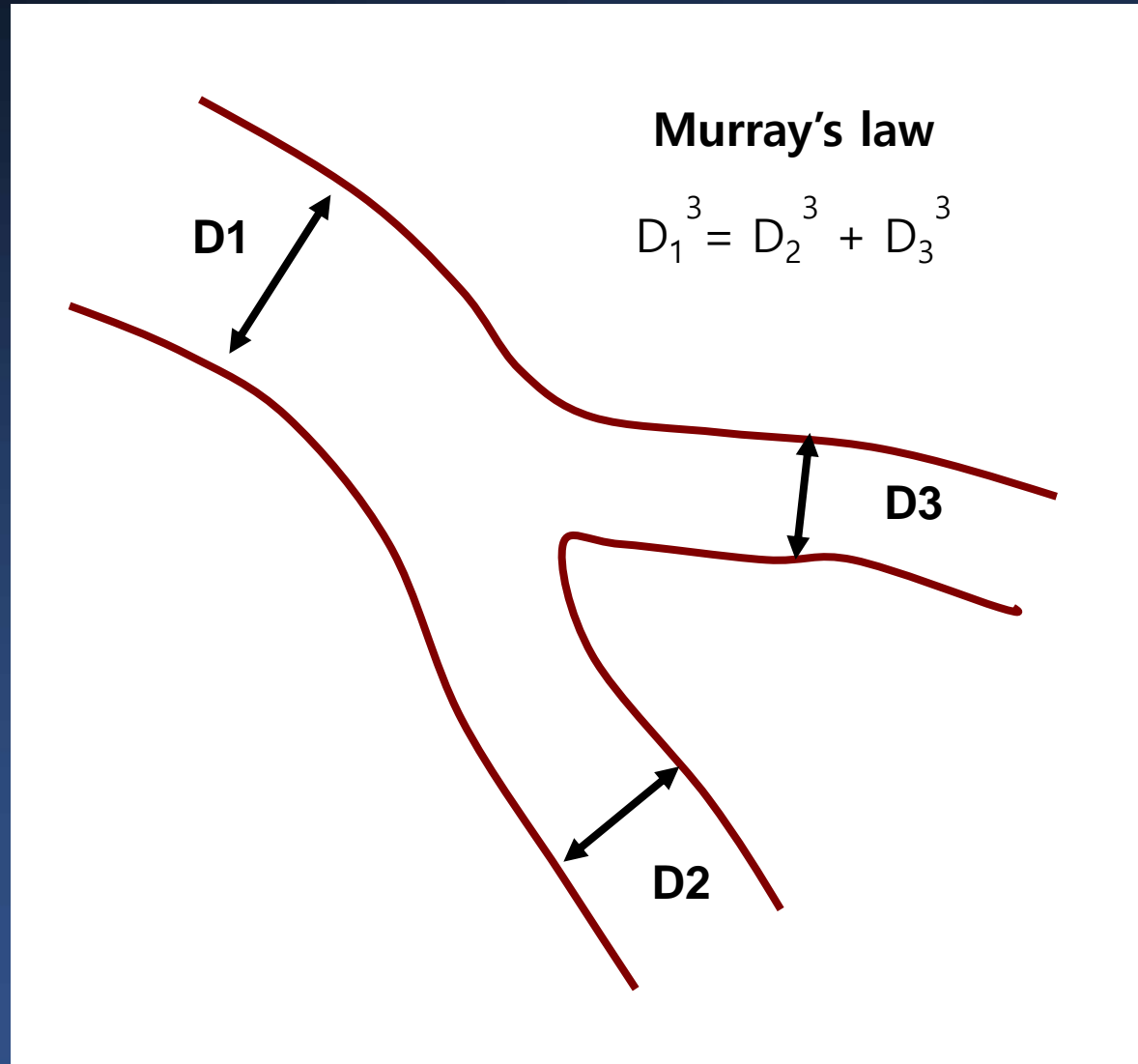# Bifurcation Master Class: Techniques A-to-Z

T. Lefèvre, ICPS, Massy, France
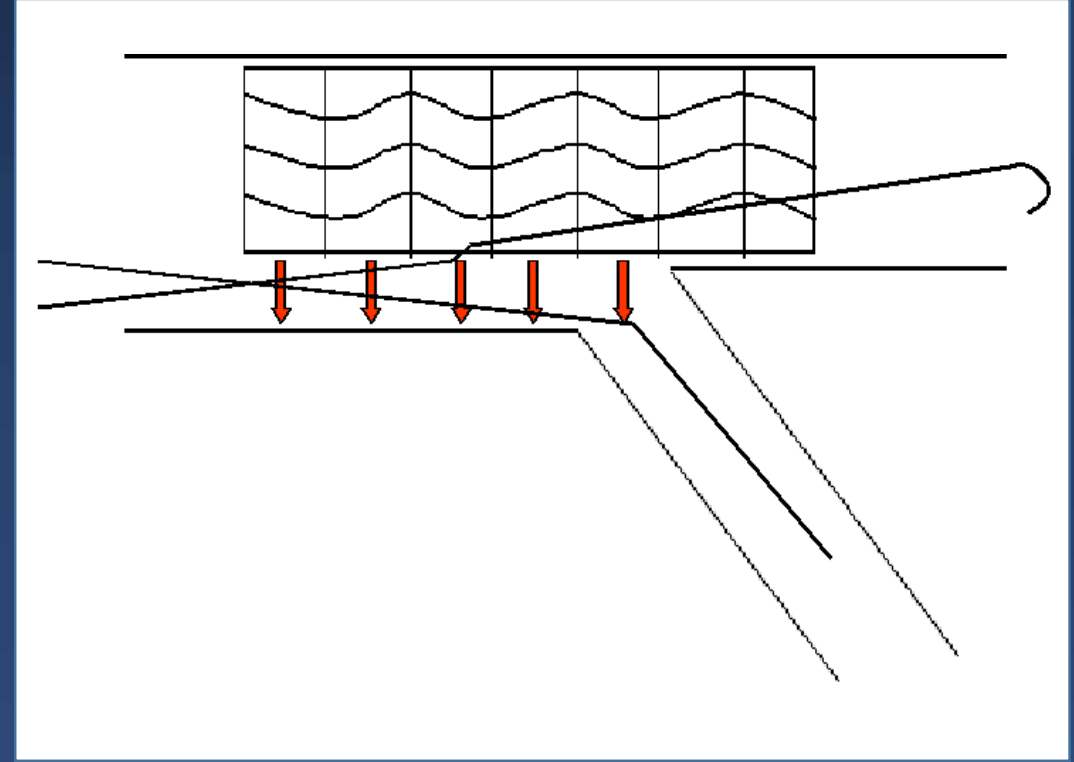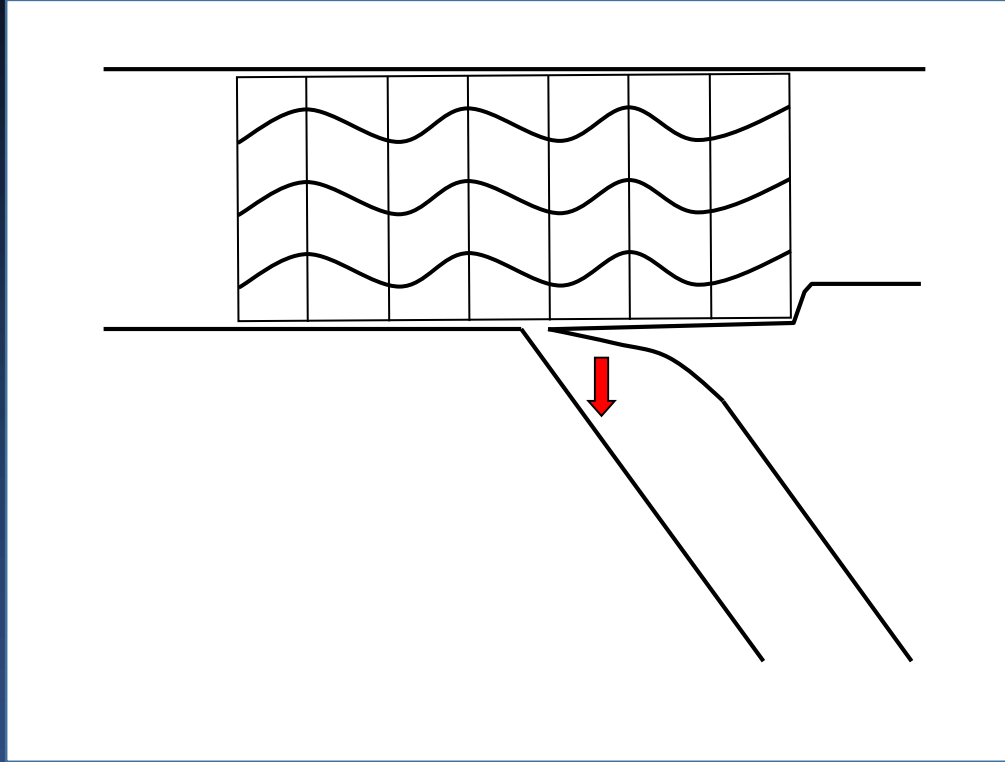
Bifurcation: a «fractal» object

