12. Lee J, Cho H, Kang M, Hong R, Seong M, Shin Y. Retinal Changes before and after Silicone Oil Removal in Eyes with Rhegmatogenous Retinal Detachment Using Swept-Source Optical Coherence Tomography. J Clin Med. 2021 Nov 21;10(22):5436. doi: 10.3390/jcm10225436.
13. Mansoori T, Sivaswamy J, Gamalapati JS, Balakrishna N. Radial peripapillary capillary density measurement using optical coherence tomography angiography in early glaucoma. J Glaucoma. 2017; 26(5):438–443. https://doi.org/10.1097/IJG.0000000000000649.
14. Mastropasqua R, Agnifili L, Borrelli E, Fasanella V, Brescia L, Di Antonio L, et al. Optical Coherence Tomography Angiography of the Peripapillary Retina in Normal-Tension Glaucoma and Chronic Nonarteritic Anterior Ischemic Optic Neuropathy. Curr Eye Res. 2018 Jun;43(6):778-784. doi: 10.1080/02713683.2018.1438630.
15. Nassar GA, Makled HS, Youssef MM, Hassan LM. Functional and perfusion changes associated with silicone oil tamponade after macula-off retinal detachment surgery. Int Ophthalmol. 2024; 44:107. https://doi.org/10.1007/s10792-024-03037-5.
16. Spaide RF, Fujimoto JG, Waheed NK, Sadda SR, Staurenghi G. Optical coherence tomography angiography. Progress in Retinal and Eye Research. 2018;64:1-55. doi:10.1016/j.preteyeres.2017.11.003.
17. Xiang W, Wei Y, Chi W, Zhang Z, Zhong L, Liu R, Zhang S. Effect of silicone oil on macular capillary vessel density and thickness. Exp Ther Med. 2020 Jan;19(1):729-734. doi: 10.3892/etm.2019.8243.
18. Zhou Y, Zhang S, Zhou H, Gao M, Liu H, Sun X. Comparison of fundus changes following silicone oil and sterilized air tamponade for macular-on retinal detachment patients. BMC Ophthalmol. 2020 Jun 22;20(1):249. doi: 10.1186/s12886-020-01523-9.

Conflict of interest. The author has no conflicts of interest to declare.

ORCID: Haji I.F. https://orcid.org/0009-0001-3067-6445.

Article received: 21.04.2025

DOI 10.26724/2079-8334-2026-2-96-135-140
UDC 615.83+616.381–002+616–089.168

Churpiy I.K., Mishchuk V.V., Kuravska Yu.S., Zelinska M.V., Lopatskyi S.V.
Ivano-Frankivsk National Medical University, Ivano-Frankivsk

PHYSICAL THERAPY PROGRAM IN PATIENTS' SURGERY DUE TO PERITONITIS IN THE EARLY POSTOPERATIVE PERIOD

e-mail:ch.igor.if@gmail.com

Mortality in peritonitis ranges from 9.2 to 37.5 % and has remained so over the past decades. We examined 165 patients with acute surgical pathology. The age of the patients ranged from 18 to 93 years. Men were – 75, women – 90. Conducting a rehabilitation program in the postoperative period in patients operated on for peritonitis contributes to the earliest restoration of the work of all vital organs and systems. Implementation of a rehabilitation program (early mobilization, breathing exercises and dosed active movements for the upper and lower extremities) 12–16 hours after the end of the surgical intervention, which were comprehensive and phased, contributed to the reduction of bronchopulmonary complications by 5.6 %, thrombosis by 3.2 %, early intestinal obstruction by 1.1 %. Conducting physical therapy should be focused on the individual characteristics of each patient, taking into account age, concomitant pathology, duration and volume of surgical intervention.

Key words: physical therapy, rehabilitation program, surgical treatment, peritonitis, early postoperative period.

Чурпій І.К., Міщук В.В., Куравська Ю.С., Зелінська М.В., Лопацький С.В.

