Personalizzazione nel trattamento PCI

Antonio Mangieri

Interventional cardiology unit

GVM care and research, Maria Cecilia Hospital, Cotignola, Ravenna

"CARDIOLOGIA DI PRECISIONE"

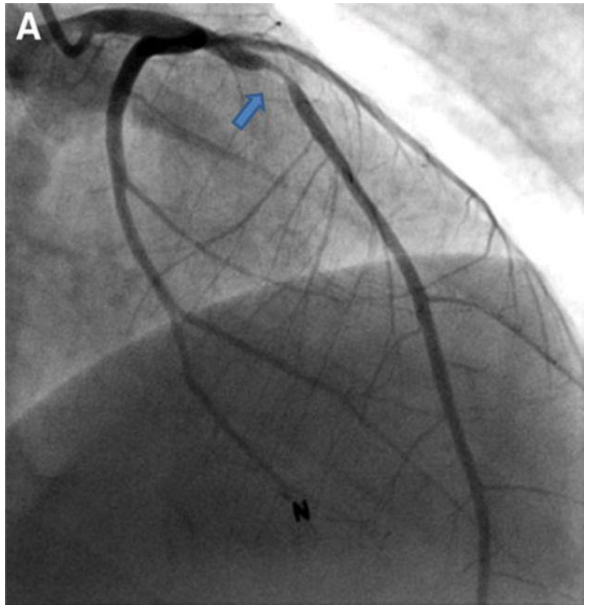
NOVARA, Venerdì 13 e Sabato 14 Settembre 2019

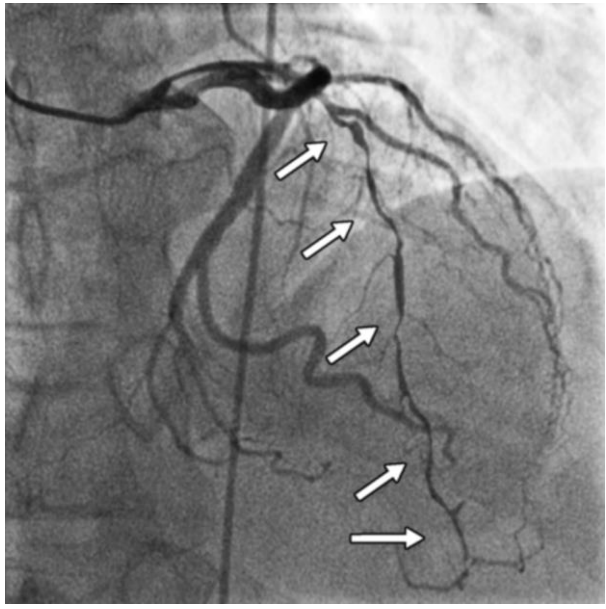
What is PCI customization?

Not the same PCI for all the people

- Differences in age gender, comorbidities
- Differences in coronary anatomies

Customized treatment weighted on coronary anatomy and patient's risk profile





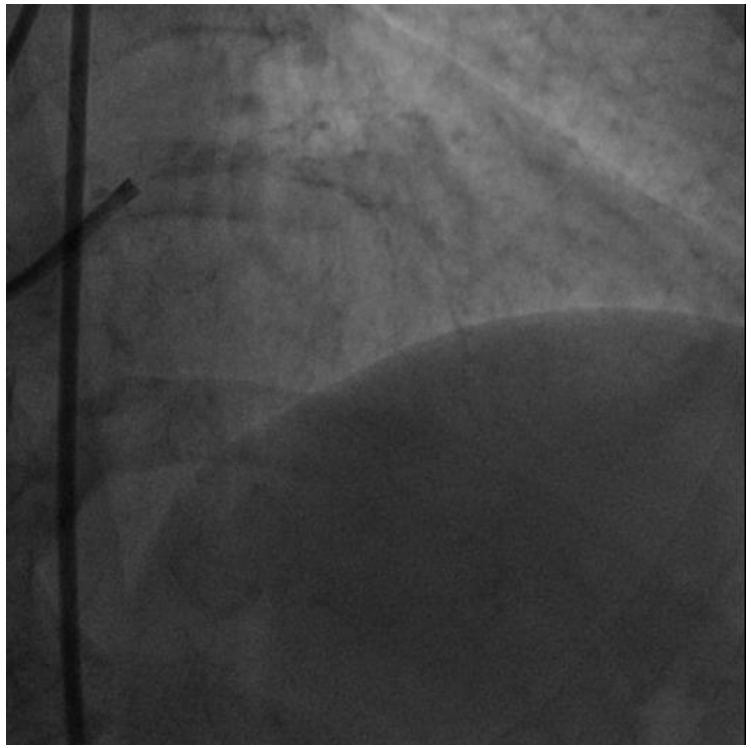
Clinical Presentation

- 70-year old male

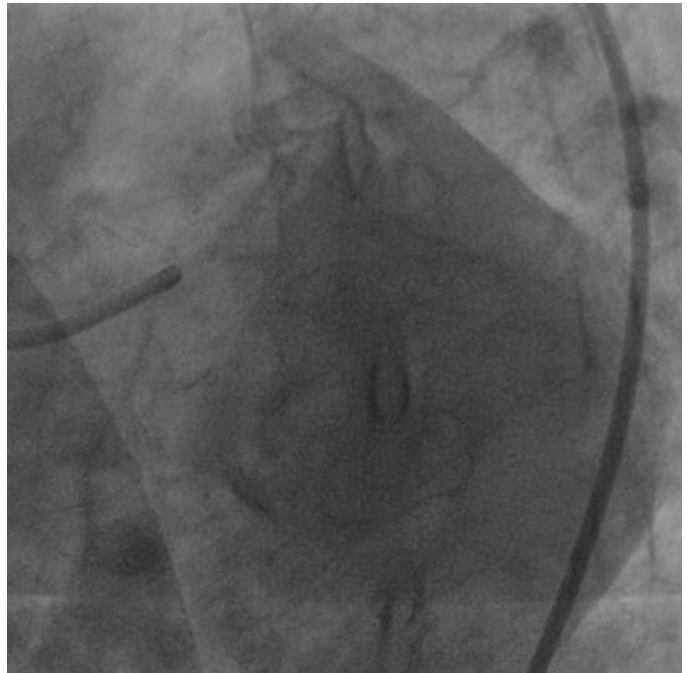
- Hypertensive, Hypercholesterolemia, Hypothyroidism, Previous stroke
- Presents with NSTEMI (Trop +) and ST depression on ECG
- Normal creatinine
- Echocardiography – ejection fraction 50%, mild MR

- Patient not even willing to discuss CABG

Possible strategies

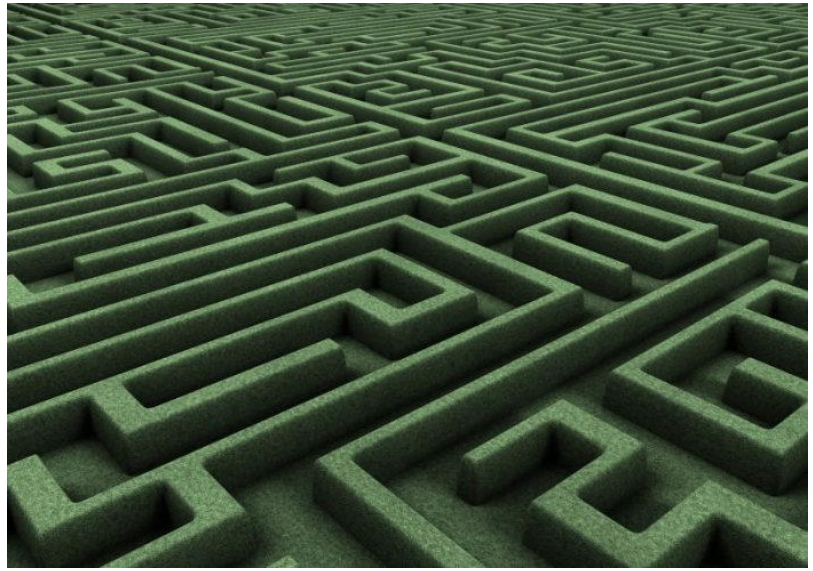


A. CABG or nothing
B. Medical Therapy
C. Reasonable uncomplete revascularization
    A. PCI of LM and LAD
D. Complete percutaneous revascularization
E. Hybrid revascularization
    A. LIMA on LAD and PCI for the Cx

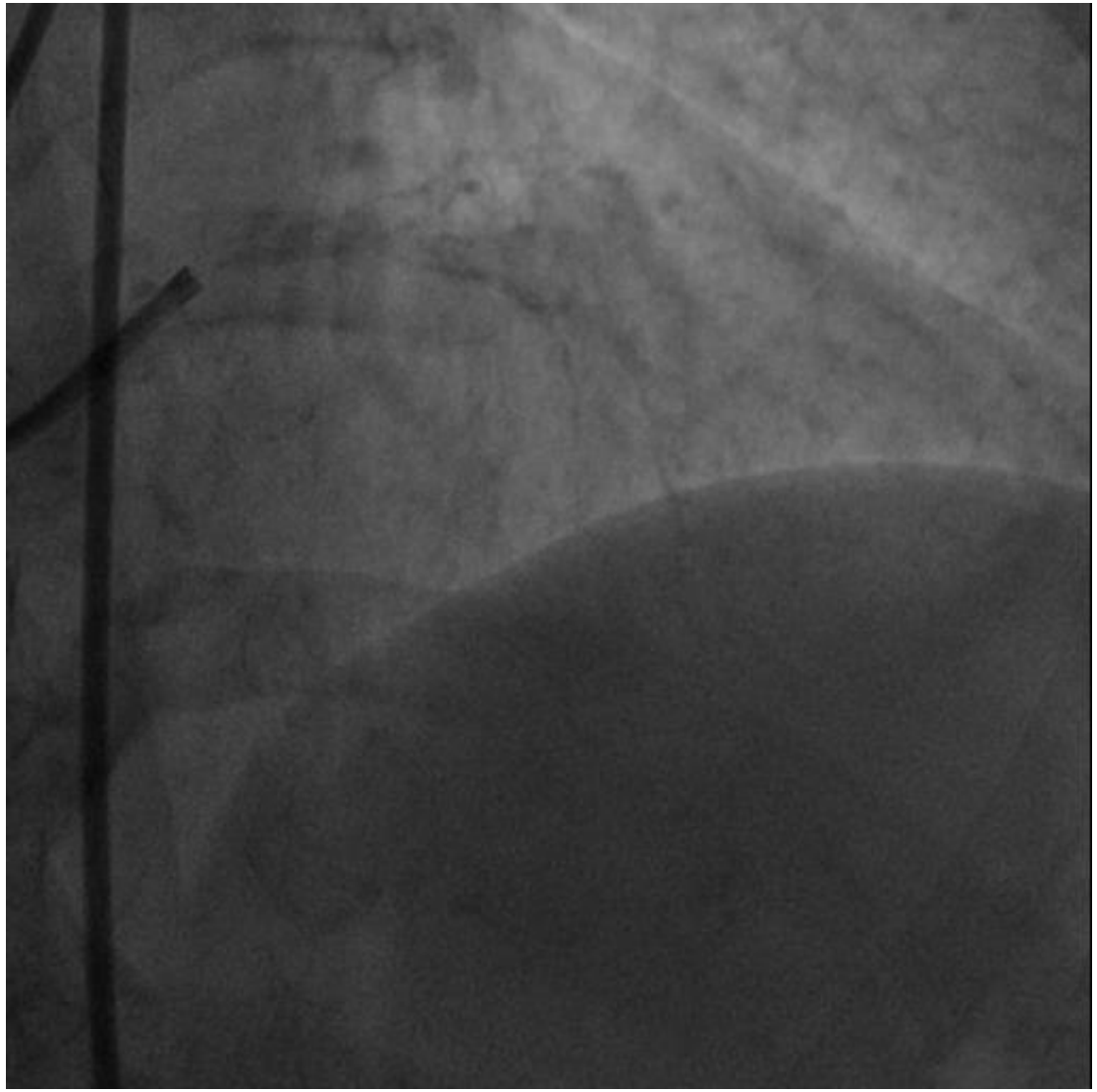


PCI strategy

- Strategy for LAD
- Strategy for Left main
  - Provisional vs. Double stenting
  - Technique
- Need for atherectomy
- Need for intravascular imaging



