

Use of Intra-Aortic Balloon Pump During Coronary Artery Bypass Graft Surgery. Current Questions and Few Answers.

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Abstract

The intra-aortic balloon pump (IABP) is used to prevent complications after coronary artery bypass grafting (CABG) surgery; although some results are controversial nowadays even contradictory. A new article on this field is published in this edition and shows that the risk factors for in-hospital mortality are the preoperative plasma creatinine level and cardiopulmonary bypass time in 177 patients. About the prophylactic use of the IABP regarding mortality the results reflected so far in meta-analyses have been highly contradictory between them, and the risk factors associated with it have been several and different. This lack of evidence has resulted in the continued variation of IABP use in these procedures. A large, multicenter RCT is certainly required to take the next step towards more definitive evidence, either for or against, the use of IABP in high-risk CABG. Until then, the unanswered questions regarding this topic will remain.

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Patients undergoing a coronary artery bypass grafting (CABG) surgery with comorbidities are considered high-risk patients (1–4). The intra-aortic balloon pump (IABP) has been widely used to improve coronary perfusion and prevent complications in CABG (5–7). Some recent randomized controlled trials (RCTs) have suggested that IABP insertion does not improve the ventricular function and does not reduce complications in patients with cardiogenic shock after acute myocardial infarction (AMI) (8), preoperative IABP use may

prevent complications in high-risk patients undergoing CABG (9–12). A recent meta-analysis suggested that preoperative IABP use is associated with mortality reduction (11), but these findings were mainly derived from small RCTs.

A new article on this field is published in this edition of Journal of Cardiac Surgery and shows that the risk factors for in-hospital mortality were reoperation (OR=5.07, 95% CI:1.17-21.9, p=0.03), preoperative plasma creatinine (OR=3.2, 95% CI: 1.23-8.75, p=0.01), CPB time (OR=1.01, 95% CI: 1.00-1.03, p=0.02) and AKI (OR=46.6, 95% CI: 5.67-383.3). On the other hand, the multivariable logistic regression analysis shown that the risk factors for in-hospital mortality were preoperative plasma creatinine and CABG time, OR=5.74 and OR=1.02, respectively (p<0.05). All this data consistent with another previous studies (11, 12, 14) thus deserving special attention.

There is still no consensus on the ideal time of insertion, since the preoperative (prophylactic) insertion of IABP in the high risk patients CABG was reported by many studies and the results showed that complications and mortality rate were similar with intraoperative IABP insertion (11, 15-17) as in this novel study only including intraoperative IABP patients (13). Despite the existing information, the proper use of ventricular support in CABG is still controversial. As will be seen later, articles endorse its preoperative use and in other studies its intraoperative use. Obtaining contradictory results in both circumstances.

Regarding secondary endpoints, the study of Samadi et al shows that patients with LVEF [?]35% had longer in-hospital length of stay (LOS) compared to patients with LVEF >50% (median [IQR] 10 [8-13] days and 8 [7-10] days respectively [p=0.04]), already seen in previous reports (9, 11, 14, 18). This outcome may be explained by the time required for accomplish the IABP weaning as well as the time for recovery after operation, a feature observed in almost all similar studies, thus giving an external validation to the results obtained in the study.

Some strengths that characterize the study by Samadi et al, and that current and future studies evaluating the effect of IABP must have, include the selection process with all patients individually assessed by a Heart Team (Clinicians included cardiac anesthesiologists, cardiac surgeons, intensivists, and cardiologists). Also, the use of contemporary techniques and medical management based on the latest coronary revascularization guidelines (19, 20); as well as the comprehensive follow up of data regarding IABP management and weaning protocol, which provides external validation to the results.

Referring to "big data", due to the high variability of definitions and the heterogeneity of the methods and postoperative management, the results reflected so far in meta-analyses have been highly contradictory between them (9, 18). Being this one more reason to generate homogenization in future studies evaluating the use of IABP or another ventricular support device in CABG procedures. It would be desirable the use of a standard definition of cardiovascular risk, since criteria for high-risk cardiac surgery vary between reported studies. For example, low LVEF may be considered as <35% or <40%; as well as "significant" left main occlusion, which has not been well defined and some studies consider >50% or >70% occlusion; or the inclusion of previous CABG as relevant risk factor and a defined cutoff value for "higher" EuroSCORE (22-24).

Many experts do not continue to acknowledge the potential utility of IABP use. An international consensus conference on mortality reduction in cardiac anesthesia and intensive care has recently published a consensus in this topic (25). Recognizing that there is a lack of general agreement regarding which nonsurgical interventions can reduce mortality in cardiac surgery, the authors sought to address this issue with a consensus-based approach identifying 11 nonsurgical interventions with possible survival implications for patients undergoing cardiac surgery, the prophylactic IABP placement as one of these interventions, suggesting its use in high-risk patients undergoing CABG might reduce mortality.

In conclusion, it is very clear that there remains a significant lack of true evidence related to the topic of preoperative or intraoperative IABP use for high-risk CABG patients that can only be resolved with a definitive RCT. This lack of evidence has resulted in the continued variation of IABP use in these procedures. A large, multicenter RCT is certainly required to take the next step towards more definitive evidence, either

for or against, the use of IABP in high-risk CABG. Until then, the unanswered questions regarding this topic will remain.

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