ПРОГРАМА ФІЗИЧНОЇ ТЕРАПІЇ У ХВОРИХ, ОПЕРОВАНИХ З ПРИВОДУ ПЕРИТОНІТУ, В РАННЬОМУ ПІСЛЯОПЕРАЦІЙНОМУ ПЕРІОДІ

Летальність при перитоніті становить від 9,2 до 37,5 % і залишається на такому рівні протягом останніх десятиліть. Нами було обстежено 165 пацієнтів із гострою хірургічною патологією. Вік хворих коливався від 18 до 93 років. Чоловіків було 75, жінок – 90. Проведення програми реабілітації у післяопераційному періоді у пацієнтів, прооперованих з приводу перитоніту, сприяє якнайшвидшому відновленню роботи всіх життєво важливих органів та систем. Впровадження програми реабілітації (рання мобілізація, дихальні вправи та дозовані активні рухи для верхніх і нижніх кінцівок) через 12–16 годин після закінчення хірургічного втручання, які мали комплексний та поетапний характер, сприяло зниженню частоти бронхолегеневих ускладнень на 5,6 %, тромбозів – на 3,2 %, ранньої кишкової непрохідності – на 1,1 %. Проведення фізичної терапії має бути зорієнтоване на індивідуальні особливості кожного пацієнта з урахуванням віку, супутньої патології, тривалості та обсягу хірургічного втручання.

Ключові слова: фізична терапія, програма реабілітації, хірургічне лікування, перитоніт, ранній післяопераційний період.

Funding. *The study is a fragment of the research project "Development and improvement of organizational and methodological foundations of physical therapy in patients with diseases of the abdominal cavity and nervous system", state registration No. 0119U000448.*

The management of patients with peritonitis presents a challenging and unpredictable task for every surgeon, regardless of their experience and skill. Prevention of complications and the rehabilitation of patients operated on for peritonitis remain largely unresolved issues. Today, as in decades past, peritonitis continues to be a complex and highly unpredictable complication of acute surgical pathologies [1]. Endogenous intoxication plays a key role in the progression of peritonitis,

inevitably leading to the dysfunction of vital organs and systems.

Consequently, mortality rates in peritonitis have remained stagnant over recent decades, ranging from 9.2 % to 37.5 % [7].

In the postoperative period, the timely initiation of rehabilitation measures is both crucial and highly effective. The primary focus of treating these patients lies in restoring functional disorders caused by the underlying disease and surgical intervention, alongside preventing early postoperative complications.

Early complications remain one of the most critical issues in abdominal surgery; among these, purulent–septic complications dominate, affecting 6–10 % of operated patients [11, 13]. Therefore, the rehabilitation of post–surgical patients plays a vital role in overall treatment efficacy [6, 8]. However, existing literature indicates that physical therapy initiated within the first hours of the postoperative period is often unstructured, and objective tests for monitoring the effectiveness of rehabilitation measures are lacking, which significantly hinders their clinical implementation [15].

The purpose of the study was to develop a targeted set of physical exercises designed to restore vital functions in patients following surgery for peritonitis.

Materials and methods. We examined 165 patients presenting with acute surgical pathologies. Patient age ranged from 18 to 93 years. The cohort included 75 men and 90 women. Age distribution was as follows: up to 30 years – 40 patients (24.2 %); 31 to 50 years – 32 patients (19.4 %); 51 to 60 years – 27 patients (16.4 %); and over 61 years – 66 patients (40 %). Notably, 93 patients (56.4 %) were older than 50 years.

Regarding concomitant pathologies, the most prevalent conditions were cardiovascular diseases in 104 patients (63 %), varicose veins of the lower extremities in 6 patients (3.6 %), chronic respiratory diseases in 34 patients (21 %), and endocrine disorders, including diabetes mellitus in 20 patients (12.1 %) and obesity in 48 patients (29.1 %).

The time elapsed from disease onset to hospitalization was: up to 6 hours for 22 patients; up to 12 hours for 25 patients; up to 24 hours for 20 patients; up to 48 hours for 74 patients; and more than 72 hours for 24 patients. Localized peritonitis was observed in 65 patients, while 100 patients presented with diffuse peritonitis.

