

Valve sparing techniques in bicuspid aortopathy in patients with acute aortic syndrome

Julia Dumfarth

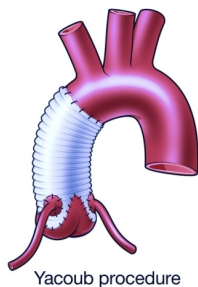
University Clinic for Cardiac Surgery

Medical University of Innsbruck

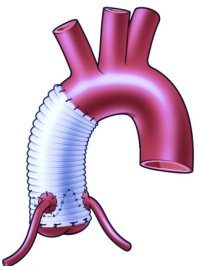


Valve sparing – bicuspid aortic valve – acute aortic syndrome

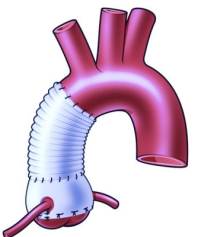
Background



Yacoub procedure



David procedure

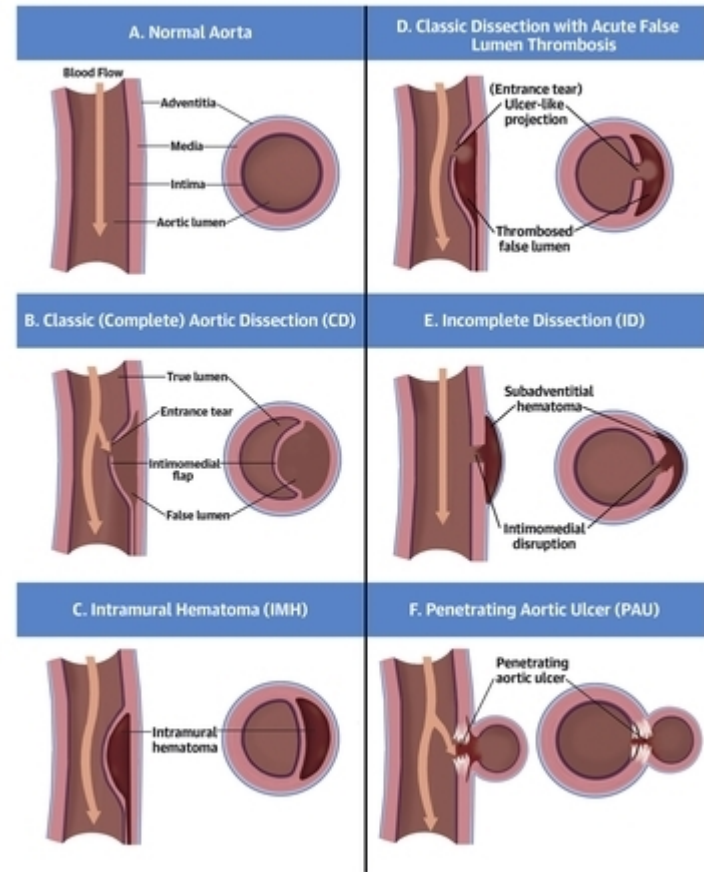


Florida sleeve

bicuspid		
2	2	2
0	1	2
purely bicuspid*	potentially tricuspid*	
2	3 anlagen, (2 under- and 1 fully developed)	3 anlagen, (2 under- and 1 fully developed)
equal	non-equal	non-equal
2	1 under- and 2 fully developed	2 under- and 1 fully developed

Sievers JTCVS 2007

CENTRAL ILLUSTRATION: Overview of Acute Aortic Syndrome Components and Their Main Morphologic Characteristics



Vilacosta, I. et al. J Am Coll Cardiol. 2021;78(21):2106-2125.

Bicuspid Aortic Valve and Aortic Syndromes

Background

10:30 COFFEE BREAK

11:00 CARDIAC SYMPOSIUM 1

BAV AORTOPATHY: FROM BASIC RESEARCH TO SURGERY

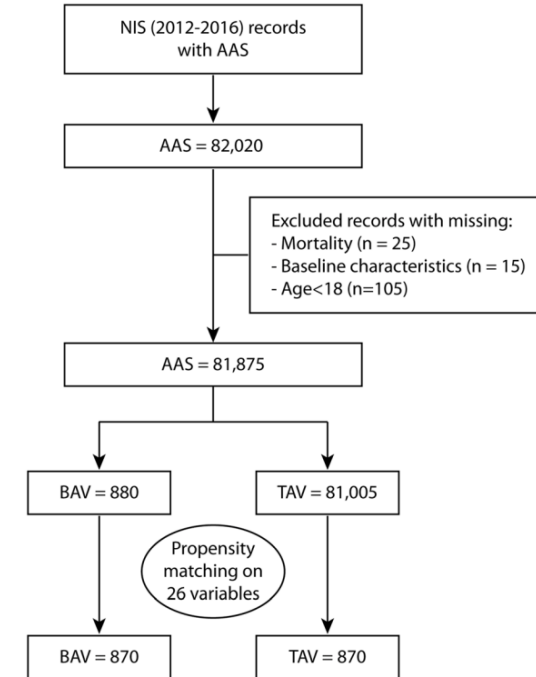
Moderators: Alessandro Della Corte, Konstantinos Tzagakis

11:00 Biomechanical implications of BAV aortopathy. Alberto Redaelli

11:07 Hemodynamic, developmental and histopathological aspects of BAV aortopathy. Nimrat Grewal

