LIR™ CLOSED-LOOP FLUID ADMINISTRATION DURING VASCULAR SURGERY

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Background: The recent availability of clinical monitors which include dynamic predictors of fluid responsiveness and cardiac output have made closed-loop fluid administration in the operating room practical. We have previously published simulation studies on the LIR closed-loop fluid administration system [1, 2], and engineering and animal study results are currently in review by journals. In this five-patient case series, the closed-loop controller was used to deliver fluid for patients having aorto-bifemoral bypass surgery.

Methods: This study was conducted between May 21st 2012 and May 25th 2012. Institutional Review Board approval was obtained in April 2012 (CPP VI, Paris, France). All patients presented in this report gave written and informed consent. We studied five patients (3 male, 2 female) aged 69 ± 8 years (from 62 to 85 years old). All patients received a 5 ml.kg⁻¹.h⁻¹ crystalloid infusion throughout the case. Colloid (Voluven – Fresenius-Kabi, Bad Homburg, Germany) was delivered by the LIR™ closed-loop system via Q-Core Sapphire infusion pump (Q-Core, Tel Aviv, Israel), using data from a LiDCO-Rapid monitor (LiDCO Ltd, London, UK).

Results: Estimated blood loss was 1,000 ± 300 ml (from 600 ml to 1500 ml) and urine output was 480 ± 310 ml (1.3 ± 0.7 ml.kg⁻¹.h⁻¹). Total crystalloid administration was 2,280 ± 870 ml (6.8 ± 1.4 ml.kg⁻¹.h⁻¹), total colloid administration was 990 ± 360 ml (2.6 ± 1.5 ml.kg⁻¹.h⁻¹), cell saver transfusion was 680 ± 490 ml and banked red blood cell administration was 810 ± 300 ml (three patients received banked blood). Starting hemoglobin value was 12.0 ± 1.2 g.dl⁻¹ and the minimum hemoglobin value recorded during a case was 9.2 ± 1.3 g.dl⁻¹. Each patient received 9 ± 2 boluses of 100ml of colloid. All patients were extubated in the operating room, and no significant post-operative complications, 90 day readmission, or mortalities were observed.

Conclusion: The LIR™ closed-loop fluid administration system is capable of intraoperative fluid administration and stroke volume optimization. The system tolerated hemodynamic noise and other clinical variability well.