

Short-Term Outcomes of the Ross Procedure in Adults Aged 45-60

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- **No perfect aortic valve replacement**
 - Bioprosthetic → early failure
 - Mechanical → lifelong anticoagulation
- **Ross offers an alternative to traditional prosthetic valve replacement**
- **Ross outcomes are promising, however most studies with relatively young patients (<45 years of age)**



Ross offers improved survival

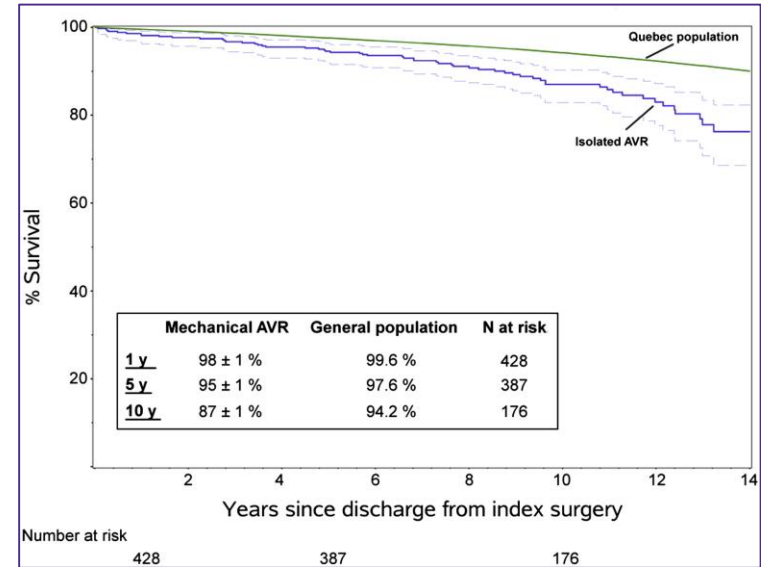
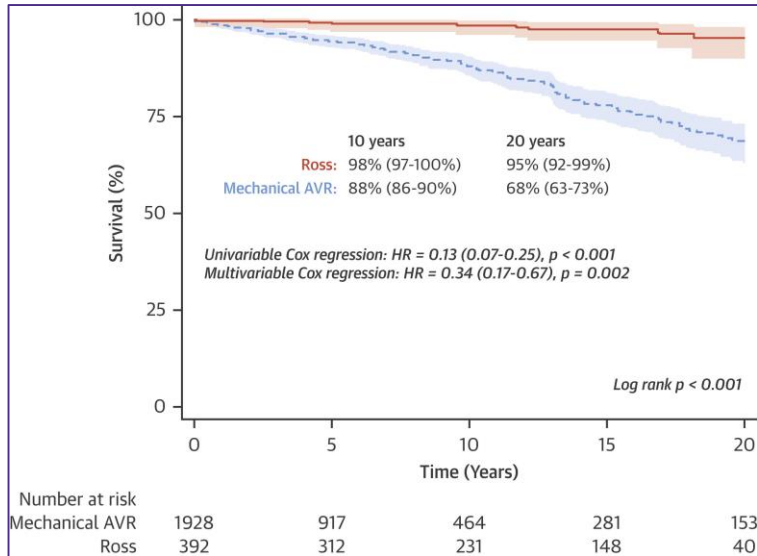


Figure 1. Survival curve comparing Ross procedure and mechanical AVR outcomes¹. Patients were aged 18-65. Mean age of mechanical and Ross recipients were 44 ± 11 years and 43 ± 11 , respectively.

Buratto E, Shi WY, Wynne R, et al. Improved Survival After the Ross Procedure Compared With Mechanical Aortic Valve Replacement. *Journal of the American College of Cardiology*. 2018;71(12):1337-1344. doi:10.1016/j.jacc.2018.01.048

Figure 2. Survival curve comparing mechanical AVR survival compared to matched general population². Mean age was 53 ± 9 years.

Bouhout I, Stevens LM, Mazine A, et al. Long-term outcomes after elective isolated mechanical aortic valve replacement in young adults. *The Journal of Thoracic and Cardiovascular Surgery*. 2014;148(4):1341-1346.e1. doi:10.1016/j.jtcvs.2013.10.064

Aims & Methods

Can Ross be performed with similar short-term outcomes in patients younger than 45 and between 45 & 60 years old?

