Bicuspid TAVR: All the Technical Issues and Data From Asan Medical Center

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Rouen, France on 16th, April 2002.

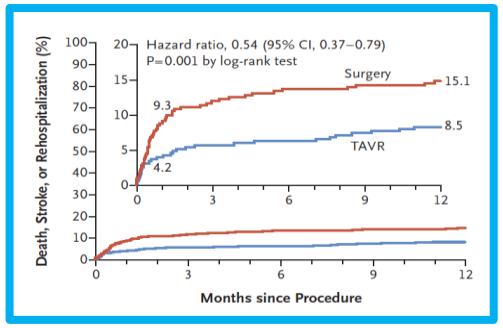
First-In-Man TAVR in Bicuspid

Cribier A, et al. Circulation. 2002;106:3006-3008
PCR Online: 20 years of TAVI - Revolutionising medicine since 2002

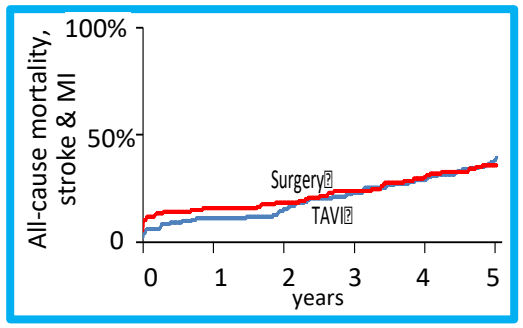
Today, His Dream Comes True in Tricuspid AS

TAVR Low-Risk Trials

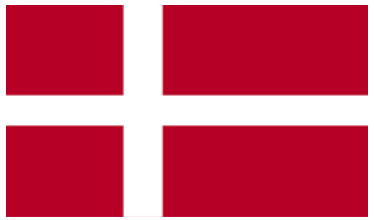
(4 RCTs - 3,661 patients)

