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Aortic root replacement with stentless xenografts, a single center longitudinal study over 17 years

Jinman Cai, MD; Mark Joseph, MD

Department of Cardiothoracic Surgery

Virginia Tech Carilion School of Medicine

Roanoke, VA

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Disclosure

No conflicts of interest to disclose

Objective

- Use of stentless aortic bioprosthesis has become increasingly common in academic setting
- Carilion Medical Center transitioned from a regional community based medical center to an academic health center in 2010
- This study reviews the outcomes of use of stentless xenograft as aortic root replacement (ARR) in a hospital as it transitioned from a community to an academic health center

Methods

- Inclusion criteria: patients > 18 years old undergoing aortic root replacement using stentless xenograft
- Study time: 2005 to 2022
- Primary outcome: 30-day mortality
- Follow-up echocardiography including immediate postoperative, one, three, six months, and subsequent yearly intervals
- Logistic regression analysis

Baseline characteristics of patients undergoing Freestyle aortic root replacement

Characteristics	Overall N = 326	Elective N = 194	Emergent N = 132
Patient Age (Mean ± Std Dev)	61.88 ± 12.82	63.94 ± 11.47	58.86 ± 14.09
Male (N, %)	169 (51.84%)	88 (45.36%)	81 (61.36%)
BMI	28.91 ± 6.03	29.22 ± 6.03	28.46 ± 6.02
Diabetes Mellitus	76 (23.31%)	46 (23.71%)	30 (22.73%)
Hypertension	235 (72.09%)	144 (74.23%)	91 (68.94%)
Infective endocarditis	47 (14.42%)	9 (4.64%)	38 (28.79%)
History of mediastinal radiation	4 (1.23%)	2 (1.03%)	2 (1.52%)
Previous cardiac surgery	12 (3.68%)	6 (3.09 %)	6 (4.55%)
Previous valve surgery	57 (17.48%)	27 (13.92 %)	30 (22.73%)
Previous percutaneous coronary intervention	27 (8.28%)	20 (10.31%)	7 (5.30%)

Baseline characteristics of patients undergoing Freestyle aortic root replacement

Characteristics	Overall N = 326	Elective N = 194	Emergent N = 132
Previous myocardial infarction	33 (10.12%)	15 (7.73%)	18 (13.64%)
History of heart failure within 2 weeks	85 (26.07%)	46 (23.71%)	39 (29.55%)
Hemodynamic ejection fraction	54.10 ± 11.40	56.00 ± 10.49	50.56 ± 12.23
Aortic valve mean gradient, mm Hg	41.35 ± 19.67	41.91 ± 19.16	39.55 ± 21.39
Aortic valve area, cm2	0.82 ± 0.45	0.80 ± 0.45	0.88 ± 0.44
Severe aortic regurgitation	99 (30.37%)	47 (24.23%)	52 (39.39%)
Severe mitral regurgitation	21 (6.44%)	14 (7.22%)	7 (5.30%)
Severe tricuspid regurgitation	7 (2.15%)	4 (2.06%)	3 (2.27%)

Operative characteristics of patients undergoing Freestyle aortic root replacement

Characteristics	Overall N = 326	Elective N = 194	Emergent N = 132
Concomitant procedures			
CABG (planned and unplanned)	57 (17.48%)	36 (18.56%)	21 (15.91%)
Mitral surgery	51 (15.64%)	25 (12.89%)	26 (19.70 %)
Tricuspid surgery	7 (2.15 %)	3 (1.55%)	4 (3.03%)
Ascending aortic replacement	168 (51.53 %)	96 (49.48%)	72 (54.55 %)
Re-operative aortic root	8 (2.45%)	0 (0%)	8 (2.45%)
Cabrol procedure	16 (4.91%)	6 (3.09%)	10 (7.58%)
Commando procedure	7 (2.15%)	0 (0%)	7 (5.30%)
Operative characteristics			
Cardiopulmonary bypass time, min	227.88 ± 92.85	202.69 ± 86.24	264.90 ± 90.07
Cross-clamp time, min	169.12 ± 64.72	153.89 ± 61.71	191.52 ± 62.69
Intra-aortic balloon pump post-surgery	2 (0.61%)	1 (0.52%)	1 (0.76%)

Post-operative complications

Characteristics	Overall N = 326	Elective N = 194	Emergent N = 132
Operative (30-d) mortality	48 (14.81%)	14 (7.22%)	34 (26.15%)
Stroke	9 (2.76%)	1 (0.52%)	8 (6.06%)
Deep sternal wound infection	3 (0.92%)	0 (0%)	3 (2.27 %)
Re-exploration for mediastinal bleeding	29 (8.90%)	9 (4.64%)	20 (15.15%)
Postoperative sepsis	4 (1.23%)	1 (0.52%)	3 (2.27%)
Pulmonary ventilation>24 h	94 (28.83%)	33 (17.01%)	61 (46.21%)
Pneumonia	16 (4.91%)	9 (4.64%)	7 (5.30%)
Renal failure requiring dialysis	34 (10.43%)	12 (6.19%)	22 (16.67%)
New-onset atrial fibrillation	115 (35.28%)	65 (33.51%)	50 (37.88%)
New pacemaker	4 (1.23%)	0 (0%)	4 (3.03%)
Blood products transfused	160 (49.08%)	71 (36.60%)	89 (67.42%)