11:14 Features and outcomes of acute aortic dissection in BAV patients. Thomas Schachner

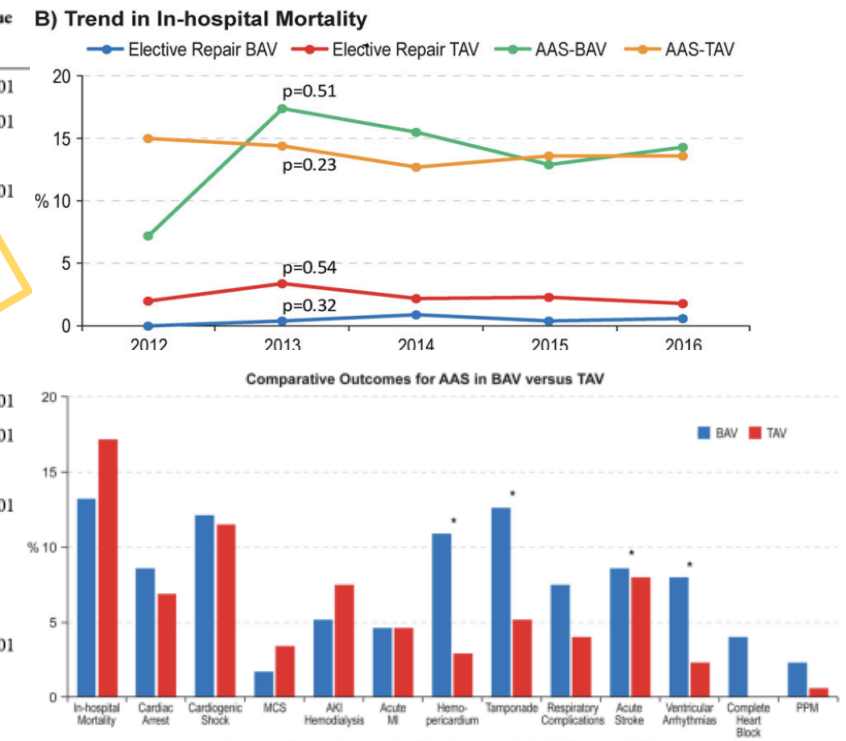
8fold higher lifetime risk for AAS in BAV patients versus TAV patients (Etz et al EJTCs 2014)



Elbadawi et al Cardiol Ther 2021

Characteristic	Unmatched cohort		P value
	BAV (n = 880)	TAV (n = 81,005)	
Age	53.07 ± 14.2	65.19 ± 15.3	< 0.001
Female sex	175	33,144	< 0.001
Race			
White	655,001	74.4%	0.001
Black	55	6.2%	
Hispanic	50	0.6%	
Asian/Pacific Islander			
Native American			
Other races			
Coarctation			< 0.001
Coronary artery disease			< 0.001
Chronic kidney disease			0.124
Hypertension			< 0.001
Hypotension			0.007
Chronic liver disease			0.002
Chronic lung disease			0.238
Coronary artery disease			< 0.001
Diabetes mellitus			0.006
Anemia			0.005
			0.030

Younger
Less comorbidities



Valve sparing vs. Valve replacement

Valve sparing procedures

More complex procedure

Risk of reoperation due to

- Failure of repair
- Aortic stenosis of BAV



Prosthesis related complication

Need for anticoagulation

Acute aortic syndrome - Life threatening disease
Indications for root repair

Valve sparing root replacement in aortic syndromes

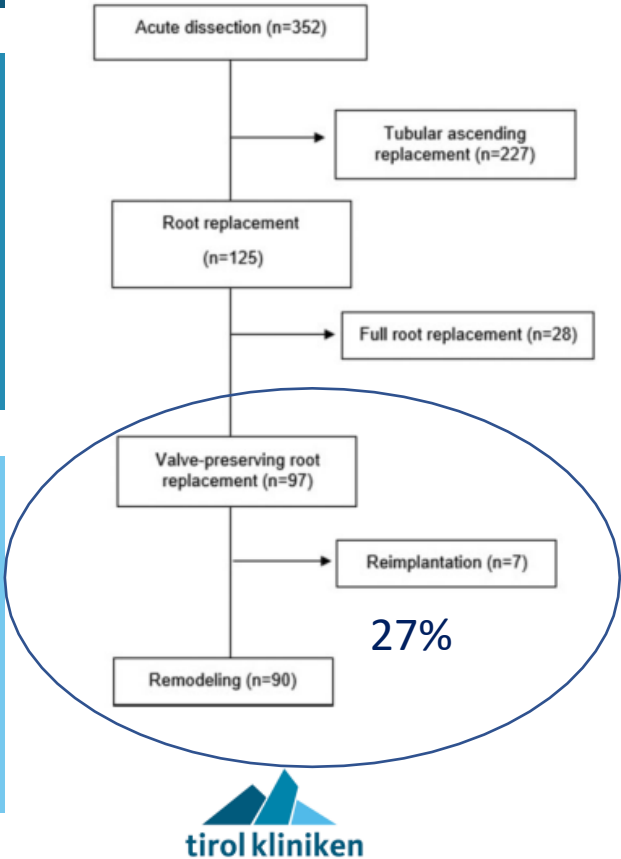
Aortic Root Remodeling in Acute Aortic Dissection

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Hans-Joachim Schäfers¹

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Thorac Cardiovasc Surg 2021;69:329–335.

