

Aortic Valve Replacement Patients: A Decade of Change

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Abstract and Introduction

Changes in Aortic Valve Surgery Over a Ten Year Period

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Introduction

We undertook this study to compare the acuity of aortic valve patients and outcomes of surgery over a ten-year period.

Method

This is a retrospective study using data from all our patients having aortic valve replacement in 1991-92 (177 patients) and those having surgery in 2000-01 (375 patients). Categorical variables were analyzed using Chi-squared statistics and continuous variables compared using t-tests.

Results

Pre-operative risk factors comparing the 1991-92 and 2001-02 groups, are shown in the table. Operative status also changed with 98% patients being rated 'elective' in 1991-02 and only 64% in 2001-02 with the other 36% classified 'urgent' (p< 0.001). Valve replacement was also being done alone 62% of the time (1991-92) but by 2001-02, 46% were combined with CABG and only 51% were solitary valve (p=0.05). The type of valves being used also differed with 1991-92 patients receiving either mechanical (71%) or bioprosthetic valves (26%). Current usage is 31% mechanical, 68% bioprosthetic and 1% homologous (p<0.001).

The outcomes of surgery were unchanged over the ten-year period, despite a changing patient population. Mortality was 6.2% in 1991-92 falling slightly to 5.6% by 2001-02 (p=ns). There was also significantly reduced post-op blood product usage, dropping from 71.2% to 57.1% over the ten years (p=0.002). Length of stay showed a significant decrease from 11.6±10.9 to 9.1±8.8 days (p=0.007). An increase in cross-clamp time (more valves combined with CABG) was measured increasing from 82.7±24.4 minutes (in 1991-92) to 90.4±32.3 today (p=0.002). No measurable change in perfusion times was measured.

Conclusions

This study shows that over the ten-year period, the patients operated on are older and are having valve surgery combined more often with CABG. They also have more diabetes and other vascular diseases. Despite this, treatment has improved with a slight reduction in mortality, less blood usage and shorter hospital stays.

Increasing patient acuity and concomitant co-morbidities have markedly changed aortic valve replacement (AVR) over the preceding decade. The feasibility of less invasive AVR procedures, including minimally invasive and percutaneous techniques, have led us to examine our AVR patient population over the last ten years in an effort to determine the applicability of these new technologies.

This study illustrates the changes in our AVR patient population over the past 10 years.

Methods

Study Period: 1991 - 2002
 Total Number of Patients: 1824
 Total AVR 1991-92 => 177 patients
 Total AVR:2001-02 => 375 patients

Procedures were categorized into isolated AVR, valve and coronary artery bypass grafting (CABG), or valve plus other procedures with/without CABG.

Compared patient data from the first two years, of this study, 1991-1992 to the last two years 2001-2002.

Statistical Analysis Used
 categorical variables: chi-squared statistics
 continuous variables: t-tests

Results

Pre-operative Risk Factors Showing Change Over 10 Year Period

Category	1991-1992	2001-2002	p-value
Total Cases	177	375	
Factor	% (N)	% (N)	
Female	26.6% (47)	38.7% (145)	0.005
Family History	26.6 (47)	39.3 (147)	0.003
Diabetes	14.7 (26)	23.7 (89)	0.02
Hypercholesterolemia	17.6 (31)	45.3 (170)	< 0.001
Hypertension	39.6 (70)	64.7 (242)	< 0.001
CVA	0.6 (1)	91. (34)	< 0.001
Lung Disease	4.5 (8)	12.8 (48)	0.002
PVD	0	9.6 (36)	< 0.001
CVD	0	14.1 (53)	< 0.001
Previous CAB	4.5 (8)	10.9 (41)	0.01
Arrhythmia	24.3 (43)	16.0 (60)	0.02
Steroids	0	5.1 (19)	0.002

