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IMMUNOLOGICAL SHIFTS IN PATIENTS WITH CHEST AND ACUTE BLOOD LOSS

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✓ **Resume**

The research is dedicated to the investigation of some defensive functions in patients under severe combined trauma and acute blood loss, including blood level of cortisol and pro-inflammatory - TNF-α. Venous blood of patients or healthy volunteers was investigated. The concentrations of TNF-α in blood was increased in patients of all groups. It has been revealed that a low blood cortisol level in the 1st day under severe combined trauma was an unfavorable sign for prognosis, witnessing high probability of lethal outcome. The results open a possibility for implementation of a highly informative test-system for prognosis of traumatic disease course and for its purposeful correction.

Key words: immune response, severe combined trauma, acute blood loss, shock, stress, cytokines, cortisol.

ИММУНОЛОГИЧЕСКИЕ СДВИГИ У БОЛЬНЫХ С ТРАВМОЙ ГРУДНОЙ КЛЕТКИ И ОСТРОЙ КРОВОПОТЕРЕЙ

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✓ ***Резюме***

Исследование посвящено изучению некоторых защитных функций у пациентов с травмой грудной клетки (ТГК) и острой кровопотерей, в том числе уровня кортизола в крови и провоспалительного - TNF-α. Исследовали венозную кровь больных или здоровых добровольцев. Концентрация TNF-α в крови была повышена у пациентов всех групп. Выявлено, что низкий уровень кортизола крови в 1-е сутки при ТГК является неблагоприятным признаком для прогноза, свидетельствующим о высокой вероятности развития гнойно-септических осложнений. Полученные результаты открывают возможность для прогнозирования течения ТГК и ее целенаправленной коррекции.

Ключевые слова: иммунный ответ, тяжелая сочетанная травма, острая кровопотеря, шок, стресс, цитокины, кортизол.

КЎКРАК ЖАРОХАТИ ВА ЎТКИР ҚОН ЙЎҚОТИШИ БЎЛГАН БЕМОРЛАРДА ИММУНОЛОГИК ЎЗГАРИШЛАР

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Тадқиқотда кўкрак қафаси травмаси ва ўткир қон йўқотиш, бўлган беморларда баъзи ҳимоя функцияларни ҳамда, қон таркибидаги кортизол ва яллигланишга оид TNF-α даражаларини ўрганишга бағишланган. Беморларнинг ва соғлом инсонларнинг веноз қони текширилди. Қондаги TNF-α концентрацияси беморларнинг барча гуруҳларида баланд эди. Кўкрак қафаси травмаси 1-кунида қон кортизолининг паст даражаси ёмон прогностик белги бўлиб, йирингли-септик асоратлар ривожланиш эҳтимоли юқори эканлигини билдиради. Олинган натижалар кўкрак қафаси травмаси касаллик кечишини ва уни мақсадли даволашни башорат қилиш имконини беради.

Калит сўзлар: иммун жавоб, оғир комбиниципялашган травма, ўткир қон йўқотиш, шок, стрес, цитокинлар, кортизол.

Relevance

One of the most important directions in the development of modern medicine is the development of methods for diagnosing and predicting the course of diseases based on determining the degree of impairment of functional activity and the possibility of correcting the protective functions of the body. Elucidation of the nature of these disorders opens up new ways and opportunities for targeted impact on them, diagnostics and prediction of the course of diseases, including trauma [1]. After removing a patient with trauma from the acute period, there is a risk of infectious complications up to the development of sepsis, which is one of the most important causes of death of patients [2, 3]. The most common complications of infectious THC are also pneumonia and wound infection [3]. Therefore, a natural consequence of THC is changes in the activity of the functions of the immune system, which become predisposing factors for the development of various complications of infectious genesis. The immune system's response to injury begins in the first minutes after it; the severity of immunological disorders and their duration depend on the strength and duration of exposure, as well as on the scale of tissue damage. In severe THC, accompanied by the development of blood loss, immediately after exposure to an extreme factor on the body, violations of the interaction of the immune and neuroendocrine systems are observed, including increased secretion of adrenal hormones that affect the cellular and humoral links of immunity. These changes further determine the course and outcomes of trauma [4]. The development of immunodeficiency occurs within the first 3 days after severe mechanical injury, which, in turn, is the direct cause of the development of frequently occurring purulent-septic complications [2-6]. Thus, a consequence of severe concomitant injury is a violation of the protective functions of the body. The study of the mechanisms of these disorders will allow, among other things, to predict the risk of development and generalization of infectious complications even before their clinical manifestation and to develop new methods of targeted preventive and therapeutic immunocorrection.

