stenting (>2.25 mm)
- And when SB stenting could be difficult if not done firstfront
- Or when SB identification is unclear

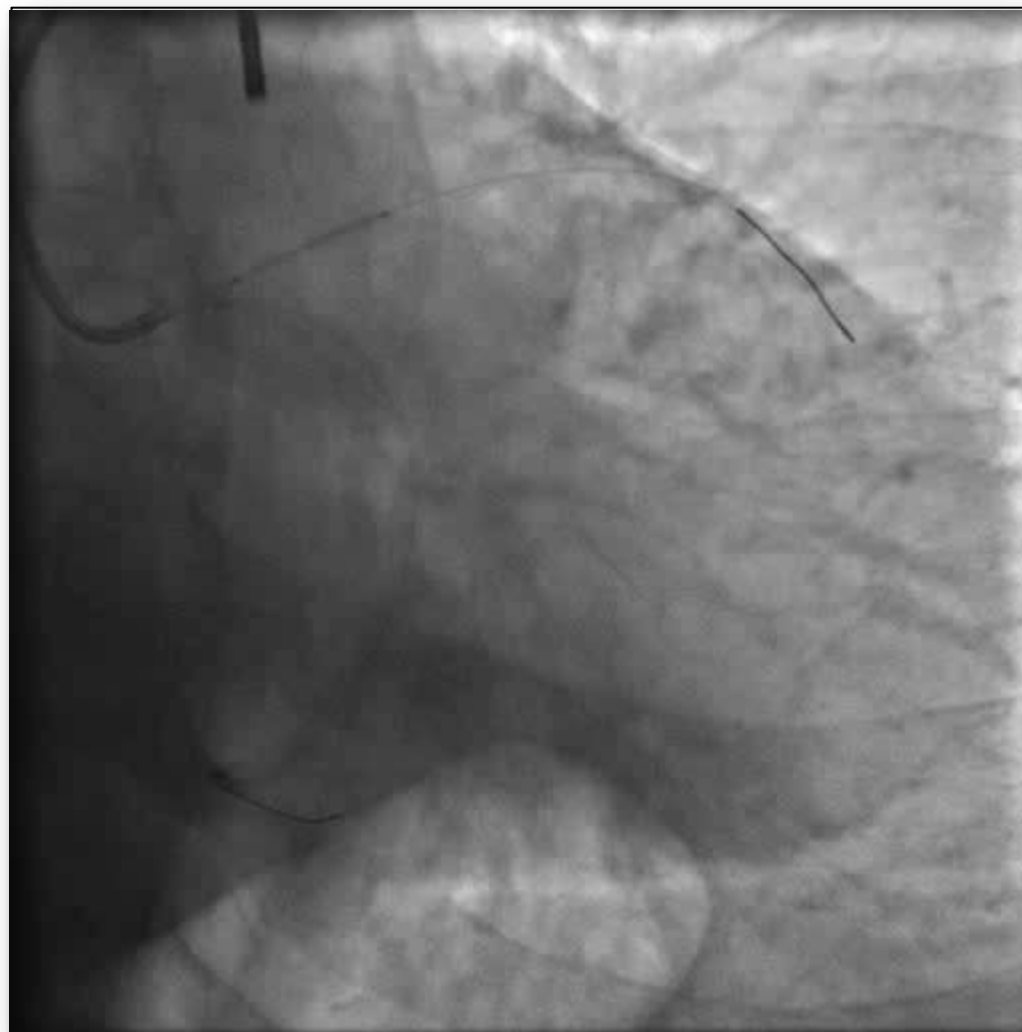






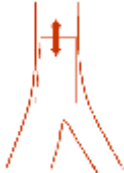









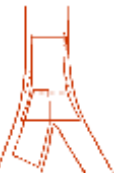




