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Idiopathic pulmonary hemosiderosis as an occupational disease: a clinical case

O.M. Raznatovska[1], G.L. Gumeniuk[2], R.M. Yasinskyi[1], A.V. Fedorec[1]
1. Zaporizhzhia State Medical and Pharmaceutical University, Zaporizhzhia, Ukraine
2. Shupyk National Healthcare University of Ukraine, Kyiv, Ukraine

Conflict of interest: none

BACKGROUND. Idiopathic pulmonary hemosiderosis (IPH) in adults is a rare pathology of unknown etiology. We did not find information about IPH in adults with occupational hazards in the available literary sources, which makes this work relevant.
OBJECTIVE. To analyze the peculiarities of the IPH course in a patient with 23 years' experience as a gas-electric welder at factories by our own clinical observation.
RESULTS AND DISCUSSION. Changes in the form of heterogeneous pneumatization of the lung parenchyma due to the increased interstitial component were determined on the computer tomography of the chest cavity (CT of the chest cavity) 1.5 years before the patient's visit, but no additional examination was prescribed, and only the diagnosis "Chronic obstructive pulmonary disease" (COPD) was made. Negative dynamics due to the increase of miliary nodular dissemination of the lungs was revealed on the CT scan of the chest after 1.5 years. IPH was already detected pathohistologically after videothoracoscopy of the right lung with biopsy. Shortness of breath and cough increased in the patient, but apart from treatment aimed at COPD treating, no other therapy was prescribed (this therapy did not have a positive effect). The patient underwent a comprehensive immunological examination: the indicators of the anti-neutrophil cytoplasmic antibodies (ANCA) profile and the complex immunological blood test were within the normal range, which ruled out pulmonary vasculitis and an immune-mediated process. Considering the positive Quantiferon test, the patient was examined and the tuberculosis was excluded. Patient have not been suffered from hemoptysis and anemia from the moment of detection of the first changes on the CT scan of chest up to the present time. Due to treatment, the clinical and radiological stabilization of the process was determined after 4 months: the clinical symptoms of the disease decreased; small nodular shadows with areas of fibrosis, which are characteristic of the period of remission, were determined on the CT scan of the chest.
CONCLUSIONS. IPH course features in a patient with a professional route are: a long period of development with COPD manifestations (without effect of therapy), absence of hemoptysis and anemia, normal indicators of the ANCA profile and complex immunological examination, a positive Quantiferon test. Corticosteroid therapy in high doses has a positive effect, which is manifested in the clinical and radiological stabilization of the process. The mechanism of IPH development may have been a toxic mechanism (23 years of work experience as a gas-electric welder at factories). Timely detection of IPH and timely prescribed corticosteroid therapy will prevent the progression of the process and the development of complications, as well as reduce mortality from this disease. Patients with IPH should be under dynamic observation due to timely evaluation of CT-dynamics of the process in the lungs and correction of the dose of corticosteroids.

KEY WORDS: idiopathic pulmonary hemosiderosis, occupational disease.

Ідіопатичний гемосидероз легень як професійне захворювання: клінічний випадок

О.М. Разнатовська[1], Г.Л. Гуменюк[2], Р.М. Ясінський[1], А.В. Федорець[1]
1. Запорізький державний медико-фармацевтичний університет, м. Запоріжжя, Україна
2. Національний університет охорони здоров'я України ім. П.Л. Шупика, м. Київ, Україна
Конфлікт інтересів: відсутній

ОБҐРУНТУВАННЯ. Ідіопатичний гемосидероз легень (ІГЛ) у дорослих – це рідкісна патологія невідомої етіології. У доступних літературних джерелах ми не знайшли даних щодо розвитку ІГЛ у дорослих осіб із професійними шкідливостями, що робить цю роботу актуальною.
МЕТА. На власному клінічному спостереженні проаналізувати особливості перебігу ІГЛ у пацієнта з 23-річним стажем роботи газоелектрозварювальником на заводах.

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РЕЗУЛЬТАТИ ТА ЇХ ОБГОВОРЕННЯ. За 1,5 року до звернення в пацієнта визначалися зміни на комп'ютерній томограмі органів грудної порожнини (КТ ОГП) у вигляді неоднорідної пневматизації паренхіми легень через посилений інтерстиціальний компонент, але додаткового дообстеження призначено не було, а встановлено лише діагноз «Хронічне обструктивне захворювання легень» (ХОЗЛ). Через 1,5 року на КТ ОГП виявлено негативну динаміку внаслідок наростання міліарної вузликової дисемінації легень. Після відеоторакоскопії правої легені з біопсією патогістологічно вже було виявлено ІГЛ. У пацієнта наростали задуха та кашель, але крім лікування ХОЗЛ, яке не мало позитивного ефекту, іншої терапії не призначалося. Пацієнту було проведено комплексне імунологічне дообстеження: показники ANCA-профілю та комплексного імунологічного дослідження крові виявилися в межах норми, що виключило легеневі васкуліти й імуноопосередкований процес. Зважаючи на позитивний квантифероновий тест, пацієнт був дообстежений, і туберкульозний процес було виключено. Із часу виявлення перших змін на КТ ОГП і дотепер у пацієнта не визначалися кровохаркання й анемія. На тлі лікування через 4 місяці спостерігалася клінічно-рентгенологічна стабілізація процесу: зменшилися клінічні прояви захворювання, на КТ ОГП визначалися дрібновузликові тіні з ділянками фіброзу, які характерні для періоду ремісії.

ВИСНОВКИ. Особливостями перебігу ІГЛ у пацієнта з професійним маршрутом є: тривалий період розвитку з проявами ХОЗЛ (без відповіді на його терапію), відсутність кровохаркання й анемії, показники ANCA-профілю та комплексного імунологічного дослідження в межах норми, позитивний квантифероновий тест. Кортикостероїдна терапія у високих дозах має позитивний ефект, що проявляється в клінічно-рентгенологічній стабілізації процесу. Розвиток ІГЛ, можливо, спричинив токсичний механізм (23-річний стаж роботи газоелектрозварювальником на заводах). Своєчасно виявлений ІГЛ і вчасно призначена кортикостероїдна терапія допоможуть запобігти прогресуванню процесу та розвитку ускладнень, а також знизити смертність від цієї хвороби. Пацієнти з ІГЛ мають перебувати під динамічним спостереженням із метою своєчасної оцінки КТ-динаміки процесу в легенях і корекції дози кортикостероїдів.