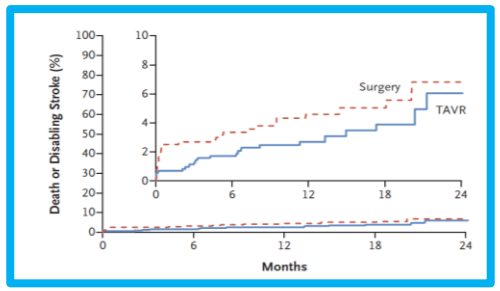


PARTNER 3

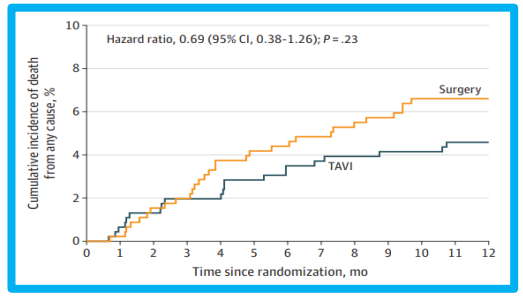


NOTION



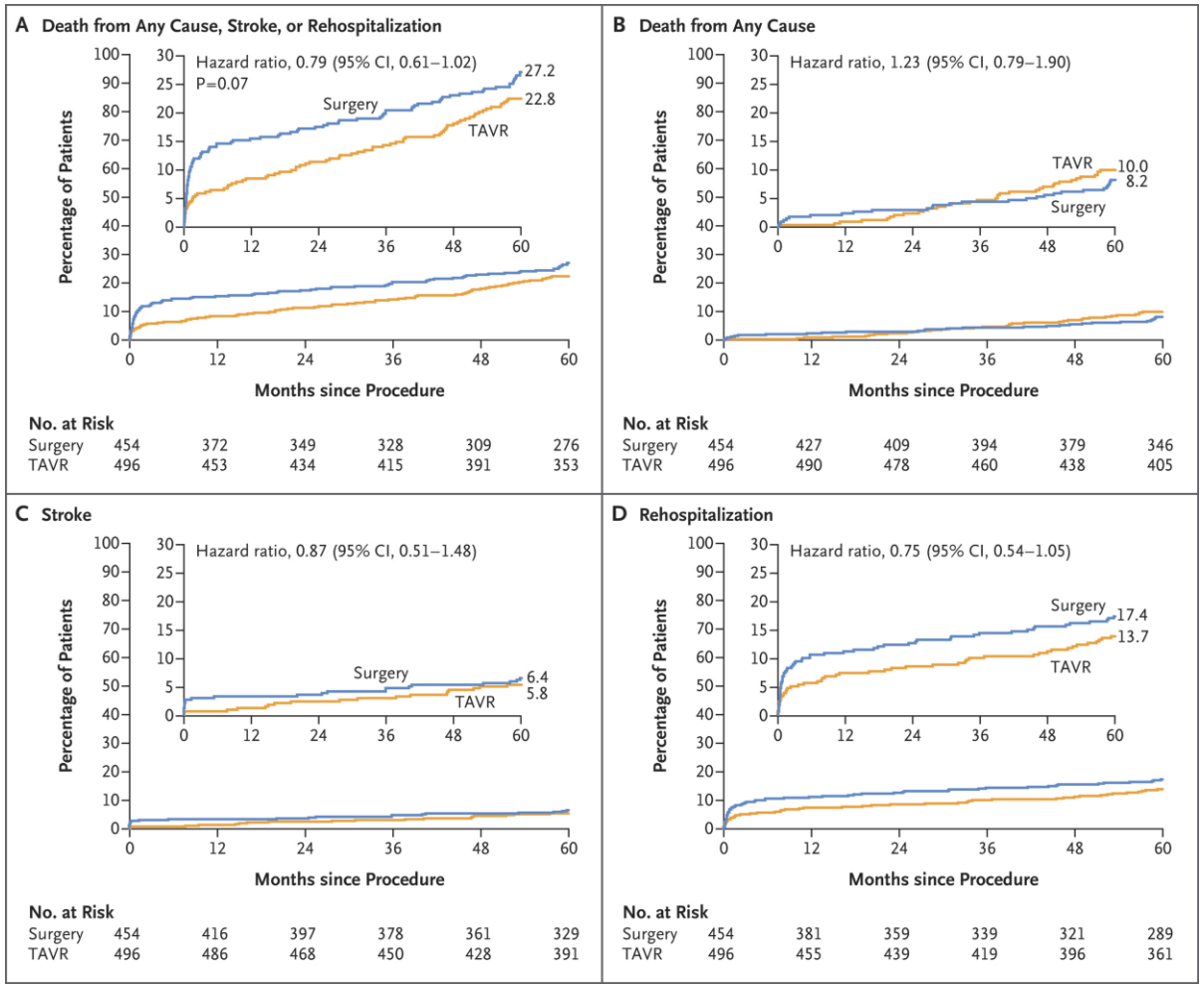


Evolut Low Risk



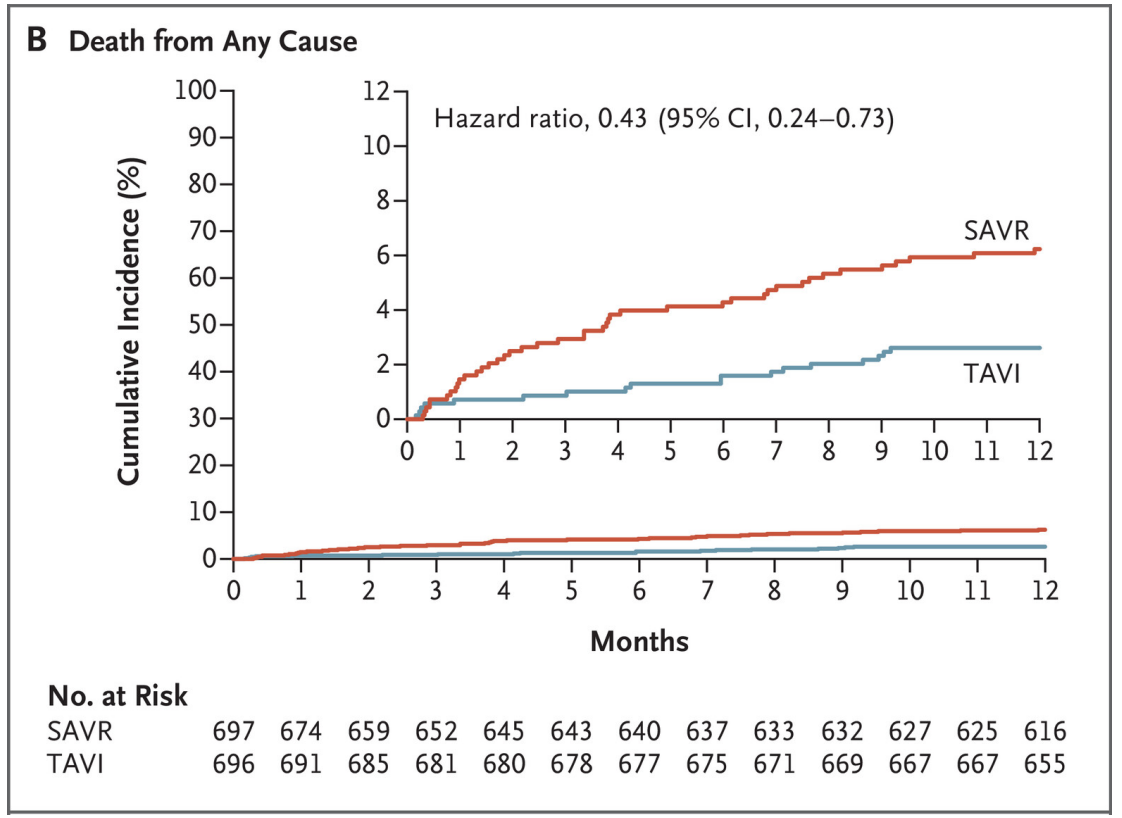
UK-TAVI

PARTNER III at 5 Years



N Engl J Med 2023;389:1949-1960

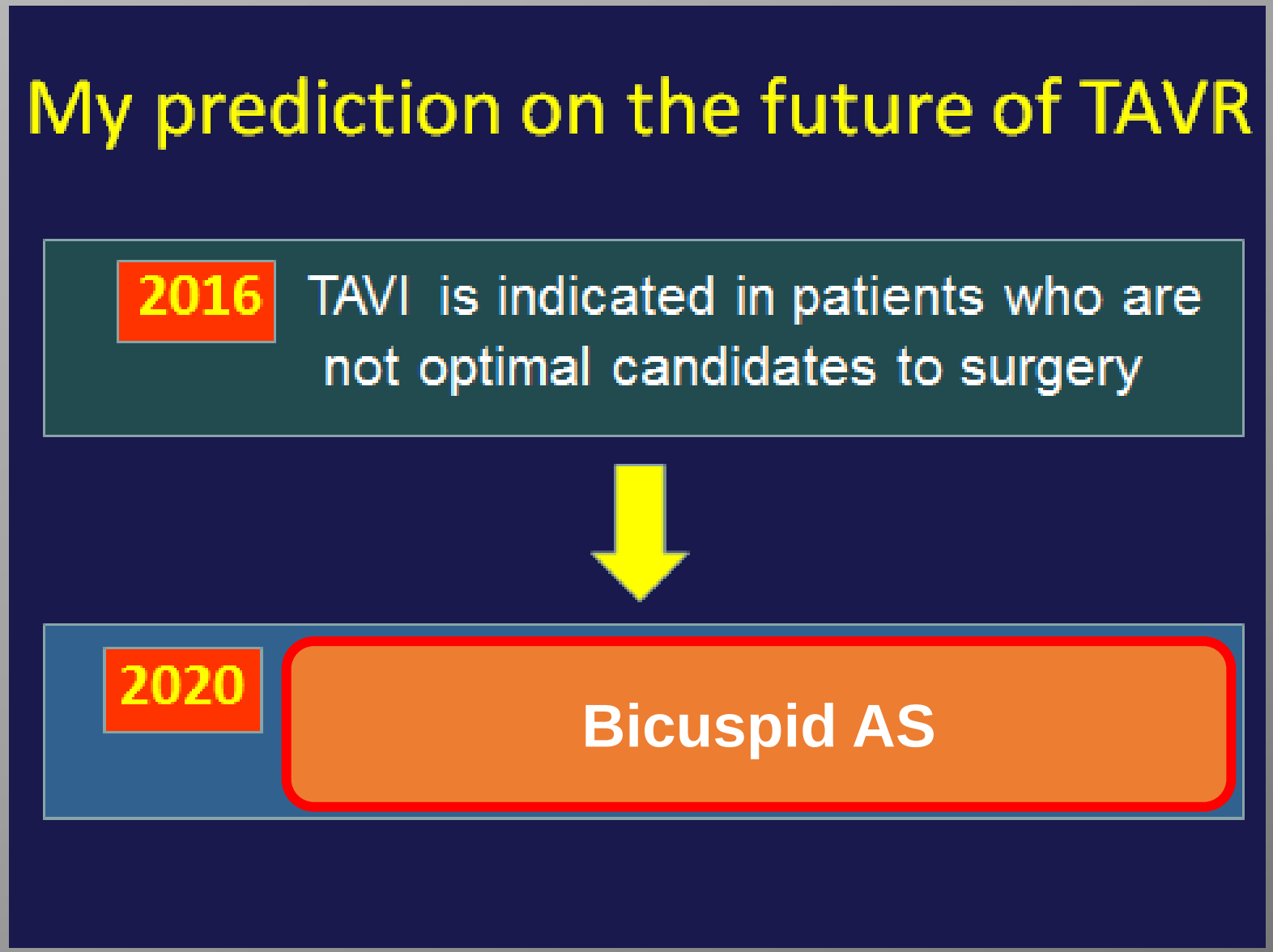
DEDICATE-DZHK6 Trial



74 YO, Local anesthesia – 75.1%
BEV 61.4%, SEV 35.1%

N Engl J Med 2024;390:1572-1583

Dr. Alain Cribier at TCTAP 2016



Clinical and Anatomical Challenges

1. Younger, and Less Comorbidities
2. More Severe Aortic Valve Stenosis
3. Larger Aortic Valve Complex
4. More Severe Aortic Valve Calcification
5. Associated Bicuspid Aortopathy

ASAN TAVR Registry

Baseline Characteristics

1) Younger and Less Comorbidities

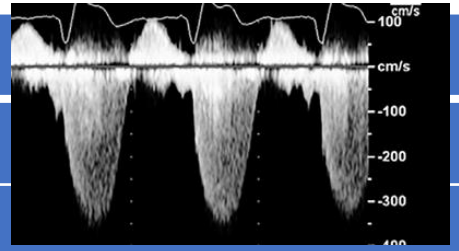
	Unadjusted cohort		
	Bicuspid	Tricuspid	
	(N=124)	(N=905)	p-value
Age (years)	77.2 ± 6.4	80.6 ± 5.7	<0.001
Sex (Male)	82 (66.1%)	400 (44.2%)	<0.001
BMI (cm/kg)	1.61 ± 0.13	1.58 ± 0.18	0.017
STS score	3.04 ± 2.43	4.11 ± 2.66	<0.001
Current smoking	21 (16.9%)	43 (4.8%)	<0.001
Hyperlipidemia	63 (50.8%)	594 (65.6%)	0.002
Diabetes	29 (23.4%)	347 (38.3%)	0.002
Hypertension	68 (54.8%)	723 (79.9%)	<0.001
Previous PCI	17 (13.7%)	213 (23.5%)	0.019

- More Optimized Results
- Life-Time Management
- Valve Longevity

ASAN TAVR Registry

Echocardiographic Assessment

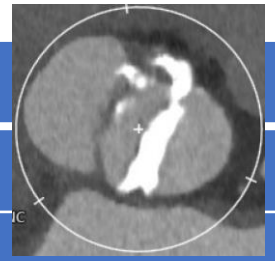
2) More Severe Aortic Valve Stenosis



	Unadjusted cohort			Propensity score-matched cohort		
	Bicuspid	Tricuspid		Bicuspid	Tricuspid	
	(N=124)	(N=905)	p-value	(N=113)	(N=113)	p-value
Ejection fraction (%)	58.2 ± 10.2	59.2 ± 10.5	0.289	57.9 ± 10.6	58.9 ± 10.6	0.506
Trans-aortic Vmax	5.02 ± 0.81	4.77 ± 0.74	0.001	5.01 ± 0.81	4.85 ± 0.68	0.104
Trans-aortic pressure gradient						
Peak pressure gradient	102.9 ± 32.4	93.0 ± 298.0	0.001	102.5 ± 32.3	95.5 ± 26.6	0.079
Mean pressure gradient	62.5 ± 20.2	55.4 ± 18.8		62.4 ± 20.1	57.2 ± 17.4	0.040
EOA (cm2)	0.60 ± 0.14	0.63 ± 0.14	0.005	0.59 ± 0.14	0.64 ± 0.13	0.019
Index EOA (cm2/m2)	0.37 ± 0.09	0.40 ± 0.09	<0.001	0.37 ± 0.09	0.40 ± 0.09	0.016

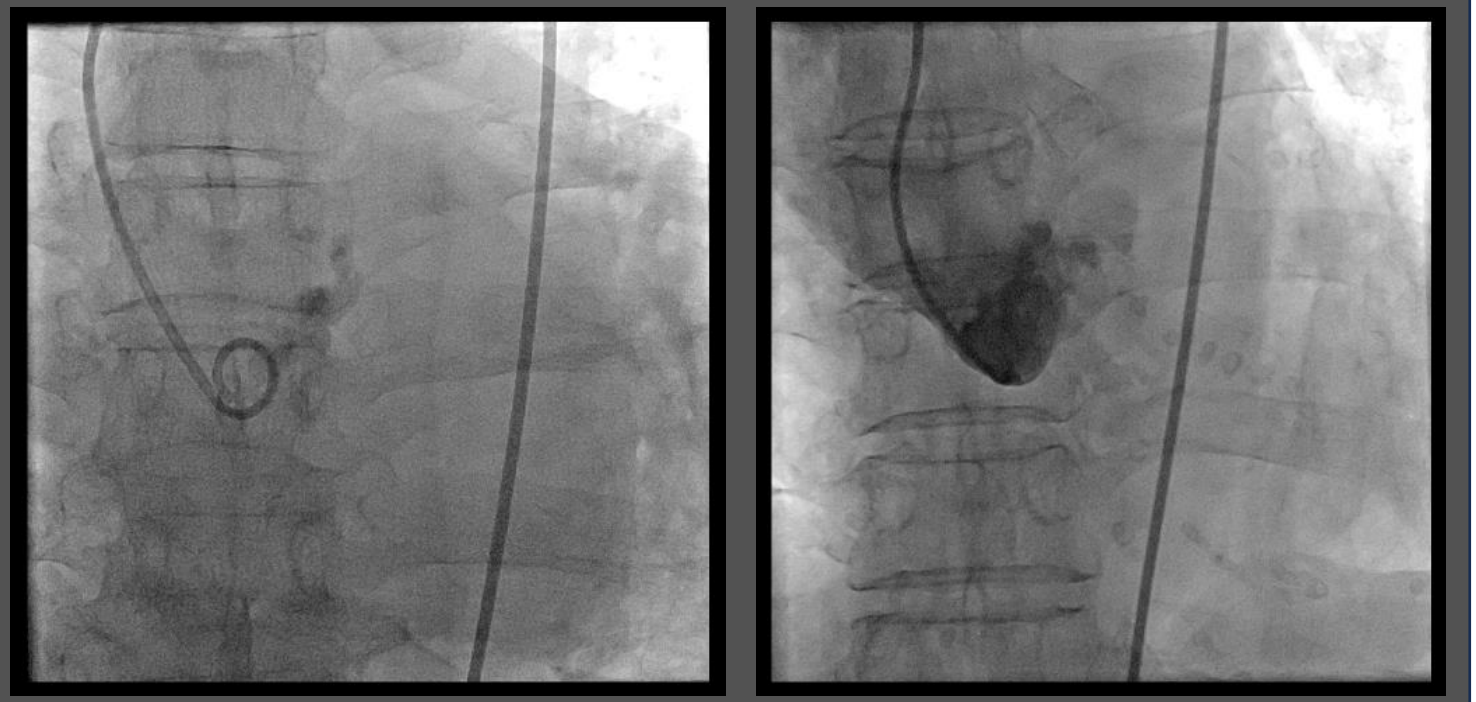
CT Measurement

3) Larger and Asymmetric Aortic Valve Complex



	Ur
	Bicuspid
	(N=124)
Annulus diameter (mm)	504.8 ± 97.5
Annulus perimeter (mm)	80.6 ± 8.0
Sinus area (mm2)	1023.9 ±197.6
STJ area (mm2)	832.5 ± 214.6
LVOT area (mm2)	492.5 ± 117.3
LCA height (mm)	15.6 ± 3.8
RCA height (mm)	18.3 ± 4.4
Total aortic valve calcium	756.3 ± 527.5

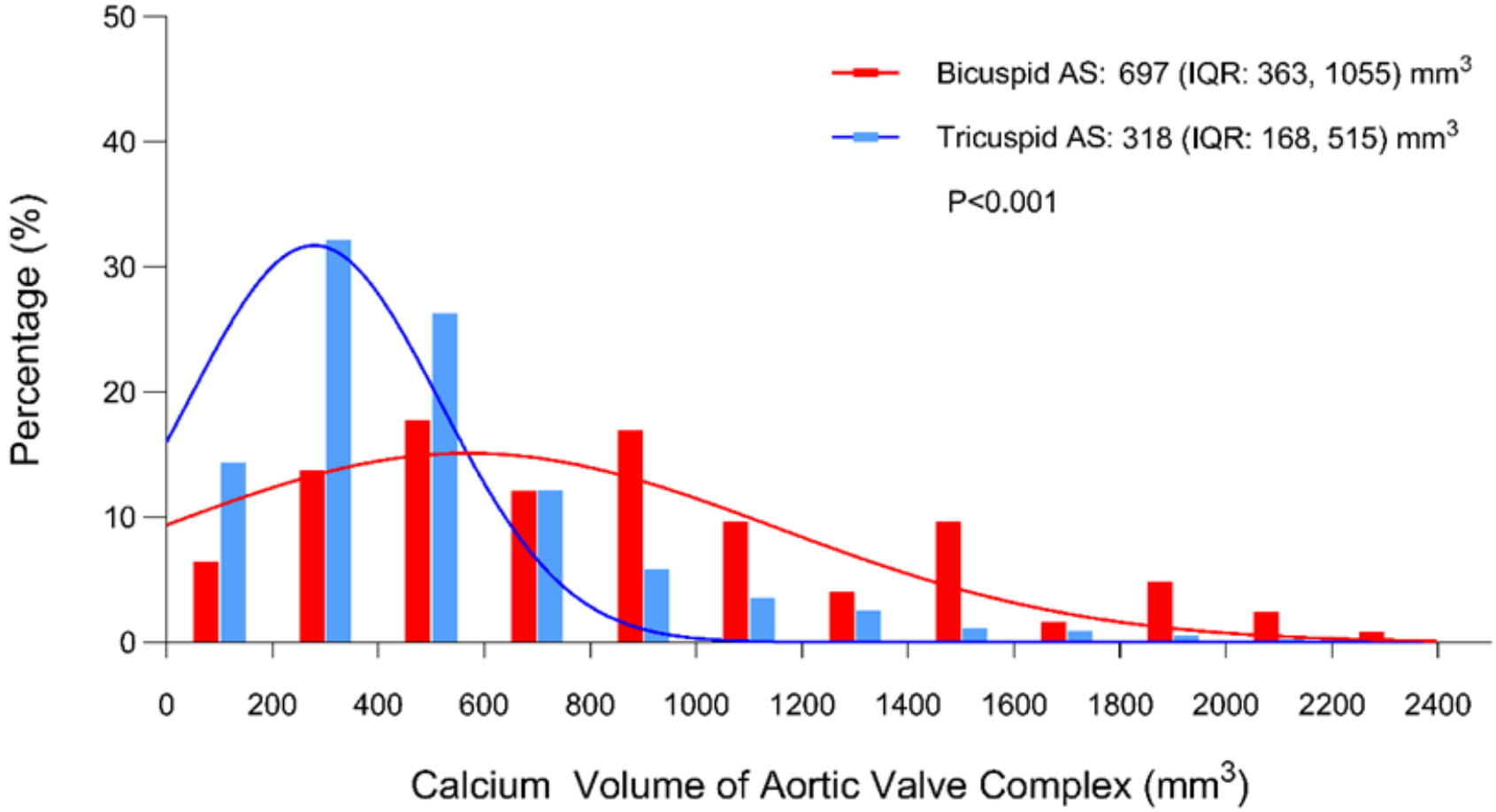
- **Difficulty in Valve Implantation**



ASAN TAVR Registry

Calcium Distribution

4) More Severe Aortic Valve Calcification



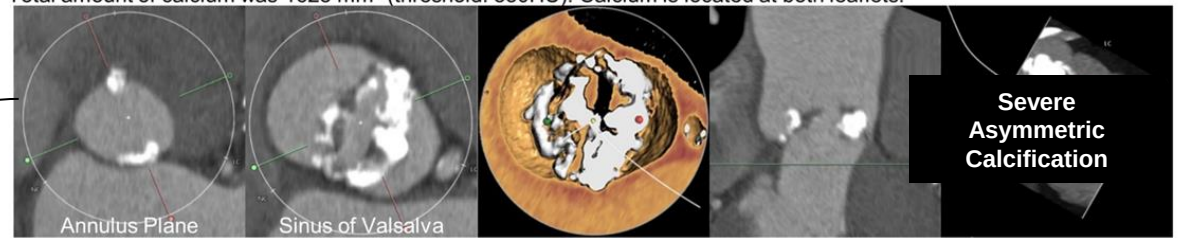
Lim SM, Ahn JM, Park SJ et al. JACC Cardiovasc Interv. 2024 Sep 9;17(17):2085-2087