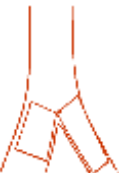




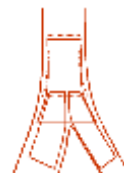





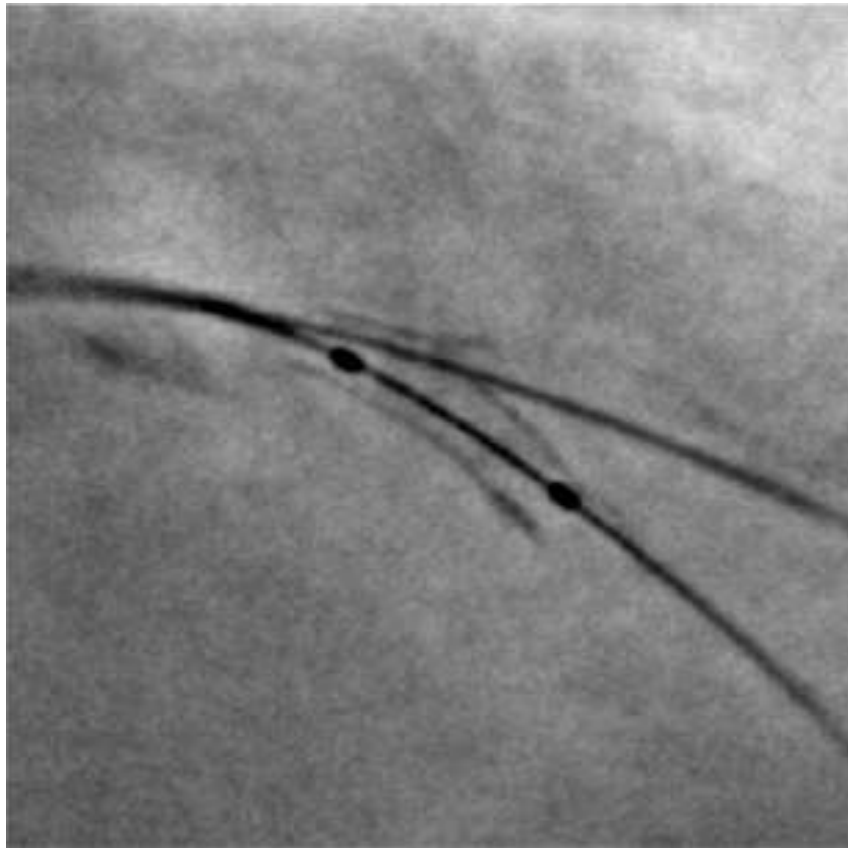




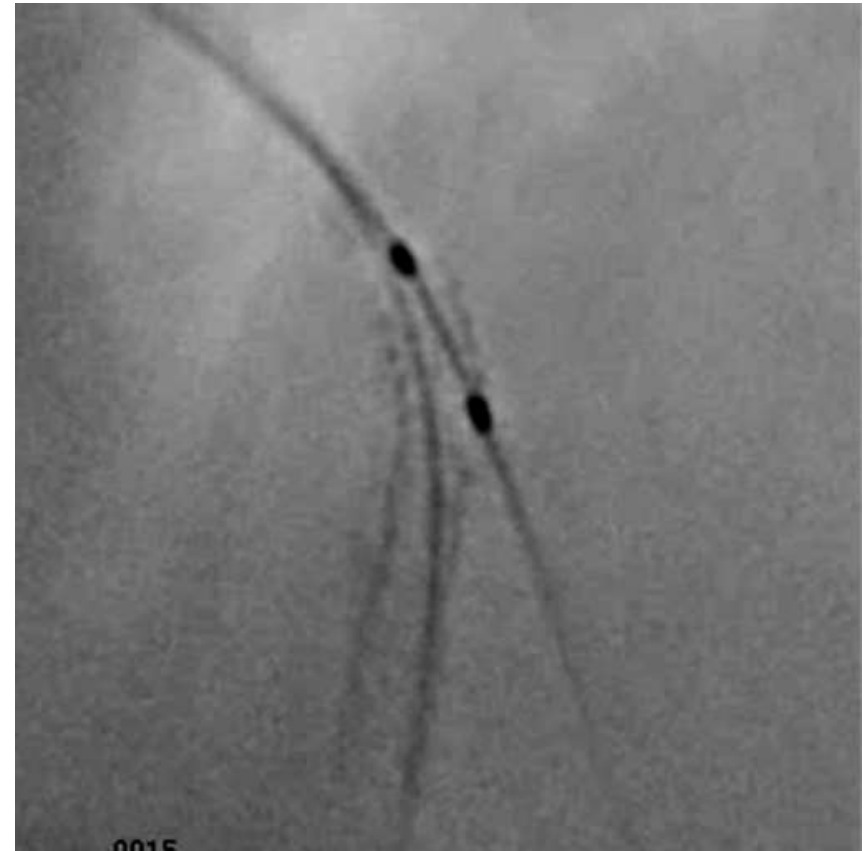


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<b>3 stents</b>	 Extended V		 Trouser legs and seat							