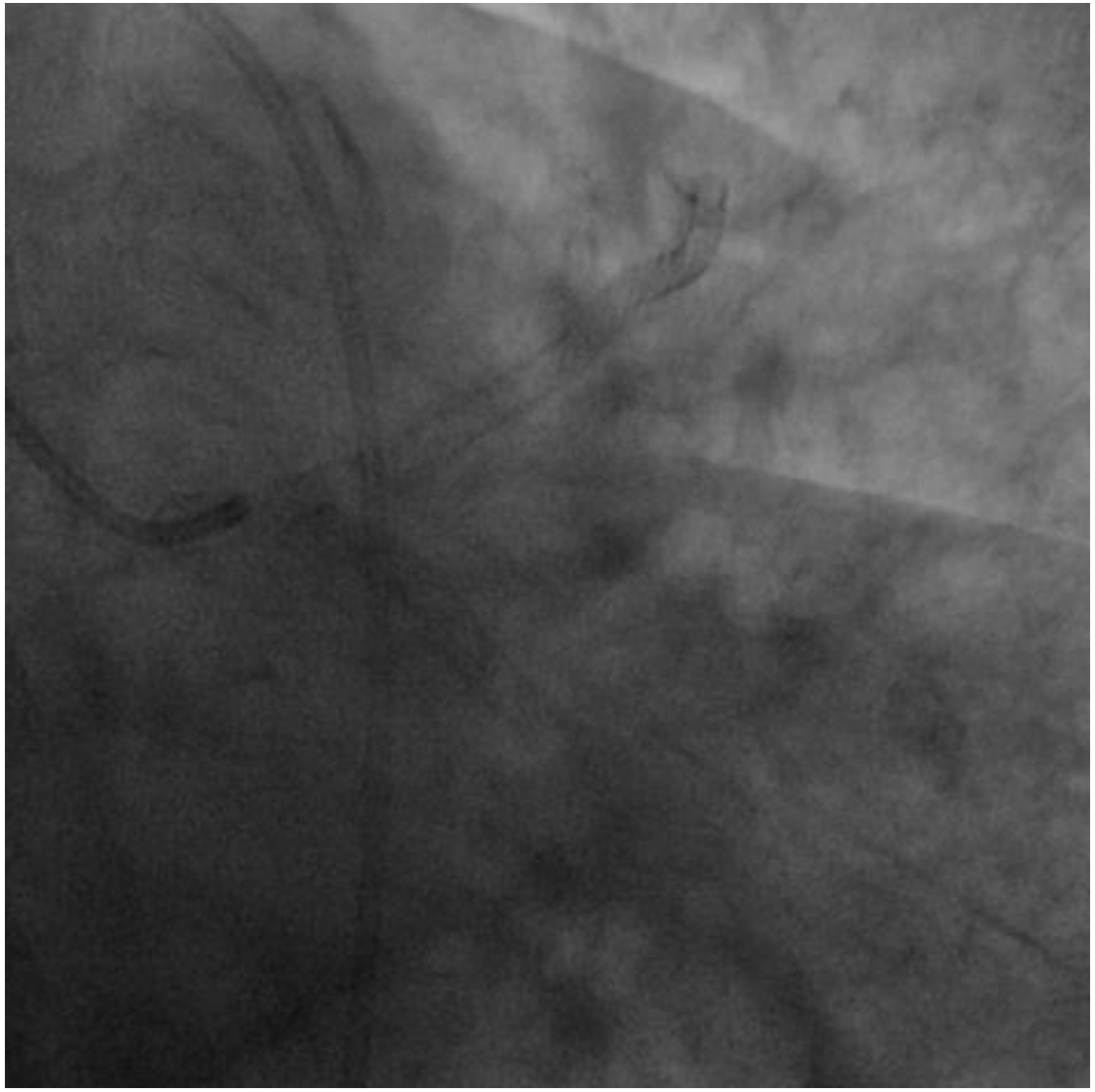
Baseline angio



Final angio

Baseline angio

Final angio

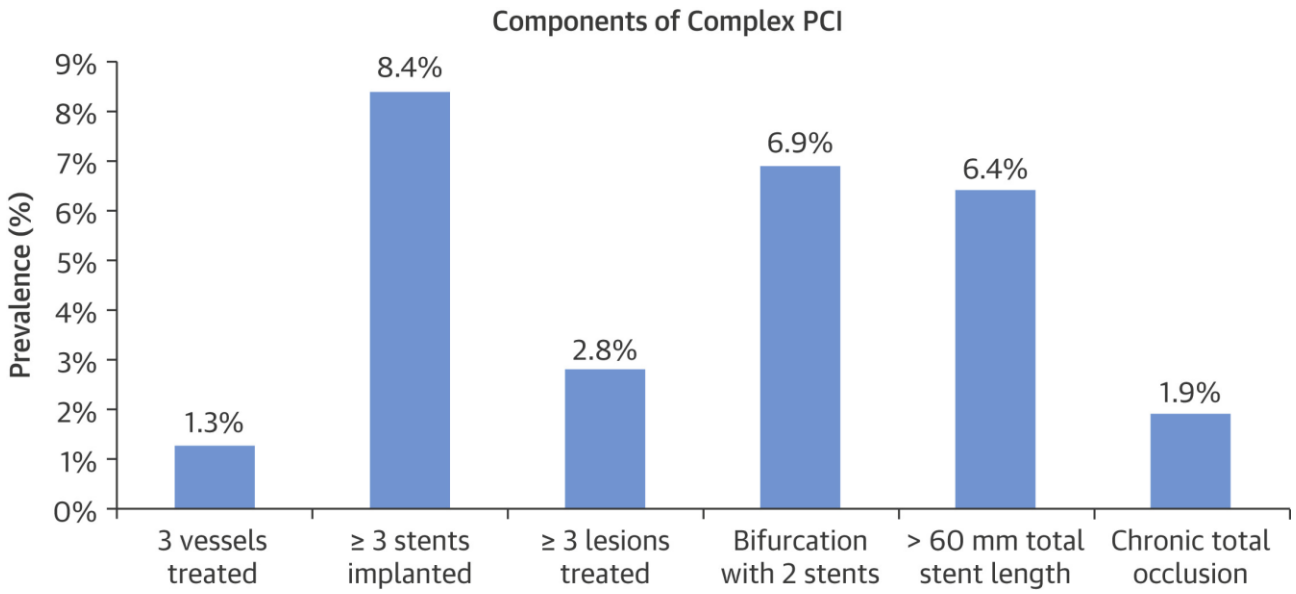


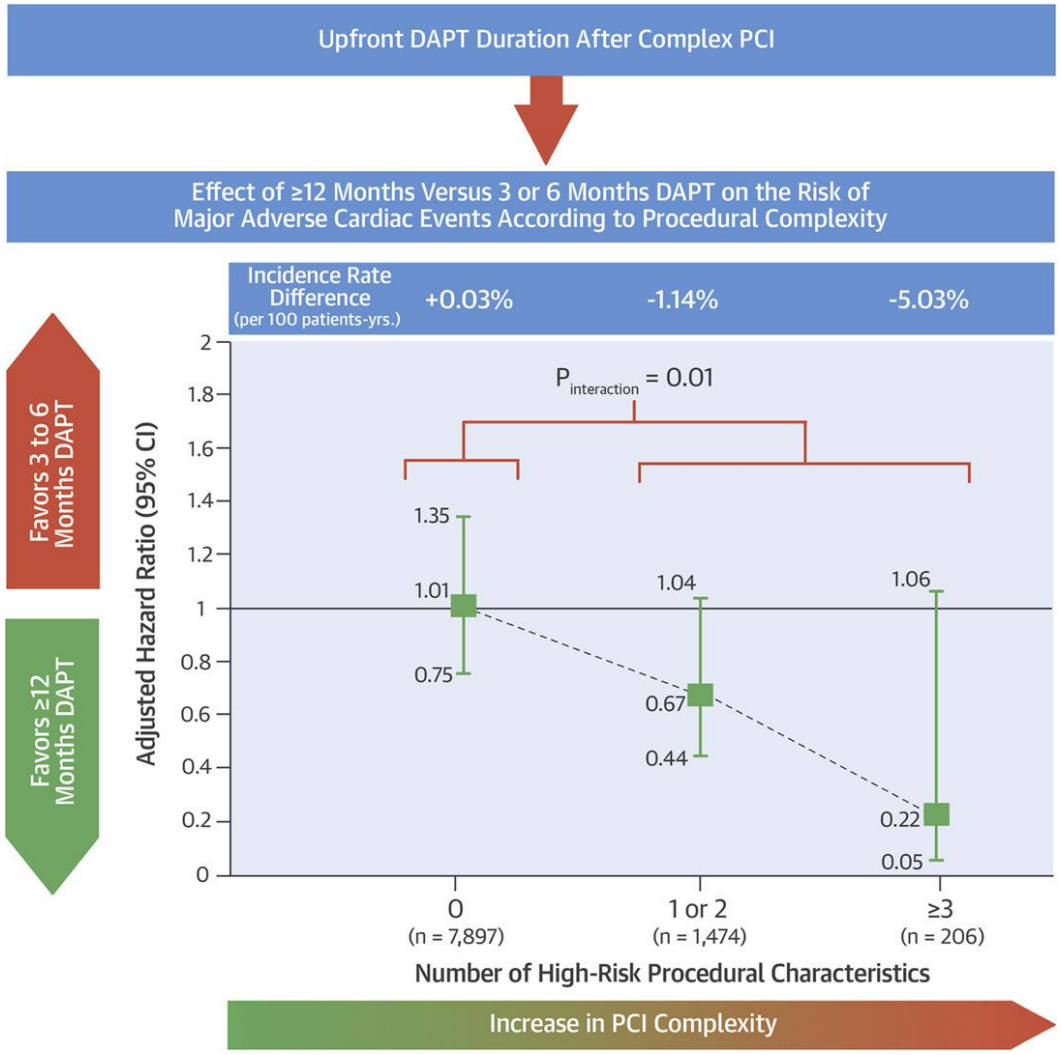
PCI customization

Old patients and patients at high risk of bleeding

High burden of comorbidities and higher risk of bleeding

Bleeding is a key negative prognostic factor





Giustino et al. Efficacy and Safety of Dual Antiplatelet Therapy After Complex PCI

PCI customization

Old patients and patients at high risk of bleeding

Minimize the lenght and number of stents

The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812 JANUARY 15, 2009 VOL. 360 NO. 3

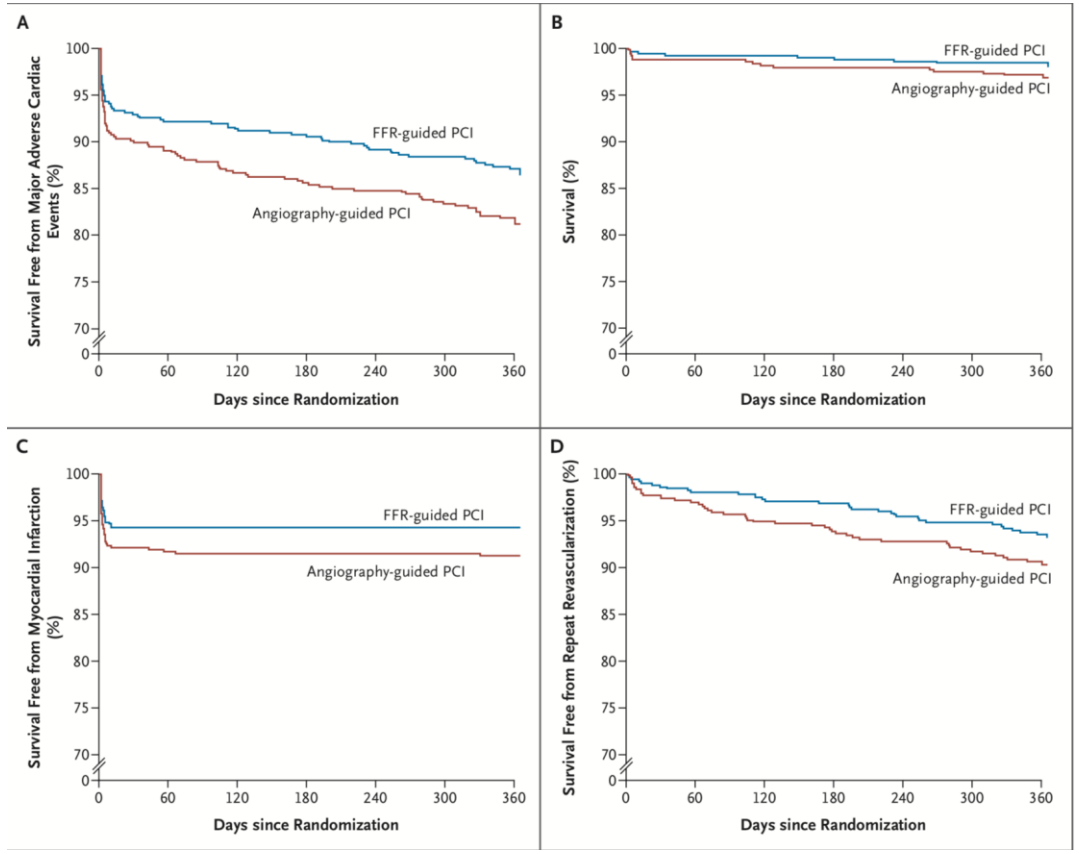
Fractional Flow Reserve versus Angiography for Guiding Percutaneous Coronary Intervention

