5-year Outcomes following Redo-aortic Surgeries: A Single Centre Experience

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Introduction

- Redo cardiac surgeries are commonly indicated to repair or redo a flaw or failure of initial surgery or treat recurrent or new cardiac conditions.

- The last few decades have seen a steady rise in incidence of reoperations in cardiac surgery, such that redo cardiac surgery has become an integral part of cardiac surgery.

- Redo aortic surgeries are complex procedures known to be associated with increased morbidity and mortality compared to primary aortic procedures.

Aims and Objectives

We aimed to analyse and report on:

- **immediate and early outcomes (in-hospital mortality) following redo aortic surgeries in our centre.**
- **the 5-year mortality outcome following redo aortic surgeries in our centre.**
- **factors predictive of these outcomes**

Methods

- Data source: Electronic medical records
- Duration: January 1st, 2018, to August 30th, 2023
- Sample size: 77 patients
- Data analysis: Univariate and multivariate Cox- proportional hazard (Cox-PH) regression models using R software
- Outcomes of interest:
  - Primary: In-hospital mortality
  - Secondary: Overall mortality, 30-day mortality, post op complications

Results

- The mean age of the total cohort of redo aortic patients was 64.22 ± 12.22.
- Majority of the patients were males (n= 57, 69.3%)
- Majority of the patients underwent elective redo-aortic surgeries (n= 48, 62.3%).
- The mean Logistic EuroScore and EuroScore II were 33.25 ± 19.52 and 24.15 ± 20.89 respectively.
- Majority of the patients had a first redo-operation (n=69, 89.6%), while only one patient (0.3%) had a fourth redo.

Patient Characteristics

	Total - 77	Female (20) n (%)/mean ± SD	Male (57) n (%)/mean ± SD	p-value
Age	64.22 ± 12.22	64.85 ± 12.46	64.00 ± 12.23	0.794
Left ventricular function				0.221
Good	61 (79.2%)	17 (22.1%)	44 (57.1%)	
Mild	6 (7.8%)	0 (0%)	6 (7.8%)	
Moderate	9 (11.7%)	2 (2.6%)	7 (9.1%)	
Poor	1 (1.3%)	1 (1.3%)	0 (0%)	
Priority				0.366
Elective	48 (62.3%)	13 (16.9%)	35 (45.4%)	
Urgent	18 (23.4%)	6 (7.8%)	12 (15.6%)	
Emergency	11 (14.3%)	1 (1.3%)	10 (13.0%)	
Logistic Euroscore	33.25 ± 19.52	29.09 ± 12.95	34.84 ± 21.42	0.220
Euroscore II	42.78 ± 99.76	24.15 ± 20.89	46.48 ± 109.24	0.477
Previous cardiac surgery				0.528
First redo	69 (89.6%)	20 (26.0%)	49 (63.6%)	
Second redo	5 (6.5%)	0 (0%)	5 (6.5%)	
Third redo	2 (2.6%)	0 (0%)	2 (2.6%)	
Fourth redo	1 (1.3%)	0 (0%)	1 (1.3%)	
Time to re-operation	9.67 ± 9.65	12.45 ± 13.28	8.72 ± 7.93	0.243
Hypertension	48 (62.4%)	14 (18.2%)	34 (44.1%)	0.580
Diabetes Mellitus	12 (15.6%)	3 (3.9%)	9 (11.7%)	0.160
Smoking history	35 (45.5%)	9 (11.7%)	26 (33.8%)	1.000
Chronic kidney disease	12 (15.6%)	2 (2.6%)	10 (13.0%)	0.721
Atrial fibrillation	24 (31.2%)	5 (6.5%)	19 (24.7%)	0.681
Stroke/TIA	19 (24.7%)	1 (1.3%)	18 (23.4%)	0.017
MI/CAD	14 (18.2%)	2 (2.6%)	12 (15.6%)	0.335
COPD/Asthma	9 (11.7%)	2 (2.6%)	7 (9.1%)	1.000

