CRT 21 Virtual

Coronary Obstruction from TAVR in Native Aortic Stenosis

Anatomic Predictors from two Large Global Registries

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Personal:

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Background

Coronary artery obstruction from TAVR

- Incidence 0.7%
- 30-day mortality 40-50%
- Screening is:
  - Unidimensional (coronary height <12mm and SoV width <30mm)
  - Based on 27 CT scans (Ribeiro et al JACC 2013)

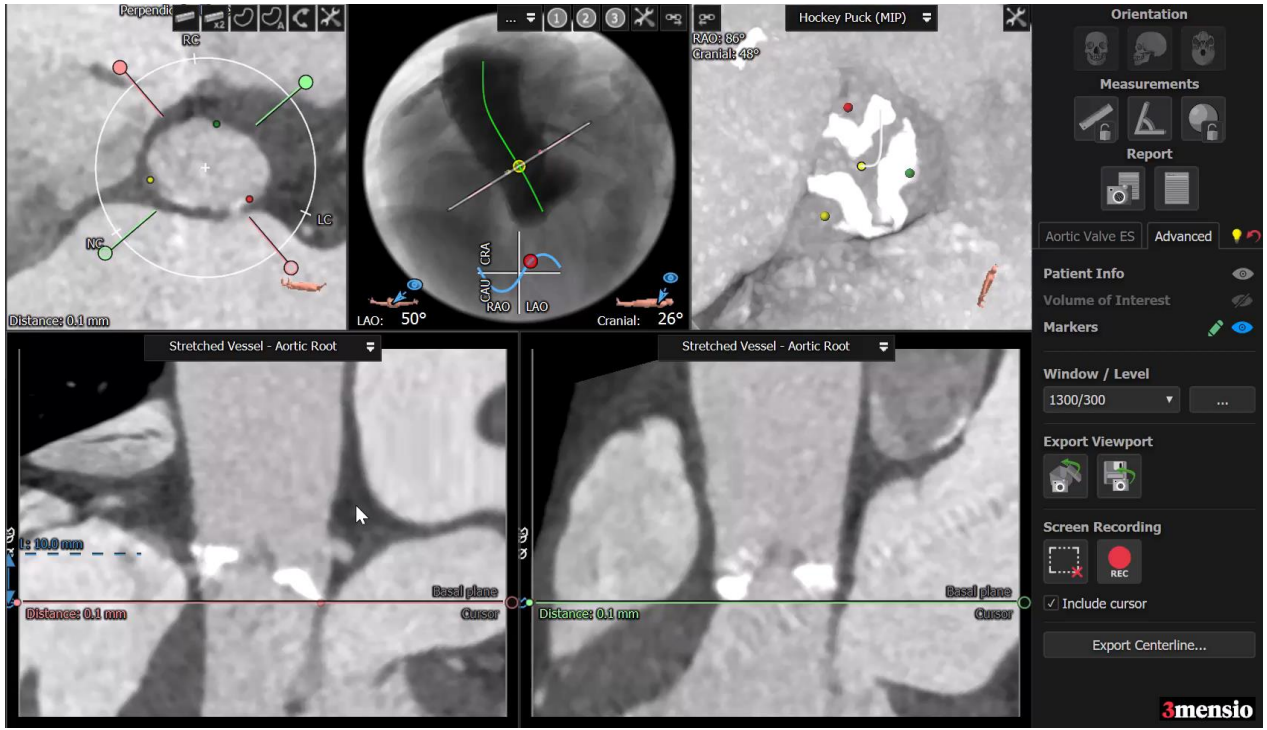
Objectives

- To determine CT anatomical features of patients with native AS who developed coronary obstruction in a large patient cohort
- To use advanced multidimensional measurements based on obstruction pathology
- Compare aortic root anatomy with native AS TAVR without obstruction

