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Coronary Obstruction Following Transcatheter Aortic Valve Implantation (TAVI) in High Risk Patients – Multicenter Registry

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Potential conflicts of interest

Speaker's name: Henrique B. Ribeiro

☑ *I do not have any potential conflict of interest*

Background - I

- Coronary obstruction due to the displacement of the calcified leaflets over the coronary ostia is a potential complication of TAVI
- Apart from reporting its incidence (usually <1%) in some TAVI studies, data on this life-threatening complication have been limited to case reports and small case series
- Very few data exist on the risk factors associated with this complication, as well as its clinical management and prognosis

Background - I

- A cutoff of 10 mm for left coronary artery (LCA) height was recommended by the current ACCF/AATS/SCAI/STS Expert Consensus (2012) on TAVI

though no definite criteria exist to exclude patients, a <10 mm distance might identify increased risk of coronary ostial occlusion (184). In this setting, placement of a guidewire or

Holmes. J Am Coll Cardiol 2012;59:1200 –54.

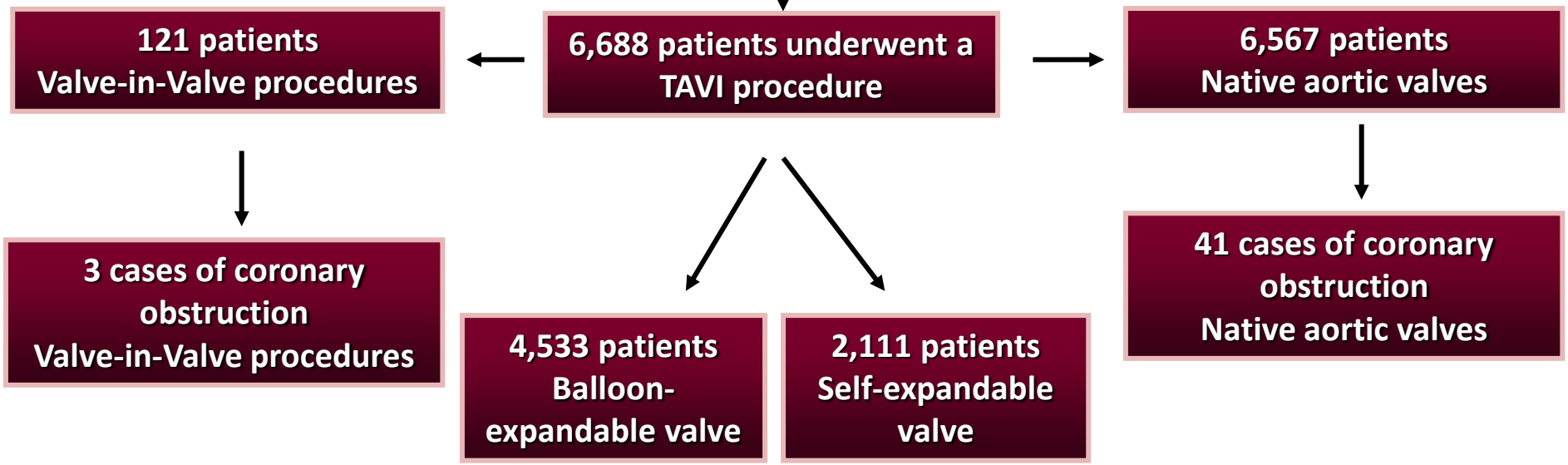
Objectives

To evaluate the main baseline and procedural characteristics, management and clinical outcomes of patients suffering from coronary obstruction following TAVI from a large series of patients

Methods

- 81 centers with a TAVI program (Canada, US, South America, Europe, Asia)
- Balloon-expandable and self-expandable valves

- Dedicated CRF with clinical, echo and CT data for coronary obstruction cases
- Age, gender, operative score, CAD, CABG, Valve Type, ViV from controls (no coronary obstruction cases)