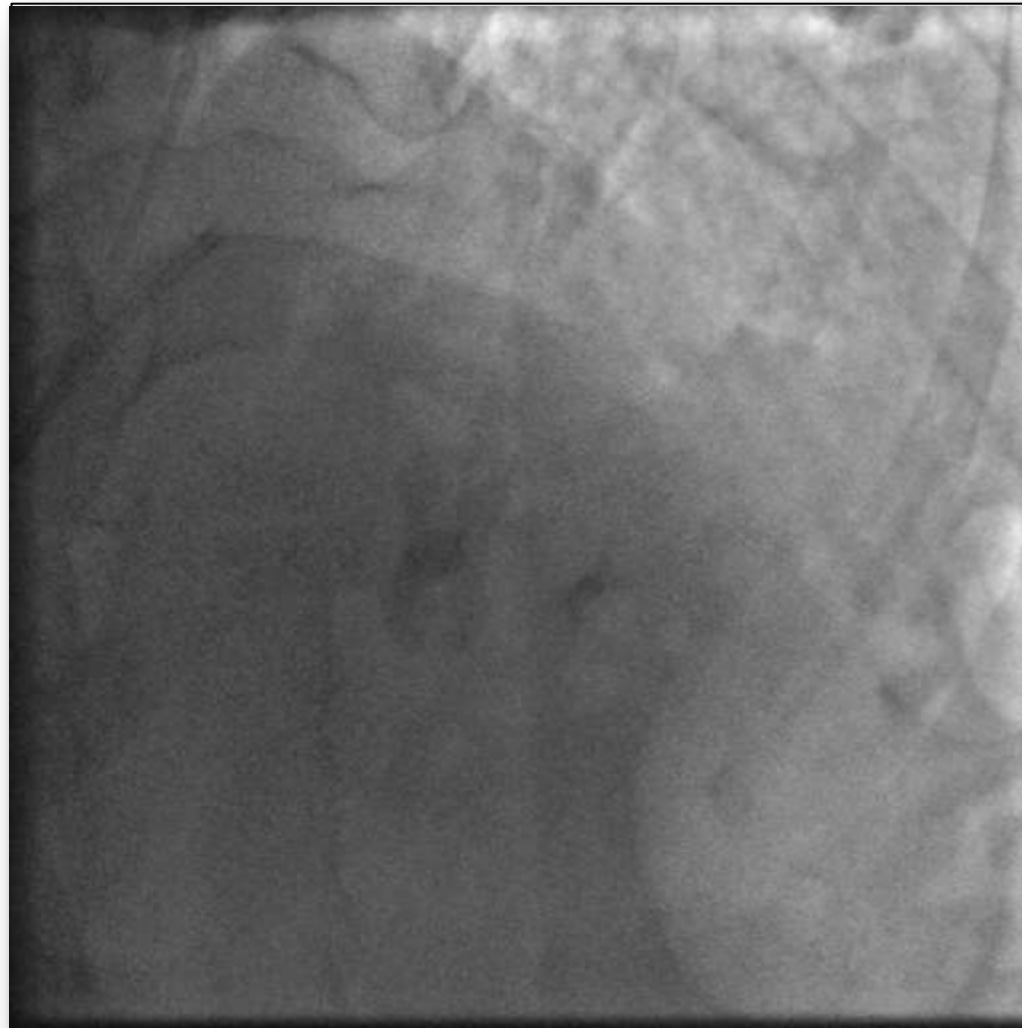
## T or TAP ? (stent boost)

