

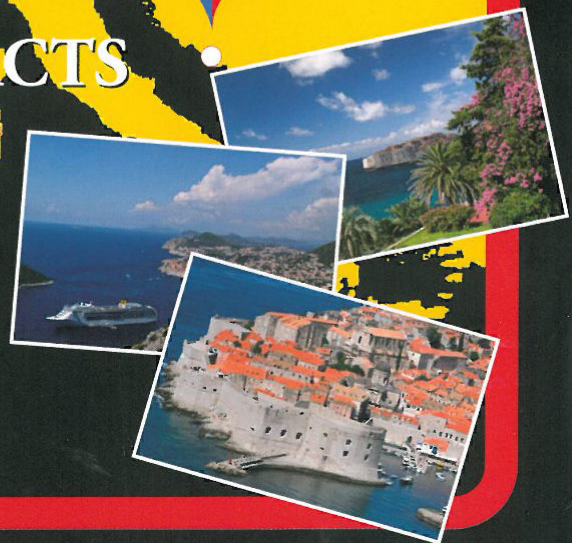


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• ABSTRACTS •



4. *Evaluation of the effectiveness of a lipid and leukocyte removing filter during cardiopulmonary bypass, and its influence on clinical outcome: preliminary results of a prospective randomized study*

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Background

Despite continuous improvements in cardiopulmonary bypass (CPB), postoperative organ injury remains a potential complication of cardiac surgery. CPB is unavoidably associated with a systemic inflammatory response, which involves activation of plasma proteins and cells, and with an ubiquitous embolic phenomenon. The liquid fat in pericardial suction blood is a potential major source of lipid emboli and together with activation of leukocytes, in particular neutrophils, directly contributes to tissue and organ injury. The use of lipid and leukocyte removing filters may be an interesting strategy to decrease morbidity and mortality. We designed a prospective randomized study to evaluate the effectiveness of an oxygenator with patented integrated lipid and leukocyte removing filter, and its influence on clinical outcome of patients.

Methods

The patients undergoing on-pump cardiac surgery procedures were randomized in two groups: in Group I (n = 12) an oxygenator with integrated lipid and leukocyte removing filter (RemoweLL, EUROSETS™), and in Group II (n = 12) a standard oxygenator without specific filter (Admiral, EUROSETS™) was employed. We evaluated the effectiveness of the RemoweLL in removing lipid particles and depleting leukocytes during CPB, taking blood samples before and after filtration. Moreover, we investigated the inflammatory response analysing TNF- α , IL-6 and C3, and organ injury analysing acute damage markers: neuron-specific enolase (NSE) for brain injury, MB-creatine phosphokinase (MB-CK) and cardiac troponin-I (cTNI) for myocardial injury, alveolar-arterial oxygen tension gradient (P(A-a)O₂) and PaO₂/FIO₂ ratio for lung injury, serum creatinine and neutrophil gelatinase-associated lipocalin (NGAL) for acute kidney injury, aspartate aminotransferase (AST) and alanine aminotransferase (ALT) for liver injury. Therefore, we evaluated in-hospital mortality and length of Intensive Care Unit (ICU) stay and postoperative hospitalization.

Results

Both groups were similar with respect to demographic characteristics and intraoperative variables. No death was observed in both groups, and there was no difference either in postoperative hospital stay (5.2 ± 2.5 days in Group I vs. 5.4 ± 1.4 days in Group II, $p = \text{NS}$), or in major postoperative complications between the two groups, except atrial fibrillation (25% in Group I vs. 42% in Group II, $p < 0.05$). After filtration in Group I, leukocytes were significantly reduced ($3.6 \pm 2.1 \times 10^3/\mu\text{L}$ after filtration vs. $5.7 \pm 3.1 \times 10^3/\mu\text{L}$ before filtration, $p < 0.05$), as well total cholesterol (97 ± 13 mg/dl after filtration vs. 155 ± 19 mg/dl before filtration, $p < 0.05$), and triglycerides (58 ± 24 mg/dl after filtration vs. 103 ± 32 mg/dl before filtration, $p < 0.05$). Platelet counts and hematocrits were not significantly different between the two groups. In Group I a better pattern of inflammatory molecules and organ injury markers was observed, although statistical difference was found only in neuron-specific enolase trend, particularly at 6 hours (20.6 ± 6.7 ng/ml in Group I vs. 27.2 ± 8.8 ng/ml in Group II, $p < 0.05$).

Conclusions

The preliminary results of our study showed that the integrated lipid and leukocyte filter is effective in reducing fat content and leukocytes from shed pericardial blood during on-pump cardiac surgery procedures. Moreover, the analysis of the inflammatory molecules and organ injury markers seems to show an improvement in the clinical outcome of patients, particularly regarding the neurological aspect.