

VERIFICATION OF COPD USING RADIOLOGICAL DIAGNOSTICS

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ANNOTATION. Examination data of 60 patients with prolonged (chronic) cough and shortness of breath were analyzed using standard and digital radiography, as well as computed tomography, among which 21 had verified chronic obstructive pulmonary disease. Chronic obstructive pulmonary disease was differentiated on the basis of a clinical and radiological symptom complex, indicating damage to the small bronchi. Diagnostically significant for chronic obstructive pulmonary disease during computed tomography was the symptom of expiratory “air trap” in combination with dilation and deformation of bronchi of various sizes, up to broncho- and bronchioectasis.

Key words: computed tomography, radiography, chronic obstructive pulmonary disease.

Relevance. An alarming fact is the continued upward trend in mortality from chronic obstructive pulmonary disease (COPD). In recent years, it has been noted that COPD is accompanied by psychological and psychiatric problems. It is estimated that modern costs in the health care and social security system in compensating for the damage caused by COPD to the health of the population are 30-40 times higher than the costs of preventing them. According to documents from the European Respiratory Society, only 25% of cases are diagnosed in a timely manner.

The development of chronic obstructive pulmonary disease in most patients can be prevented, and significant success can be achieved in its treatment. The results of an objective examination of patients with COPD depend on the severity of bronchial obstruction and emphysema. However, the results of an objective examination do not fully reflect the severity of the disease, and the absence of clinical symptoms does not exclude the presence of chronic obstructive pulmonary disease in the patient.

In modern evidence-based medicine, a whole arsenal of radiation diagnostic methods based on various physical principles is used to diagnose chronic obstructive pulmonary disease. According to some authors, imaging methods are of limited value in the diagnosis of chronic obstructive pulmonary disease, since the morphological signs of COPD are often nonspecific and inconsistent, which determines the absence of typical radiation signs. The main purpose of radiation examination is usually to exclude other diseases and pathological conditions that may have similar clinical manifestations or be combined with chronic obstructive pulmonary disease.

The purpose of the study is to evaluate the diagnostic capabilities of computed tomography in diagnosing early signs of COPD at various degrees of obstructive obstruction.

Material and methods. For the period from 2018 to 2019. 60 patients (40 men and 20 women) were examined for suspected COPD. The age of the patients ranged from 20 to 70 years. The main clinical symptoms of the disease in the majority of patients

examined were chronic cough with sputum production and shortness of breath on exertion.

All patients, along with a clinical examination, underwent a plain radiography of the chest organs in frontal and lateral projections, and computed tomography.

Research results. Of all 60 patients examined, COPD was detected in 21 (35%). The distribution of the remaining 39 patients according to nosological forms of lung diseases was as follows: chronic bronchitis was diagnosed in 22 (56.4%) patients, pulmonary emphysema - in 17 (43.6%). All patients with a confirmed diagnosis of COPD (21 people) were divided into 4 main groups depending on the severity of the disease: stage 1 - mild COPD; Stage 2 - moderate COPD; Stage 3 - severe and stage 4 - extremely severe COPD and a risk group for developing COPD.

Patients at risk of developing the disease (8 people) were bothered by a prolonged cough and moderate sputum production. Five patients who made up the group with severity level 1 (mild course) complained of shortness of breath with significant physical exertion, cough, and production of a moderate amount of sputum. With moderate severity of COPD, 4 patients (grade 2) had shortness of breath on exertion, cough, and production of a significant amount of sputum. For the 3rd degree of severity (3 patients), in severe cases, shortness of breath at rest, cough and production of large amounts of sputum were observed. And finally, 1 patient, who made up the group with the 4th degree of severity, had an extremely severe course of the disease, severe shortness of breath at rest, cyanosis, acrocyanosis, respiratory and right ventricular failure.

All radiographs of the lungs were performed at the height of inspiration, with held breathing. The most characteristic radiological signs of obstruction in the lungs were: increased airiness of the lung tissue in the exhalation phase due to excess air content in the respiratory parts of the lungs (14%); flattening of the domes of the diaphragm and smoothness of the pleural sinuses (19%); vertical position of the heart axis on a plain X-ray of the chest organs in a direct projection (heart shadow of "small" sizes or the so-called "drip" heart) (19%); "saber-shaped" shape of the trachea - the predominance of the sagittal (antero-posterior) size of the trachea, determined by a lateral radiograph over the transverse size, changed by a radiograph in a direct projection (12.6%).

In addition, plain radiography of the chest organs in patients with COPD revealed: strengthening and deformation of the pulmonary pattern in the hilar and supradiaphragmatic parts of the lungs (19%); thickening of the walls of the lobar and segmental bronchi (23%); blurred contours of blood vessels, bronchi, as well as "blurred" structure of the roots of the lungs (33%), as well as signs of deformation of the pulmonary pattern in the hilar regions of the lungs with thickening of the walls of the bronchi of various sizes.

