Features of oxygen therapy in complex treatment purulent wounds in patients with diabetes mellitus 2 types

Sayfiddin Sayfullayev
Muslimaxon Rajabova
Malohat Shodiyeva
Gulnoza Fayzullayeva
Shaxzoda Tojiboyeva
Scientific adviser: A.D.Davranova
Samarkand State Medical University

Abstract: The article gives the information about features of oxygen therapy in complex treatment purulent wounds in patients with diabetes mellitus 2 types.

Keywords: TSH, triiodothyronine, cholelithiasis, hypothyroidism, thyroid hormones, tetraiodothyronine, obesity

Relevance. Since November 2019, a new coronavirus infection caused by the SARS-CoV-2 virus has become a global threat to humanity [1]. This infection leads to a sharp suppression of antiviral immune defense and hyperproduction of pro-inflammatory cytokines ("cytokine storm" - an uncontrolled generalized systemic inflammatory reaction) [2-4]. During the COVID-19 pandemic, an increase in the number of postoperative complications caused by severe disorders in the homeostasis system, the development of a generalized form of purulent infection and sluggish wound healing is recorded [5-7]. Pathomorphologists have identified risk factors that adversely affect the outcome of the disease. According to them, these include: age over 65 years, presence of type 2 diabetes mellitus (T2DM), coronary artery disease, COPD, chronic renal failure [8; 9]. In patients with T2DM with infections of the skin and soft tissues, expression of basic fibroblast growth factor (bGFG) is observed, which is stimulated by the inclusion of ozone in basic treatment, as a result of which it is possible to stimulate bFGF and thereby eliminate the imbalance in the cytokine profile and stimulate regeneration processes [10-13], which, according to a number of researchers, is associated with the antiplatelet, anticoagulant and direct mechanism of action of ozone, which helps improve cellular metabolism [14; 15]. In recent years, close attention has been paid to the properties of water saturated with oxygen [16; 17], its effect on mitochondrial function during adjuvant therapy for type 2 diabetes [18], treatment of infected chronic wounds in diabetic foot syndrome [19], surgical infection of soft tissues [20; 21], purulent wounds in patients with type 2 diabetes mellitus [22]. This action is based on the so-called "oxidative stress", which stimulates the body's

(cc) BY

antioxidant defense and normalizes homeostasis by restoring redox processes in the body [23]. However, the use of oxygenated water (OW) and drugs in the complex treatment of purulent wound infection in patients with T2DM during the COVID-19 pandemic has not been used. We think it is possible to argue for the use of OM in combination with the use of oxygenated drugs in the complex treatment of purulent wounds of various origins in patients with insulin-dependent T2DM during the COVID-19 pandemic.

Purpose of the study: improve the results of complex treatment of purulent wound infection in patients with diabetes during the COVID-19 pandemic.

MATERIALS AND METHODS OF RESEARCH. A comparative analysis of the results of complex treatment and examination of 30 patients with T2DM aged from 48 years to 73 years with purulent wounds after opening abscesses and soft tissue phlegmons admitted to the purulent surgery department of the city hospital of Samarkand from 2021 to January 2023 was carried out. In the study group there were 9 men, 12 women (average age 62.5±5.2), complex treatment was supplemented by taking oral agent in a volume of 15 ml 2 times a day and wound management with gauze bandages soaked in Levomekol ointment with agent in a ratio of 1:2. Dressings were carried out once a day. The comparison group, matched by gender and age, consisted of 9 people. All patients were administered similar drugs without OS. In order to clarify the effect of oral administration of OM to the patient, oxygen saturation in the blood was determined using the Oxytest ML-320 apparatus (Russia). Studies were carried out before taking the drug and then after 30 minutes, 60 minutes, 120 minutes, 240 minutes, and 480 minutes for 7-10 days. The effectiveness of treatment was assessed clinically, by studying laboratory, integral and biochemical blood parameters, qualitative and quantitative studies of microflora (CFU) before the start of treatment, on days 3, 5, 7, 9, 11-13, 15-17. The dynamics of changes in the microlymphocirculatory system were determined using a laser Doppler diagnostic complex ("LASMA MC-1 peripheral blood flow and lymph flow analyzer with 2-channel recording"). One channel is for laser Doppler flowmetry of blood flow in microvessels, the other is for lymph flow. The indicator of microhemo- and lymphocirculation in the probed region was assessed (both in perfusion units), characterizing the average stationary perfusion of microvessels during the study. Using wavelet analysis, the amplitude of fluctuations in blood and lymph flow was determined. Three measurements were taken in each zone. We studied M - the average flow in the microcirculatory bed, Q - an indicator influencing the constancy of particles in the lymphatic bed, and L - the scattering coefficient of erythrocytes in the probed tissue volume. In order to clarify the effect of oral