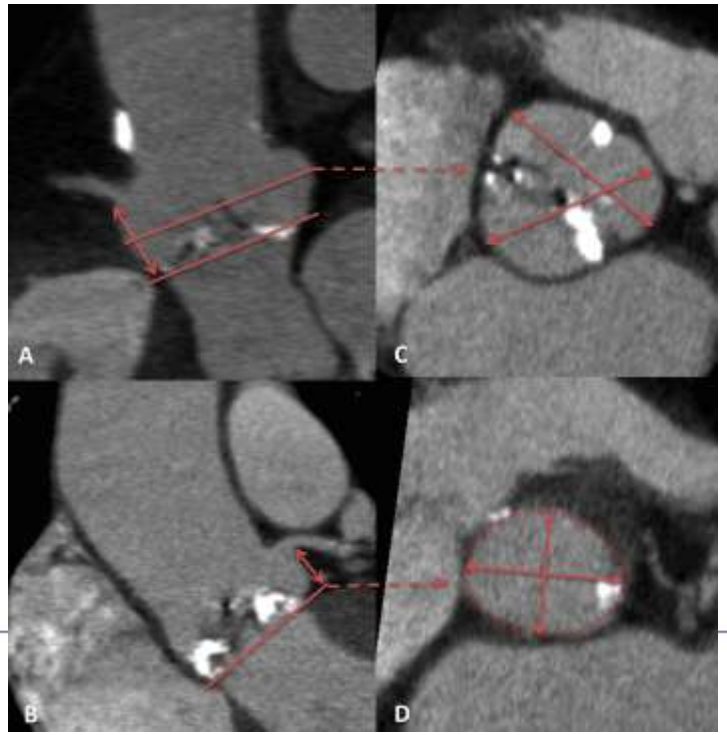
Methods: Computed tomography (CT) data

- 345 patients with no coronary obstruction (control group)
- 28 patients with coronary obstruction with CT data

- CT data from both groups (sinus of Vasalva diameter, coronary arteries height, annulus diameter and area)

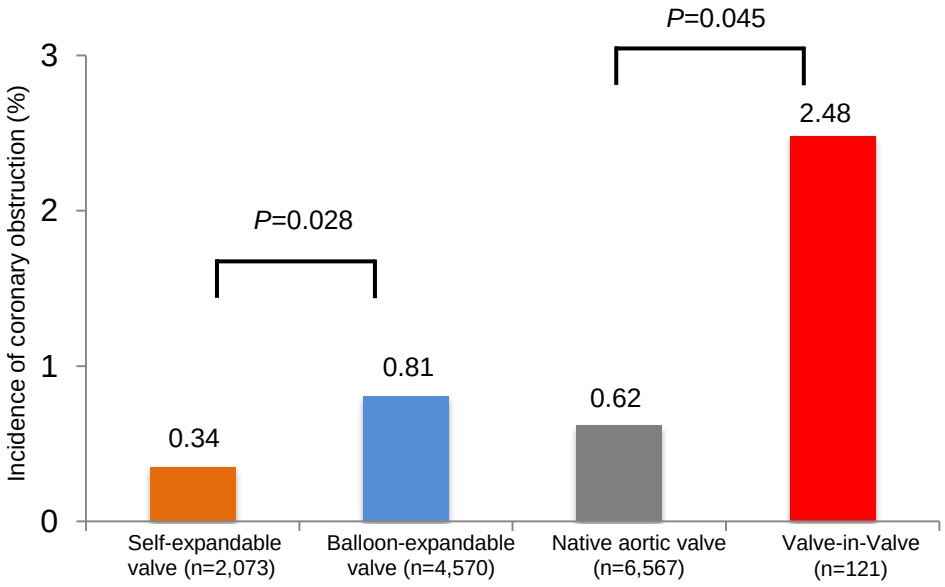
- Case-matching (1:1) for age, gender, prior CABG, valve type and size
- Bootstrap technique (1000 samples with replacement)