КЛЮЧОВІ СЛОВА: ідіопатичний гемосидероз легень, професійне захворювання.

Introduction

Idiopathic pulmonary hemosiderosis (IPH) is a rare disease of unknown etiology, characterized by: recurrent intra-alveolar hemorrhages with deposition of iron-containing hemosiderin in the lung parenchyma. IPH mostly affects children (IPH is extremely rare in adults) and men [1, 2, 5, 11, 12, 15, 16]. The main cause of death in patients is acute respiratory failure due to diffuse alveolar hemorrhage or chronic respiratory failure and cor pulmonale due to severe fibrosis [2].

Classic manifestations of IPH are the presence of hemoptysis, an infiltrative process in the lungs and iron deficiency anemia [1, 2, 5, 8, 11, 18]. But IPH does not always have this triad of symptoms, periods of exacerbation alternate with periods of relative normality, which creates a significant difficulty in early diagnosis, and therefore it often takes years to make a diagnosis using transthoracic / transbronchial thoracoscopy with biopsy [4, 14, 11, 16].

Chen X.Y. et al. [5] in their 15-year review of adult with IPH cases found that IPH in middle-aged patients is characterized by an immunologically mediated beginning, male predominance, absence of anemia, and high mortality in the acute phase. At the same time, Castellazzi L. et al. [4] emphasized the fact that the absence of hemoptysis does not exclude the diagnosis of IPH.

There are no pathognomonic radiological changes in IPH, but the researchers indicate, that the main manifestations on the CT scan of chest are "ground-glass opacity" changes and consolidation – in the acute phase, and small nodular shadows with areas of fibrosis – in the remission period [2, 7]. At the same time, Harte S. et al. [7] additionally described the presence of multiple cellular cysts in patients with IPH, which are localized mainly in the posterior and lateral basal segments. The authors associate these changes with the recurrence of hemosiderin deposition in the interstitial tissue, which leads to progressive fibrosis. The authors also suggest that these cellular cysts may indicate the sites of the most severe and recurrent alveolar hemorrhages in adults with IPH.

The analysis of bronchoalveolar lavage for siderophages (alveolar macrophages that contain hemosiderin) detection has a high diagnostic significance for the IPH detection [2, 4, 15].

According to the literature, the course of IPH in adults is longer and the prognosis is more favorable than in children [8, 9, 14]. The basis of IPH treatment is corticosteroid therapy, and lung transplantation may be the only option for the patient in the terminal stage of the disease [5, 6, 13, 10, 14]. Corticosteroid therapy in patients with IPH can be combined with immunosuppressants (azathioprine, etc.) [2, 3, 18]. Plasmapheresis [2] has a positive effect on the course of the disease. The key to adequate immunosuppressive treatment is early and timely diagnosis of IPH [4, 17].

Thus, the analyzed literary sources indicate that IPH in adults is a rare pathology of unknown etiology. At the same time, patients do not always have the classic triad of symptoms, typical for the IPH course, which makes timely diagnosis difficult. There are different versions of the pathogenetic mechanisms of the IPH development, but we did not find information about IPH development in adults with occupational hazards in the available literature, which makes this work relevant.

Purpose: to analyze the peculiarities of the IPH course in a patient with 23 years' experience as a gas-electric welder at factories by our own clinical observation.

Materials and methods

Medical history of patient D. (40 years old), who independently sought for medical help to the department of phthisiology and pulmonology of Zaporizhzhia State Medical and Pharmaceutical University, because the complaints were disturbing, and treatment was not prescribed for a long time. The article presents the results of joint patient's management

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by specialists of the departments of phthisiology and pulmonology of Zaporizhzhia State Medical and Pharmaceutical University and Shupyk National Healthcare University of Ukraine.

Results and discussion

Patient D., 40 years old. Professional route. The patient works as a gas-electric welder: 2000-2006 – at a metal products factory; 2007-2016 – at factory "Zaporizhstal"; from 2016 to the present time – at the Zaporizhzhia foundry and mechanical plant. The work is associated with dust, static and dynamic load.

It is known from the anamnesis, that the patient was suffered from cough and shortness of breath during physical exertion in January, 2021. An X-ray examination was done – CT scan of the chest (fig. 1). At that time, the diagnosis was made: chronic obstructive pulmonary disease (COPD). No additional examination was prescribed.

Patient received treatment of community-acquired pneumonia of the lower lobe of the right lung at a family doctor from 18.07.2022 to 29.07.2022. On July 28, 2022, a CT scan of the chest was done (fig. 2) which revealed negative dynamics compared to the CT scan of the chest on January 21, 2021 due to the increase of miliary nodular dissemination of the lungs. Considering the CT scan results, the patient was referred for further examination to the Zaporizhzhia regional phthisio-pulmonology clinical treatment and diagnostic center (ZRPPCTDC).

From 29.07.2022 to 18.08.2022 the patient was in the surgical department of ZRPPCTDC with a preliminary diagnosis: dissemination syndrome of unknown etiology. On August 10, 2022, video thoracoscopy (VTS) of the right lung with biopsy was performed. Wounds healed with primary intention.