Murray's law

$$D_1^3 = D_2^3 + D_3^3$$
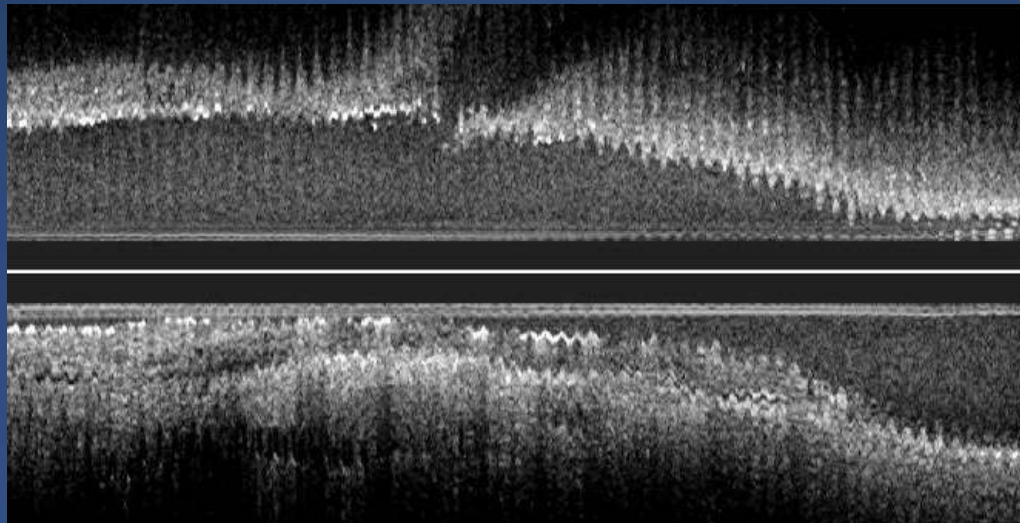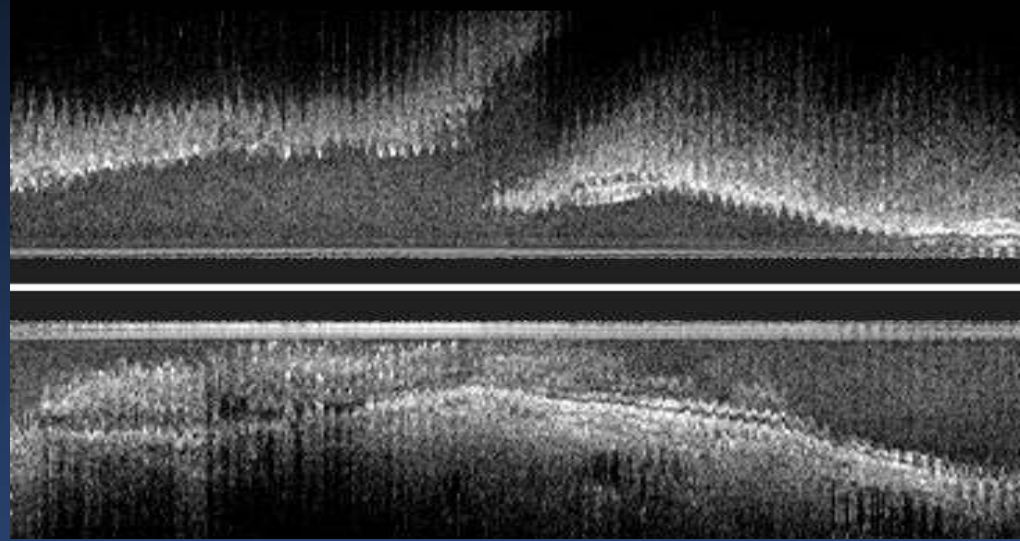
D1

