Management of coronary obstruction in TAVR

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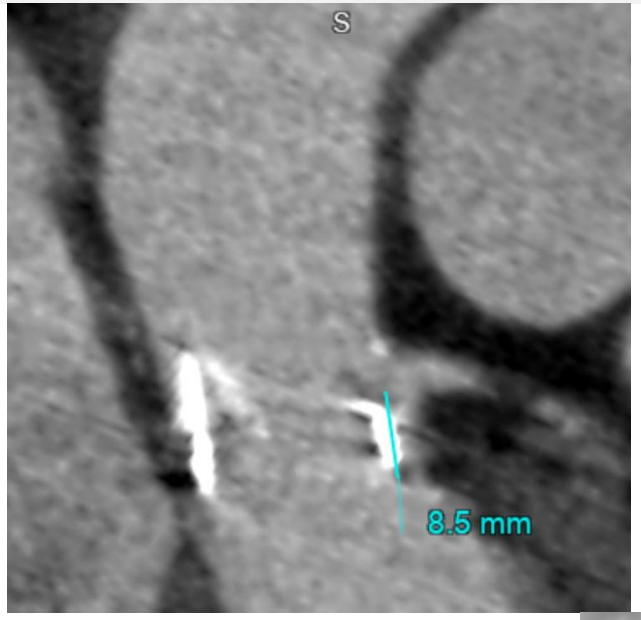
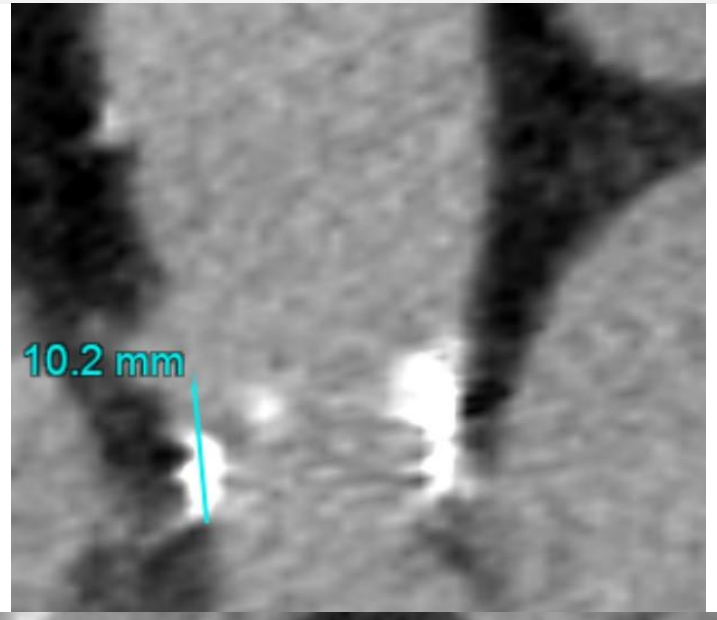
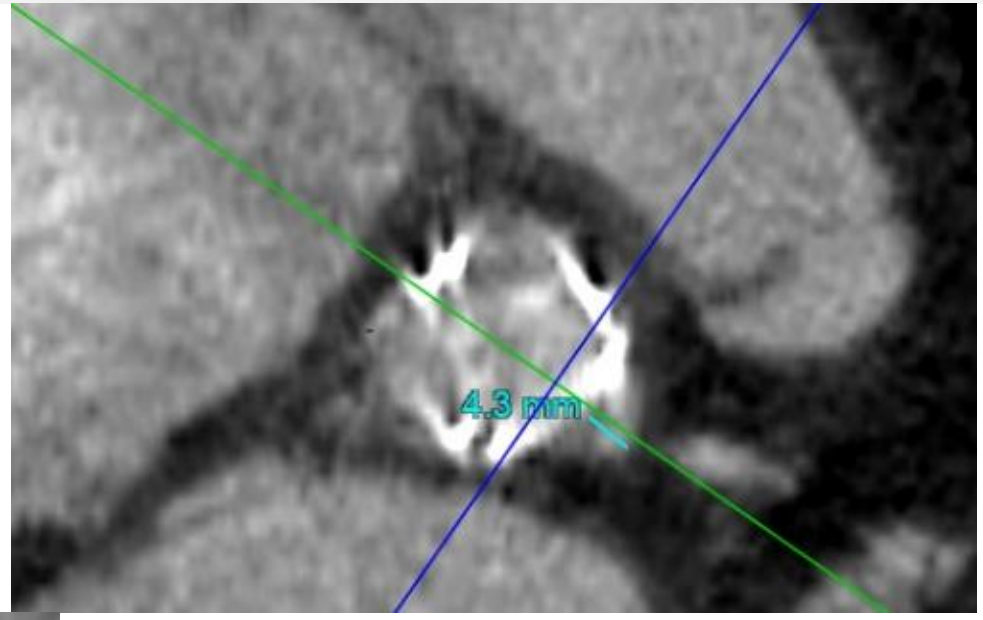
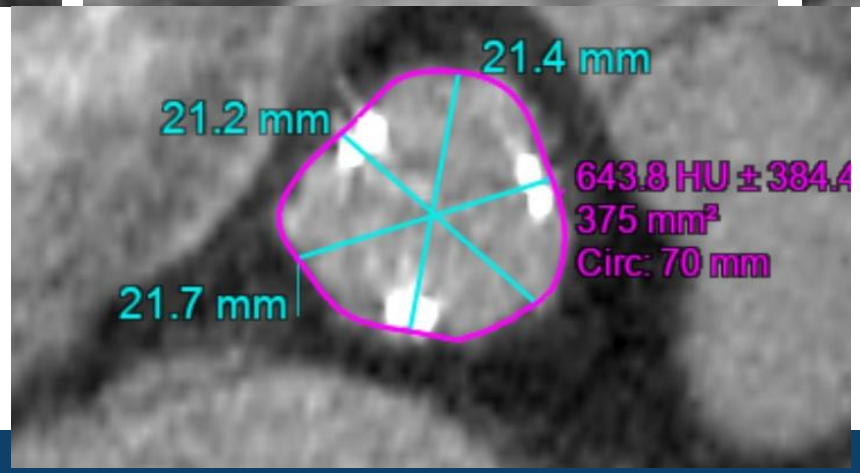
Obstruct?

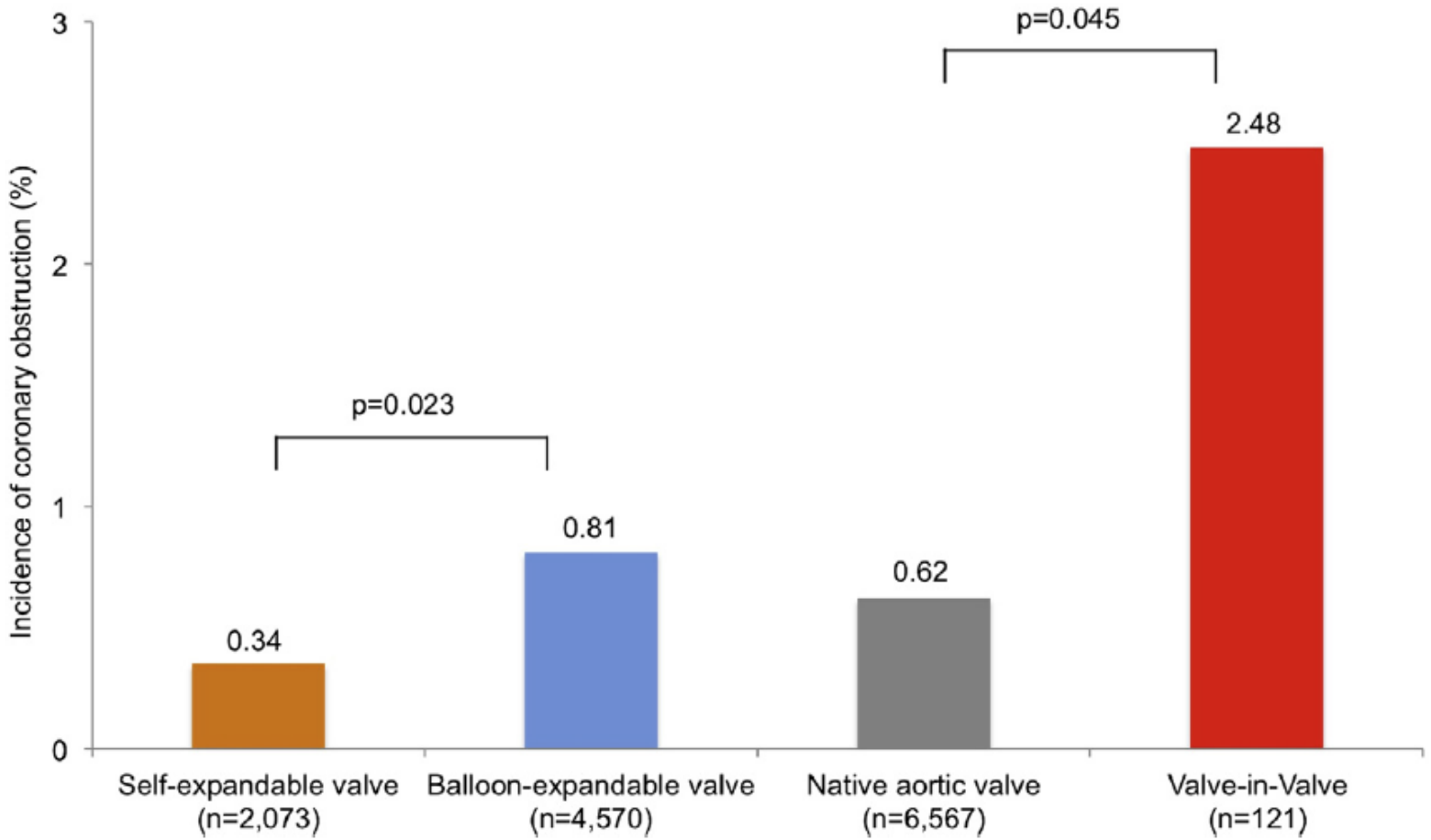

S
8.5 mm


10.2 mm


4.3 mm


21.4 mm
21.2 mm
643.8 HU ± 384.4
375 mm²
Circ: 70 mm
21.7 mm

Frequency of Coronary obstruction



Riberio H et al. JACC 2013;62:1552.

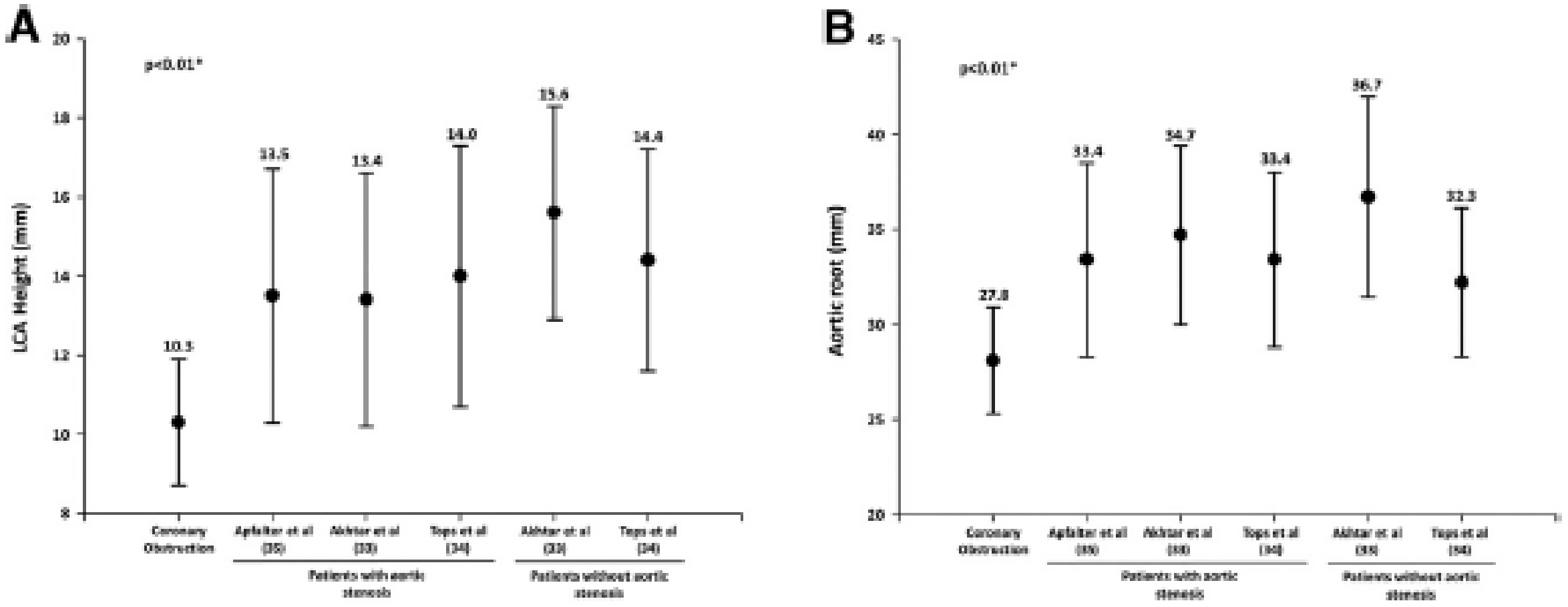
Coronary Obstruction
High morbidity and mortality

Obstructed coronary artery	
Left coronary artery	39 (88.6)
Right coronary artery	2 (4.5)
Both	3 (6.8)
Timing	
After balloon valvuloplasty	4 (9.1)
After valve implantation	31 (70.5)
After balloon post-dilation	4 (9.1)
Within 24 h following TAVI	4 (9.1)
More than 24 h following TAVI	1 (2.3)
Clinical presentation	
Severe persistent hypotension	30 (68.2)
ECG changes	25 (56.8)
ST-segment elevation	14 (56.0)
Ventricular fibrillation	7 (28.0)
Ventricular tachycardia	3 (12.0)
Atrial fibrillation	2 (8.0)
Left bundle branch block	2 (8.0)

30-day outcomes	
Myocardial infarction	21 (47.7)
Peak CK-MB, µg/l	82.4 (24.3–240.6)
New Q waves*	5 (35.7)
New left bundle branch block	4 (9.1)
New pacemaker	1 (2.3)
Major vascular complications	5 (11.4)
Major or life-threatening bleeding	7 (15.9)
Acute renal failure	9 (20.4)
Dialysis	2 (4.5)
Stroke	4 (9.1)
Death	18 (40.9)
Hospitalization length, days	6 (3–17)

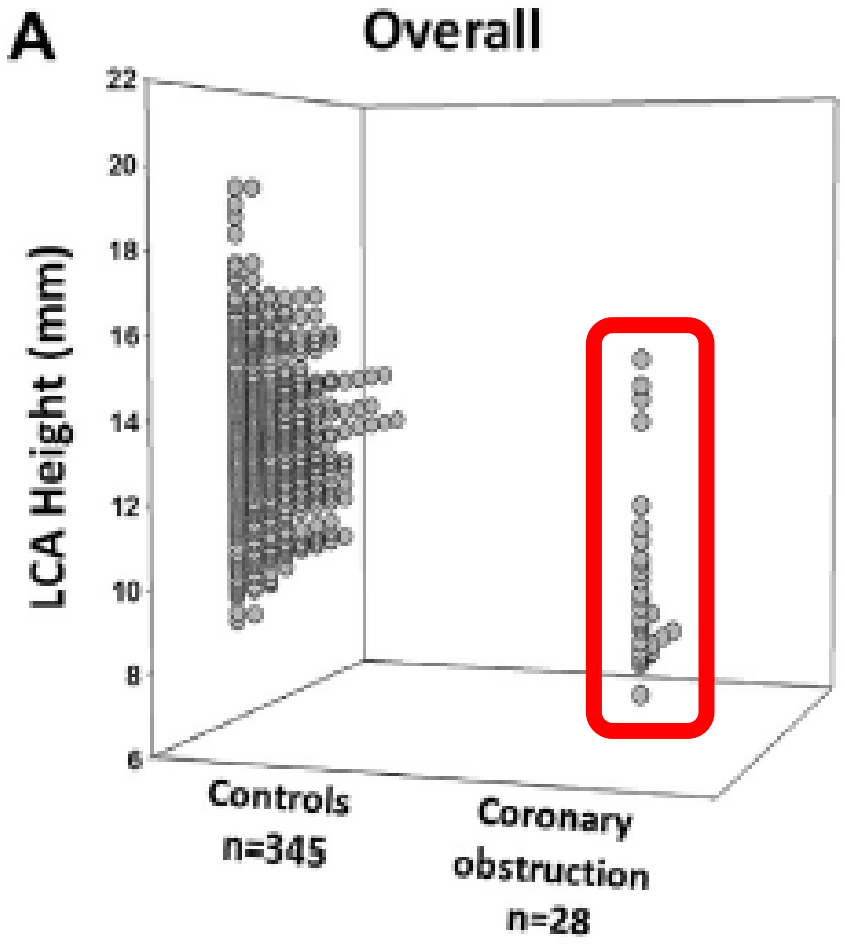
Riberio H et al. JACC 2013;62:1552.