The result of the patho-histological examination of the C6 area of the right lung from August 10, 2022: Tissue's fragments with preserved histoarchitectonics. Moderate peribronchial and perivascular pneumosclerosis, weak emphysema, some bronchi and bronchioles with signs of deformation, hypertrophy of muscle layer and weak diffuse lympho-histio-plasmacytic infiltration are determined. Hemosiderophages forming focal nodular clusters under the pleura and in the lung parenchyma are determined in the alveoli in all lung fields. A similar morphological picture can be observed in systemic diseases of the connective tissue, diseases of the circulatory system or be a manifestation of the initial stage of idiopathic pulmonary hemosiderosis. Data for a malignant process, specific

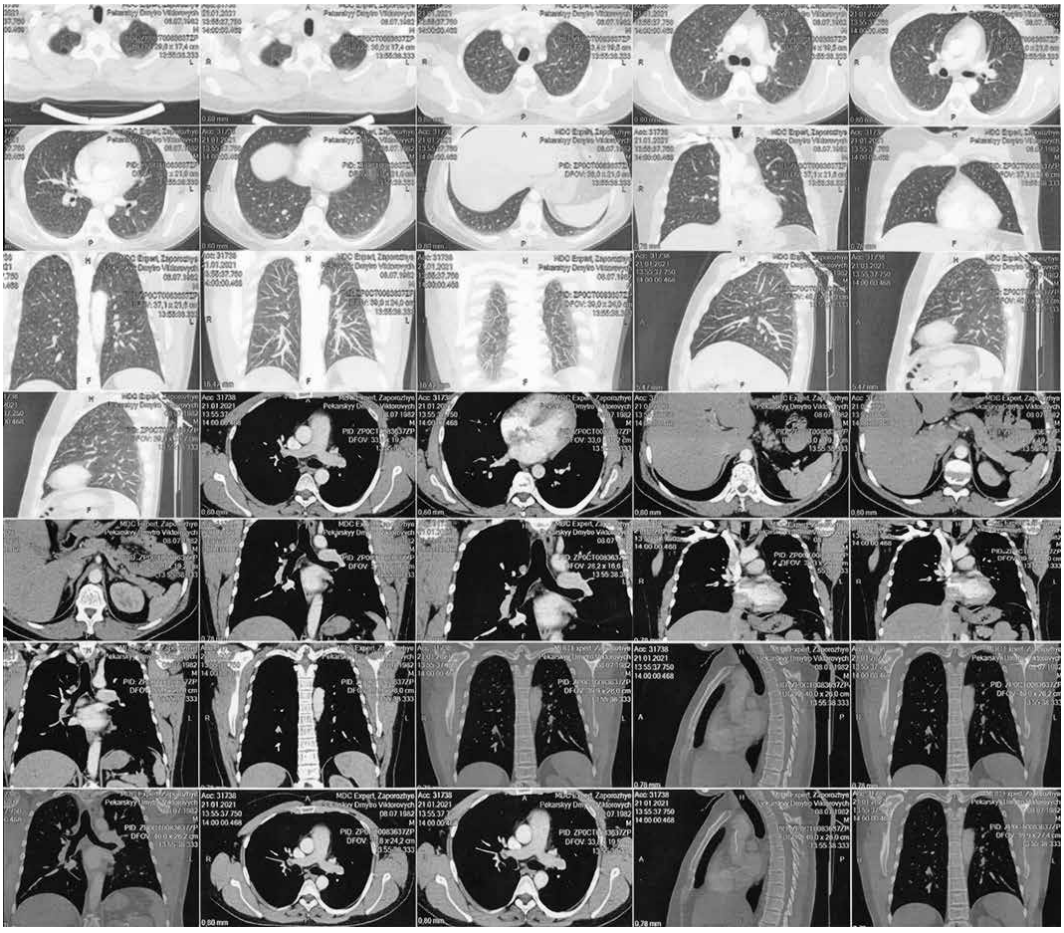

Fig. 1. CT scan of the chest from 21.01.2021

Lung parenchyma of heterogeneous pneumatization due to increased interstitial component and hypostases on the back surfaces. The vascular pattern is increased, compacted on both sides. The roots of the lungs are structural. Trachea, main and lobar bronchi are not obturated, without visible pathology. No free fluid or pleural layering are detected in both pleural cavities. The mediastinum is located along the midline. An increase in lymph nodes was not detected. Esophagus without volume formations. No bone-destructive changes were detected. Soft tissues without pathological changes. Conclusion: no focal and infiltrative changes were detected in the lungs.

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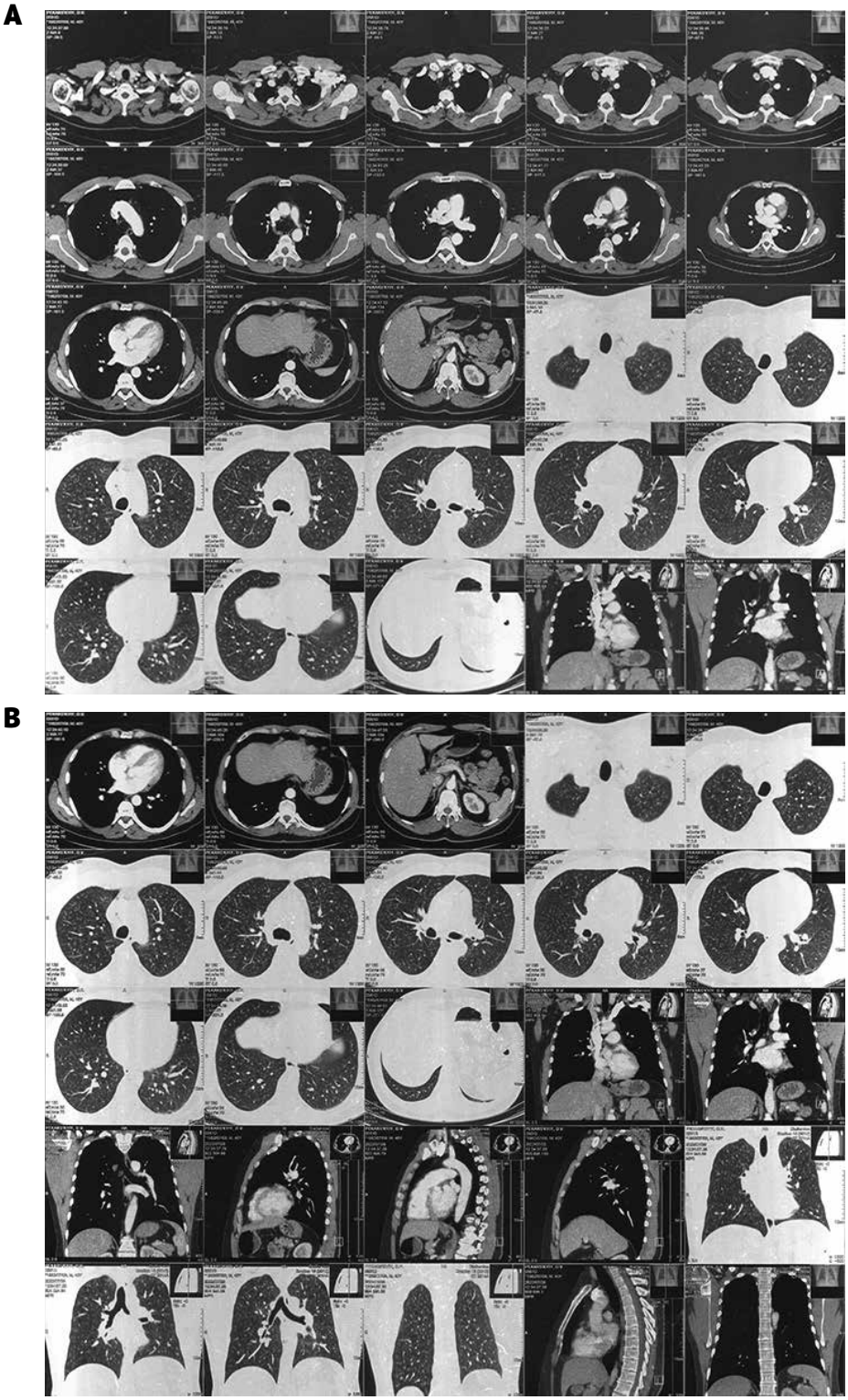

