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POSSIBILITIES OF COMPREHENSIVE DIAGNOSTICS OF CHRONIC OBSTRUCTIVE LUNG DISEASE

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Таянч сўзлар: "Она-бола" саломатлик ҳолати, микроэлементлар, она сути, таркиби.
Ключевые слова: состояние здоровья «Мать-ребенок», микроэлементы, грудное молоко, состав.
Key words: health status of “Mother-child”, microelements, breast milk, composition.

The late treatment of patients and low diagnostic accuracy in the early stages are prerequisites for numerous studies devoted to the development of methods for the early detection of chronic obstructive pulmonary disease (COPD) and the assessment of the influence of various factors on the severity of the disease and its outcome. The data of complex computed tomography and the study of the function of external respiration of patients from the COPD risk group were analyzed. The most frequent lung changes in patients at risk of COPD was emphysema. The symptom of expiratory "air trap" in combination with expansion and deformation of bronchi of various sizes, up to broncho- and bronchioectasis, was diagnostically significant for COPD during computed tomography. An optimized diagnostic algorithm for managing a patient with suspected COPD during the initial and dynamic treatment allows detecting signs of the disease at an early stage, while the Tiffno index remains within the normal range. In the presence of clinical symptoms of bronchial obstruction and negative spirometry data, patients should undergo inspiratory-expiratory CT to detect signs of COPD, including the symptom of "air traps".

O'PKANING SURUNKALI OBSTRUKTIV KASALLIGINI KOMPLEKS DIAGNOSTIKA QILISH IMKONIYATLARI

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Bemorlarni tibbiy yordamga kechiktirish va erta bosqichlarda past diagnostika aniqligi surunkali obstruktiv o'pka kasalligini (SOO'K) erta aniqlash usullarini ishlab chiqish, kasallik va uning oqibatlari va turli omillarning og'irlik darajasiga ta'sirini baholashga bag'ishlangan ko'plab tadqiqotlar uchun zarurdir. SOO'K xavfi guruhidagi bemorlarning kompleks kompyuter tomografiyasini va tashqi nafas olish funktsiyasini ma'lumotlari tahlil qilindi . SOO'K xavfi bo'lgan bemorlarda o'pkaning tez-tez o'zgarishi emfizemaga olib keladi. Bronxo- va bronxioektaziyagacha har xil o'lchamdagi bronxlarning kengayishi va deformatsiyasi bilan birgalikda ekspirator "havo tutqichi" simptomi SOO'K kompyuter tomografiyasi uchun diagnostik ahamiyatga ega. Tiffno indeksi normal diapazonda qolgan xolda, dastlabki va dinamik davolash jarayonida SOO'K ga shubha bo'lgan bemorni tashxislash uchun optimallashtirilgan diagnostika algoritmi kasallik belgilarini erta bosqichda aniqlash imkonini beradi. Bronxial obstruktsiyaning klinik belgilari va salbiy spirometriya ma'lumotlari mavjud bo'lganda, bemorlar SOO'K belgilarini, shu jumladan "havo tutqichlari" simptomini aniqlash uchun inspirator-ekspirator KTdan o'tqazish kerak.

ВОЗМОЖНОСТИ КОМПЛЕКСНОЙ ДИАГНОСТИКИ ХРОНИЧЕСКОЙ ОБСТРУКТИВНОЙ БОЛЕЗНИ ЛЕГКИХ

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Позднее обращение пациентов за медицинской помощью и низкая точность диагностики на ранних стадиях являются предпосылками для многочисленных исследований, посвященных разработке методик раннего выявления хронической обструктивной болезнью легких (ХОБЛ) и оценке влияния различных факторов на тяжесть заболевания и его исход. Проанализированы данные комплексной компьютерной томографии и исследование функции внешнего дыхания пациентов из группы риска ХОБЛ. Наиболее частым изменением легких у больных группы риска ХОБЛ являлась эмфизема. Диагностически значимыми для ХОБЛ при проведении компьютерной томографии явился симптом экспираторной «воздушной ловушки» в сочетании с расширением и деформацией бронхов различного калибра, вплоть до бронхо- и бронхиолоэктазов. Оптимизированный диагностический алгоритм ведения пациента с подозрением на ХОБЛ при первичном и динамическом обращении позволяет выявить признаки заболевания на раннем этапе, в то время как индекс Тиффно остается в пределах нормы. При наличии клинических симптомов бронхиальной обструкции и отрицательных данных спирометрии пациентам необходимо проводить инспираторно-экспираторную КТ для выявления признаков ХОБЛ, в том числе симптома «воздушных ловушек».