Pim A.L. Tonino, M.D., Bernard De Bruyne, M.D., Ph.D., Nico H.J. Pijls, M.D., Ph.D., Uwe Siebert, M.D., M.P.H., Sc.D., Fumiaki Ikeno, M.D., Marcel van 't Veer, M.Sc., Volker Klauss, M.D., Ph.D., Ganesh Manoharan, M.D., Thomas Engstrøm, M.D., Ph.D., Keith G. Oldroyd, M.D., Peter N. Ver Lee, M.D., Philip A. MacCarthy, M.D., Ph.D., and William F. Fearon, M.D., for the FAME Study Investigators*

FFR or iFR-driven revascularization allows to reduce the number of treated stenosis

Table 2. Results of PCI.*

Variable	Angiography Group (N=496)	FFR Group (N=509)	P Value†
Procedure time — min‡	70±44	71±43	0.51
Volume of contrast agent used — ml	302±127	272±133	<0.001
Drug-eluting stents			
No. of stents per patient			
Mean	2.7±1.2	1.9±1.3	<0.001
Median (interquartile range)	3 (2–3)	2 (1–3)	
Total length per patient — mm	51.9±24.6	37.9±27.8	<0.001
Average diameter per patient — mm	2.96±0.33	2.92±0.36	0.13
Total no. of stents	1359	980	
Zotarolimus-eluting — no. (%)	603 (44.4)	403 (41.1)	
Sirolimus-eluting — no. (%)	273 (20.1)	202 (20.6)	
Paclitaxel-eluting — no. (%)	414 (30.5)	316 (32.2)	
Other — no. (%)	69 (5.1)	59 (6.0)	
Lesions in which stents successfully placed — no./total no. (%)§	1237/1350 (91.6)	819/874 (93.7)	

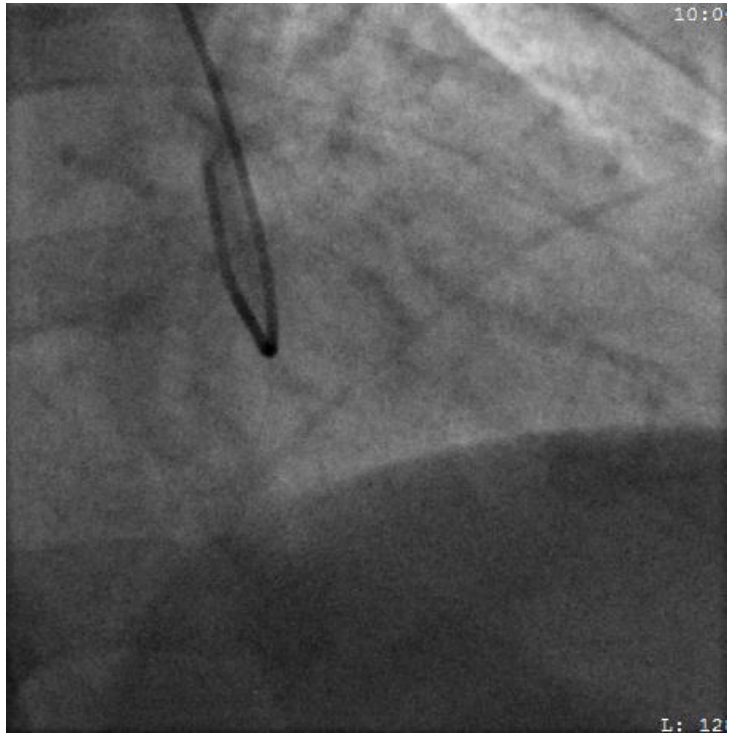


PCI customization

Old patients and patients at high risk of bleeding

Minimize the lenght and number of stents

FFR or iFR-driven revascularization allows to reduce the number of treated stenosis



Negative FFR on diagonal

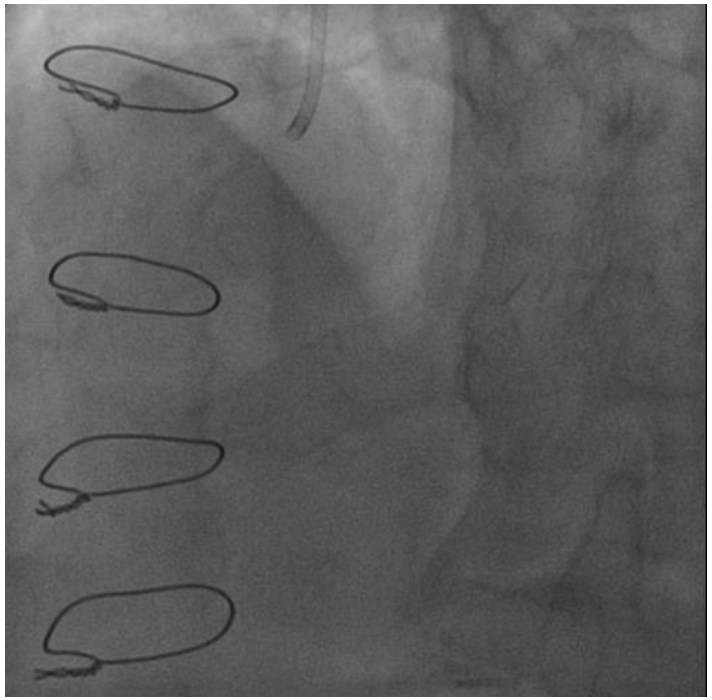
Significant drop of pressure in the proximal LAD

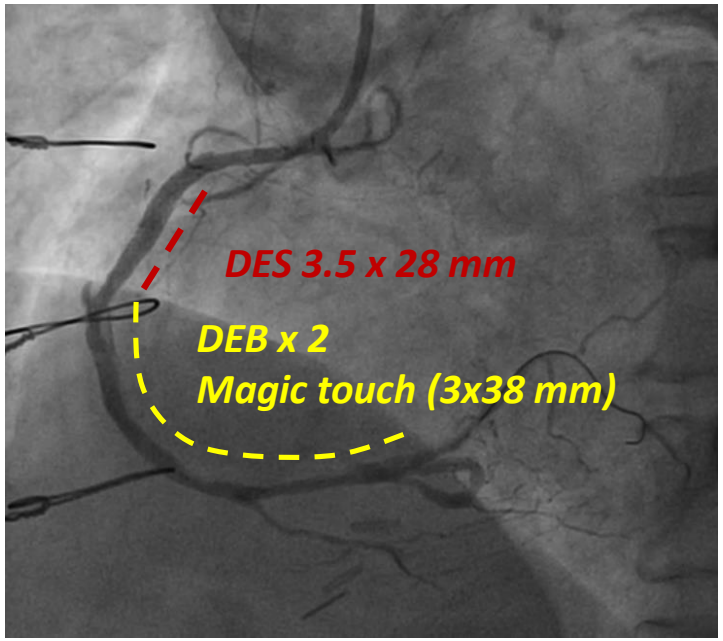
1 DES at the proximal LAD with short DAPT