Fig. 2. CT scan of the chest from 28.07.2022

The chest is of the correct shape, symmetrical. The lung is spread out, of equal pneumatization, of normal air filling. There are numerous miliary (up to 1-1.2 mm) centrilobular nodules of the "trees in buds" type on both sides of all lung fields, which partially cover the lung pattern. The lung pattern is diffusely enhanced, deformed on both sides. Trachea, main and lobar bronchi are not obturated, without visible pathology. The mediastinum not expanded, pathological shadows are not detected. Lymph nodes of the roots of the lungs and mediastinum are not enlarged. The diaphragm is normally located, its domes are even and clear. No free fluid is detected in both pleural cavities. Unexpressed degenerative-dystrophic changes of the thoracic spine, numerous Schmorl's nodes up to 8.5×5 mm in size are determined. Conclusion: CT signs of total bilateral miliary nodular dissemination of the lungs (maybe of granulomatosis nature – pneumoconiosis?), unlikely – of infectious nature. No infiltrative, volumetric pathology of the lungs and mediastinum are detected. During the control period from January 21, 2021, the increase of miliary dissemination in the lungs is determined.

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inflammation and sarcoidosis were not found within the studied material.

Pathomorphological conclusion after the review of the micropreparation on August 10, 2022: Small focal subpleural hemosiderosis with perifocal pneumosclerosis and focal intra-alveolar hemosiderosis of the lung. Spastic deformation of some bronchioles, small focal atelectasis and focal emphysema of the lungs without concomitant interstitial or peribronchial pneumosclerosis. There are no signs of inflammatory, granulomatous and tumor dissemination in the lungs. Diagnosis at discharge from ZRPPCTDC: Hemosiderosis of the lungs. COPD of the 2nd degree, pulmonary insufficiency (PI) of the 2nd degree. State after operation (SAO) the VTS, biopsy of the right lung (August 10, 2022).

Since August 18, 2022 the patient has been under the supervision of a family doctor. On August 22, 2022 he was consulted by a pulmonologist. Conclusion of a pulmonologist: COPD of the I-II degree without exacerbation, group C, PI of the 0 degree. Hemosiderosis of the lungs. Treatment by Zafiron was recommended. Re-examination after 1 month, CT scan of the chest once a year were prescribed.

Considering the increase in the patient's complaints: shortness of breath and cough, on August 30, 2022, the patient was consulted by a pulmonologist again. Conclusion of a pulmonologist: COPD of the II-III degree without exacerbation, group C, PI of the I degree. Secondary hemosiderosis of the lungs. Treatment by Zafiron was recommended. Consultation of a occupational health physician and immunologist, CT scan of the chest after 6 months were recommended.

From 06.09.2022 to 14.09.2022 he was at inpatient treatment in the pulmonology department with a following diagnosis: COPD of the III degree, emphysema of the 2nd degree, the exacerbation phase, PI of the I degree. SAO the VTS, biopsy of the right lung (August 10, 2022). Suspicion on pneumoconiosis.

Blood analysis from 06.09.2022: hemoglobin (Hb) – 140 g/l, erythrocytes (Er) – 4.79×10^{12}/l, leukocytes (WBC) – 6.0×10^{9}/l, platelets (pl) – 246×10^{9}/l, eosinophils (Ef) – 0 %, band neutrophils (b/n) – 3 %, segmented neutrophils (s/n) – 57 %, lymphocytes (Lf) – 35 %, monocytes (m) – 5 %, erythrocyte sedimentation rate (ESR) – 13 mm/h.

Spirography from 06.09.2022: the obstructive type of ventilation's violation of III degree in all departments of the bronchial tree (generalized obstruction syndrome).

Biochemical analysis of blood from 09.09.2022: rheumatoid factor <10 IU/ml (norm <14 IU/ml), C-reactive protein – 3.31 mg/l (norm <5 mg/l), cyclic citrulline peptide (Anti-SSR), immunoglobulin (Ig) G antibodies – <8 Units/ml (normal <17 Units/ml).

Treatment in the pulmonology department was aimed to COPD therapy.

On September 26, 2022 the patient was consulted by an immunologist, who diagnosed: other specified immunodeficiency disorders. COPD, group C, unspecified chronic interstitial lung disease. Next treatment was prescribed (Anoro Ellipta once a day for 6 months, Acetylcysteine once a day for 6 months, a course of Glutoxim) and a comprehensive immunological follow-up examination.

Blood analysis from 05.10.2022: Hb – 152 g/l, Er – 4.86×10^{12}/l, WBC – 6.33×10^{9}/l, pl – 237×10^{9}/l, Ef – 2 %, b/n – 2 %, s/n – 49 %, Lf – 38 %, m – 8 %, ESR – 2 mm/h.

Blood glucose from 05.10.2022: 5.91 mmol/l.

Blood analysis from 05.10.2022: 25-hydroxyvitamin D, 25(OH)D – 25.3 ng/ml (a sufficient level is 30-50 ng/ml).

