CHARACTERISTICS OF CHANGES IN CYTOKINE LEVELS IN PATIENTS WITH DIABETIC FOOT SYNDROME ON THE BACKGROUND OF VARIOUS TYPES OF ANESTHESIA

Oltiev U.B.[1], Hamdamov B.Z.[2] (Republic of Uzbekistan)

[1]Oltiev Usmon Bebitovich - Researcher;
[2]Hamdamov Bakhtiyor Zarifovich - DSc, Professor,
DEPARTMENT OF FACULTY AND HOSPITAL SURGERY, UROLOGY,
BUKHARA STATE MEDICAL INSTITUTE,
BUKHARA, REPUBLIC OF UZBEKISTAN

Abstract: *in the structure of morbidity of residents of economically developed countries, diabetes mellitus (DM) occupies one of the first places. There is still a discussion in the literature about the choice of the optimal method of anesthesia for operations performed for diabetic foot syndrome. The aim of the study is a comparative study of the effect of general, epidural and conduction anesthesia on the dynamics of changes in cytokine levels in patients operated for diabetic foot syndrome. The study included 157 patients diagnosed with diabetic foot syndrome who were on inpatient treatment in the department of purulent surgery of the Bukhara Regional Multidisciplinary Medical Center. The average age of the patients was 62.5 years. The results of the study showed that out of 51 patients of the first-control group who underwent general anesthesia, 7 patients had a cardiac arrhythmia, 4 cases had uncontrolled hypotension, 11 patients had a duration of post-acute awakening, 3 patients had a hypoglycemic condition. In 5 cases, relaxant regularization was observed, and 3 patients developed congestive pneumonia in the postoperative period.*
Keywords: *diabetic foot syndrome, anesthesia, cellular and humoral immunity.*

ХАРАКТЕРИСТИКА ИЗМЕНЕНИЙ УРОВНЯ ЦИТОКИНОВ У БОЛЬНЫХ С СИНДРОМОМ ДИАБЕТИЧЕСКОЙ СТОПЫ НА ФОНЕ РАЗЛИЧНЫХ ВИДОВ АНЕСТЕЗИИ

Олтиев У.В.[1], Хамдамов Б.З.[2] (Республика Узбекистан)

[1]Олтиев Усмон Бебитович - научный сотрудник;
[2]Хамдамов Бахтиёр Зарифович - доктор технических наук, профессор,
кафедра факультетской и госпитальной хирургии, урологии,
Бухарский государственный медицинский институт,
г. Бухара, Республика Узбекистан

Аннотация: *в структуре заболеваемости жителей экономически развитых стран сахарный диабет (СД) занимает одно из первых мест. В литературе до сих пор ведется дискуссия о выборе оптимального метода анестезии при операциях, выполняемых по поводу синдрома диабетической стопы. Цель исследования — сравнительное изучение влияния общей, эпидуральной и проводниковой анестезии на динамику изменения уровня цитокинов у больных, оперированных по поводу синдрома диабетической стопы. В исследование включены 157 больных с диагнозом синдром диабетической стопы, находившихся на стационарном лечении в отделении гнойной хирургии Бухарского областного многопрофильного медицинского центра. Средний возраст больных составил 62,5 года. Результаты исследования показали, что из 51 больного первой контрольной группы, которым была проведена общая анестезия, у 7 больных отмечалась сердечная аритмия, у 4 - неконтролируемая артериальная гипотензия, у 11 больных - длительность постистрого пробуждения, у 3 больных - гипогликемическое состояние. В 5 случаях наблюдалась регуляризация релаксации, у 3 пациентов в послеоперационном периоде развилась застойная пневмония.*
Ключевые слова: *синдром диабетической стопы, анестезия, клеточный и гуморальный иммунитет.*

Introduction. In the structure of morbidity of residents of economically developed countries, diabetes mellitus (DM) occupies one of the first places. There is still a discussion in the literature about the choice of the optimal method of anesthesia for operations performed for diabetic foot syndrome (DFS). A sufficient amount of data has been accumulated indicating the advantage of neuroaxial anesthesia in comparison with other types of anesthesia.