The underlying pathology distribution for localized peritonitis was: acute phlegmonous appendicitis – 2; acute gangrenous appendicitis – 7; acute perforated appendicitis – 10; acute calculous cholecystitis – 12; salpingitis – 8; strangulated hernia – 4; ovarian apoplexy – 15; and other conditions – 7.

The pathology profile for diffuse peritonitis included: gangrenous appendicitis – 7; gangrenous cholecystitis – 3; acute intestinal obstruction – 27; strangulated hernia – 8; Crohn's disease – 5; perforated gastric and duodenal ulcers – 26; abdominal trauma (hollow viscera injuries) – 11; large intestine perforation – 5; small intestine perforation – 1; and other causes – 7.

The primary exclusion criterion was localized peritonitis at presentation. There were no dropouts or changes in group composition after the study commenced.

Patients were divided into two groups comparable in age and disease severity. The first group (comparison group) comprised 75 patients (39 of whom (52 %) were over 50 years old) who received standard therapy. The second group (intervention group) included 90 patients (57 of whom (63.3 %) were over 50 years old) who additionally performed the proposed physical exercise complex.

An analysis of the medical records in the comparison group revealed insufficient and unsystematic use of physical therapy during the early postoperative period. Interventions were often prescribed at varying intervals after surgery, lacking clear phasing or a standardized approach. Grounded in modern scientific data and our own findings, we developed a structured physical therapy program based on the principles of early mobilization and dosed kinesiotherapy for patients recovering from surgical treatment of peritonitis.

The main concept by which abdominal surgery (surgery of the abdominal organs) after major abdominal operations is currently operating is called ERAS (Enhanced Recovery After Surgery) – that is, the protocol of accelerated (or enhanced) recovery after surgical interventions. Order of the Ministry of Health of Ukraine No. 1422 (Basic permission for the use of international protocols) dated December 29, 2016 [12].

The study adhered to all ethical principles and regulatory documents, including Ministry of Health of Ukraine Orders No. 690 (dated Sept 23, 2009), No. 944 (dated Dec 14, 2009), and No. 616 (dated Aug 3, 2012); the Declaration of Helsinki of the World Medical Association (1964–2013); and the “Code of Ethics and Professional Conduct of Physical Therapists in Ukraine” (dated May 28, 2009, and revised December 21, 2019), approved by the NGO “Ukrainian Association of Physical Therapy” [14].

The research methods used comply with the 2008 Declaration of Helsinki and were approved by the Ethics Committee of Ivano–Frankivsk National Medical University (IFNMU) during the planning stage of a comprehensive research project. This project was ratified by the Academic Council of IFNMU (protocol № 19, dated December 20, 2018).

Results of the study. An important principle of rehabilitation was the active participation of the patient in performing exercises, which increased the effectiveness of recovery and contributed to the formation of independence. The physical therapy

program, including the choice of exercises, intensity and duration of the workload, was determined individually by a multidisciplinary team taking into account the clinical condition of the patient, the course of the postoperative period and existing risk factors.

To prevent bronchopulmonary, hypodynamic, thromboembolic complications, complications from the postoperative wound and adhesive disease, restore bowel function, reduce intra–abdominal pressure, a structured physical therapy program was used, which included early mobilization, breathing exercises and dosed active movements for the upper and lower extremities.

The patient was given a position with the head elevated or semi–sitting, which contributed to improving ventilation of the lower parts of the lungs, draining exudate into the lower parts of the abdomen, which, as a rule, are always well drained. The set of exercises was expanded on the 2nd – 3rd day, the patient was taught to independently perform exercises, the duration of which increased.

In order to quickly restore all functions of organs and systems, exercises were started 12–16 hours after the operation, from the moment of regaining consciousness after general anesthesia, but their beginning was individual for each patient.

In the early postoperative period, respiratory kinesiotherapy was given key importance in combination with dosed motor activity.

