Low Coronary Ostium with Narrow or Wide Sinus

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Disclosure Statement of Financial Interest

Within the past 12 months, I or my spouse/partner have had a financial interest/arrangement or affiliation with the organization(s) listed below.

Affiliation/Financial Relationship

- Grant/Research Support
- Grant/Scientific Advisory Board
- Executive Physician Council

Company

- Edwards Lifesciences
- Medtronic
- Boston Scientific Corp



Incidence of Coronary Obstruction According to Valve Type and Valve-in-Valve Procedure



Incidence of Coronary Obstruction According to the Different Approaches for TAVR



Table 3

Clinical Presentation and Management of Coronary Obstruction Following TAVI (n = 44)

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)
Stenosis severity	
Partial occlusion	25 (56.8)
Complete occlusion	19 (43.2)

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Clinical Presentation and Management of Coronary Obstruction Following TAVI (n = 44)

Treatment					
PCI attempted	33 (75.0)				
Successful	27 (81.8)				
Stent successfully implanted	25 (75.8)				
Guidewire protection only	1 (3.0)				
Catheter cannulation only	1 (3.0)				
Unsuccessful	6 (18.2)				
Coronary cannulation failure	2 (33.3)				
Wire crossing failure	2 (33.3)				
Stent could not be advanced	1 (16.7)				
Stent implanted but no flow	1 (16.7)				
Type of stent					
Bare-metal stent(s)	6 (24.0)				
Drug-eluting stent(s)	17 (68.0)				
Bare-metal and drug-eluting stents	2 (8.0)				
Urgent CABG	6 (13.6)				
Conversion to open heart surgery	2 (6.1)				

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Clinical Presentation and Management of Coronary Obstruction Following TAVI (n = 44)

Procedural complications

Need for cardiopulmonary resuscitation	18 (40.9)
Need for hemodynamic support	16 (36.4)
СРВ	7 (43.8)
IABP	4 (25.0)
Fem-Fem CPB	3 (18.8)
ECMO	1 (6.3)
Impella	1 (6.3)
Inotropes	30 (68.2)
Valve embolization	2 (4.5)
Need for a second valve	3 (6.8)
Cardiac tamponade	3 (6.8)

Table 3

Clinical Presentation and Management of Coronary Obstruction Following TAVI (n = 44)

30-day outcomes

Myocardial infarction	21 (47.7)
Peak CK-MB, µg/I	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)

CT Data

- Pre-TAVR CT data were available in 28 of 44 pts with coronary obstruction (63.6%)
- Pts with coronary obstruction exhibited a smaller
 - Aortic annulus area
 - SOV diameter
 - STJ diameter
 - LCA height

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 \pm 0.11	$\textbf{1.05} \pm \textbf{0.09}$	0.084
Relation SOV/annulus	$\textbf{1.25} \pm \textbf{0.17}$	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	$\textbf{2,354} \pm \textbf{1,187}$	2,872 \pm 1,726	0.290

CT Data: Case-Matched Analysis

In the case-matched analysis

Table 5

- The SOV diameter remained smaller (HR 1.37)
- The LCA height remained lower (HR 2.17)

CT Data From the Case-Matched Analysis, According to the Occurrence of Coronary Obstruction Following TAVI

	Coronary Obstruction	Control Subjects		
	(n = 27)	(n = 27)	OR (95% CI)	p Value
Annulus diameter, mm	$\textbf{23.0} \pm \textbf{0.6}$	23.6 ± 0.4	1.15 (0.92-1.45)	0.510
Annulus area, mm ²	410 ± 18	458 ± 17	1.01 (0.99-1.02)	0.126
Aortic SOV diameter, mm	$\textbf{28.3} \pm \textbf{0.8}$	$\textbf{31.3} \pm \textbf{0.6}$	1.37 (1.13-1.66)	0.011
Relation prosthesis size/annulus	$\textbf{1.08} \pm \textbf{0.02}$	$\textbf{1.05} \pm \textbf{0.02}$	0.02 (0.01-3.99)	0.315
Relation SOV/annulus	$\textbf{1.26} \pm \textbf{0.04}$	$\textbf{1.34} \pm \textbf{0.03}$	20.0 (1.28-333)	0.003
Left coronary height, mm	$\textbf{10.7} \pm \textbf{0.4}$	$\textbf{13.3} \pm \textbf{0.3}$	2.17 (1.62-2.90)	<0.001
Right coronary height, mm	$\textbf{12.7} \pm \textbf{0.8}$	$\textbf{14.2} \pm \textbf{0.4}$	1.36 (1.10-1.68)	0.047
Calcium score, Agatston units	2,284 ± 318	2,733 ± 313	1.00 (0.99-1.10)	0.333