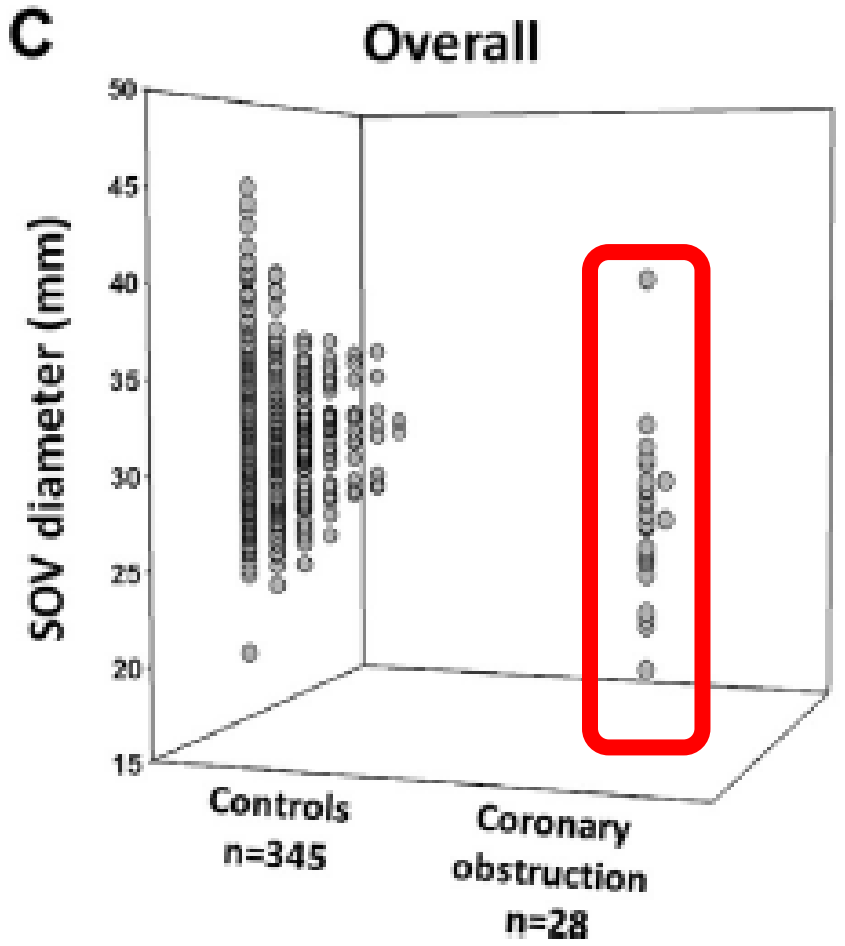
CT data for coronary obstruction



Riberio H et al. JACC Int. 2013;6:452.

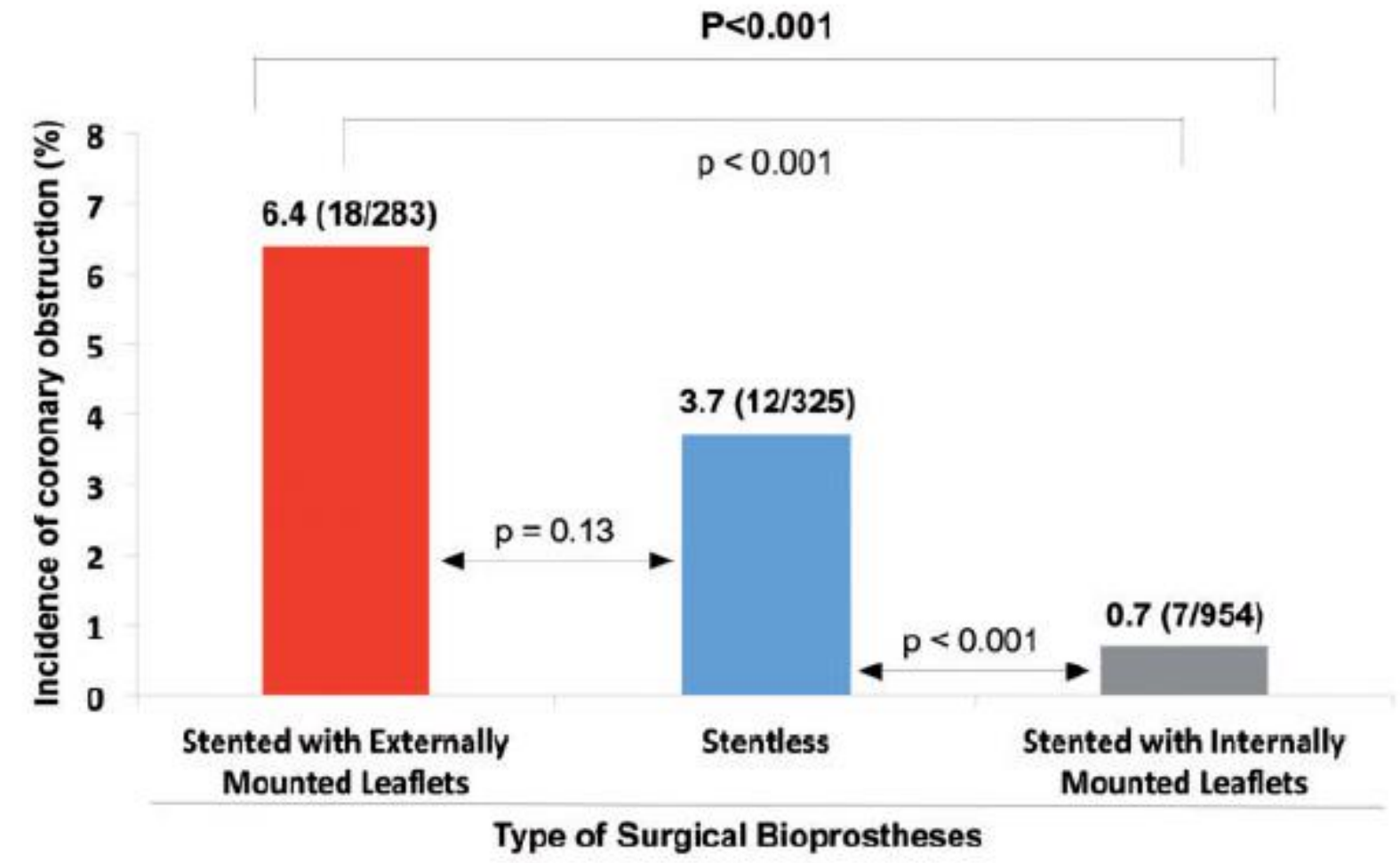
Coronary Obstruction
LM height and SOV





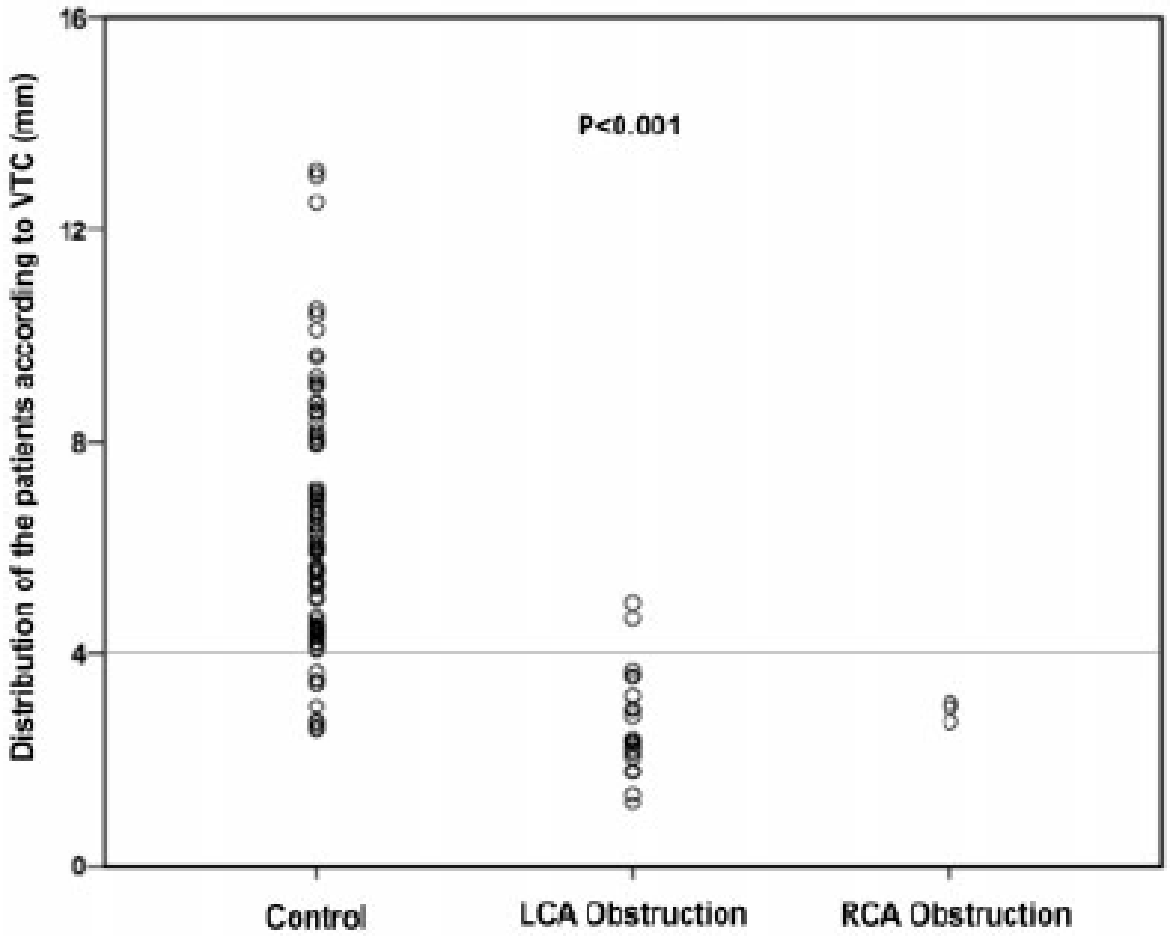
Riberio H et al. JACC Int. 2013;6:452.

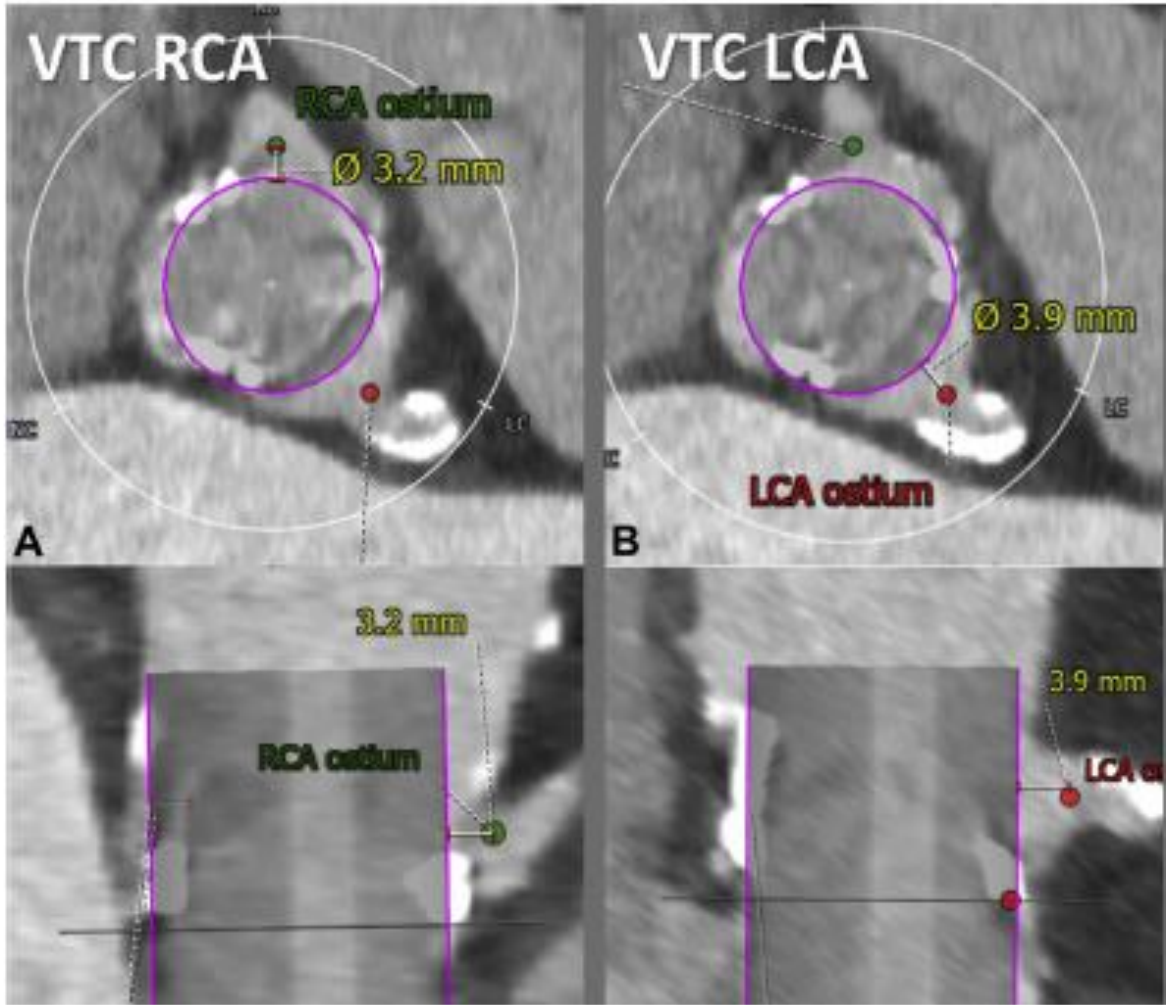
Valve-in-Valve
Valve type matters



Riberio HB et al. EHJ 2018;39:687-695.

Coronary obstruction risk According to VTC





Riberio HB et al. EHJ 2018;39:687-695.
Lederman RJ et al JACC Int 2019;12:1197.

Predictors of Coronary Obstruction

Table 4 Predictors of coronary obstruction following valve-in-valve procedures

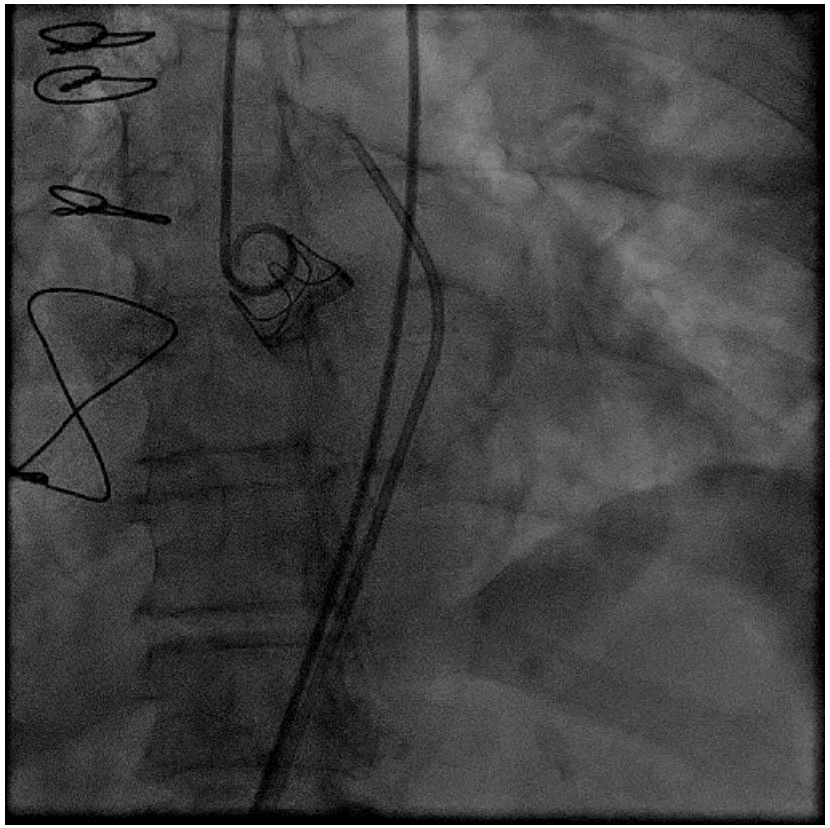
	Univariable OR (95% CI)	*P*-value	Multivariable model OR (95% CI)	*P*-valu
Model for the overall population ($n = 1612$)				
CABG to the left system	0.36 (0.13–1.03)	0.056	0.38 (0.13–1.09)	0.07
STS-PROM	1.03 (0.99–1.06)	0.068	1.02 (0.99–1.05)	0.21
Post-dilatation	2.05 (0.92–4.56)	0.080	1.82 (0.8–4.14)	0.15
Stented with external mounted leaflet or stentless bioprosthesis	7.07 (3.09–16.2)	<0.001	7.67 (3.14–18.7)	<0.001
Model for the computed tomography cohort ($n = 110$)				
VTC[a]	0.18 (0.08–0.39)	<0.001	0.22 (0.09–0.51)	<0.001
Sinus of Valsalva mean diameter	0.70 (0.58–0.83)	<0.001	0.95 (0.72–1.25)	0.71
Stented with external mounted leaflet or stentless bioprosthesis	4.90 (1.51–15.9)	0.008	4.30 (0.85–21.7)	0.08