Literature data on the effect of various anesthesia methods on the immune system in patients with DFS are few and contradictory.

The aim of the study is a comparative study of the effect of general, epidural and conduction anesthesia on the dynamics of changes in cytokine levels in patients operated for diabetic foot syndrome.

Materials and methods of research. The study included 157 patients diagnosed with diabetic foot syndrome who were on inpatient treatment in the department of purulent surgery of the Bukhara Regional Multidisciplinary Medical Center. The average age of the patients was 62.5 years. In most cases of observation, patients suffered from type 2 diabetes mellitus (94.5%), where mainly moderate and severe degrees of severity of diabetes mellitus in the stage of subcompensation and decompensation were observed.

Depending on the types of anesthesia, the patients were divided into 3 groups: Group 1 consisted of 51 patients (32.48%) operated on for DFS under general anesthesia (GA). The second group consisted of 52 (33.12%) patients who underwent anesthesia during surgical interventions on the lower extremities by epidural anesthesia (EA). The third group consisted of 54 (34.4%) patients who underwent conduction anesthesia (stem blockade) (CA).

All patients underwent routine noninvasive hemodynamic monitoring using DASH 3000 monitors: ECG, blood pressure, heart rate, SpO2.

Interleukins VEGF A, MCP-1, IL-18 were determined in blood serum by solid-phase enzyme immunoassay.

Results and their discussion. The results of the study showed that out of 51 patients of the first-control group who underwent general anesthesia, 7 (13.72%) patients had a cardiac arrhythmia, 4 (7.8%) cases had uncontrolled hypotension, 11 (21.6%) patients had a duration of post-acute awakening, 3 (5.8%) patients had a hypoglycemic condition. In 5 (9.8%) cases, relaxant recurarization was observed, and 3 (5.8%) patients developed congestive pneumonia in the postoperative period. Moreover, in 2 (3.9%) cases, difficulties with tracheal intubation were noted.

In the group of patients who underwent epidural anesthesia, 1 (1.9%) patient had unintentional damage to the root, which was accompanied by paresthesia of the lower limb, 5 (9.8%) patients had post-operative back pain, which persisted for 10-12 days after the end of the operation, 3 (5.8%) patients had headache, which in 2 cases lasted more than a day, 1 (1.9%) patient had an epidural hematoma, which was detected by computed tomography in the postoperative period, in 4 (7.8%) patients, persistent hypotension was observed against the background of severe intoxication and hypovolemia, in 2 (3.8%) patients, inadequate anesthesia was noted. At the same time, 2 patients (3.8%) have a hypoglycemic condition. In patients of the third group operated under conditions of conduction (stem nerve blockade) anesthesia (CA), 14-15 minutes after the blockade of the nerve trunks, the effect of anesthesia was manifested, which persisted at all stages of the operation and no additional administration of analgesics was required. Hemodynamic parameters were fairly stable. At the same time, respiratory dysfunctions were not observed. The duration of analgesia in the postoperative period lasted from 7 hours to 11 hours. No serious complications were observed, but the following reactions were noted: headache developed in 2 (3.7%) patients after the introduction of a local anesthetic, nausea developed in 3 (5.6%), and muscle tremor was noted in 2 (3.7%) patients. These symptoms were regarded by us as a toxic effect of the anesthetic. In 5 (9.3%) patients, bradycardia was noted, which was stopped by the introduction of an atropine sulfate solution. Regional anesthesia provided a complete blockade of nociception during surgical interventions on the lower extremities, as well as a smooth course of the postoperative period with rapid activation of patients. Conduction anesthesia was the most bladeless method of anesthesia in patients who underwent 2 or more surgical interventions on the lower extremities, which required repeated anesthesia. Especially this type of anesthesia significantly positively influenced the results of treatment of patients with low reserve of the cardiovascular system (ACS, PICS, MOF)

In our studies, it was revealed that the serum level of VEGF-A in patients with DFS averaged 115.9 ± 6.3 pg/ml, which is significantly higher than in the control group - 65.8 ± 4.2 pg/ml, P <0.001). At the same time, the level of MSR-1 in patients with DFS averaged 125.6 ± 5.4 pg/ml, which is 2.3 times higher than the values of the control group (53.7 ± 2.8 pg/ml) (P <0.001). The level of IL-18 in patients with DFS was 2.5 times higher than the values of the control group – 73.8 ± 4.4 pg/ml versus 28.9 ± 1.6 pg/ml (P<0.01).