An immunological examination of the patient for ANCA by immunoblot method was prescribed. Analysis result from 05.10.2022: ribonucleoproteins/SM-polypeptides (nRNP/Sm) IgG antibodies – negative, Smith-Antigen antibodies IgG antibodies – negative, ribonucleoproteins (RNP 70, -A, -C) IgG antibodies – borderline, nuclear ribonucleoproteins (SS-A) IgG antibodies – negative, Ring-dependent E3 ligase (Ro-52) IgG antibodies – borderline, nuclear ribonucleoproteins (SS-B) IgG antibodies – borderline, topoisomerase I (Scl-70) IgG antibodies – negative, PM complex -Scl IgG antibodies (scleroderma marker) – negative, histidyl-tRNA synthetase (Jo-1) IgG antibodies – borderline, centromere B (CEN pB) IgG antibodies – negative, proliferating cell nuclear antigen (PCNA) IgG antibodies – borderline, double-helical DNA (dsDNA) IgG antibodies – negative, nucleosomes (Nucleosomes) IgG antibodies – negative, histones (Histones) IgG antibodies – negative, ribosomal protein (Rib, P-protein) IgG antibodies – negative, antimitochondrial antibodies (AMA-M2) IgG antibodies – negative.

Blood test for α_1-antitrypsin from 05.10.2022: 1.28 g/l (norm – 0.9-2.0 g/l).

Proteinogram from 05.10.2022: total protein – 68.6 g/l (norm – 0.9-2.0 g/l), albumin – 66.4 % (norm – 55-69 %), fraction of α_1-globulins – 2.4 % (norm – 1.6-4.2 %), fraction of α_2-globulins – 9.6 % (norm – 5.9-11 %), fraction of β-globulins – 11.9 % (norm – 7.9-14 %), γ-globulin's fraction – 9.7 % (norm – 11-18 %), albumin/globulin ratio – 1.98 (norm – 1-2).

Comprehensive immunological examination of blood from 05.10.2022: IgA – 3.63 g/l (norm – 0.7-4 g/l), IgM – 1.57 g/l (norm – 0.4-2.3 g/l), IgG – 7.77 g/l (norm – 7-16 g/l), IgE – 95.5 g/l (norm <100 g/l), complement (C3C component) – 1.19 g/l (norm – 0.9-1.8), complement (C4 component) – 0.39 g/l (norm – 0.1-0.4).

Evaluation of the subpopulation of Lf in the blood from 05.10.2022: T-Lf ($CD3^+$, $CD19^-$) – 82.4 % (norm – 54-83 %), T-helpers/T-inducers ($CD4^+$, $CD8^-$) – 35.5 % (norm – 26-58 %), T-suppressors / T-cytotoxic cells ($CD4^-$, $CD8^+$) – 46.2 % (norm – 21-35 %), immunoregulatory index ($CD4^+$, $CD8^-/CD4^-$, $CD8^+$) – 0.8 (norm – 1.2-2.3), cytotoxic cells ($CD3^+$, $CD56^+$) – 6.3 % (norm – 3-8 %), NK cells ($CD3^-$, $CD56^+$) – 6.1 % (norm – 5-15 %), B-Lf ($CD3^-$, $CD19^+$) – 8.5 % (norm – 5-14 %), monocytes/macrophages (CD14) – 7.5 % (norm – 6-13 %), total leukocyte antigen (ZLA, CD45) – 99.5 % (norm – 95-100 %).

Functional activity of immune cells / circulating immune complexes (CIC) from 05.10.2022:

- phagocytic activity of neutrophils in nitroblue tetrazolium test: spontaneous – 105 optical units, OU (norm – 80-125 OU), induced – 297 OU (norm – 150-380 OU), phagocytic index – 2.8 (norm 1.5-3);
- proliferative activity of Lf in lymphocyte blast transformation (LBT) reaction – 1.15 OU (norm – 1.2-1.68 OU);
- CIC, large – 6 OU (norm – up to 20 OU);
- CIC medium – 75 OU (norm – 60-90 OU);
- CIC small – 178 OU (norm – 130-160 OU).

The immunologist prescribed to the patient a Quantiferon test, which turned out to be positive. Based on the obtained results, the immunologist diagnosed: Other specified immunodeficiency disorders. Hypogammaglobulinemia, decreased LBT, vitamin D deficiency, impaired glucose tolerance?, reactivated mycobacterial infection (according

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to the Quantiferon test). And the treatment was prescribed: Olidetrim 4000 IU daily for 6 months (control of 25(OH)D level after 3 months), Hepavista for 3 months and to plan intravenous immunoglobulin therapy after phthisiologist's consultation (due to a positive Quantiferon test).

In November 2022, he came to us for a consultation. At the department the patient complained of shortness of breaths of a mixed nature in minor physical exertion, chest pain, and a dry paroxysmal cough. Auscultation: breathing over the lungs was hard with dry scattered rales.

A control CT scan of the chest was prescribed (fig. 3). Its results established that miliary dissemination in the lungs remained unchanged, but periscissuritis signs appeared on the right side. Tuberculosis was excluded.