In the department of surgery of the Bukhara branch of the RSCEMP, informative tests have been developed based on the analysis of the activity and functional reserves of immunocompetent cells, which make it possible to reveal the mechanisms of violations of protective functions under various destabilizing influences [7]. The use of functional tests contributes to the identification of those links in the immune system, changes in which reflect the severity of the process in patients and have prognostic value.

The aim of this work is to study changes in some indicators of the activity of the body's protective functions, including the functional activity of monocytes and lymphocytes of peripheral blood, the level of cytokines: tumor necrosis factor (TNF-α), as well as cortisol in the blood of patients who have suffered severe chest trauma and acute blood loss.

Material and methods

The study used venous blood from patients with severe chest trauma with the development of acute blood loss, as well as the blood of healthy volunteers. All patients were treated at the Bukhara branch of the RSCEMP. Blood sampling was performed three times: the first time - within the first 24 hours after hospitalization; the second time - on the 7th day; the third time - on the 14th day of hospitalization. Direct determination of the concentration of cytokines and cortisol in the blood serum was carried out by a standard enzyme immunoassay using reagents of test systems of OOO Proteinovy contour (St. Petersburg). Statistical processing of the results was carried out using the Student's t test.

Result and discussion

When analyzing changes in the concentration of TNF-α in the blood serum of patients who underwent severe chest trauma, a higher level of cytokine was found at all follow-up periods compared with the same indicator in healthy donors. There were no significant differences in the level of cytokine in the blood in patients of these two groups. In patients after acute blood loss, the serum TNF-α content increased on the 1st day after hospitalization, and then decreased on the 7th and 14th days, reaching values comparable to the cytokine level in healthy donors. On the 7th and 14th days of observation (as opposed to the 1st day), the concentration of TNF-α in the blood in patients with THC with acute blood loss is lower than in patients without blood loss. Thus, the concentration of the pro-inflammatory cytokine TNF-α in the blood serum of patients with severe THC is significantly higher than in patients with THC with acute blood loss, and remains elevated throughout the observation period. A distinctive feature of changes in the level of cortisol in the blood of patients in this study is its low concentration in the blood of patients on the 1st day

of observation. When determining the concentration of cortisol in the serum of the peripheral blood of healthy people and patients after severe THC, a significantly higher level of the hormone in the blood was observed in patients only on the 1st day after undergoing severe THC compared with control values in healthy people.

The concentration of cortisol in the blood serum of patients after THC with the development of acute blood loss at all periods of observation did not significantly differ from this indicator in healthy people.

The results of the study allow us to conclude that the functional activity of immunocompetent cells in patients changes after suffering severe THC and acute blood loss at different times after hospitalization of patients and depends on the severity of the injury.

With the development of THC with a high likelihood of developing septic complications, the determination of changes in the concentration of TNF-α in the blood of patients is of particular importance. The study established an increased level of this cytokine in the blood of patients with trauma during all periods of observation and patients with acute blood loss - on the 1st day. The literature data concerning the content of TNF-α in the blood of traumatized patients are contradictory. It has been suggested that the change in the concentration of TNF-α in the blood of traumatized patients is not a reliable indicator for predicting the development of complications [4,5]. According to other data, an increase in the level of TNFα in severe chest trauma is an unfavorable prognostic sign indicating a high probability of developing septic complications and death [2,7].

The results of the study of changes in the concentration of cortisol in the blood of patients allow us to conclude that a low level of cortisol in the blood serum of patients on the 1st day after severe chest trauma is a prognostically unfavorable sign indicating a high probability of developing infectious complications. These data confirm the results of clinical observations, which established a relationship between low cortisol levels and the risk of developing purulent-septic complications in patients with THC [3]. A high concentration of cortisol in the blood serum of people who have undergone severe trauma, on the contrary, is a typical, natural response of the body's neuroendocrine system to an extremely strong stressful effect caused by THC [1,5].

Conclusion

The results of the study make it possible to assess some mechanisms of violations of the body's protective functions in case of chest trauma and acute blood loss. Revealing the mechanisms of immunity disorders opens up possibilities for the development of highly informative prediction of the course of THC with blood loss and its purposeful immune-oriented correction.

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