During the administration of OM and treatment of OB wounds, oxygen saturation in the blood was determined using the Oxytest ML-320 apparatus (Russia). The studies

(cc) BY

were carried out twice a day: before taking the drug, after 30 minutes, 60 minutes, 120 minutes, 240 minutes and 480 minutes for 10 days. Statistical relationships between the obtained indicators were assessed using the correlation module “Basic Statistics and Tables STATISTICA 10.0”. The adaptive randomization method was used. In order to determine the significance of p differences between groups, Student's t test and one-way analysis of variance with calculation of Fisher's F test were used. The reliability of data differences in groups was assessed using the Mann-Whitney U-test for paired comparisons. Differences were considered statistically significant at $p \leq 0.05$. The relationship between the indicators was determined using the Spearman rank correlation coefficient, which allows one to check the heteroskedasticity of random errors in the regression model ($p \leq 0.05$).

RESEARCH RESULTS. From the beginning of the pandemic until January 1, 2023, 138 patients with purulent wounds of various origins affecting the pulmonary fabrics from 25% to 50%. 52 people (37.7%) had insulin-dependent T2DM with a disease duration of 3 to 17 years. 30 patients were admitted with primary purulent wounds of the torso - 17 (56.7%), external quadrants of the buttocks - 7 (23.3%), thighs - 6 (20%). During bacteriological studies, in all cases a mixed infection was cultured: St. aureus in various combinations with gram-negative microbiota (E. coli, Pr. vulgaris, Ps. aeruginosa), representatives of which were characterized by a high degree of resistance to antibiotics of the III-IV generation, fluoroquinolones and carbopenems. In wound impression smears, a cytological picture of a purulent wound process was observed with a predominance of degenerative forms of neutrophils (up to 90-96%) with an incomplete and perverted form of phagocytosis and until the visual fields were closed by the wound microflora. On the day of admission, all patients underwent surgical debridement of purulent wounds under general anesthesia. In the study group of patients, by the end of 5-7 days from the start of treatment, patients noted an improvement in their health, body temperature normalized, and pain in the wound significantly decreased. By this time, the purulent process was localized within the damaged tissues, inflammatory phenomena in the paravulnar tissues were stopped, the level of glucose in the blood decreased and stabilized, the amount sharply decreased, and the nature of the purulent discharge changed. The average time for the appearance of granulations and the regenerative type of cellular reaction in the main group was 7.1 ± 1.3 bed days, in the comparison group - 10.1 ± 1.7 bed days ($p > 0.05$). By this time, the cytological picture had changed: the number of normal neutrophils with a completed form of phagocytosis prevailed, up to 19% of mononuclear cells with the presence of profibroblasts were recorded (19.6±3.1%). In the comparison group, slower dynamics of wound healing were noted (Table 1).

(cc) BY

Table 1.

Indicators of clinical efficacy of purulent wounds treatment in DM2 patients in groups (M±m)

Groups of patients	Average time (days)			
	Cleansing the wound	CFU ±102-3	The appearance of granules lations	Stationary treatment (bed-day)
Main	6.5±0.3	7.9±0.4	7.1±1.3	16.6±2.2
Comparisons	8.1±0.4	11.2±0.4	10.1±1.7	20.8±2.1

Note: * - p≤0.05 in relation to the previous study.

Blood oxygen saturation after oral administration of OM is presented in Table 2. The study revealed that 30 and 60 minutes after administration of OM there was an increase in blood oxygen saturation, and a direct correlation was noted with a high closeness of connection (r = 0.71 at p ≤0.05). Subsequently, a decrease in SpO2 was noted.

Table 2.

Oxygen saturation of blood after OV oral intake (SpO2; %), Me[min;max]

Values	Study time (min.)					
	Before your appointment	thirty	60	120	240	480
SpO2 (%) Me [min;max]	85 [82;90]	93*[86;95]	92*[87;96]	92*[88;94]	91*[86;95]	89*[88;92]

Note: * - significance of changes in values at p≤0.05 in relation to the previous study.

There was no correlation noted in the comparison group. The most revealing results were studies of the microlymphocirculatory bed in the paravulnar tissues of wounds received at different periods of treatment. The results of the wavelet analysis showed that in the study group the average amplitude of fluctuations in blood and lymph flow was restored much faster than in the comparison group. The obtained data correlated with the results of clinical effectiveness of treatment in the comparison groups (p<0.05).