Example from CT measurements

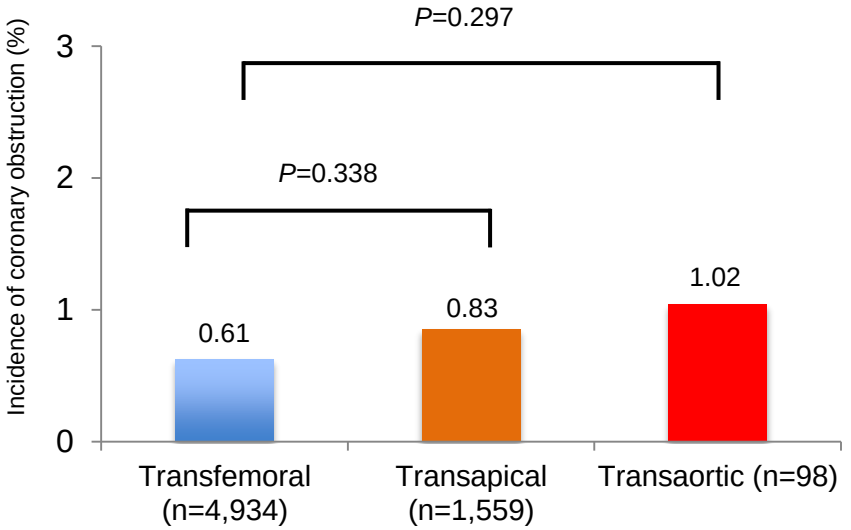


Results: Incidence of coronary obstruction (%)

According to valve type and procedure



According to approach



Results: Main clinical and procedural characteristics

	Coronary Obstruction (n=44)	Controls (n=6,644)	P
Clinical variables			
Age, years	83.1 ± 8.0	81.0 ± 7.1	<0.001
Female	37 (84.1)	3,408 (51.3)	<0.001
Prior Coronary Artery Disease	19 (45.2)	2,270 (55.5)*	0.102
Prior CABG	4 (9.1)	919 (22.5)*	0.043
STS-PROM score, %	10.2 ± 5.5	8.8 ± 7.4	<0.001
Logistic EuroSCORE, %	23.2 ± 16.2	18.1 ± 13.6	<0.001
Procedural Variables			
Valve type			0.028
Sapien/Sapien XT	37 (84.1)	4,533 (68.2)	
CoreValve	7 (15.9)	2,066 (31.1)	
Approach			0.320
Transfemoral	30 (68.2)	4,904 (73.8)	
Transapical	13 (29.5)	1,546 (23.3)	
Others	1 (2.3)	194 (2.9)	
Valve-in-valve	3 (6.8)	118 (1.8)	0.045

*Data available for 4,386 patients
Values are expressed as n (%) or mean (±SD).

Results: Clinical Presentation

	Coronary Obstruction (n=44)
Obstructed Coronary	
Left coronary artery	39 (88.6)
Right coronary artery	2 (4.5)
Both	3 (6.8)
Stenosis Severity	
Partial occlusion	25 (56.8)
Complete occlusion	19 (43.2)
Timing	
After balloon valvuloplasty	4 (9.1)
After valve implantation	31 (70.5)
After balloon post-dilatation	4 (9.1)
After the procedure	5 (11.4)
Clinical Presentation	
Severe persistent hypotension	30 (68.2)
Electrocardiographic changes	25 (56.8)
• ST-segment elevation	14 (56.0)
• Ventricular arrhythmias	10 (40.0)

Values are expressed as n (%)