The set of physical exercises included: breathing exercises performed with an emphasis on controlled diaphragmatic and thoracic breathing, as well as effective coughing techniques. Patients were recommended to breathe without delay, with a smooth prolonged exhalation, avoiding forced inhalations, which corresponds to modern approaches to the prevention of postoperative pulmonary complications. To reduce pain during breathing, methods of supporting the anterior abdominal wall (splinting) were used, which increases the safety and tolerability of the exercises.

Given the presence of postoperative pain syndrome, especially in the first 24–48 hours, diaphragmatic breathing was used in a gentle mode with intensity control.

Breathing exercises were combined with activation of the distal extremities, which contributes to improving peripheral blood circulation and preventing venous stasis. The complex of dynamic exercises for the upper extremities included flexion and extension in the elbow joints, as well as abduction of the arms in the shoulder joints during inhalation with a return to the starting position on exhalation. This combination of movement with breathing phases contributes to an increase in chest excursion, improved lung ventilation and reduced risk of atelectasis.

For the lower extremities, exercises aimed at activating the musculo–venous pump were used: dorsiflexion and plantar flexion of the feet, alternating sliding of the heels on the bed with flexion in the knee joints (“simulation of walking while lying down”), as well as careful rotational movements of the bent legs. Such exercises provide stimulation of venous and lymphatic return, reduce the risk of thromboembolic complications, and at the same time contribute to indirect activation of abdominal structures.

Particular attention was paid to the inclusion of exercises that indirectly stimulate the motor function of the intestine. Rhythmic movements of the lower extremities in combination with breathing contribute to a change in intra–abdominal pressure, which, according to modern research, has a positive effect on the restoration of peristalsis and the prevention of postoperative ileus.

The proposed approach is based on the principles of early mobilization, continuity and individualization of the workload and corresponds to modern evidence–based recommendations for the management of surgical patients. The combination of respiratory therapy with active movements allows you to simultaneously influence the respiratory, cardiovascular and digestive systems, which provides a multi–system effect and increases the effectiveness of rehabilitation.

Therapeutic gymnastics was performed 3–4 times a day for 5–7 minutes by an individual method. Patients were taught to conduct classes independently. The task was in the early postoperative period: prevention of possible complications of hypostatic pneumonia, atony of the stomach and intestines, the formation of thrombosis, prevention of the adhesion process, the formation of an elastic mobile scar, improvement of general and local blood circulation and lymph drainage, improvement of the patient's psychoemotional state and training in self–care skills.

In the first days after surgery, patients with peritonitis have a restriction of diaphragmatic breathing, which is due to increased intra–abdominal pressure and intestinal paresis. According to functional studies, the amplitude of diaphragmatic breathing decreases by 10–20 % in acute surgical pathology and additionally by 10–20 % after surgery, with partial recovery within 7–10 days. In this regard, in the early period, the emphasis was placed on gentle breathing exercises with gradual involvement of the diaphragm, which corresponds to modern approaches to respiratory physical therapy.

Taking into account the effects of anesthesia, the duration of surgery, and the use of muscle relaxants, patients experienced decreased muscle strength and increased fatigue. Therefore, physical activity was dosed individually, with the advantage of short, repetitive, low–intensity sessions.

On the 2nd–3rd day after surgery, provided that the pain syndrome decreased, patients switched to performing full (combined) breathing with gradual

involvement of the diaphragm. During inhalation, chest expansion was achieved with controlled involvement of the anterior abdominal wall, which contributed to improving ventilation of the lower parts of the lungs.

Respiratory therapy was combined with controlled coughing techniques to optimize the drainage function of the bronchial tree. In order to create positive pressure at the end of exhalation, exercises with dosed exhalation through resistance (for example, through a tube or other simple devices) were used, which contributed to the prevention of atelectasis and improved oxygenation.

In the first two days, classes were performed with a high frequency (every 40–60 minutes) in short sessions lasting 3–5 minutes, with an emphasis on gentle breathing exercises, mainly due to the thoracic component, with a gradual transition to deeper breathing.