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Valve-sparing aortic root replacement using a straight tube graft (David I procedure)

Malakh Shrestha, MBBS, PhD, Dietmar Boethig, MD, Heike Krüger, RN, Tim Kaufeld, MD, Andreas Martens, MD, PhD, Axel Haverich, MD, PhD, and Erik Beckmann, MD, PhD

TABLE 1. Preoperative patient characteristics

JTCVS 2022, in press

Preoperative patient characteristics (n = 677)	
Sex (male)	480 (70.9%)
Age (y)	56.0 (42.0–65.0)
Marfan syndrome	111 (16.4%)
Pathology:	
Aneurysm	544 (80.4%)
Acute aortic dissection type A	133 (19.6%)
Previous cardiac surgery (re-do)	34 (5.0%)
Urgency of procedure:	
Urgent	137 (20.2%)
Elective	540 (79.8%)
BMI (kg/m ²)	25.9 (23.4–28.5)
LVEF (%)	60.0 (55.0–69.0)
Coronary artery disease	122 (18.0%)
Arterial hypertension	411 (60.7%)
Hyperlipidemia	167 (24.7%)
Diabetes	31 (4.6%)
Nicotine	134 (19.8%)
COPD	36 (5.3%)
Bicuspid aortic valve	71 (10.5%)
Previous stroke	3 (0.4%)

BMI, Body mass index; LVEF, left ventricular ejection fraction; COPD, chronic obstructive pulmonary disease.



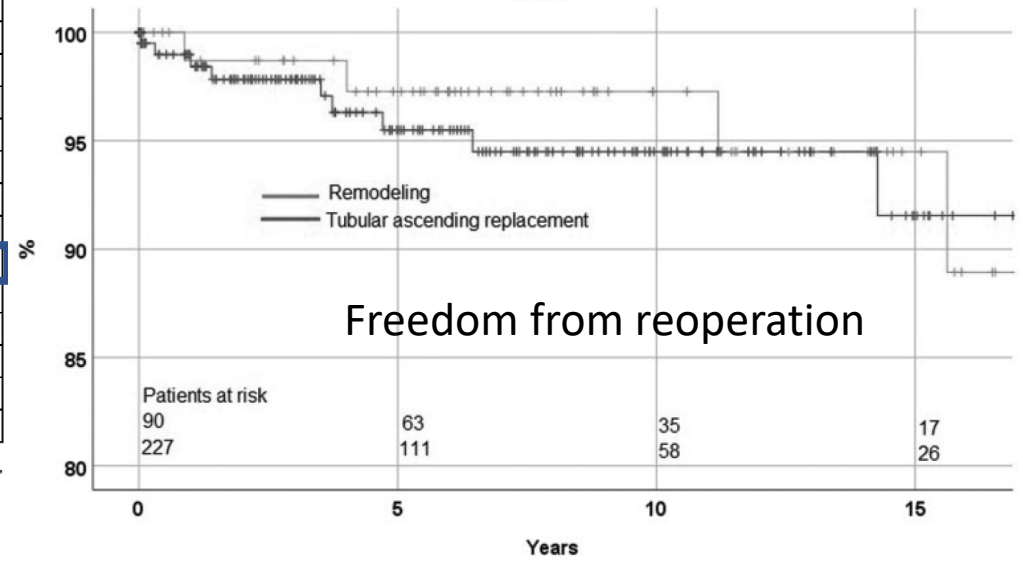
Valve sparing procedures

Root Remodeling in aortic syndromes

Table 1 Baseline characteristics, root geometry, and operative procedures

Variable	Remodeling (n = 90)	Ascending replacement (n = 227)	p-Value
Baseline characteristics			
Male sex, n (%)	70 (78)	139 (61)	0.005
Age, years, mean \pm SD	57 \pm 15	63 \pm 12	<0.001
Body height, cm, mean \pm SD	177 \pm 9	172 \pm 9	<0.001
Body weight, kg, mean \pm SD	89 \pm 18	83 \pm 16	0.011
Bicuspid aortic valve, n (%)	13 (14)	11 (5)	0.005
Marfan's syndrome, n (%)	4 (4)	3 (1)	0.1
Previous cardiac/aortic surgery, n (%)	8 (9)	12 (5)	0.234
Aortic valve regurgitation grade, mean \pm SD	2.4 \pm 1.1	1.4 \pm 1.4	<0.001
Preoperative malperfusion	3 (0.9)	7 (2.2)	1
Malperfusion, n (%)	14 (15.6)	25 (11)	0.267
Tamponade, n (%)	34 (37.8)	94 (41.4)	0.552
Root geometry			
AVJ diameter, mm, mean \pm SD	28 \pm 2.7	26 \pm 4	0.004
Valsalva sinus diameter, mm, mean \pm SD	46 \pm 7.1	37 \pm 4	0.002
STJ diameter, mm, mean \pm SD	40 \pm 5.1	29 \pm 7	<0.001
Operative procedures			
Cusp plication, n (%)	54 (60)	70 (31)	<0.001
Concomitant CABG, n (%)	9 (10)	21 (9)	0.837
Total arch replacement, n (%)	5 (5.6)	13 (6)	1
Duration of CPB, minutes, mean \pm SD	150 \pm 55	121 \pm 45	<0.001
Duration of AXC, minutes, mean \pm SD	94 \pm 27	60 \pm 19	<0.001
Duration of circulatory arrest, minutes, mean \pm SD	15 \pm 6	16 \pm 6	0.104