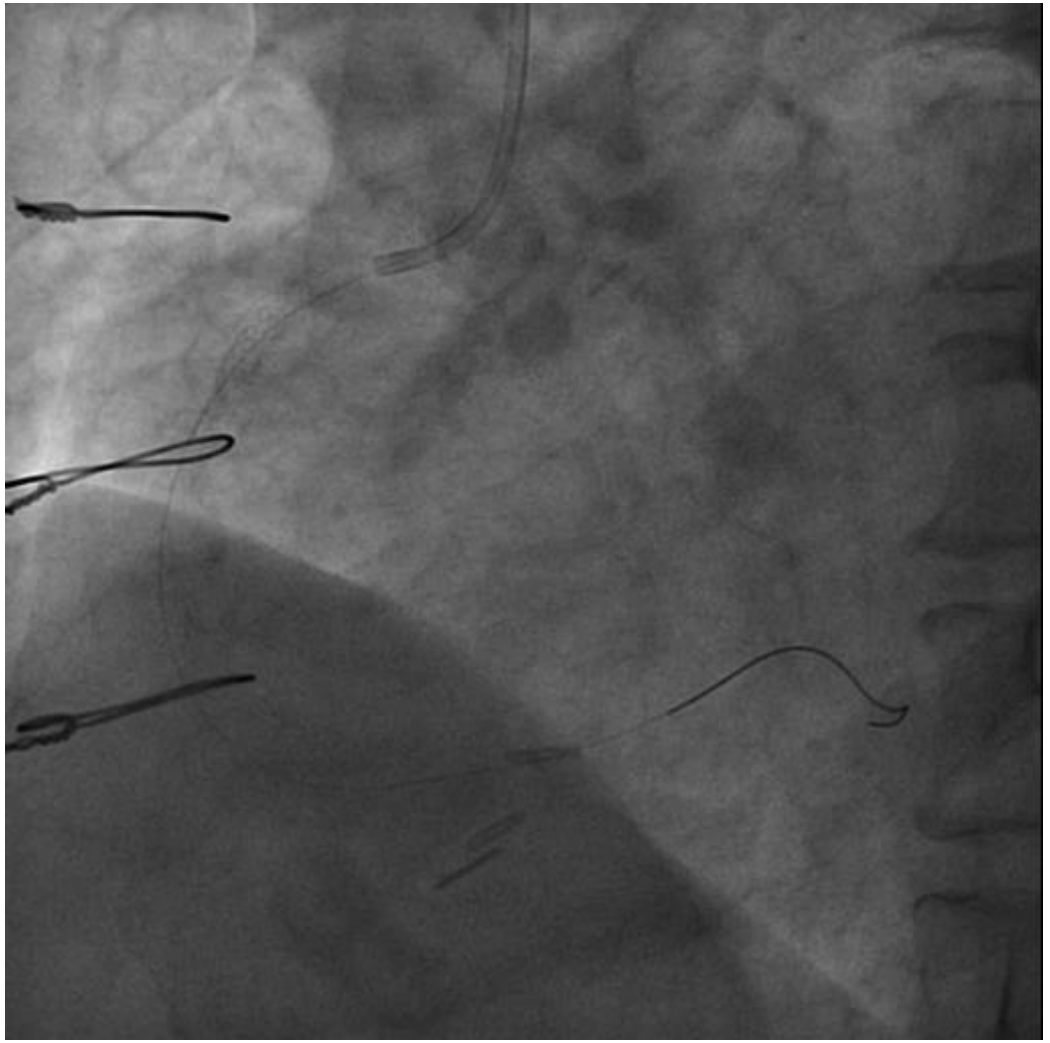
PCI customization

Old patients and patients at high risk of bleeding

Use of Drug eluting ballons can reduce the lenght of stents







PCI customization

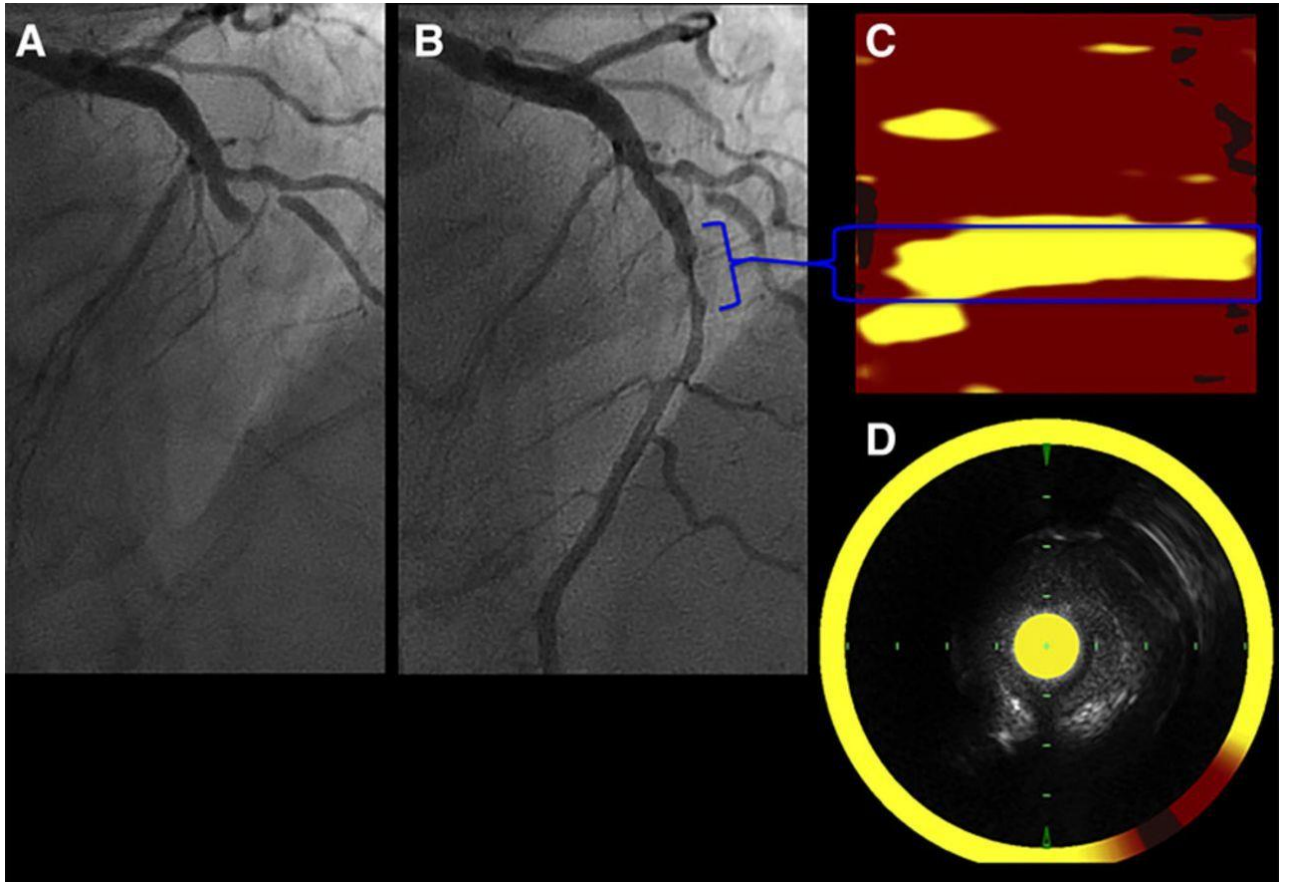
Old patients and patients at high risk of bleeding

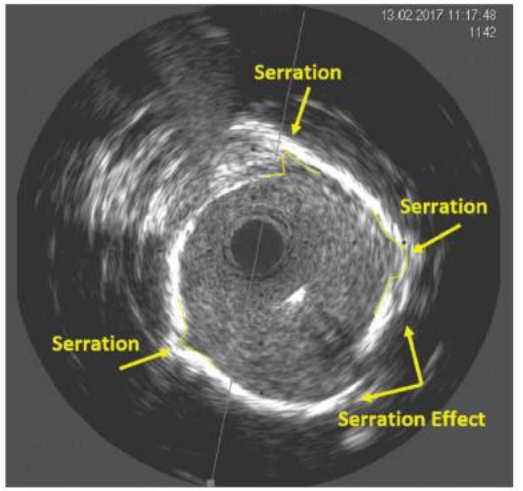
NIRS→ Near-infrared spectroscopy

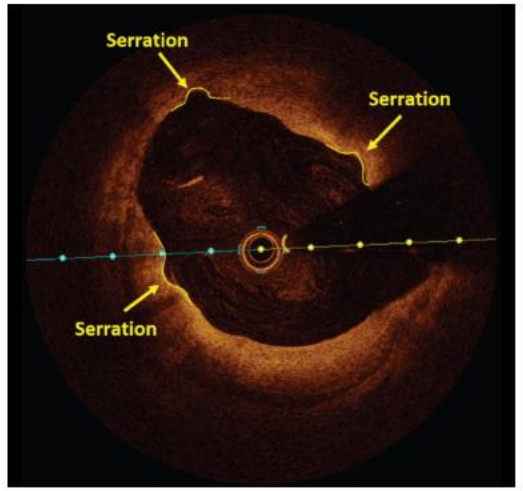
Helps to identify critical unstable stenosis

Possibly helps to minimize the lenght of the stent targeting the culprit lesion

Stable lesions can be skipped





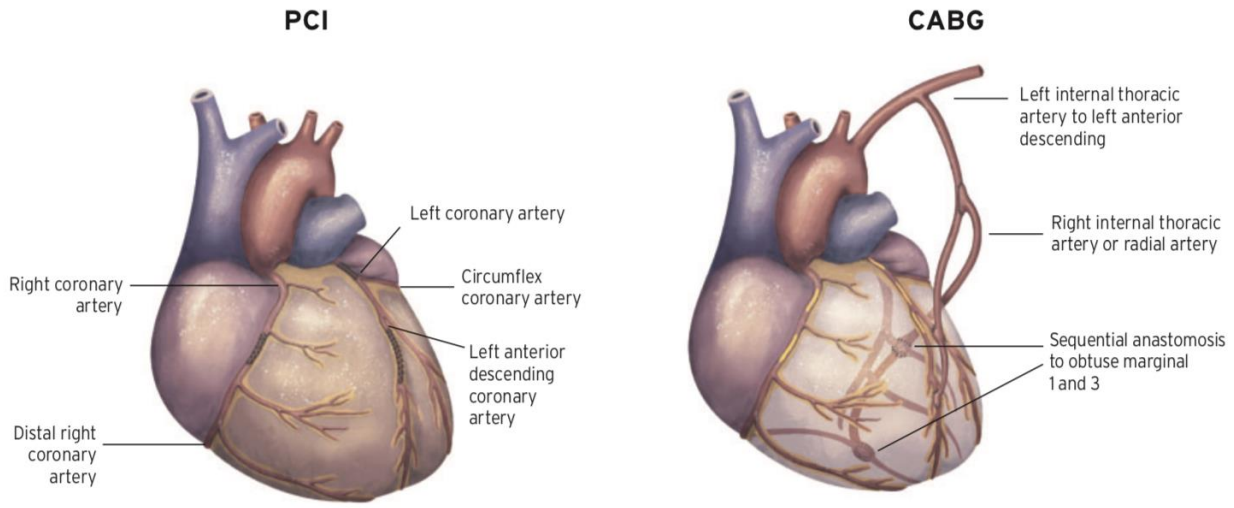


PCI customization

Diabetic patients

Diabetes represents on of the most challenging scenarios in the current PCI era due to:

- Higher rate of restenosis
- Presence of diffuse disease
- Higher rate of complex plaques



FAVOURS PCI
Clinical characteristics
Presence of severe co-morbidity (not adequately reflected by scores)
Advanced age/frailty/reduced life expectancy
Restricted mobility and conditions that affect the rehabilitation process
Anatomical and technical aspects
MVD with SYNTAX score 0–22
Anatomy likely resulting in incomplete revascularization with CABG due to poor quality or missing conduits
Severe chest deformation or scoliosis
Sequelae of chest radiation
Porcelain aorta[a]

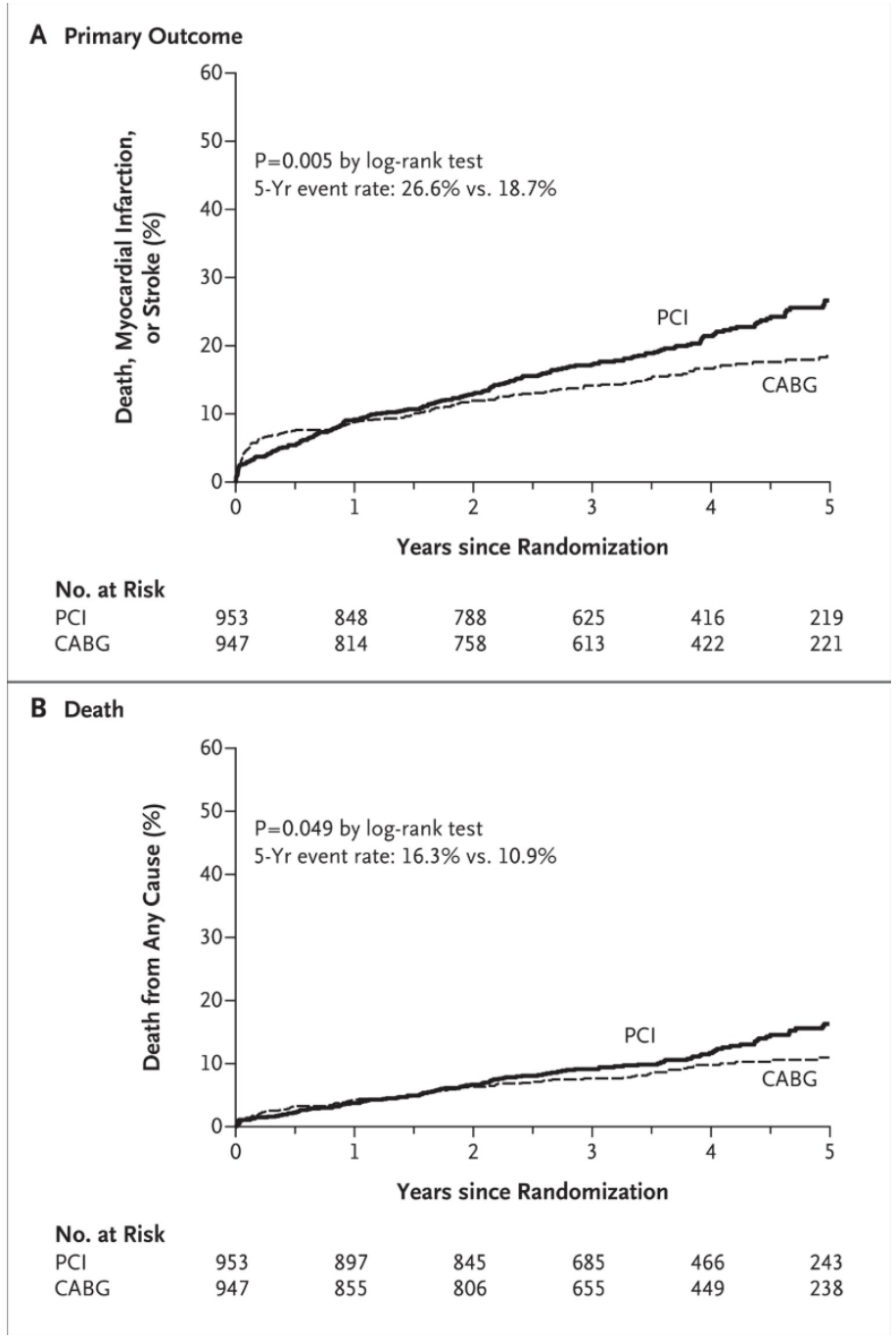
FAVOURS CABG
Clinical characteristics
Diabetes
Reduced LV function (EF ≤35%)
Contraindication to DAPT
Recurrent diffuse in-stent restenosis
Anatomical and technical aspects
MVD with SYNTAX score ≥23
Anatomy likely resulting in incomplete revascularization with PCI
Severely calcified coronary artery lesions limiting lesion expansion
Need for concomitant interventions
Ascending aortic pathology with indication for surgery
Concomitant cardiac surgery

PCI customization

Diabetic patients

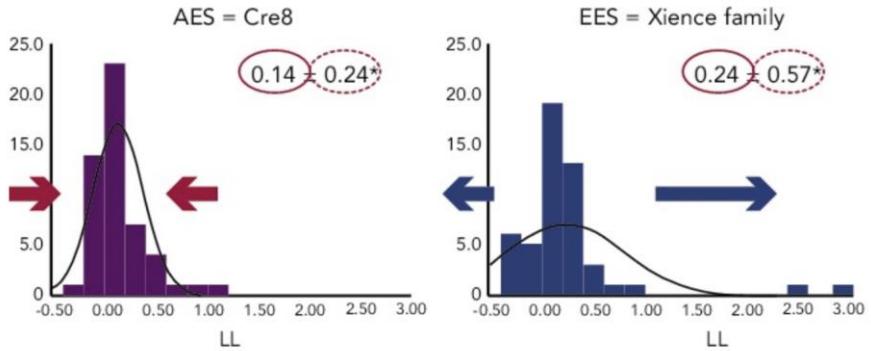
Table 3. Kaplan–Meier Estimates of Major Adverse Cardiovascular and Cerebrovascular Events at 30 Days and 12 Months after the Procedure.

