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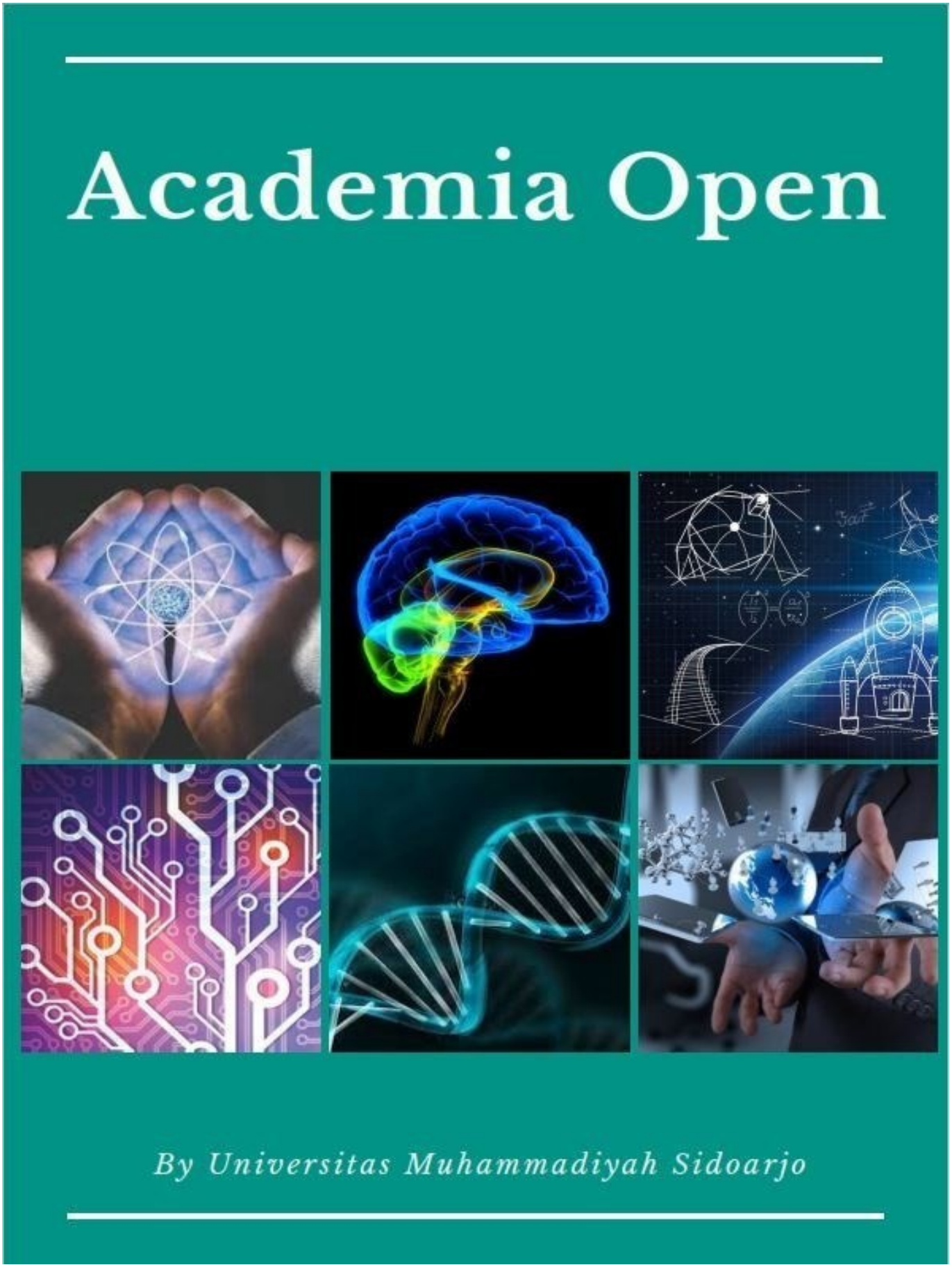

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The Importance of Endolymphatic Administration of Drugs In The Treatment of Persistent Postoperative Peritoniti