D3

D2

Finet's formula

$$D_1 = (D_2 + D_3) \times 0.678$$

Bifurcation: a «fractal» object

Bifurcation: a «fractal» object
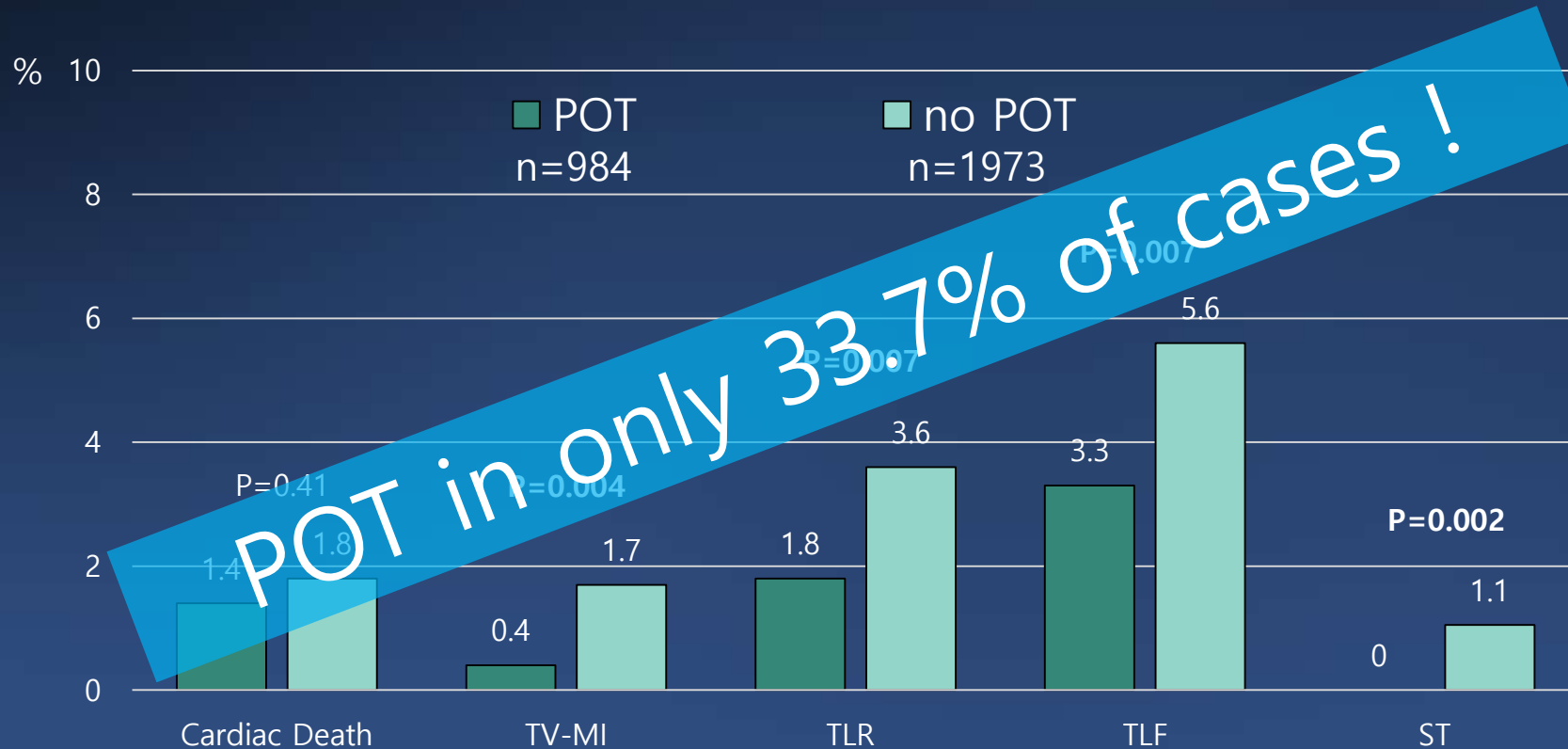

Koo et al EBC 2008

Role of POT

Darremont et al. EBC 2007

COBIS II: Role of POT

Propensity score, SB diameter ≥ 2.5 mm by QCA

	POT (n=204)	No POT (n=665)	HR (95% CI)	p value
MACE	6 (2.9)	78 (11.7)	0.25 (0.11-0.60)	0.002
All-cause death	7 (3.4)	25 (3.8)	0.97 (0.41-2.33)	0.95
Cardiac death	1 (0.5)	9 (1.4)	0.37 (0.05-2.97)	0.35
Myocardial infarction	0 (0.0)	12 (1.8)	-	-
Stent thrombosis	2 (1.0)	8 (1.2)	0.98 (0.20-4.77)	0.98
TLR	5 (2.5)	61 (9.2)	0.27 (0.10-0.69)	0.006
MV, proximal	3 (1.5)	40 (6.0)	0.25 (0.07-0.82)	0.02
MV, distal	4 (2.0)	47 (7.1)	0.28 (0.10-0.80)	0.02
SB	4 (2.0)	35 (5.3)	0.37 (0.13-1.09)	0.07
Both vessels	5 (2.5)	48 (7.2)	0.34 (0.13-0.88)	0.03

POT in only 23.5% of cases !

Gwon, EBC 2016

Ultimaster Registry

1 year clinical outcomes after one-stent technique propensity matched analysis (n=2921)

POT in only 33.7% of cases !