DISCUSSION OF RESEARCH RESULTS. Analysis of the clinical results obtained showed that in all patients with purulent wounds admitted from Covid hospitals, purulent wound infection (PWI) occurred in a severe clinical form (APACH II - 11-15 points). The severity of GRI was due to the presence of long-term T2DM against the background of lung damage CI up to 50% (CT 2) and associated with hypoxia of the macroorganism and gross disturbances in the microlymphocirculatory bed of the paravulnar tissues. Over the last decade, a number of studies have been published on the use of not only oxygen preparations in their pure form, but also in combination with biological media in the treatment of diabetic patients with purulent infection [15-19]. There is information on the results of using oxygenated water (OxyEnergy) in the treatment of purulent wounds [20] and purulent foci in patients with insulin-dependent type 2 diabetes [21; 22]. It turned out that OM has antioxidant

(cc) BY

and antihypoxic properties, increases local cellular immunological and general protection of the wound wall and paravulnar tissues from the etiological factor. In the complex treatment of purulent wounds in patients with diabetes during the COVID-19 period, the use of oxygen therapy using an agent with double the content of cluster oxygen (OxyEnergy-Sport") made it possible to maintain the partial pressure of oxygen in the blood, restore microlymphocirculation in the paravulnar tissues and relatively quickly localize the purulent process within damaged tissues, transfer it to the regeneration stage. The pilot results we obtained indicate the effectiveness of oxygen therapy for OB in the treatment of this group of patients and suggest further development of the technique with the subsequent possible development of detailed clinical recommendations. The inclusion of oxygenated therapy in complex treatment from oral intake of oxygenated water 15 ml 2 times a day and treatment of wounds with oxygenated Levomekol ointment made it possible to relatively quickly localize the purulent process within the damaged tissues, transfer it to the regeneration stage, and restore microlymphocirculation in the paravulnar tissues. OS and OL make it possible to eliminate the deficiency of oxygenation of wound tissues and the macroorganism, which has a beneficial effect on the metabolic process of wound healing, suppresses the activity of wound microbiota, improves the performance of laboratory and biochemical blood tests, and thereby improves the quality of treatment for this group of patients.

CONCLUSIONS

1. The new coronavirus infection COVID-19 is a powerful factor aggravating the course of purulent surgical infection against the background of the insulin-dependent form of T2DM.

2. Oxygen therapy, carried out using the innovative drug "OxyEnergy-Sport", with a double content of cluster oxygen (up to 500,000 ppm) allows you to eliminate the deficiency of oxygenation of the macroorganism and wound tissues, normalize the functioning of microlymphocirculation in the paravulnar tissues, which reduces the time of hospital treatment by 5- 7 bed days and reduces the complexity of the treatment process.

References

1. Gorbatenya AE, Baker SC, Baric RS The species severe acute respiratory syndrome related coronavirus classifying 2019-nCoV and naming it SARS-CoV-2. Nat. Microbiol. 2020;118(4):536-544. doi: 10.1038/s41564-020-00695-z.

2. Somova L.M., Kotsyurbiy E.A., Drobot E.I. Clinical and morphological manifestations of dysfunctions of the immune system during the new coronavirus infection COVID-19. Clinical and experimental morphology. 2021;10(1):11-20. doi: 10.31088/CEM2021.10.1.11-20.

(cc) BY

3. Vabret N., Britton GJ, Gruber C. Immunology of COVID-19: current state of the science Immunology of COVID-19: current state of the science. Sinai Immunology Review Project. Immunity. 2020; 52:910-941. doi: 10.1016/j.

4. Blanco-Melo D., Nillson-Paynt BE, Liu WC Imbalanced host response to SARS-CoV-2 drives development of COVID-19. Cell. 2020;181(5):1036- 1045. DOI: 10.16/j.cell.2020.02.026.

5. Hussain A., Bhowmik B., do Vale Moreira NC COVID-19 and diabetes: knowledge in progress. Diab Res ClinPract. 2020;162;10814.

6. Sobirjonovna K. N. Factors determining the clinical significance of depiptidyl peptidase 4 inhibitors in the treatment of patients with type 2 diabetes mellitus //World Bulletin of Public Health. 2022. Т. 8. – С. 67-72.

7. Курбонова Н.С. Негматова Г.Ш. “Ортиқча вазнли қизларда хайз даврининг бузулиши”// Тиббиѐтда янги кун. 9(47) 287-291 бет. 2022

8. Курбонова Н.С. Негматова Г.Ш. "Эриктильная дисфункция у больных сахарным диабетом и ее клинический анализ"//Биомедицина ва амалиѐт 5.1 сон. 160-165 бет. 2022 йил.

9. Курбонова Н.С. "Clinical manifestations and classification of lesions of the macular area in diabetes." Eurasian scientific herald. Vol13/2022/ 97-101стр.

10. Курбанова Нозима Сабиржановна “FACTORS DETERMINING THE CLINICAL SIGNIFICANCE OF DEPIPTIDYL PEPTIDASE 4 INHIBITORS IN THE TREATMENT OF PATIENTS WITH TYPE 2 DIABETES MELLITUS” World Bulletin of Public Health (WBPH)Volume-8, March 2022 67-72

11. Nazira K., Siddikovna T.G., Davranovna D.A., Takhirovich D.A., Tulkinovich O.S. (2021). Cardiovascular complications in patients with covid and diabetes mellitus 2. Central Asian Medical and Natural Science Journal, 2(3), 37-41.