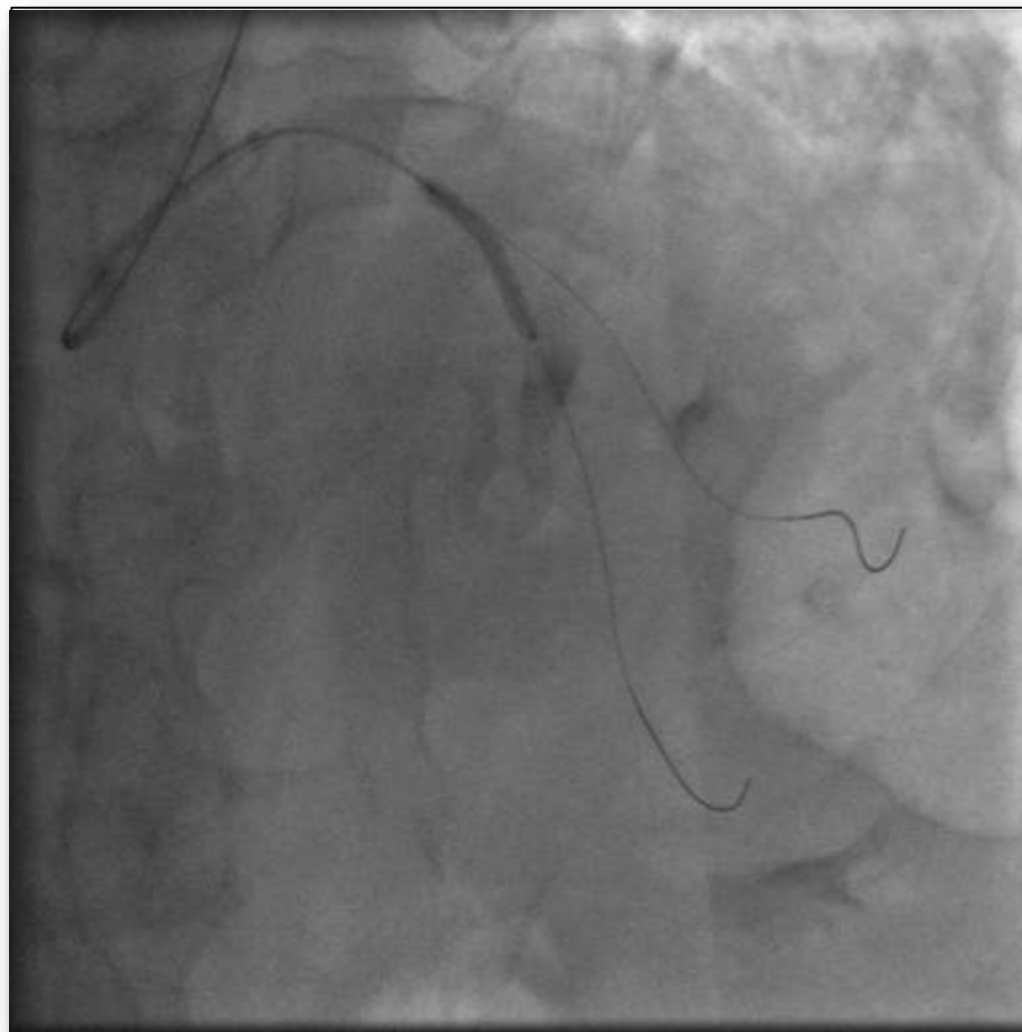


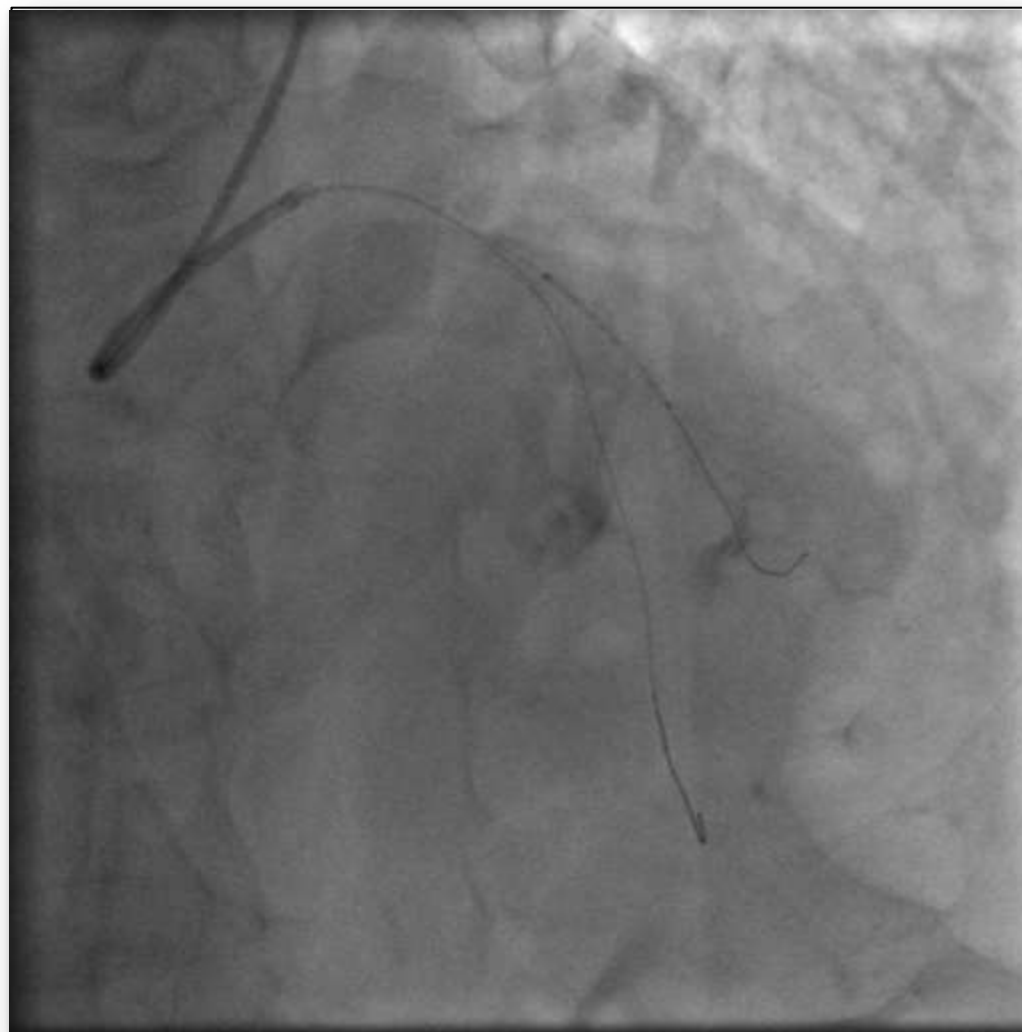