Results

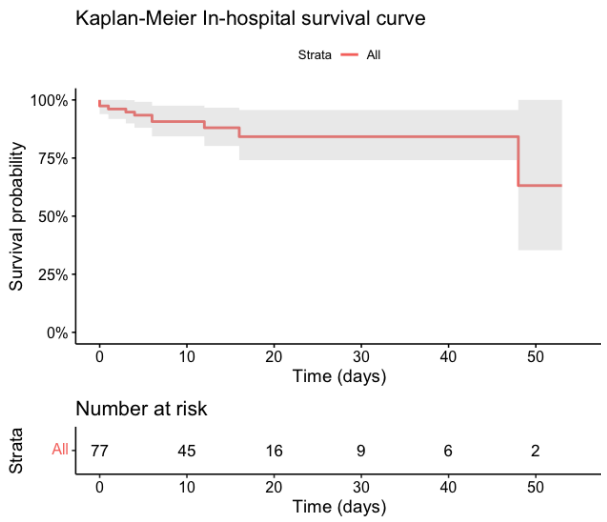
- The most common indication for redo surgery was aortic dilatation (n=41, 53.2%).
- The most common surgery type was aortic arch surgery (frozen elephant trunk) with ascending aortic replacement (n=34, 44.1%).
- Tissue aortic valve replacement was the most common concomitant procedure performed

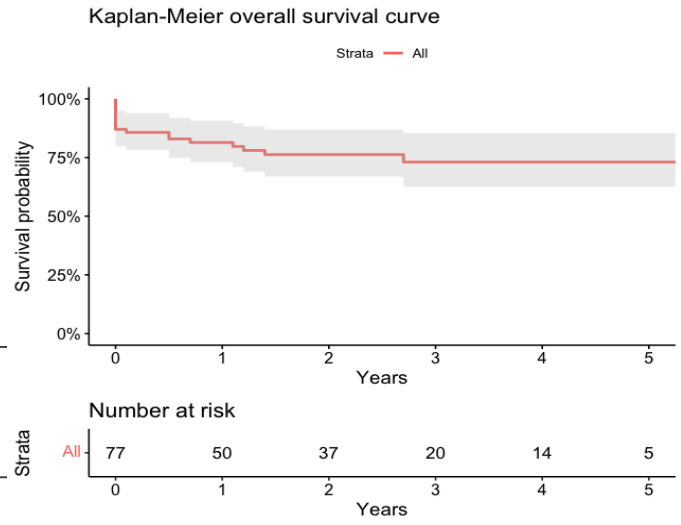
VARIABLE	Total – 77 n (%)
Indications	
Aortic dilatation	41 (53.2%)
Infective endocarditis	17 (22.1%)
Aortic dissection	10 (13.0%)
Pseudo aneurysm	7 (9.1%)
Penetrating atherosclerotic ulcer rupture	1 (1.3%)
Graft leak	1 (1.3%)
Surgery type	
Ascending aortic replacement	14 (18.2%)
Aortic root replacement	19 (24.7%)
Aortic root + ascending aortic replacement	10 (13.0%)
Ascending aortic + Aortic arch	34 (44.1%)
Concomitant procedures	
Aortic valve replacement (tissue)	31 (40.3%)
Aortic valve replacement (mechanical)	8 (10.4%)
Mitral valve replacement (tissue)	3 (3.9%)
Mitral valve replacement (mechanical)	1 (1.3%)
Mitral valve repair	1 (1.3%)
Coronary bypass graft	5 (6.5%)

Surgery types and Indications

Outcomes of Interest

- The rate of freedom from in-hospital mortality was 63.1% (95% CI 35.4 – 100%).
- Overall survival rate at the end of the 5-year follow-up period was 73.1% (95% CI 62.6 – 85.4%).





Postoperative Outcomes	Total cohort	Female	Male	p-value
Re-exploration	8 (10.4%)	3 (3.9%)	5 (6.5%)	0.421
Prolonged ventilation	20 (26.0%)	3 (3.9%)	17 (22.1%)	0.3151
Renal dysfunction	11 (14.3%)	5 (6.5%)	6 (7.8%)	0.141
Seizure	2 (2.6%)	0 (0.0%)	2 (2.6%)	0.975
Stroke	10 (13.0%)	4 (5.2%)	6 (7.8%)	0.275
Arrythmia	20 (26.0%)	3 (3.9%)	17 (22.1%)	0.315
Permanent pacemaker	7 (9.1%)	2 (2.6%)	5 (6.5%)	0.442
Wound infection	13 (16.9%)	2 (2.6%)	11 (14.3%)	0.294
ICU stay	6.11 ± 8.70	8.70 ± 14.04	5.21 ± 5.70	0.292
Hospital stay	14.47 ± 12.00	15.35 ± 14.34	14.16 ± 11.19	0.738
In-hospital mortality	10 (13.0%)	2 (2.6%)	8 (10.4%)	0.940
Overall mortality	18 (23.4%)	4 (5.2%)	14 (18.2%)	0.768