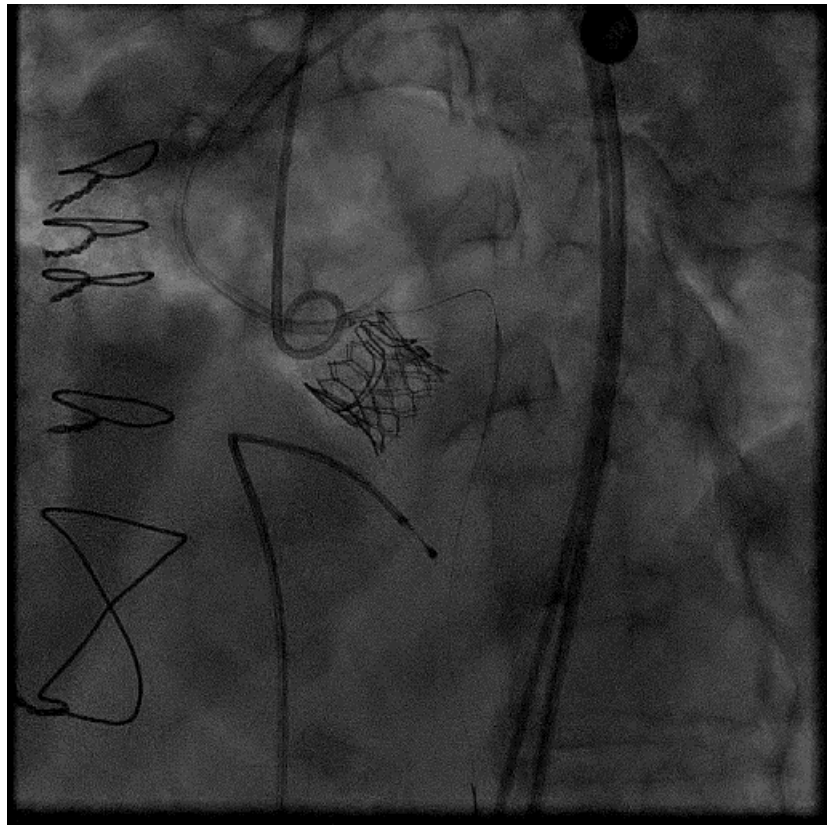
Abbreviations as in Tables 1 and 3.

[a]Per unit increase.

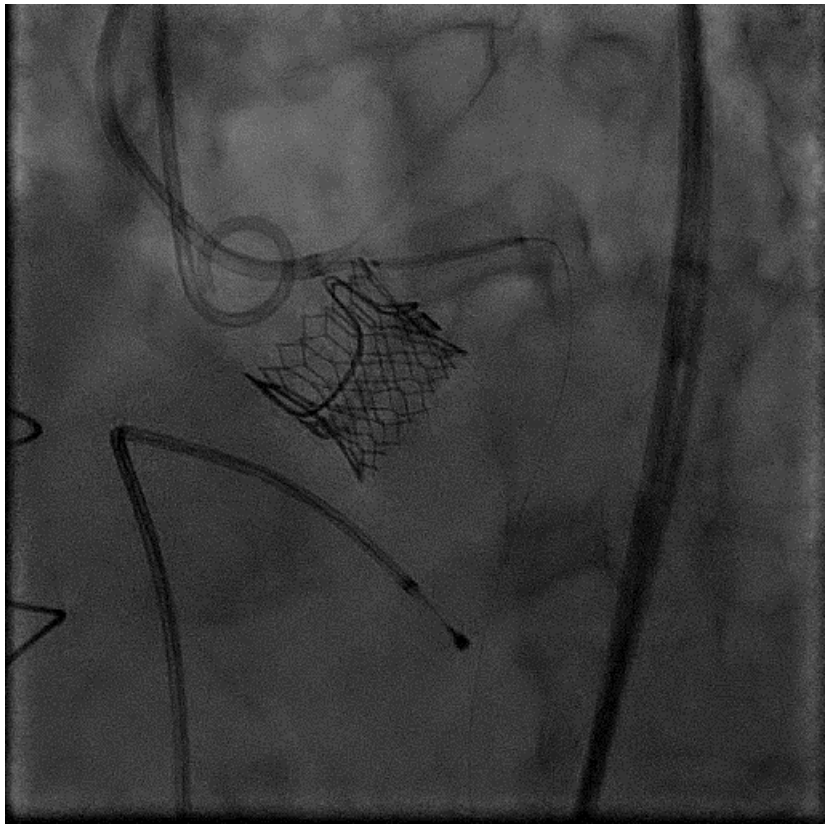
Riberio HB et al. EHJ 2018;39:687-695.

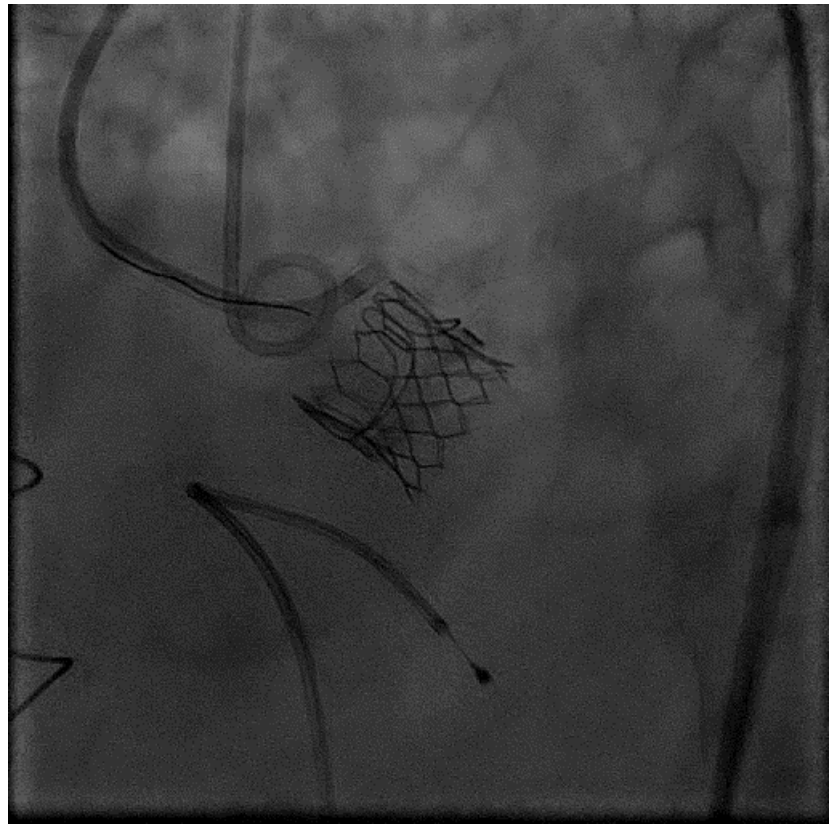
VIV TAVR
Edwards 20 mm Valve





Coronary Wire Protection with stent

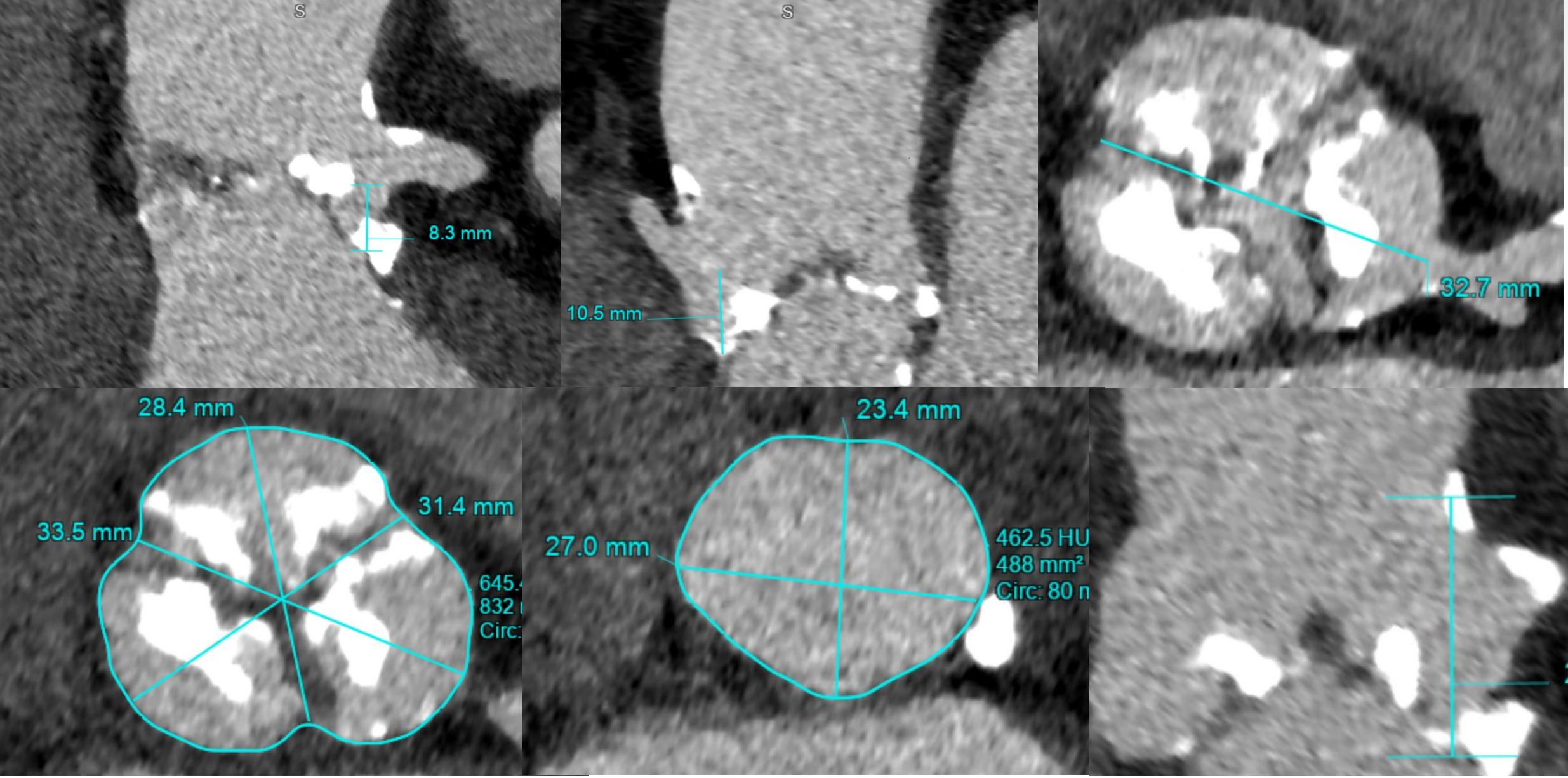




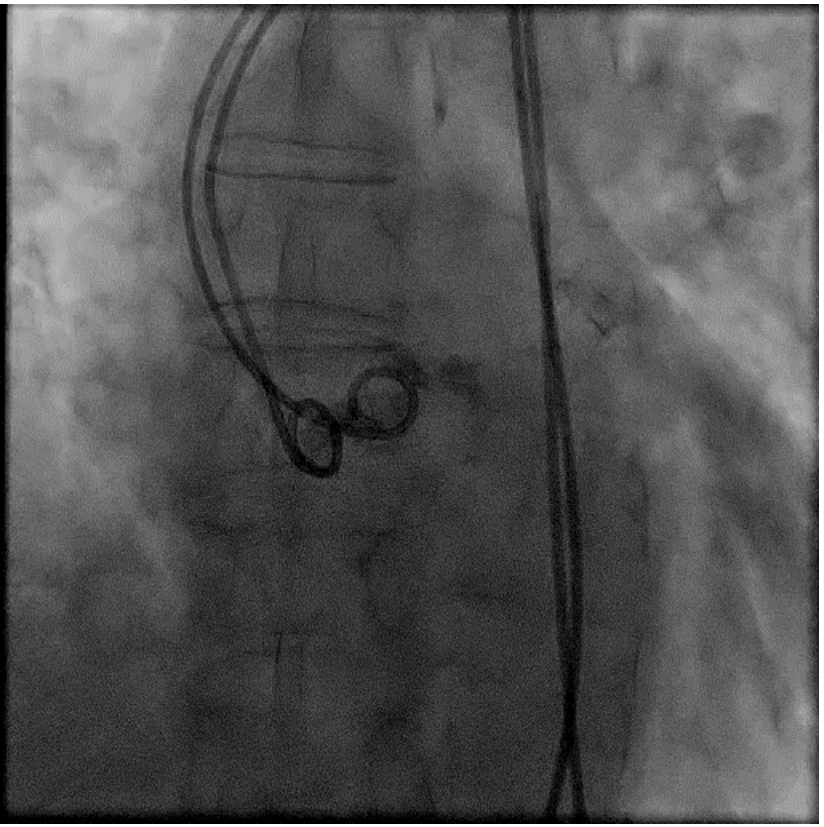
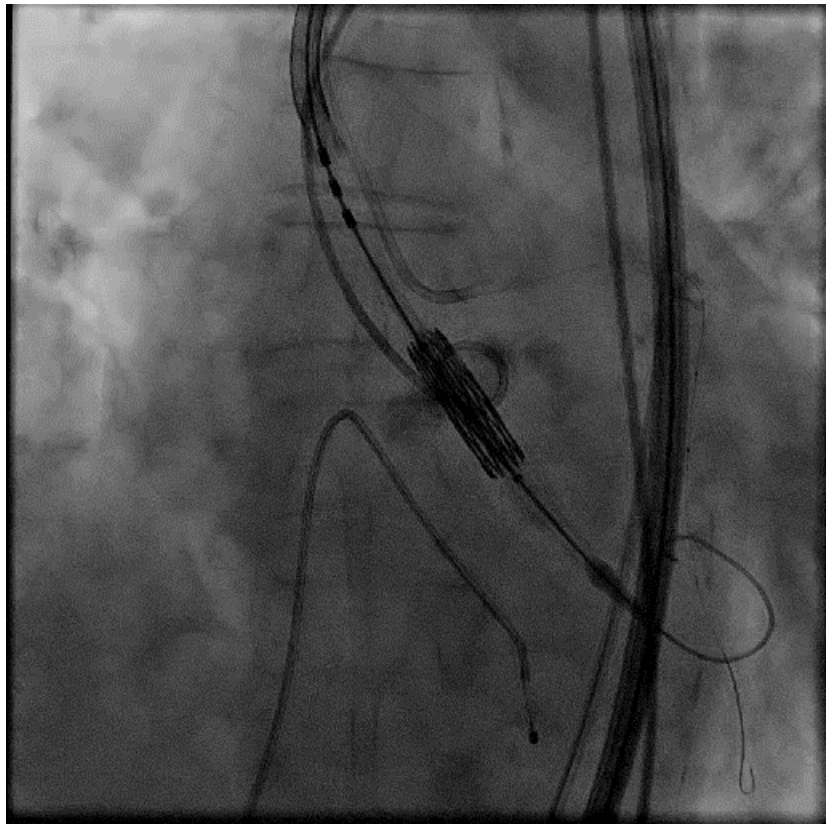
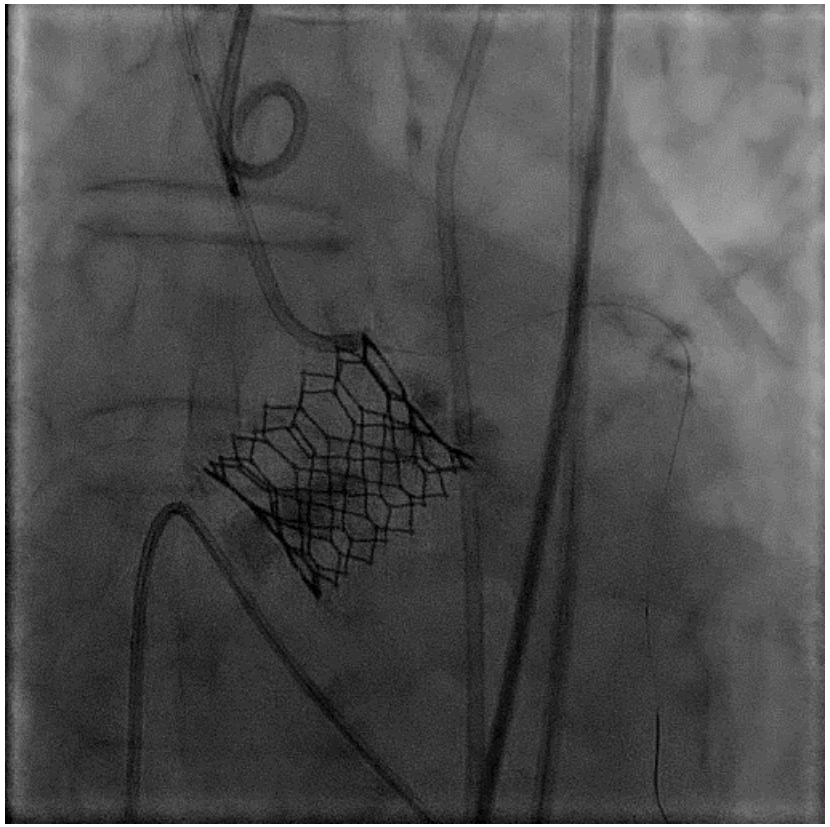
Multicenter Registry
94 coronary protection cases