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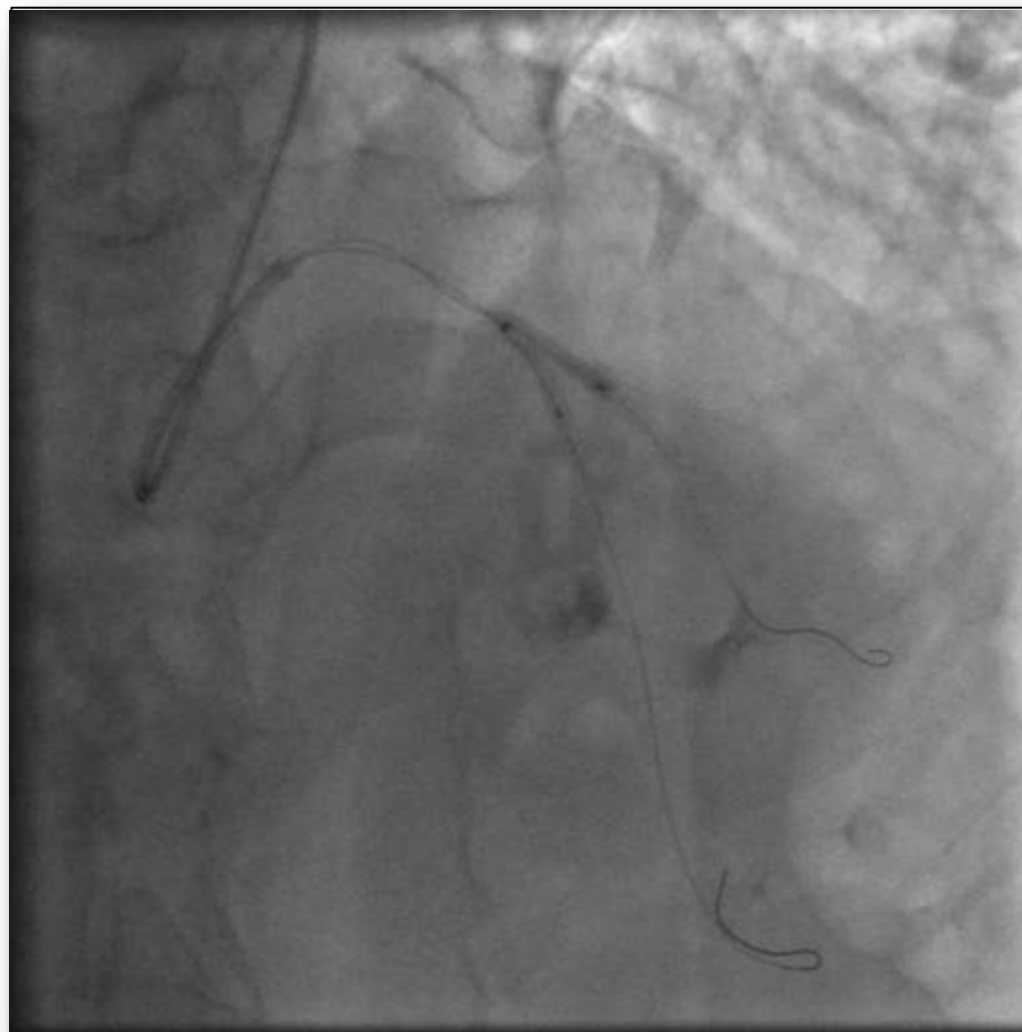