Legend:
- ■ POT n=984
- ■ no POT n=1973

	Cardiac Death	TV-MI	TLR	TLF	ST
POT	1.4	0.4	1.8	3.3	0
no POT	1.8	1.7	3.6	5.6	1.1
P-value	P=0.41	P=0.004	P=0.007	P=0.007	**P=0.002**
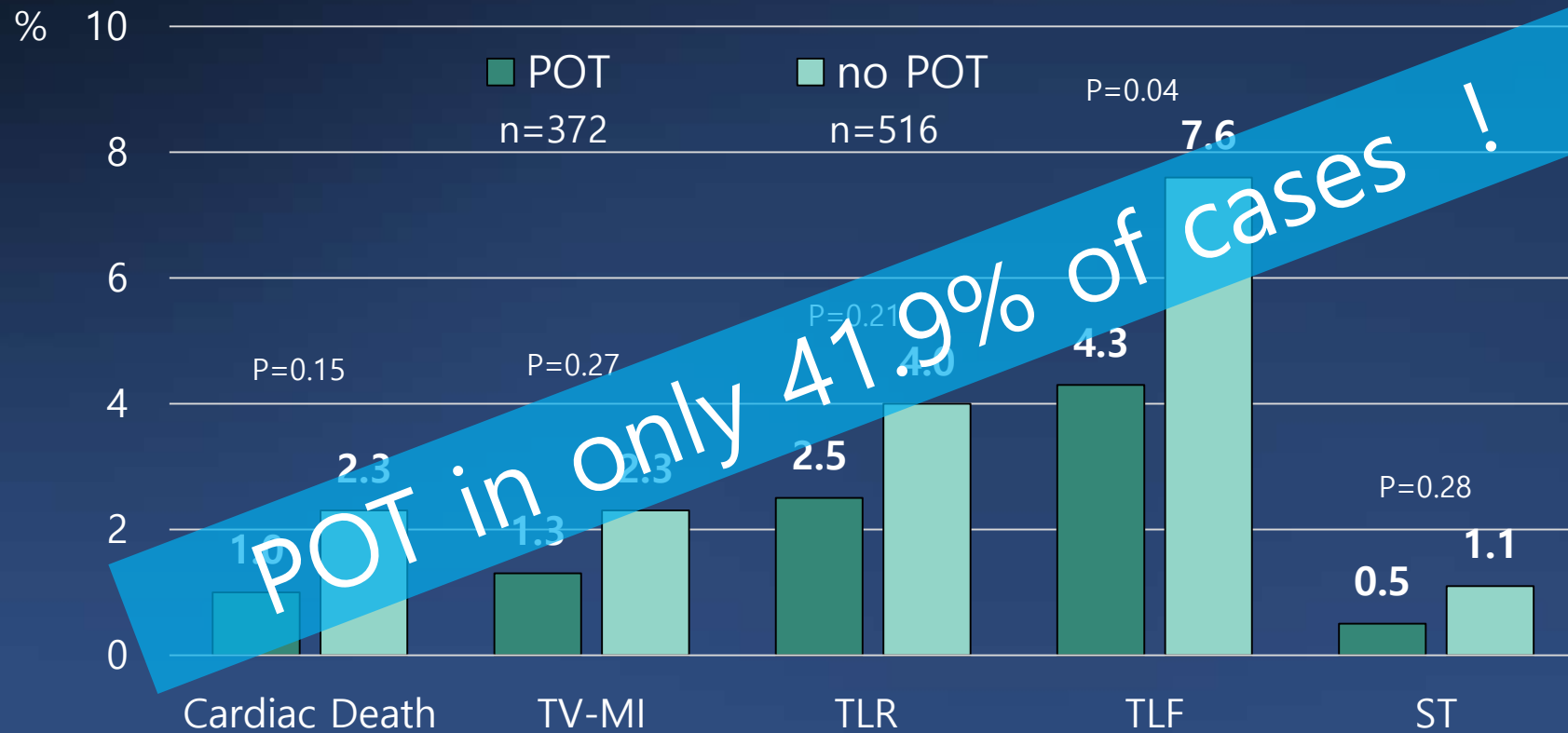
TV-MI: target vessel myocardial infarction, **TLR**: target lesion revascularization, **TLF**: target lesion failure (cardiac death, target vessel MI or clinically driven TLR), **ST**: definite/probable stent thrombosis.
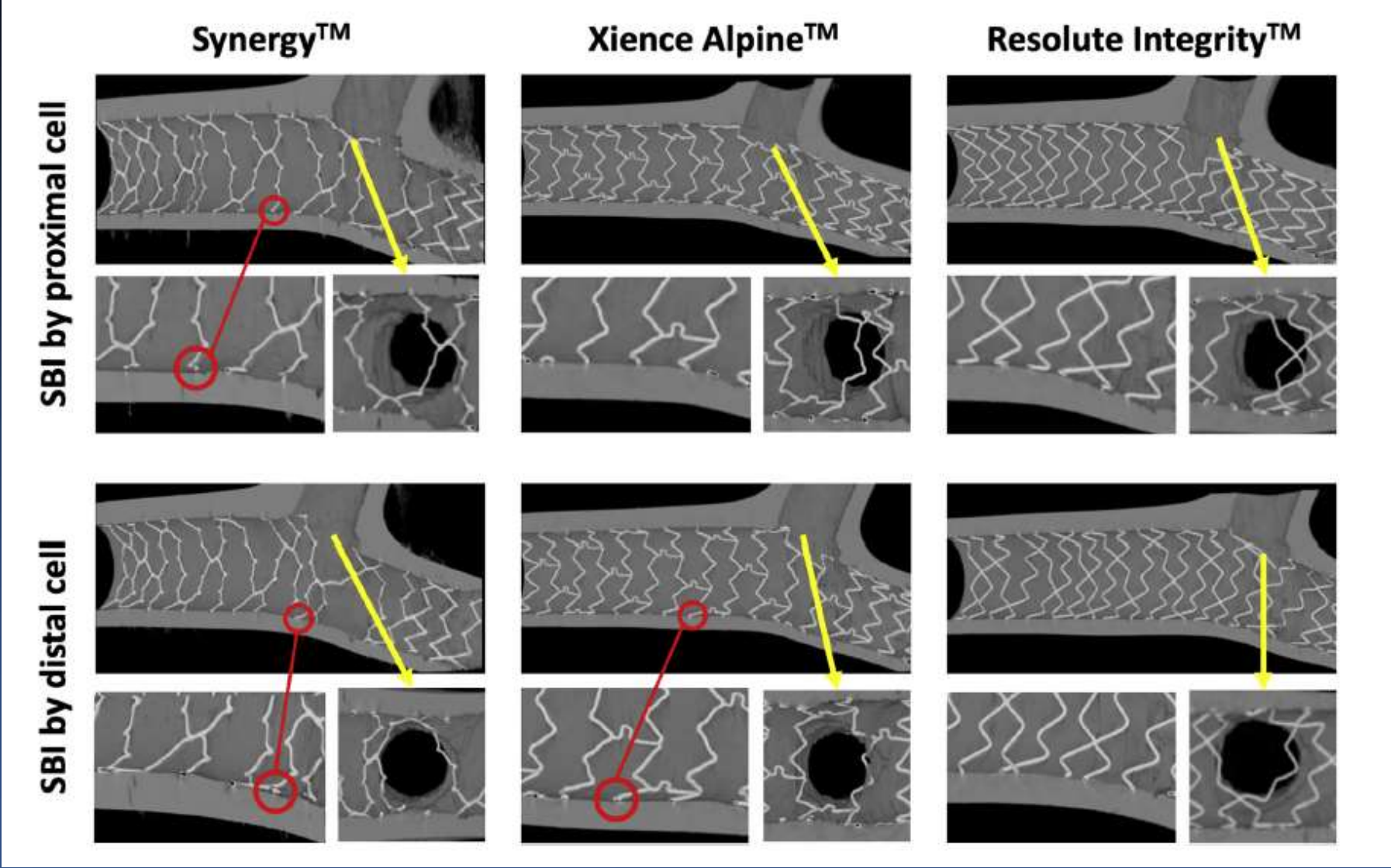
Chevalier EBC 2019