Event	30 Days after Procedure			12 Months after Procedure		
	PCI	CABG	P Value	PCI	CABG	P Value
	number (percent)			*number (percent)*		
Major adverse cardiovascular and cerebrovascular events	45 (4.8)	47 (5.2)	0.68	157 (16.8)	106 (11.8)	0.004
Death	8 (0.8)	15 (1.7)	0.12	32 (3.4)	38 (4.2)	0.35
Myocardial infarction	17 (1.8)	15 (1.7)	0.82	54 (5.8)	30 (3.4)	0.02
Stroke	3 (0.3)	16 (1.8)	0.002	8 (0.9)	17 (1.9)	0.06
Repeat revascularization	31 (3.3)	10 (1.1)	0.002	117 (12.6)	42 (4.8)	<0.001



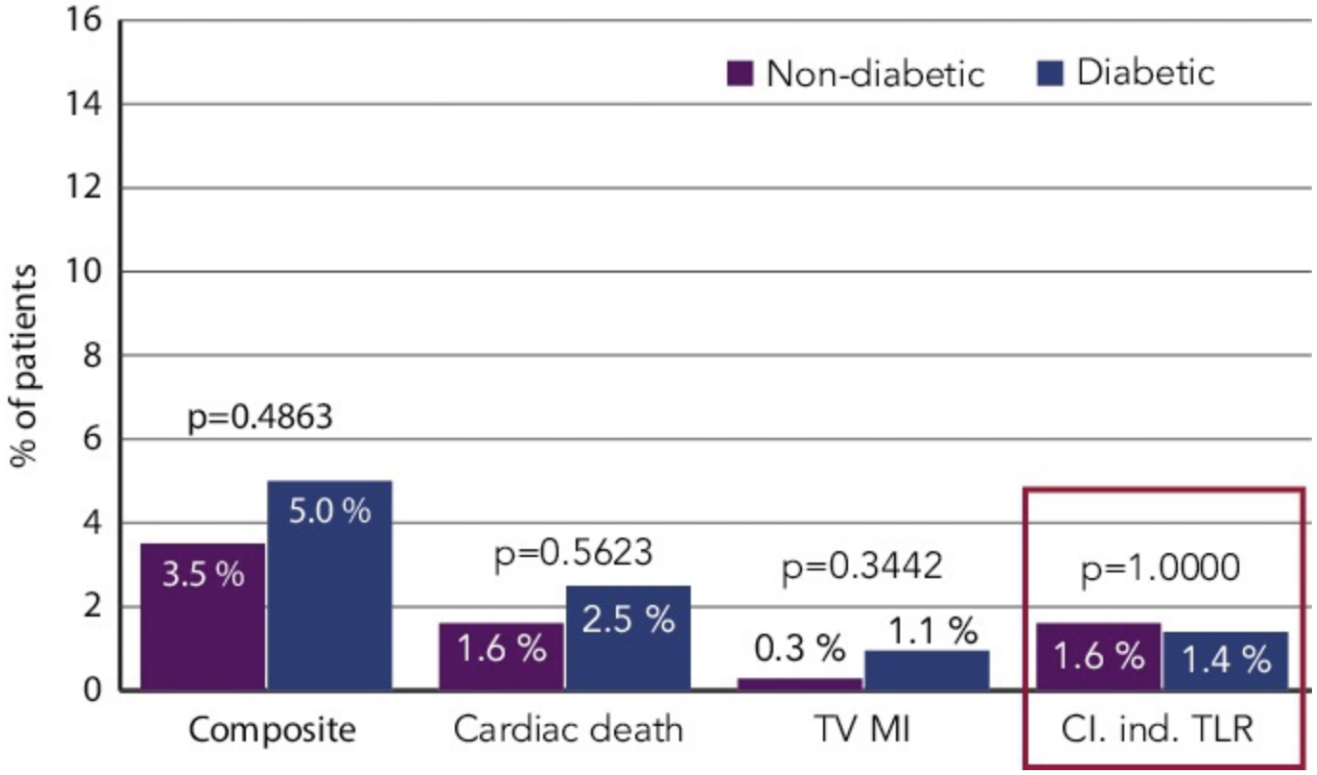
PCI customization

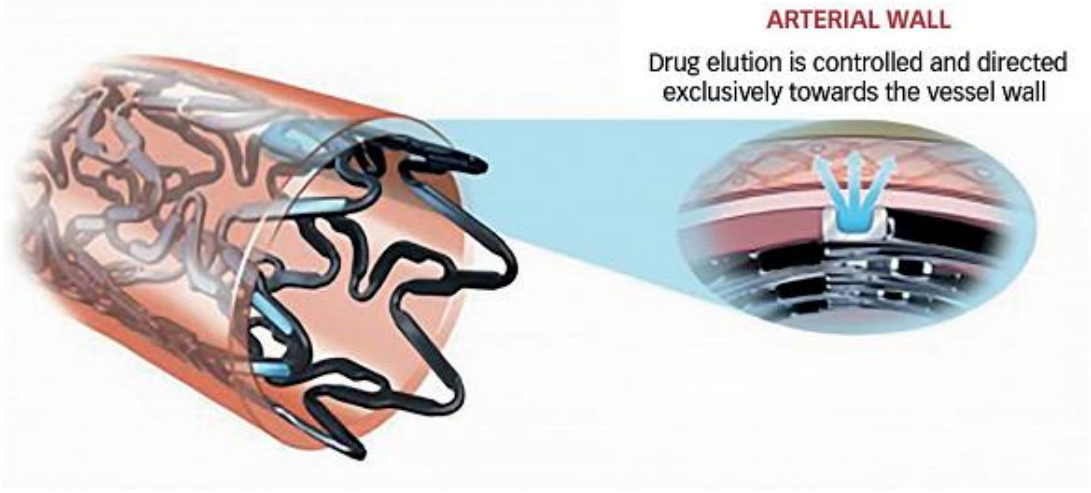
Diabetic patients



*SD

	AES	EES	p-value
MLD (mm)			
In-stent	2.38 ± 0.44	2.19 ± 0.59	0.07
In-segment	2.09 ± 0.45	1.84 ± 0.61	0.02

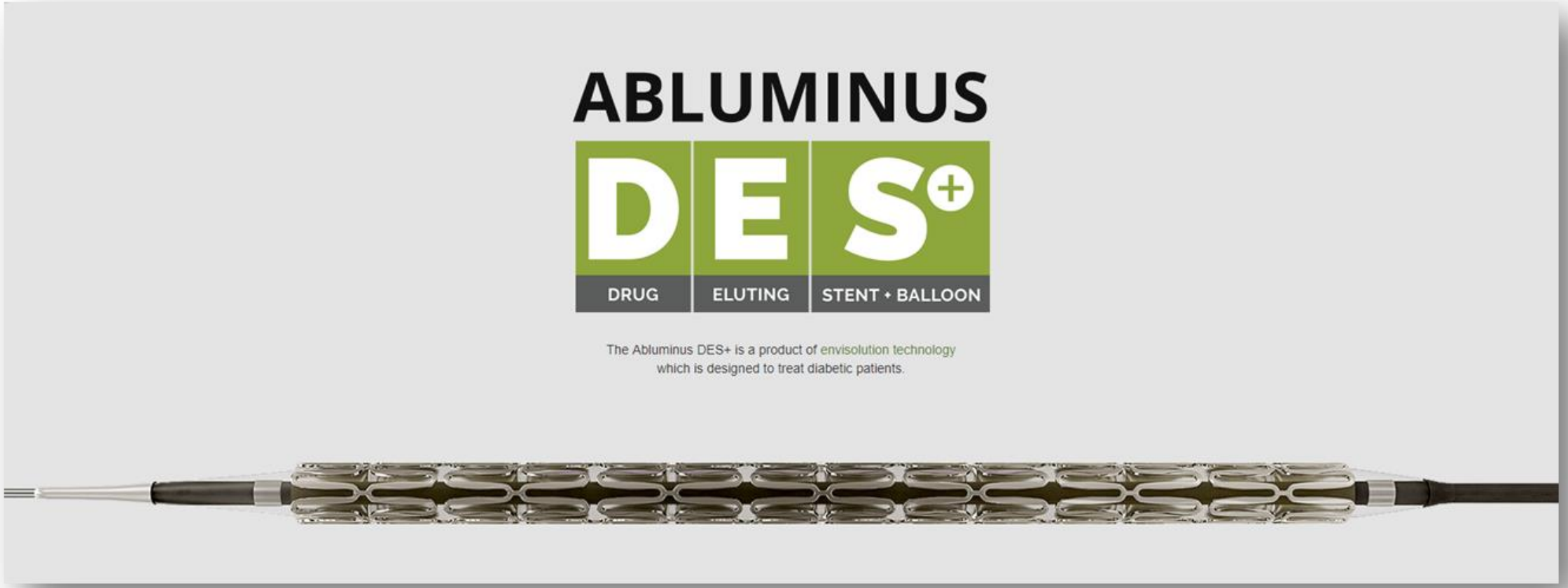




- Amphirolimus-eluting stent
- Abluminar reservoir technology
- Polymer-free technology

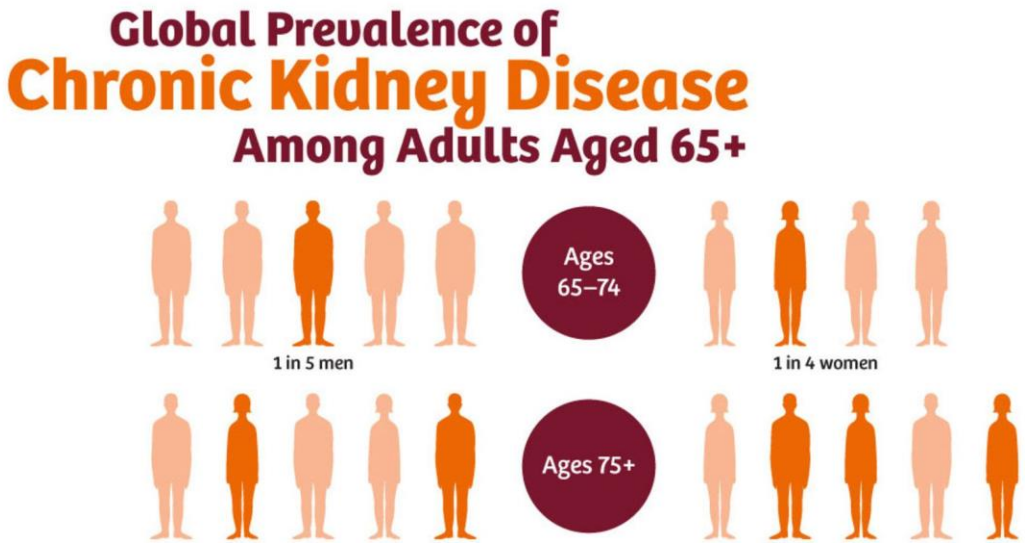
PCI customization

Diabetic patients



PCI customization

Chronic Kidney disease



ESC European Society of Cardiology
European Heart Journal (2019) **40**, 87–165
doi:10.1093/eurheartj/ehy394