Patients, n	Overall n = 666	CP n = 94	Non-CP n = 572	p value
Intensive care unit stay, days	1.0 (1.0–3.0)	1.0 (1.0–2.0)	1.0 (1.0–3.0)	0.084
Hospital stay after procedure, days	11.0 (7.0–16.0)	9.0 (7.0–14.5)	11.0 (7.0–17.0)	0.051
30 day mortality, n	14 (2.1)	4 (4.3)	10 (1.7)	0.12
Acute coronary obstruction, n	10 (1.5)	7 (7.4)	3 (0.5)	<0.001
Periprocedural myocardial injury, n	6 (0.9)	3 (3.2)	3 (0.5)	0.011
Stroke, n	16 (2.4)	1 (1.1)	15 (2.6)	0.36
Transit ischemic accident, n	3 (0.5)	0 (0.0)	3 (0.5)	0.48
Acute kidney injury ≥ grade 2, n	28 (16.3)	9 (20.0)	19 (15.0)	0.43

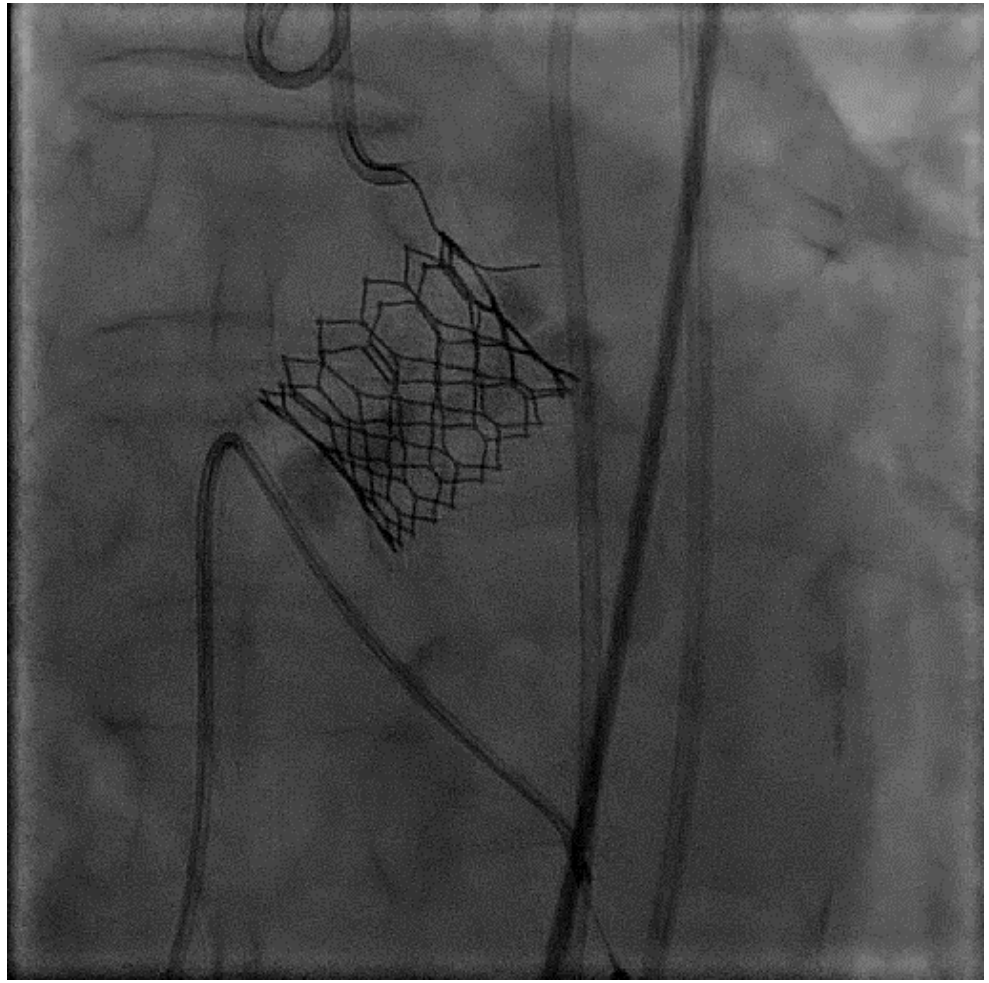
Yamamoto M et al. IJC 2016;217:58-63.

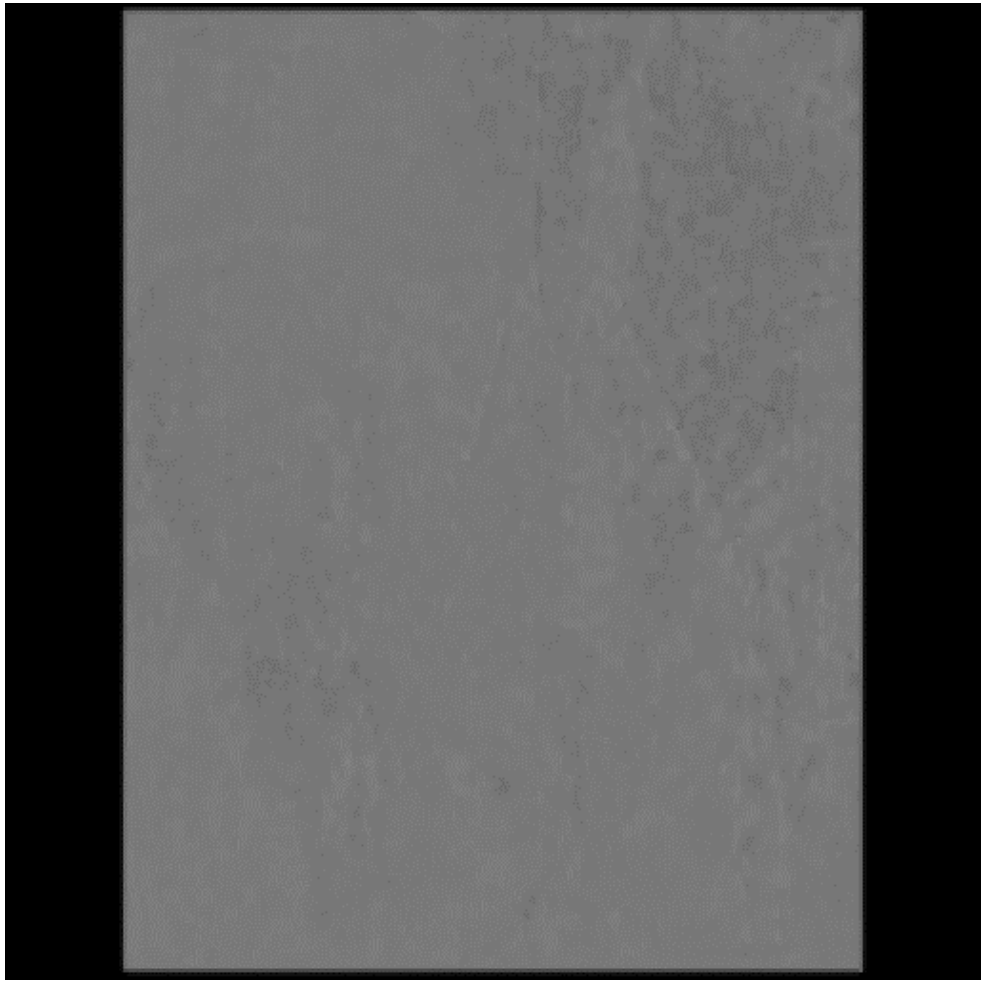

S
8.3 mm
S
10.5 mm
32.7 mm
28.4 mm
31.4 mm
33.5 mm
23.4 mm
27.0 mm
462.5 HU
488 mm²
Circ: 80 n
20.7

Implantation of a 26 mm Sapien 3

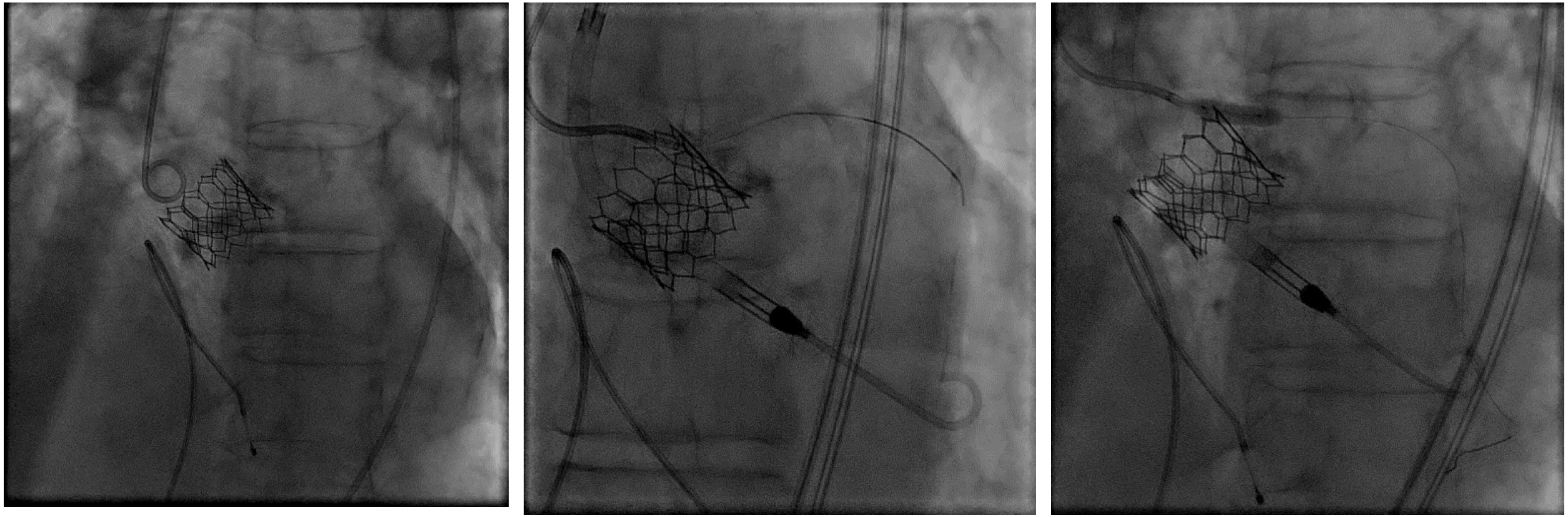
TIMI III Flow



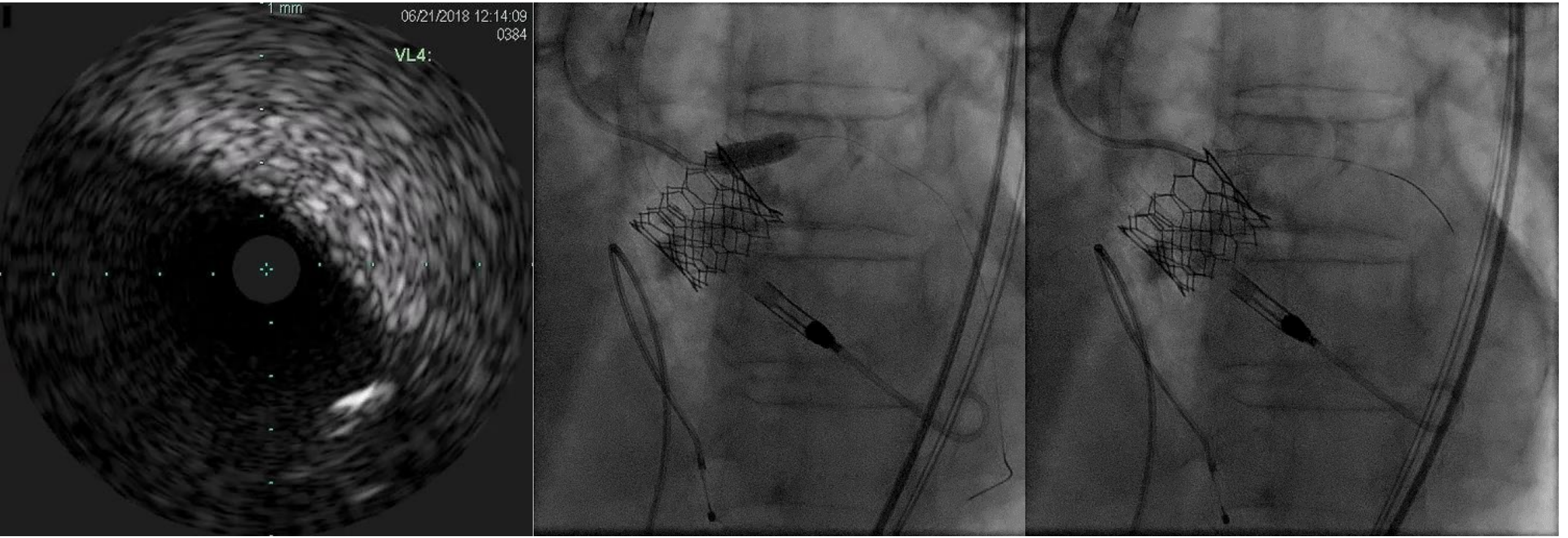


Hypotension!