Distal vs Proximal strut

Derimay et al. Int J Cardiol 2019

Rheology in Bifurcation lesions

Normal (high) ESS

Low or Oscillatoy ESS

dv/dy

Flow

Low or Oscillatoy ESS
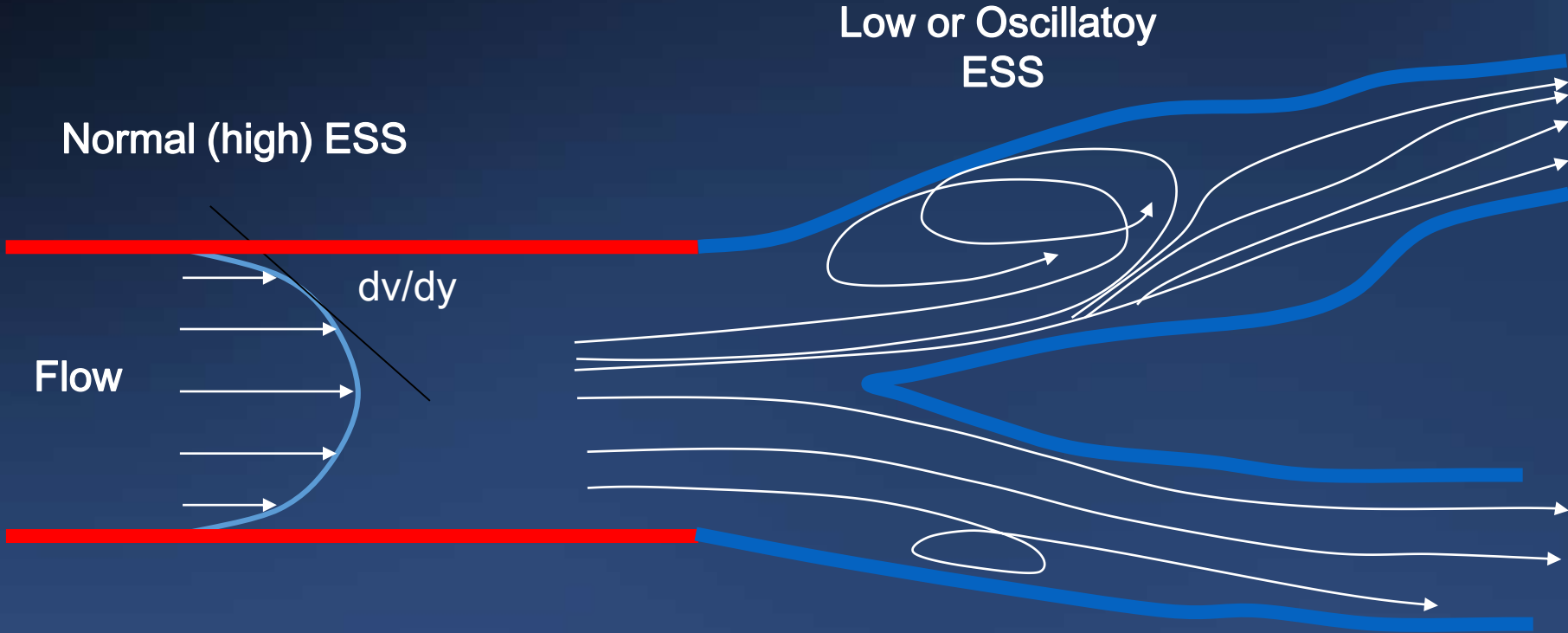
$$ESS = \mu \cdot dv/dy$$

μ = viscosity

dv/dy = spatial gradient of blood velocity at the wall

Adapted from Y S Chatzisisis et al JACC 2007

CVRF

Location of SB access and shear stress

Insights from bench modeling and computational flow simulation

Foin, Int. J Cardiol. 2013; 68:3623–28
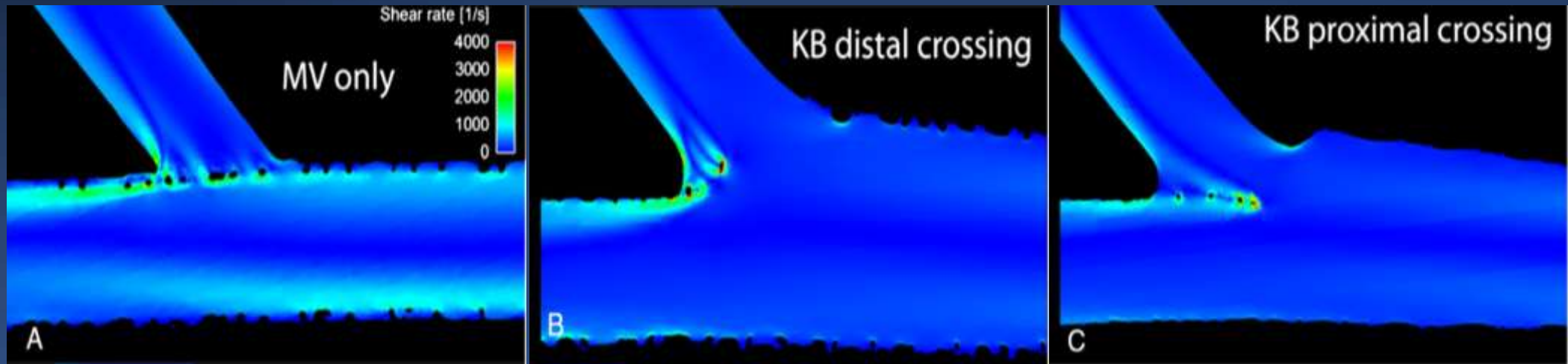
Is there a role for final Kissing ?

✓ Reposition the carina in the center

✓ Remove the struts in front of the SB

✓ Optimise Rheology

Strongly recommended with 2 stent techniques

Controversial with 1 stent technique

Kissing Recommendations

✓ Sizing according to distal MB and SB reference

✓ Kiss in the POC

✓ SB inflated first (better in the bench)

✓ Short NC balloon for the SB

✓ Long or repeated inflations

✓ Simultaneous deflation

Provisional SB Stenting is established as the default approach
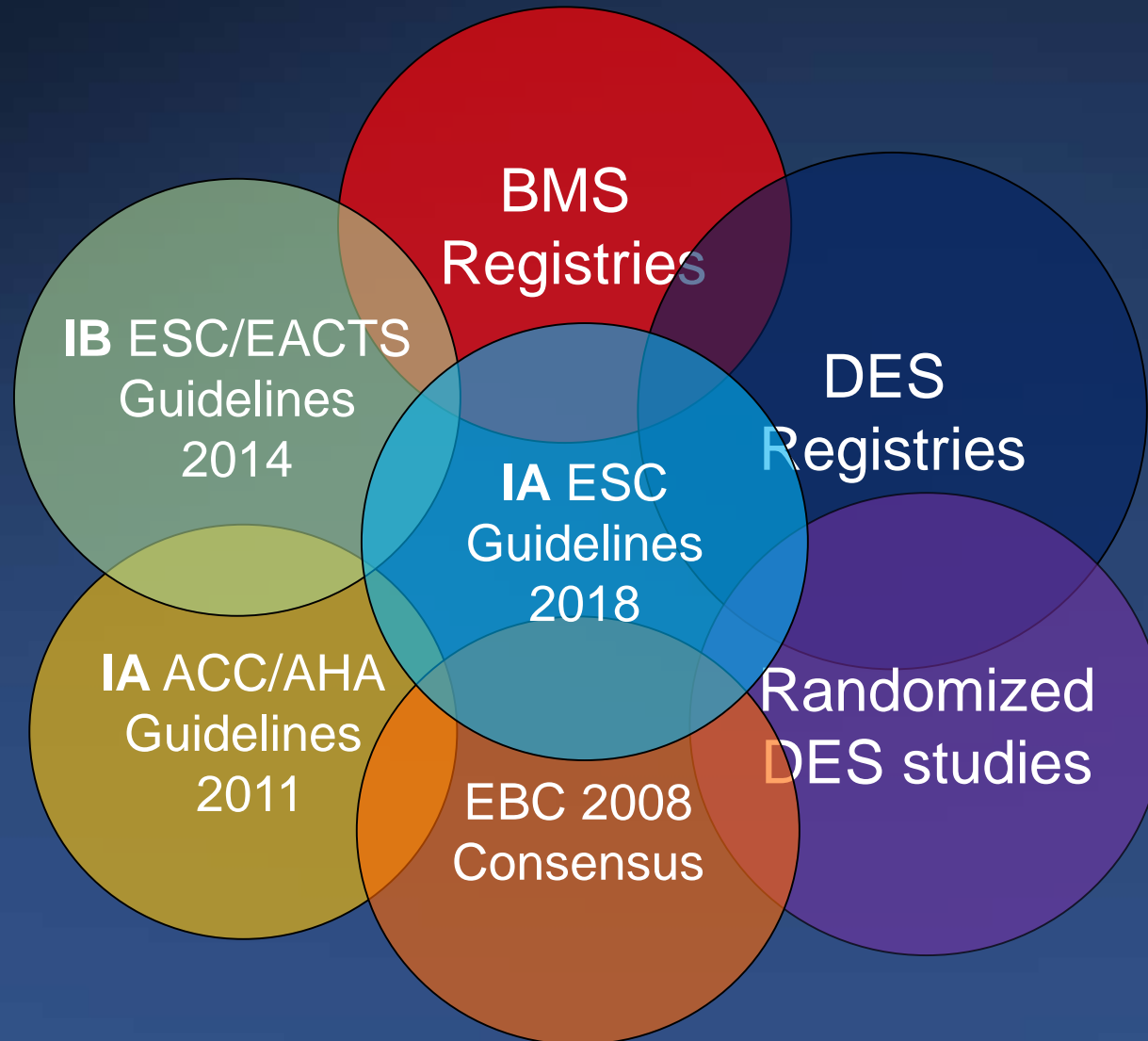
Provisional SB stenting approach is a philosophy … It does not mean that the procedure will be performed with only one stent.