Pre-operative Risk Factors That Did Not Change Over 10 Year Period

Current Smoker	17.5 (31)	12.8 (48)	ns
Renal Failure	2.8 (5)	4.0 (15)	ns
Previous Valve	6.2 (11)	4.3 (16)	ns
MI	10.7 (19)	11.5 (43)	ns
CHF	41.8 (74)	37.1 (139)	ns
Angina	40.1 (71)	40.8 (153)	ns
Preop Inotropes	1.7 (3)	2.9 (11)	ns
Left Main > 50%	3.1 (5)	6.2 (53)	ns
Aortic Stenosis	81.9 (145)	80.0 (300)	ns
IABP Usage	6.8 (12)	5.3 (20)	ns

Outcomes Showing A Change From 1991-2 to 2001-2

Factor	1991-1992 % (N)	2001-2002 % (N)	p-Value
Blood Products	71.2 (126)	57.1 (213)	0.002
Pneumonia	1.2 (2)	4.3 (16)	NS (0.06)
Coagulopathy	8.5 (15)	3.7 (7)	NS (0.06)
Valvular Complications	8.5 (15)	0.0	<0.001
Prolonged Ventilator	3.4 (6)	17.6 (66)	<0.001

Outcomes Not Showing A Change From 1991-2 to 2001-2

Mortality Rate	6.2 (11)	5.6 (21)	ns
A Fib	39.0 (69)	31.7 (119)	ns
Renal Failure	5.1 (9)	8.8 (33)	ns
Dialysis Required	0.6 (1)	2.1 (8)	ns
MI	0.6 (1)	0.3 (1)	ns
Re-op Bleeding	9.6 (17)	8.5 (32)	ns
Septicemia	0.6 (1)	1.3 (5)	ns
Sternal Deep Infection	0.6 (1)	0.8 (3)	ns
Stroke- Permanent	2.3 (4)	3.5 (13)	ns
Stroke- Transient	1.1 (2)	0.8 (3)	ns
GI	1.1 (2)	2.9 (11)	ns
Tamponade	0.6 (1)	1.3 (5)	ns
Heart Block	0.0	1.6 (6)	ns
Multisystem Failure	1.1 (2)	1.1 (4)	ns

Change in Continuous Variables Over 10 Year Period

	1991-1992	2001-2002	p-Value
Age	63.6±14.2	68.4±12.9	< 0.001
Length of Stay	11.6±10.9	9.1±8.8	0.007
Ejection Fraction (%)	53.3±12.0	50.9±12.4	0.04
# Distal Arteries	0.07±0.29	0.58±0.57	< 0.001
Cross-Clamp Time (min)	82.7±24.4	90.4±32.3	0.002
Perfusion Time (min)	121.7±40.9	127.7±48.1	ns
Body Surface Area (m2)	1.94±0.21	1.97±0.29	ns

Results (cont'd)

Comparison of Valve Procedures

Category / Yr	1991 - 92	2001-02
CAB + Valve	37.3% (66)	45.6% (171)
Isolated AVR	61.6 (109)	50.9 (191)
Valve + Other	0	1.9 (7)
CAB + Valve + Other	1.1 (2)	1.6 (6)

Types of Valves Implanted

Valve Types/ Yr	1991 - 92	2001-02
Bioprosthetic	26.0% (46)	67.8% (253)
Mechanical	71.2 (126)	31.1 (116)
Homograft	0	1.1 (4)
None (repair)	0	2.8 (5)

Summary

Patients undergoing AVR in 2001-02 (compared to 1991-2):

- were significantly older 68.4 yrs. vs. 63.6 yrs. (p<0.001)
- had worse ejection fractions 50.9% vs. 53.3% (p=0.04)
- more likely to have
 - diabetes 23.7% vs. 14.7% (p=0.02)
 - previous CAB 10.9% vs. 4.5% (p=0.01)
 - lung disease 12.8% vs. 4.5% (p=0.002)
- required more valve plus CABG procedures 45.6% vs. 37.3% and fewer isolated valve procedures 50.9% vs. 61.6% (p=0.05)
- more likely received a bioprosthetic valve 67.8% vs. 26% (p<0.001).

Despite the increased severity, mortality decreased slightly over the decade, 6.2% in 1991-1992 vs. 5.6% in 2001-2002 (p=ns) and significant reductions over time were seen in transfusion requirements 71.2% vs. 57.1% (p=0.002), and length of hospital stay 11.6±10.9 days vs. 9.1±8.8 days (p=0.007).