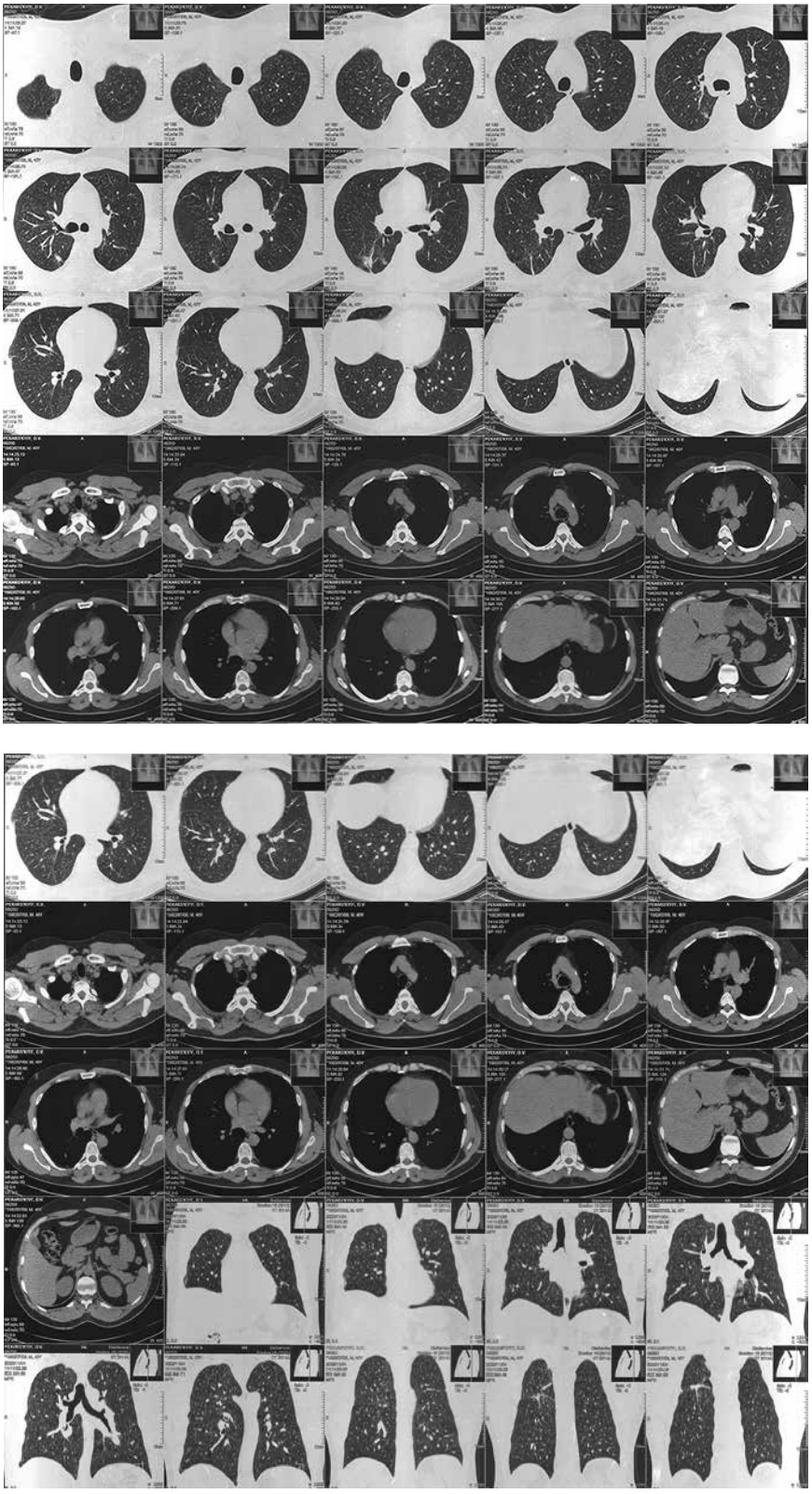

Fig. 3. CT scan of the chest from 04.11.2022

The chest is of the correct shape, symmetrical. Lungs' parenchyma: SAO the VTS, biopsy of the right lung. The lungs' parenchyma is spread out, of equal pneumatization, of normal air filling from both sides. Numerous miliary (up to 1-1.2 mm) centrilobular nodules of the "trees in buds" type are kept on both sides of all lung fields, which partially cover the lung pattern. There are a compaction area with radial contours within 25×21 mm and fibrous cords in the right lung at the border of C2-C6, adjacent to the main and partly to the horizontal interlobular pleura; a pleuro-pulmonary linear cord in C6 is determined. No infiltrative changes are detected. The lung pattern is diffusely enhanced, deformed on both sides. Trachea, main and lobar bronchi are not obturated, without visible pathology. The mediastinum not expanded, pathological shadows are not detected. Lymph nodes of the roots of the lungs and mediastinum are not enlarged. The diaphragm is normally located, its domes are even and clear. No free fluid is detected in both pleural cavities. The costo-diaphragmatic sinus on the right side is obliterated, moderate pleural layers above the diaphragm are identified. Unexpressed degenerative-dystrophic changes of the thoracic spine, numerous Schmorl's nodes up to 8,5×5 mm in size are determined. Conclusion: CT signs of SAO the VTS, biopsy of the right lung. Total bilateral miliary nodular dissemination of the lungs (according to histological result – pulmonary hemosiderosis). The perifissural area of compaction at the C2/C6 border of the right lung (periscissuritis with the formation of local fibrous changes – post-operative changes?), a pleuro-pulmonary linear cord in C6. No infiltrative, volumetric pathology of the lungs and mediastinum are detected. During the control period from 28.07.2022 post-operative changes in the right lung, regarding the pulmonary component – miliary dissemination in the lungs is unchanged, but the appearance of signs of periscissuritis on the right is determined.

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An analysis of blood indicators for iron deficiency anemia was carried out:

- immunochemical analyses: ferritin – 326.6 ng/ml (norm – 30-400 ng/ml), vitamin B_{12} – 264 pmol/l (norm – 145-569 pmol/l), folic acid – 9.6 nmol/l (norm – 10.4-42.4 nmol/l);
- biochemical analyzes for iron-binding capacity: iron – 17.5 μmol/l (norm – 12.5-32.2 μmol/l), total iron-binding capacity – 57.7 μmol/l (norm – 41-77 μmol/l), saturated iron-binding capacity – 40.2 μmol/l (norm – 27.8-63.6 μmol/l), saturation coefficient – 30.4 % (norm – 20-50 %).

Based on the obtained data, the next diagnosis was made: Idiopathic hemosiderosis of the lungs, X-ray stage IV. COPD grade 3, PI grade 2-3. SAO the VTS, biopsy of the right lung (August 10, 2022). The treatment of IPH was prescribed: systemic glucocorticosteroids in high doses.