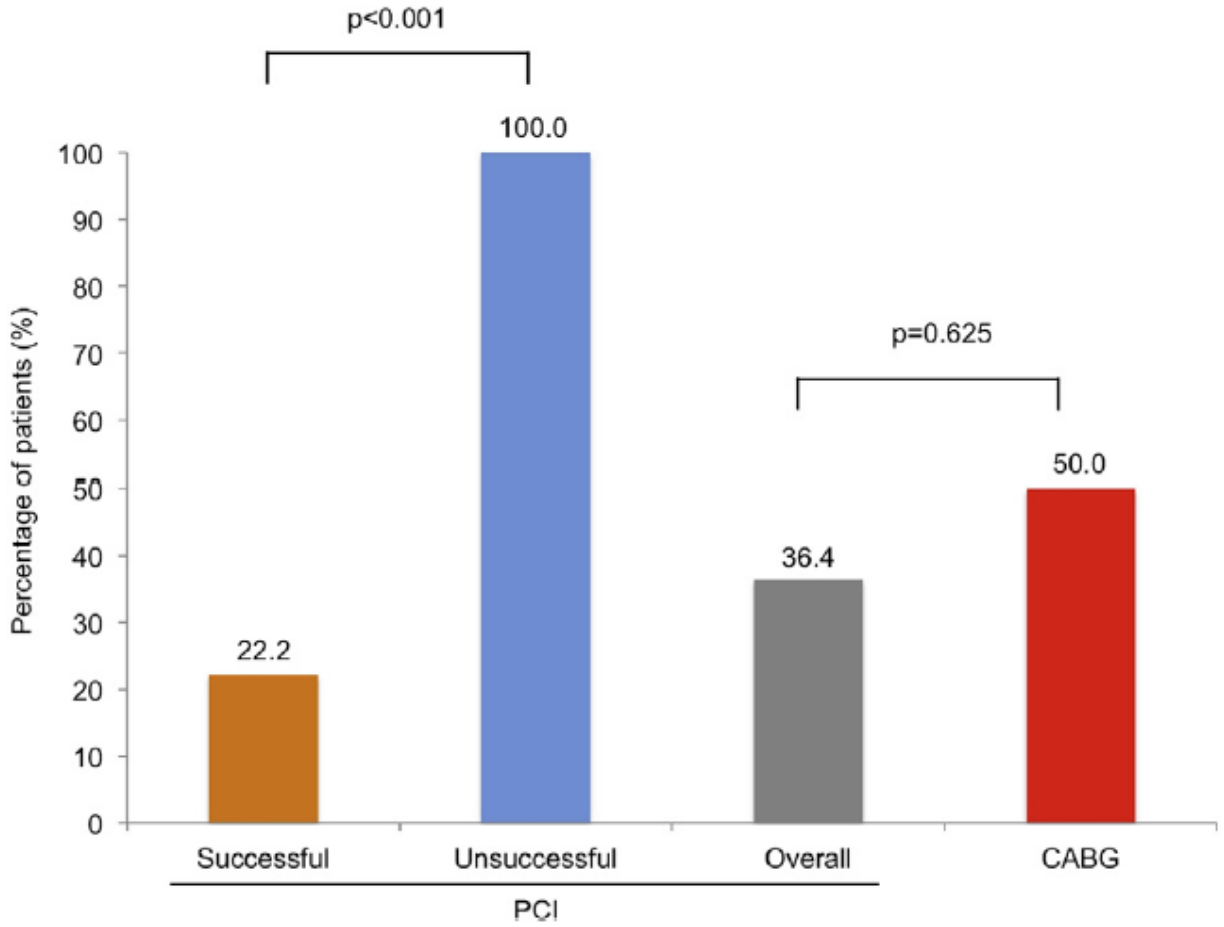
pVAD
Angioplasty

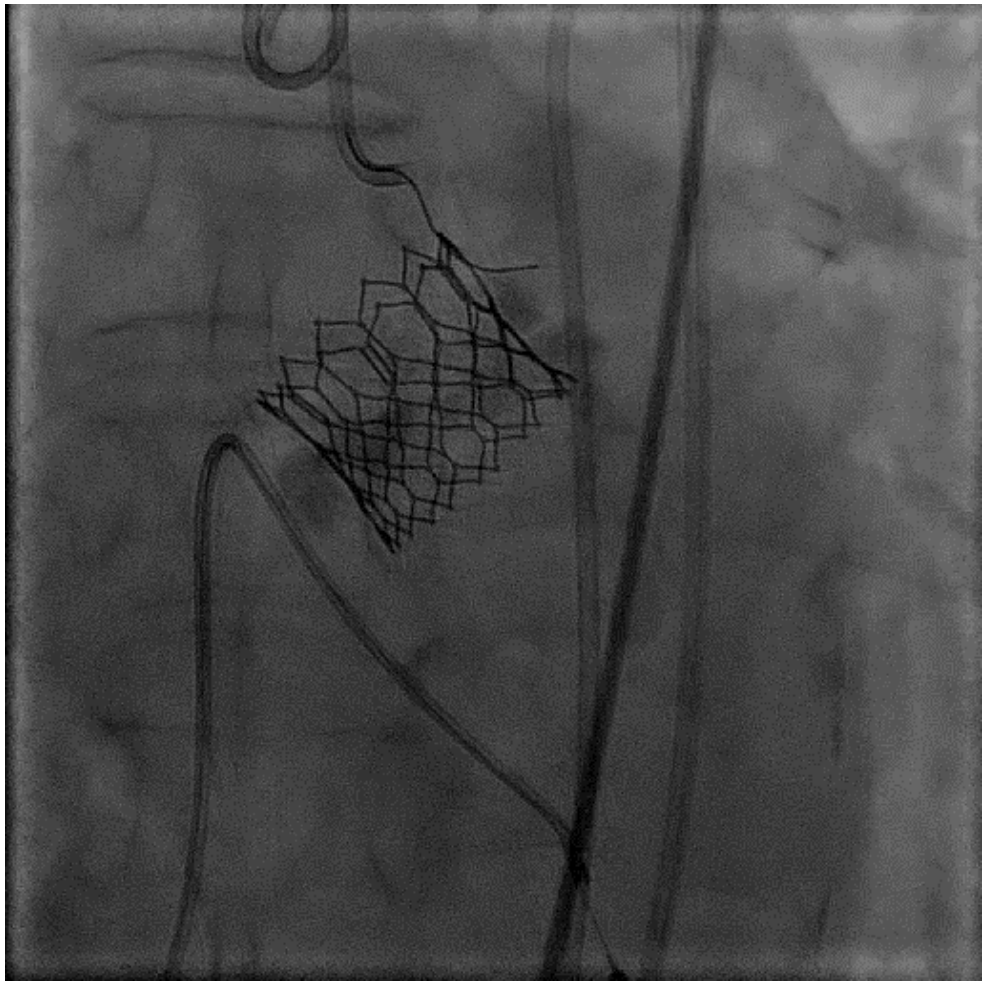


IVUS
Stent



Mortality with PCI and coronary obstruction

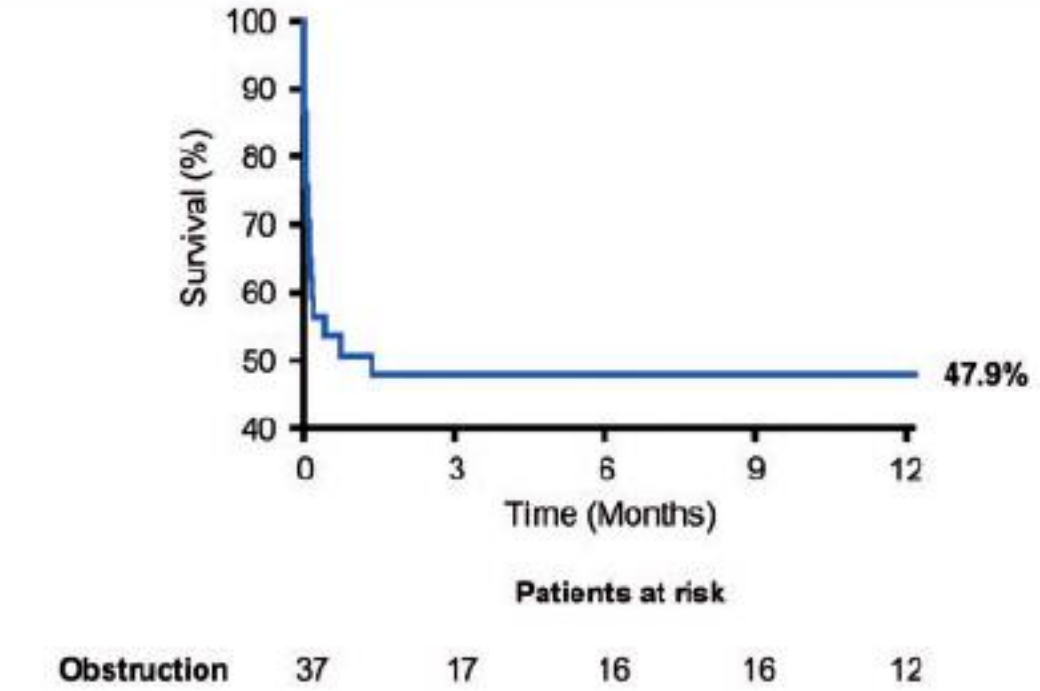




Riberio H et al. JACC 2013;62:1552.

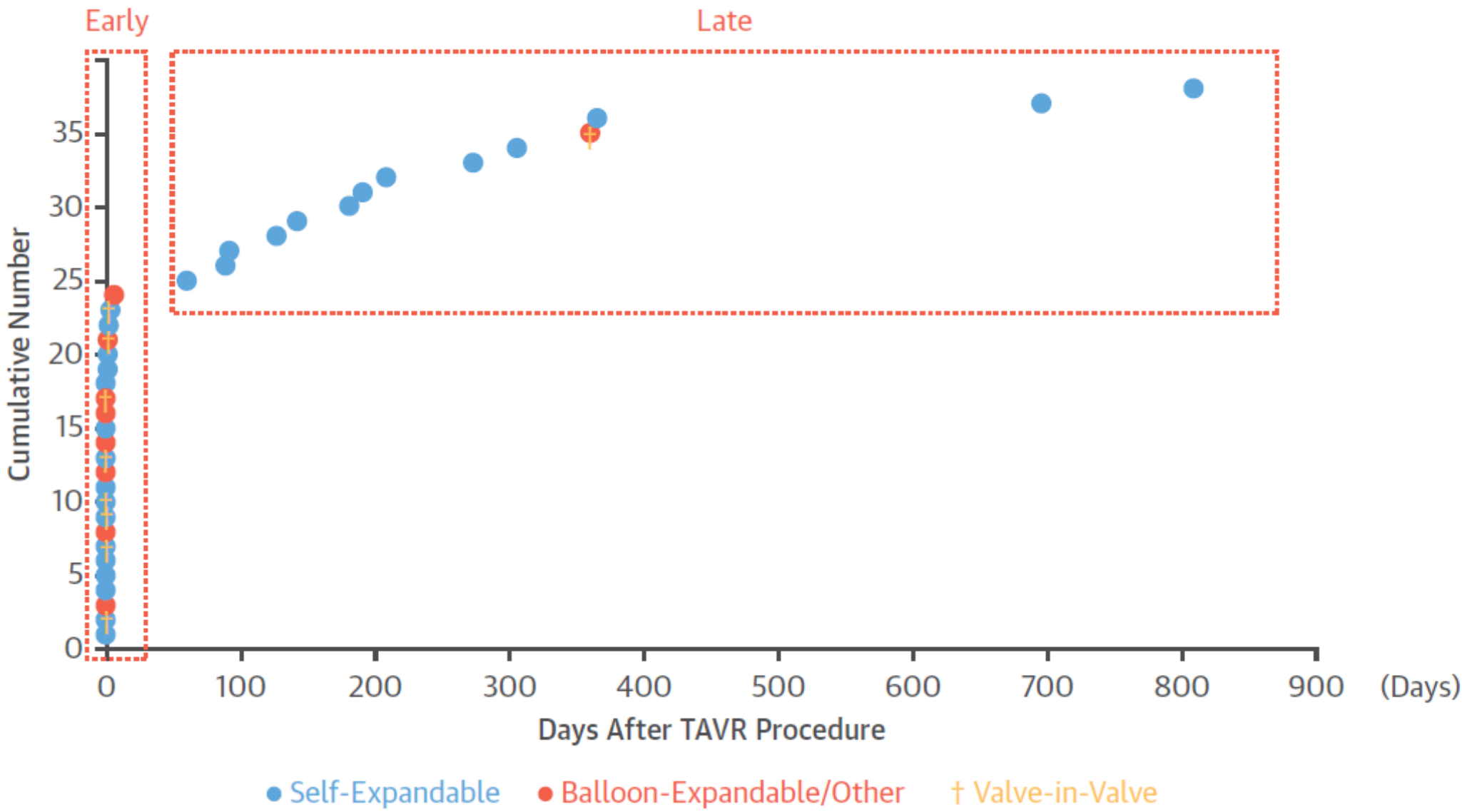
PCI patients
PCI failure- 80% died within 30 days

Treatment	
PCI attempted	28/36 (77.8)
Successful	18/28 (64.3)
Unsuccessful	10/28 (35.7)
Coronary cannulation failure	3/10 (30.0)
Wire crossing failure	5/10 (50.0)
Stent could not be advanced	1/10 (10.0)
Stent implanted but no flow	1/10 (10.0)



Riberio HB et al. EHJ 2018;39:687-695.

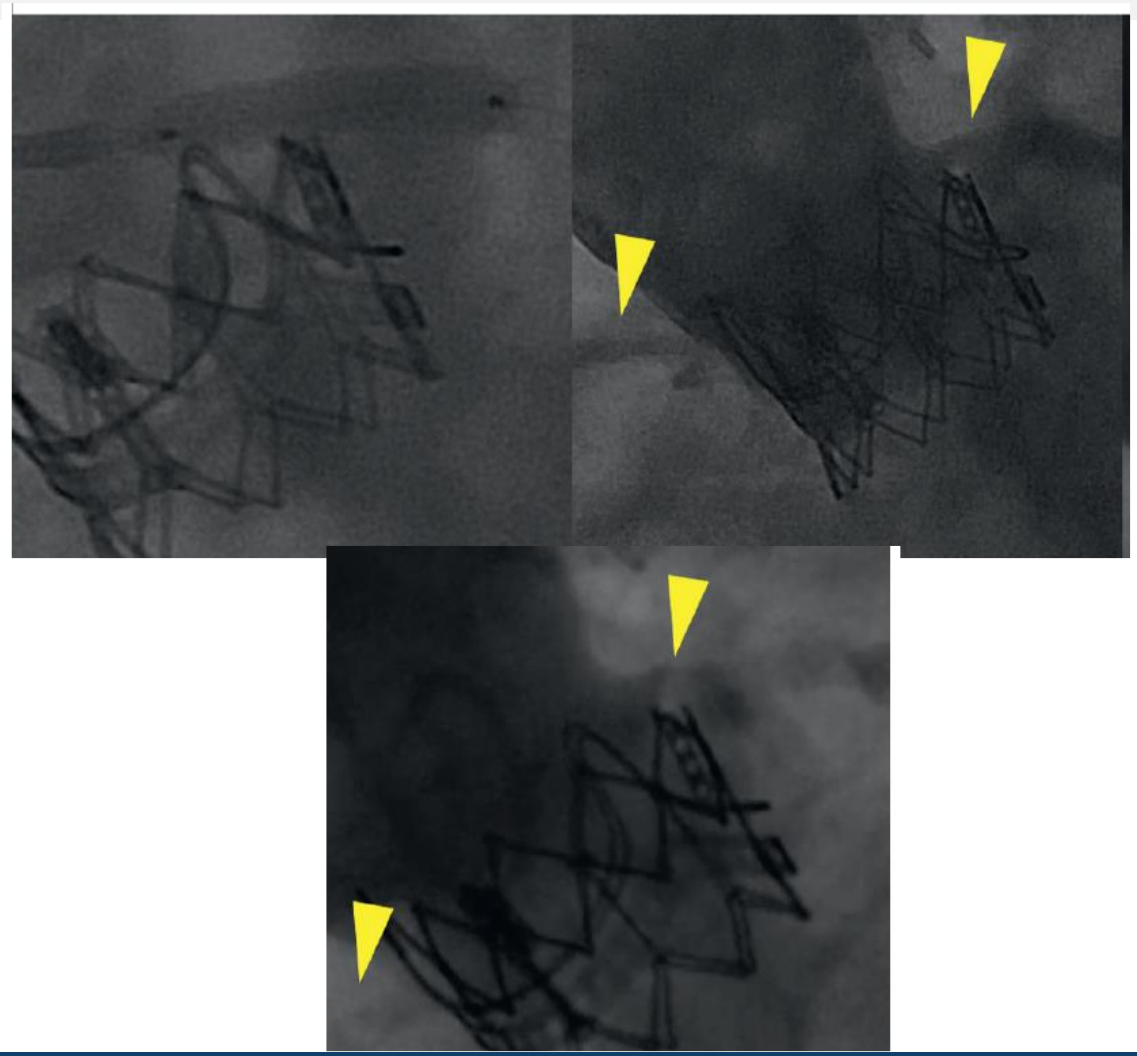
FIGURE 2 Timing of Delayed Coronary Obstruction Events Following TAVR Procedure



Jabbour R et al. JACC 2018; 71:1513.