Methods

- Retrospective cohort study
- Mean follow up time: 10.7 months

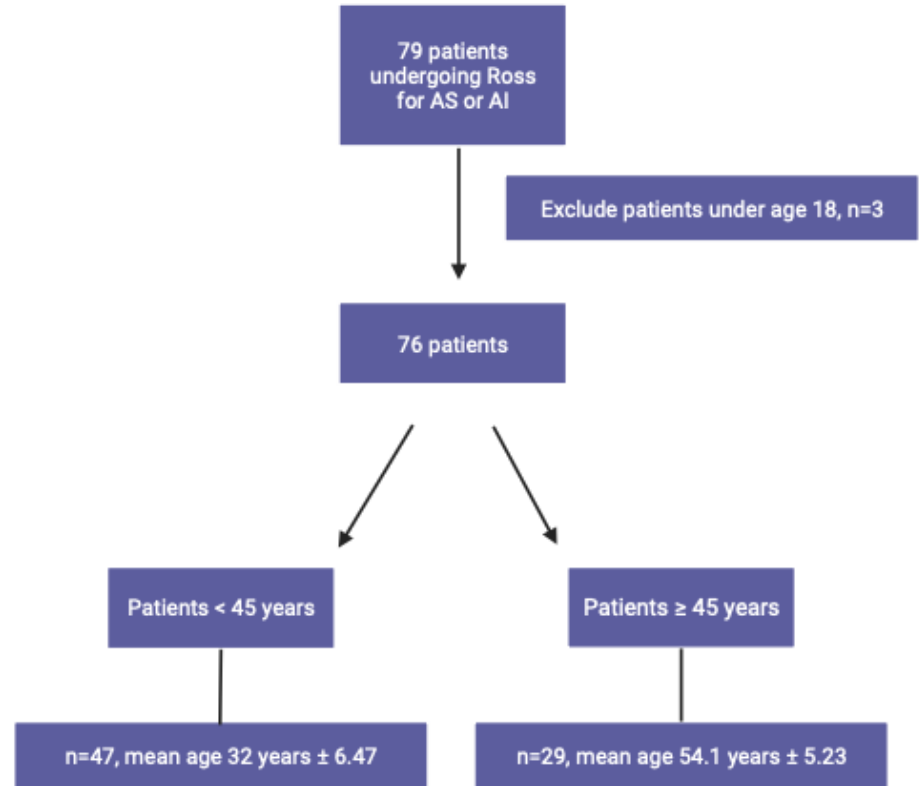


Figure 3. Flowchart of study inclusion and exclusion criteria

Pre-Operative Demographics

	<u>Age <45 (n=47)</u>	<u>Age ≥ 45 (n=29)</u>	<u>Total (n=76)</u>	<u>p-value</u>
Age at surgery	32 ± 6.47	54.1 ± 5.23	40.43 ± 12.36	*<0.001
Sex (% male)	32 (68.09%)	23 (79.31%)	55 (72.37%)	0.429
Hypertension	10 (21.28%)	14 (48.28%)	24 (31.58%)	*0.022
Hyperlipidemia	3 (6.38%)	18 (62.07%)	21 (27.63%)	*<0.001
Prior cardiac surgery (%)	15 (31.91%)	4 (13.79%)	19 (25%)	0.104
Coronary artery disease	1 (2.13%)	6 (20.69%)	7 (9.21%)	*0.011
Valve lesion				*0.002
Isolated aortic stenosis (AS)	12 (25.53%)	20 (68.97%)	32 (42.11%)	
Isolated aortic insufficiency (AI)	6 (12.77%)	1 (3.45%)	7 (9.21%)	
Mixed AS/AI - AS Predominant	22 (46.81%)	7 (24.14%)	29 (38.16%)	
Mixed AS/AI - AI Predominant	7 (14.89%)	1 (3.45%)	8 (10.53%)	

Intra-Operative Characteristics

	<u>Age < 45 (n = 47)</u>	<u>Age ≥ 45 (n = 29)</u>	<u>Total (n=76)</u>	<u>p-value</u>
Cardiopulmonary bypass time (min)	208 (187, 228)	215 (192, 233)	210 (188, 232)	0.487
Cross-clamp time (min)	175 (163, 193)	176.5 (161, 190)	176 (161, 192)	0.983
Bicuspid aortic valve	17 (36.17%)	22 (75.86%)	39 (51.32%)	*0.003
Aortic annulus size (mm)	25 (23, 27)	25 (25, 27)	25 (24, 27)	0.526
Pulmonary homograft size (mm)	27 (26, 28)	27 (26, 29)	27 (26, 28)	0.077
Concomitant procedures				
CABG	1 (2.13%)	2 (6.9%)	3 (3.95%)	0.554
Hemiarch	19 (40.43%)	7 (24.14%)	26 (34.21%)	0.213
Techniques				
Sinotubular junction ring	27 (57.45%)	21 (72.41%)	48 (63.16%)	0.227
External annuloplasty ring	10 (21.28%)	2 (6.9%)	12 (15.79%)	0.116