Thus, the level of the studied cytokines in patients with SDS was significantly higher than the values of the control group.

The next stage of the research was to study the level of serum cytokines VEGF A, MCP-1 and IL-18 in patients with DFS after surgery using various types of anesthesia.

Analysis of studies has shown that the level of VEGF A varies depending on the anesthesia used. In patients who were treated with GA, the level of VEGF A increased by 1.7 times compared to the baseline data, averaging 201.7 ± 7.6 pg/ml (P<0.01). In EA, this indicator was significantly higher than the initial data – 183.5 ± 7.1 pg/ml (P<0.01), but lower than in GA. During anesthesia using stem conductor blockade (CA), the VEGF A level only tended to increase, averaging 120.6 ± 5.8 pg/ml.

Analysis of data on the study of the level of MSP-1 in patients with DFS showed that the level of this cytokine in patients with DFS after EA also significantly increased, averaging 158.7 ± 5.8 pg/ml (P<0.01). The level of MSR-1 with the use of CA almost did not change – 127.8 ± 4.5 pg / ml.

The level of serum interleukin-18 in patients with DFS after surgery with the use of various types of anesthesia did not significantly change, but only an upward trend was observed.

Thus, when using general anesthesia (GA), the level of IL-18 averaged 81.4 ± 5.1 pg/ml, when using epidural anesthesia (EA) – 78.5 ± 4.9 pg/ml and when using stem conductor blockade (CA) – 75.3 ± 4.1 pg/ml. that is, the inflammatory process that accompanied the development of diabetic foot syndrome no longer depended on the type of anesthesia.

Thus, the increase in blood serum of such molecular markers of inflammation and angiogenesis as MCP-1 and VEGF A confirms the development of vascular lesions or metabolic imbalance, which, causing intermittent damage to the vascular wall, accompanies catabolic processes, differentiation of endothelial and smooth muscle cells. The results of the conducted studies have shown that when using general anesthesia during operational processes, the level of the studied cytokines is significantly increased, that is, the stress caused by the operational process is aggravated by the anesthesia used, contributing to the maintenance of secondary immunological insufficiency. The method of epidural anesthesia is less aggressive, but nevertheless causes a change in the cytokine content. And only anesthesia associated with stem conduction blockade does not have a damaging effect on the levels of the studied cytokines.

It can be assumed that the examined groups of patients have manifestations of endothelial dysfunction caused by leukocyte aggression, increased release of endothelin-1 into the vascular bed, an increase in the content of such an inflammatory mediator as MCP-1, as well as VEGF A.

Thus, the results of measuring the content of MCP-1 and VEGF A of blood serum can be proposed as laboratory predictors and criteria for predicting the outcomes of various types of anesthesia. Any surgical intervention, even performed for vital reasons and with the best intentions, is nothing more than a certain form of aggression, to which the body is forced to respond by a complex of complex homestatic mechanisms. The general adaptation syndrome, as the final manifestation of a stress reaction, develops during any operations. Only in one case it is more pronounced, and in the other – less.

Conclusions: 1. Measurements of the content of MCP-1 and VEGF A of blood serum can be proposed as laboratory predictors and criteria for predicting the outcomes of various types of anesthesia.

2. When using general anesthesia during surgical processes, the level of the studied cytokines is significantly increased, that is, the stress caused by the surgical process is aggravated by the anesthesia used, contributing to the maintenance of secondary immunological insufficiency.