Predictive Factors

- The factors found to be predictive of overall mortality were
  - Priority of surgery (HR 3.48, 95% CI 1.20-10.05, p=0.02)
  - Time to re-operation (HR 0.89, 95% CI 0.81–0.99, p=0.025)
  - Pre-op chronic kidney disease (HR 3.16, 95% CI 1.18-8.43, p=0.022)
  - Need for mechanical circulatory support (HR 12.7, 95% CI 4.23-38.12, p<0.001)
  - Post operative renal dysfunction (HR 4.03, 95% CI 1.50-10.79, p=0.006)
  - Post op re-exploration (HR 47.82, 95% CI 13.9–164.4, p<0.001).
- Need for mechanical circulatory support (HR 7.74, 95% CI 2.09 – 28.69, p=0.002) was found to be predictive of in-hospital mortality.

	In-hospital mortality		Overall mortality	
	Hazard ratio (95% CI)	p-value	Hazard ratio (95% CI)	p-value
Age	1.02 (0.96 – 1.08)	0.460	0.99 (0.95 – 1.02)	0.453
Sex: Male	1.53 (0.32 –7.38)	0.596	1.28 (0.42 -3.90)	0.660
Left ventricular function				
Good	ref	ref	ref	ref
Mild	0.94 (0.11 – 7.79)	0.951	0.63 (0.08 – 4.79)	0.657
Moderate	0.61 (0.07 – 4.94)	0.640	1.13 (0.27 – 5.03)	0.867
Poor	0.00 (0 - Inf)	0.998	0.00 (0 - Inf)	0.998
Priority				
Elective	ref	ref	ref	ref
Urgent	0.43 (0.05 –3.57)	0.432	1.51 (0.45 – 5.02)	0.505
Emergency	2.51 (0.06 – 10.43)	0.207	3.48 (1.21 – 10.05)	0.021
Logistic Euroscore	1.02 (0.99 – 1.05)	0.252	1.01 (0.99 – 1.04)	0.336
Euroscore II	0.99 (0.93 – 1.06)	0.787	1.00 (1.00 – 1.01)	0.328
Previous cardiac surgery				
One redo	ref	ref	ref	ref
Two or more redo	2.03 (0.41 –9.98)	0.385	2.08 (0.60 – 9.20)	0.248
Time to re-operation	0.90 (0.79 – 1.03)	0.121	0.89 (0.81 – 0.99)	0.025
Hypertension	0.37 (0.10 – 1.33)	0.129	0.76 (0.30 – 1.93)	0.565
Diabetes Mellitus	0.00 (0.00 – Inf)	0.998	0.31 (0.04 – 2.32)	0.253
Smoking history	0.51 (0.13 – 1.98)	0.333	0.66 (0.24 – 1.75)	0.399
Chronic kidney disease	1.97 (0.48 – 8.11)	0.347	3.16 (1.18 – 8.43)	0.022
Atrial fibrillation	2.92 (0.78 –10.87)	0.090	1.75 (0.68 – 4.55)	0.248
Stroke/TIA	1.85 (0.52 – 6.63)	0.344	0.99 (0.32 – 2.98)	0.971
MI/CAD	0.41 (0.05 – 3.24)	0.395	1.08 (0.31 – 3.76)	0.908
COPD/Asthma	2.72 (0.69 –10.77)	0.154	2.54 (0.83 – 7.75)	0.090
Cardiopulmonary Bypass time	1.00 (0.99 – 1.01)	0.354	1.00 (0.99 – 1.01)	0.780
Cross clamp time	1.00 (0.99 – 1.01)	0.788	1.00 (0.99 – 1.01)	0.457
Mechanical circulatory support	7.74 (2.09 – 28.69)	0.002	12.7 (4.23 – 38.12)	<0.001
Prolonged post op ventilation	3.18 (0.87 – 11.63)	0.08	2.33 (0.87 – 6.05)	0.070
Post op stroke	1.49 (0.30 – 7.42)	0.624	0.92 (0.21 – 4.01)	0.912

Effects of Variables on Outcomes

Conclusion

- **Survival rates following redo aortic surgery in our centre are comparable with those gotten in other studies with immediate and 5-year outcomes shown to be favourable.**

- **In addition, several independent risk factors have been shown to be predictors of mortality.**

5-year Outcomes following Redo-aortic Surgeries: A Single Centre Experience