2018 ESC/EACTS Guidelines on myocardial revascularization

Patients undergoing coronary angiography or MSCT			
It is recommended that all patients are assessed for the risk of contrast-induced nephropathy.		I	C
Adequate hydration is recommended.		I	C
Patients with moderate or severe CKD (National Kidney Foundation stages 3b and 4)			
Use of low-osmolar or iso-osmolar contrast media is recommended.[284–286]		I	A
It is recommended that the volume of contrast media be minimized.[287,288]	Total contrast volume/GFR <3.7.[c]	I	B
In statin-naïve patients, pre-treatment with high-dose statins should be considered.[293]	Rosuvastatin 40/20 mg or atorvastatin 80 mg.	IIa	A
Pre- and post-hydration with isotonic saline should be considered if the expected contrast volume is >100 mL.	1 mL/kg/h 12 h before and continued for 24 h after the procedure (0.5 mL/kg/h if LVEF ≤35% or NYHA >2).	IIa	C
As an alternative to the pre- and post- hydration regimen, tailored hydration regimens[d] may be considered.[295–297]		IIb	B

PCI customization

Chronic Kidney disease

Coronary angiopraphy

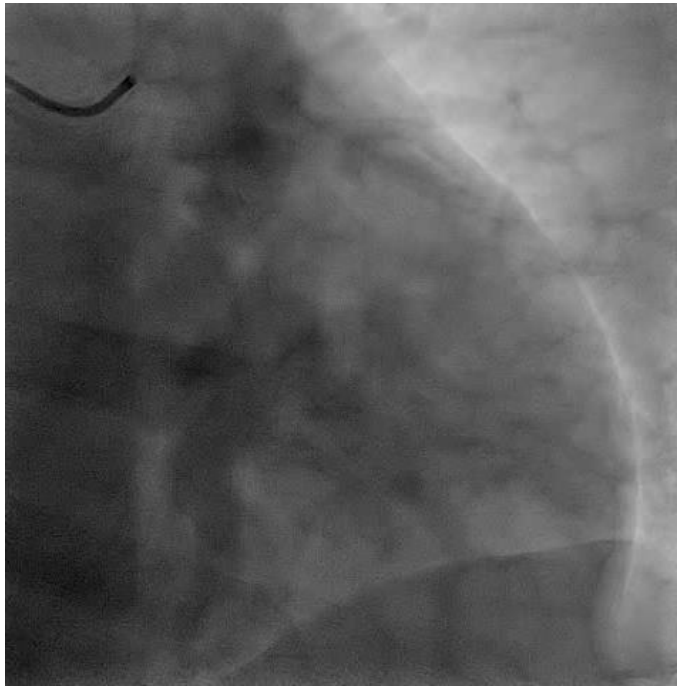
[not same day of PCI]

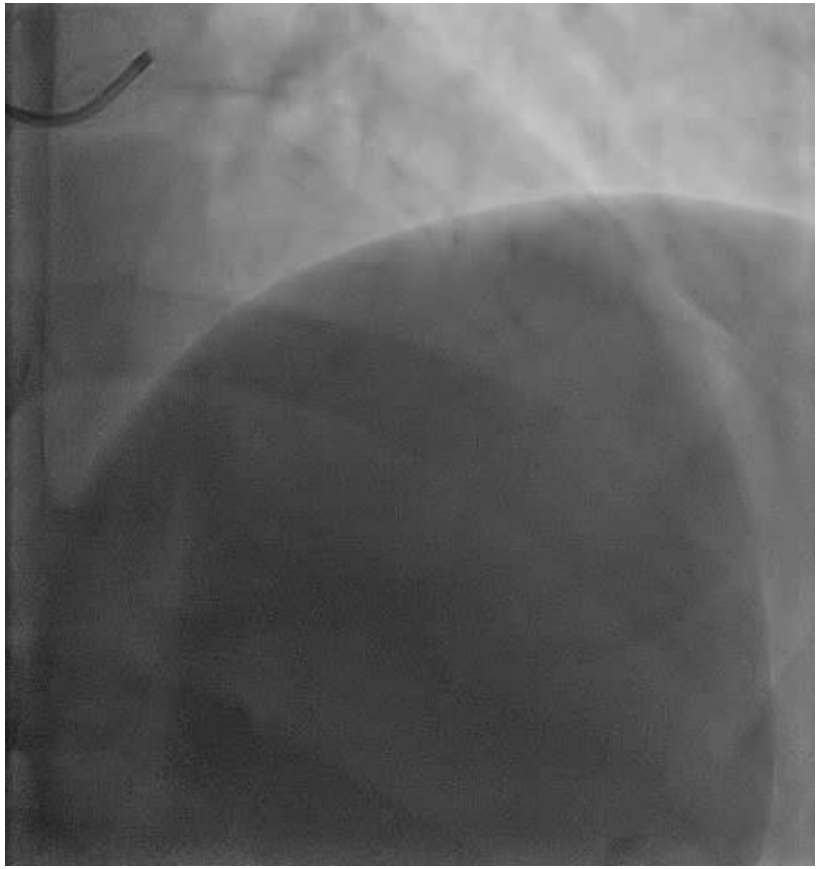
52 years-old

Chronic kidney disease (sCr 2.7 mg/dl)