High Risk Calcification

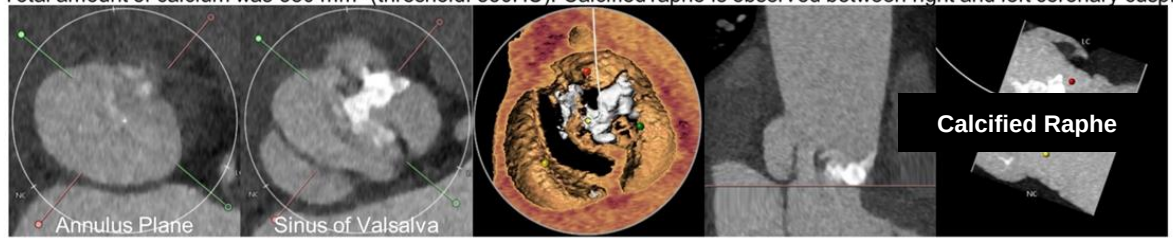
Higher Risk

Case 1
Total amount of calcium was 65 mm^3 (threshold: 850HU). There was only small amount of calcium.

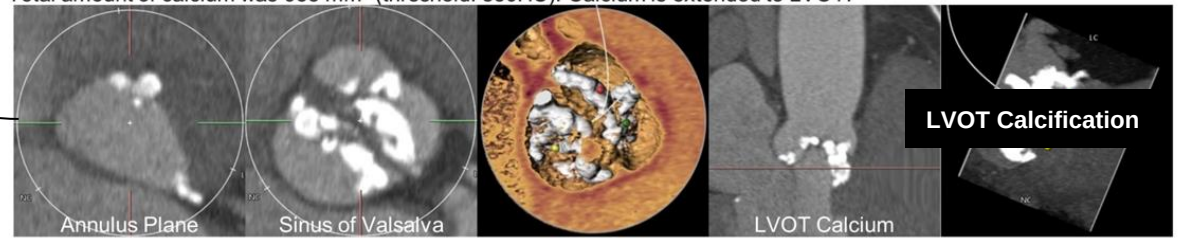
Case 2
Total amount of calcium was 1625 mm^3 (threshold: 850HU). Calcium is located at both leaflets.



Case 3
Total amount of calcium was 380 mm^3 (threshold: 850HU). Calcified raphe is observed between right and left coronary cusp.



Case 4
Total amount of calcium was 958 mm^3 (threshold: 850HU). Calcium is extended to LVOT.



Severe Calcification

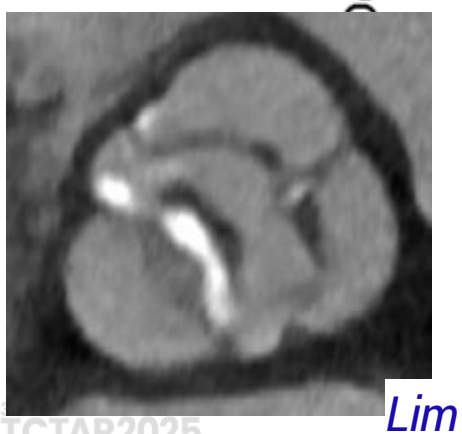
Raphe Calcification

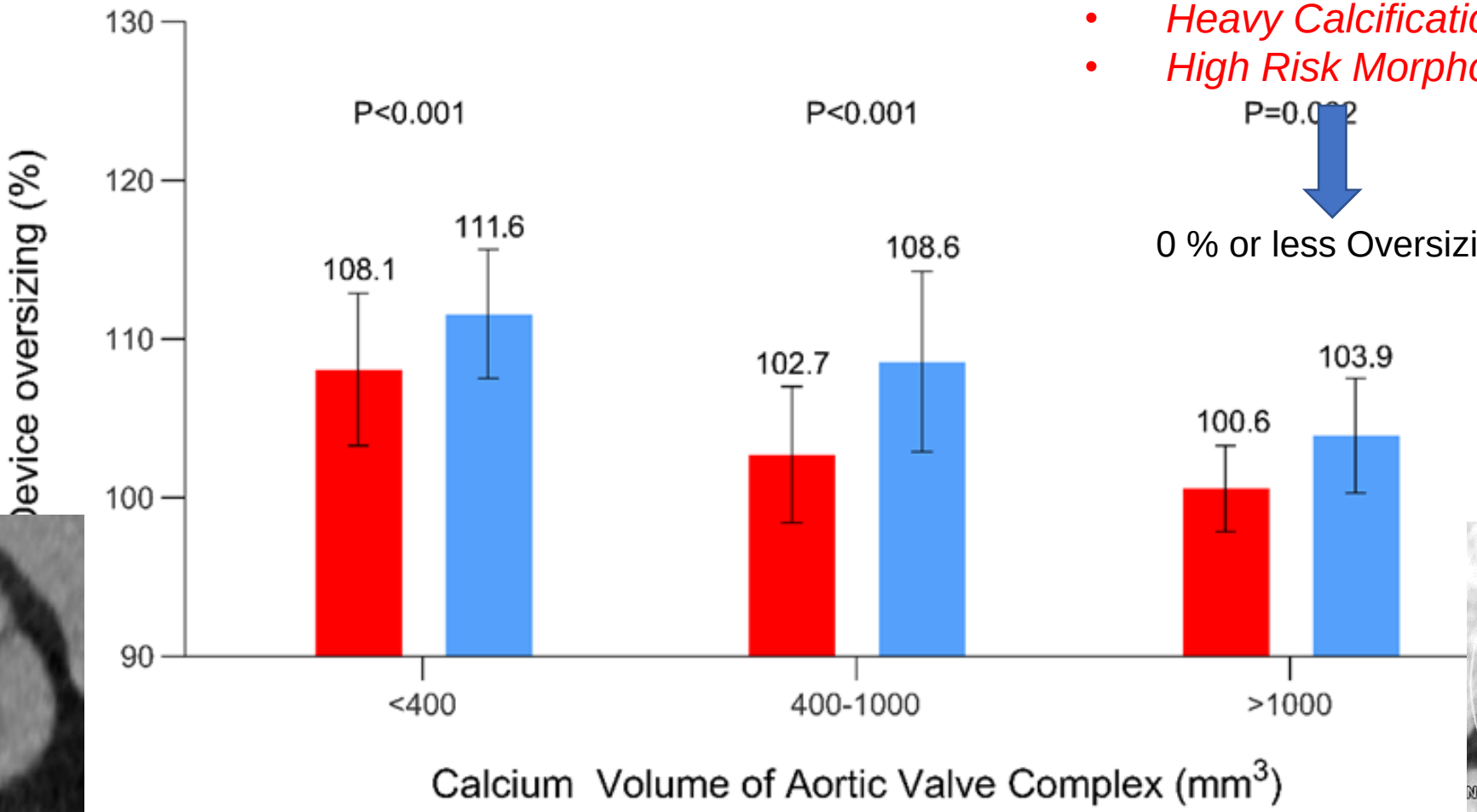
LVOT Calcification

Initial S3 Oversizing By Calcium Volume

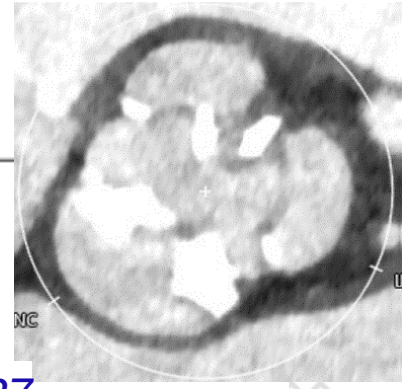
6) Less Oversizing

- *Bicuspid AS*
- *Heavy Calcification*
- *High Risk Morphology*





0 % or less Oversizing



Lim SM, Ahn JM, Park SJ et al. JACC Cardiovasc Interv. 2024 Sep 9;17(17):2085-2087

Procedural Characteristics (1)

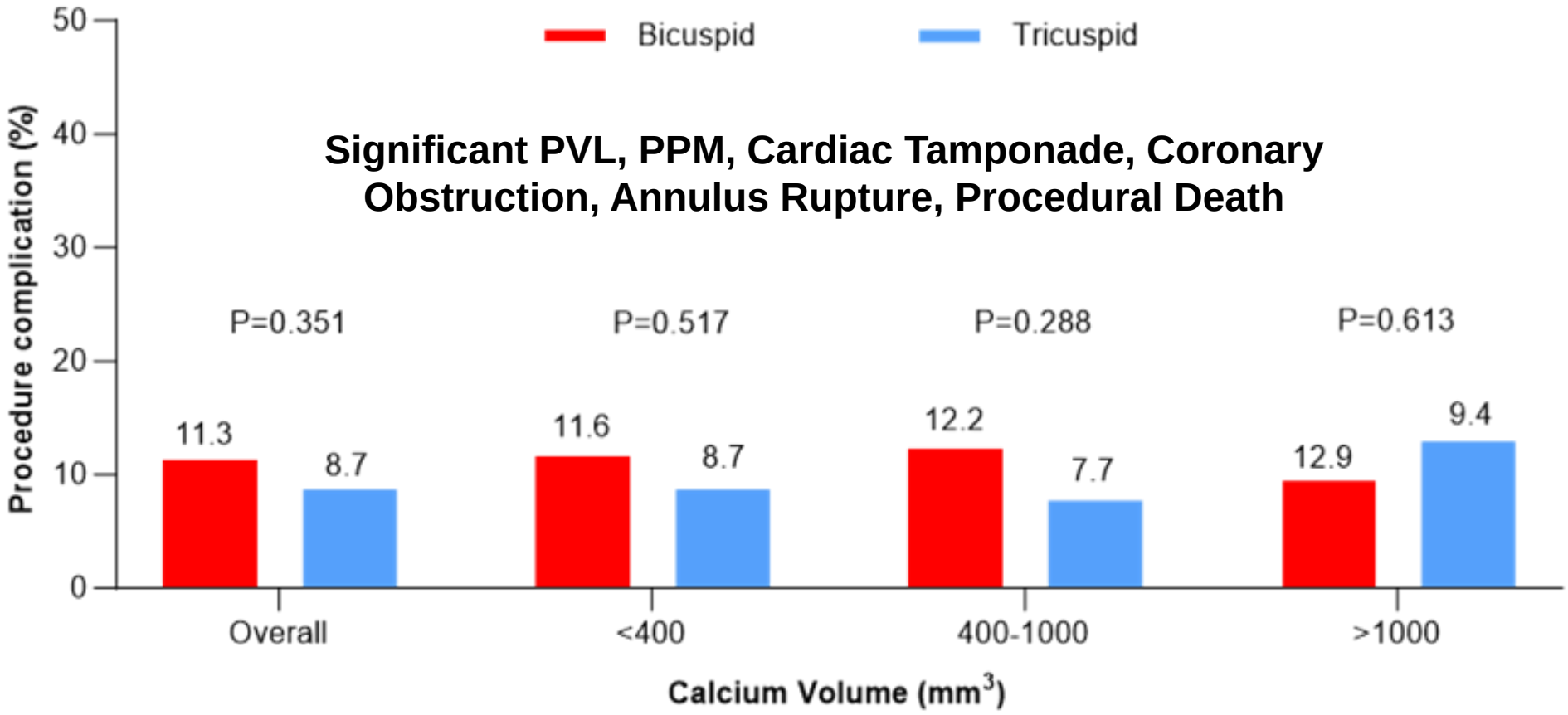
5) Larger THV was Implanted with More Frequent Pre and Post Dilation