On the control CT scan of the chest (fig. 4) after 4 months of IPH treatment with glucocorticosteroids, the following

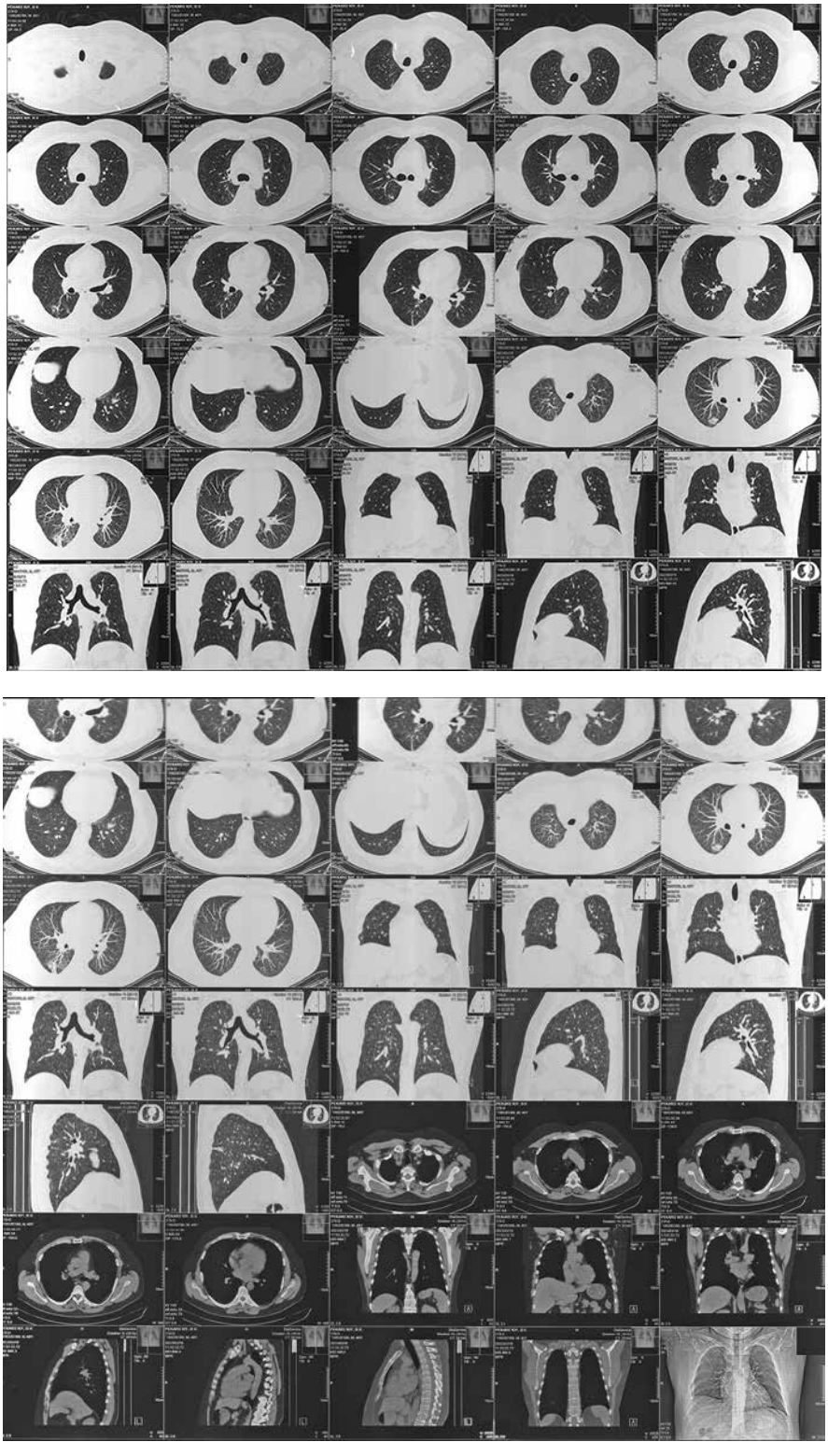

Fig. 4. CT scan of the chest from 18.03.2022

The chest is of the correct shape, symmetrical. Lungs' parenchyma: SAO the VTS, biopsy of the right lung. The lungs' parenchyma is spread out, of equal pneumatization, of normal air filling from both sides. Numerous miliary (up to 1-1.2 mm) centrilobular nodules of the "trees in buds" type are kept on both sides of all lung fields, which partially cover the lung pattern. There are a compaction area with radial contours within 25×21 mm and fibrous cords in the right lung at the border of C2-C6, adjacent to the main and partly to the horizontal interlobular pleura; a pleuro-pulmonary linear cord in C6 is determined. Curved subpleural linear fibrosis is determined in the middle lobe of the right lung. No infiltrative changes are detected. A bulla of size 8×6.1 mm is determined at the apex of the right lung. The lung pattern is diffusely enhanced, deformed on both sides. Trachea, main and lobar bronchi are not obturated, without visible pathology. The mediastinum not expanded, pathological shadows are not detected. Lymph nodes of the roots of the lungs and mediastinum are not enlarged. The diaphragm is normally located, its domes are even and clear. No free fluid is detected in both pleural cavities. The costo-diaphragmatic sinus on the right side is obliterated, moderate pleural layers above the diaphragm are identified. Unexpressed degenerative-dystrophic changes of the thoracic spine, numerous Schmorl's nodes up to 8.5×5 mm in size are determined. Conclusion: CT signs of SAO the VTS, biopsy of the right lung. Total bilateral miliary nodular dissemination of the lungs. The perifissural area of compaction at the C2/C6 border of the right lung (periscissural and fibrous changes), fibrous pleuro-pulmonary linear cords in C6, subpleural linear fibrosis of the middle lobe of the right lung. A small bulla on the apex of the right lung. No infiltrative, volumetric pathology of the lungs and mediastinum are detected.

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changes were diagnosed: the appearance of a bulla at the apex of the right lung, a linear fibrous cord in the middle lobe of the right lung, and a subpleural linear fibrosis at the site of periscissuritis on the right on the background of nodular dissemination were diagnosed.

It should be noted that due to the treatment, the patient's symptoms of shortness of breath have decreased, cough occurs periodically. Indicators of blood analysis from 18.03.2023 within the norm: Hb – 148 g/l, Er – 4.6×10^{12}/l, WBC – 6.9×10^{9}/l, pl – 245×10^{9}/l, Ef – 1 %, b/n – 5 %, s/n – 48 %, Lf – 38 %, m – 8 %, ESR – 4 mm/h.

