

## Acute Kidney Injury following heart, lung and combined heart-lung transplantation

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### Introduction

Heart and lung transplantation provide definitive treatment for advanced heart failure and end-stage pulmonary disease respectively<sup>1</sup>. Pulmonary disease often co-exists with cardiac pathology, thus combined heart-lung transplantation is indicated in patients with dual-organ failure<sup>2</sup>.

Acute Kidney Injury (AKI) commonly occurs after solid organ transplantation and is reported to be associated with reduced graft and patient survival<sup>3</sup>. Nevertheless, there is wide variation in the reported incidence of AKI following heart, lung and combined heart-lung transplantation. AKI is reported to occur in 6.7 – 76% of patients, and AKI requiring some form of renal replacement therapy in 0.6 – 29%. In addition, few studies have investigated dialysis dependent AKI following heart, lung or heart-lung transplantation. We have evaluated the incidence of AKI, dialysis dependent AKI and renal recovery in a large cohort of heart, lung and heart-lung transplant recipients from a tertiary referral centre.

### Methods

We conducted a retrospective study, evaluating records of all patients that had a heart, lung or combined heart-lung transplant at a tertiary referral centre, between January 2010 and January 2020. Patients with end stage renal failure prior to transplantation were excluded. Data was extracted from the hospital's electronic patient records and anonymised. AKI stage was calculated using the NHS England AKI algorithm<sup>8</sup>, based upon the KDIGO definition of AKI<sup>9</sup>. Use of RRT in critical care was not evaluated. Inpatient ward based intermittent haemodialysis data was collected, along with renal outcomes at discharge and 3 months post discharge. Data analyses were carried out using Microsoft Excel, SPSS and GraphPad Prism.

### Results

A total of 416 patients received a heart, lung or combined heart-lung transplant in the period studied, out of which 412 patients met our inclusion criteria.

82% of the entire study group were noted to develop AKI post-transplant, 80% of heart transplant patients, 84% of lung transplant patients and 100% (n=8) of combined heart-lung transplant patients. 25% of patients developed AKI stage I, 30% AKI stage II and 28% AKI stage III. 9% (n=36) of patients did not recover from their AKI post Critical Care discharge and received at least 1 session of ward based intermittent haemodialysis (10% -21/233 heart transplant patients, 7% - 12/171 lung, 37.5% - 3/8 combined heart-lung transplant patients). Analysis of renal outcomes at hospital discharge and at 3 months post-discharge as well as predictors of AKI and dialysis dependent AKI is on-going.

### Discussion

Our findings demonstrate that AKI is an important complication of heart, lung and combined heart-lung transplantation. AKI in such cases is likely multi-factorial. Respiratory failure is common post heart and lung transplantation. This inflammatory response can contribute to cytokine mediated AKI and multi-organ failure<sup>5,6</sup>. Renal ischaemia is also compounded by haemodynamic instability, prolonged cardiopulmonary bypass runs during cardiothoracic surgery and the nephrotoxic effect of calcineurin inhibitors, diuretics, antibiotics and other drugs used in the post-operative period<sup>7</sup>.

Our study forms the largest UK based series investigating AKI following heart, lung and combined heart-lung transplantation and confirms that AKI as well as dialysis dependent AKI is a significant post-operative complication.