On the 3rd–4th day after surgery, the physical therapy program was expanded by activating the patient: controlled turns in bed, gradual transition to a sitting position, and preparation for verticalization were performed. The main emphasis was on active exercises for the upper and lower extremities aimed at improving peripheral circulation, preventing venous stasis and thromboembolic complications. In order to additionally stimulate the drainage function of the respiratory tract, auxiliary manual techniques (light vibration techniques) were used in some cases, however, their use was considered as a secondary addition to active respiratory therapy. In the early postoperative period, catabolic processes prevailed, i.e. the body has limited energy resources. In patients with peritonitis, the heart rate is significantly increased – 100–120 beats/min, which leads to an increase in energy expenditure in 1 minute – 4.97–7.60 kcal/min, while at a heart rate of 85–80 beats/min, energy expenditure is 0.60–2.47 kcal/min.

To prevent depletion of the body's energy resources, we suggest doing physical exercises 3–4 times a day, but in short sessions of 5–7 minutes, which allows you to prevent overloading the body and at the same time maintain the necessary tonic effect.

In the first days after surgery, the physical capabilities of patients are limited. The presence of pronounced pain syndrome in some cases leads to the refusal of patients to perform physical exercises. Massage, unlike exercises, does not require the patient's willpower and is the most sparing form of increasing the overall tone of the body, giving a good clinical effect.

The tasks of manual techniques in the early postoperative period are a general effect on the patient's body, increasing overall tone, improving blood circulation, breathing, stimulating regenerative processes and preventing number of postoperative complications (especially pneumonia, thrombophlebitis and embolism) against the background of the mandatory use of low–molecular heparins.

For the prevention of bronchopulmonary complications in the early postoperative period, manual techniques of influence on the chest with elements of rubbing, stroking, light vibration, which was performed with the fingers, were used. Vibration techniques were started in the first 12–16 hours after the operation. Special attention is paid to elderly patients and patients with concomitant pulmonary diseases, since they have a high risk of postoperative complications from the side of the pulmonary system.

Discussion. In the postoperative period after operations on the abdominal organs (outside the postoperative wound), it is recommended to perform manual techniques lasting 10–15 min. 1 time per day. After the procedure, accelerated muscle blood circulation lasts about 3 hours, which contributes to the rapid healing of postoperative wounds [7, 16].

In peritonitis, to prevent complications from the respiratory system, in the medical care protocols, it is recommended to perform vibration techniques for three days without specifying the frequency and duration [3, 15]. We have proposed to perform, in addition to vibration exposure, segmental–reflex massage techniques, which through reflex connections affect the functional state of internal organs and systems, as well as local (local) techniques, the action of which is directed directly to the zone of influence. The duration of the procedure is 5–6 minutes up to 4 times a day in order to maintain impaired functions of the respiratory system. This duration is satisfactorily tolerated by patients with a positive result for them [5].

According to the recommendation [4], in the medical care protocols, to prevent complications from the respiratory system, it is necessary to carry out aerosol therapy for three days by inhaling a soda solution, oropharyngeal sanitation. Such prophylaxis was carried out in the control group of patients with peritonitis. In the main group, inhalation was carried out with a 5 % solution of sea salt [6], which accelerates and facilitates sputum discharge.

Inhalations with the addition of sea salt were carried out twice a day for 5–6 days. A 5 % solution for inhalation was prepared by diluting 50 g of sea salt in 1 L of water.

Inhalations were carried out with ultrasonic inhalers (ultrasound aerosol portable device 402A). Ultrasonic nebulizers use ultrasonic vibrations for spraying, which provide an average size of aerosol particles up to 0.5–5 microns, which is 50 % better than in compressor nebulizers. Due to the small size of aerosol particles, they reach small bronchi and bronchioles in a higher concentration, which improves the drainage function of the respiratory tract, helps reduce edema and the activity of the inflammatory process, improves microcirculation of the respiratory tract mucosa, and relieves bronchospasm. In order to prevent

bronchopulmonary complications, preventive irradiation of the chest area with ultraviolet light was performed using the OKN–11 irradiator in the amount of 1 biodose per day from a distance of 50 cm to the skin surface with an area of 400 cm^2 [9, 10].