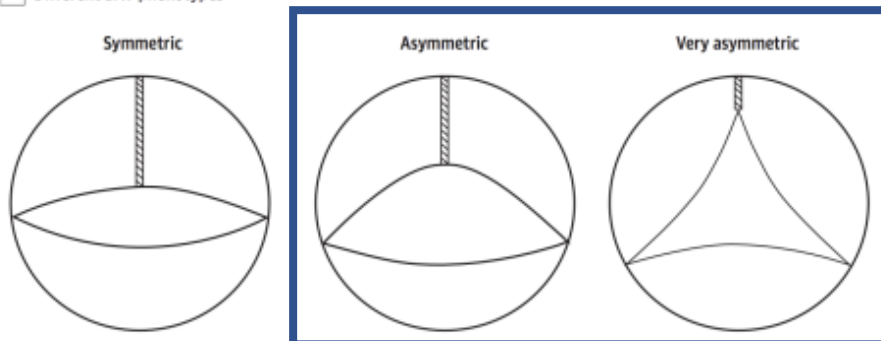
Abbreviations: AVJ, aortoventricular junction; AXC, aortic cross-clamping; CABG, coronary artery bypass grafting; CPB, cardiopulmonary bypass; SD, standard deviation; STJ, sinotubular junction.



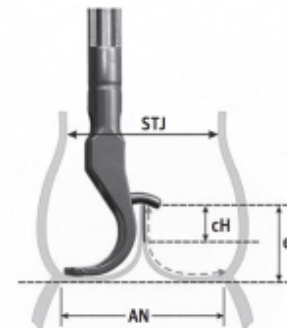
Ehrlich T et al Thorac Cardiovasc Surg 2021

Reoperation- Lessons learnt from BAV repair

A Different BAV phenotypes



B Landmarks of the aortic root



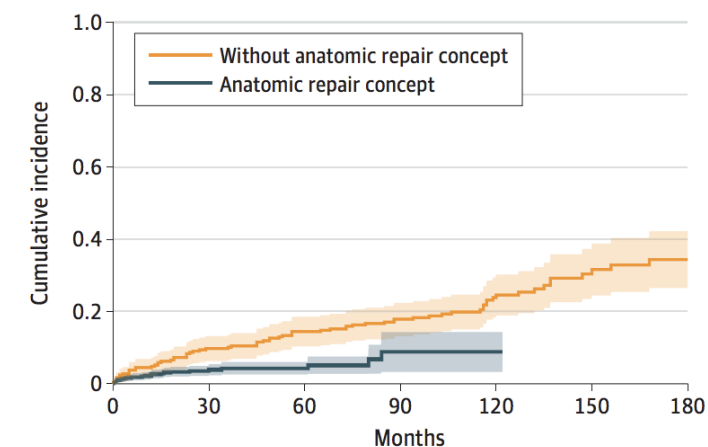
Schneider et al JAMA Heart 2020

Findings In this case series of 1024 patients who underwent bicuspid aortic valve repair with a differentiated anatomic repair approach, 15-year survival was 82%. Cusp calcification, asymmetric commissural orientation, and the need for partial cusp replacement were risk factors associated with valve failure.

Table 2. Associations With Time to Reoperation From Fine-Gray Models

Characteristic	Crude model	
	SHR (95% CI)	P value
Annuloplasty ^a	0.52 (0.32-0.86)	.01
Commissural orientation ^b		
Tricuspid-like vs symmetric ^b	0.93 (0.43-2.03)	.86
Asymmetric without modification vs symmetric ^b	3.87 (2.09-7.17)	<.001
Modified asymmetric vs symmetric	0.79 (0.37-1.66)	.53
Cusp calcification ^c	2.44 (1.63-3.64)	<.001
Pericardial patch	5.25 (3.52-7.82)	<.001
Root replacement ^d	0.47 (0.31-0.72)	.001
1995-2008	0.30 (0.17-0.52)	<.001
2009-2016	1.22 (0.59-2.53)	.59
Annuloplasty	1.32 (0.60-2.90)	.50
Subcommissural plication ^e	1.84 (1.18-2.88)	.007

A Cumulative incidence of reoperation after BAV repair



No. at risk

Without anatomic repair concept	296	253	235	204	120	75	58
Anatomic repair concept	726	278	126	33	13		

