

Esmolol as an Adjuvant to Traditional Cardioplegia
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Background

Advancements in surgical technique have largely reduced the risks associated with cardiac surgery, however, relatively high morbidity and mortality rates persist due to postoperative complications. As a result, various myocardial protection strategies have emerged to address these complications which commonly include: ischemia-reperfusion (IR) injury, ventricular fibrillation and myocardial dysfunction. Based on the available literature, this review attempted to determine whether the perioperative administration of the short-acting beta-1-adrenergic receptor blocker, esmolol, is capable of attenuating these unfavourable postoperative side-effects.

Methods

Articles were analyzed and selected based on their criteria for patient selection, myocardial protection strategies, means of esmolol administration and primary outcome parameters.

Results

Patients receiving esmolol as an additive to hyperkalemic cardioplegia solutions presented with significantly reduced serum cardiac troponin levels both peri- and postoperatively. Consequently, esmolol's negative inotropic properties further suppress myocardial oxygen consumption, thus attenuating the oxygen supply-demand mismatch and preventing IR injury as well as cardiomyocyte death. Moreover, when administered prior to cross-clamp removal, esmolol was found to increase the incidence of auto re-beat while decreasing the likelihood of ventricular arrhythmias. Lastly, the post-operative preload recruitable stroke work (PRSW) relationship in patients receiving esmolol was consistently significantly higher, indicating a superior preservation of left ventricular contractility. While significant clinical improvements have been noted in some studies, little impacts have been seen in others.

Conclusion

Esmolol is a safe adjuvant to traditional cardioplegia that does not impart any lasting negative hemodynamic impacts. The aforementioned inconsistent clinical outcomes seen among studies is likely caused by the timing of esmolol administration; due to its ultra-short half-life of 9 minutes, timing is crucial. Therefore, future work correlating beneficial clinical outcomes to the timing of perioperative esmolol administration is needed.