Chronic obstructive pulmonary disease (COPD) is a chronic disease characterized by persistent airflow limitation that usually progresses and is associated with an increased chronic inflammatory response of the lungs to pathogenic particles or gases. Chronic obstructive pulmonary le-

sions are in fourth place among the causes of death - after cardiovascular, oncological and cerebrovascular diseases - and are a common cause of temporary disability [3,6,8].

Unfortunately, timely diagnosis of COPD occurs in only 25% of cases, despite the widespread prevalence of the disease [1,9]. This circumstance adversely affects the quality of treatment, since therapy is especially effective in the early stages of bronchial obstruction. This situation is due to the late treatment of patients for medical care and low diagnostic accuracy in the early stages [2,4,5,7].

These facts are the prerequisites for numerous studies devoted to the development of methods for the early detection of COPD and the assessment of the influence of various factors on the severity of the disease and its outcome.

Considering the above, **the aim of our study** is to determine the clinical, functional and computed tomographic features of COPD, the possibility of predicting its development.

Material and methods. The material of our work was a computed tomographic examination of 40 patients at risk of COPD aged 55 to 80 years, whose average age was 66.8 ± 10.6 years, who were patients of the therapy department of the 1st clinic of the Samarkand state medical university in the period from 2018 to 2021 years. The studies were carried out in the Department of X-ray Radiology.

Computed tomography was performed in a spiral mode, in 2 stages: inspiratory and expiratory phases (without administration of contrast medium) on a Light Speed 16 computed tomograph (General Electric Medical Systems) using high-resolution computed tomography (HRCT) parameters. Scanning was performed with the patient supine in the cranio-caudal direction. Physical and technical conditions of the study: X-ray generation voltage - 120 kV, exposure 200 mAs, tomographic slice thickness 3.0 mm, tube rotation time 0.5 s. The studies were studied in the axial plane, followed by the construction of image reconstruction in the coronal and sagittal planes.

The study of the function of external respiration was carried out by analyzing the "flow-volume" and "volume-time" curves on the SPIROKOM apparatus (Ukraine). The information received was processed and the absolute and relative (percentage of the due for the corresponding anthropometric data) indicators were calculated. The following main indicators were assessed: forced expiratory volume in 1 second in absolute values (FEV1 abs.), as a percentage of the required volume (FEV1%), forced vital capacity (FVC abs. and %), Tiffno index.

The COPD risk group included patients presenting with complaints of recurrent coughing fits with or without sputum, with definite history data (long-term smoking) and clinical examination (percussion and auscultation). According to spirometry data, patients from the COPD risk group were divided into two equal groups: those corresponding to the diagnosis of COPD (Tiffno's index less than 0.7) and the diagnosis of chronic non-obstructive bronchitis (Tiffno's index more than 0.7).

Research results. In our study, the study group of patients included only patients from the COPD risk group, i.e., with a long history of smoking and with characteristic complaints of shortness of breath as a manifestation of bronchial obstruction. We deliberately excluded a part of patients with chronic non-obstructive bronchitis without signs of bronchial obstruction.

On computed tomography, the most frequent morphological changes in the main group were: emphysema (bullous, paraseptal, centrilobular, panlobular), pneumosclerosis, pleuropulmonary and pleurodiaphragmatic adhesions, broncho- and bronchioloectasis, thickening of the bronchial wall along the tramway type type of "frosted glass", areas of hyper-airiness on expiratory scans (symptom of "air trap") (Fig.1 - Fig.4). The frequency of detection of the described changes is presented in table 1.