TAVR Sizing Guide

	Sheath (F)	Minimum Vessel Diameter (mm)	OD (mm) max exp	Annulus Size (TEE) (mm)	3D Area (CT) (mm2)	3D Derived Diameter (mm)	Perimeter (CT) (mm)	Ascending Aorta Diameter ⁶ (mm)	Sinus of Valsalva	Sinus of Valsalva Height (mm)
Sapien XT							((1
23	16	6.0	8.9	18 - 22	275 - 415					
26	18	6.5	8.9	21-25	416 - 540					
29	20	7.0	9.9	24 - 27	541 - 680					1
Sapien 3										
20	14	5.5		16 - 19	273 - 345	18.6 - 21.0				
23	14	5.5	7.6	18 - 22	338 - 430	20.7 - 23.4				
26	14	5.5	8.0	21 - 25	430 - 546	23.4 - 26.4				_
29	16	6.0	8.6	24 - 28	540 - 683	26.2 - 29.5				
CoreValve							(
23	18 (Gore DrySeal)	6	6.8			18 - 20	56.5 - 62.8	≤ 34	≥ 25	≥ 15
26	18 (Gore DrySeal)	6	6.8			20 - 23	62.8 - 72.3	≤ 40	≥ 27	≥15
29	18 (Gore DrySeal)	6	6.8			23 - 27	72.3 - 84.8	≤ 43	≥ 29	≥ 15
31	18 (Gore DrySeal)	6	6.8			26 - 29	81.6 - 91.1	≤ 43	≥ 29	≥15
CoreValve Ev	volut R									
23	14 (equivalent)	5	6.0 (1	8F)		17**/18 - 20	56.5 - 62.8		≥ 25	≥15
26	14 (equivalent)	5	6.0			20 - 23	62.8 - 72.3		≥ 27	≥15
29	14 (equivalent)	5	6.0	\checkmark		23 - 26	72.3 - 81.7		≥ 29	≥15
Portico										
23	18 (Gore DrySeal)	6	6.8		277 - 346 *	19 - 21	60 - 66 *	26 - 36		
25	18 (Gore DrySeal)	6	6.8		338 - 415 *	21 - 23	66 - 73 *	28 - 38		
27	19 (20 Gore DrySeal)		7.5		405 - 491 *	23 - 25	72 - 79 *	30 - 40		
29	19 (20 Gore DrySeal)		7.5		479 - 573 *	25 - 27	79 - 85 *	32 - 42		
Lotus										
23	Small (equivalent to Cook 18F)	6	6.9	20 - 23	350 - 420	20-23	66 - 73		<540>600>1100	
25	Large (equivalent to Cook 20F)	6.5	7.2	23 - 25	420 - 500	23-25	73 - 79		<595>700>1200	
27	Large (equivalent to Cook 20F)	6.5	7.2	25 - 27	500 - 580	25-27	79 - 85		<650>800>1300	

⁶Ascending Aorta measurements are taken at 30 mm from the aortic annulus for the 23 mm device and at 40 mm from the aortic annulus for the 26, 29, and 31 mm devices.

*Recomendation driven by circular or eliptical geometry (≥ 0.73 ratio).

**Measurement of TAV-in-SAV only

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91 yo woman with severe aortic stenosis

- NYHA class 3 symptoms
- Limited mobility due to extensive degenerative joint disease
- Felt to be extreme risk due to her severe COPD and poor rehab potential
- Height 152 cm
- Weight 70.4 kg
- ▶ BSA 1.6 m2
- Echo
 - ► AVA 0.6
 - LVOT 1.9 cm



Annulus evaluation

- Annulus 20x23 (Area 362 mm2, Perimeter 70 mm)
- Sinuses 30.6 x 30.4 x 28.9 mm
- Sinotubular junction 25 x 27.5 mm
- Left coronary height 8.4 mm (leaflet length 17.1 mm)
- Right coronary height 7.4 mm (leaflet length 13.5)
 - mm)



Left coronary to annulus





Right coronary to annulus



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TAVR Options?

- ► TAVR feasible?
- Protect coronaries?
- Valve type?







Baseline and valvuloplasty



TAVR







Restoration of coronary flow...





Crushed stent between sinus and thickened valve leaflet



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Coronary occlusion

Perfect storm

- Low coronaries
- Small sinuses
- Very thickened/calcified leaflet
- Stenting may not solve the problem
- Role for repositionable/recapturable valves



73 yo woman with severe aortic stenosis

- Hypertension
- COPD FEV1 48% predicted
- Moderate carotid stenosis
- Frail
- AVA 0.7 cm2
- AV vel 3.7 m/s, mean gradient 41 mmHg
- LVOT 18 mm
- ▶ BSA 1.6 m2

Poor vascular access

3.2x5.4mm

RT COMMON ILIAC 3.2 mm (2D)

5.4 mm (2D)

RT COMMON ILIAC 12.1 mm²

4.4x6.1mm Volume Rendering No cut

4.8x6.0mm DFOV 32.0 cm No Filter 4.5x5.4mm

3.9x5.5mm

JU

3.3x6.4mm

5.8x7.0mm Ex:May 06 2014 4.0x6.9mm

-3.2x5.5mm

2.9x4.7mm 2.5x5.9mm

-3.0x7.0mm

2.9 mm (2D)

) cm

LT EXTILIAC

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REGIONAL HEART CENTER

4.7 mm

Other vascular issues





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Coronary heights





Options?

- Balloon expandable v. Self-expanding?
- Annular rupture/aortic dissection?
- Coronary occlusion/access?





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TAVR: CoreValve 23 mm





Deploying CoreValve 23





Constrained valve



AVA 1.4 cm2



Potential Coronary Occlusion

- Low coronary heights
- Small sinuses
- Long leaflets
- Bulky (calcified) leaflets
- PROTECT, PROTECT, PROTECT
- ? Retrievable systems