3. From the position of influence on the cytokine status, the method of choice for operations on the lower extremities in patients with diabetic foot syndrome is conductive anesthesia (CA) based on stem nerve blockades.

References / Список литературы

1. *Askarov T.A., Khamdamov B.Z., Oltiev U.B., Khamdamov I.B., Teshaev U.S.* Improving the methods of anesthetic aids for diabetic foot syndrome. // Materials of the XIX Republican scientific and Practical conference "Vakhidov readings-2014", "Errors and complications in elective surgery of the thoracic and abdominal cavity, heart and blood vessels", Fergana, 2014, Uzbekistan Surgery. № 3. Pp. 157-158.
2. *Akhmedov R.M., Hamdamov B.Z., Hamdamov I.B.* Assessment of amputation methods at the shin level in severe forms of diabetic foot syndrome // Problems of biology and medicine. Samarkand, 2019. № 4 (113). P. 29-32.
3. *Davlatov S.S., Khamdamov B.Z., Teshaev S.J.* Neuropathic form of diabetic foot syndrome: etiology, pathogenesis, classifications and treatment (literature review) // Journal of Natural Remedies, 2021. T. 22. № 1 (2). P. 147-156.
4. *Davlatov S.S.* The review of the form of neuropathic diabetic foot // Science and education issues, 2021. № 24. P. 149.
5. *Yeselevich R.V.* Methods of correction of immune disorders in patients with purulent-necrotic forms of diabetic foot syndrome: Dissertation for the degree of Candidate of Medical Sciences. St. Petersburg, 2016. 105 p.
6. *Kazanin A.A., Zagrekov V.I.* Anesthesiological support for patients with diabetic foot syndrome and critical lower limb ischemia // Journal "Medicine". № 1, 2018. Pp. 51-59.
7. *Kosinets A.N.* Features of immunological disorders and their correction in patients with diabetic foot syndrome / A.N. Kosinets, A.A. Zenkov // Vestnik VSMU, 2004. Vol. 3. № 1. Pp. 16-26.
8. *Orujaeva S.A., Zvyagin A.A.* Anesthesiological support for patients with complicated diabetes mellitus during amputations below the knee joint. // Wounds and wound infections. B.M. Kostyuchenka Magazine, 2016. Volume 3. № 3. Pp. 26-32.
9. *Oltiev U.B.* Comparative characteristics of the state of the dynamics of changes in laboratory, hemodynamic and stress hormone parameters in patients with diabetic foot syndrome under various types of anesthesia. Biology va tibbiyot muammolari, 2022. № 1 (134). P. 67-75.
10. *Khinovker V.V., Krasavina E.Yu., Gazenkampf A.A.* The effect of various methods of anesthesia of total hip replacement on the patient's immune system // Modern problems of science and education, 2017. № 5.

[Electronic Resource]. URL: http://science-education.ru/ru/article/view?id=26941/ (date of access: 13.05.2022).
11. *Jin J.W., Wang G., Gong M.W. et al.* Retrospective comparison of the effects of epidural anesthesia versus peripheral nerve block on postoperative outcomes in elderly Chinese patients with femoral neck fractures. ClinAging. 2015: 10. P. 1223-31.
12. *Khamdamov B.Z., Oltiev U.B.* The level of cytokines in various types of anesthesia in patients with diabetic foot syndrome. "Journal of Theoretical and Clinical Medicine", No. 1, 2022. P. 76-80.
13. *Khamdamov B.Z., Nuraliev N.A.* Pathogenetic approach in complex treatment of diabetic foot syndrome with critical lower limb ischemia. // American Journal of Medicine and Medical Sciences, 2020 10 (1) 17-24 DOI: 10.5923/j.20201001.05.
14. *Khamdamov B.Z.* Indicators of immunocitocine status in purulent-necrotic lesions of the lover extremities in patients with diabetes mellitus. // American Journal of Medicine and Medical Sciences, 2020, 10 (7). P 473-478. DOI: 10.5923/j.ajmm.20201007.08.