Failure of Root Remodeling Technique

Giebels et al Ann Thorac Surg 2022

TABLE 2 Main Indications for Reoperation and Modes of Valve Failure

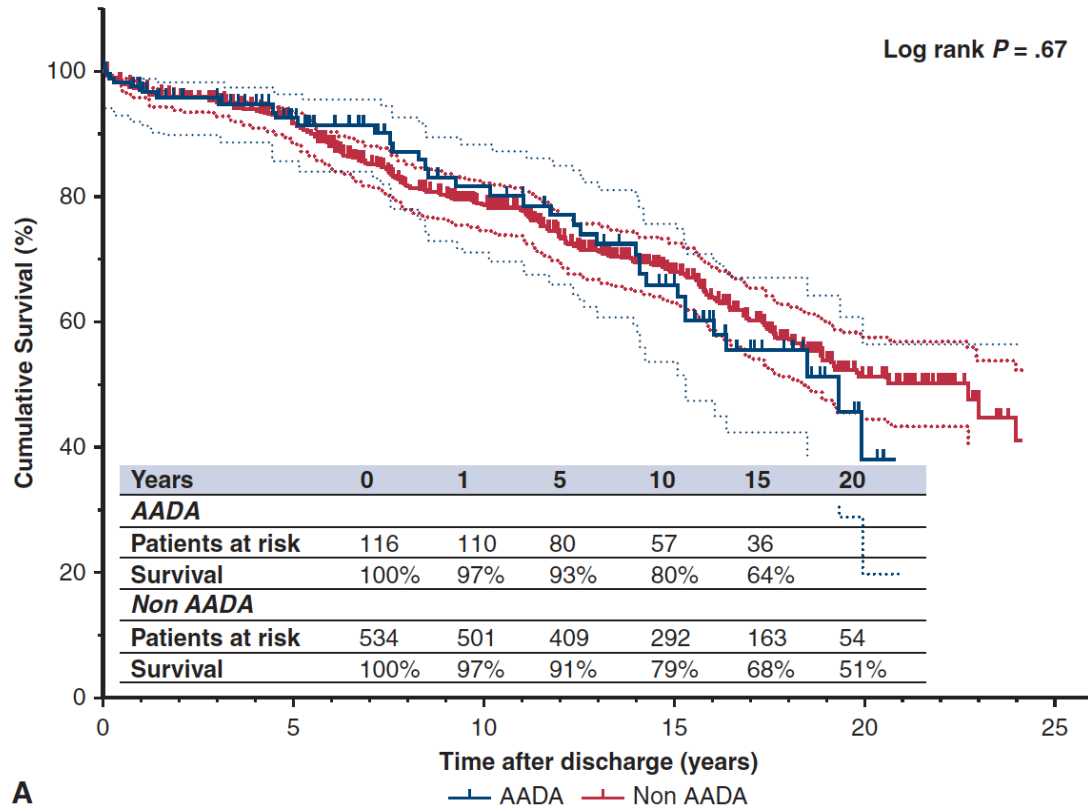
Indications and Failure Modes	All (n = 54)	TAV (n = 23)	BAV (n = 26)	UAV (n = 5)
Indication for reoperation				
Regurgitation	39 (72.2)	19 (82.6)	15 (57.7)	5 (100.0)
Endocarditis	7 (13.0)	4 (17.4)	3 (11.5)	...
Stenosis	6 (11.1)	...	6 (23.1)	...
VSD	2 (3.7)	...	2 (7.7)	...
Modes of valve failure				
Patch dehiscence	16 (29.6)	...	12 (46.2)	4 (80.0)
Cusp prolapse	14 (25.9)	12 (52.2)	2 (7.7)	...
Retraction	8 (14.8)	7 (30.4)	1 (3.8)	...
Endocarditis	7 (13.0)	4 (17.4)	3 (11.5)	...
Aortic stenosis	6 (11.1)	...	6 (23.1)	...
VSD caused by erosion	2 (3.7)	...	2 (7.7)	...
Unrecognized UAV	1 (1.9)	1 (20.0)

Dichotomous variables are n (%). BAV, bicuspid aortic valve; TAV, tricuspid aortic valve; UAV, unicuspid aortic valve; VSD, ventricular septal defect.

TABLE 1 Perioperative Patient Data at Initial Aortic Root Remodeling Procedure

Patient and Perioperative Data	All (November /1995 to December 2019)		P Value
	All (n = 1084)	Reoperated Patients (n = 54)	
Age, y	53 ± 15 (3-86)	49 ± 16 (3-80)	.099
Male sex	907 (83.7)	49 (90.7)	.167
Primary indication for surgery			
Aortic regurgitation	668 (61.6)	37 (68.5)	.308
Aortic aneurysm	342 (31.5)	13 (24.1)	.247
AADA	74 (6.8)	4 (7.4)	.869
Marfan syndrome	53 (4.9)	1 (1.9)	.306
Aortic valve morphology			
TAV	616 (56.8)	23 (42.6)	.040
BAV	434 (40.0)	26 (48.1)	.236
UAV	34 (3.1)	5 (9.3)	.016
Aortic valve repair procedure			
Cusp plication	913 (84.2)	37 (68.5)	.002
Pericardial patch insertion	100 (9.2)	20 (37.0)	<.001
Triangular resection	139 (12.8)	7 (13.0)	.976
Suture annuloplasty	578 (54.5)	6 (11.1)	<.001
Subcommissural plication	13 (1.2)	1 (1.9)	.671

