

SCA 1

RENAL DYSFUNCTION AFTER DEEP HYPOTHERMIC CIRCULATORY ARREST FOR REPAIR OF THORACIC ANEURYSMS AND DISSECTIONS

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Background: Acute renal failure (ARF) is a major complication of cardiac surgery that contributes to significant morbidity and mortality. The development of post-operative renal failure is associated with a mortality rate between 24% and 70%¹. In particular, the presence of post-operative ARF is a determinant of long-term survival after replacement of ascending and transverse aortic arch lesions².

The use of deep hypothermic circulatory arrest (DHCA) has been identified as an independent predictor of ARF¹. Although the incidence and risk factors for ARF after DHCA have been established in the paediatric population³, there are only limited studies on the impact of DHCA on renal dysfunction in adults.

Objectives: To determine the incidence of, and elucidate the risk factors for renal dysfunction after DHCA for repair of thoracic aortic aneurysm and dissection.

Methods: From the cardiothoracic databases of National University Hospital and Singapore General Hospital, we identified 59 patients who underwent DHCA for repair of thoracic aortic aneurysm and dissection from Jan 99 to Apr 02. A chart review to extract data pertaining to medical history, operative details and postoperative progress was performed. Postoperative renal dysfunction was defined as (i) a rise of serum creatinine above 177 $\mu\text{mol/l}$ for patients with normal preoperative creatinine, or (ii) doubling of creatinine from preoperative values for patients with pre-existing impaired renal function, or (iii) requirement for postoperative renal dialysis. Using a statistical software package (SPSSTM 11.0, USA), data was analyzed with Student's t-test or Fisher's Exact Test as appropriate. Results were presented as mean values. $P < 0.05$ was considered significant.

Results: Of the 59 patients, 36 (61%) of them sustained postoperative renal dysfunction. 11 (30.6%) of these 36 patients required postoperative dialysis. 7 of these 11 patients (63.6%) died. Demographic data, baseline parameters and operative data are presented in tables 1-2. The significant risk factors were elderly age, longer bypass time, lower haematocrit and base excess during cardiopulmonary bypass, more bicarbonate administration and more blood salvage device usages. There was a trend towards longer DHCA and aortic cross-clamp times, although this did not reach statistical significance. Intensive care and hospitalization were significantly longer in the renal dysfunction group. Gender, obesity, presence of diabetes or hypertension, myocardial infarction or stroke,

preoperative ejection fraction, preoperative creatinine level, and the use of aprotinin were not associated with development of post-operative renal dysfunction.

Conclusion: Postoperative renal dysfunction is a significant problem for patients who are undergoing DHCA for repair of thoracic aortic lesions, affecting 61% of patients. We identified older age, lower haematocrits, longer bypass time, and presence of acidosis as risk factors for postoperative renal dysfunction, leading to increased morbidity and mortality.

References:

Zanardo G et al. J Thorac Cardiovasc Surg 1994;107:1489-95

Estrera AL et al. Ann Thorac Surg 2002;74:1058-65

Dittrich S et al. Pediatr Cardiol 2002;23:15-19

Table 1: Demographics and Medical History

	Renal Dysfunction	Normal Renal Function
n	36	23
Age (yrs)	64 \pm 8 *	56 \pm 11
Gender (M/F)	30/5	18/6
Baseline Creatinine ($\mu\text{mol/l}$)	159 \pm 122	117 \pm 68
Preoperative Ejection Fraction (%)	55 \pm 13	60 \pm 9

Figures are in mean \pm S.D. * $P < 0.05$

Table 2: Operative Data

	Renal Dysfunction	Normal Renal Function
n	36	23
Duration of bypass (min)	243 \pm 82*	204 \pm 51
Cross clamp time (min)	41 \pm 41	47 \pm 44
Duration of circulatory arrest (min)	47 \pm 27	35 \pm 12
Lowest haematocrit (%)	18 \pm 2*	20 \pm 3
Worst base excess (mmol/l)	-8.2 \pm 3.3*	-6.3 \pm 2.7
Bicarbonate used (ml)	206 \pm 160*	123 \pm 88
Aprotinin used (n)	26	19
Cell Saver used (n)	32*	16
Post-op blood loss (ml)	1431 \pm 1225	996 \pm 684
Intensive care stay (days)	9 \pm 7	3 \pm 2
Hospital stay (days)	30 \pm 23*	18 \pm 11

Figures are in mean \pm S.D. * $P < 0.05$