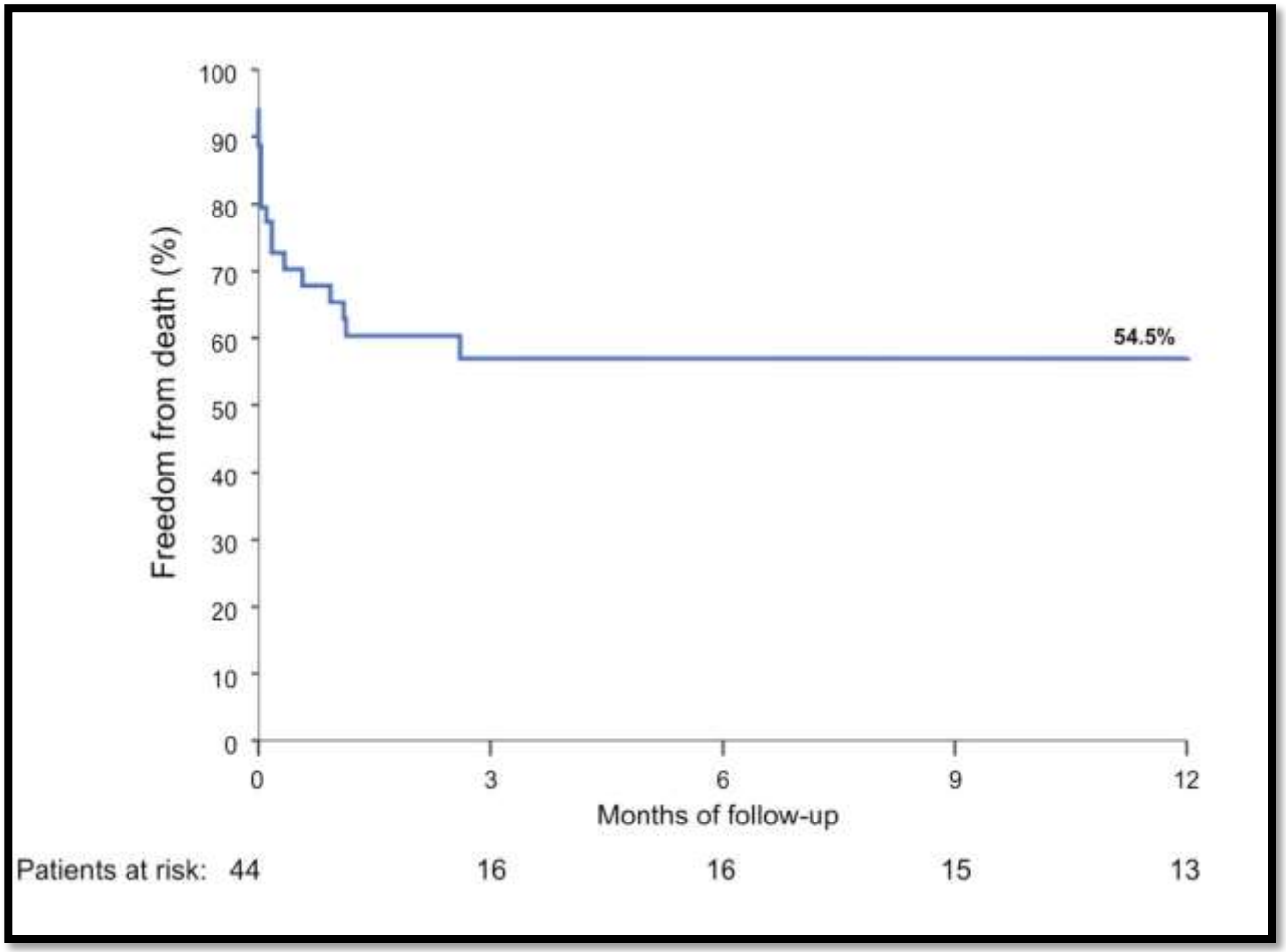
Results: Management and In-hospital outcomes

	Coronary Obstruction (n=44)
Treatment	
PCI attempted	33 (75.0)
Successful PCI	27 (81.8)
Reason for PCI failure	
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)
Urgent CABG	6 (13.6)
Need for hemodynamic support	16 (36.4)
Drug-eluting stent	17 (68.0)
In-hospital outcomes	
Myocardial infarction*	21 (47.7)
Major or life-threatening bleeding	7 (15.9)
Stroke	4 (9.1)
Death#	18 (40.9)

*After excluding procedural deaths

#Procedural deaths: 7 (15.9%)

Results: KM survival curve at 1-year



No cases of reintervention at follow-up.