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Abstract

Persistent postoperative peritonitis remains a major challenge in abdominal surgery due to high rates of septic complications, antimicrobial resistance, and insufficient drug concentrations at the site of inflammation, making optimization of regional drug delivery clinically relevant. This study aims to evaluate the clinical and immunological effectiveness of endolymphatic drug administration in the comprehensive treatment of appendicular peritonitis. A retrospective and comparative clinical study was conducted on 66 patients with appendicular peritonitis treated in surgical departments of Tashkent city clinics, divided into a main group receiving endolymphatic therapy and a control group managed with conventional treatment. Clinical severity scores, biochemical parameters, intoxication indices, and immunological markers were analyzed using non-parametric statistical methods. The results demonstrate that endolymphatic drug administration achieved higher local therapeutic concentrations, significantly improved lymphocyte subpopulations, enhanced humoral immunity indicators, reduced endogenous intoxication, and accelerated recovery compared with standard therapy. Unlike prior studies that focused primarily on systemic antibiotic regimens, this research provides empirical evidence on the immunomodulatory and detoxifying advantages of targeted endolymphatic therapy in postoperative peritonitis. These findings contribute to the theoretical understanding of lymphatic system involvement in inflammatory control and support practical and policy-oriented implications for integrating endolymphatic drug administration into surgical infection management protocols to reduce complications and improve patient outcomes.

Keywords : Endolymphatic antibiotic therapy, appendicular peritonitis, immunomodulation, lymphatic drug delivery, surgical sepsis prevention, postoperative complications

Highlight :

- Endolymphatic therapy increases total T-lymphocytes 1.41-fold and improves immunoglobulin levels significantly.
- Neutrophil phagocytic activity rises 1.68-fold in treated patients versus minimal improvement in controls.
- The intervention normalizes microcirculation and enhances lymph transport into bloodstream effectively.

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Introduction

Prevention and treatment of various inflammatory diseases occurring in acute surgery, as well as most postoperative complications such as surgical sepsis and septic shock due to a variety of infections, have become a priority issue in recent years[1]. This, in its turn, encourages the process of seeking effective means of treating individuals using antibacterial and other medications by conducting different approaches.

The loss of the effectiveness of antibacterial therapy has taken place in recent years due to several factors, among which are the rapid evolution of antibiotic-resistant strains of microorganisms, growth of inflammatory diseases in the surgical patients, and the higher number of surgical operations in patients with critical conditions, irrational use of antibiotics, the inability to develop effective methods of treatment, and the lack of antibiotics concentration in the pathological site[2-3]. The need to find rational approaches to antibacterial treatment promotes the elaboration of pathogenetically-founded approaches, which are particularly necessary in the treatment of purulent-septic complications which are observed following long-term antibiotic treatment[4-5].

This technique has been invented and used in recent years to deliver drugs by injecting them directly into lymphatic vessels through the peripheral catheterisation. The introduction of the directly controlled endolymphatic antibiotic therapy (TTBET) directly into the complex of interventions in the acute pathology of the abdominal organs plays a crucial role in improving the quality of the treatment process, enabling the achievement of a reduction in the total volume of the course of antibiotics, reducing the level of purulent-septic complications, and, most importantly, resulting in a more rapid patient recovery Yarema I.V. et al., 1993, 2008; Virenkov Yu.E. et al.,

Nevertheless, as numerous problems associated with the treatment of pathological processes directing the lymphatic system and the exploration of the body's response to TTBET have been insufficiently studied, this aspect needs to be further investigated in-depth on a scientific level[6]. It lacks adequate information on indications and contraindications of TTBET, the number of fluids to be administered on a daily and course basis, and timing and duration of endolymphatic therapy in the literature[7-8].

Purpose: The endolymphatic drug therapy has a curative effect based on several processes: their good concentration in the lymph nodes and site of inflammation, lymphocyte cooperation of the lymph nodes, normalisation of the microcirculation system, immunomodulation of lymph nodes in the microvessels and interstitium.