	Unadjusted cohort			Propensity score-matched cohort		
	Bicuspid	Tricuspid		Bicuspid	Tricuspid	
	(N=124)	(N=905)	p-value	(N=113)	(N=113)	p-value
Valve size			<0.001			0.028
20 mm	5 (4.0%)	45 (5.0%)		5 (4.4%)	6 (5.3%)	
23 mm	25 (20.2%)	375 (41.4%)		23 (20.4%)	32 (28.3%)	
26 mm	55 (44.4%)	392 (43.3%)		49 (43.4%)	58 (51.3%)	
29 mm	39 (31.5%)	93 (10.3%)		36 (31.9%)	17 (15.0%)	
Pre-balloon valvuloplasty	93 (75.0%)	380 (42.0%)	<0.001	83 (73.5%)	58 (51.3%)	<0.001
Post-balloon valvuloplasty	49 (39.5%)	270 (29.8%)	0.037	45 (39.8%)	33 (29.2%)	0.124

ASAN TAVR Registry

Incidence of Procedural Complications

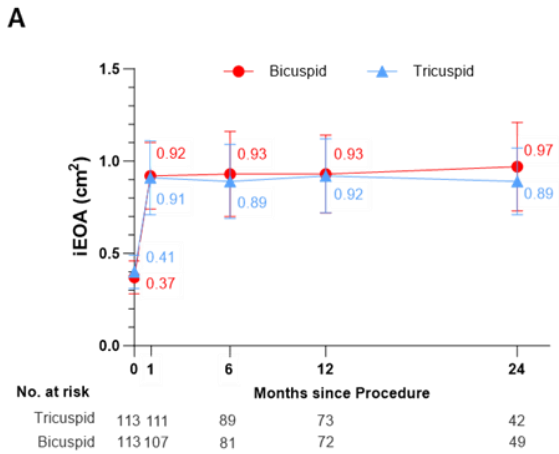
7) Acceptable Procedural Outcome



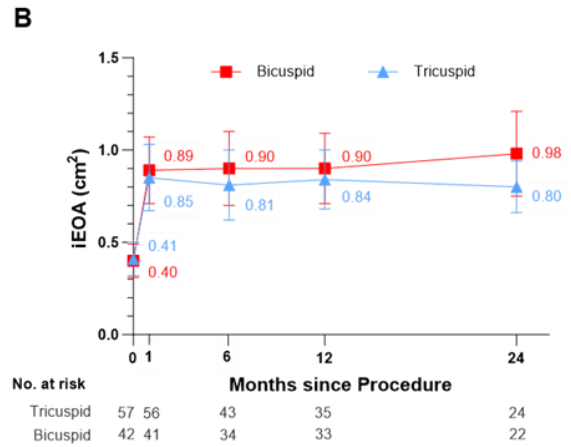
Echocardiographic Follow-Up

8) Good Hemodynamic Outcome upto 2 Years

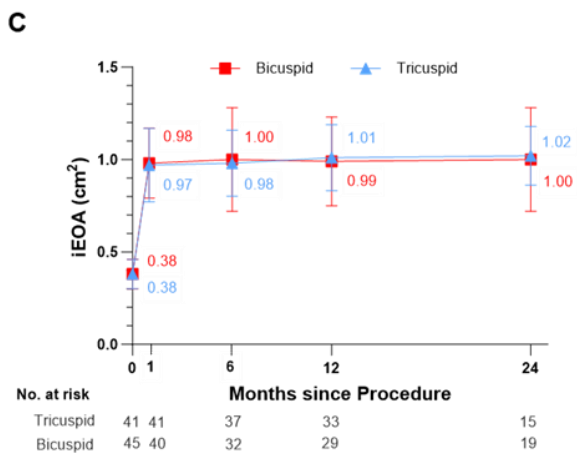
Overall



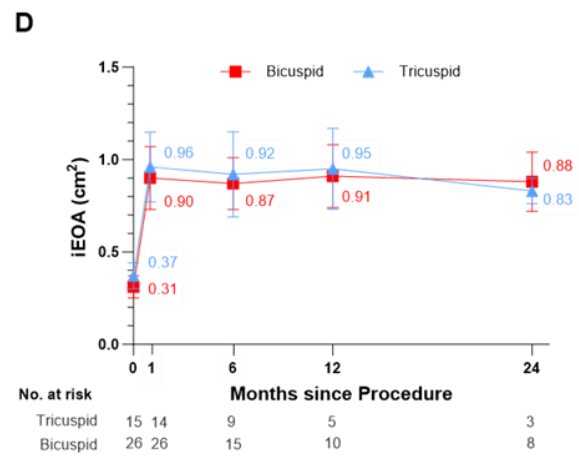
Calcium Volume (<400mm³)



Calcium Volume (400-1000mm³)



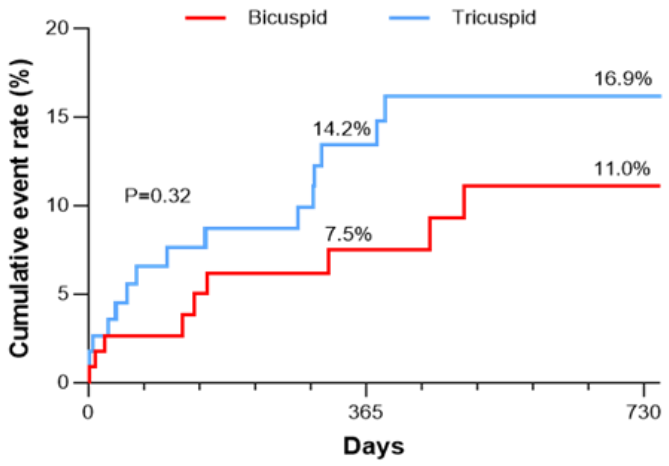
Calcium Volume (>1000mm³)



Clinical Outcomes of TAVR with S3

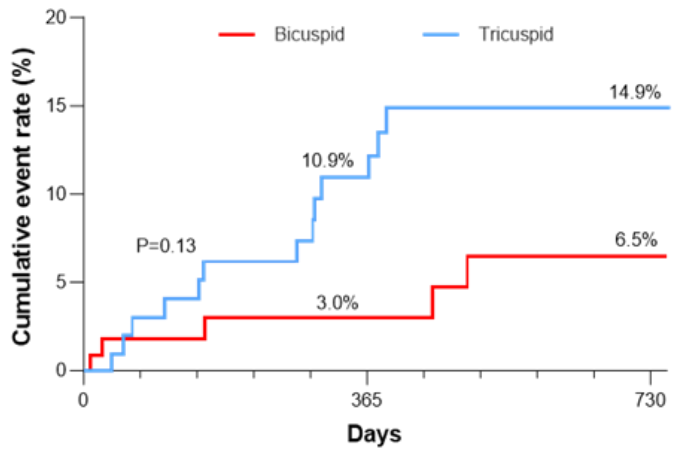
8) Comparable Clinical Outcomes upto 2 Years

Death and Stroke



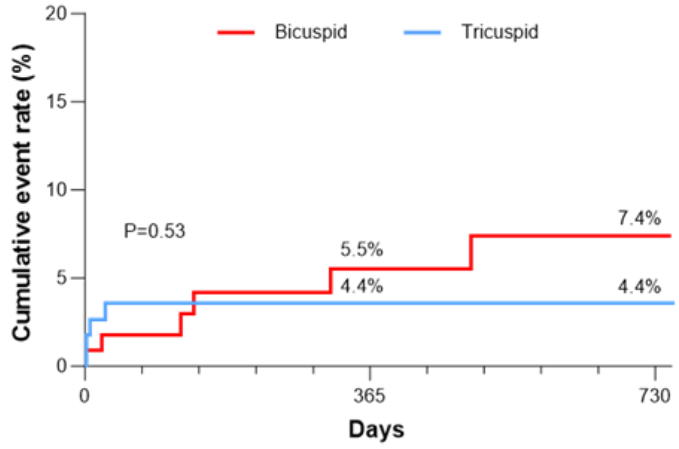
No. at risk			
Bicuspid	113	68	46
Tricuspid	113	71	41