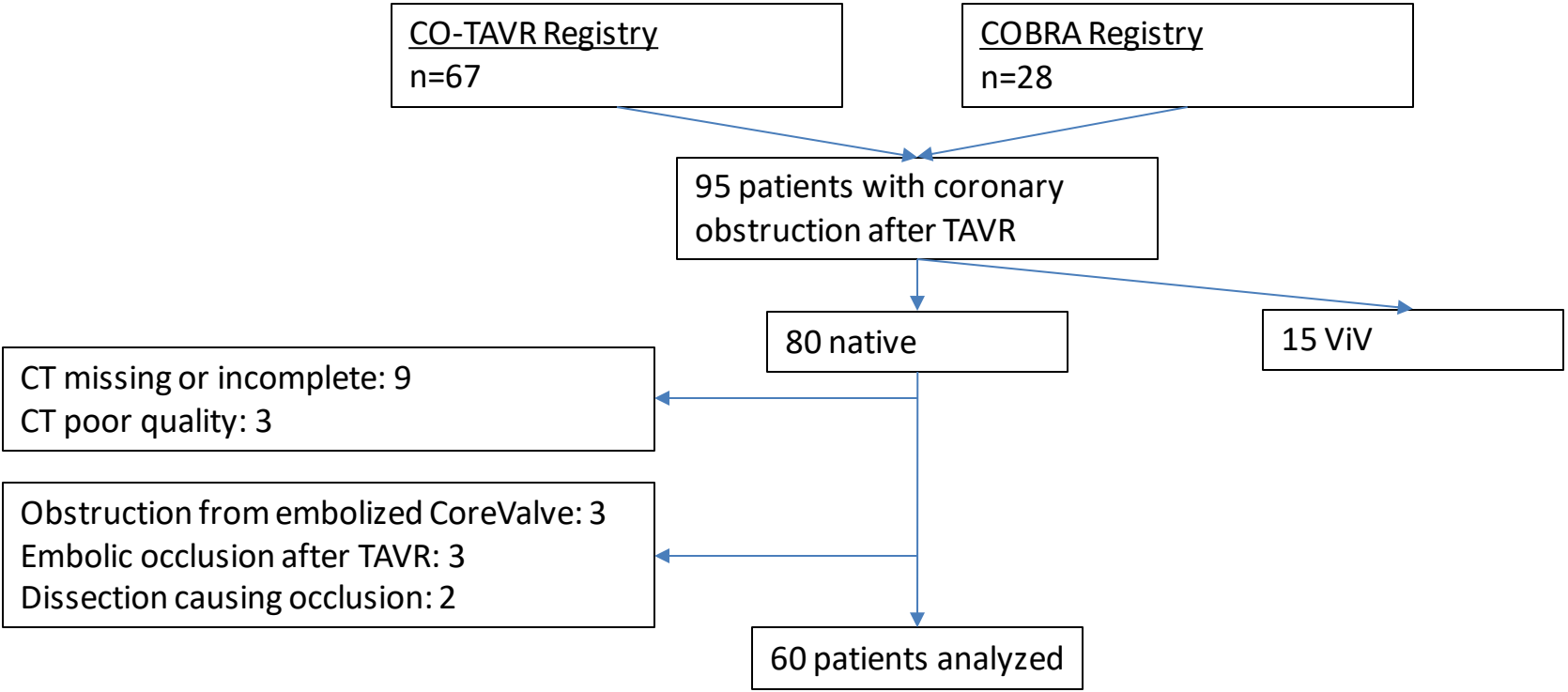
Methods

- Coronary Obstruction with TAVR (CO-TAVR) and Coronary Obstruction Risk Assessment (COBRA) Registries
- Retrospective, multicenter, single arm
- Included patients who had coronary artery obstruction after TAVR
- Excluded embolic obstruction
- CTs analyzed by central laboratories at MWHC and Emory
- Coronary obstruction centrally adjudicated on fluoroscopy