Reimplantation Technique in Aortic Dissection

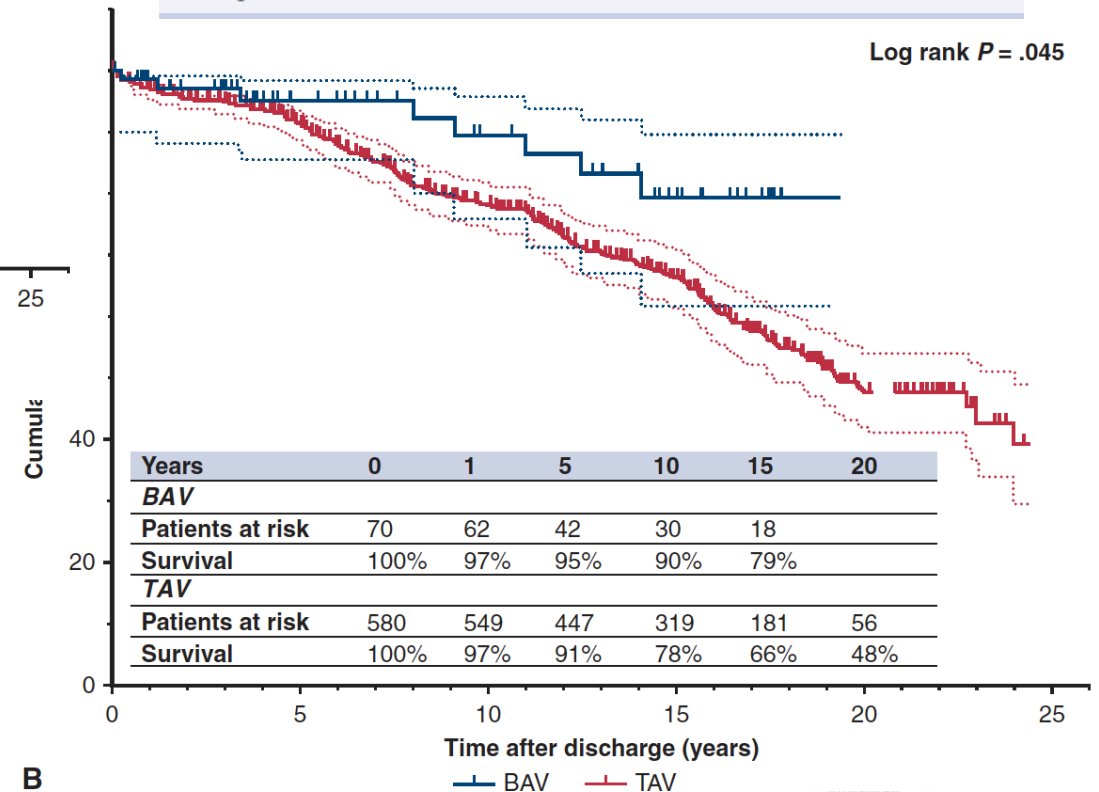


A

Shrestha et al JTCVS 2022, in press

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B

Florida Sleeve in Aortic Dissection

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ORIGINAL ARTICLE

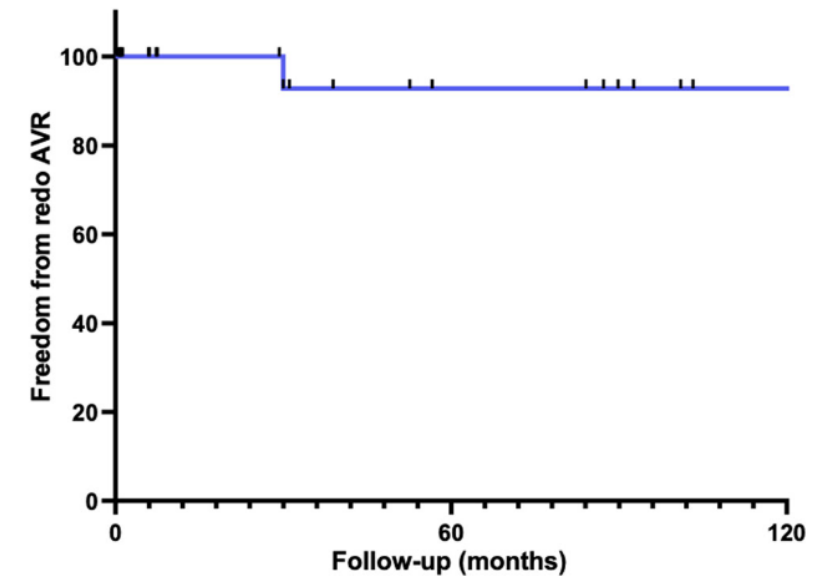
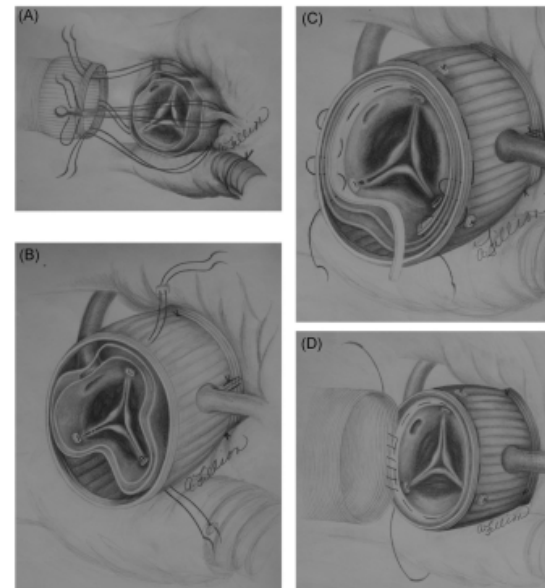
JOURNAL OF
CARDIAC SURGERY WILEY