The most frequent lung changes in patients with COPD risk group was emphysema (25.0% of patients). Emphysema in patients was identified by the presence of areas of reduced density (less than -950 HU) in the pulmonary parenchyma. At the same time, the generally accepted types of emphysema were distinguished: paraseptal emphysema with damage to the distal parts of the secondary lobules, located mainly subpleurally, in the upper parts of the lungs (17.5% of all pa-

Table 1.

Distribution of the frequency of tomographic symptoms (n = 40).

Sign	Frequency of symptom n (%)
Emphysema	25,0%
Bronchiectasis	12,5%
Bulls	15,0%
Emphysema paraseptal	17,5%
Emphysema centrilobular	15,0%
Panacinar emphysema	2,5%
Tram rails	40,0%
Frosted glass	22,5%
Air traps	15,0%
Thickening of the interlobular interstitium	25,0%
Saber trachea	15,0%
Adhesions	17,5%
Pneumosclerosis	20,0%
Barrel chest	5,0%

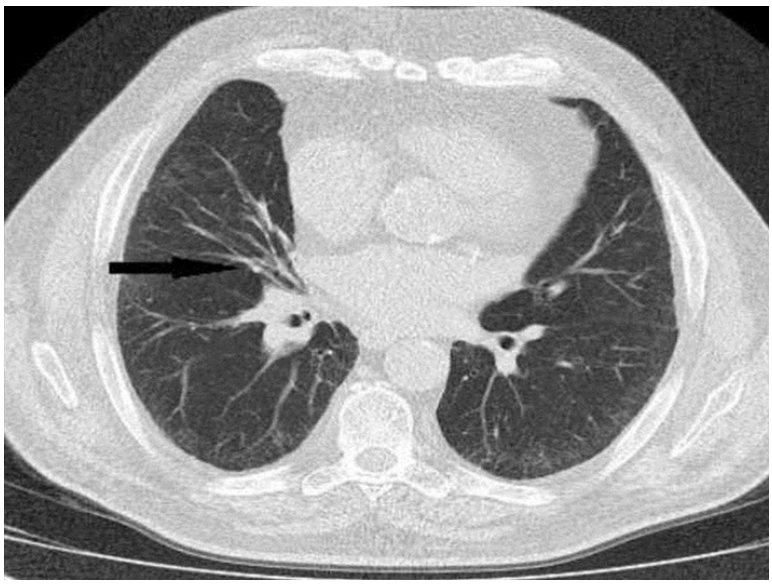

Fig. 1. Patient A., 58 years old. Computed tomogram in the axial plane. In the right lung, a thickening of the bronchial walls is determined in the form of a tram rail symptom (arrow).

Fig. 2. Patient I., 60 years old. Fragment of a CT scan in the coronal plane. In the right lung, the expansion of the segmental and subsegmental bronchus is determined in the form of a cylindrical bronchiectasis (arrow).

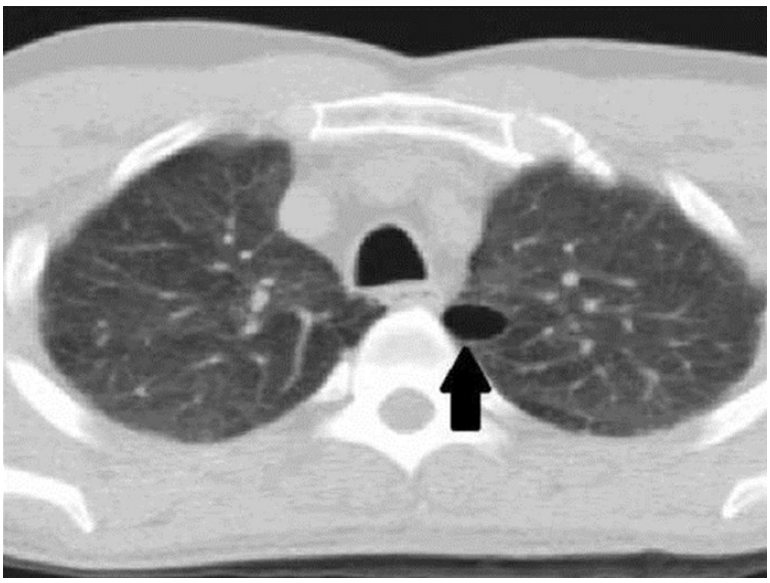

Fig. 3. Patient J., 74 years old. Computed tomogram in the axial plane. On both sides in the lung tissue, areas of low density are determined, corresponding to the size of the secondary lobule, - ăir traps."On the left, a single bulla (arrow) is visualized subpleurally.