To stimulate reparative processes and prevent complications from the surgical wound and to treat complications that arose in the postoperative period from the surgical wound (inflammation in the postoperative wound area, suppuration of the postoperative wound), a comprehensive physiotherapeutic approach was used: ultraviolet irradiation with an irradiator "OKN–11" in the amount of 1 biodose. An electric field of UHF was used with an UHF–20 apparatus for a duration of 10 min., magnetotherapy, laser therapy. The devices "Mavr", "Mag–0.2" were used for magnetotherapy. The magnetotherapy session took place once a day for 10 min. with a magnetic field power of 20 mT. Laser therapy was performed once a day using a portable quasi–laser "INS–3K", "INS–3S". The radiation power was 20 mW/cm2, duration 90 seconds. The effectiveness of the use of UHF electric field, magnetotherapy, laser therapy is confirmed in literary sources [2–5].

The effectiveness of respiratory prophylaxis was assessed by the general condition of the patient, existing complaints, auscultatory picture in the lungs, dynamics of intoxication indicators (leukocyte count, leukocyte intoxication index), as well as by the manifestation of systemic inflammation (body temperature, pulse, respiratory rate).

Absolute contraindications for physical therapy: severe general condition of the patient, due to the main or concomitant disease; high fever (38–39°C); persistent pain syndrome; anemia; risk of bleeding.

When conducting physical therapy for patients with peritonitis in the early postoperative period, it was taken into account that the complex of rehabilitation measures was minimal, but sufficient to restore lost or reduced functions. At the same time, it should not exceed the functional capabilities of the patient and ensure the greatest efficiency of recovery. In this regard, the issues of organizing a rehabilitation program, which should be preventive in nature, come to the fore.

Conclusions

1. Conducting a rehabilitation program in the postoperative period in patients operated on for peritonitis contributes to the earliest restoration of the work of all vital organs and systems.

2. Implementation of a rehabilitation program (early mobilization, breathing exercises and dosed active movements for the upper and lower extremities) 12–16 hours after the end of the surgical intervention, which were comprehensive and phased, contributed to the reduction of bronchopulmonary complications by 5.6 %, thrombosis by 3.2 %, early intestinal obstruction by 1.1 %.

3. Conducting physical therapy should be focused on the individual characteristics of each patient, taking into account age, comorbidities, duration and volume of surgical intervention.

Prospects for further research. Future research will focus on developing and refining highly specialized, objective clinical metrics to further optimize early–stage postoperative physical therapy protocols for patients recovering from peritonitis.