Mortality Rate of Root Replacement and Concomitant Procedures

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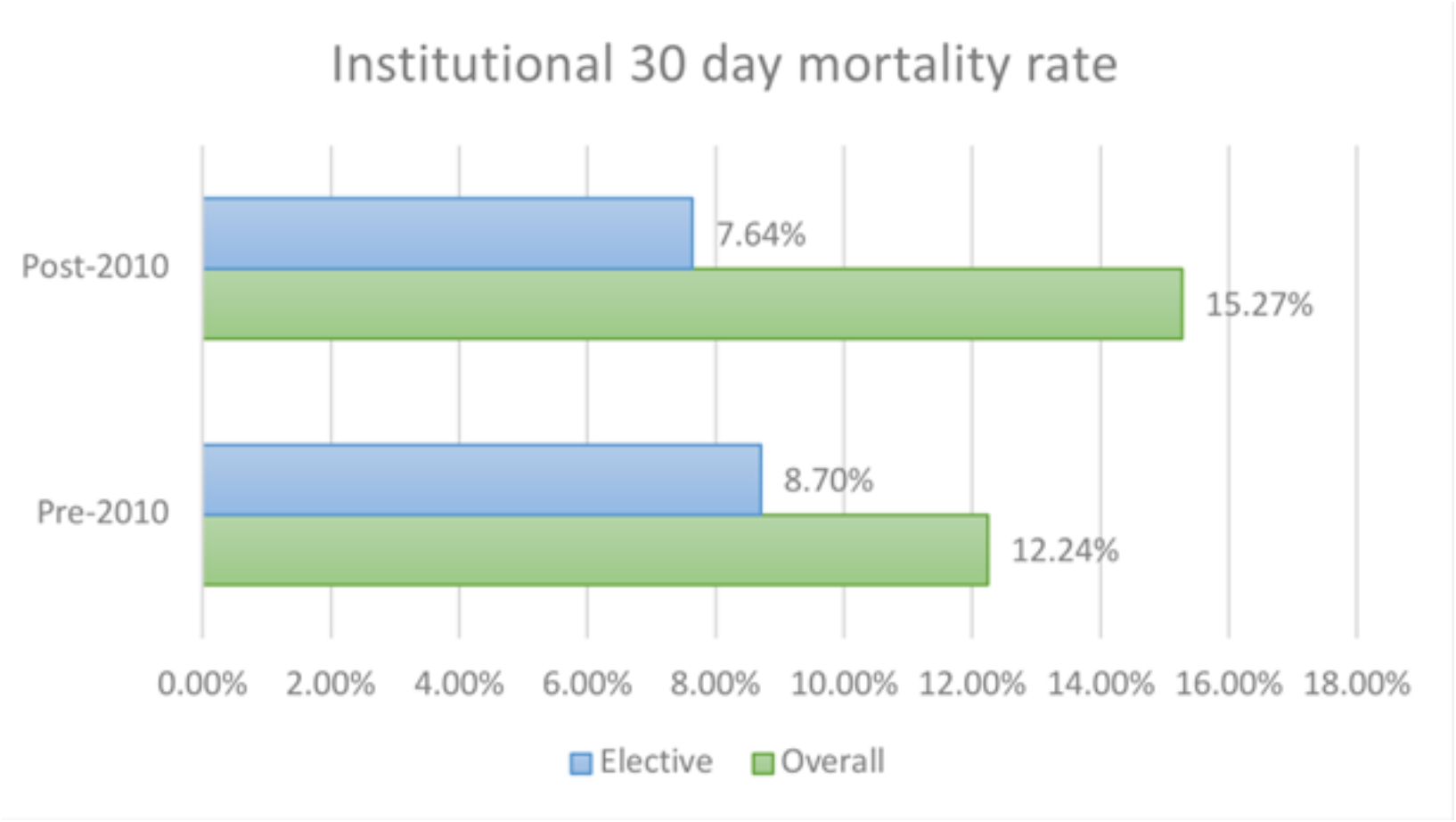
Concomitant procedures	Overall		Elective Cases		Emergent Cases	
	n		n		n	
Root replacement only	**62**	**4 (6.4%)**	**44**	**2 (4.5%)**	**18**	**2 (11.1%)**
Ascending aortic replacement	92	8 (8.6%)	58	2 (3.4%)	34	6 (17.6%)
CABG	48	6 (12.5%)	32	1 (3.1%)	16	5 (31.2%)
Mitral surgery	28	3 (10.7%)	17	1 (5.8%)	11	2 (18.2%)
Tricuspid surgery	2	1 (50%)	0	0 (%)	2	1 (50%)
Ascending aortic replacement and CABG	53	12 (22.7%)	26	3 (11.5%)	27	9 (33.3%)
Mitral surgery and CABG	10	2 (20%)	4	1 (25%)	6	1 (16.7%)
"Commondo" procedure	7	2 (28.6%)	0	0 (%)	7	2 (28.6%)
"Cabrol" procedure	16	8 (50%)	6	3 (50%)	10	5 (59%)

No significant difference in 30-day mortality before and after transition to an academic health center



P-value = 0.58 (overall) P-value = 0.87 (elective)

Effect	Estimate	95% Confidence Limits		p-value
Cardiopulmonary bypass time (CPB), min	1.03	1.02	1.04	<0.0001
Cross-clamp time (XC), min	0.98	0.96	0.99	0.0073
Re-exploration for mediastinal bleeding	4.60	1.20	17.66	0.0263
Renal failure requiring dialysis	11.43	2.38	54.77	0.0023
New-onset atrial fibrillation	0.10	0.02	0.48	0.0037
Cabrol procedure	4.91	0.93	25.92	0.0612

- CPB time, XC time, re-exploration for mediastinal bleeding, renal failure requiring dialysis, new-onset atrial fibrillation and concomitant Cabrol procedure placed a significant role in affecting the 30-day mortality

Conclusion

- Favorable 30-day mortality rate ARR with stentless xenograft at our institution as we transitioned from a community to an academic health center
- Stentless xenografts can be used in a variety of settings both electively and emergent cases with possible long-term durability