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Perioperative cytokine release and its effects on the early postoperative course in patients undergoing extracardiac Fontan operation (ECFO) in an off-pump technique compared to CPB-supported ECFO

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Objective:
Cardiopulmonary bypass in pediatric heart surgery is still assumed to be a major cause of systemic inflammatory response syndrome (SIRS).
We investigated perioperative cytokine release and its effects on the early postoperative course in patients undergoing extracardiac Fontan operation (ECFO) in an off-pump technique compared to CPB-supported ECFO.
Methods: In the last consecutive 22 of the total of 138 patients (off-pump: n=11, on-pump CPB: n=11) undergoing ECFO in our institution, plasma concentrations of Il-1alpha, Il-1beta, Il-6, Il-8, Il-10, TNF-alpha and MCP-1 were measured pre- and perioperatively, immediately after CPB and at 4h and 24h postoperatively. Median age of patients studied was 4.0 (1.7-12.3) years and median weight 12 (9.8-53.8) kg. Clinical signs of cardiac, pulmonary and renal dysfunction were evaluated.
Results: There were no differences between the two groups regarding preoperative hemodynamics and anthropometric data or cytokine levels except for Il-1alpha (p=0.028). Plasma levels of all mediators were below reference values preoperatively and rose during surgical procedure in both groups. There were significantly higher values of Il-1alpha (p=0.016), Il-8 (p=0.019), Il-10 (p=0.023) and TNF-alpha (p=0.016) in the CPB group during surgical procedure. All parameters peaked at the 4hour postoperative measure with Il-6 reaching 241 times, Il-8 34 times and TNF-alpha 1.7 times the preoperative levels. In the CPB group, plasma levels were significantly higher for Il-1a ($p<0.001$) and Il-10 (p=0.04) 4h postoperatively. Twenty-four hours after operation no differences between groups were found. However, all parameters were still above preoperative levels.
High perioperative cytokine plasma levels (IL-1alpha, IL6, IL8, IL10 and MCP1) correlate significantly with higher postoperative creatinine level as well as pleural effusion volume and positive fluid balance 24 and 48h postoperatively.
High levels of Il-8 correlated significantly with prolonged mechanical ventilation (>24h), ICU stay and duration of pleural effusions.
Conclusions:
The results emphasize the contributing effect of CPB in cytokinemia and systemic inflammation that correlates with increased early postoperative requirement of fluid resuscitation and inotropic agents. Completion of Fontan circulation using off-pump technique for extracardiac conduit may improve early postoperative outcome.