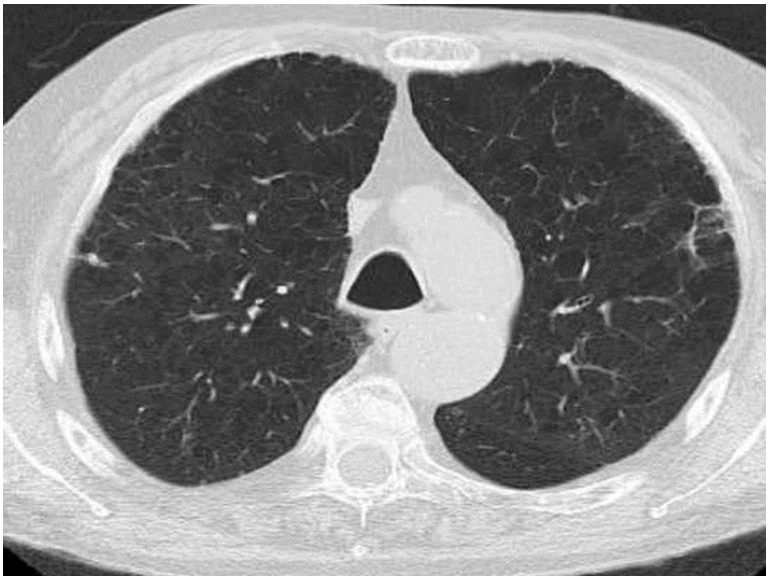

Fig. 4. Patient H., 68 years old. Computed tomogram in the axial plane. In the lung tissue, centrilobular emphysema is determined on both sides.

tients), and centrilobular emphysema, characterized by the presence of multiple zones of reduced density located near the center of the secondary lobules (15.0%). Bullous emphysema manifests itself as areas of swelling of the lung tissue with a diameter of more than 10 mm and a wall thickness of up to 1 mm (15.0%). Bullae were located asymmetrically in the subpleural or paramediastinal parts of the lungs, mainly in the apex region. Panacinar emphysema with widespread lesions of both subpleural and intralobular areas was revealed in 1 patient.

When analyzing images obtained in the expiratory phase, we searched for the so-called "gas trapping", that is, areas of lobular hyperactivity that retain a reduced density in comparison with the surrounding lung tissue. "Air traps" according to computed tomography were found in 6 patients (15.0%), and in 3 patients they were the only deviation from the norm in the expiratory phase with a normal tomographic picture in the inspiratory phase.

The tomographic study revealed that changes in the lung tissue in two groups (COPD and chronic non-obstructive bronchitis) are observed with different frequencies. To identify the reliability in their prevalence, the calculation of the Mann-Whitney index was carried out. The frequen-

Table 1.

Distribution of the frequency of tomographic symptoms and the reliability of their differences in patients of the study groups.

Sign	Group 1 (FEV1 / FVC<0.7), %	Group 2 (FEV1 / FVC> 0.7), %	Meaning p
Emphysema	25,0	15,0	0,730
Bronchiectasis	12,5	15,0	0,249
Bulls	15,0	10,0	0,834
Emphysema paraseptal	17,5	15,0	0,561
Emphysema centrilobular	15,0	5,0	0,093
Tram rails	40,0	17,5	0,666
Frosted glass	22,5	22,5	0,928
Air traps	15,0	40,0	0,039
Thickening of the interlobular interstitium	25,0	17,5	0,666
Saber trachea	15,0	5,0	0,873
Adhesions	17,5	10,0	0,418
Pneumosclerosis	25,0	27,5	0,823
Barrel chest	5,0	15,0	0,249

cy of symptoms according to CT data and the significance of differences in their prevalence are presented in table 2.