TABLE 1 Patients demographics and preoperative characteristics

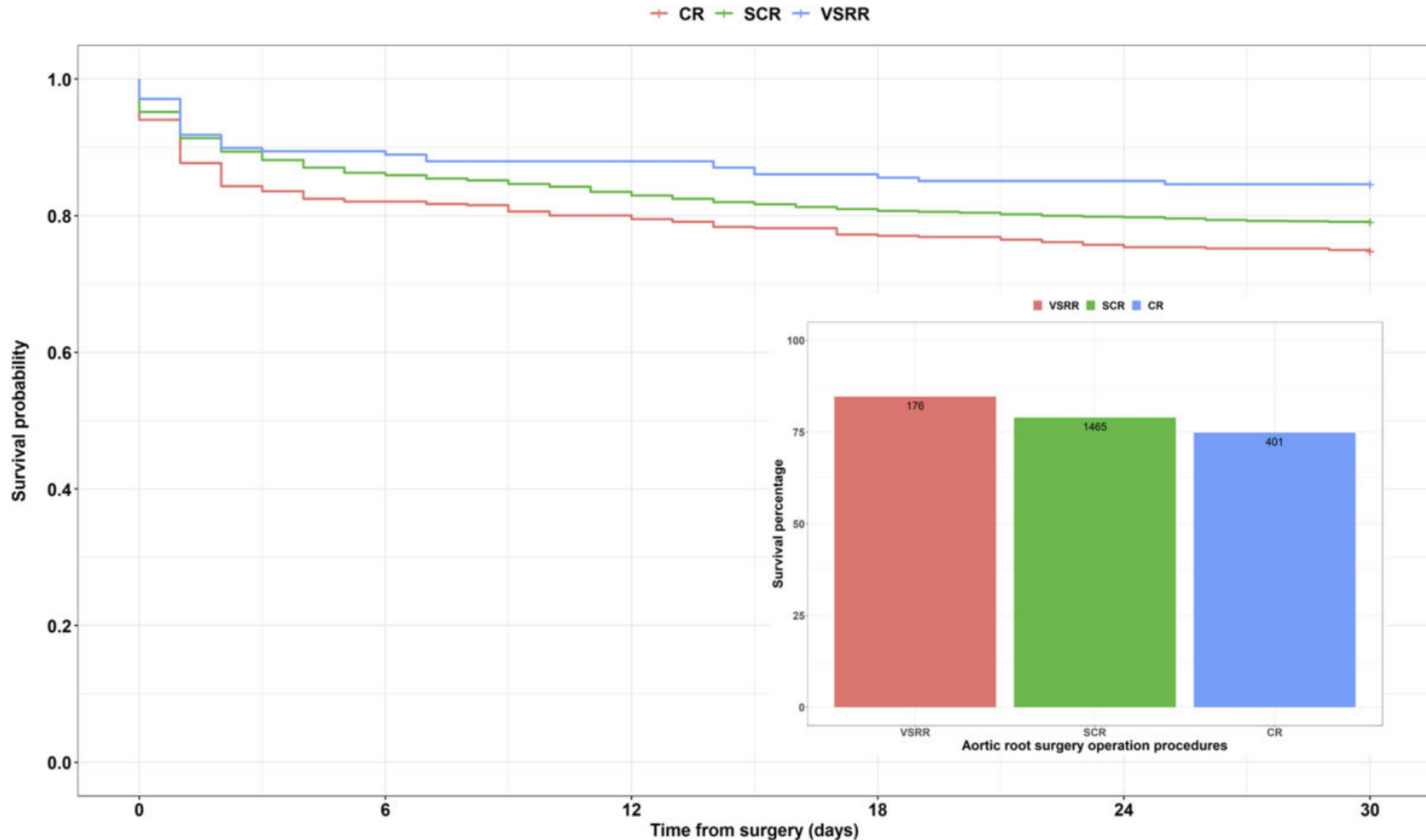
Variables	N = 24 (%)
Age (years) mean \pm SD	49.25 \pm 14.04
Male	19 (79.2)
Body mass index mean \pm SD	28.4 \pm 6.9
Type of dissection (Debakey classification)	
I	21 (87.5)
II	3 (12.5)
Marfan syndrome	4 (16.7)
Bicuspid aortic valve (BAV)	1 (4.2)
Familial aortic aneurysms (non-marfan)	3 (12.5)
Current or ex-smoker	13 (54.5)
Chronic lung disease	3 (12.5)

Florida sleeve is a safe and effective technique for valve salvage in acute stanford type A aortic dissection