Provisional vs 2 stents, a Meta-analysis

All causes mortality

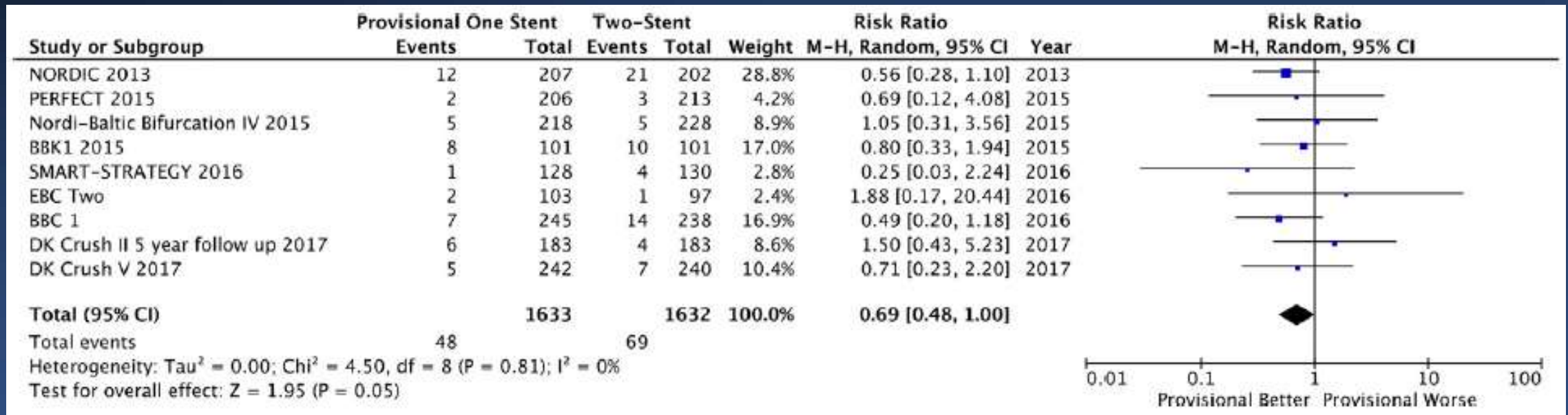| Study or Subgroup	Provisional One Stent Events	Total	Two-Stent Events	Total	Weight	Risk Ratio M-H, Random, 95% CI	Year	Risk Ratio M-H, Random, 95% CI
NORDIC 2013	12	207	21	202	28.8%	0.56 [0.28, 1.10]	2013	
PERFECT 2015	2	206	3	213	4.2%	0.69 [0.12, 4.08]	2015	
Nordi-Baltic Bifurcation IV 2015	5	218	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: Tau^2 = 0.00; Chi^2 = 4.50, df = 8 (P = 0.81); I^2 = 0%
Test for overall effect: Z = 1.95 (P = 0.05)