Despite the fact that some differences were revealed in the frequency of detection of tomographic symptoms, for most of them the differences were with a low level of reliability. The p = 0.093 level, which slightly exceeds the established threshold value of 0.05, was determined by analyzing the frequency of centrilobular emphysema, which was nevertheless detected much more often in patients with COPD.

It was revealed that the frequency of only the symptom of "air traps" was significantly different, and it was more often observed in patients with non-obstructive bronchitis. This picture is probably due to the fact that this symptom is observed when bronchial obstruction is localized at the level of the terminal bronchi. With further progression of the disease, the larger bronchi are affected, with a thickening of the bronchial wall like "tram rails" and the appearance of cylindrical bronchiectasis.

This symptom is considered as an early manifestation of bronchial obstruction, when air trapped in the secondary lobule during inhalation cannot leave it during exhalation due to obstruction of the bronchioles, which manifests itself as hyper-airiness on expiratory scans. The symptom of "air traps" was observed much more often in the group of patients with a Tiffno index of more than 0.7. In our opinion, this picture is due to the fact that "air traps" are detected at an early stage of the pathogenesis of COPD, and in advanced cases, when lung tissue is destroyed due to emphysema, "air traps" are often impossible to detect. That is, some of the patients who, according to the existing classification, are classified as non-obstructive bronchitis, are in fact patients with COPD at an early stage. This suggests that changes that are described as manifestations of COPD and indicate the presence of bronchial obstruction develop in some patients who cannot be formally diagnosed with COPD, i.e., when the Tiffno index is more than 0.7 due to summation the nature of this indicator. Such patients often remain without appropriate treatment, although it is in this group that bronchodilator therapy is most effective due to the reversibility of bronchial obstruction and the small caliber of the affected bronchi.

In our study, the groups of patients with complaints characteristic of COPD (the presence of exacerbations with bouts of coughing and shortness of breath) were divided into two groups: the first group - those for whom pulmonologists have the formal right to diagnose COPD, with a Tiffno index less than 0.7, and the second group patients who, despite complaints of shortness of breath, will be diagnosed with chronic non-obstructive bronchitis, with a Tiffno index of more

than 0.7. There were no significant differences between the groups in the frequency of the main tomographic changes in computed tomography, with the exception of the frequency of the "air trap" symptom.

As an illustration, we present a clinical observation of a patient who was admitted with complaints of shortness of breath, cough with sputum production. No pathological changes were revealed during chest X-ray. With spirometry, the Tiffno index was 0.72, which exceeds the threshold value of 0.7. When conducting computed tomography on inspiration, pathological changes were also not revealed (Fig. 5). At the same time, in the expiratory phase, zones of increased transparency - "air traps" (Fig. 6) were determined in the lower sections. Thus, in this case, only with the help of functional computed tomography was it possible to reveal the changes inherent in the initial bronchial obstruction.

