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Isoflurane and Propofol Synergy in Reducing Myocardial Ischemia-Reperfusion Injury in Patients

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Objective: Heart-type fatty acid binding protein (hFABP) has been shown to be a rapid marker of perioperative myocardial damage and peaks earlier than creatine kinase MB (CKMB) and troponin I (TnI) during coronary bypass surgery [1] . Either isoflurane preconditioning or high dose propofol treatment has been shown to attenuate myocardial ischemia-reperfusion injury in patients undergoing coronary artery bypass grafting (CABG) surgery. We hypothesized that joint isoflurane preconditioning and propofol treatment should synergistically attenuate myocardial injury in patients undergoing CABG surgery using cardiopulmonary bypass (CPB) during early phase of myocardial reperfusion.

Methods: 120 patients selected for CABG surgery were randomly assigned to one of the four groups (n=30 each). After the induction, anesthesia was maintained either with fentanyl and midazolam in control group (Control); or with propofol at 100 mg/kg/min before and during CPB followed by propofol 60 mg/kg/min 15 min after aortic declamping (group-P); or an inspired concentration of isoflurane 1%-1.5% throughout the surgery (Group-I) or an inspired concentration of isoflurane 1%-1.5% before CPB and switched to propofol at 100 mg/kg/min during CPB followed by propofol 60 mg/kg/min 15 min after aortic declamping (Group-IP). Statistical evaluation of patients' files and perioperative data was performed by unpaired Student's *t* -test or Chi-square test when appropriate. Between-groups and within-group differences of bio-assay data were analyzed using two-way analysis of variance with repeated measures and Bonferroni corrections.

Results: The duration of aortic cross-clamping and CPB as well as patient characteristics did not differ statistically among groups. Plasma levels of hFABP, TnI and CKMB all increased significantly after aortic declamping relative to baseline ($P<0.01$), and peaked at 1 h, 4 h and 12 h, respectively, after CPB. The level of hFABP at 1 h after CPB in the Group-IP, but not in the Group-I or Group-P was lower than that in the control group ($P<0.05$). Troponin I was lower at 24 h after CPB in group-P and group-I compared with control group ($P < 0.05$) and was further reduced in Group-IP ($P<0.05$ vs. Group-I or Group-P). At 24 h after CPB, CKMB levels in the Group-IP, Group-I and Group-P were respectively lower than in the control group ($P<0.05$), but CKMB levels did not differ significantly among the three treatment groups. In addition, time to extubation and the duration of intensive care unit stay were shorter in group-IP than in groups P and I ($P<0.05$) or control group ($P<0.01$).

Conclusion: It is concluded that the joint isoflurane and propofol anesthesia regimen synergistically attenuated myocardial injury during early phase of reperfusion in patients undergoing CABG surgery using CPB and that hFABP appears to be a sensitive early marker of myocardial damage which can well predict the relative effectiveness of different cardioprotective regimens during cardiac surgery.

Reference:

1. Petzold T. et al. Eur J Cardiothorac Surg 2001;19:859-864.

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