Death



No. at risk			
Bicuspid	113	72	49
Tricuspid	113	73	42

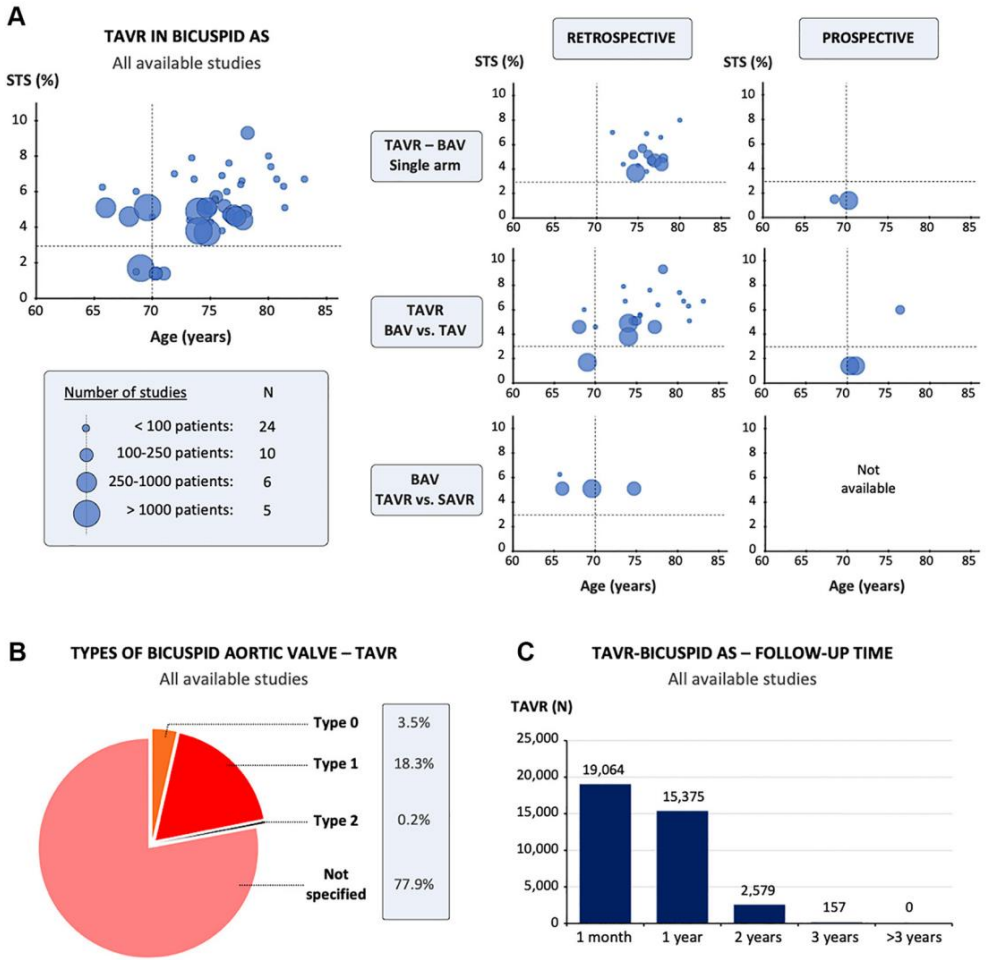
Stroke



No. at risk			
Bicuspid	113	68	46
Tricuspid	113	71	41

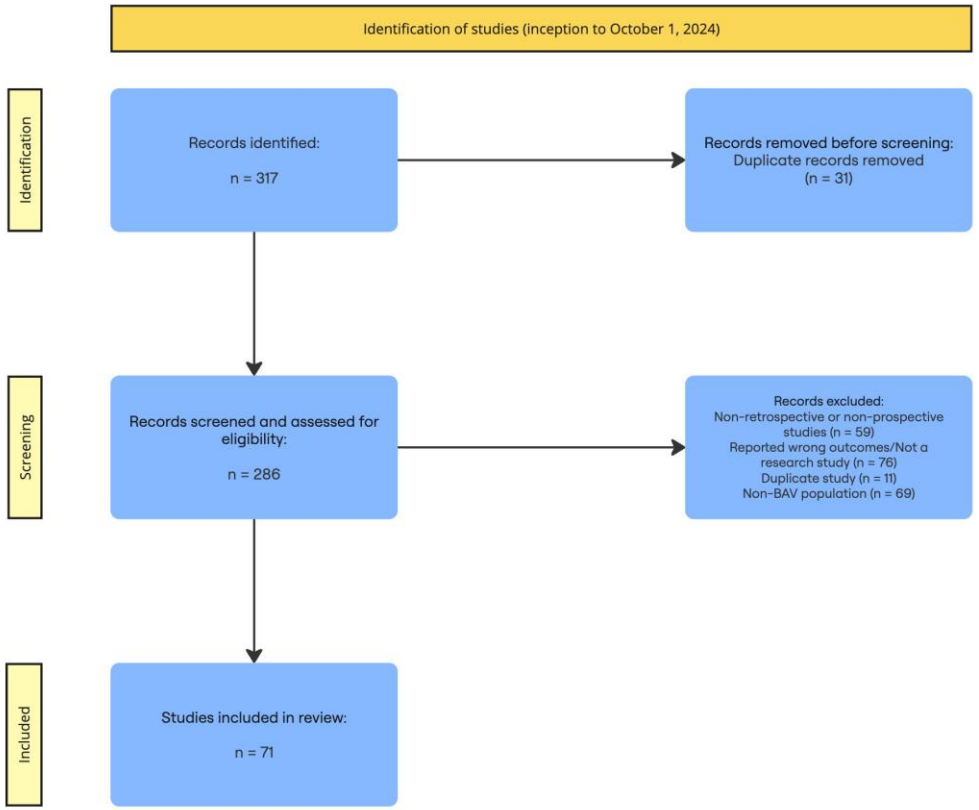
ASAN TAVR Registry

Available Evidence on TAVR in BAV Stenosis



JACC Cardiovasc Interv. 2023 Jul 10;16(13):1682-1687

Meta-analysis



1. TAVR Outcomes in Bicuspid AV Stenosis
2. Bicuspid vs. Tricuspid AS For TAVR
3. TAVR vs. SAVR For Bicuspid AV Stenosis

TAVR Outcomes in Bicuspid Aortic Valve Stenosis

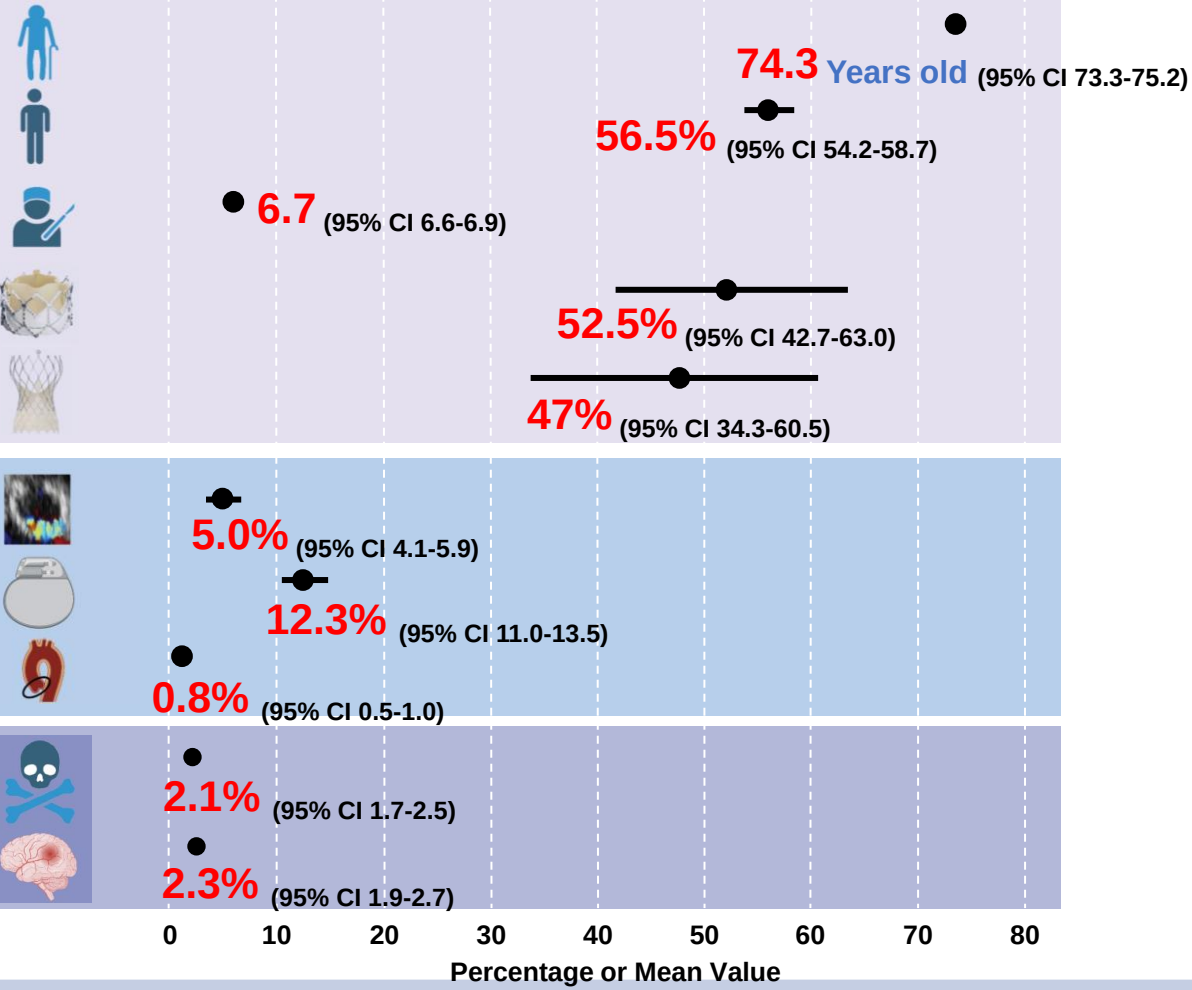
5954 Patients From 27 Studies

First Author	Year	N	Age, years	Male	STS (%)	BEV	SEV	PVL ≥ Moderate	PPM	Aortic Root Injury*	Mortality at 30 Days	Stroke at 30 Days
Wijesinghe N[52]	2010	11	73.2±12.5	6 (54.5%)	4.4±2.6	11 (100%)	0 (0%)	3 (27.3%)	NR	NR	2 (18.2%)	NR
Himbert D[53]	2012	15	79.8±9.5	12 (80.0%)	8.0±4.5	0 (0%)	15 (100%)	1 (6.7%)	6 (40.0%)	1 (6.7%)	1 (6.7%)	NR
Mylotte D[54]	2014	139	78.0±8.9	78 (56.1%)	4.9±3.4	48 (34.5%)	91 (65.5%)	8 (6.0%)	32 (23.2%)	1 (0.7%)	7 (5.0%)	3 (2.2%)
Yousef A[55]	2015	108	75.5±14.4	69 (63.9%)	NR	61 (56.5%)	47 (43.5%)	10 (9.6%)	21 (19.4%)	1 (0.9%)	9 (8.3%)	3 (2.8%)
Perlman GY	2016	51	76.2±9.3	24 (47.1%)	5.2±3.7	51 (100%)	0 (0%)	0 (0%)	12 (23.5%)	0 (0%)	2 (3.9%)	1 (1.9%)
Jilaihawi H[15,56]	2016	130	76.6±0.4	80 (61.5%)	4.7 (IQR 3.0-7.3)	70 (53.8%)	60 (46.2%)	23 (17.7%)	28 (26.2%)	3 (2.3%)	5 (3.8%)	4/127 (3.2%)
Du F[26]	2020	73	74.30 ± 6.15	36 (49.3%)	5.72 ± 3.80	NR	NR	7 (10.0%)	7 (11.7%)	NR	3 (4.1%)	5 (6.8%)
Attinger-Toller A[57]	2020	79	76 ± 9	44 (55.7%)	3.8 (IQR 2.3–5.5)	79 (100%)	0 (0%)	2 (2.8%)	14 (18%)	0 (0%)	3 (3.8%)	1 (1.3%)
Dowling C[58]	2020	9	79.1 ± 6.9	NR	4.7 ± 3.2	9 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	NR	NR
Zhao ZG[59]	2020	75	73.8 ± 5.8	44 (58.7%)	7.9 ± 5.8	0 (0%)	75 (100%)	NR	14 (18.7%)	2 (2.7%)	2 (2.7%)	0 (0%)
Weir-McCall JR[60]	2020	44	75 ± 10	26 (59.1%)	4.3 ± 2.3	44 (100%)	0 (0%)	0 (0%)	NR	4 (9.0%)	5 (11%)	NR
Yoon SH[27]	2020	1034	74.7 ± 9.3	610 (59.0%)	3.7 ± 3.3	188 (18.2%)	740 (71.6%)	33 (3.2%)	118 (12.2%)	18 (1.7%)	21 (2.0%)	28 (2.7%)
Forrest JK[61]	2021	150	70.3 ± 5.5	78 (52.0%)	1.4 ± 0.6	0 (0%)	150 (100%)	0 (0%)	22 (15.1%)	NR	1 (0.7%)	6 (4.0%)
Ielasi A[24]	2021	243	80 ± 7.9	163 (67.1%)	3.5 ± 4.6	170 (70.0%)	73 (30.0%)	10 (4.1%)	35 (14.7%)	4 (1.6%)	9 (4.0%)	3 (1.4%)
Bugani G[62]	2021	353	77.8 ± 8.3	229 (64.9%)	4.4 ± 3.3	242 (68.6%)	111 (31.4%)	14 (4.0%)	51 (16.1%)	4 (1.2%)	NR	NR
Moscarella E[63]	2022	291	77.8 ± 8.3	194 (66.7%)	4.1 ± 2.9	203 (69.8%)	88 (30.2%)	11 (3.8%)	41 (14.3%)	3 (1.0%)	10 (3.7%)	4 (1.4%)
Lee YT[64]	2022	56	71.1 ± 11.5	33 (58.9%)	6.0 ± 6.5	56 (100%)	0 (0%)	3 (5.4%)	4 (7.1%)	0 (0%)	0 (0%)	1 (1.8%)
He JJ[28]	2022	510	72.1 ± 7.1	285 (55.9%)	5.2 ± 4.0	0 (0%)	492 (96.5%)	40 (7.8%)	101 (19.8%)	NR	19 (3.7%)	6 (1.2%)
Deeb GM[65]	2023	150	70.3 ± 5.5	78 (52.0%)	1.1 ± 2.9	0 (0%)	150 (100%)	NR	NR	NR	1 (0.7%)	6 (4.2%)
Deutsch O[66]	2023	106	74.9 ± 8.7	69 (65%)	2.6 ± 1.8	68 (64.2%)	38 (35.8%)	NR	17 (16%)	1 (0.9%)	1 (0.9%)	3 (2.8%)
Wang C[67]	2024	262	72 (IQR 67-75)	146 (55.7%)	2.03 (IQR 1.38-3.27)	8 (3.1%)	254 (96.9%)	NR	11 (4.2%)	NR	9 (3.4%)	5 (1.9%)
Zito A[68]	2024	946	78 (IQR 73-83)	592 (62.6%)	2.50 (IQR 1.55-3.81)	417 (44.1%)	529 (55.9%)	36 (3.8%)	129 (14.5)	NR	NR	NR
Fan J[69]	2024	111	74.7 ± 7.2	38 (34.2%)	NR	0 (0%)	111 (100%)	NR	11 (1.0%)	0 (0%)	NR	NR
Zahr F[70]	2024	150	70.3 ± 5.5	78 (52.0%)	1.3 (IQR 0.9-1.7)	0 (0%)	150 (100%)	0 (0%)	NR	NR	NR	NR
Lee YT[71]	2024	75	71 ± 11.7	42 (56.0%)	4.4 ± 3.5	43 (57.3%)	32 (42.7%)	4 (5.3%)	5 (6.7%)	0 (0%)	NR	NR
Buono A[72]	2024	602	78 (IQR 73-83)	384 (63.8%)	2.52 (IQR 1.65-3.76)	301 (50.0%)	301 (50.0%)	22 (3.7%)	80 (13.3%)	2 (0.3%)	6/582 (1.0%)	20/582 (3.4%)
Ruck A[73]	2024	181	77.5±7.2	76 (42.0%)	2.3 (IQR 1.6-3.7)	0 (0%)	181 (100%)	7 (4.3%)	11 (6.5%)	0 (0%)	4 (2.2%)	3 (1.6%)
Summary estimates		5,954	75.0 (95% CI 74.5, 75.5); I² 91.2%	57.5% (95% CI 54.7%, 60.3%); I² 77.1%	3.8 (95% CI 3.4, 4.3); I² 90.4%	45.2% (95% CI 37.6%, 52.9%); I² 84.9%	53.9% (95% CI 42.2%, 65.7%); I² 90.2%	3.8% (95% CI 2.6%, 5.1%); I² 84.2%	13.5% (95% CI 11.4%, 15.7%); I² 81.5%	0.7% (95% CI 0.3%, 1.1%); I² 21.0%	2.4% (95% CI 1.6%, 3.1%); I² 49.7%	2.0% (95% CI 1.5%, 2.5%); I² 20.1%

