

Levels of Inflammatory Mediators in Children with Pyoinflammatory Diseases of Soft Tissues

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Abstract

Aim of the research was to study the dynamics of proinflammatory mediators in children with various forms of purulent-septic diseases.

Methods. A study was carried out for 328 children with pyo-septic soft tissue diseases aged 1 to 16 years old for the period from 2010 to 2017. ELISA method was used for detection of the IL-1 β , interleukin-6 IL-6, interleukin-8 IL-8 in serum using the test system (eBioscience, Austria).

Results and discussions. Evaluation of cytokine levels in the blood serum of patients with various types of purulent-inflammatory processes showed high numbers of interleukins IL-1, IL-6, IL-8. Mean level IL-1 was 1,4 (0,16:1,8) pg/ml in group of abscess, 5,8 (0,8 7,64) pg/ml group of phlegmon, 1,9 (0,2:2,7) pg/ml in group of purulent wound. Mean level IL-6 was 2,1 (0,3:2,6) pg/ml in group of abscess, 4,7 (1,1:5,8) pg/ml group of phlegmon, 2,2 (0,3:4,3) pg/ml in group of purulent wound. Mean level IL-8 was 1,2 (0,14:1,6) pg/ml in group of abscess, 4,3 (0,9:6,3) pg/ml group of phlegmon, 3,2 (0,4:4,9) pg/ml in group of purulent wound. Analys showed that the level of proinflammatory mediators is indicative of the severity of the inflammatory process and the possibility of using IL-1, IL-6 IL-8 to assess the effectiveness of treatment and the dynamics of the wound process.

Conclusions. Hyper secretion of proinflammatory mediators in children with purulent-inflammatory diseases of soft tissues is associated with imbalance in the system of cytokine regulation. Levels of markers of inflammation corresponded to specific features of the severity of the inflammatory process. Dynamics of indices of proinflammatory mediators can be used to assess the course of the wound process and the effectiveness of treatment.

Keywords: inflammatory diseases of soft tissues, interleukin, children

Introduction

Purulent wounds remain one of the urgent problems of pediatric surgery. Over the last decade, there has been an increase in the frequency and severity of purulent-septic diseases in children and the increase in postoperative complications [1, 2, 5, 6]. Thus, this fact makes the problem of treating a surgical infection particularly urgent [1, 4, 5]. One of the main factors that lead to the emergence and development of various purulent-septic complications, is a violation in the immune system. The latter is associated with a high level of pro-inflammatory cytokines, and some criteria based on them have been proposed, which were proposed as prognostic signs [2, 3, 6].

The course and duration of wound healing is affected by the development of inflammatory reactions. The inflammatory process is caused by the interaction of many factors: the amount of damage, the shape of the wound, the presence of microflora, the reactivity of the body, the methods of treatment [4, 5]. But, inflammation is a protective reaction of the body to damaging factors. In the development of the inflammatory process, a significant role is played by cytokines [1, 2, 3].

Inflammation mediators that are most studied in trauma and other infected and aseptic lesions in children and adults include interleukin-1 β (IL-1 β), interleukin-6 (IL-6), interleukin-8 (IL-8), interleukin and tumor necrosis factor α (TNF- α). According to the literature, these cytokines are mediators of processes aimed at regulating reparation processes in the wound [1, 3, 5]. And also each of them has a certain role in the development of the wound process.

Aim of the research was to study the dynamics of proinflammatory mediators in children with various forms of purulent-septic diseases.

Materials and methods

A study was carried out for 328 children with pyo-septic soft tissue diseases aged 1 to 16 years for the period from 2010 to 2017.

Patients were divided into three groups, in accordance with clinical diagnoses. The first group - 176 children with abscesses, the second group - 118 patients with phlegmon and the third group- 34 patient with purulent posttraumatic wounds. The groups were homogeneous by sex, age and duration of the disease.

All children with purulent wounds immediately after hospitalization performed a surgical treatment, which consisted in excision of nonviable tissues, a wide opening of abscesses.

Local therapy of patients was conducted on the generally accepted principles of treatment of acute purulent surgical infection and was aimed at correction of hemostasis disorder, elimination of the causative agent of infection, stimulation of reparative regeneration processes.

The control group consisted of 60 conditionally healthy children of the same age. Interleukin-1 β (IL-1 β), interleukin-6 (IL-6), interleukin-8 (IL-8) cytokine concentrations were studied on the first day of blood serum immunoassay using the test system (eBioscience, Austria). The venous blood was taken by the standard method from the cubital vein and stored in accordance with the instructions of the test systems. To test the distribution for normality, the Shapiro-Wilk test was used, comparing the central trends of two independent samples using the Wilcoxon W-test, comparing the mean of two independent samples by the Student's criterion. For multiple comparisons of nonparametric data, the Kruskal-Wallis ranked one-factor analysis was used. Statistical processing of the received data was carried out using the "Statistica7.0" software package.

Results and discussions

Evaluation of cytokine levels in the blood serum of patients with various types of purulent-inflammatory processes showed high numbers of interleukins IL-1, IL-6, IL-8 (Table 1).

Table 1
Levels of proinflammatory cytokines in children
(Me (Q25:Q75), pg / ml)

Indicators	Control (n=60)	Abscess (n=176)	Phlegmon (n=118)	Purulent wound (n=34)
IL-1 β	0,8 (0,07:0,96)	1,4 (0,16:1,8)*	5,8 (0,8 7,64)**	1,9 (0,2:2,7)*
IL-6	0,9 (0,07:1,2)	2,1 (0,3:2,6)*	4,7 (1,1:5,8)*	2,2 (0,3:4,3)*
IL-8	0,4 (0,09:0,6)	1,2 (0,14:1,6)*	4,3 (0,9:6,3)*	3,2 (0,4:4,9)**

Note: * - $p < 0.01$; ** - $p < 0.05$ - reliability of differences in the parameters of the study groups from the control

Analysis of the obtained data indicates that the values of IL-1, IL-6 and IL-8 were significantly higher in comparison with the control group. The indices of IL-1 were significantly higher in cases of soft tissue phlegmon in comparison with abscesses and purulent wounds. While the levels of IL-1 in abscesses and wounds did not differ significantly.

A similar pattern was observed in cases of interleukin-6, which was characterized by a high index in patients with phlegmon.

Analysis of the interleukin-8 index revealed that the highest level was determined in patients with phlegmon and purulent post-traumatic wounds. And with abscesses, IL-8 was less, but significantly higher in comparison with the control group.

The highest levels of proinflammatory cytokines were determined in patients with soft tissue phlegmon.

Thus, data analysis showed that the level of indices of proinflammatory mediators is indicative of the severity of the inflammatory process and the protective reaction of the body and the possibility of using IL-1, IL-6 IL-8 to assess the effectiveness of treatment and the dynamics of the wound process.

Conclusions

Hyper secretion of proinflammatory mediators in children with purulent-inflammatory diseases of soft tissues is associated with imbalance in the system of cytokine regulation. Levels of markers of inflammation corresponded to specific features of the severity of the inflammatory process. Dynamics of indices of proinflammatory mediators can be used to assess the course of the wound process and the effectiveness of treatment.

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Ethical Declaration: The study was approved by the local ethics committee of Bogomolets National Medical University, Kiev, Ukraine. This study was carried out in conformity with the Declaration of Helsinki.

Conflict of interest: The authors declare no conflict of interest

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