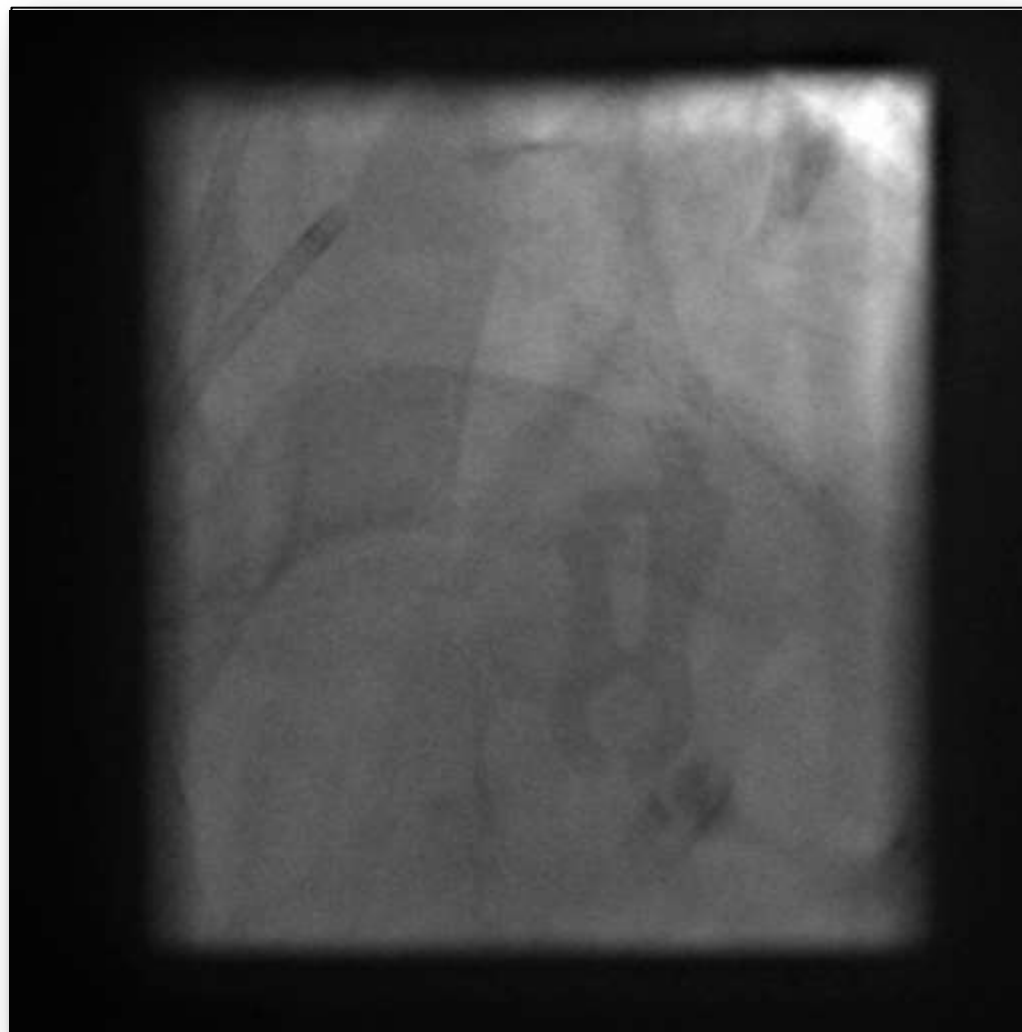
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TAP