Outcomes of TAVR in Patients with Bicuspid Aortic Valve Stenosis

From 75 Patients
27,937 BAV Patients

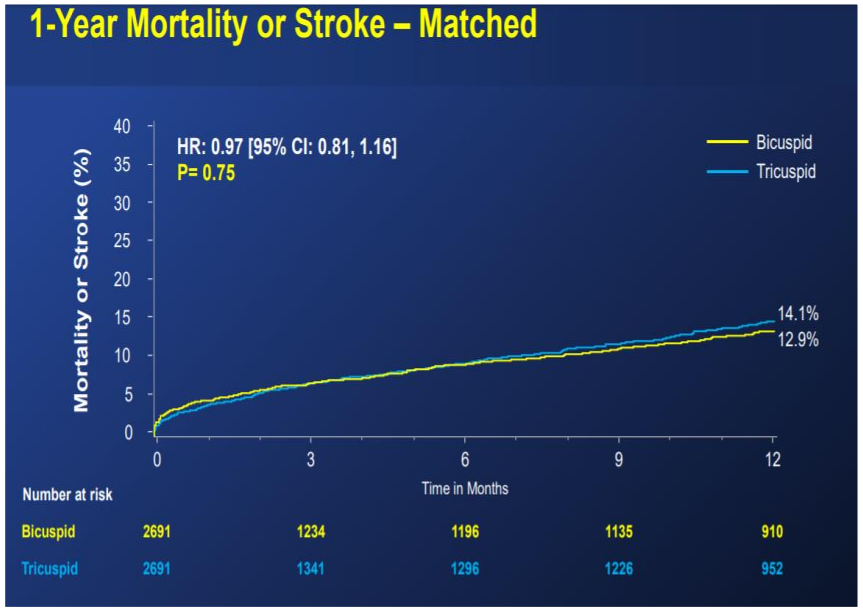
BICUSPID AORTIC VALVE



Bicuspid vs. Tricuspid AS For TAVR

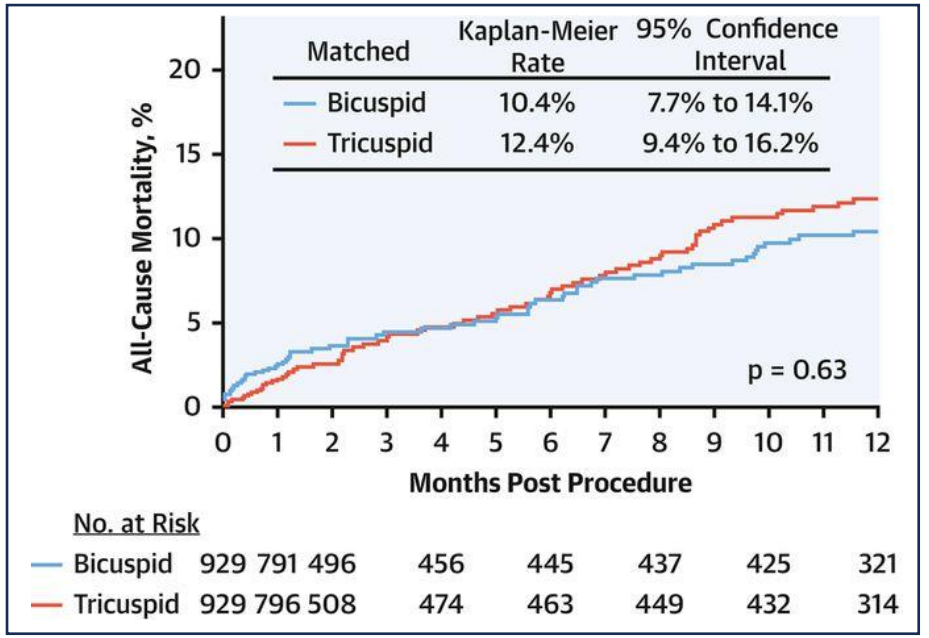
STS/ACC TVT Registry

Sapien 3



JAMA 2019 Jun 11;321(22):2193-2202

Evolut R



JACC CVI 2020 May 23;S1936-8798(20)30763-9

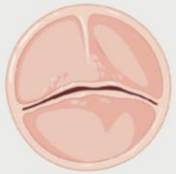
13,328 Patients From 34 Studies

	Year	Number		Age		Male		PVL ≥ Moderate		PPM		Aortic root injury*		Major Bleeding		Mortality at 30 days		Stroke at 30 days	
		BAV	TAV	BAV	TAV	BAV	TAV	BAV	TAV	BAV	TAV	BAV	TAV	BAV	TAV	BAV	TAV	BAV	TAV
Hayashida K[74]	2013	21	208	82.0±7.0	83.2±6.5	12 (57.1%)	111 (53.4%)	0 (0%)	2 (1.0%)	3 (14.3%)	15 %)	0 (0%)	3 (1.4%)	1 (4.8%)	9 3%)	1 (4.8%)	17 (8.2%)	NR	NR
Bauer T[75]	2014	38	1357	80.7±6.6	81.8±6.2	17 (44.7%)	570 (42.0%)	10 (25%)	204 (15%)	6 (17%)	475 (35%)	1 (2.6%)	5 (0.4%)	NR	NR	4 (11%)	149 (11%)	0 (0%)	41 (3%)
Costopoulos C[76]	2014	21	447	76.7±7.1	79.8±7.4	12 (57.1%)	212 (47.4%)	0 (0%)	11 (3%)	3 (14%)	67 (15%)	NR	NR	4 (19%)	90 (20%)	3 (16%)	16 (3.6%)	0 (0%)	5 (1.0%)
Kochman J[77]	2014	28	84	77.6±5.5	79.1±6.8	13 (46.4%)	40 (47.6%)	9 (32%) ‡	19 (23%) ‡	8 (28%)	28 (33%)	0 (0%)	0 (0%)	3 (11%)†	12(14%)†	1 (4%)	6 (7%)	0 (0%)	3 (4%)
Liu XB[78]	2015	15	25	75.4±5.7	75.8±5.5	9 (60.0%)	17 (68.0%)	0 (0%)	1 (4.0%)	2 (13.3%)	3 (12.0%)	0 (0%)	0 (0%)	1 (6.7%)	5 (20.0%)	1 (6.7%)	2 (8.0%)	1 (6.7%)	1 (4.0%)
Watanabe Y[79]	2015	11	56	82.5±4.6	84.4±6.0	7 (63.6%)	37 (66.1%)	5 (45.5%)‡	15 (26.8%) ‡	NR	NR	0 (0%)	2 (11.1%)	NR	NR	NR	NR	NR	NR
Arai T[80]	2017	10	143	81.3±5.1	82.6±6.2	7 (70.0%)	61 (42.7%)	0 (0%)	8 (6%) ‡	0 (0%)	12 (8%)	0 (0%)	1 (1%)	0 (0%)	1 (1%)†	0 (0%)	1 (1%)	0 (0%)	0 (0%)
Sannino A[81]	2017	88	735	80.2±8.4	81.8±7.9	53 (60.2%)	389 (52.9%)	4 (5.3%)	32 (5.0%)	20 (22.7%)	133 (18.2%)	NR	NR	3 (3.4%)	15 (2.0%)	3 (3.4%)	23 (3.1%)	2 (2.3%)	27 (3.7%)
Yoon SH[7]	2017	546‖	546‖	77.2±8.2	77.2±8.8	343 (62.8%)	331 (60.6%)	57 (10.4%)	37 (6.8%)	84 (15.4%)	84 (15.4%)	9 (1.6%)	0 (0%)	20 (3.7%)	22 (4.0%)	20 (3.7%)	18 (3.3%)	16 (2.9%)	10 (1.8%)
Liao YB[18]	2018	87	70	73.4±6.4	74.3±7.0	50 (57.5%)	45 (64.3%)	1 (1.1%)	0 (0%)	21 (24.1%)	20 (28.6%)	0 (0%)	0 (0%)	12 (13.8%)	7 (10%)	8 (9.2%)	3 (4.3%)	1 (1.1%)	0 (0%)
Aalaei-Andabili S H[82]	2018	32	96	68.6±11.1	74.0±10.8	20 (66.7%)	54 (56.3%)	1 (3.1%)	2 (2.1%)	4 (12.5%)	13 (13.5%)	NR	NR	NR	NR	2 (6.3%)	4 (4.2%)	2 (6.3%)	3 (3.1%)
De Biase C[83]	2018	83	166	81.4±7.6	82.9±5.7	57 (68.7%)	108 (65.1%)	3 (3%)	4 (2%)	12 (14%)	17 (10%)	1 (1.2%)	0 (0%)	NR	NR	4 (5%)	5 (3%)	0 (0%)	1 (0.6%)
Kim WK[84]	2018	144	288	NR	NR	NR	NR	16 (11.1%)	8 (2.8%)	NR	NR	6 (4.2%)	2 (0.7%)	NR	NR	7 (4.9%)	10 (3.5%)	NR	NR
Nagaraja V[85]	2018	359‖	359‖	68.2±12.7	68.0±13.4	125 (34.8%)	135 (37.6%)	NR	NR	40 (11.1%)	15 (4.2%)	NR	NR	64 (17.8%)	85 (23.7%)	20 (5.6%)	5 (1.4%)	10 (2.8%)	20 (5.6%)
Xiong TY[33]	2018	67	49	74.0	75.0	40 (59.7%)	28 (57.1%)	4 (6.3%)	3 (6.3%)	17 (25.4%)	11 (22.4%)	NR	NR	NR	NR	6 (9.0%)	2 (4.1%)	NR	NR
Mangieri A[41]	2018	54	658	80±5.3	82.1±4.3	21 (38.9%)	420 (63.9%)	4 (7.4%)	9 (3.1%)	5 (9.2%)	57 (8.6%)	0 (0%)	0 (0%)	2 (3.7%)	34 (5.1%)	2 (3.7%)	17 (2.8%)	4 (7.4%)	12 (1.8%)
Tchetche D[46]	2019	101	88	78.2±10.1	83.1±5.7	66 (65.3%)	41 (46.6%)	21 (20.8%) ‡	11 (12.5%) ‡	13 (13%)	12 (14%)	NR	NR	11 (11%)	4 (4.5%)	0 (0%)	3 (3.4%)	2 (2%)	0 (0%)
Pineda AM[86]	2020	50	517	70 (IQR 64-74)	81 (IQR 75-86)	32 (64%)	289 (55.9%)	2 (4.0%)	19 (3.7%)	4 (8%)	73 (14.1%)	1 (2%)	3 (0.6%)	1 (2.0%)	1 (0.2%)	3 (6.0%)	8 (1.5%)	NR	NR
Forrest JK[87]	2020	929‖	929‖	73.0 ± 10.3	72.6 ± 10.8	512 (55.1%)	508 (54.7%)	47 (5.6%)	18 (2.1%)	133 (14.3%)	115 (12.4%)	NR	NR	1 (0.1%)	1 (0.1%)	23 (2.6)	15 (1.7)	31 (3.4)	25 (2.7)
Halim SA[38]	2020	5412	165547	74.0	82.0	3200 (59.1%)	87474 (52.8%)	(4.4%)	(3.2%)	NR	NR	NR	NR	(5.7%)	(6.2%)	NR	NR	NR	NR
Kim WK[88]	2021	242‖	726‖	80.0	80.4	152 (62.8%)	440 (60.6%)	5 (2.1%)	17 (2.3%)	38 (15.7%)	91 (12.5%)	3 (1.2%)	5 (0.7%	17 (7.0%)	51 (7.0%)	4 (1.7%)	19 (2.6%)	9 (3.7%)	21 (2.9%)
Makkar RR[29]	2021	3168‖	3168‖	68.8±8.7	68.7±9.0	2190 (69.2%)	2230 (70.4%)	38 (1.8%)	24 (1.1%)	189 (6.2%)	156 (5.2%)	12 (0.4%)	9 (0.3%)	0	0	28 (0.9%)	24 (0.8%)	42 (1.4%)	37 (1.2%)
Medranda GA[89]	2021	47	60	68.4 ± 7.8	76.0 ± 5.7	21 (44.7%)	37 (61.77%)	0 (0%)	1 (1.7%)	3 (6.4%)	1 (1.7%)	NR	NR	NR	NR	0 (0%)	0 (0%)	1 (2.1%)	0 (0%)
Xu Q[90]	2021	9	14	71.2 ± 4.8	76.9 ± 5.7	3 (33.3%)	9 (64.3%)	0 (0%)	0 (0%)	NR	NR	NR	NR	NR	NR	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Jung JH[91]	2021	19	48	73.2 ± 7.2	77.8 ± 5.8	12 (63.2%)	23 (47.9%)	NR	NR	0 (0%)	2 (4.2%)	0 (0%)	0 (0%)	0 (0%)	1 (2.1%)	NR	NR	NR	NR
Deeb GM[92]	2022	145‖	145‖	70.5 ± 5.5	70.5 ± 5.5	77 (53.1%)	74 (51.0%)	2 (1.4%)	3 (2.1%)	21 (14.9%)	25 (17.2%)	NR	NR	2 (1.4%)	4 (2.8%)	1 (0.7%)	0 (0%)	6 (4.1%)	3 (2.1%)
Williams MR[93(p3)]	2022	148‖	148‖	71.0	72.0	86 (58.1%)	89 (60.1%)	NR	NR	9 (6.1)	10 (6.8)	NR	NR	NR	NR	0 (0%)	0 (0%)	2 (1.4)	2 (1.4)
Fan J[94]	2022	223	172	72.0	76.0	137 (61.4%)	85 (49.4%)	NR	NR	20 (9.0%)	14 (8.1%)	6 (2.7%)	4 (2.3%)	NR	NR	7 (3.3%)	1 (0.6%)	7 (3.3%)	5 (3.1%)
Jin Q[95]	2022	195	149	74.8 ± 7.3	77.1 ± 9.3	96 (49.2%)	77 (51.7%)	27 (13.8%)	10 (6.7%)	25 (12.8%)	22 (14.8%)	0	1 (0.7%)	2 (1.0%)	2 (1.3%)	3 (1.5%)	4 (2.7%)	10 (5.1%)	3 (2.0%)
Hong N[96]	2023	229	160	72.9 ± 6.9	75.3 ± 6.7	149 (65.1%)	107 (66.9%)	6 (2.6%)	4 (2.5%)	15 (6.6%)	14 (8.8%)	NR	N/A	6 (2.6%)	2 (1.3%)	2 (0.9%)	1 (0.7%)	7 (3.3%)	0 (0%)
Mukai T[97]	2023	423	16802	NR	NR	225 (53.2%)	21 (30.3%)	13 (3.2%)	323 (1.9%)	19 (4.5%)	880 (5.2%)	0	46 (0.3%)	1 (0.2%)	54 (0.3%)	2 (0.5%)	214 (1.3%)	8 (1.9%)	213 (1.3%)
Zheng HJ[98]	2023	185	482	67 (IQR 65-76)	78 (IQR 74-85)	128 (69.2%)	280 (58.1%)	6 (6.7%)	13 (6.5%)	8 (8.9%)	20 (10.0%)	NR	NR	NR	NR	NR	NR	NR	NR
Liu K[99]	2024	29	36	72.1 ± 7.6	73.8 ± 7.0	19 (65.5%)	21 (58.3%)	2 (6.9%)	2 (5.6%)	1 (3.4%)	5 (13.9%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	NR	NR	NR	NR
Li HD[100]	2024	170	145	72.31±6.66	73.92±6.41	81 (47.6%)	83 (57.2%)	3 (1.8%)	0 (0%)	43 (25.7%)	34 (24.8%)	NR	NR	17 (10.0%)	6 (4.2%)	NR	NR	NR	NR

