

# ANESTHESIOLOGY



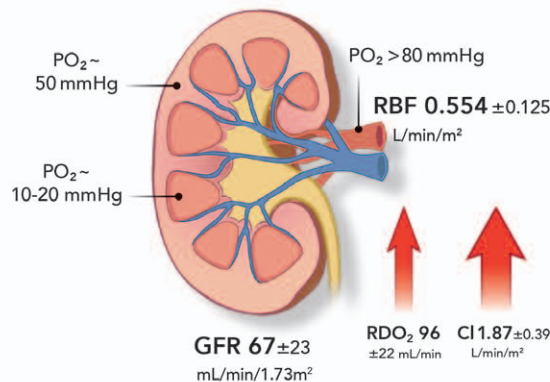
## Into Thin Air:

## Cardiopulmonary Bypass, Renal Oxygenation, & Acute Kidney Injury

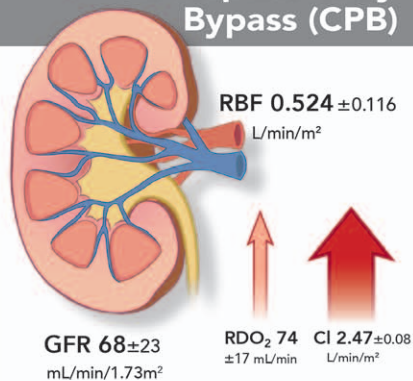
While AKI affects up to 30% of cardiac surgery patients, its etiology is not fully understood. A recent study<sup>1</sup> evaluated renal perfusion during cardiac surgery.

Physiologic low blood flow to the renal medulla maintains osmotic gradients, but results in baseline hypoxia.<sup>2</sup>

### Normal Physiology

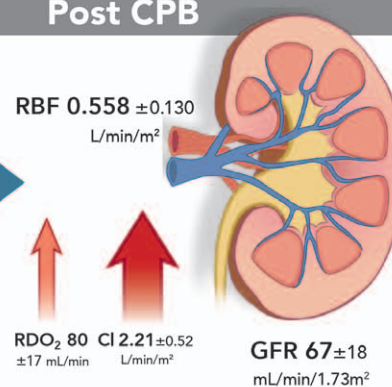


### Cardiopulmonary Bypass (CPB)



During CPB, systemic blood flow increases while renal blood flow is constant. Although renal function is maintained, hemodilution and vasoconstriction reduce renal oxygen delivery.

### Post CPB



After CPB, renal oxygen delivery remains low while oxygen extraction increases. This renal oxygenation impairment is accompanied by a 7x rise in urinary NAG, a tubular injury marker.

**CPB impairs renal oxygenation and is associated with a rise in a tubular injury marker.**

AKI = acute kidney injury; CI = cardiac index; CPB = cardiopulmonary bypass; GFR = glomerular filtration rate; NAG = N-acetyl- $\beta$ -d-glucosaminidase; RBF = renal blood flow; RDO<sub>2</sub> = renal oxygen delivery.

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1. Lannemyr L, Bragadottir G, Krumbholz V, Redfors B, Sellgren J, Ricksten S-E. Effects of cardiopulmonary bypass on renal perfusion, filtration, and oxygenation in patients undergoing cardiac surgery. *ANESTHESIOLOGY* 2017;126:205-13

2. Brezis M, Rosen S. Hypoxia of the renal medulla—its implications for disease. *N Engl J Med* 1995; 332:647-55