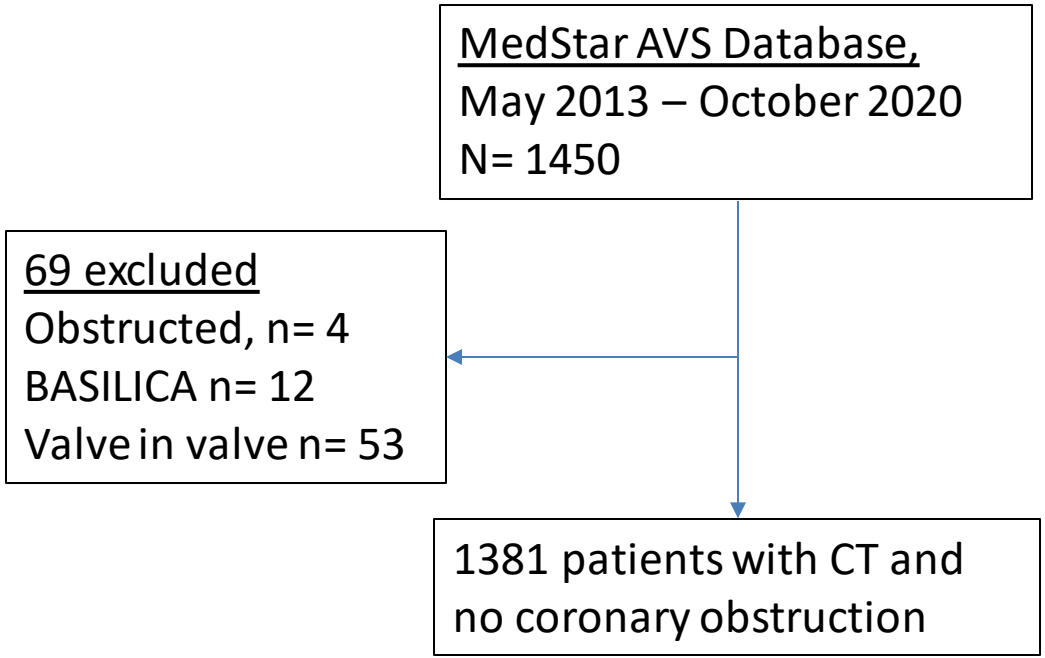
Methods: CT measurements



Results: Patients, cases



Results: Patients, controls



Results: Patient demographics

- January 2011 – December 2020
- 60 patients from 22 centers in 13 countries in Asia, North America, South America and Europe

	Obstruction, n=60	No obstruction, n=1381	p-value
Female	58.3%	47.1%	0.09
Age	79.6 ± 8.1	79.3 ± 10	0.75

Top Enrolling Centers

Site	PI	n
West China Hospital	Mao Chen, Yijian Li	8
Hospital Clinico Universitario Valladolid	Ignacio J. Amat Santos	6
MedStar Washington Hospital Center	Ron Waksman	5
Emory University Hospital	Vasilis Babaliaros	5
Institute of Cardiology Warsaw	Lukasz Kalinczuk	4
Hamburg	Sebastian Ludwig, Dirk Westermann	4
Kokura Memorial Hospital	Shinichi Shirai, Tomohiro Kawaguchi	4
Kurashiki Central Hospital	Y Fuku	4
University of Bonn	Jan-Malte Sinning	3

Results: THV

	Obstruction, n=60	No obstruction, n=1400	p-value
BEV, %	46.6%	43.5%	0.82
SEV, %	46.6%	52.5%	0.53
MEV, %	6.9%	4%	0.30
THV nominal size	24.6	24.4	0.65

Results: Coronary obstruction

	Per patient analysis, n=60
Coronary artery obstructed	
Left	47 (78.3%)
Right	10 (16.7%)
Both	3 (5%)

	Per vessel analysis, n=63
Level of obstruction	
Coronary ostium	58 (92.1%)
STJ	5 (7.9%)

	Obstruction, n=60	No obstruction, n=1381	p-value
In-hospital death	26.7%	0.7%	<0.001