Peri-Operative Characteristics

	<u>Age < 45 (n = 47)</u>	<u>Age ≥ 45 (n = 29)</u>	<u>Total (n=76)</u>	<u>p-value</u>
Total length of stay (days)	7 (6, 9)	8 (6, 11)	7 (6, 10)	*0.02
Peri-op atrial fibrillation	6 (12.77%)	10 (34.48%)	16 (21.05%)	*0.041
Prolonged inotropes (>48 hr)	1 (2.13%)	6 (20.69%)	7 (9.21%)	*0.011
In-hospital mortality	0 (0%)	0 (0%)	0 (0%)	
Pneumonia	1 (2.13%)	4 (13.79%)	5 (6.58%)	0.061
Stroke	0 (0%)	1 (3.45%)	1 (1.32%)	0.382
Dialysis	0 (0%)	1 (3.45%)	1 (1.32%)	0.382
Prolonged ventilation (>40 hr)	0 (0%)	2 (6.9%)	2 (2.63%)	0.142
Takeback for Bleeding	2 (4.26%)	0 (0%)	2 (2.63%)	0.522
Pacemaker Placement	4 (8.51%)	1 (3.45%)	5 (6.58%)	0.644
Re-op	1 (2.13%)	0 (0%)	1 (1.32%)	>0.999

Short-Term Outcomes

	<u>Age < 45 (n = 47)</u>	<u>Age ≥ 45 (n = 29)</u>	<u>Total (n=76)</u>	<u>p-value</u>
Age at latest follow-up	33.63 ± 6.86	55.69 ± 5.3	41.98 ± 12.47	*<0.001
Length of follow-up (months)	10.76 (5, 16)	12.25 (6, 18)	10.78 (6, 18)	0.672
Death	1 (2.13%)	0 (0%)	1 (1.32%)	>0.999
Readmission from any cause	6 (12.77%)	8 (27.59%)	14 (18.42%)	0.129
Arrhythmia needing reintervention	4 (8.51%)	2 (6.9%)	6 (7.89%)	0.524
Endocarditis	0 (0%)	0 (0%)	0 (0%)	
Reinterventions				
Neo-aortic valve related	0 (0%)	0 (0%)	0 (0%)	
Pulmonic stenosis related				
Transcatheter valve	0 (0%)	0 (0%)	0 (0%)	
Balloon	2 (4.26%)	1 (3.45%)	3 (3.95%)	
Reoperation	0 (0%)	0 (0%)	0 (0%)	

One Year Echocardiography Data

	<u>Age < 45 (n = 47)</u>	<u>Age ≥ 45 (n = 29)</u>	<u>Total (n=76)</u>	<u>p-value</u>
Aortic regurgitation				0.354
None	3 (11.54%)	1 (9.09%)	4 (10.81%)	
Trace	15 (57.69%)	4 (36.36%)	19 (51.35%)	
Mild	8 (30.77%)	5 (45.45%)	13 (35.14%)	
Moderate/severe	0 (0%)	1 (9.09%)	1 (2.7%)	
Severe	0 (0%)	0 (0%)	0 (0%)	
Mean Autograft Gradient (mmHg)	3 (2.9, 4.7)	3 (2.9, 4)	3 (2.9, 4.68)	0.813
Neo-Aortic Root Diameter (cm)	3.5 ± 0.38	3.81 ± 0.53	3.6 ± 0.45	0.12
Mean Homograft Gradient (mmHg)	10.5 (7, 17)	11 (9.9, 20)	11 (8, 17.3)	0.322
EF				0.538
≤35	0 (0%)	0 (0%)	0 (0%)	
36-54	3 (12%)	0 (0%)	3 (8.33%)	
≥55	22 (88%)	11 (100%)	33 (91.67%)	

Conclusions

- **Similar outcomes between cohorts**
 - Older cohort had more co-morbidities: hypertension, hyperlipidemia, coronary artery disease
 - Statistically significant outcomes: prolonged ventilation, peri-op atrial fibrillation, total length of stay
 - No significant difference in CPB or cross-clamp time, readmission rate
 - Echo data are similar at one year
- **Reasonable to consider Ross in healthy adults aged 45-60 at high-volume centers**



Discussion

- **Limitations**

- Small cohort
- Short follow-up time

- **Future directions**

- Evaluate and review long-term outcomes
- Follow for autograft dilatation/insufficiency, pulmonary stenosis

- **Outcomes likely dependent on Ross procedural volume and institutional experience**

- **Who to consider for Ross over 45?**

- Minimal co-morbidities
- Near normal ventricular function
- Life expectancy > 15 years