Late Obstruction
Sometimes related to prior PCI

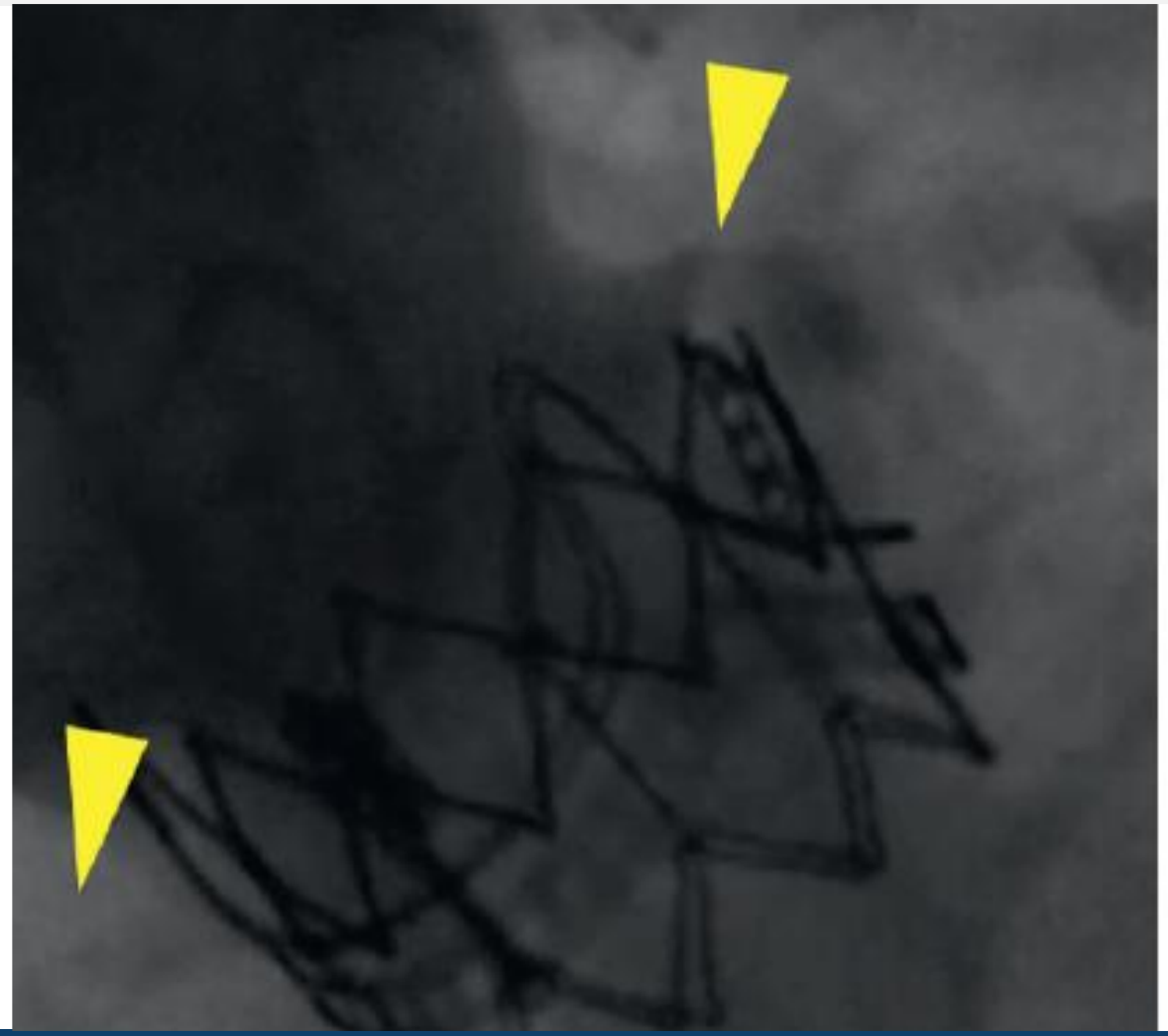
	Overall (N = 38)	Early (0-7 Days) (n = 24)	Late (>7 Days) (n = 14)	p Value
Approach				1.00
Transfemoral	37 (97.4)	23 (95.8)	14 (100.0)	
Transapical	1 (2.6)	1 (4.2)	0 (0.0)	
Valve-in-valve	9 (23.7)	8 (33.3)	1 (7.1)	0.12
Valve type				0.21
CoreValve/Evolut R	26 (68.4)	15 (62.5)	11 (78.6)	
Portico	3 (7.9)	1 (4.2)	2 (14.3)	
Sapien XT/3	8 (21.1)	7 (29.2)	1 (7.1)	
Lotus	1 (2.6)	1 (4.2)	0 (0.0)	
Procedural details				
Pre-dilation	24 (63.2)	11 (45.8)	13 (92.9)	0.005
Post-dilation	5 (13.2)	5 (20.8)	0 (0.0)	0.14
Left main protection	9 (23.7)	6 (25.0)	3 (21.4)	1.0
Left main stenting	7 (18.4)	2 (8.3)	5 (35.7)	0.08



Jabbour R et al. JACC 2018; 71:1513.

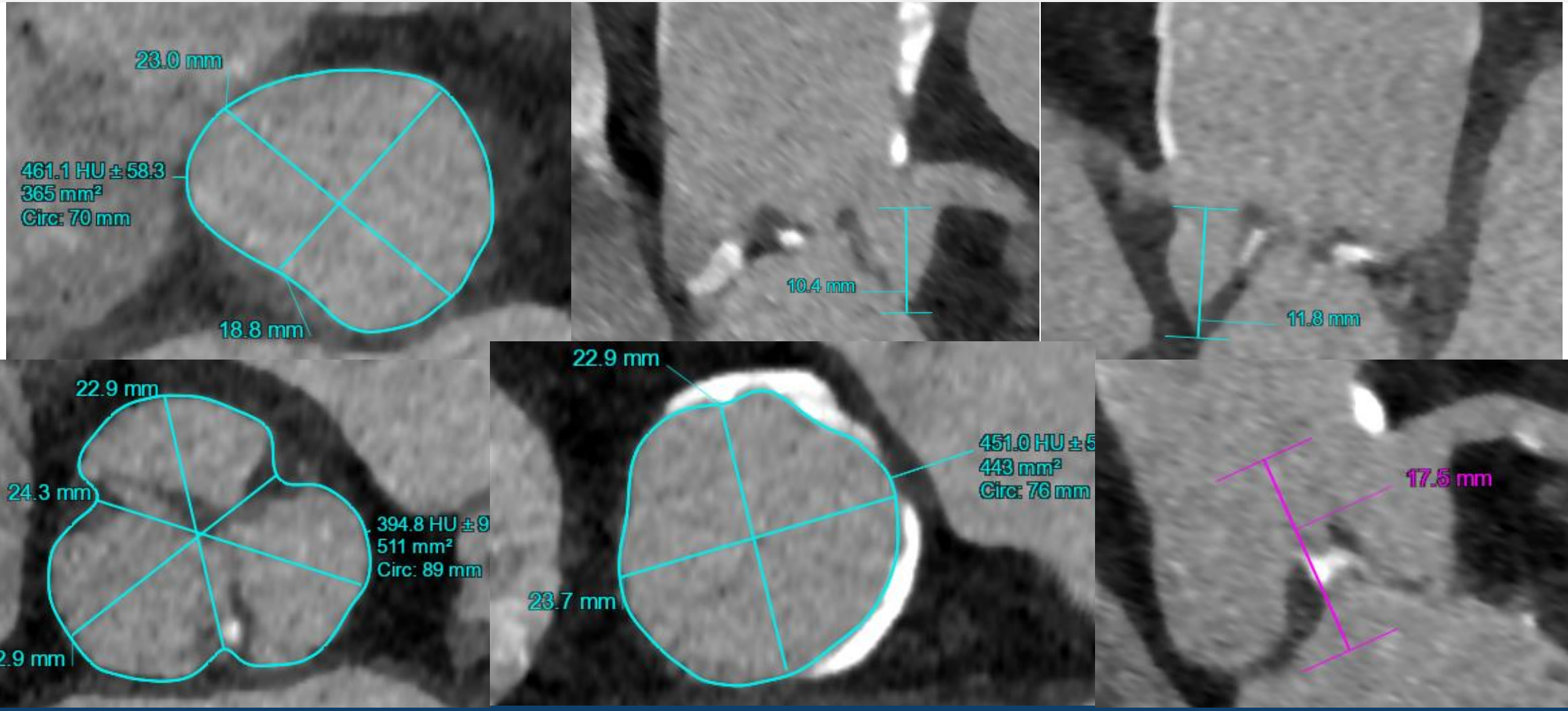
Late Obstruction
Variable Presentation

	Overall (N = 38)	Early (0-7 Days) (n = 24)	Late (>7 Days) (n = 14)
Timing			
Within 24 h	18 (47.4)	18 (75.0)	-
After 24 h ≤7 days	6 (15.8)	6 (25.0)	-
8 to <30 days	0 (0.0)	-	0 (0.0)
30 to <60 days	0 (0.0)	-	0 (0.0)
60 to <180 days	5 (13.2)	-	5 (35.7)
180 to <360 days	6 (15.8)	-	6 (42.9)
≥360 days	3 (7.9)	-	3 (21.4)
Clinical presentation*			
Cardiac arrest	12 (31.6)	9 (37.5)	3 (21.4)
STEMI	9 (23.7)	9 (37.5)	0 (0.0)
NSTEMI	8 (21.1)	4 (16.7)	4 (28.6)
Unstable angina	6 (15.8)	2 (8.3)	4 (28.6)
Stable angina	3 (7.9)	0 (0.0)	3 (21.4)
Asymptomatic	0 (0.0)	0 (0.0)	0 (0.0)

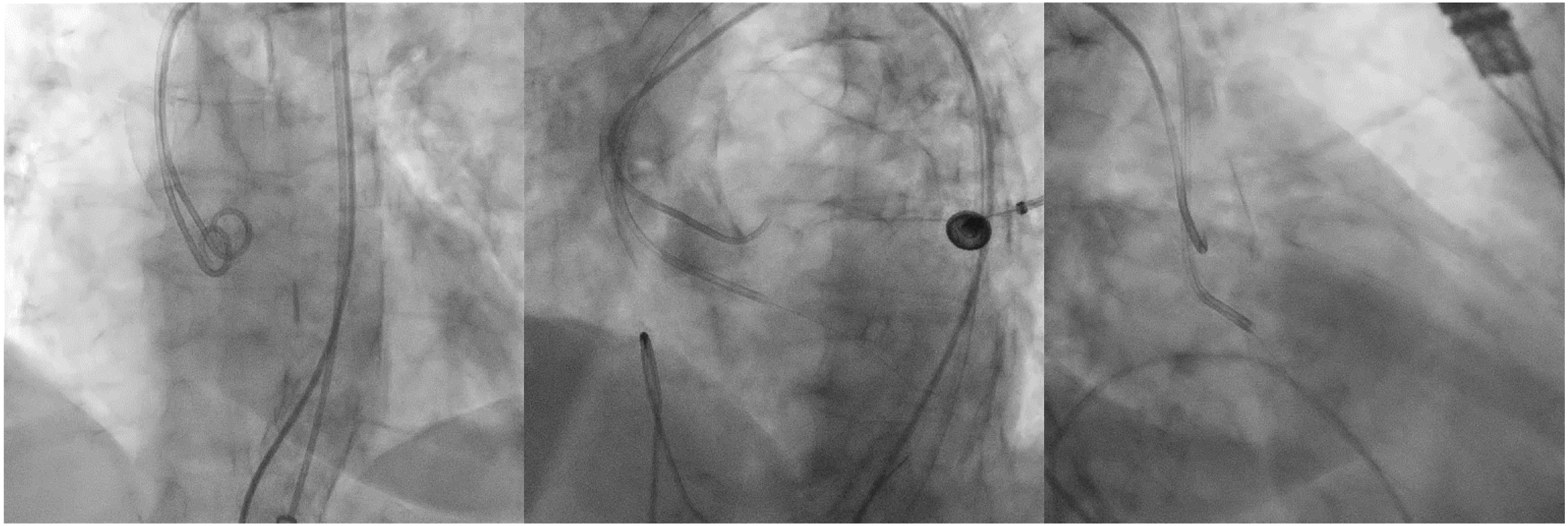


Jabbour R et al. JACC 2018; 71:1513.

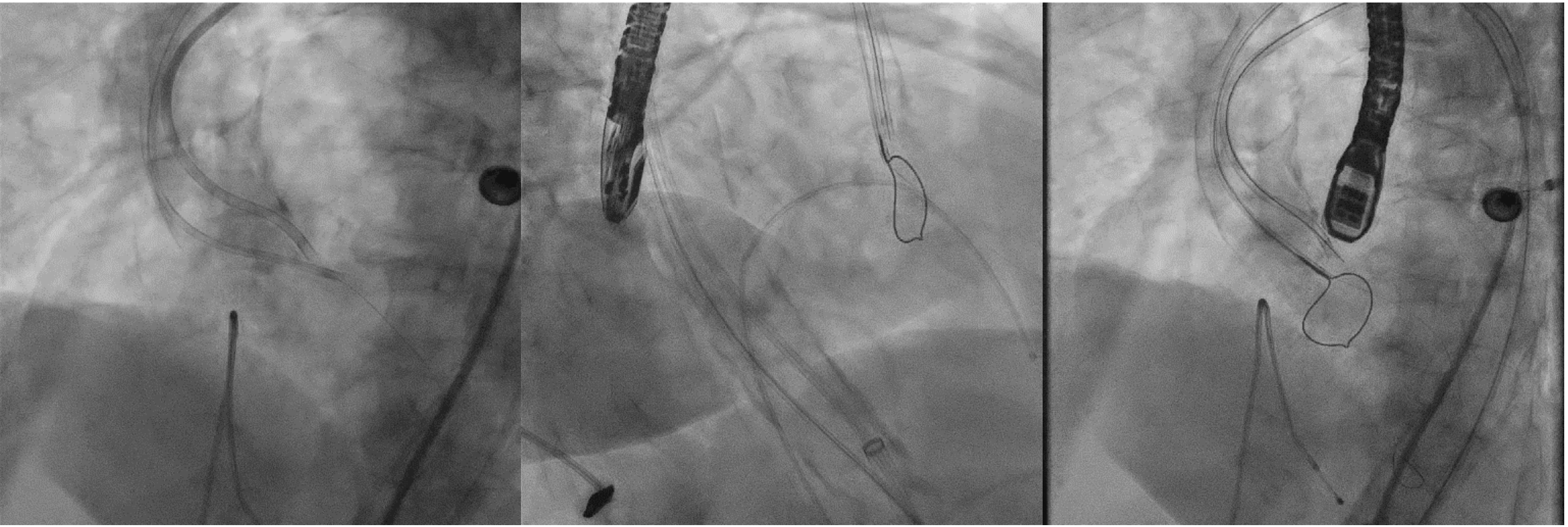
84 yo F
Severe aortic valve stenosis



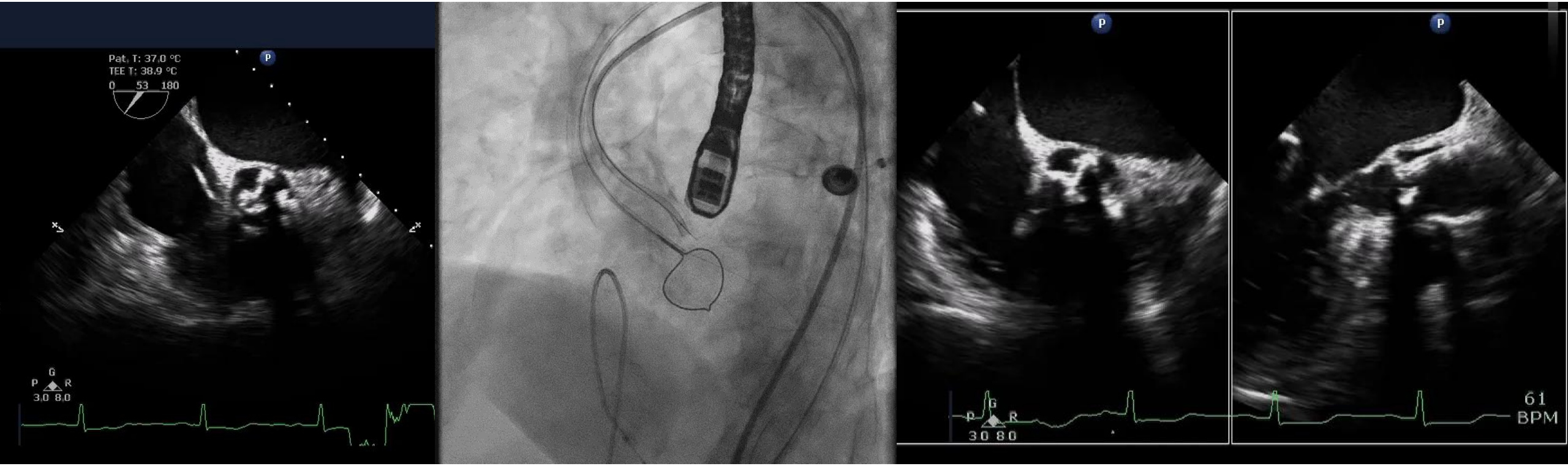
BASILICA
Diagnostic angiography set-up



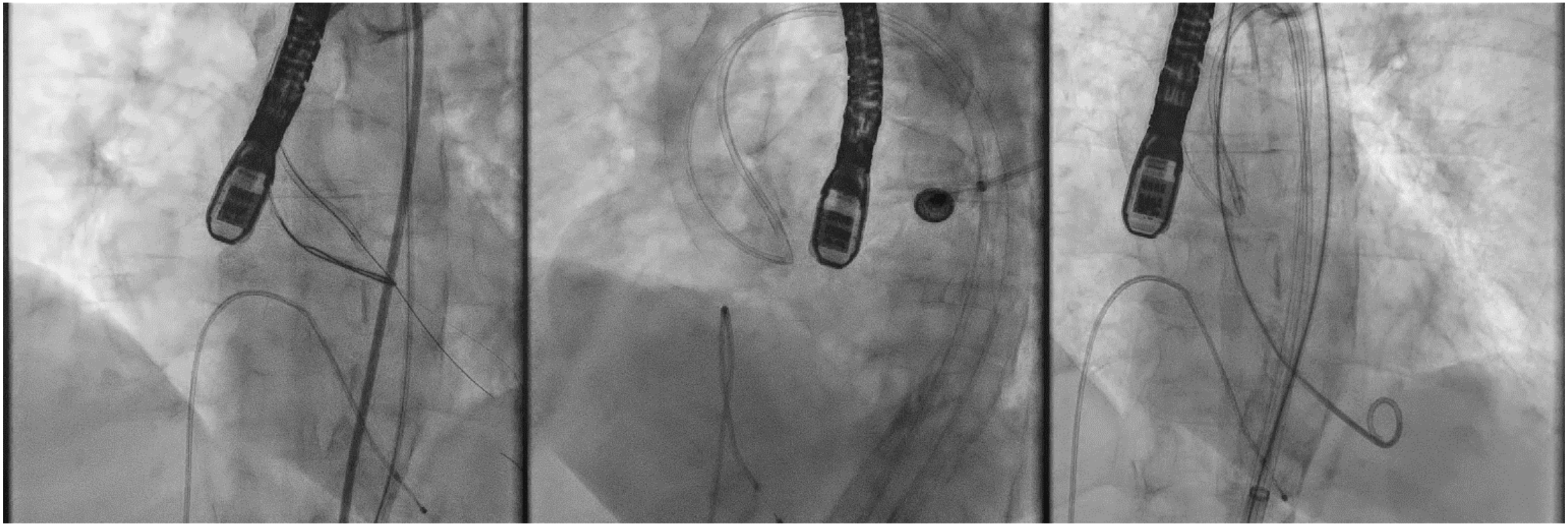
BASILICA
Preparing for leaflet penetration