Tasks:

1. To conduct a retrospective study of risk factors that lead to purulent complications in peritonitis.

2. To detect clinical, biochemical, and immunological alterations of patients with peritonitis before and after TTBET.

3. To identify the signs of intoxication (LII, NDI) in patients with peritonitis.

Materials and Methods

Sixty-six patients who were treated with appendicular peritonitis in the surgical departments of Tashkent clinics were analysed. Every patient was categorised into two groups. The main group (first group) was provided with an extensive range of interventions, which comprised endolymphatic therapy. The second group (control group) was made up of patients who did not receive lymphogenic (endolymphatic) therapy. Dynamic laboratory examination of biological media (blood, urine, lymph) is performed in all patients. Biochemical testing involves total protein and fractionation, remaining nitrogen, creatinine, cholesterol and diastase and others.

Immunological and toxic (LII, NDI) and clinical parameters (SAPS-II, APACHE- II) were measured.

The patients of the former group were catheterised of the peripheral lymphatic vessels of the foot or lower leg and in the area of the Les Franc joints in accordance with the general method, which was introduced in our surgical department since 1982.

All the patients were separated into two groups in accordance with the inclusion of lymphogenic methods into the therapeutic complex. The first sample (main group) included 36 patients who underwent endolymphatic therapy as a complex of interventions. The second group (control group) consisted of 30 patients who had no lymphogenic interventions.

The patients who were chosen to be observed had developed peritonitis as an adverse effect of acute appendicitis.

Dynamic biological media (blood, urine, lymph) monitoring was done on all of the patients. Biochemical examination was done to establish the total protein and its subunits, urea, creatinine, cholesterol, diastase and blood glucose concentration. In the former, the peripheral lymphatic vessels in the foot were catheterised or the Les-Frank joint, or the distal third of the lower leg. Drainage of the thoracic lymphatic duct (TLD) was done in five severely intoxicated patients as recommended by the standard procedure used in our department since 1989.

Antibiotics, proteolytic enzyme inhibitors, heparin, and rheological preparations were given via the catheterised peripheral lymphatic vessel depending on the clinical indicators. The association of the drugs, their doses, and volumes was decided by the severity and the cause of peritonitis and the condition of the patient. The immunological monitoring was done at baseline and at day 14 of treatment on the basis of the primary immunological markers: relative and absolute number of total T-lymphocytes, T- and B-cell mediated cellular immunity by rosette tests, and the major subpopulations. The method of A.M. Zemskov was used to determine phagocytic activity. The key biochemical parameters were identified as per V.S. Kamyshnikov.

The statistical analysis was done with the help of the STATISTICA software package (Windows version 11. All the numerical data were subject to statistical processing in order to determine reliability. The arithmetic mean (M) and the standard error of the mean (m) were determined on all populations. The following non-parametric criteria were applied to determine the important differences: dynamics of indicators between the study and control groups, comparing the data using the Wilcoxon test of paired samples, comparing the data between the study and control groups using a single indicator, and comparing it using the Mann-Whitney U-test. Statistical tests were all at a two-sided level of significance. At $p = 0.05$, significant differences were taken into account.

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Results and Discussions

The lymphatic system has a significant role in the occurrence of devastating alterations at the inflammation location. The cascade of events that causes swelling in the inflammatory focus is related to increased blood vessel exudation and decreased reabsorption of fluid and colloidal substances across intercellular spaces in the lymphatic system. The emerging oedema, in this case, contributes substantially to the hampered trophism of tissues in the inflammatory location, leading to low oxidation of metabolites and cellular necrosis, therefore augmenting the systemic toxin burden.

These were the circumstances that led to choosing the endolymphatic preparations that may be employed in our study. To illustrate, the application of antibiotics alone is not likely to provide an efficient entry point into the area of inflammation and the lymph nodes of the region. But with the administration of the same antibiotic following lymphatic heparinization, there is a likelihood that the anticipated discharge of the biological fluid across the lymphatic routes will be greatly increased. Similar to other authors, we stressed the fact that endolymphatic infusions hasten lymph flow in the primary lymphatic vessels[9-10]. The same effect was found in clinical observations in the case of patients with endotoxicosis: several hours after infusion of endolymphatic antibiotic, body temperature tended to increase, and intoxication symptoms increased, which is connected with the active entry of toxic lymph into the bloodstream.