Similar clinical symptoms in patients with various pathological changes in the lungs created significant difficulties in differential diagnosis of COPD with chronic bronchitis and emphysema, as well as in assessing the severity of COPD. This circumstance served as the basis for studying the additional capabilities of computed tomography (CT) in the diagnosis of COPD in order to increase the effectiveness of radiation research methods.

Computed tomography in patients with COPD allows one to evaluate the structure of the lung tissue and the condition of the small bronchi. Using CT, the localization of the most airy zones in the lungs is clarified. With emphysema, this figure rises to -900 HU, and sometimes even to -1000 HU. In addition, comparison of densitometric indicators of adjacent areas of the lung during inhalation and exhalation helps to determine not only overinflated, but also poorly ventilated sections.

CT scan of the lungs using functional respiratory tests (inhalation and exhalation phases) made it possible to detect early signs of COPD development already at the preclinical (people at risk) stage of the disease, even under conditions of normal respiratory function. When using CT in the expiratory phase, all patients from the risk group were found to have air “traps” in the lungs, a “tree with buds” symptom, indicating pathological changes at the level of small bronchi.

When performing a CT scan, in 2 patients with 1st degree of severity of COPD, expansion and deformation of the segmental and subsegmental bronchi were noted, and in 1 patient there was bronchial damage, mainly in the peripheral parts of the lungs. At the same time, in 2 (9.5%) patients, when examined in the inhalation phase, the lung tissue was not changed. In 3 (14.3%) patients there were signs of a “mosaic” lung in the inhalation phase and in all 5 patients there were signs of an “air trap” in the exhalation phase. As can be seen, according to the results obtained, in almost half of the examined patients with COPD (43.8%), radiography did not reveal changes in the lungs, while according to CT data these changes were established.

When performing CT scans, practically all patients with COPD with grade 2 severity of the disease showed signs of damage to the bronchi of various sizes. At the same time, thickening and deformation of the walls of the segmental and subsegmental bronchi were detected in 3 (14.3%) patients, of which 1 patient had a symptom of “tram rails”. Damage to the distal bronchi was detected in 2 patients, and to the proximal bronchi - in 3 (15%) patients. Increased pulmonary pattern in the lower lobes of the lungs was noted in 3 (15%) patients. During a CT study in the inhalation phase, signs of a “mosaic” lung were noted in 3 patients out of 4 examined, and in 1 patient no changes in the lungs were detected. In all 4 COPD patients with stage 2 of the disease, CT signs of an “air trap” were revealed in the lungs during expiratory phase examination.

With an established diagnosis of stage 3 COPD, 3 patients were examined, whose radiographs revealed changes in the pulmonary pattern in the form of pneumosclerosis and thickening of the bronchial walls, the presence of bronchiectasis: saccular and cylindrical bronchiectasis were differentiated. CT revealed the following signs of bronchial lesions: thickening of the walls, the “tram rails” symptom, changes at the level of small bronchioles (the “tree with buds” symptom). Moreover, in all 3 patients in the expiratory phase there was a symptom of a pronounced expiratory “air trap”.

In the 4th degree of severity of COPD, the leading clinical sign of the disease was severe shortness of breath at rest, worsening with the slightest exertion. In addition, the patient's condition was marked by drowsiness and some lethargy. Upon examination, cyanosis of the skin was revealed. An X-ray examination revealed multiple “sac-like” bronchiectasis, thickening and intensification of the pulmonary pattern in the lower parts of the lungs, and an increase in the size of the heart shadow. On CT scan, in the inhalation

and exhalation phases, the lungs remained as if swollen and were in a state of “fixed inhalation.” When performing expiratory CT, the greatest diagnostic value in these cases was the identification of bronchiectasis and the symptom of valvular swelling, “air trap”. Thus, a radiation examination of a patient with COPD begins with radiography (fluorography) of the chest organs. If there are clinical indications or questionable X-ray results, a CT scan of the lungs may be performed. The introduction of computed tomography, including expiratory, into clinical practice has significantly expanded the capabilities of radiation diagnostics and made it possible to identify a number of characteristic changes in the lungs, often invisible on conventional radiographs.

Conclusions. Assessment of the degree of ventilation impairment in the lungs in patients with COPD should be carried out under CT conditions performed in the inspiratory and expiratory phases. Diagnostically significant for COPD during computed tomography is the symptom of expiratory “air trap”, in combination with dilation and deformation of bronchi of various sizes, up to broncho- and bronchiolectasis. CT is an informative research method that allows timely detection of the development of pathological changes in COPD in the lung tissue and bronchi, especially small ones. COPD is formed as a result of damage to the small bronchi, which determines the characteristic clinical and radiological symptom complex, and makes it possible to differentiate this disease from emphysema and chronic bronchitis. CT can serve as a non-invasive method for detecting morphological changes in the lungs in the early stages of COPD, which makes it possible to prescribe adequate treatment in a timely manner and judge the effectiveness of the therapy. Thus, the most informative method of radiological diagnosis of chronic obstructive pulmonary disease is inspiratory-expiratory CT.

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