Study Demonstrates That Low Prime Volume Oxygenator Significantly Reduces Hemodilution

A recent study published in Perfusion — "Effects of Priming Volume Reduction on Allogeneic Red Blood Cell Transfusions and Renal Outcome After Heart Surgery" — confirms the beneficial effects of reducing circuit prime volume to reduce hemodilution during CPB.

The study was led by Marco Ranucci, M.D., Director of Clinical Research of the Department of Anesthesia and Intensive Care at IRCCS Policlinico San Donato Hospital in Milan, Italy.

In this retrospective study of 1,724 adult patients receiving heart surgery utilizing CPB, (N=383) patients were assigned to a low prime volume oxygenator (LPVO) while (N=1341) patients were assigned to a conventional oxygenator.

Dynamic priming volume, hematocrit levels, RBC transfusions, and acute kidney injury (AKI) were compared between groups. Priming volume was significantly (p=0.001) lower in the LPVO group (624 ±113 ml) vs. the conventional group (775 ±150 ml). In the LPVO group, 139 patients (36.3%) received RBC transfusions vs. 535 (40%) in the conventional group. In the LPVO group, 16 (4.2%) patients had a postoperative AKI vs. 94 (7.1%) in the conventional group (P=0.043).

It is well known, with a high level of evidence (Class 1 a), that excessive hemodilution during CPB leads to an increased incidence of red blood cell (RBC) transfusion.

This study demonstrated that using a low prime volume oxygenator significantly reduces hemodilution during CPB, and that limiting the degree of hemodilution resulted in fewer patients requiring RBC transfusions, and a lower number of patients suffering from postoperative AKI.

An additional implication of this study stated by the authors is the impact of incremental reductions in prime volume on transfusion rates and AKI.

The prime volume in the LPVO group was approximately 150 mL less than the conventional group, which represents a 20 percent reduction in priming volume. Even a 20 percent reduction in prime volume showed significant clinical benefits, including containment of transfusion needs, and confirmation of the link between hemodilution during CPB and adverse renal outcomes.

This study strongly supports Terumo's Prescriptive Oxygenation™ approach and its benefits. In this same study, if the clinical team had substituted Terumo's LPVO — the CAPIOX® FX15 Oxygenator — for Sorin's Inspire® 6 Oxygenator, the prime volume could have been reduced an additional 140 mL, making it 38 percent less than the conventional circuit — and reducing hemodilution further. This information affirms the role of limiting the reduction of hemodilution during CPB.

Reference

Ranucci, et al. Effects of Priming Volume Reduction on Allogeneic Red Blood Cell Transfusions and Renal Outcome After Heart Surgery. Perfusion. 2015. 30(2):120-126.

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