Results: Computed Tomography data

	CT cohort (n=345)	Control population (n=6,298)	P
Age (years)	81.1 ± 6.6	81.0 ± 7.1	0.798
Female	161 (46.5)	2.887 (45.8)	0.807
Prior coronary artery disease	231 (66.8)	2.039 (50.5)	<0.001
Prior CABG	98 (28.3)	821 (22.5)	<0.001
Logistic EuroSCORE	18.6 ± 14.8	18.0 ± 13.5	0.461

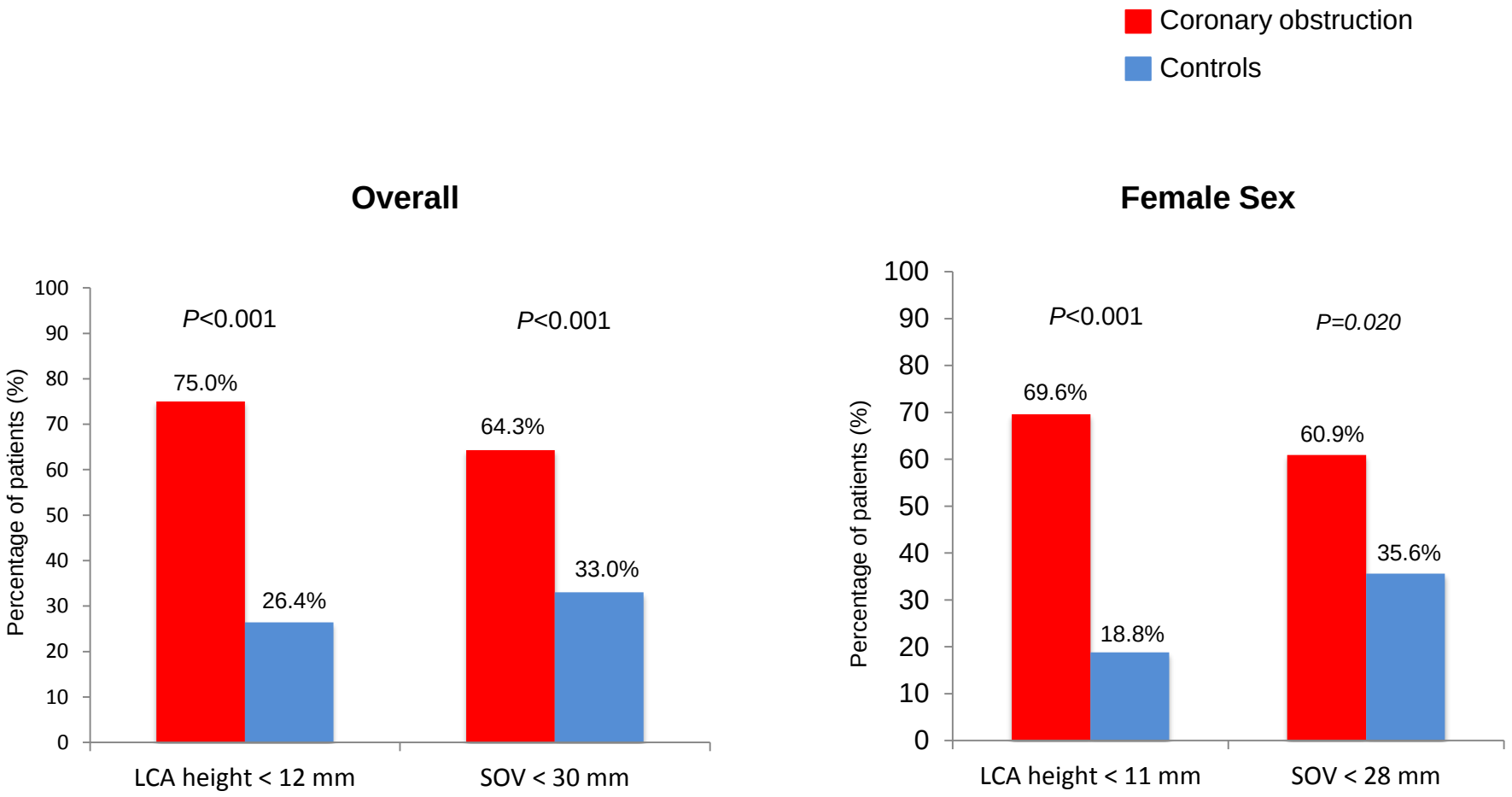
Values are expressed as mean ± SD or (95% CI).

