Predictors of mortality of dialysis-requiring acute kidney injury patients after cardiac surgery

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Introduction

Acute kidney injury (AKI) is a common complication of cardiac surgery with cardiopulmonary bypass, occurring in up to 30% of patients. About 1% of patients develop severe AKI requiring renal replacement therapy. AKI requiring dialysis (AKI-D) is an important prognostic factor associated with increased morbidity and mortality, with an eight-fold increase in risk-adjusted mortality rates after adjusting for comorbidities and other postoperative complications. Several validated risk scores have been developed to predict the risk of patients developing AKI-D. However, the predictors of long term mortality of patients that survived till discharge from hospital have not been well studied. In this study, we aimed to determine the predictors of long term mortality of AKI patients that had a new need for dialysis after cardiac surgery.

Materials and methods

With institutional review board approval, we prospectively recruited 3008 patients who underwent cardiac surgery at the two main heart centers in Singapore between August 2008 and July 2012. Only patients who underwent coronary artery bypass graft (CABG), valve, and combined CABG and valve surgery were included. Perioperative safety and outcomes data were prospectively collected and entered into a cardiac anaesthesia database. The exclusion criteria was patients who were on renal replacement therapy prior to surgery. Post-operative AKI was defined using the Acute Kidney Injury Network criteria. The decision to initiate dialysis was based on the combined decision of the intensivist and the nephrologist. Information about the mortality of patients was obtained from the Singapore births and deaths registry.

Population demographic characteristics, medical history, preoperative risk assessment, intraoperative variables, and postoperative outcomes were analyzed descriptively. Univariate analyses were carried out by using two-tailed independent sample t test for numerical factors and chi-square test for categorical factors.

Results and discussion

Between 2008 and 2012, a total of 3008 patients underwent cardiac surgery on cardiopulmonary bypass. 46.3% were diabetic, 80.4% were male and the average euro score was 3.8 ± 5.3 . 56 AKI-requiring dialysis patients met the criteria for analysis.

The average Euro score for these patients was 9.9 ± 15.9 . Over a 4.4 ± 2.8 year follow up, the mortality rate was 37.5%. 28.6% died before discharge and 8.9% died after discharge. For those who died in-hospital, the length of hospitalisation was 31 ± 52 days. Factors predictive of mortality were: pre-existing congestive cardiac failure ($p = 0.044$), patients with acidosis ($p = 0.010$) and persistently low bicarbonate (20.5 ± 3.6 , $p = 0.004$) after the first session of dialysis and longer duration of inotrope use in the ICU ($p = 0.023$).

Variable	No mortality (n= 35)	Mortality (n= 21)	P value
Gender = Male	26 (74.3%)	15 (71.4%)	0.055
Age	61.1 (10.8)	63.4 (11.24)	0.431
BMI	27.0 (5.3)	24.4 (4.3)	0.049
Race			
Chinese	17 (48.6%)	9 (42.9%)	0.107
Malay	8 (22.9%)	10 (47.6%)	
Indian	10 (28.6%)	2 (9.5%)	
Indications for dialysis			
Acidosis	2 (5.7%)	7 (33.3%)	0.010
Low urine output	24 (68.6%)	9 (42.9%)	0.092
Hyperkalemia	13 (37.1%)	6 (28.6%)	0.572
Rising Cr/urea	12 (34.3%)	7 (33.3%)	1
HCO ₃ after 1 st session	23.7 (3.5)	20.5 (3.6)	0.004
Pre-operative congestive cardiac failure	14 (40)	9 (42.9)	0.044
Duration of post-operative inotrope use			
Up to 24h only	7 (20%)	3 (14.3%)	0.023
24-72h	12 (34.3%)	3 (14.3%)	
Over 72h	7 (20%)	13 (61.9%)	

Conclusions

We conclude from the study that pre-existing congestive cardiac failure, acidosis, persistently low bicarbonate and long duration of inotrope use are important predictors of mortality in patients with AKI-requiring dialysis. Aggressive management of acidosis remains one of the keys to preventing mortality in these high risk populations.

References:

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