Thomas Ford et al. JAHA 2018

Anticipate technical difficulties

Have a strategy

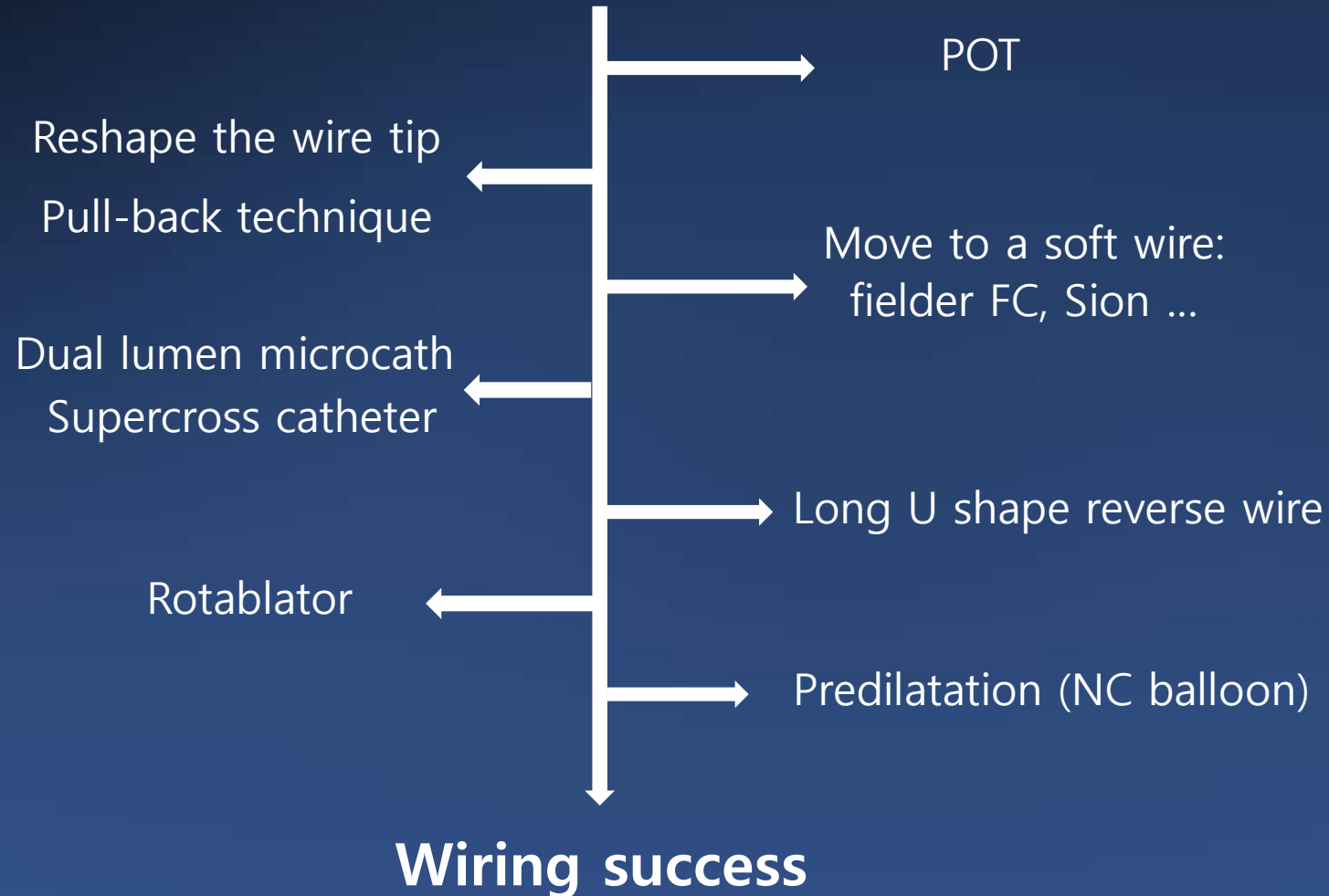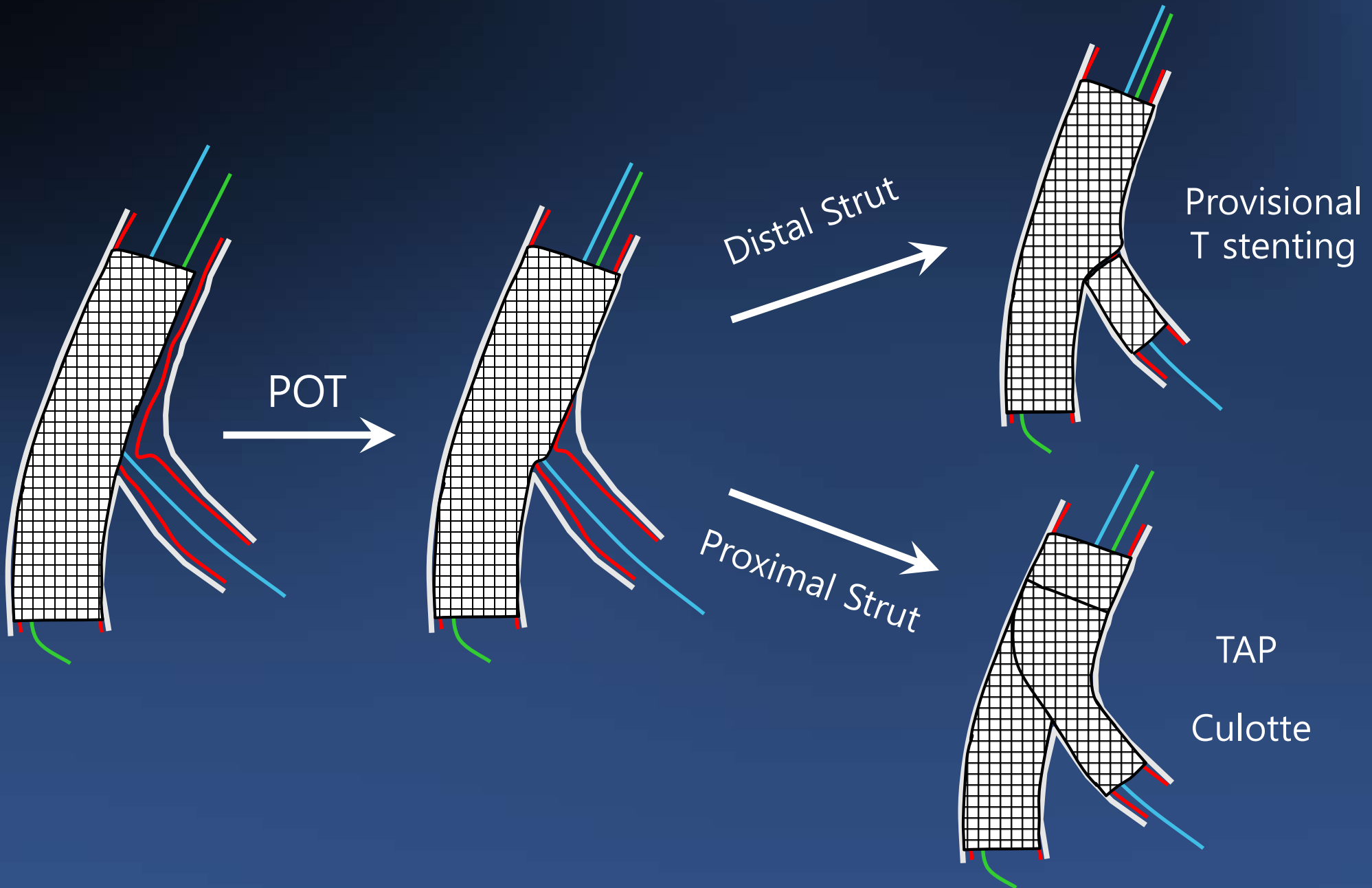**Start with a good support**

Have a good view of the bifurcation

Wire escalation for difficult branch access

Most difficult branch wiring failure

POT

Reshape the wire tip

Pull-back technique

Move to a soft wire:
fielder FC, Sion ...

Dual lumen microcath

Supercross catheter

Long U shape reverse wire

Rotablator

Predilatation (NC balloon)