Results: Computed Tomography data

	Coronary Obstruction (n=28)	Controls (n=345)	P
Annulus diameter (mm)	23.1 (21.8-24.4)	24.4 (24.1-24.7)	0.059
Annulus area (mm^2)	403 (376-448)	476 (405-560)	0.002
Aortic sinus of valsalva diameter (mm)	28.0 (26.5-29.5)	31.9 (31.5-32.3)	<0.001
Sinotubular junction (mm)	24.7 (23.3-26.1)	27.9 (27.5-28.3)	0.012
Relation prosthesis size/annulus	1.08 (1.04-1.12)	1.05 (1.04-1.06)	0.224
Relation Sinus of Valsalva/annulus	1.24 (1.17-1.31)	1.31 (1.29-1.33)	0.015
Left Coronary Height overall (mm)	11.2 (10.1-12.3)	13.4 (12.9-14.4)	<0.001
Right Coronary Height overall (mm)	13.2 (11.8-14.6)	14.1 (13.9-14.4)	0.112
Calcium score (Agatston)	2,536 (2,107-2,965)	2,872 (2,690-3,054)	0.779

Values are expressed as mean (95% CI).

Results: CT-data on LCA height and SOV diameter



LCA: left coronary artery; SOV: sinus of valsalva.

Results: Case-Match Analysis

	Coronary Obstruction (n=27)	Controls (n=27)	OR (CI 95%)
Annulus diameter (mm)	23.2 ± 0.1	23.6 ± 0.4	1.08 (0.94-1.29)
Annulus area (mm^2)	418 ± 3	458 ± 17	1.01 (0.99-1.02)
Aortic sinus of valsalva diameter (mm)	27.4 ± 0.1	31.3 ± 0.6	1.41 (1.22-1.64)
Relation prosthesis size/annulus	1.07 ± 0.02	1.05 ± 0.02	0.06 (0.02-1.37)
Relation sinus of valsalva/annulus	1.23 ± 0.01	1.34 ± 0.03	10.9 (5.6-22.6)
Left coronary height (mm)	11.2 ± 0.1	13.3 ± 0.3	1.72 (1.47-2.08)
Right coronary height (mm)	13.2 ±0.1	14.2 ± 0.4	1.19 (1.06-1.37)
Calcium score (Agatston)	2485 ± 81	2744 ± 312	1.01 (0.99-1.01)

Values are expressed as mean ± SE; OR: Odds ratio (95% CI).

Limitations

- The very low incidence of coronary obstruction and the lack of individual clinical and CT data for the entire cohort precluded to determine the independent predictors of coronary obstruction
- Only cases of symptomatic coronary obstruction were analyzed
- Future prospective studies with a very large number of patients with systematic CT measurements will be needed to confirm these results

Conclusions - I

- Coronary obstruction following TAVI was a rare (0.66%) but life-threatening complication (mortality: 40.9%), and it was more frequent in women, in patients with prior surgical bioprosthesis, and in those who received a balloon-expandable valve.

- Clinical presentation included most likely persistent severe hypotension and electrocardiographic changes, such as ST-segment elevation and ventricular arrhythmias.

- Most patients were treated with PCI, which was successful in about 80% of them; nonetheless open heart surgery or mechanical hemodynamic support were still required in a significant number of patients.

Conclusions - II

- Low lying coronary ostia (specially a LCA height <12 mm), and a narrow aortic root (<30 mm) appeared as important risk factors on CT related to the occurrence of coronary obstruction

- These results should contribute to a better understanding of this important complication leading to improvements in its prevention and treatment.