References

1. Hlyniana OO, Kopochynska YuV, Khudetskyi IYu. Fizychna terapiia pry khirurhichnykh zakhvoriuvanniakh: navch. posib. Kyiv: KPI im. Ihora Sikorskoho; 2020. 207 s. [in Ukrainian].
2. Hrynchuk AF. Taktyka likuvannia khvorykh na hostryi perytonit. Art of Medicine. 2020;3(15):53–66. https://doi.org/10.21802/artm.2020.3.15.53 [in Ukrainian].
3. Zakon Ukrainy pro reabilitatsiiu u sferi okhorony zdorovia [Internet]. Zakonohdavstvo Ukrainy. [cited 2026 Jun 28]. Available from: https://zakon.rada.gov.ua/laws/show/1053-20#Text7 [in Ukrainian].
4. Kashuba VO, Hryhus IM, Samoiliuk OV. Osoblyvosti rukhovoi funktsii osib zriloho viku u protsesi zaniat fizychnymy vpravamy. Rehabilitation and Recreation. 2024;(18):179–188. https://doi.org/10.32782/2522-1795.2024.18.3.16 [in Ukrainian].
5. Churpiy IK, Aravitska MH, Kuravska YS, Pylypiv LA, Zelinska MV, Hutsol MI, Pachkiv MA. Rehabilitation of women after caesarean section and prevention of muscle diastasis in women recently confined. Art of Medicine. 2024;4(32):99–104. https://doi.org/10.21802/artm.2024.4.32.99.
6. Al-Ansari K, Sakran M, Davidson BL, El-Alaili R, El-Sayyed H. Nebulized 5 % or 3 % hypertonic or 0.9 % saline for treating acute bronchiolitis in infants. J Pediatr. 2010;157(4):630–634. https://doi.org/10.1016/j.jpeds.2010.04.074.
7. Al-Mandeel MM, Watson T. Shortwave diathermy (high–frequency electric field) in surgical wound healing: Dosimetry and clinical efficacy. Phys Ther Rev. 2022;27(3):185–194. https://doi.org/10.1080/10833196.2022.2067441.
8. Brindle M, Nelson G, Lobo DN, Ljungqvist O, Carli F. Recommendations from the ERAS® Society for standards for the development of enhanced recovery after surgery guidelines. Br J Surg. 2020;107(6):699–707. https://doi.org/10.1002/bjs5.50238.
9. Guo L, Stark RI. Efficacy of shortwave diathermy on deep tissue healing and surgical site inflammation. Arch Phys Med Rehabil. 2021;102(8):1544–1552. https://doi.org/10.1016/j.apmr.2021.03.022.
10. Gustafsson UO, Scott MJ, Hubner M, Nygren J, Demartines N, Francis N, et al. Guidelines for perioperative care in elective colorectal surgery: Enhanced Recovery After Surgery (ERAS®) Society recommendations: 2018. World J Surg. 2019;43(3):659–695. https://doi.org/10.1007/s00268-018-4844-y.
11. Long B, Gottlieb M. Emergency medicine updates: Spontaneous bacterial peritonitis. Am J Emerg Med. 2023 Aug;70:84-89. https://doi.org/10.1016/j.ajem.2023.05.015.
12. Bass GA, Dzierba AL, Taylor B, Lane-Fall M, Kaplan LJ. Tertiary peritonitis: considerations for complex team-based care. Eur J Trauma Emerg Surg. 2022 Apr;48(2):811-825. https://doi.org/10.1007/s00068-021-01750-9.
13. Nguyen MP, Crotty MP, Daniel B, Dominguez Ed. An Evaluation of Guideline Concordance in the Management of Intra–Abdominal Infections. Surg Infect (Larchmt). 2019;20(8):650–657. https://doi.org/10.1089/sur.2018.317.

14. Li PK, Chow KM, Cho Y, Fan S, Figueiredo AE, Harris T, et al. ISPD peritonitis guideline recommendations: 2022 update on prevention and treatment. Perit Dial Int. 2022 Mar;42(2):110-153. https://doi.org/10.1177/08968608221080586.
15. Prysiazhniuk VP, Rokochynska VV, Vance JA. Physical therapy and early mobilization protocols in patients following emergency abdominal surgery for peritonitis. Ukr J Rehabil Med. 2020;14(2):112–119. https://doi.org/10.32782/ujrm.2022.2.14.
16. Sartelli M, Chichom–Mefire A, Labricciosa FM, Hardcastle T, Abu–Zidan FM, Adesunkanmi AK, et al. The management of intra–abdominal infections from a global perspective: 2017 WSES guidelines for management of intra–abdominal infections. World J Emerg Surg. 2017;12:29. https://doi.org/10.1186/s13017-017-0141-6.

Conflict of interest. The authors declare no conflicts of interest.

ORCID: Churpiy I.K. https://orcid.org/0000-0003-1735-9418, Mishchuk V.V. https://orcid.org/ 0000-0002-0665-9514, Kuravska Yu.S. https://orcid.org/0000-0002-1338-0757, Zelinska M.V. https://orcid.org/0009-0008-8623-4743, Lopatskyi S.V. https://orcid.org/0000-0002-9508-3042.