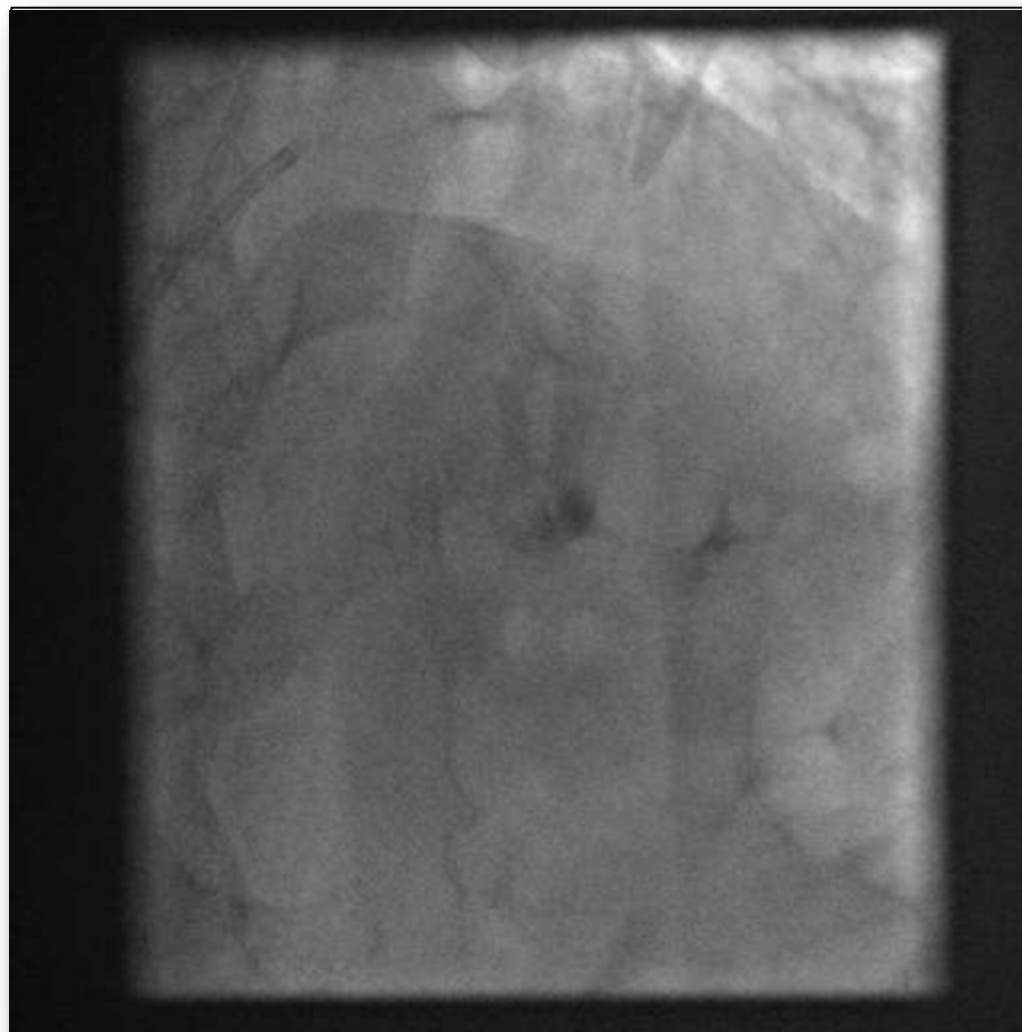




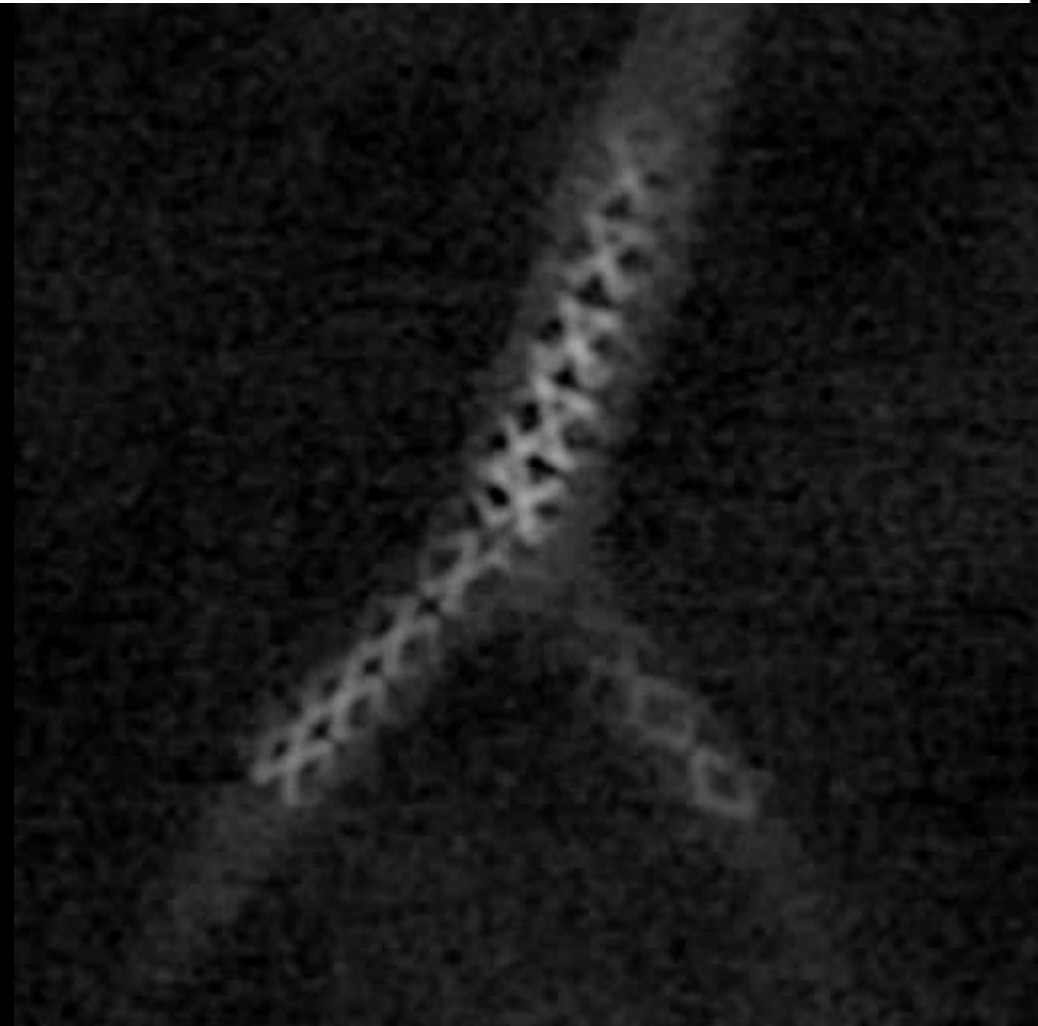












# Take home message

2 stent technique may be selected based on disease extension in large SB (>2.5 mm, >50%, >5 mm long)

Even in this situation, it is still possible to stent across first in majority of cases

A good one stent technique allows you to avoid two stents in 90% of cases