

PW4-4

Going down, going slow - Esmolol as potent myocardial protector in rescue cardiac extracorporeal membrane oxygenation (ECMO)

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Introduction: Cardiac failure or arrest post elective cardiac surgery in neonates and children are rare events. However their occurrence during a highly vulnerable period of myocardial recovery imply immediate expert support by specialized intensive care unit staff. Most of the time ECMO has to be initiated. Timing and efficiency of resuscitation as well as duration of cannulation for ECMO are crucial for the survival of affected patients. Equally important are subsequent cardiovascular management of those patients to optimize myocardial recovery. Beside volume unloading by ECMO to prevent excessive myocardial stretch, optimal coronary perfusion has to be maintained to protect cardiomyocytes from oxidative stress and acute cell death. Recently it could be shown that beta blockers combine cardioprotective mechanisms not only by improving myocardial relaxation and simultaneously coronary perfusion but also by increasing antioxidative activity (glutathione peroxidase, superoxide dismutase).

Methods: Patients (n=6) requiring rescue ECMO post elective cardiac surgery due to acute heart failure or sudden cardiac arrest were started on Esmolol infusion as soon as stabilized. Complete cardiac unloading was achieved by full flow ECMO (≥ 150 ml/kg/min). Serial transthoracic echocardiography was performed to assess myocardial contractility and cardiac unloading.

Results: 6 patients (2 male, 4 female), age 2.2 ± 4.1 y with single ventricle physiology (n=3), complex cyanotic heart disease (n=2), coronary anomaly (n=1). All patients demonstrated myocardial stunning. ECMO duration 8.8 ± 1.9 days, maximum dose Esmolol 106.7 ± 50.1 μ g/kg/min, maximum heart rate (HR) prior to Esmolol 168.3 ± 11.7 beats per minute (bpm), maximum heart rate during Esmolol infusion 73.3 ± 8.2 bpm, fractional shortening (FS) prior to Esmolol 9.2 ± 4.9 %, FS post Esmolol 33.3 ± 7.5 %. Weaning of ECMO was successful in 4 patients. 2 patients died on ECMO due to neurological issues.

Conclusions: In this small pilot study without case control, all patients showed significant improvement in myocardial contractility. Esmolol appears to provide cardioprotection for pediatric patients post cardiac failure / arrest requiring ECMO due to stunning myocardium. We speculate that its combined potential antioxidative effect may further support recovery of the affected myocytes by increased activity of glutathione peroxidase and superoxide dismutase.