**UDC: 612.017.1:519.216.3:616.12-089-044.267-053.4**

**EFFECTS OF CYTOKINES ON PROGNOSIS OF POSTOPERATIVE COMPLICATIONS IN CHILDREN AFTER CARDIOPULMONARY BYPASS SURGERY**

L.V. Moshkivska, S.G.Khemio Arnes, E.A.Nastenko, V.V.Lazoryshynets

*Amosov National Institute of Cardiovascular Surgery (Kyiv)*

The current work is dedicated to the analysis of cytokines effects on the prognosis of the severity and the amount of postoperative complications in children after cardiopulmonary bypass surgery (CPB). The frequency of complications was calculated and a direct correlation between the level of cytokines and the development of postoperative complications was established for patients undergoing cardiac surgery.

**Key words:** cytokines, complications, congenital heart diseases, cardiopulmonary bypass

**Objective:**

Research the effects of cytokines on the prognosis of the development and severity of postoperative complications in patients undergoing cardiac surgery.

**Materials and Methods:**

From 2013 to 2015 in the department of newborns and young children of the Amosov National Institute of Cardiovascular Surgery of the AMS of Ukraine 35 patients with congenital heart disease after cardiopulmonary bypass surgery were examined and their levels of cytokines were analyzed in order to research the effects of cytokines in the prognosis of postoperative complications. The study of cytokine status was performed preoperatively (before the incision) and at intraoperative period (beginning of cardiopulmonary bypass, end of the operation). Children's age ranged from 2.0 to 37.0 months. Statistical data processing was performed.

**Results and discussion**

The operated patients revealed the following complications: heart failure, pulmonary complications, and infectious complications.

The cytokines’ dynamics at different stages of operation shows: a slight increase in the level of proinflammatory cytokine TNF-α, and a significant increase in anti-inflammatory cytokine IL-10 and proinflammatory IL-6 at the end of operation.

This indicates the development of inflammation as a response to surgical factors such as incision, chest opening, cardiopulmonary bypass.

The analysis of cytokine levels at different stages of the operation in children with complications showed a significant increase in the level of IL-10 at the end of the operation, also a slight increase in the level of TNF-α during cardiopulmonary bypass, these results reveal an imbalance between the cytokines and the immunosuppression, which is more manifested in the group of patients with postoperative complications.

The most important diagnostic and prognostic criteria is the imbalance between proinflammatory and anti-inflammatory cytokines: with increasing of the severity of the patient’s condition and spreading of the inflammatory process in the postoperative period, the level of IL-10 rises, which indicates the development of a deep defect of cell-mediated immune protection, and the manifestation of early postoperative complications.

**Conclusions:**

* The prognosis of development and severity of postoperative complications is possible due to previous determination of cytokine levels (TNF-α, IL-6, IL-10).
* Patients with complications reveal higher levels of anti-inflammatory cytokines with lower levels of pro-inflammatory cytokines, which indicates their imbalance with prevalence of immunosuppression.
* With increasing of the severity of the patient’s condition and spreading of the inflammatory process in the postoperative period, the level of IL-10 rises, which indicates the development of a deep defect of cell-mediated immune protection

**References**

1. Шумаков В. И., Сускова B. C., Емец В. И. и др. Тактика иммунодиагностики и иммунокоррекции на разных этапах лечения больных при операциях на сердце // Вестник трансплантологии и искусственных органов. – 2006. – № 4. – С. 55–61.

2. Чернышев В. А., Гусев Е. Ю. Иммунология воспаления: роль цитокинов. Мед. иммунология. – 2001. – № 3(3). – С. 361–368.

3. Косякова Н. И., Прохоренко С. В., Прохоренко И. Р. Дисбаланс продукции цитокинов у больных тяжелым хирургическим сепсисом // Иммунология. – 2005. – Т. 26. – № 5. – С. 319–321.

4. Eppinger M. J., Ward P. A., Boiling S. F., Deeb G. M. Regulatory effects of interleukin-10 on lung ischemia-reperfusion injury // J Thorac Cardiovasc Surg. – 1996. – Vol. 112. – P. 1301–1305.

5. Бережная Н. И. Цитокиновая регуляция при патологии: стремительное развитие и неизбежные вопросы // Цитокины и воспаление. – 2007. – Т. 6, № 2. – С. 26–36.

6. Caruso, Raffaele; Trunfio, Salvatore; Milazzo, Filippo; et al. Early Expression of Pro- and Anti-Inflammatory Cytokines in Left Ventricular Assist Device Recipients With Multiple Organ Failure Syndrome // ASAIO Journal. – 2010. – Vol. 56 (4). – P. 313–318.

7. Casey L.C. Immunologic response to infection and its role in septic shock // Crit. Care Clin. – 2000. – Vol. 16. – P. 193–213.

8. Cinel Ismail, Steven M. Opal, Molecular Biology of Inflammation and Sepsis // Crit Care Med. – 2009. – Vol. 37(l). – P. 291–304. Lippincott Williams & Wilkins.

9. Raychaudhuri B., Fisher C. J., Farver C. F., Malur A., Drazba J., Kavuru M. S., Thomassen M. J. Interleukin 10 (IL-lO)-mediated Inhibition of inflammatory cytokine production by human alveolar macrophages // Cytokine. – 2000. – Vol. 12. – P. 1348–1355.