Results: Obstruction versus Control

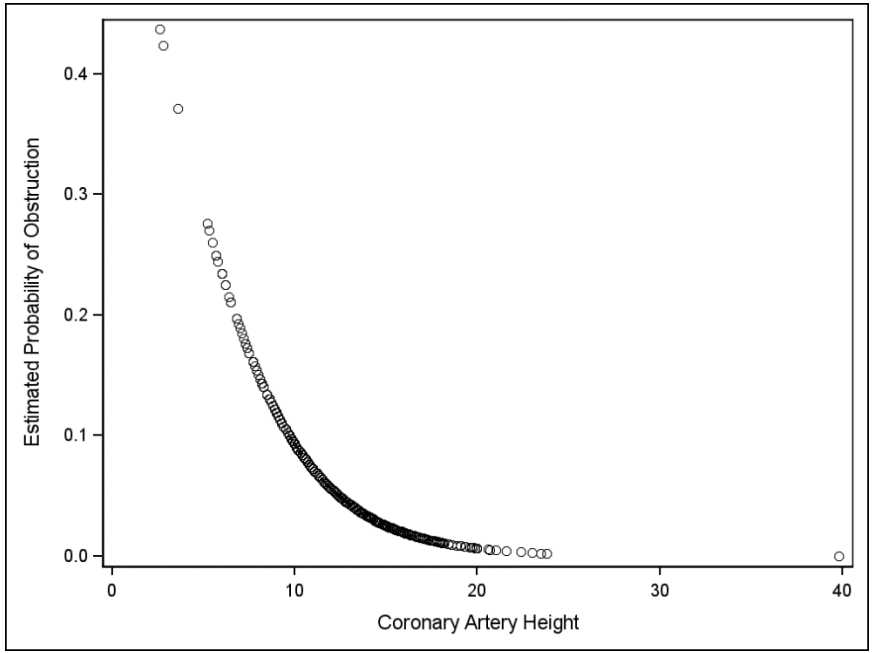
	Obstruction, n=60	No obstruction, n=1381	P-value
Annulus area	415 ± 89	468 ± 103	<0.001
Annulus perimeter	70.6 ± 13.7	77 ± 8.1	<0.001
Coronary artery height (left)	10.8 ± 3.3	13.1 ± 3	<0.001
Coronary artery height (right)	12.2 ± 1.7	15.5 ± 3.4	<0.001
Sinus diameter (left)	29.8 ± 3.4	32.7 ± 4.1	<0.001
Sinus diameter (right)	26.3 ± 2.6	31.1 ± 4	<0.001
STJ height left	17.5 ± 2.9	21.9 ± 4.2	<0.001
STJ height right	17.8 ± 2.5	22.4 ± 4.2	<0.001
STJ diameter	26.2 ± 3.1	29.6 ± 3.7	<0.001
Left Sinus – THV diameter	5 ± 3.2	8.2 ± 3.7	<0.001
Right Sinus – THV diameter	2.7 ± 3.5	6.6 ± 3.7	<0.001

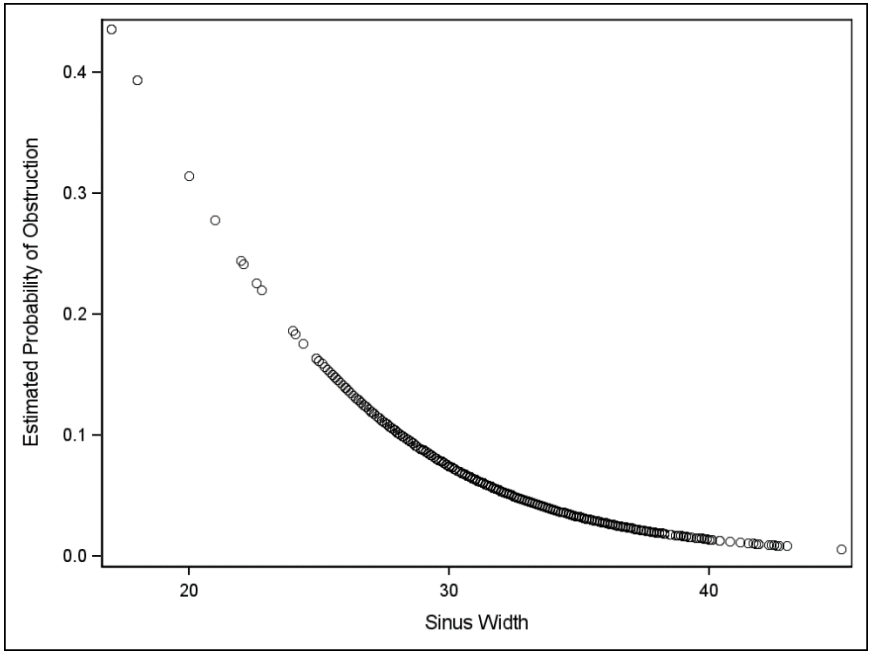
*all significant after Bonferroni correction