Comparative Outcomes of TAVR in Bicuspid versus Tricuspid Aortic Valve Stenosis

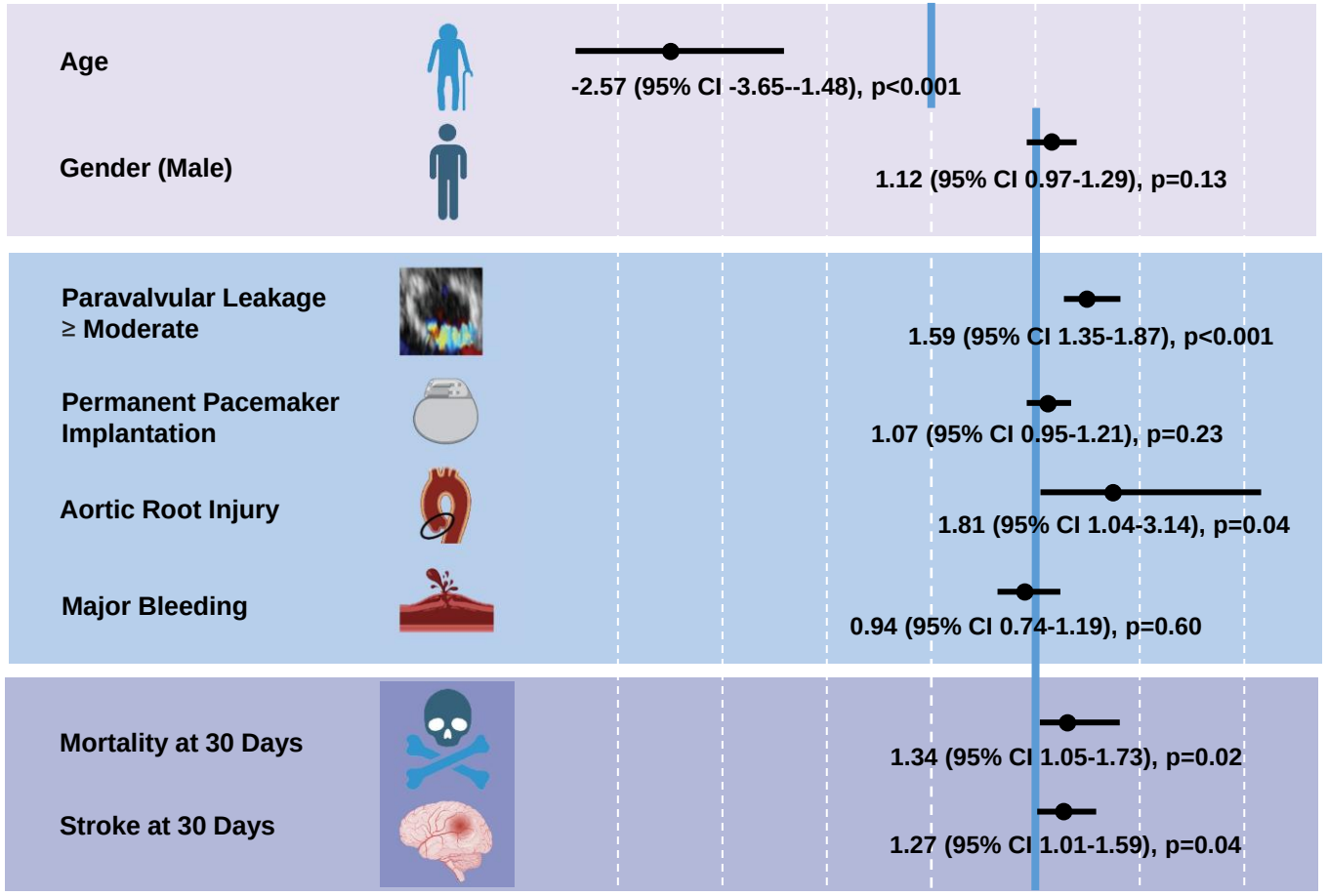
From 35 Studies
13,825 BAV Patients
195,120 TAV Patients