Article received: 12.05.2025

DOI 10.26724/2079-8334-2026-2-96-140-144
UDC 612.115-06:616.28-008.1-02:616.98:578.834]-047.44

Shydlovska T.A., Bezeha M.I.[1], Burlaka Yu.B., Voroshilova N.M., Ver'ovka S.V.
State Institution "Institute of Otolaryngology named after Prof. O.I. Kolomiychenko of the National Academy of Medical Sciences of Ukraine", Kyiv
[1]Poltava Medical State University, Poltava

ASSESSMENT OF BLOOD COAGULATION SYSTEM STATUS IN PATIENTS WITH SENSORINEURAL HEARING IMPAIRMENTS WHO HAVE RECOVERED FROM COVID-19

e-mail: m.bezeha@pdmu.edu.ua

COVID-19 is a systemic disease that affects various body systems, including the auditory system and the hemostatic system. Changes in platelet-vascular, coagulation, and fibrinolytic components of hemostasis were studied in 32 patients with sensorineural hearing impairments who had recovered from COVID-19 and 20 healthy individuals with normal hearing. Normalization of fibrinogen and ecarin time was established. An increase in soluble fibrin concentration was detected against the background of decreased D-dimer levels. This indicates the activation of the blood coagulation system and the inability of fibrinolysis to hydrolyze fibrin clots, which is indirectly confirmed by increased levels of RFMC. A decrease in protein C content was established, indicating intravascular thrombin generation, as a result of which there is an increase in prothrombin-1 and soluble fibrin concentration. Prolongation of activated partial thromboplastin time and prothrombin time against the background of changes in the aforementioned parameters is a manifestation of chronic consumptive coagulopathy. The absence of normalization of hemostasis parameters in patients who have recovered from COVID-19 is an unfavorable prognostic sign.

Key words: COVID-19, post-COVID syndrome, sensorineural hearing loss, hemostasis, soluble fibrin, chronic coagulopathy.

Шидловська Т.А., Безега М.І., Бурлака Ю.Б., Ворошилова Н.М., Верьовка С.В.

ОЦІНКА СТАНУ СИСТЕМИ ЗСІДАННЯ КРОВІ У ПАЦІЄНТІВ ІЗ СЕНСОНЕВРАЛЬНИМИ ПОРУШЕННЯМИ СЛУХУ, ЯКІ ПЕРЕХВОРІЛИ НА COVID-19

COVID-19 є системним захворюванням, при якому уражаються різні системи організму, зокрема слухова і система гемостазу. Було досліджено зміни показників тромбоцитарно-судинної, коагуляційної та фібринолітичної ланок гемостазу у 32 пацієнтів з сенсоневральними порушеннями слуху, які перехворіли на COVID-19 та 20 здорових нормальночуючих осіб. Встановлена нормалізація фібриногену та екамулінового часу. Виявлено підвищення концентрації розчинного фібрину на тлі зниження Д-димеру. Це свідчить про активацію системи зсідання крові та не здатність фібринолізу гідролізувати фібринові згустки на що опосередковано підтверджує підвищення рівня РФМК. Встановлено зниження вмісту протеїну С, що вказує на внутрішньосудинну генерацію тромбіну. Внаслідок надпродукції якого відбувається підвищення претромбіну-1 й концентрації розчинного фібрину. Подовження активованого часткового тромбопластинового часу та протромбінового часу на тлі змін вищевказаних показників, є проявом хронічної коагулопатії споживання. Відсутність нормалізації показників гемостазу у пацієнтів, які перехворіли на COVID-19 є несприятливою прогностичною ознакою.

Ключові слова: COVID-19, постковідний синдром, сенсоневральна приглухуватість, гемостаз, розчинний фібрин, хронічна коагулопатія.

Funding. *The work is a fragment of the research project "Comprehensive clinical and instrumental characteristics of the state of sensory systems – auditory, olfactory and vestibular systems, as well as extraaural manifestations in COVID-19", state registration No. 0121U113546.*

COVID-19 is a systemic disease because, in addition to the respiratory system, it can also affect other body systems, including the cardiovascular, nervous, hematopoietic, gastrointestinal, immune, and others [5, 6]. There are reports in the literature of sensory system impairments in COVID-19, in particular the auditory system. Moreover, the reduction of auditory function, subjective ear noise, and the feeling of ear fullness may be caused by both