Wiring success

COMPLEX PCI
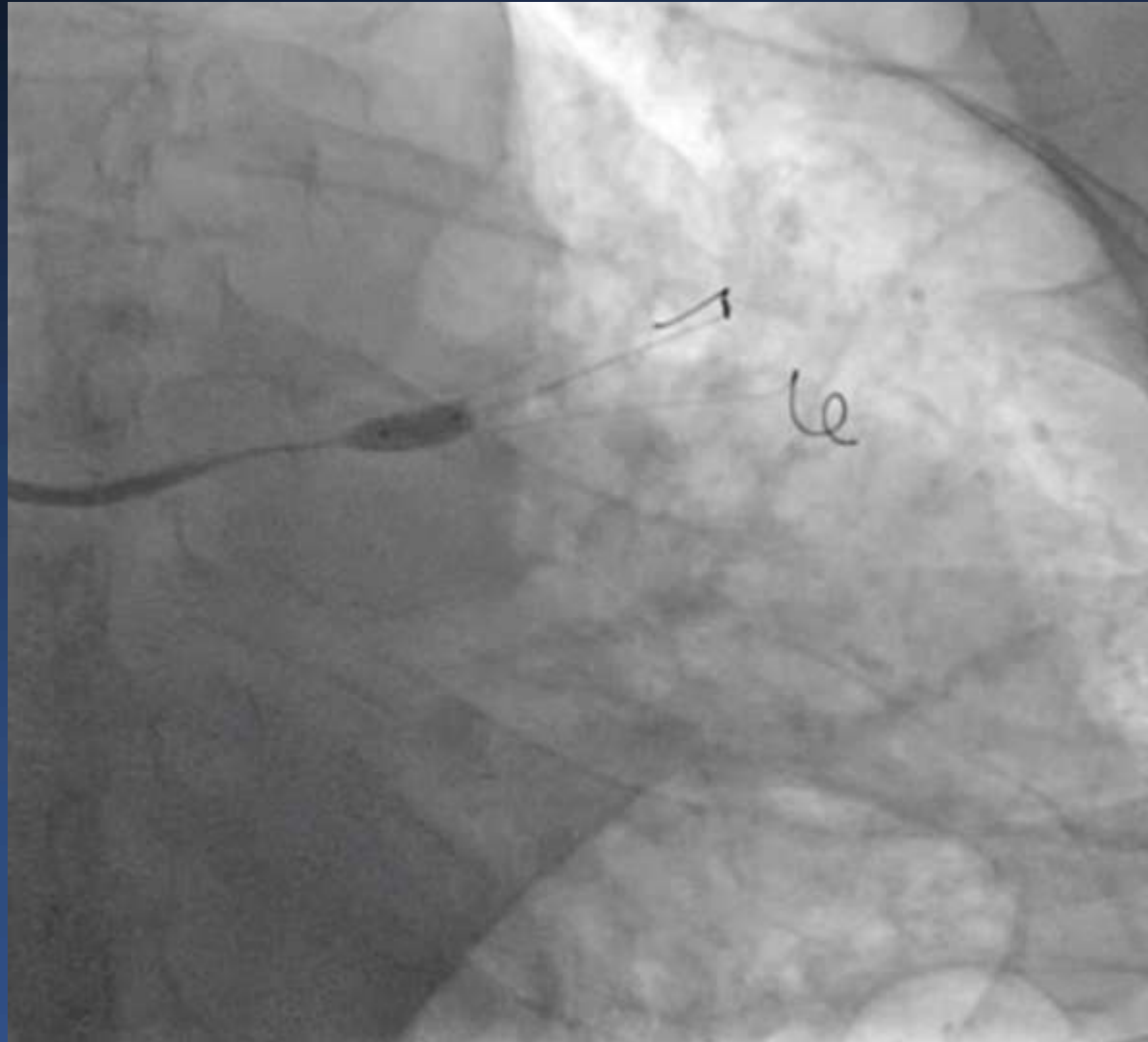Make It Simple!

CVRF

Think provisional !

Think provisional !
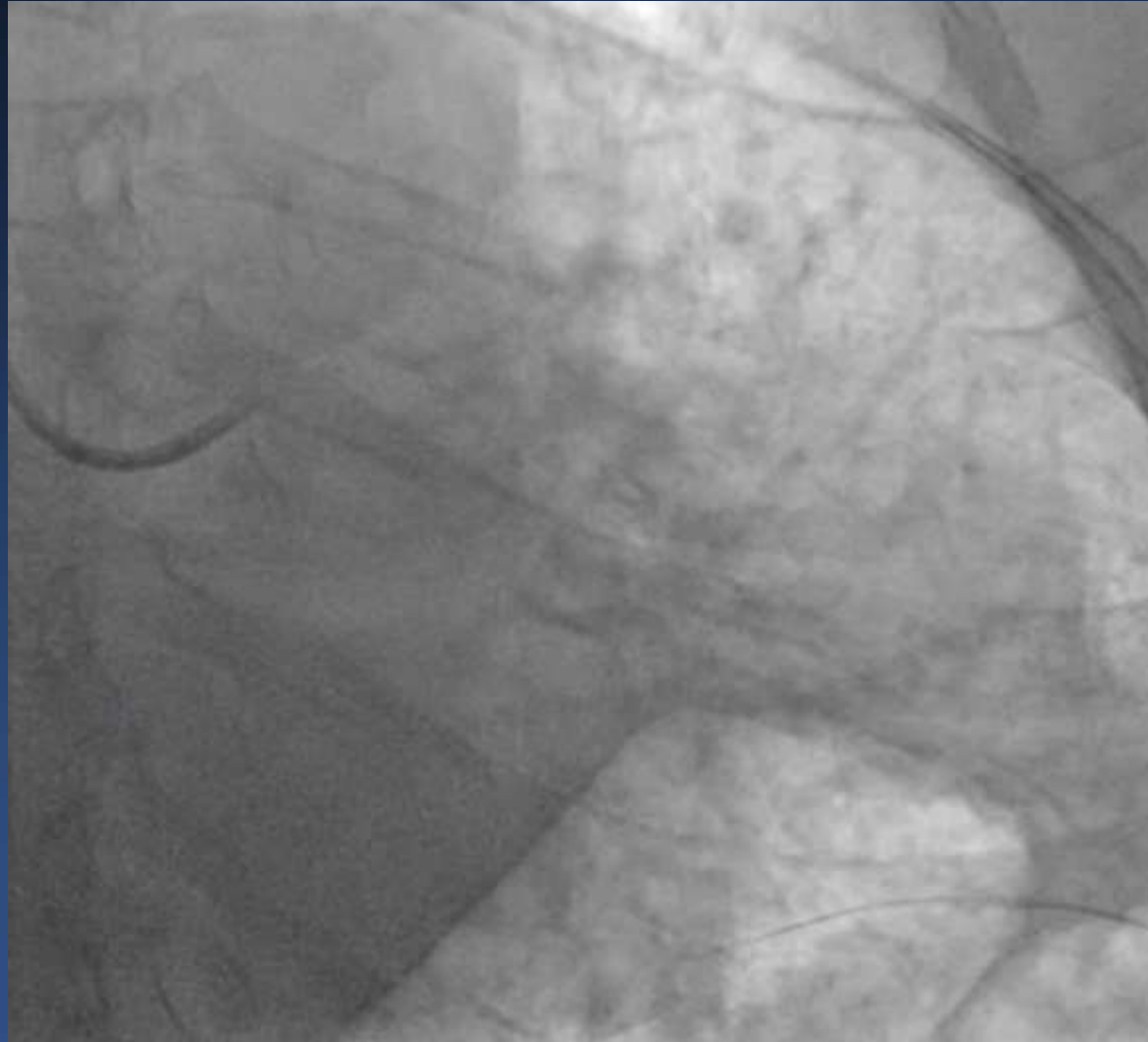
Think provisional !

Think provisional !

Think provisional !

Think provisional !

Think provisional !

Think provisional !

✓ Protect side branches

✓ Respect the fractal law

✓ Do a POT

✓ Treat only relevant side branches

✓ Minimize the number of stents

✓ Know how to solve difficult access