Multivariate and Primary Component Analysis

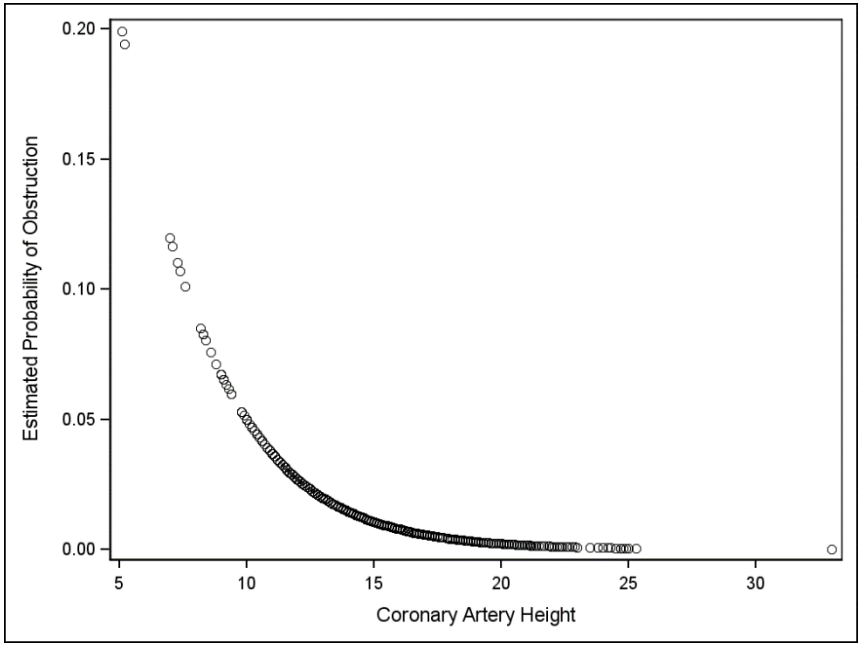
	Left Odds Ratio		Right Odds Ratio	
Coronary height	0.78 (0.71-0.88)	P<0.0001	0.80 (0.64-0.99)	p 0.039
Sinus width	0.87 (0.80-0.95)	p 0.002	0.82 (0.71-0.94)	p 0.005
Annulus area	0.98 (0.86 – 1.12)	p 0.81	0.90 (0.74 – 1.11)	p 0.32
Primary Component Analysis	0.87 (0.82-0.91)	p<0.0001	0.83 (0.73 – 0.89)	p<0.0001