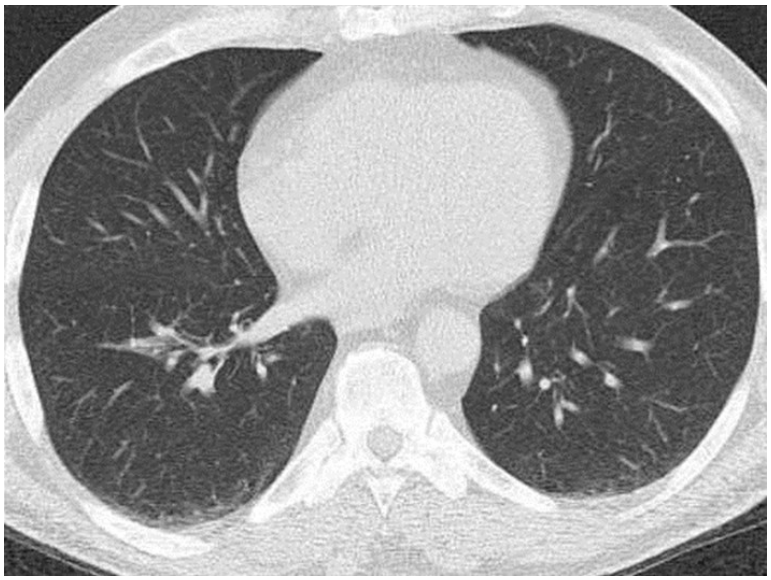

Fig. 5. Patient Sh., 56 years old. Computed tomogram in the axial plane. Inspiratory phase. No pathological changes were found.

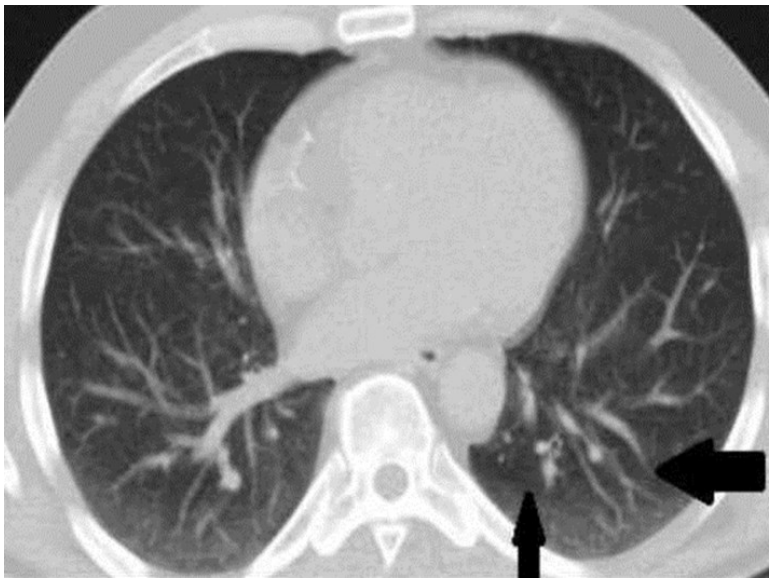

Fig. 6. The same patient. Computed tomogram in the axial plane at the same level. Expiratory phase. In the left lung in the lower lobe, lobular areas of increased airiness are determined - "air traps" (indicated by arrows).

The described changes showed a more frequent detection of the symptom of "air traps" in the group of patients with COPD compared with the group of patients with chronic non-obstructive bronchitis.

To determine the contribution of various tomographic symptoms to changes in the function of external respiration and, as a consequence, the effect on the patient's quality of life, the correlation was calculated using Spearman's method between tomographic signs and the main indicators of the function of external respiration. A correlation was established between the presence of bullae with FVC (forced vital capacity), FEV1 (forced expiratory volume in 1 second), the presence of areas of reduced transparency like “ground glass” with FVC, and barrel deformation of the chest with FEV1. It was determined that the areas of "ground glass", which reflect the development of pneumosclerosis, affect the restrictive disorders of the patient, and the barrel chest, in addition to the obvious effect on restrictive disorders, also has a weak correlation with bronchial obstruction. Thus, the rest of the tomographic symptoms affect the function of external respiration as a result of summation interaction and mutual amplification.

Conclusions. An optimized diagnostic algorithm for managing a patient with suspected COPD during the initial and dynamic treatment allows detecting signs of the disease at an early stage, while the Tiffno index remains within the normal range. In the presence of clinical symptoms of bronchial obstruction and negative spirometry data, patients should undergo inspiratory-expiratory CT to detect signs of COPD, including the symptom of "air traps".

Inspiratory-expiratory computed tomography is an effective technique for the diagnosis of morphological signs of COPD. The frequency of structural changes in lung tissue during computed tomography in patients with COPD and chronic non-obstructive bronchitis does not significantly differ, with the exception of the frequency of the symptom of "air traps": 15% among patients with COPD and 40% among patients with chronic non-obstructive bronchitis.

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