Journal of Anesthesia & Clinical Research

Belletti, et al., J Anesth Clin Res 2016, 7:5
DOI: 10.4172/2155-6148.1000624

Short Communication Open Access

When to Start and Stop the Inotropic Drugs in Cardiac Surgery?

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Received date: April 18, 2016; **Accepted date:** May 18, 2016; **Published date:** May 26, 2016

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All cardiac anesthesiologist are familiar with inotropes and vasopressors, as patients undergoing cardiac surgery frequently require administration of these drugs during the perioperative period. Surgery of the heart can now be conducted without cardioplegia and cardiopulmonary bypass (CPB), and even percutaneously (e.g. transcatheter aortic valve implantation-TAVI), patients have by definition a pre-operative severe cardiac disease, which increases the risk of post-operative hemodynamic instability. Ventricular function declines in the first hours following cardiac surgery in almost every patient, regardless of type of operation [1], not to mention the critical phase of weaning from CPB. Therefore, cardiac anesthesiologists must often balance the need for maintaining adequate cardiac output (CO) and organ perfusion to achieve successful CPB weaning and help the patient overcoming first few hours of post-operative period, with the well-described side effects of currently available inotropes and vasopressors [1]. Of note, side effects of inotropes and vasoconstrictors include development of tachyarrhythmias and increased myocardial oxygen consumption, which might become particularly relevant in patients with an already compromised myocardial function.

Despite being so widely used, several surveys and studies highlighted a large inter- and intra-center variability in use of inotropes in adult and pediatric cardiac surgery, both in frequency of administration and in choice of first-line agents [2-4]. Furthermore, observational studies have suggested that inotropes use may increase mortality, although this finding does not seem to find confirmation in randomized clinical trials (RCTs) [5].

In such a context, implementation of evidence-based recommendations may be of great help for physicians and improve outcome, as occurred after the development of Surviving Sepsis Campaign guidelines [6].

Unfortunately, available evidence on inotropes use after cardiac surgery is weak [7]. Although a consistent number of RCTs have been performed, only few were adequately designed to investigate clinically relevant outcomes, such as mortality [7], even though the call for high-quality evidence dates back to the late '80s [7].

Furthermore, post-operative pathophysiology might be very different between patients depending on the pre-operative cardiac disease. For example, variation in heart rate and rhythmus, preload, afterload or ventricular compliance may be very differently tolerated if the heart was chronically ischemic, pressure-overloaded or volume-overloaded, and management should vary accordingly, thus making development of guidelines and design of RCTs particularly difficult. An objective quantification of inotropic support may thus be of help both for clinicians and researchers, allowing stratification of disease severity and prognosis. The Vasoactive-Inotropic Score (VIS) currently derived and validated only for pediatric cardiac surgery [8], is a simple tool which could be more extensively applied also to adult patients.

Timing of initiation and suspension of inotropes and vasopressors is also critical, as an unnecessary administration exposes the patient to side effects without providing benefits, while waiting too long before initiating hemodynamic support may lead to end-organ damage. Therefore, accurate and comprehensive monitoring of hemodynamic parameters and perfusion indices has a pivotal role. Is thus not surprising that also in this setting goal-directed perioperative hemodynamic optimization showed promising results [9], although the efficacy of standardized protocols in intensive care unit (ICU), particularly concerning hemodynamic management, is a matter of debate [9]. It is worth noting that, while several studies addressed the question of when to start inotropic treatment, nobody focused on determining when treatment has been successful and is appropriate to interrupt vasoactive administration.

Besides pharmacologic support, perioperative hemodynamic management include also optimization of volume status and pacing, transfusion and, if necessary, institution of mechanical circulatory support (which can range from intra-aortic balloon pump [IABP] to full cardiopulmonary support with extra-corporeal membrane oxygenation [ECMO]). Unfortunately, all of these issues are subject to controversies and debate (perioperative fluid administration is a clear example).

However, despite all these limitations, guidelines on post-operative intensive care management of cardiac surgery patients have been developed in Germany and have been helpful in changing clinical practice [10].

We believe that recommendations from world-renowned experts, based on available evidence, should be developed for perioperative hemodynamic management of cardiac surgery patients.

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