Thus, as we can see from the presented clinical case, the patient had already changes on the CT scan of the chest in January 2021 in the form of heterogeneous pneumatization of the lung parenchyma due to the increased interstitial component and hypostases on the back surfaces. The vascular pattern was increased and compacted on both sides. Considering the results of the CT scan of the chest and the professional route of the patient, no additional examination was prescribed, and only the diagnosis of COPD was established. Perhaps, if the patient had undergone to fibro-bronchoscopy and the bronchoalveolar lavage was examined for the presence of siderophages at this stage, then the correct treatment would have been prescribed – further progression of IPH would have been prevented. This moment indicates the lack of vigilance of the family doctor for the presence of occupational diseases.

Negative dynamics due to the increase of miliary nodular dissemination of the lungs were revealed on the CT scan of the chest after 1.5 years (in July 2022). IPH was already detected pathohistologically after VTS of the right lung with biopsy. Shortness of breath and cough increased in the patient from August to November 2022, but apart from treatment aimed at COPD treating, no other therapy was prescribed. This therapy did not have a positive effect.

From September, 2022 the patient was consulted by an immunologist, who diagnosed: Other specified immunodeficiency disorders. COPD, group C, unspecified chronic interstitial lung disease. The patient underwent a comprehensive immunological examination. The indicators of the ANCA profile and the complex immunological blood test were within the normal range, which ruled out pulmonary vasculitis and an immune-mediated process. Considering the positive Quantiferon test, the patient was examined by specialists from our department and the tuberculosis was excluded.

It should be noted, patient have not been suffered from hemoptysis and anemia from January, 2021 up to the present time and the indicators of blood tests (general blood test, analysis for iron deficiency anemia detection) were within the normal range, which indicated the absence of anemia.

According to the literature [4, 5], the absence of hemoptysis and anemia do not exclude the diagnosis of IPH. This is despite the fact that the ANCA profile and histological examination results indicated the absence of pulmonary vasculitis signs, and the histological examination results confirmed the diagnosis of IPH.

Because the basic treatment of IPH is corticosteroid therapy [5, 6, 13, 10, 14], the patient was underwent to systemic glucocorticosteroids in high doses, which gave a positive effect. Due to treatment, the clinical and radiological stabilization of the process was determined after 4 months: the clinical symptoms of the disease decreased; small nodular shadows with areas of fibrosis, were determined on the CT scan of the chest which are characteristic of the period of remission according literature [2].

Conclusions

- IPH course features in a patient with a professional route (gas-electric welder + work at factories for 23 years) are: a long period of development with COPD manifestations (without effect of therapy), absence of hemoptysis and anemia, normal indicators of the ANCA profile and complex immunological examination, a positive Quantiferon test.
- The mechanism of IPH development may have been a toxic mechanism (23 years of work experience as a gas-electric welder at factories).
- Corticosteroid therapy in high doses has a positive effect, which is manifested in the clinical and radiological stabilization of the process.
- Timely detection of IPH and timely prescribed corticosteroid therapy will prevent the progression of the process and the development of complications, as well as reduce mortality from this disease.
- Patients with IPH should be under dynamic observation due to timely evaluation of CT-dynamics of the process in the lungs and correction of the dose of corticosteroids.

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ВІДОМОСТІ ПРО АВТОРІВ / INFORMATION ABOUT AUTHORS

Разнатовська Олена Миколаївна
Завідувачка кафедри фтизіатрії та пульмонології Запорізького державного медико-фармацевтичного університету.
Д-р мед. наук, професор.
26, просп. Маяковського, м. Запоріжжя, 69035, Україна.
ORCID iD: orcid.org/0000-0003-2252-9063

Гуменюк Галина Львівна
Професор кафедри фтизіатрії і пульмонології Національного університету охорони здоров'я України ім. П.Л. Шупика; старший науковий співробітник відділення діагностики, терапії та клінічної фармакології захворювань легень ДУ «Національний інститут фтизіатрії і пульмонології ім. Ф.Г. Яновського НАМН України».
Д-р мед. наук, професор.
10, вул. М. Амосова, м. Київ, 03038, Україна.
ORCID iD: orcid.org/0000-0001-8160-7856

Ясінський Роман Миколайович
Доцент кафедри фтизіатрії та пульмонології Запорізького державного медико-фармацевтичного університету.
Канд. мед. наук.
26, просп. Маяковського, м. Запоріжжя, 69035, Україна.
ORCID iD: orcid.org/0000-0003-4132-731X

Федорець Андрій Васильович
Асистент кафедри фтизіатрії та пульмонології Запорізького державного медико-фармацевтичного університету.
26, просп. Маяковського, м. Запоріжжя, 69035, Україна.
ORCID iD: orcid.org/0000-0003-0994-5265

Raznatovska Olena Mykolaivna
Head of the department of phthisiology and pulmonology, Zaporizhzhia State Medical and Pharmaceutical University.
MD, professor.
26, Mayakovskogo ave., Zaporizhzhia, 69035, Ukraine.
ORCID iD: orcid.org/0000-0003-2252-9063

Gumeniuk Galyna Lvivna
Professor of the department of phthisiology and pulmonology, Shupyk National Healthcare University; senior researcher of treatment, diagnosis, and clinical pharmacology of lung disease, SI "National institute of phthisiology and pulmonology named after F.G. Yanovsky of the NAMS of Ukraine".
MD, professor.
10, M. Amosova st., Kyiv, 03038, Ukraine.
ORCID iD: orcid.org/0000-0001-8160-7856

Yasinskyi Roman Mykolaiovych
Associate of professor of the department of phthisiology and pulmonology, Zaporizhzhia State Medical and Pharmaceutical University.
PhD.
26, Mayakovskogo ave., Zaporizhzhia, 69035, Ukraine.
ORCID iD: orcid.org/0000-0003-4132-731X

Fedorec Andrii Vasyliovych
Assistant of the department of phthisiology and pulmonology, Zaporizhzhia State Medical and Pharmaceutical University.
26, Mayakovskogo ave., Zaporizhzhia, 69035, Ukraine.
ORCID iD: orcid.org/0000-0003-0994-5265

КОНТАКТНА ІНФОРМАЦІЯ / CORRESPONDENCE TO
Разнатовська Олена Миколаївна
26, просп. Маяковського, м. Запоріжжя, 69035, Україна.
E-mail: raxnatovskaya@gmail.com

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