Anaesth Crit Care Pain Med 38 (2019) 669–670

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Letter to the Editor

Immediate haemodynamic impact response to a mini-fluid challenge is independent of fluid type: A post-hoc analysis of a randomised double blinded controlled trial

To the Editor

We recently published a bi-centre randomised double-blinded controlled trial that investigated the impact of the type of fluid (balanced crystalloid versus balanced colloid solution) on postoperative outcome following elective major open abdominal surgery [1]. When using a closed-loop assisted goal-directed fluid strategy, patients receiving colloid boluses developed fewer postoperative complications when compared to patients who received crystalloids. The observed beneficial effect has been attributed to a significantly lower net fluid balance in the colloid group in relation to a lower amount study fluid volume received during the surgery. Indeed, patients in the crystalloid group received (median [interquartile]) 4 [2.6 to 6.2] mL/kg/h of mini-fluid challenges compared to 2.9 [1.9 to 3.9] for patients in the colloid group (ratio: 1.37). The originality of the study consisted in the use of an automated closed-loop fluid delivery system to eliminate the clinician-related bias when determining when to deliver fluid boluses. We present here a post-hoc analysis of the main trial comparing the immediate hemodynamic (first 6 minutes) response to 100-mL fluid boluses (mini-fluid challenge) of either a balanced crystalloid (Plasmalyte, Baxter, Belgium) or a balanced colloid (Volulyte, Fresenius Kabi, Bad Homburg, Germany) solution.

Ethic Committee approval and written patient consent were obtained prior to deidentification of the hemodynamic data and collaboration with Edwards Lifesciences (Irvine, California, USA) for further post-hoc analysis. As the pump used for this study (QCore, Netaya, Israel) delivered fluid at a maximum rate of 999 mL/h, all mini-fluid challenges of either study fluids were consistently infused over a 6 minutes period. The percent change in stroke volume (DSV) following each 100-mL bolus was tabulated and cross-referenced to the type of fluid. A responder was defined as a DSV $\geq$ 5% [2]. The responder rate and the DSV cumulative distribution function (CDF) were determined for each type of fluid administered. The mean DSV was compared between the two fluids using a student *t*-test.

From the 160 patients reported in the main trial [1], 119 were used in the present analysis (57 for the crystalloid group and 62 for the colloid group). Forty-one patients declined to share their de-identified hemodynamic data with Edwards Life Sciences for this post-hoc analysis. The CDFs are plotted in Fig. 1. More crystalloid boluses were administered during the study (873 crystalloid boluses vs. 578 colloid boluses). In both groups, the responder rate was around 50% (49% in the crystalloid group vs. 51% in the colloid group). Median and [25th to 75th percentiles] for DSV was not significantly different between groups [5.1% (−1.0 to 11.5%) in the crystalloid group vs. 5.7% (−0.7 to 12.3%) in the colloid group; P = 0.57).

We can therefore conclude that responder rates and CDFs were not significantly different between the two types of fluids, suggesting that the immediate haemodynamic response to 100-ml fluid boluses is independent from the fluid type. These results are in accordance with those of Müller et al and Biais et al who demonstrated that 100 mL fluid boluses of either a colloid or a crystalloid are able to predict fluid responsiveness in critically ill and surgical patients [2,3]. The lower number of boluses required to achieve the targeted haemodynamic endpoints in the colloid group compared to the crystalloid group might therefore be related to the longer intravascular persistence of the colloid solution. Of note, in this "volume-loading model" the ratio colloid/crystalloid is in accordance with the ratio observed in previous studies comparing both solutions during fluid resuscitation in critically ill patients [4,5].

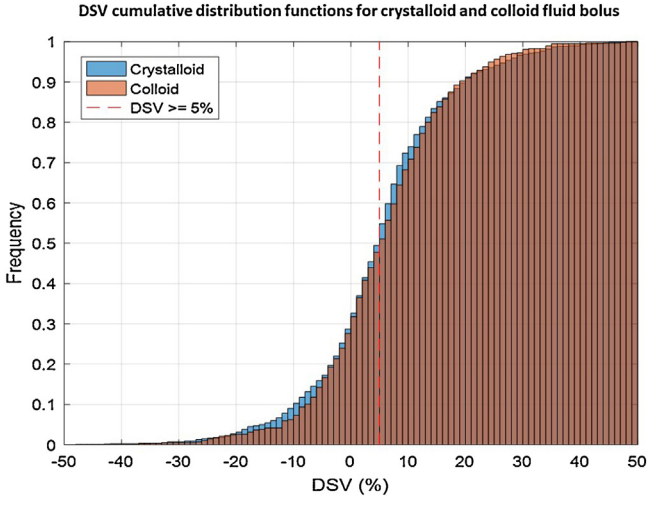

Fig. 1. DSV cumulative distribution functions for crystalloid and colloid fluid bolus.

https://doi.org/10.1016/j.accpm.2018.10.017

Funding

No funding

Disclosure of interest

Alexandre Joosten is a consultant for Edwards LifeSciences (Irvine, California, USA). Philippe Van der Linden has received, within the past 5 years, fees for lectures and consultancies from Fresenius Kabi GmbH, Laboratoire Aguettan, France and Nordic Pharma, Belgium.
Joseph Rinehart: Ownership interest in Sironis, a company developing closed-loop systems; Consulting for Edwards Lifesciences (Irvine, California, USA).
The other authors declare that they have no competing interest.

Acknowledgement

Not applicable

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Available online 18 December 2018