arterial return during cardiopulmonary bypass. Yet, the aim of our study was exclusively the comparison of right- and left-sided unilateral cerebral perfusion (UCP) for efficiency of cerebral protection rather than the suitability of a particular carotid artery for arterial return. The assessment of pressure in the left radial artery is of utmost importance in UCP, regardless if right- or left-sided perfusion is performed, because it reveals the efficiency of collateral pathways. As explained elaborately in the paper, our monitoring tools include therefore, amongst others, pressure measurement in both radial arteries.

Nevertheless, the monitoring of the arterial return should not rely on the measurement of the pressure in the right radial artery alone, even if the right carotid or right axillary artery is cannulated with a side-graft, because the pressure is always higher on the directly perfused side. Cannulating the innominate artery that is very close to the aortic arch is surely the best haemodynamic, but for anatomo-pathological reasons, a rare option.

Secondly, Kestelli et al. suggest, even without the support of any haemodynamic data, that the right carotid artery is a better approach for arterial return than the left carotid artery. This is in accordance with our study in which specific flow and pressure characteristics were examined during cardiopulmonary bypass [3]. This study was published elsewhere in 2010 and mentioned in our paper as reference number 23, leading to the conclusion that ‘we consider the right-sided cerebral perfusion as the standard, especially because the right carotid artery and the innominate artery are more suitable for cannulation than the left carotid artery’. We hope that this statement as well as the referenced study will be clear to attentive readers.

REFERENCES


LETTER TO THE EDITOR

Is it time to draw such a conclusion concerning the use of washed donor blood during paediatric cardiopulmonary bypass?

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Received 3 November 2011; accepted 15 November 2011

Keywords: Washed donor blood • Cardiopulmonary bypass • Paediatric

We read with great interest the recent retrospective series by Boks et al. [1]. The authors concluded that cell saver washing of packed red blood cells (RBCs) does not help prevent hyperkalemia and hyperlactaemia during paediatric cardiopulmonary bypass (CPB) procedure. Consequently, they did not recommend routinely using this technique during paediatric CPB. However, there are some controversial issues concerning the use of washed RBCs during paediatric CPB: Swindell et al. [2] concluded that cell saver washing of packed RBCs helps prevent hyperkalemia during CPB but does not prevent hyperlactaemia in paediatric patients; Liu et al. [3] concluded that the levels of potassium, blood glucose and lactate were significantly lower than in the unprocessed group at the beginning and end of CPB.

Currently, although smaller circuits and oxygenators have been used for small children and neonates, it is difficult to avoid using donor blood during CPB. Moreover, packed RBCs are an essential part of the CPB priming solution to maintain sufficient oxygen supply in small children and neonates. The storage media in packed RBCs may cause significant acid-base, glucose and electrolyte imbalances, which have been implicated in the development of severe complications [4]. For providing better priming for paediatric patients, many measures have been implemented pre-CPB, such as cell saver and ultrafiltration. In the Boks et al. study, they did not find any benefit in using cell saver to process packed RBCs during CPB. They also suggested that an estimated addition of unwashed RBCs might increase the lactate, K+ and other measurable variables above acceptable levels. If not, however, pre-washing should not be applied under such specific CPB circumstances.

We do not agree with Boks’ opinions. First, their conclusion was based on a retrospective study. Furthermore, they did not compare the results between the two groups regarding post-operative pulmonary function since another recent study [5] reported that washed blood transfusions in cardiac surgery...
reduced inflammatory biomarkers and may have an impact on post-operative pulmonary function. Consequently, it seems too early to draw such a conclusion based solely on this retrospective study. We think this issue is still under debate and requires a larger number of patients for further clinical investigation to prove whether paediatric patients are benefited by this clinical practice during paediatric CPB.

REFERENCES


LETTER TO THE EDITOR RESPONSE

Reply to Ji et al.


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Received 10 November 2011; accepted 15 November 2011

Keywords: Infant and neonatal cardiopulmonary bypass • Washed red blood cells • Prime composition

The authors thank Dr Ji and his co-workers for their interest in and comments on our work [1, 2]. Their remarks confirm that prewashing of red blood cells (RBCs) in cardiopulmonary bypass is an important issue that remains controversial.

In his study published in 2003, Kaidan concluded that the significantly higher concentration of potassium and lactate and lower pH in old stored RBCs have only a minimal effect on the final constitution of priming solution before and during paediatric cardiopulmonary bypass [3]. He used on average 280 ± 50 ml of RBCs in the priming as his circuit was based upon the Cobe VPCML oxygenator. On the other hand, Swindell et al. [4] established that the washing of irradiated RBCs reduces potassium and lactate loads and prevents hyperkalaemia during cardiopulmonary bypass. During the study, the control group received 1 unit of unwashed RBCs in the prime and the addition of unwashed product during bypass, in contrast the study group received 2 units of prewashed product in the prime. Unfortunately, Swindell did not present any information about the exact volume of RBCs used during the study period. The miniaturization of neonatal and infant cardiopulmonary bypass circuit that was achieved recently in our institution consequently led to the reduction of allogeneic blood product use during the cardiopulmonary bypass [5]. Therefore, we were evaluating the efficacy of the prewashing of irradiated RBCs under those new specific conditions. We did not find it appropriate to perform a prospective randomized study on this subject as it had been already validated by others [3, 4]. The inflammatory biomarkers reduction caused by the prewashing [6] was not the focus of our audit. Cholette et al. found that washed blood transfusions in cardiac surgery reduced inflammatory biomarkers, number of transfusions, donor exposures and were associated with no significant trend towards reduced mortality, independently of the duration of blood product storage. Still, their results were measured at 12 h after cardiopulmonary bypass in a study population of children aged from newborn to 17 years old. We agree with Ji that this specific issue related to the prewashing of RBCs should be studied separately in the neonatal population.

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