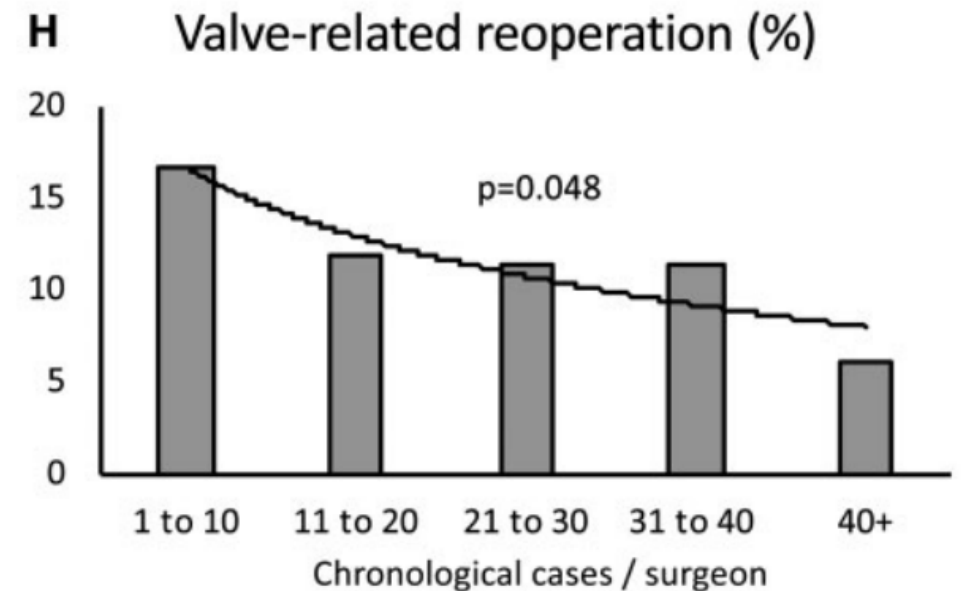
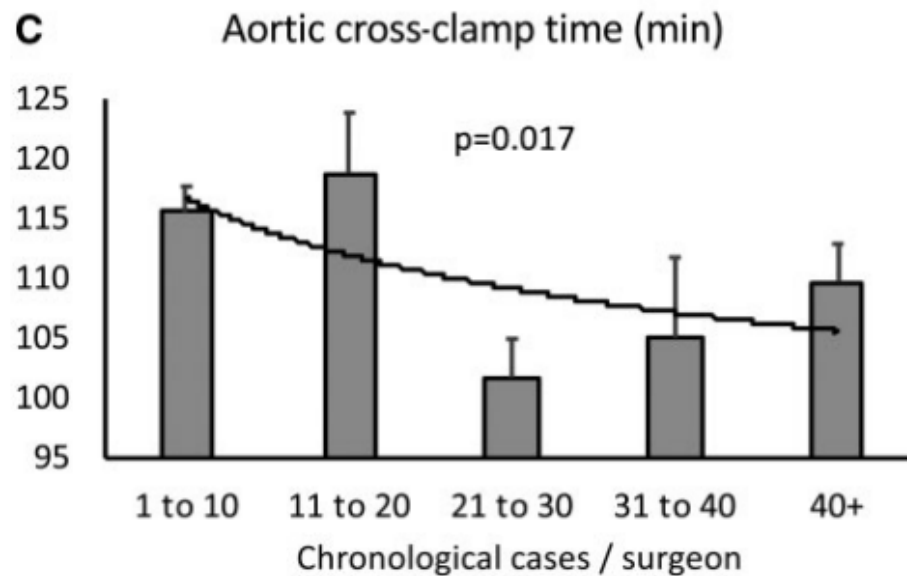
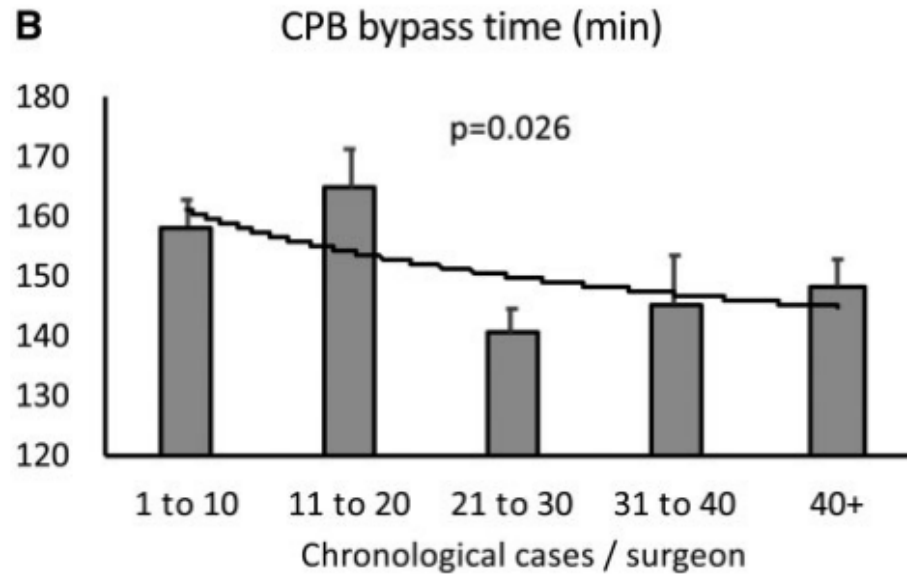
Mahmoud Alhussaini MD, PhD¹ | Eric I. Jeng MD² | Tomas D. Martin MD² |
Amber Fillion² | Thomas M. Beaver MD, MPH² | George J. Arnaoutakis MD²



The Dilemma of the Aortic Root in Typ A Dissection



Complexity and Learning Curve



Beckman et al, Interact CardioVasc Thorac Surg 2020

Acute Aortic
Syndrome

Challenging procedure
Valve repair techniques -
annuloplasty, plication,...



Life threatening situation
Young patients

Risk of reoperation

BAV valve
sparing root

In experienced hands it is associated with good perioperative
outcome and durable results

Conclusion

Section 4. Recommendations on indications for surgery in aortic root or tubular ascending aortic aneurysm (irrespective of the severity of aortic regurgitation)

Revised	Aortic valve repair, using the reimplantation or remodelling with aortic annuloplasty technique, is recommended in young patients with aortic root dilation and tricuspid aortic valves, when performed by experienced surgeons.	I	Valve-sparing aortic root replacement is recommended in young patients with aortic root dilation, if performed in experienced centres and durable results are expected.	I
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ESC/EACTS Valvular Guidelines 2021