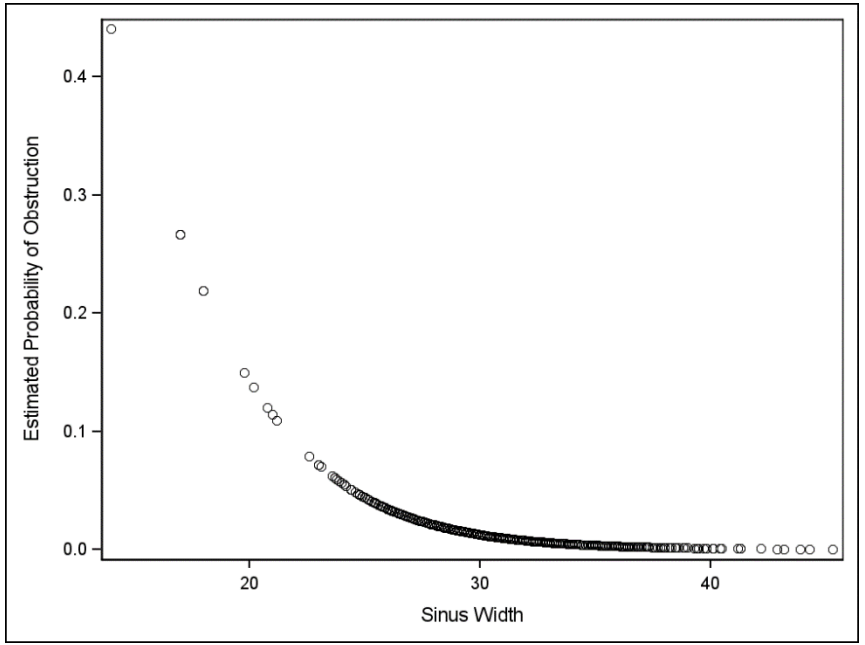
Odds ratio of LCA obstruction



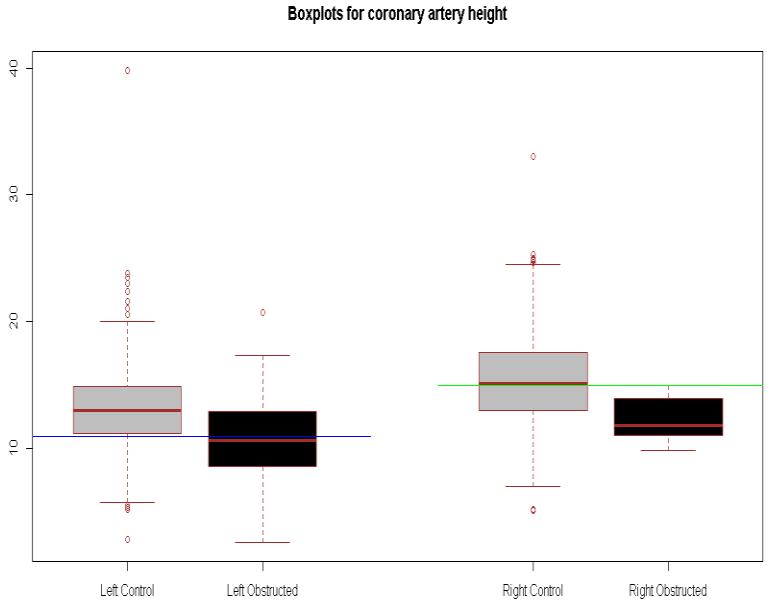


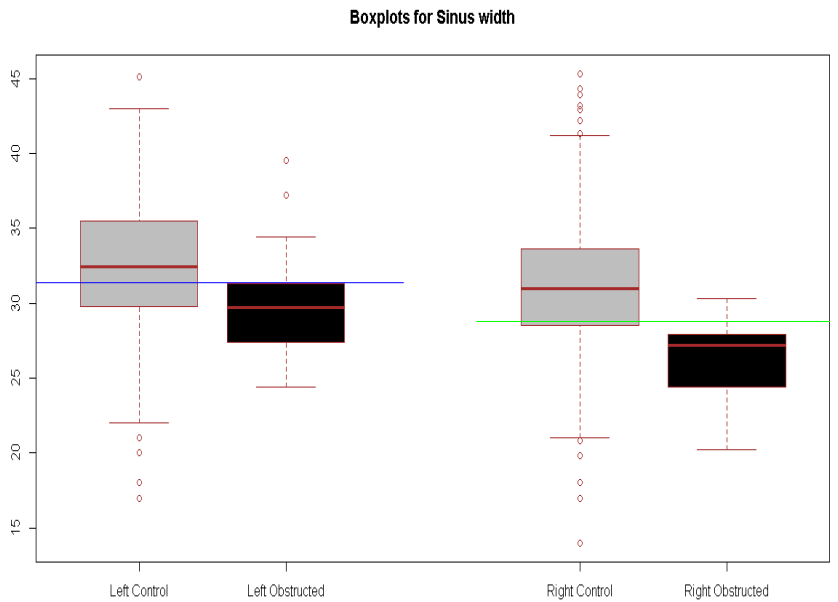
Odds ratio of RCA obstruction





Distribution of coronary height and sinus width



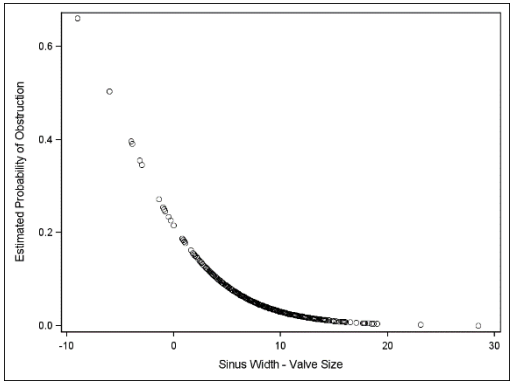


Optimal cut-off LCA 10.9 (AUC 0.71)
Optimal cut-off RCA 15 (AUC 0.80)

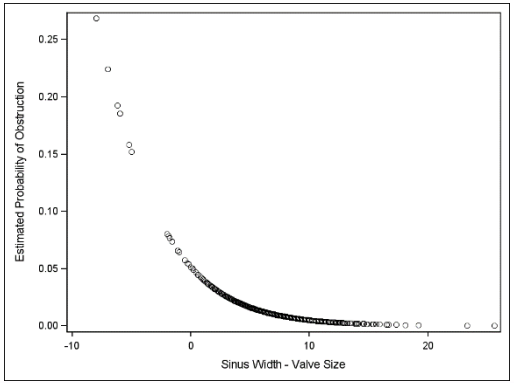
Optimal cut-off L SoV 31.4 (AUC 0.72)
Optimal cut-off R SoV 28.8 (AUC 0.85)