12. GROWTH HORMONE FOR THE TREATMENT OF HEREDITARY DISEASES IN CHILDREN Ortikov Shahzod Tulkinovich. Karimova Nazira Alimovna, Kurbanova Nozima Sobirjanovna, Daminov Abdurasul Takhirovich / International Journal of Innovative Engineering and Management Research. 2021 281-284.

13. Features of the course of type 2 diabetes mellitus with arterial hypertension and ways of their correction Negmatova Gulzoda Shukhratovna, Salimova Dildora Erkinovna Eurasian Medical Research Journal 17, 39-41, 2023.

14. FEATURES OF THE TECHNIQUE OF TYPE 2 DIABETES MELLITUS IN COMBINATION WITH ARTERIAL HYPERTENSION AND WAYS OF CORRECTION IX G.Sh. Negmatova, D.E. Salimova LLC "Research and publications", Enlightener, 2023.

(cc) BY

15. Features of the coexistence of type 2 diabetes mellitus with arterial hypertension and their treatment Gulzoda Shukhratovna Negmatova, Dildora Erkinovna Salimova LLC "Ochik fan", Science and education, 2023.

16. Khalimova Z.Yu. and G.Sh. Negmatova. Autoimmune polyglandular syndromes. Literature review". Central Asian Journal of Medical and Natural S

17. Даминов А., Хайдаров О., Хасанова М. и Абдукахорова Р. (2023). ОСЛОЖНЕНИЯ ГЛЮКОКОРТИКОИДНОЙ ТЕРАПИИ У ПАЦИЕНТОВ С ДИАБЕТОМ, ПЕРЕЖИВШИХ КОВИД-19. Евразийский журнал медицинских и медицинских наук , 3 (4), 197-200.ciences 2.4 (2021): 166-175.

18. Khamidova M.N., Ismatova I.F., Zh.Sh. Berdirov, G.Sh. Negmatova and A.T. Daminov. "DIABETES AND COVID-19". Eurasian Journal of Medicine and Natural Sciences 2, no. 13 (2022): 190-204.

19. Takhirovich D.A., Burchaklar S.J.A., Shukhratovna N.G., Shukhratovna S.G., Zainuddinovna M.G. (2022). COURSE OF COVID-19 IN PATIENTS WITH DIABETES. Web of Scientist: International Journal of Scientific Research, 3(02), 73–76.

20. Takhirovich D.A., Korners S.J.A., Shukhratovna N.G., Shukhratovna S.G., Zainuddinovna M.G. (2022). COURSE OF COVID-19 IN PATIENTS WITH DIABETES. Web of Scientist: International Journal of Scientific Research, 3(02), 73–76.

21. Z.Y Xalimova G.Sh. Negmatova - "Аутоиммунные Полигландулярные Синдромы. Обзор Литературы". Central Asian Journal of Medical and Natural Science, 2021

22. Togaeva G.S. «Ўз-узини назорат қилиш мактабида ўқиган қандли диабет 2 тип билан касалланган беморларнинг клиник ва биохимиявий курсаткичлари». Journal of Biomedicine and Practice 2 Special Issue. Tashkent in 2020. Pages 132-135.

23. Togaeva Gulnora Siddikovna., Oripov Firdavs Suratovich., Davranova Aziza Davranovna.: "Structural features of cells of the islets of Langerhans in offspring with alloxonic diabetes" (Review article). Annals of the Romanian Society for Cell Biology 2021; P.158-162

24. Negmatova G.Sh, Togayeva G.S., Davranova A.D., Azimbegova S.N. "Assessment of the effectiveness of cardioprotectiva drugs in treatment of childeren with diabetic cardiomyopathy"/ The American juornal of medical sciences and pharmaceutical research//4.01. 79-83.

25. Negmatova G.Sh., Togayeva G.S., Davranova A.D., Azimbegova S.N. Uzbek medical journal. // Criteria for physical and sexual devolopent in with thyroid diseases. 4. 32.

26. Negmatova G.Sh, Togayeva G.S., Davranova A.D., Azimbegova S.N. "Assessment of the effectiveness of cardioprotectiva drugs in treatment of childeren

with diabetic cardiomyopathy"/ The American juornal of medical sciences and pharmaceutical research//4.01. 79-83.

27. Davranova A. (2022). QALQONSIMON BEZ PATOLOGIYASI BO'LGAN O'SMIR QIZLARDA HAYZ DAVRINING BUZILISHINI O'ZIGA XOSLIGI. Евразийский журнал медицинских и естественных наук, 2(8), 113–115.