



**The Effect of Influenza Vaccination on the Systemic Inflammatory Response and Myocardial Protection in Patients Undergoing Cardiac Surgery: a Randomized Controlled Trial**

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**ABSTRACT:**

**Introduction:** Despite improvement in cardioprotective strategies, myocardial dysfunction after cardiac surgery remains an ongoing problem. Cardiac surgery with cardiopulmonary bypass (CPB) induces an acute inflammatory reaction that is associated with postoperative complications.

**Hypothesis:** Studies have shown an association between influenza and an increase in the proinflammatory reaction. Furthermore, influenza vaccination in patients with coronary disease has been associated with a decrease in cardiovascular morbidity. Interestingly, some of this association has been attributed to possible anti-inflammatory properties of the vaccine. Therefore, we hypothesize that influenza vaccination would attenuate the inflammatory reaction after CPB.

**Methods:** This is a prospective, double-blind trial of 30 patients who presented for cardiac surgery and were randomized to receive the influenza vaccine (group 1, N=15) or a placebo (group 2, N=15) preoperatively. Blood samples of proinflammatory markers (TNF $\alpha$ , IL-8, IL-6) as well as anti-inflammatory cytokines (IL-10) were collected at different time points intraoperatively as well as postoperatively. Assessment of myocardial protection was investigated by measuring hemodynamic and echocardiographic data as well as lactate and troponin levels. Other clinical outcomes were collected prospectively.

**Results:** Patients in both groups had similar preoperative characteristics. There were significantly lower levels of proinflammatory markers such as IL-8 (65.03 vs 118.56 pg/mL,  $p < 0.03$ ), and TNF $\alpha$  (12.05 vs 20.8 pg/mL,  $p < 0.05$ ) in group 1. Interestingly, the level of the anti-inflammatory cytokine IL-10 was significantly higher in group 1 (83.3 vs 15.15 pg/mL,  $p < 0.01$ ). This difference persisted for 24 hours postoperatively. There was also a clear trend of improved myocardial protection in group 1 as seen by a decreased troponin levels (6.02 vs 12.1 ng/mL,  $p < 0.03$ ).

**Conclusions:** Influenza vaccination blunts the inflammatory reaction seen following CPB as reflected by a decrease level of proinflammatory markers IL-8, TNF $\alpha$  and an increase level of the anti-inflammatory cytokine IL-10. There was also a trend towards an improved myocardial protection and early metabolic recovery in group 1.