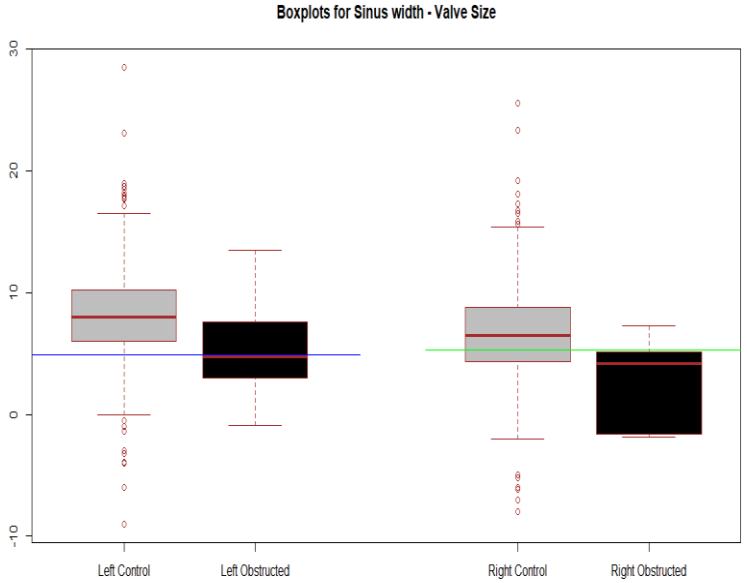
Distribution of (Sinus width minus THV size)

Left



Right



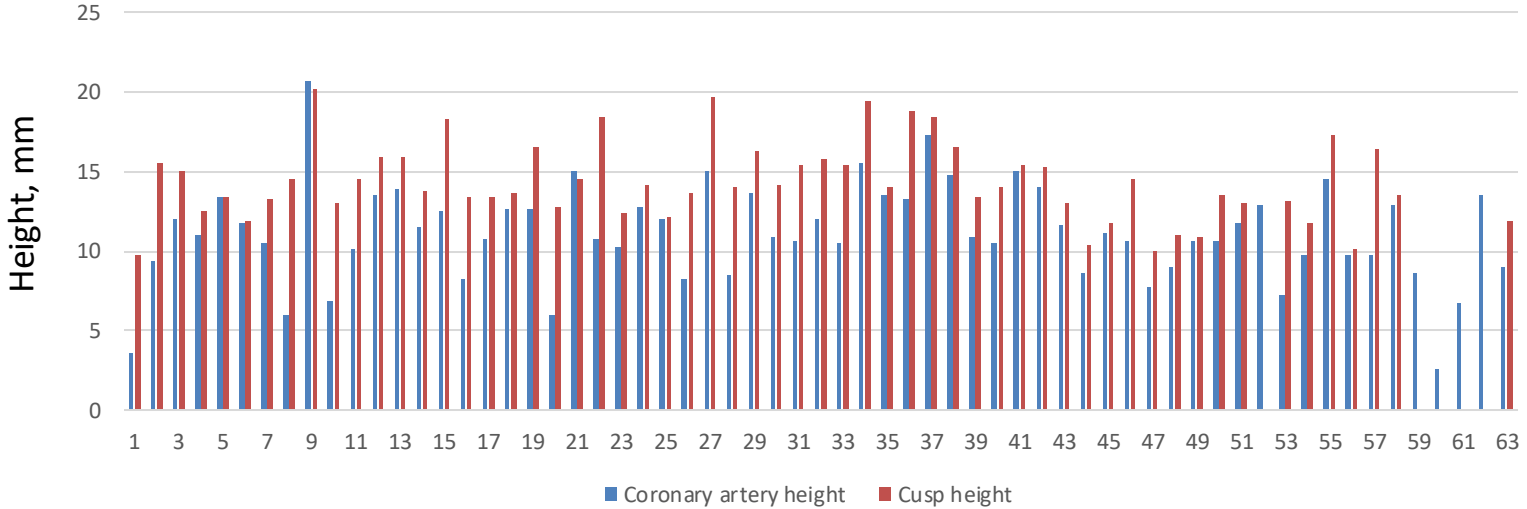


Optimal cut-off left 4.9 (AUC 0.76)