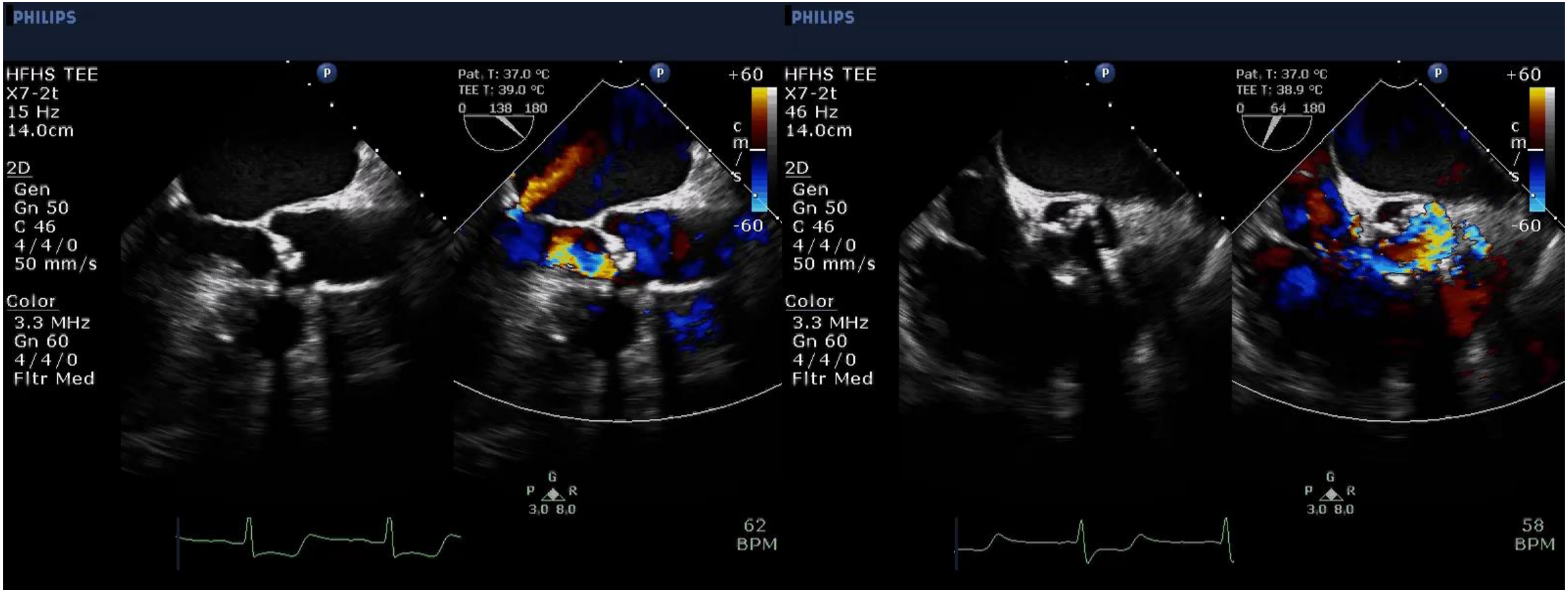
BASILICA
Leaflet penetration



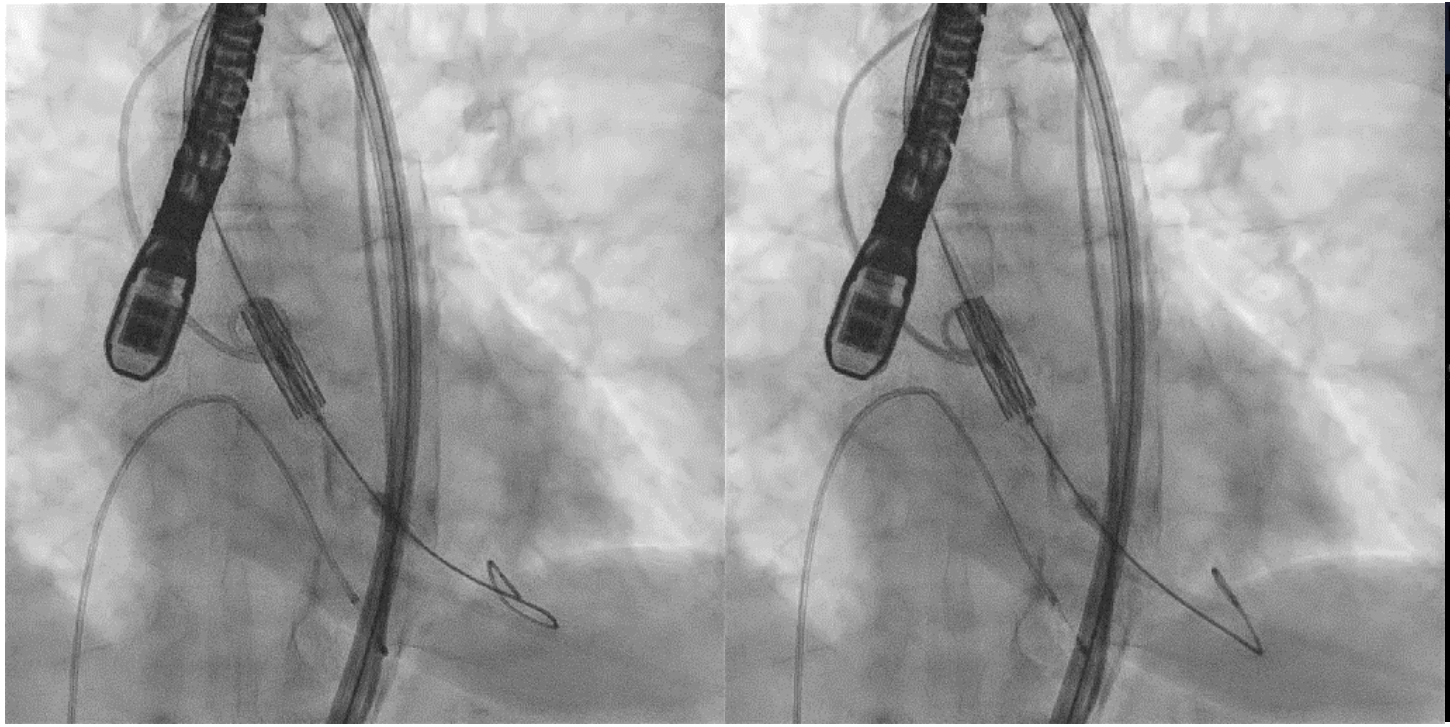
BASILICA
Laceration of the left leaflet

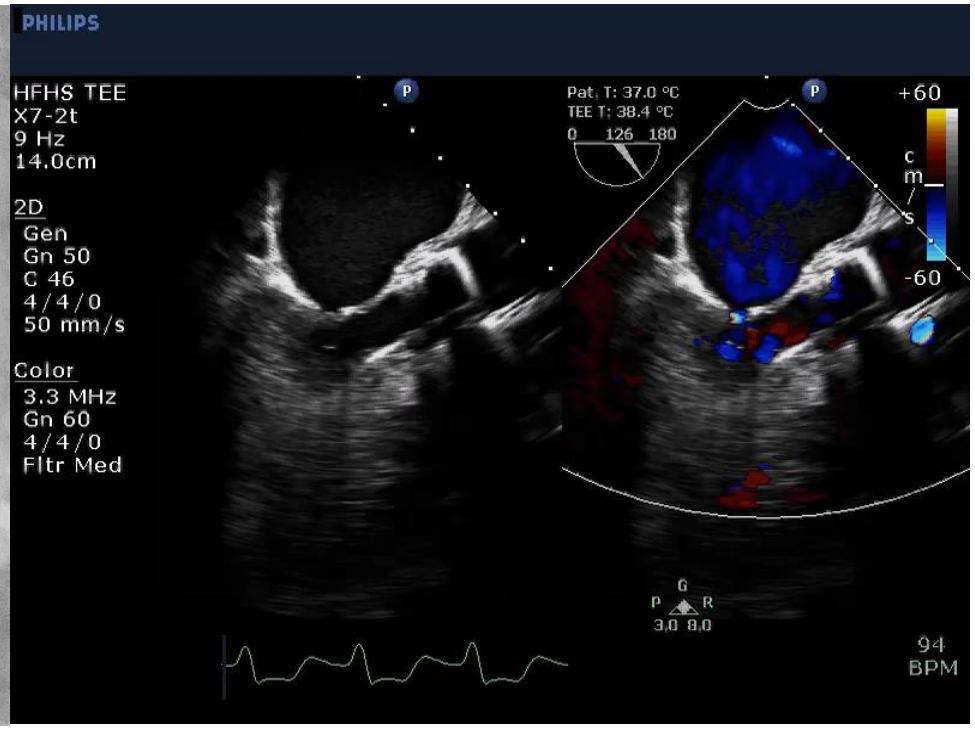


Post-Laceration
Severe AI

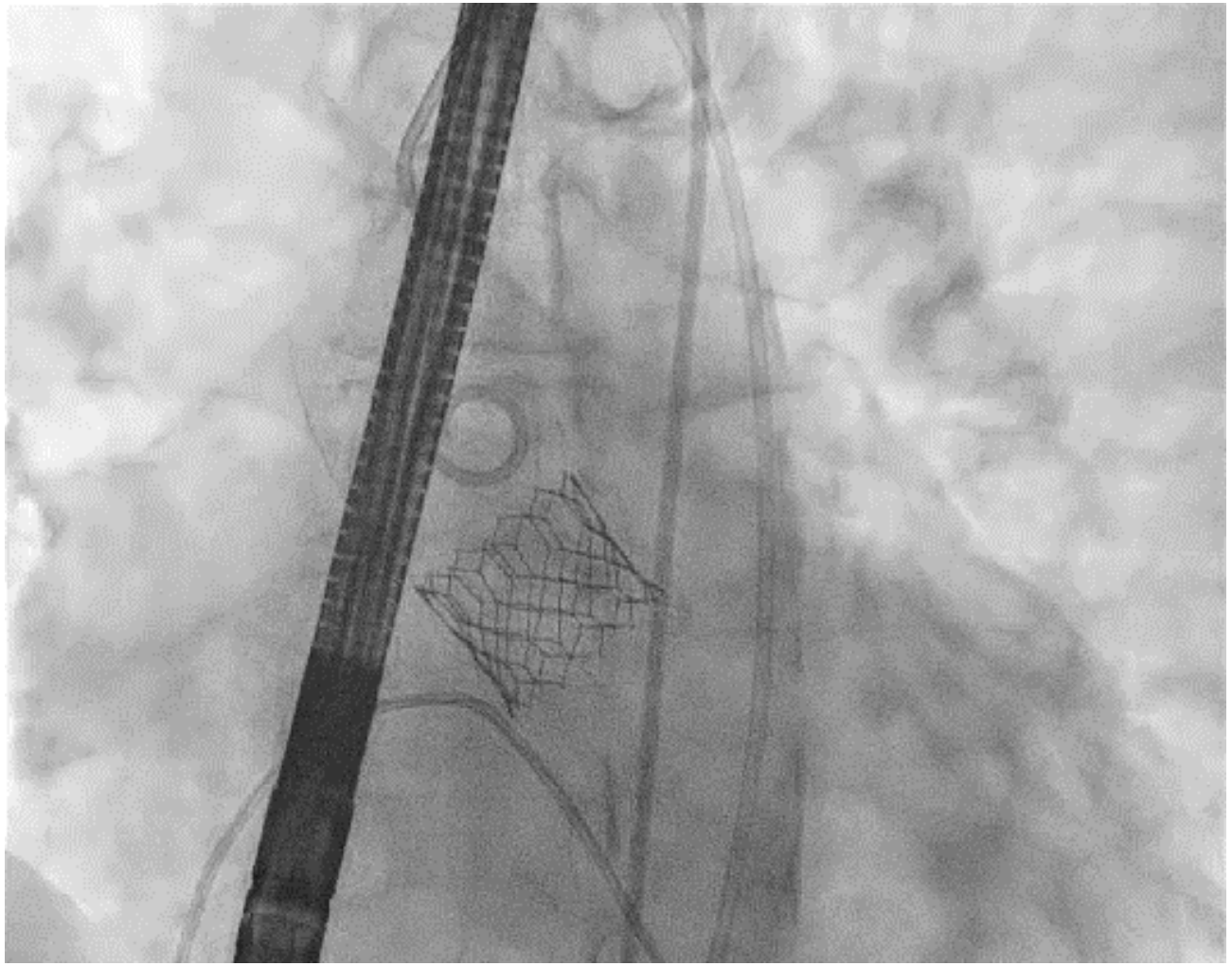


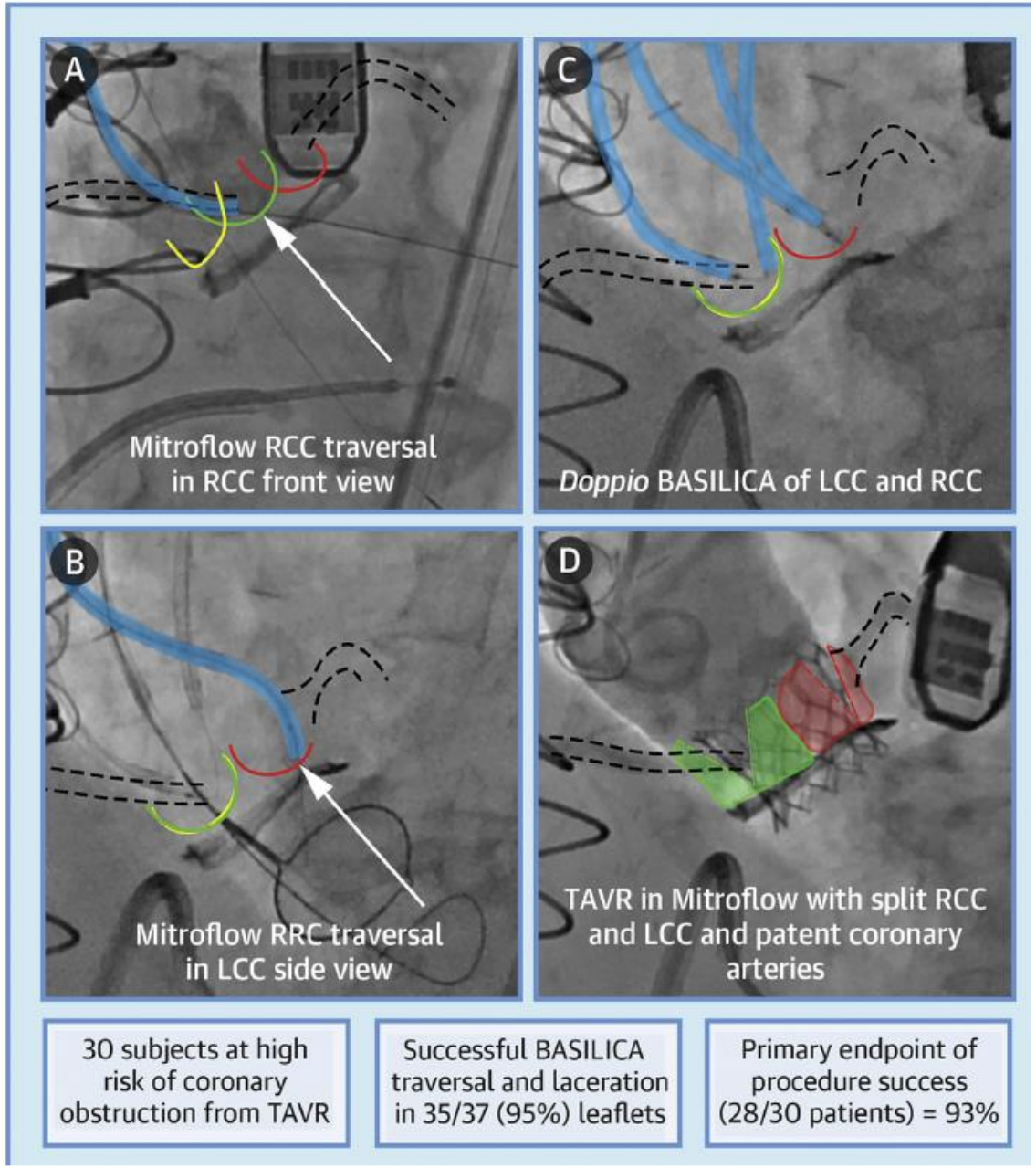
Valve implantation





BASILICA
Final Aortography

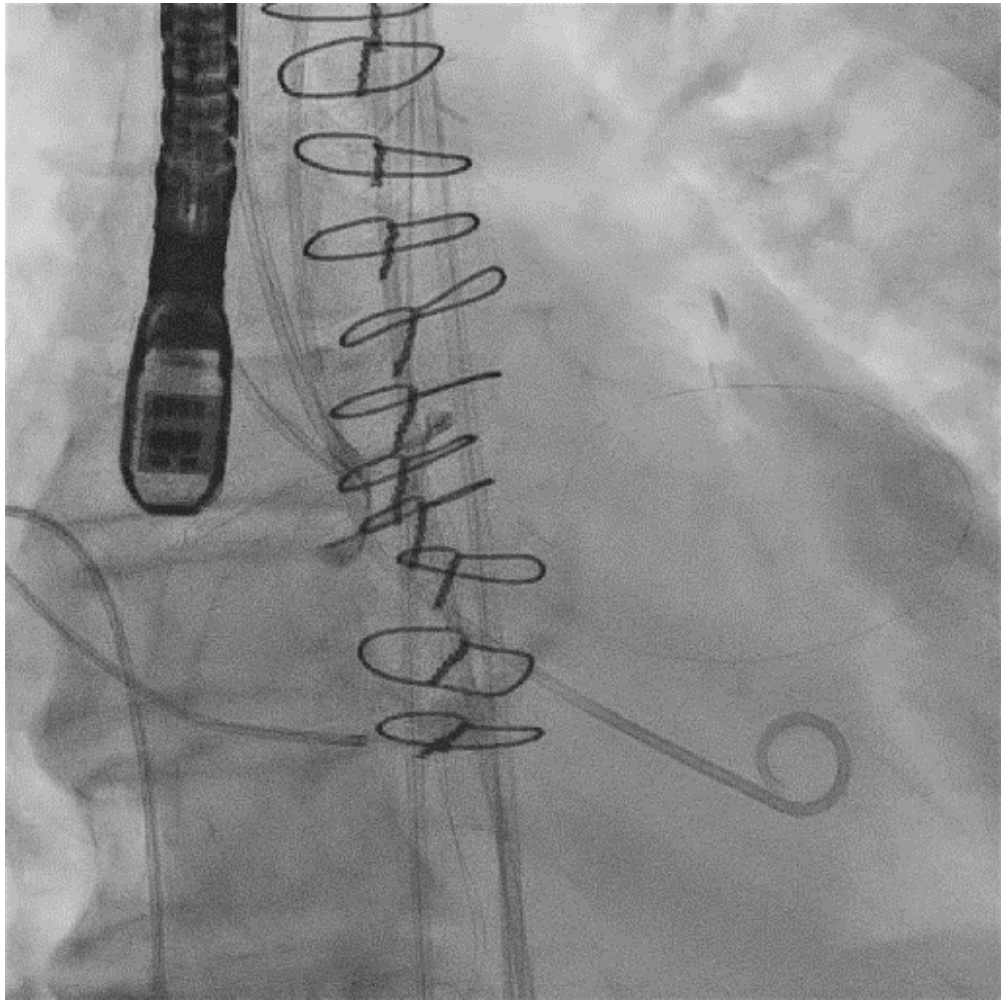




Khan J et al. JACC Int 2019;12:1240.

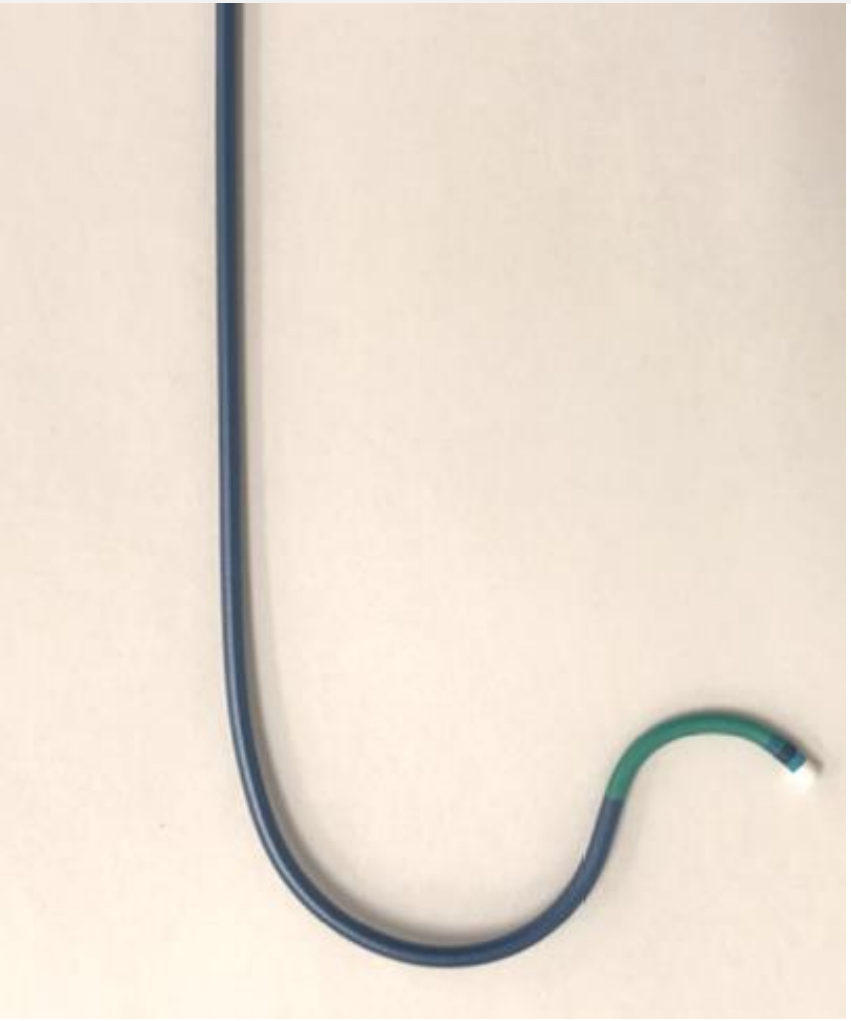
TABLE 4 Clinical Outcomes

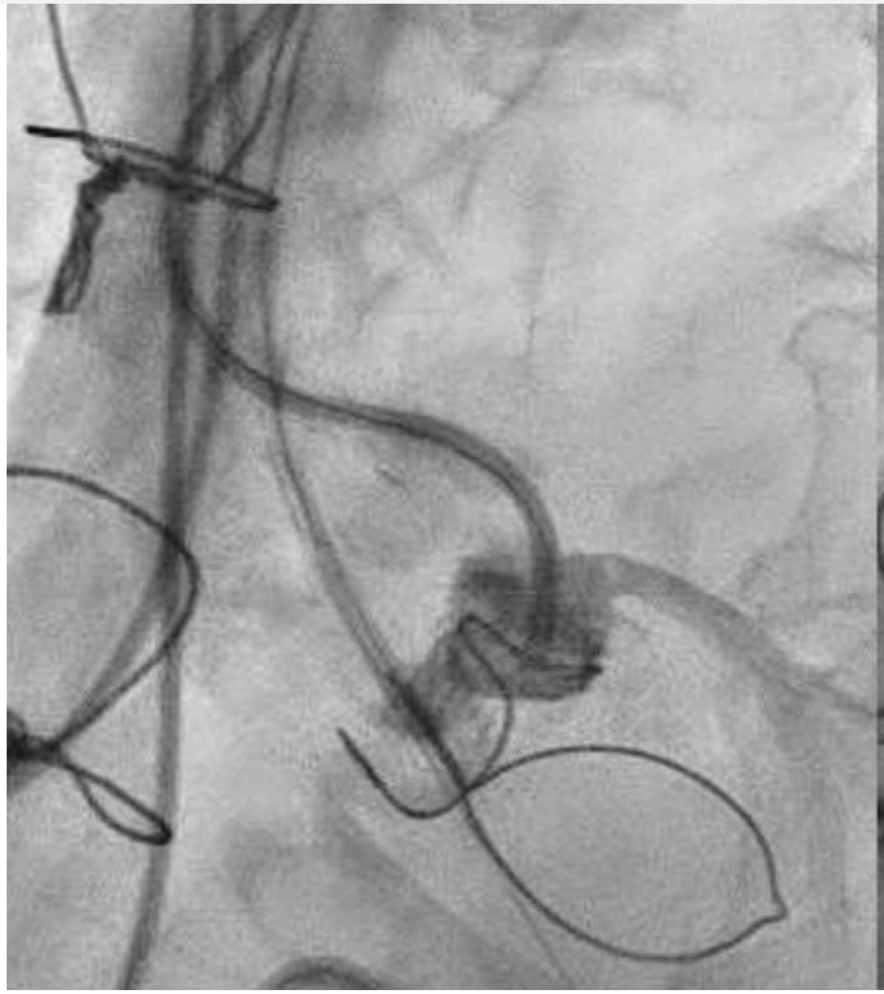
Primary efficacy endpoint (exit from catheter laboratory)*	(n = 30)
Successful BASILICA traversal and laceration	28 (93)
Immediate survival	30 (100)
Successful first TAVR device implantation	30 (100)
Coronary obstruction	0 (0)
Freedom from emergency surgery or reintervention related to BASILICA or TAVR	30 (100)
Technical success (all of above)	28 (93)
Primary safety endpoint (30 days)*	(n = 30)
All death	1 (3)
Cardiovascular	1 (3)
Noncardiovascular	0
All stroke	3 (10)
Disabling	1 (3)
Nondisabling	2 (7)
Life threatening bleeding	2 (7)

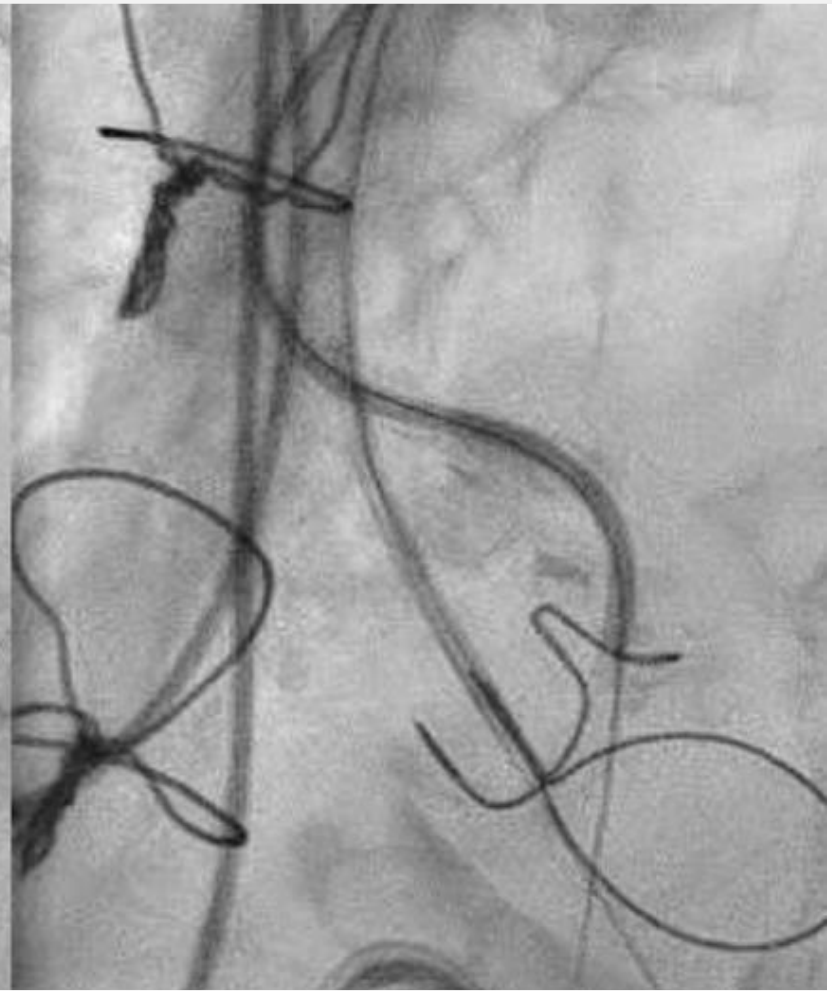


Khan J et al. JACC Int 2019;12:1240.

Pachyderm Catheter
Custom made for BASILICA







Lisko J et al. CRM 2019;19:782.

Summary

- Coronary Obstruction is a deadly event