with prior renal transplantation

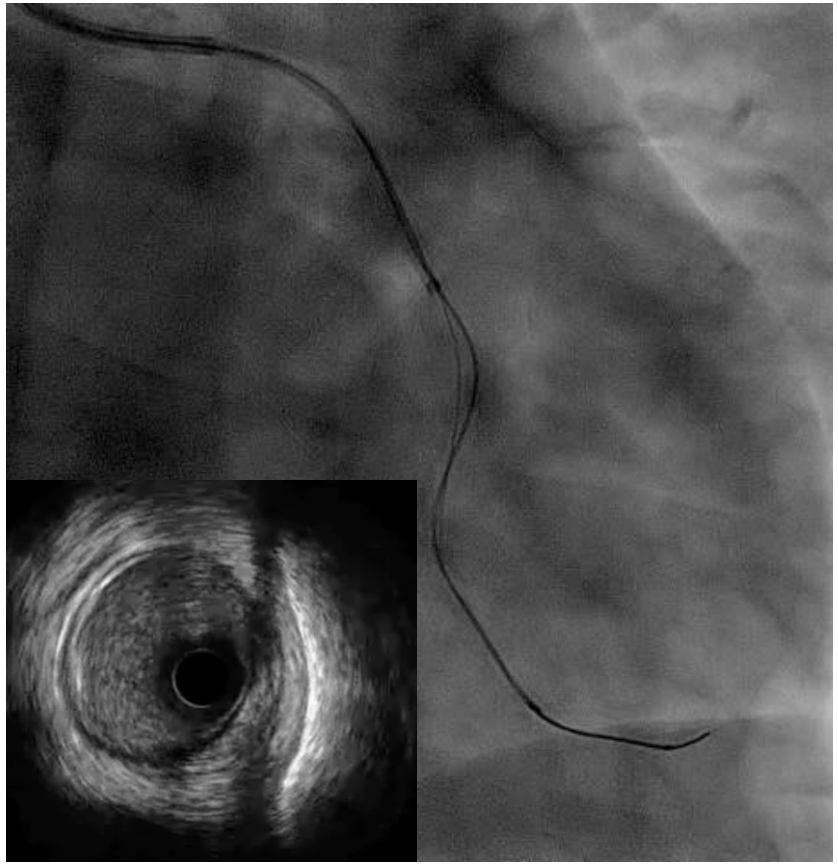
Chronic hepatitis C



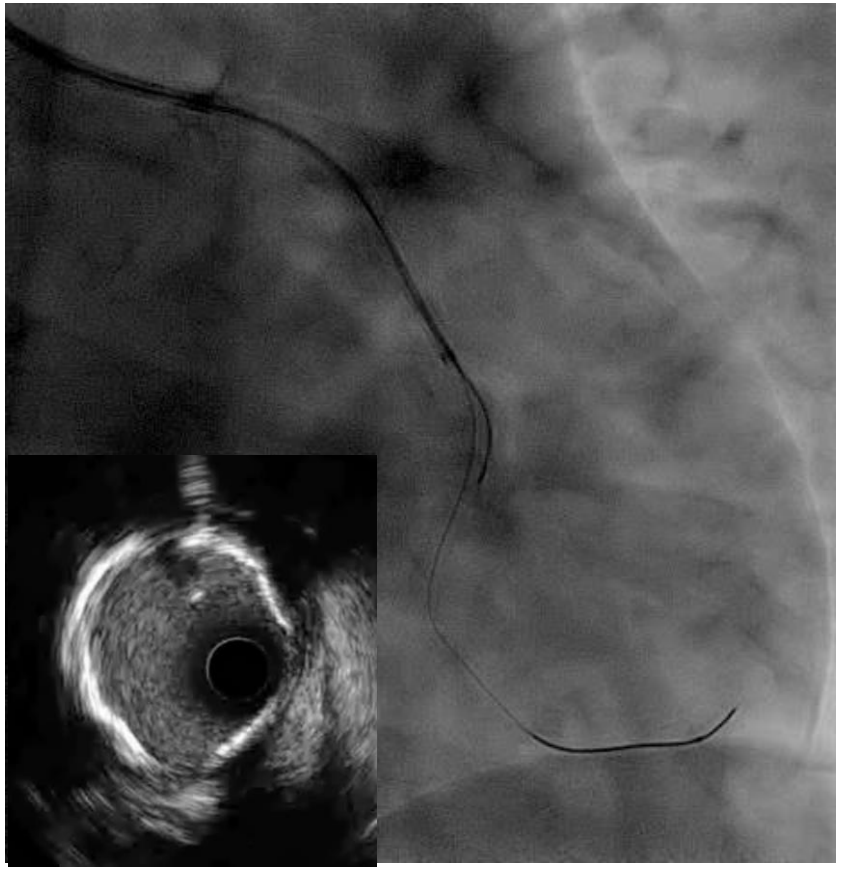


Landing sites were marked with IVUS

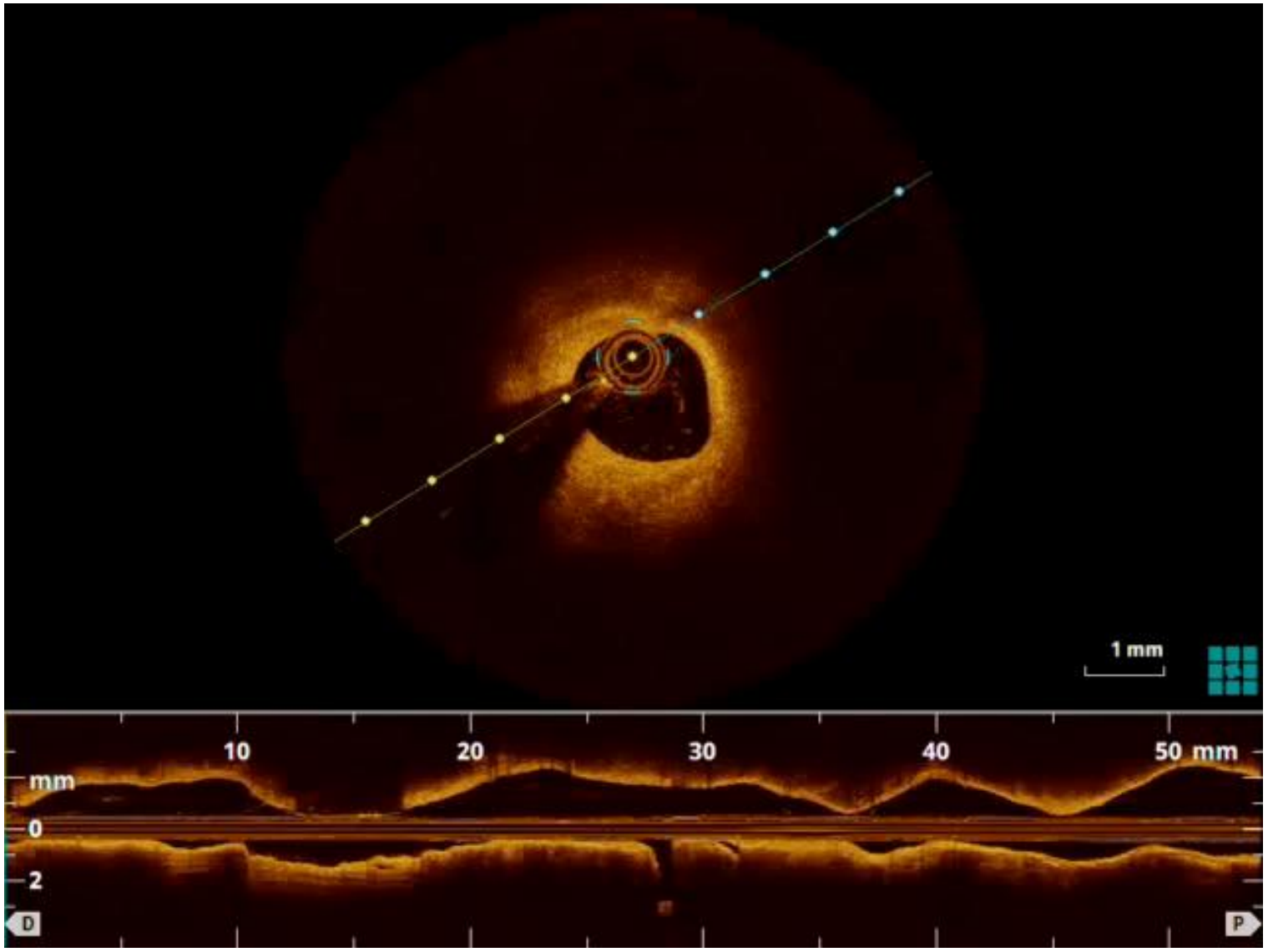
- Distal marking



- Proximal marking

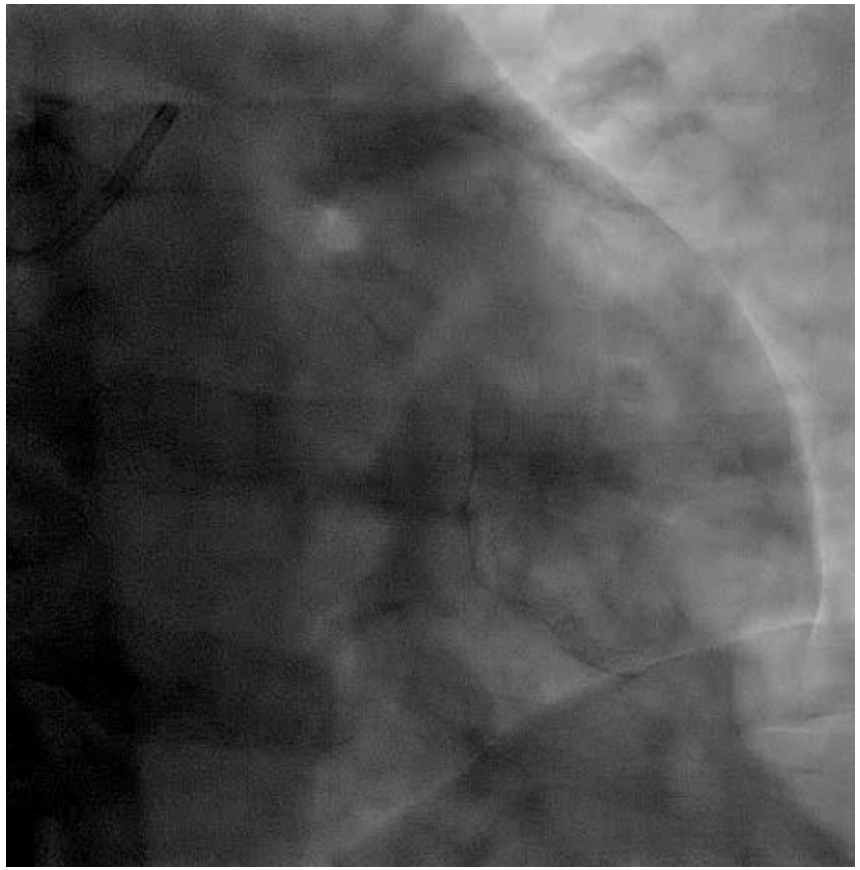


Excellent OCT image with only dextran using Guideliner catheter



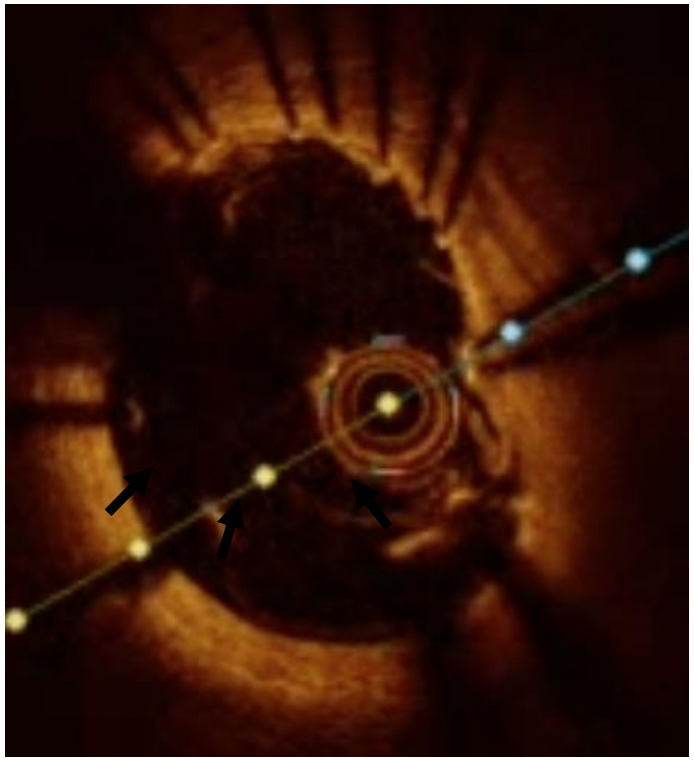
PCI customization

Chronic Kidney disease

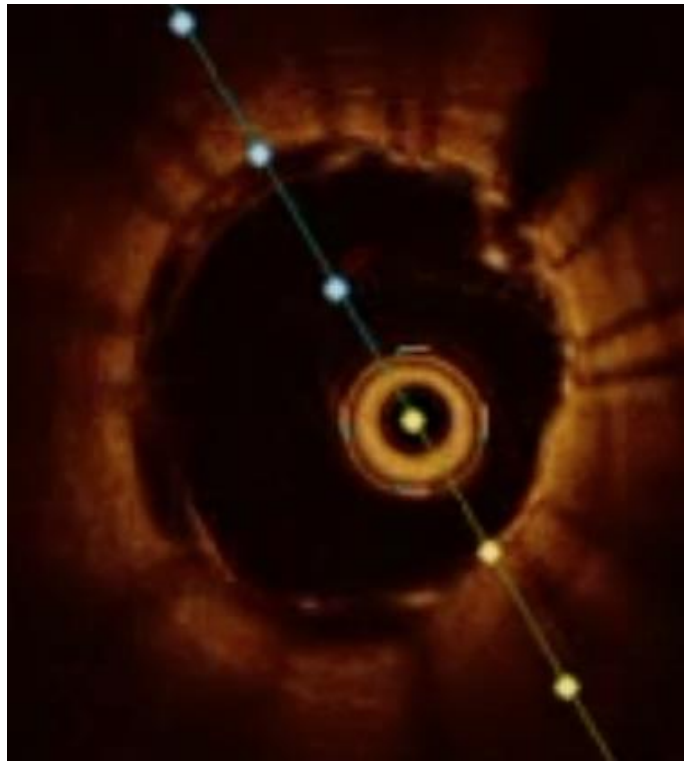


Angiography with half contrast

Before post dilatation



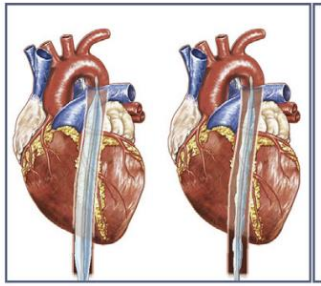
After post dilatation

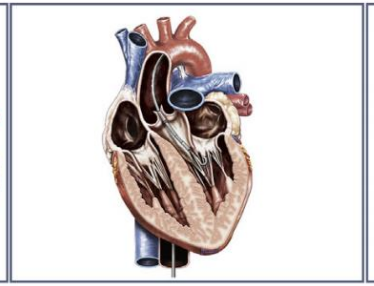


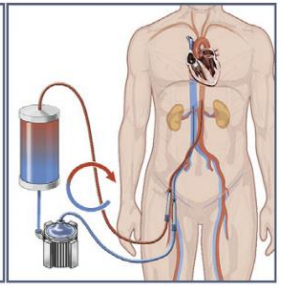
- **Contrast volume: 12.5ml**
- sCr after 72 hours: 2.7 mg/dl (same as before)

PCI customization

Left ventricular ejection fraction







	IABP	IMPELLA	TANDEMHEART	VA-ECMO
Cardiac Flow	0.3-0.5 L/ min	1-5L/ min (Impella 2.5, Impella CP, Impella 5)	2.5-5 L/ min	3-7 L-min
Mechanism	Aorta	LV → AO	LA → AO	RA → AO
Maximum implant days	Weeks	7 days	14 days	Weeks
Sheath size	7-8 Fr	13-14 Fr Impella 5.0 - 21 Fr	15-17 Fr Arterial 21 Fr Venous	14-16 Fr Arterial 18-21 Fr Venous
Femoral Artery Size	>4 mm	Impella 2.5 & CP - 5-5.5 mm Impella 5 - 8 mm	8 mm	8 mm
Cardiac synchrony or stable rhythm	Yes	No	No	No
Afterload	↓	↓	↑	↑↑↑
MAP	↑	↑↑	↑↑	↑↑
Cardiac Flow	↑	↑↑	↑↑	↑↑
Cardiac Power	↑	↑↑	↑↑	↑↑
LVEDP	↓	↓↓	↓↓	↔
PCWP	↓	↓↓	↓↓	↔
LV Preload	---	↓↓	↓↓	↓
Coronary Perfusion	↑	↑	---	---
Myocardial oxygen demand	↓	↓↓	↔↓	↔

PCI customization

Left ventricular ejection fraction

Patient Demographics

Age: 77 year old
Gender: male

Medical History

Hypertension; Dyslipidaemia
NIDDM

Advanced chronic kidney disease (eGFR 16 ml/min/1.73 m2)

Permanent AF (CHADSVASC 6, HASBLED 5) → left appendage occlusion

Clinical Presentation

Stable angina (CCS II)
Recurrent decompensated HF
ECHO: LVEF 25%
SPECT: ischemic and viable anterior wall + apex

Coronary angio:

LAD: critical stenosis on D1 → PCI + 1 DES (September 2017)
LCX: small vessel with diffuse disease
RCA: non critical ostial stenosis