TRICUSPID AORTIC VALVE



BICUSPID AORTIC VALVE

Caution

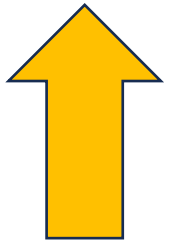


59%

81%

34%

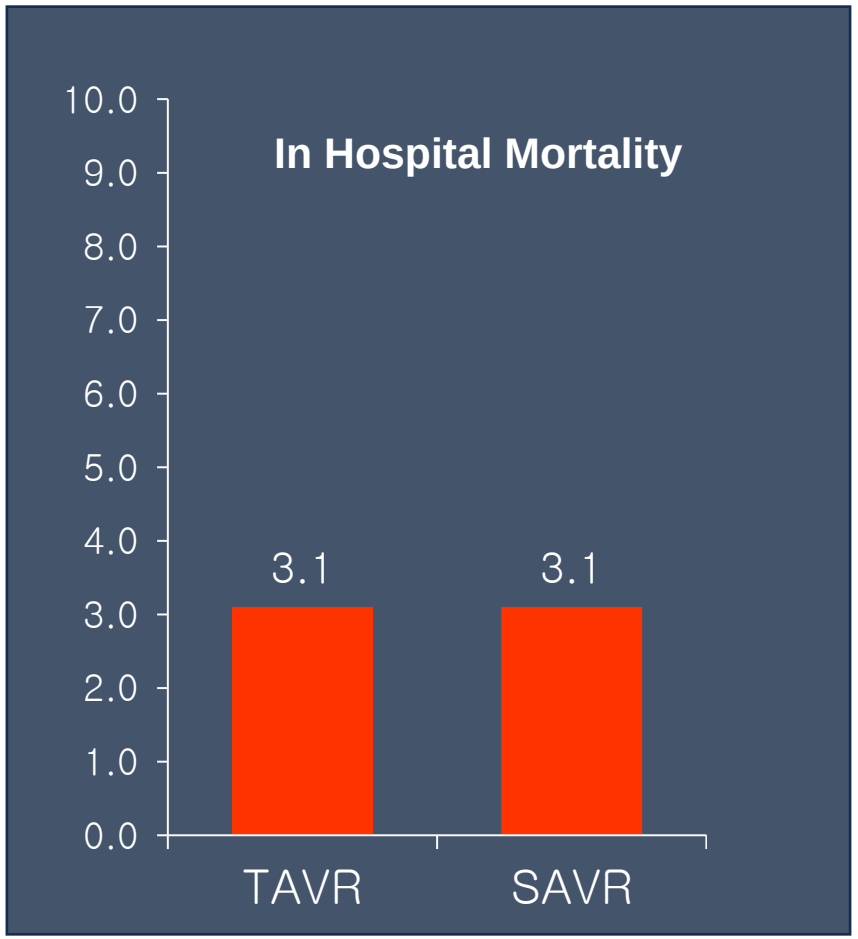
27%



TAVR vs. SAVR For Bicuspid AV Stenosis

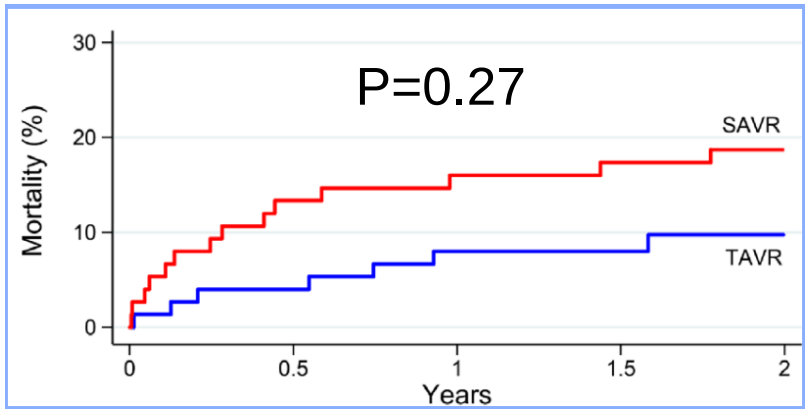
TAVR vs. SAVR in Bicuspid AS

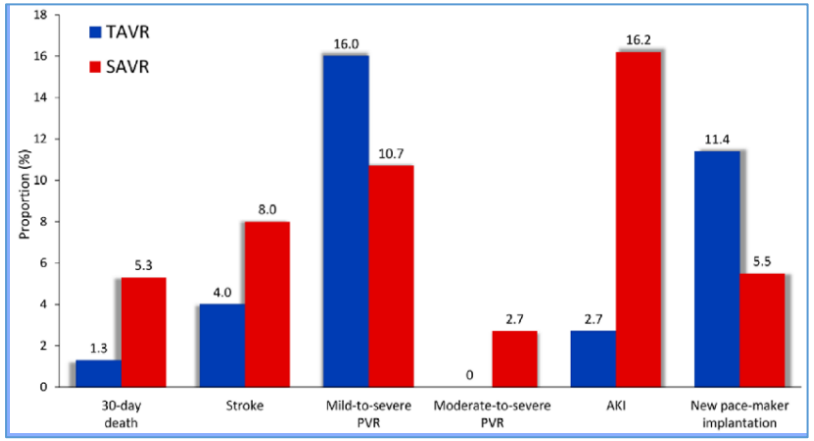
NIS Data-base (USA)



JACC Cardiovasc Interv . 2019;12(18):1811-1822.

The FinnValve Registry



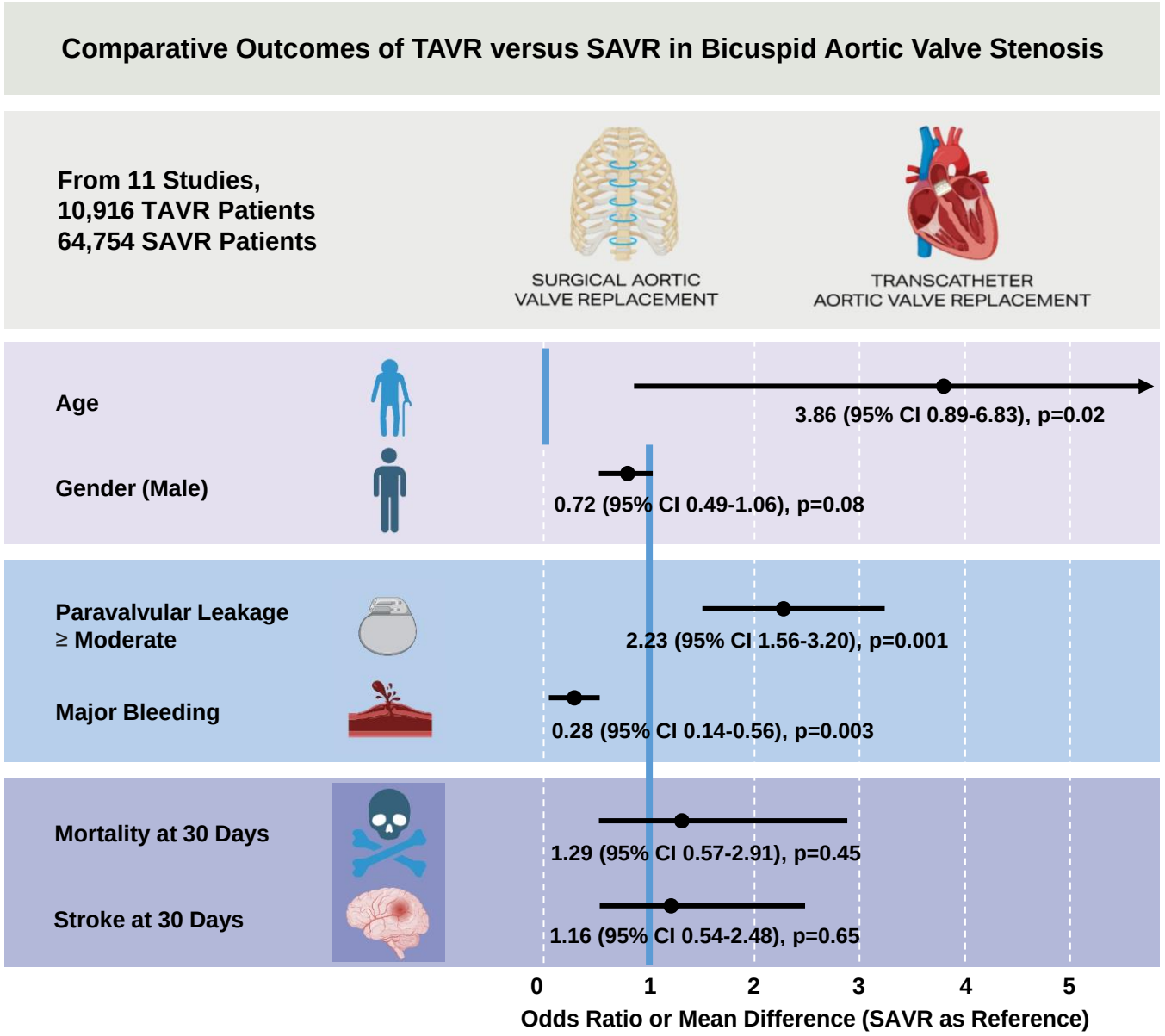


Clinical Research in Cardiology (2021) 110:429–439

10 studies with 7,750 TAVR patients and 56,631 SAVR patients.

	Year	Number		Age		Male		PVL ≥ Moderate		PPM		Aortic root injury*		Major Bleeding		Mortality at 30 days		Stroke at 30 days	
		TAVR	SAVR	TAVR	SAVR	TAVR	SAVR	TAVR	SAVR	TAVR	SAVR	TAVR	SAVR	TAVR	SAVR	TAVR	SAVR	TAVR	SAVR
Elbadawi A[101]	2019	975‖	975‖	65.70 ± 16.53	65.20 ± 11.52	675 (69.2%)	620 (63.6%)	NR	NR	135 (13.8%)	45 (4.6%)	NR	NR	70 (7.2%)	265 (27.2%)	NR	NR	NR	NR
Mentias A[102]	2020	699‖	699‖	74.7 ± 9.4	69.9 ± 6.8	NR	NR	NR	NR	85 (12.2%)	53 (7.6%)	NR	NR	37 (5.3%)	150 (21.5%)	20 (2.9%)	18 (2.7%)	28 (4.0%)	26 (3.7%)
Soud M[103]	2020	68‖	68‖	65.0 ± 14.8	64.6 ± 12.4	22 (32.4%)	49 (72.1%)	NR	NR	7 (10.3%)	7 (10.3%)	NR	NR	5 (7.4%)	9 (13.2%)	NR	NR	NR	NR
Waksman R[104]	2020	61	216	68.6 ± 7.4	63.4 ± 8.2	26 (42.6%)	142 (65.7%)	1 (1.6%)	NR	7 (11.5%)	12 (5.6%)	NR	NR	1 (1.6%)	0 (0%)	0 (0%)	1/211 (0.5%)	1 (1.6%)	0 (0%)
Husso A[30]	2021	75‖	75‖	75.8 ± 8.4	75.7 ± 6.3	42 (56.0%)	41 (54.7%)	0 (0%)	0 (0%)	8 (11.4%)	4 (5.5%)	0 (0%)	1 (1.3%)	2 (2.7%)	16 (21.3%)	1 (1.3%)	4 (5.3%)	3 (4.0%)	6 (8.0%)
Tsai HY[105]	2021	48	82	65.7 ± 7.8	51.5 ± 32.3	28 (58.3%)	57 (69.5%)	6 (12.5%)	0 (0%)	NR	NR	NR	NR	0 (0%)	0 (0%)	NR	NR	NR	NR
Majmundar M[106]	2022	1393‖	1393‖	68.3 ± 10.1	68.1 ± 8.6	867 (62.2%)	858 (61.6%)	NR	NR	155/1309 (11.8%)	113/1314 (8.6%)	NR	NR	35 (2.5%)	145 (10.5%)	<10 (0.3%)	<10 (0.7%)	<10 (0.1%)	<10 (0.0%)
Sanaiha Y[107]	2023	3855	52476	69 (IQR 62-76)	59 (IQR 51-66)	2359 (61.2%)	36313 (69.2%)	NR	NR	292 (7.6%)	1597 (4.4%)	NR	NR	166 (4.3%)	11440 (21.8%)	62 (1.6%)	420 (0.8%)	31 (0.8%)	367 (0.7%)
Ogami T[108]	2024	573‖	573‖	74.0 (IQR 69.0–81.0)	74.0 (IQR 69.0–79.0)	165 (28.8%)	161 (28.1%)	NR	NR	NR	NR	NR	NR	NR	NR	18 (3.2%)	5 (0.9%)	9 (1.6%)	16 (2.7%)
Connolly JE[109]	2024	78	74	74.1 ± 8.93	66.0 ± 8.29	42 (53.8%)	47 (63.5%)	NR	NR	5 (6.4%)	4 (5.4%)	NR	NR	4 (5.1%)	19 (25.7%)	NR	NR	NR	NR
Summary estimates		7750	56631	69.5 ± 11.4	63.6 ± 11.7	4226/7126 (59.3%)	38288/55932 (68.5%)	N/A	N/A	694/7120 (9.7%)	1835/55897 (3.3%)	N/A	N/A	320/7252 (4.4%)	12044/56058 (21.5%)	101/5263 (1.9%)	448/54034 (0.8%)	72/5263 (1.4%)	415/54034 (0.8%)
				4.09 (95% CI 0.76, 7.42); p =0.020		0.72 (95% CI 0.46, 1.12); p = 0.130		N/A		2.01 (95% CI 1.45, 2.77); p = 0.001		N/A		0.19 (95% CI 0.15, 0.26); p < 0.001		1.66 (95% CI 0.69, 3.99) p = 0.180		1.02 (95% CI 0.64, 1.64); p = 0.900	

High PVL in TAVR



High Bleeding in SAVR

Summary

- Available data suggests that carefully selected patients with BAV can undergo TAVR with current-generation devices.
- Our meta-analysis found increased procedural complications, and the risk of mortality and stroke in BAV patients, emphasizing the need for meticulous patient selection, pre-procedural planning, and post-procedural optimization to ensure favorable outcomes and mitigate risks.
- Given the younger age of many patients with BAV, reducing the rate of pacemaker implantation risk through improved devices and implantation techniques should be prioritized.
- It is important to recognize that not all cases of BAV are suitable for TAVR. Like the Echo score used for rheumatic mitral stenosis, a scoring system specific to BAV should be developed to guide the decision between transcatheter and surgical aortic valve replacement.