The lymph nodes have an active role in immunology besides the barrier and detoxification roles that they play. All groups of lymphocytes are maintained and multiplied. In this regard, the role of microorganisms and microbial toxins in the lymph nodes as an etiological factor of degenerative changes is demonstrated in restoring the immunological reactivity of the body. In some instances, however, particularly where the signs of lymphopenia are very severe, there is a need to stimulate immunogenesis[11]. Thus, in case of low lymphocyte counts in the bloodstream and relatively lower numbers of T- lymphocyte subpopulations, we used T-activin by the endolymphatic pathway, which is done after acute inflammation at the site of lesion has been patented.

The endolymphatic therapy was conducted in the framework of generally accepted treatment methods to restore the balance of water and electrolytes, metabolism of proteins and vitamins, acid-base state, and the prevention of the emergence of complications in vital organs and in the body system. The antibiotics, heparin, antienzymatic agents and T-activin were provided only through the endolymphatic route and in accordance with established guidelines[12]. The amount of drugs prescribed, the amount of infused solutions, the order of endolymphatic infusions and the timing of the initiation depended on the course of the disease and its severity in a particular patient. In general, the primary category of patients was further divided into two minor subgroups, namely subgroup 1 and subgroup 2, comprising patients with localised versus diffuse peritonitis. Patients subgroup 2 would normally report to our clinic with postoperative complications after undergoing surgery, despite the repetitive use of antibiotic therapy in conventional modes.

In subgroup 1, the endolymphatic therapy was started soon after the operation and even prior to the surgical treatment, whereas in subgroup 2, it was started 4-6 days or later after the onset of the disease. The TTBET plan of these subgroups involved the antibiotic treatment, the use of inhibitors of protease activities, the treatment of microcirculation disorders, and, in case of need, the detoxification treatment[9-10]. In the case of massive types of peritonitis, the discrepancy in strategies was that the endolymphatic antibiotic treatment was started together with the traditional antibiotics of another mechanism of action. In case no positive response could be noted 3-4 days (e.g. the stabilisation of temperature, the decrease of leukocytosis, the recovery of intestinal peristalsis) the preparation was substituted.

Upon catheterisation of peripheral lymphatic vessels, the initial dose of 2.0 ml of 2,500 IU of heparin (0.5 0.6 ml of solution per minute) was given. When choosing the antibiotics to be used in our study, we mostly resorted to broad-spectrum cephalosporins and aminoglycosides. Precisely, cephalosporins were given once a day, and gentamicin at 1.0 g in a solution of 2 ml, three times less than the intramuscular intake of Metrogyl of 50mg daily. In severe intoxication syndrome patients, the regimen mentioned above was combined with 15 20 ml of Reosorbilact given endolymphatically, 68 hours after antibiotics or protease inhibitors to avoid the interaction of drugs[113-14]. The Reosorbilact was administered give slow the infusion was carried out over 2530 minutes, and a total of 34 infusions were done throughout the treatment course. In case of lymphopenia less than 17, T-activin was given endolymphatically 1 to 1.5 hours in the presence of antibiotics with a dosage of 100mg thrice daily on 1-2-5 days accordingly[15]. The analysis of immunological parameters in the compared groups of patients with appendicular peritonitis has been conducted with the TTBET method (see Table 1).

Table 1. Main immunological indicators (M±m) in the compared groups of patients with peritonitis on the 14th day of treatment

Indicator, unit of measurement	Normal values (n = 66)	Comparison groups	
		Main group	On the 14th day of treatment
T-lymphocytes, total (E-ROK), abs. ×10⁹/L	1,15±0,2	(I) 0,63±0,1 (II) 0,64±0,08	0,89±0,09 0,67±0,1
		z=0,39; p=0,69	z=3,06; p=0,0022
T-helper cells, abs. ×10⁹/L	0,72±0,04	(I) 0,42±0,07 (II) 0,41±0,09	0,63±0,06 0,47±0,09
		z=0,2; p=0,85	z=2,96; p=0,003