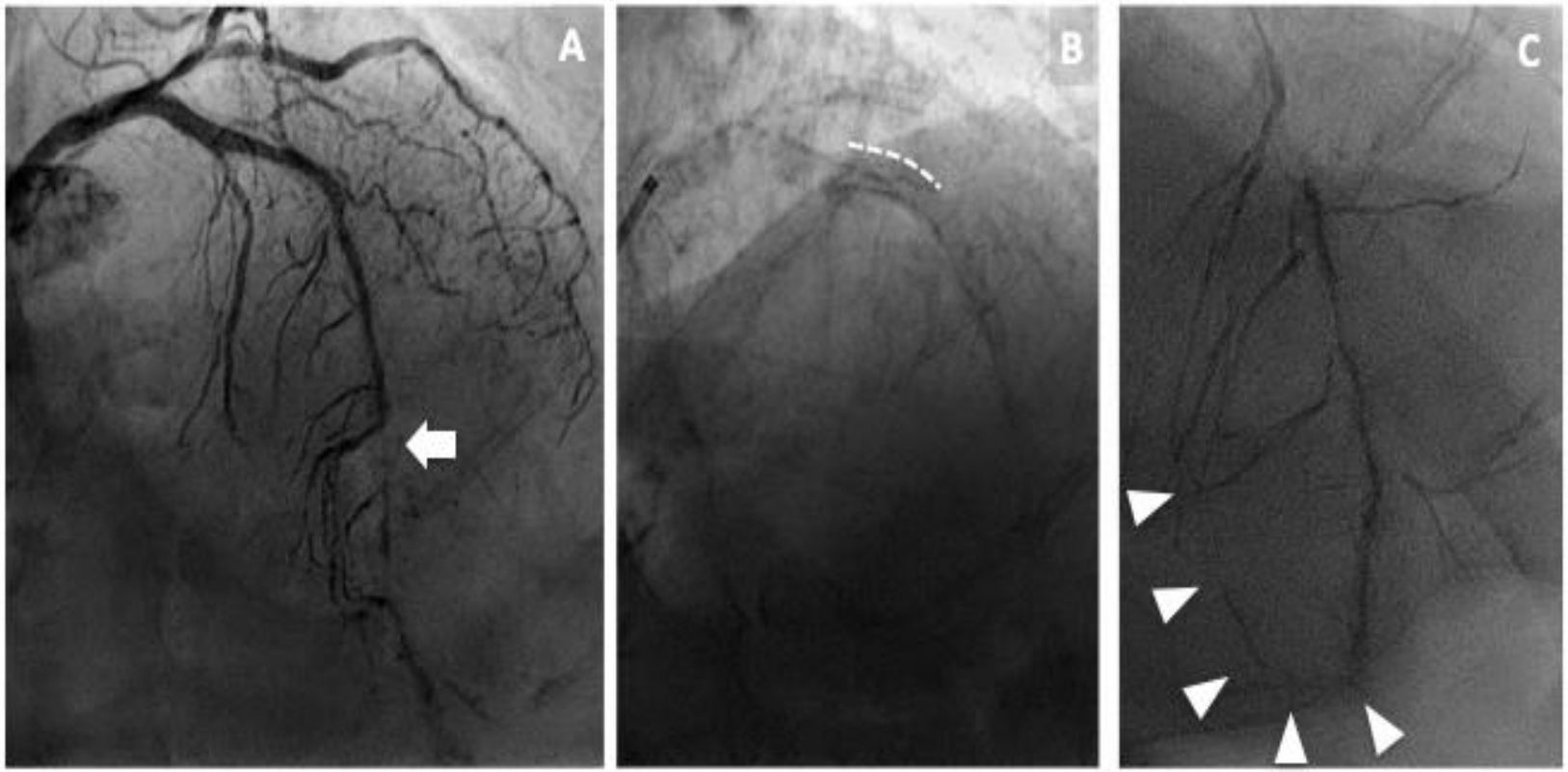
Residual distal LAD chronic occlusion and severely underexpanded stent in the proximal vessel

SYNTAX score: 23.5 (LAD CTO 17.5 pts)
JCTO score 2: calcium, >20 mm

PCI customization

Left ventricular ejection fraction

Baseline angio

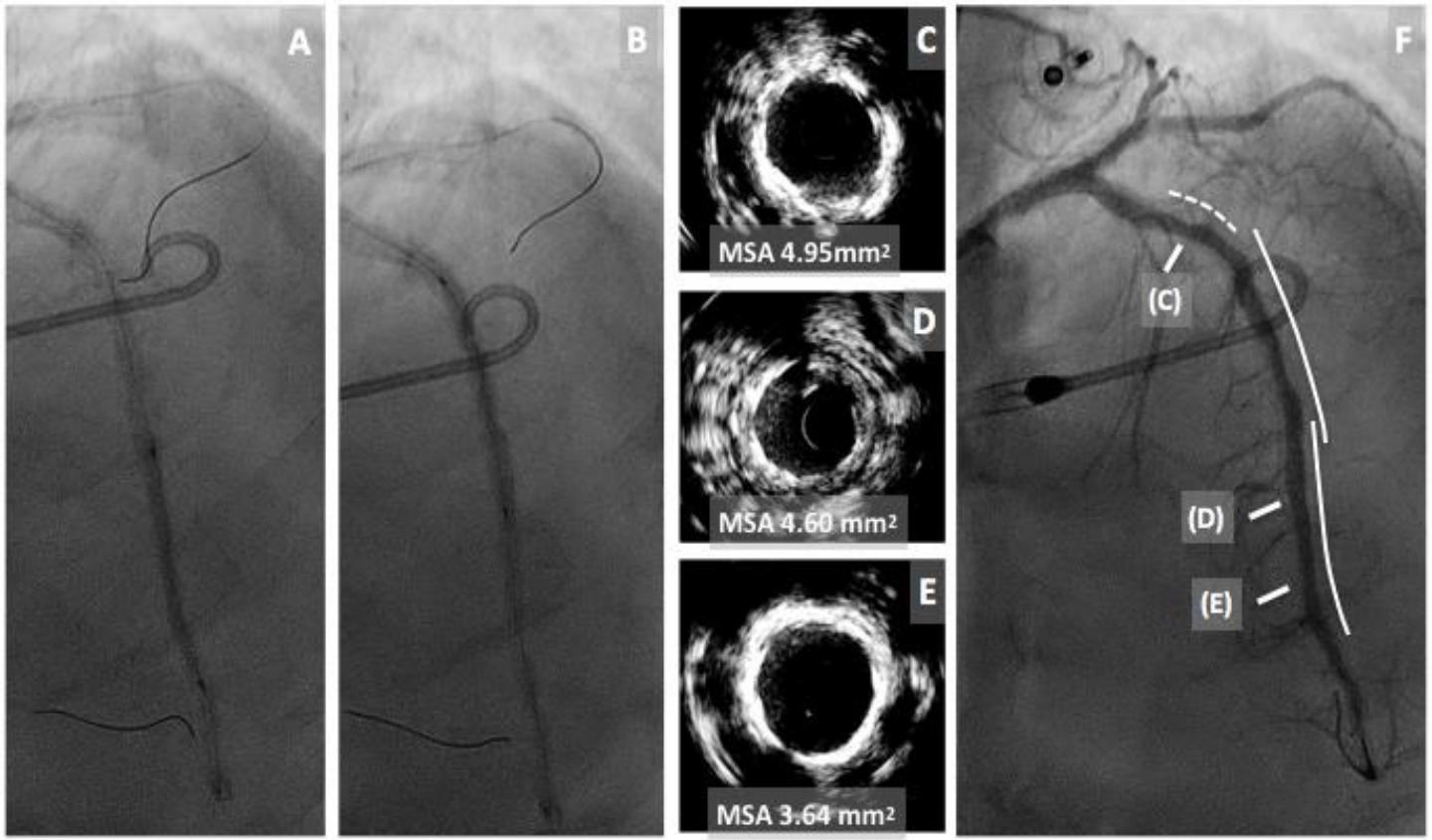


- Panel A shows mid-left anterior descending artery occlusion (arrow). In Panel B the underexpanded stent in the proximal part of the artery is highlighted (dotted line). Panel C shows good interventional collaterals through septo-septal and septo-apical circulation (arrowheads).
- Baseline angio was performed with minimal contrast use (25 ml)

PCI customization

Left ventricular ejection fraction

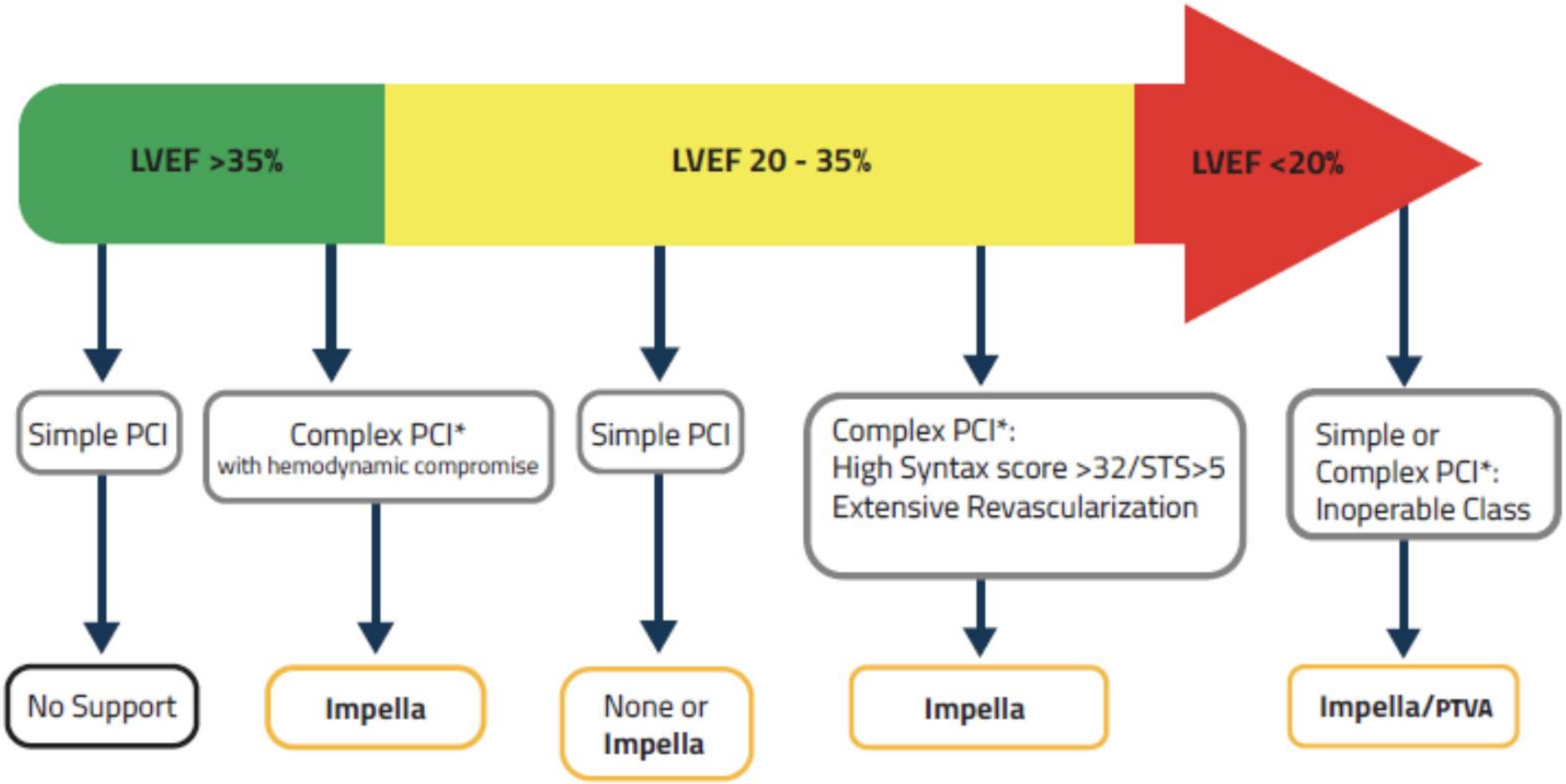
Procedure_2



- Panel A and B show drug-eluting stents implantation, which are presented with lines in Panel F (final angiogram).
- The stents were implanted from the distal to the mid segment, immediately distal to the previously implanted underexpanded stent (dotted line); Panels C-E summarize good final result on intravascular ultrasound.

PCI customization

Left ventricular ejection fraction



*Complex PCI defined as:
- Long calcified lesion
- Bifurcation lesion
- Unprotected LM lesion
- SVG lesion

Conclusions

- Every patient need to receive a PCI waighted on angiographic and clinical features.
- In the new DES era, we should minimize the use of stents, with a paradigm shift (from angiography to functional/morphological evalutation)
- New technologies are changing our idea on «challenging cases»
- Tought patients are becoming more accessible, thus enlarging the PCI armamentarium