- Low coronary heights, small aortic sinus, small VTC important risk factors
  - Not every obstruction had low coronary heights
- Pre-emptive stent placement common
  - Some late obstructions
- BASILICA
  - Challenging procedure
  - Seems to prevent obstruction
  - Dedicated catheters available
  - Requires proctoring for the first cases

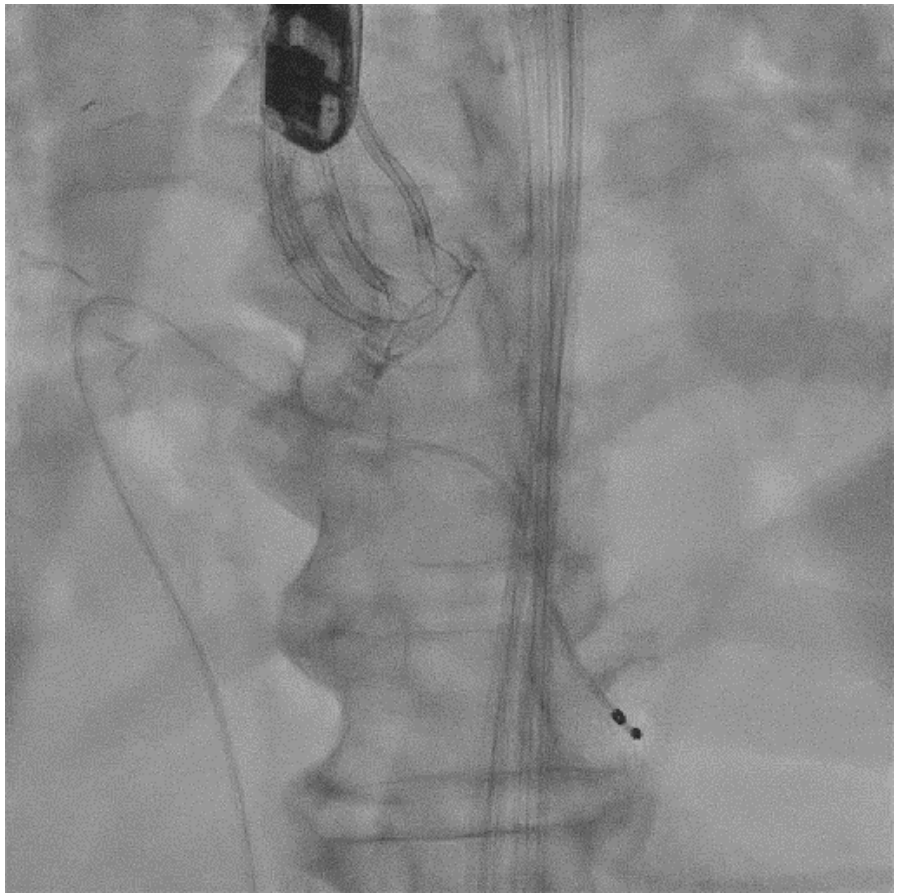


Table 4 Computed Tomography Data, According to the Occurrence of Coronary Obstruction Following TAVI

	Coronary Obstruction (n = 28)	Control Subjects (n = 345)	p Value
Annulus diameter, mm	22.9 ± 3.1	24.4 ± 2.9	0.010
Annulus area, mm^2	387 (375–424)	476 (405–560)	0.002
Aortic SOV diameter, mm	28.1 ± 3.8	31.9 ± 4.1	<0.001
Sinotubular junction, mm	25.2 ± 3.1	28.0 ± 3.9	0.003
Relation prosthesis size/annulus	1.09 ± 0.11	1.05 ± 0.09	0.084
Relation SOV/annulus	1.25 ± 0.17	1.31 ± 0.14	0.054
Left coronary height, mm	10.6 ± 2.1	13.4 ± 2.1	<0.001
Right coronary height, mm	12.4 ± 3.2	14.1 ± 2.4	0.003
Left coronary height, mm*	10.4 ± 2.0	13.5 ± 2.0	<0.001
Right coronary height, mm†	11.3 ± 2.1	14.0 ± 2.4	0.048
Calcium score, Agatston units	2,354 ± 1,187	2,872 ± 1,726	0.290

Values are mean ± SD or median (interquartile range). *Cases of right coronary artery obstruction excluded. †Cases of left coronary artery obstruction excluded.

SOV = sinus of Valsalva; other abbreviations as in Tables 1 and 3.