Optimal cut-off right 5.3 (AUC 0.78)

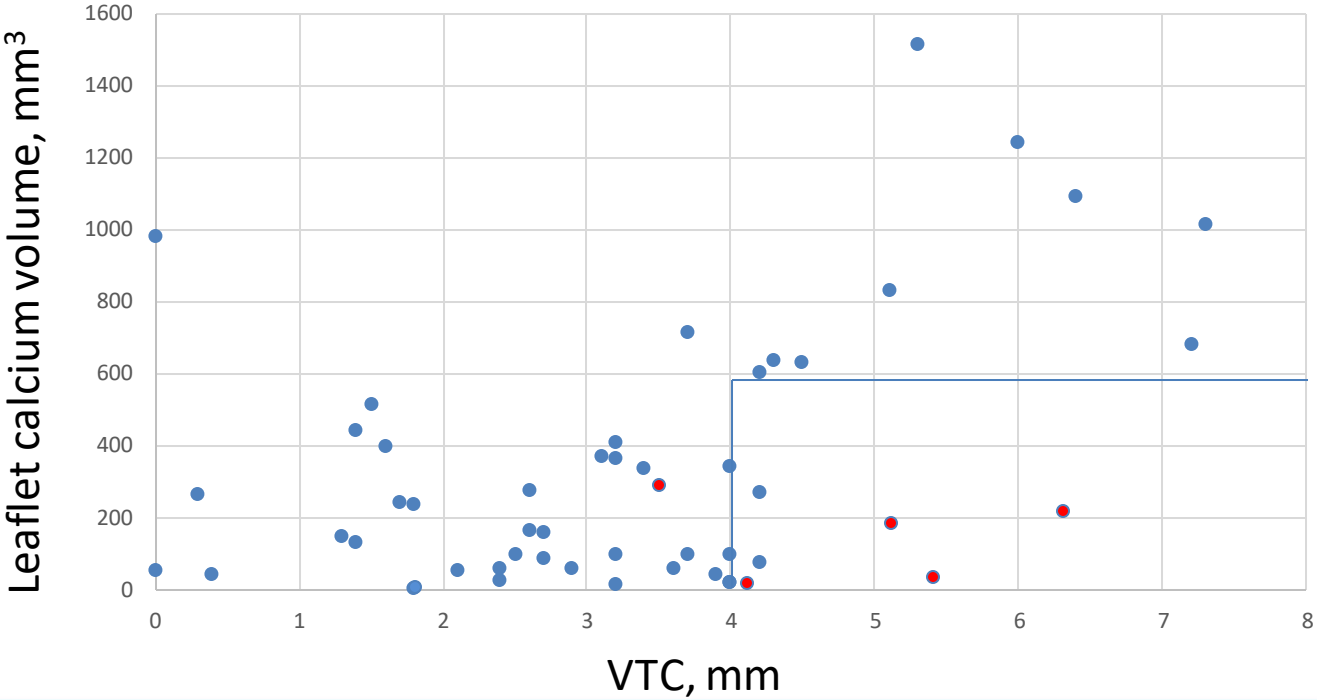
Coronary height and Cusp height

Cusp height is ≥ coronary height in 56/58 (96.6%)



Cases of obstruction, n=63

VTC and Leaflet Calcium Volume



VTC<4mm; or
Calcium volume >600mm³
Predicts 43/45 (95.6%) of ostial obstruction

Limitations

- Comparisons are across registries and groups are not matched
- Advanced measurements (VTC, cusp height, leaflet calcium volume) were not made in the control group

Conclusions

- Native obstruction occurs more commonly on the left, and at the level of the coronary ostium.
- Annulus area and perimeter, coronary height, sinus diameter, STJ height and diameter were all smaller in patients with obstruction compared with controls.
- Coronary height and sinus width were strongly correlated with increased risk of obstruction
- However, these dimensions alone are moderate discriminators for coronary obstruction
- Cusp height ≥ coronary height appears an important mechanism for obstruction, with 96.6% sensitivity.
- VTC<4mm or calcium volume>600mm^3 has 95.6% sensitivity for coronary obstruction.