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T-suppressor cells, abs. ×10⁹/L	0,52±0,03	(I) 0,36±0,02 (II) 0,37±0,08	0,41±0,09 0,49±0,05
		z=0,14; p=0,89	z=0,74; p=0,46
B-lymphocytes (M-ROK), abs. ×10⁹/L	0,15±0,03	(I) 0,11±0,02 (II) 0,11±0,05	0,18±0,03 0,12±0,02
		z=0,07^=0,93	z=2,42; p=0,016
IgG, g/L	11,3±0,6	(I) 12,4±0,3 (II) 12,5±0,8	21,6±1,1 8,4±0,2
		z=1,21; p=0,23	z=2,35; p=0,018
Ig A, g/L	1,9±0,07	(I) 2,3±0,04 (II) 2,32±0,05	2,1±0,04 0,9±0,03
		z=0,13; p=0,896	z=2,5; p=0,013
Ig M, g/L	1,2±0,03	(I) 0,9±0,03 (II) 0,89±0,02	1,1±0,03 0,7±0,02
		z=0,46; p=0,67	z=3,56; p=0,0037
Phagocytic activity of neutrophils, %	60,2±2,7	(I) 41,7±2,56 (II) 41,9±3,12	69,9±4,3 46,4±2,7
		z=0,09^=0,93	z=2,4; p=0,017

Note: (I) - main group (n = 36), (II) - comparison group (n = 30)

Immunological indicators were analysed in patients with peritonitis and revealed that the absolute number of total T-lymphocytes E-RC was 1.83 and 1.79 times under normal values in groups I and II, respectively, with no significant difference between the groups (z = 0.39; p = 0.69) (Table 3). By the end of the 14 th treatment day, group I tended to amplify this indicator by 1.41-fold, but in group II it amplified by just 4.5 per cent (z = 3.06; p = 0.0022). Relative to normal values, by the end of the 14 days of treatment, total T- lymphocytes had fallen by 22.6% in group I and 41.7% in group II in the number. The levels of T-helper cells of groups I and II were lower by 1.71 and 1.76, respectively, than the level in the control group, and there is no significant difference between the two groups (z = 0.2; p = 0.85). In group I, it had increased 1.5-fold compared to group II, which increased by 12.8% by day 14. In comparison to normal values, group I and group II showed -12.5 and -34.7 percentage reductions in absolute T-helper cells, respectively, by day 14. The absolute number of T-suppressor cells in groups I and II was less than normal by 1.44 and 1.4 times in the two groups, and there was no significant difference between groups (z = 0.14; p = 0.89). In group I, the T-suppressor cells increase was insignificant amount by day 14, +12.2%, whereas group II was +24.5%, which could also be an indication of the severity of the lesion and the formation of purulent-septic complications.

The humoral immunity analysis revealed that the baseline absolute B-lymphocyte number (M-RC) in groups I and II decreased by 1.36-fold, and there was no statistically significant difference (z = 0.07; p = 0.93). In group I, B-lymphocytes had increased by 30.9% and in group II by only 8.3%, indicating adequate differentiation, activation of antigen-presenting cells, and production of antibodies by the immune system in the primary group. There was no significant difference between Baseline IgG levels in either group (8.9% in group I and 9.6% in group II), which were slightly over normal. On day 14, group IgG increased 1.7 times (p < 0.05), and group II increased 1.49 times or reduced 1.35 times compared to normal. The IgG was more than 2.4-fold different (z = 2.35; p = 0.0018).

There was no significant difference between baseline levels of IgA and IgM in the groups (p = 0.896; p = 0.64). The basal level of IgA was 1.21 and 1.22 times higher than normal in groups I and II, probably because antigen-presenting B-lymphocytes had been activated in the gastrointestinal mucosa. Group IgA had almost gone back to normal by day 14, but group IIgA was still 2.1 times lower than normal (z = 2.5; p = 0.013). The two groups had IgM values that were below normal (1.33 and 1.34 times lower) (p = 0.64). At day 14, IgM had risen 1.55 times in group I, which is slightly higher than normal. IgM in group II also declined by 1.27 percent compared to baseline, and was still 41.7 percent below normal. On day 14, a twofold difference in IgM was established between groups (z = 3.56; p = 0.0037)[16-17].

As far as phagocytic immunity (as indicated by neutrophil phagocytic activity) is concerned, the baseline activity of both groups was similar (z = 0.09; p = 0.93), showing -30.4% of normal activity. Neutrophil phagocytic activity in group I 14 days had increased by 1.68-fold, but in group II, the increase was only by 9.7, or -22.9/ normal values.

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Conclusion

TTBET is intended to bring about hypocoagulation correction, antibacterial, detoxification and immunostimulatory effects in postoperative ongoing peritonitis. Endolymphatic drug therapy can be used virtually in any contraindication. It increases the absolute number of total T-lymphocytes and T-helper cells, increases in IgG and IgM immunoglobulin levels and the neutrophil phagocytic activity. The lymphatic endolymphatic infusions of the solutions enhance the rapidity of lymph transportation via the lymphatic system and its entry into the bloodstream, which helps in normalisation of the microcirculatory system.

References

1. Based on the document provided, here are the complete references with all necessary information:
2. Abdumajidov, A., et al. (2019). Complex treatment of pyoinflammatory diseases in patients with diabetes mellitus. Central Asian Journal of Pediatrics, 2(3), 57-59.
3. Agzamova, M. N., et al. (2018). Study of microbial flora in peritonitis. Young Scientist, 1, 33-34.
4. Agzamova, M. N., Zuparov, K. F., & Zikrilla, T. Z. (1999). Oxidative status during alloplasty in patients with postoperative ventral hernia. Infection, Immunity and Pharmacology, 5.
5. Akhmedov, A. I., Tursumetov, A. A., & Zhafarov, K. M. (2020). Features of allohernioplasty for postoperative ventral hernias in the on-lay position under conditions of infection in the experiment. European Journal of Molecular and Clinical Medicine, 7(3), 3897-3905.
6. Akhmedov, M. D., et al. (2019). Cytochrome oxidase activity of liver parenchyma at various durations of ischemia and obstructive jaundice. European Science, 2(44), 71-75.
7. Ashurmetov, A. M., et al. (2018). Lymphoimmunostimulation in diffuse purulent peritonitis. Young Scientist, 7, 103-105.
8. Buyanov, V. M., Rodoman, G. V., & Laberko, L. A. (1995). Modern methods for assessing endogenous intoxication in diffuse peritonitis. In Proceedings of the 1st Moscow International Congress of Surgeons (pp. 16-17). Moscow, Russia.
9. Ermolov, A. S., Udovskiy, E. E., & Grigoryan, A. R. (1987). State of nonspecific humoral immunity in endolymphatic antibiotic therapy of surgical infection. Khirurgiya, 1, 76-79.
10. Golbraikh, V. A. (1998). Endolymphatic therapy in the complex treatment of patients with purulent-inflammatory diseases of the abdominal cavity (Doctoral dissertation). Moscow, Russia.
11. Ismailov, F. M., et al. (2018). Causes of death in emergency conditions of the abdominal organs. Young Scientist, 8, 44-46.
12. Jafarov, K. M., et al. (2002). Method of treatment of purulent-inflammatory diseases in patients with diabetes mellitus. Palliative Medicine and Rehabilitation, 2-3, 113.
13. Jafarov, K., & Melnik, I. (2021). Immediate results of surgical treatment of patients with strangulated ventral hernia of the anterior abdominal wall. Asian Pacific Journal of Environment and Cancer, 4(S1), 13-14.
14. Mirzakhidovich, J. K., Abdumalikovich, T. A., & Ibrogimovich, A. A. (2021). Prevention of postoperative wound complications in rappeded abdominal hernia. Annals of the Romanian Society for Cell Biology, 6473-6484.
15. Navruzov, S. N., Mekhmonov, Sh. R., & Dolimov, K. S. (2003). Extended and combined operations in large bowel obstruction. Bulletin of the Association of Physicians of Uzbekistan, 3, 20-23.
16. Usarov, A. M. (2024). Immunological basis of lymphatic therapy in appendicular peritonitis. Miasto Przyszlosci, 53, 795-800. https://miastoprzyszlosci.com.pl/index.php/mp/article/view/4937
17. Abdurazzakova, D. A., et al. (2018). Efficiency of endolymphatic drug administration. Young Scientist, 9, 61-62.