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FEATURES OF COMPLEX RADIATION DIAGNOSIS OF IDIOPATHIC PULMONARY HYPERTENSION

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Abstract. *Idiopathic pulmonary arterial hypertension (IPAH) is a type of pulmonary arterial hypertension, the etiology of which has not been established. For many years, ventilation perfusion scintigraphy and pulmonary angiography have been the "gold standard" for preoperative diagnosis of pulmonary hypertension, but now several non-invasive imaging methods, such as chest X-ray, echocardiography (Echo-KG), multispiral computed tomography (MSCT), as well as magnetic-resonance imaging (MRI).*

Keywords: *idiopathic pulmonary hypertension, patients, echocardiography, multispiral computed tomography, right ventricle.*

Pulmonary hypertension (PH) is a condition characterized by increased pressure in the small circle of blood circulation. It may be idiopathic or be observed in other conditions. PH is defined as an average pulmonary pressure of 25 mmHg or more at rest. A pressure of 20 mmHg or lower at rest is considered normal, and a pressure of 21-24 mmHg is doubtful, but often requires further study [4,6,8].

IPAH is a subtype of pulmonary arterial hypertension without an established cause. Although cases of idiopathic pulmonary arterial hypertension have been reported in patients of all ages, it is usually considered a young age disease, most often occurring between the ages of 20 and 45 years. Women get sick more often than men. Clinical manifestations are nonspecific and may include shortness of breath during exercise (60% of all cases), fatigue, angina pectoris, syncope and pulmonary heart disease. The average delay between the onset of symptoms and the diagnosis of idiopathic pulmonary arterial hypertension is 2 years. The prognosis is unfavorable, the median survival rate is 2.8 years, and the 5-year survival rate is only 34%. Factors influencing the pathogenesis of idiopathic pulmonary arterial hypertension include genetic predisposition, endothelial cell dysfunction, and disorders vasomotor control, thrombotic obliteration of the vascular lumen and vascular remodeling [5, 6, 10].

Classically, chest X-rays can indicate an expansion of the central pulmonary vessels with rapid narrowing of the peripheral ones, and an increase in the right parts of the heart can also be detected with IPAH. Chest X-ray is rarely used as the only imaging method in the diagnosis of hypertension [7].

Echocardiography is mainly used to determine the presence of pulmonary hypertension and exclude possible cardiac causes.

MSCT is a routinely used imaging technique for evaluating patients with suspected PH. Sometimes a left-sided heart lesion can be diagnosed accidentally for the first time with a CT scan. Studies can be carried out without intravenous administration of a contrast agent using a high-resolution mode when it comes only to the parenchyma of the lungs. Patients should undergo MSCT with intravenous bolus contrast to confirm the presence of primary (idiopathic) pulmonary hypertension and the absence of any cardiac pathology leading to the development of LV problems. With the help of MSCT data, it is possible to distinguish ILG, determine the main

pathogenic syndrome and detect additional unusual forms of pulmonary hypertension. The advantages of MSCT are that it is performed quickly, contains more information and is an accessible research method [3, 6, 9].

Magnetic resonance imaging is another approach that can be used to diagnose IPAH. Its advantages include the absence of ionizing radiation and the elimination of the need for an iodide contrast agent. MRI of the heart is one of the most accurate methods for assessing the size, morphology and function of the right ventricle. It can also be used to evaluate the anatomy of the pulmonary arteries and pulmonary blood flow. An MRI of the heart is used to make sure that there are no signs of insufficiency in the right ventricle (for example, dilation or decreased ejection fraction) that require additional intervention or medication. MSCT and MRI methods complement each other. In the promotion of diagnostic studies in ILG, their joint application is a priority.

Catheterization of the right parts of the heart allows direct measurement of pulmonary pressure, pulmonary resistance and cardiac output. It remains the standard for the diagnosis of LH, and can also be used to predict the response to vasodilators. Because it is invasive and provides little information about the lungs or mediastinum, catheterization of the right heart is usually performed in combination with other methods.

IPAH is most often diagnosed in the late stages due to the nonspecific nature of the early symptoms and signs. Although clinical evaluation is important in the examination of patients with suspected PH, echocardiography is a key screening tool in the diagnostic algorithm. It allows you to assess the pressure in the pulmonary artery both at rest and during physical activity and is useful to exclude secondary causes of pulmonary hypertension. In addition, echocardiography is used in evaluating prognosis and treatment options, monitoring the effectiveness of specific therapeutic interventions, and to identify preclinical stages of the disease.

All of the above puts forward the problem of echocardiography and MSCT diagnosis of primary (idiopathic) pulmonary hypertension as one of the most relevant in cardiac surgery and determines the need for further study and accumulation of experience in improving these techniques for practical healthcare.

The purpose of the study. Improving the diagnosis of idiopathic pulmonary hypertension by using non-invasive methods - echocardiography and multispiral computed tomography.

Research materials and methods. 57 patients from branches of the Republican specialized Scientific and Practical Center of Cardiology of Andijan and Namangan regions with suspected PH were examined. All patients were hospitalized and/or examined on an outpatient basis every 6 months to assess the dynamics of the condition.

Transthoracic echocardiography was performed on ultrasound devices "Esaote My Lab X6" and "Mindray DC-70" using sector sensors with a frequency of 2.5-5.5 MHz. The study was performed according to a standard protocol in 2D mode in the following projections: subcostal, suprasternal, parasternal and apical. The slices in all accesses were located in the long and short axes. Image registration was carried out with the determination of the end-diastolic diameter (EDD) of the left ventricle (LV) (norm 2-4 cm), the longitudinal and transverse dimensions of the right atrium (RA), the anterior-posterior size (RA) of the pancreas (norm < 2.9 cm), the thickness of the anterior wall of the pancreas (norm < 0.5 cm), the diameter of the trunk and branches of the aircraft. In pulsed mode, Doppler echocardiography calculated the degrees of valvular regurgitation, the level of systolic pressure in the PA (SPAP) using a modified Bernoulli equation.

MSCT was performed using a wide-detector 32-slice computed tomography "Anatom 32 fit" by Anke, the thickness of the cross sections was 0.5 mm, with a thickness interval of 0.25 mm and an algorithm for soft tissue reconstruction. The voltage of the scanning tube was 100 kV and the current was 400 Ma. The scan was performed from the level of the sternoclavicular junction to the diaphragmatic surface.

High-resolution computed tomography was also used to determine small areas of decreased airiness of the pulmonary parenchyma by the type of "frosted glass" that occur in ILG. During the initial examination of a patient with pulmonary hypertension without a clear reason, a hybrid protocol consisting of non-contrast expiratory images and a protocol of post-contrast inhalation pulmonary angiography can be used. The CT approach to the diagnosis of LH begins with the detection of an enlarged pulmonary artery diameter of more than 29 mm, which is usually larger than that of the ascending aorta at the same level. This diameter should be measured in the axial plane at the bifurcation point perpendicular to the long axis of the pulmonary artery.

The results of the study. Dilation of the right ventricle was assessed in the parasternal projection along the long axis, along the short axis and in the apical four-chamber projection. When the afterload of the pancreas becomes chronically elevated, the walls of the pancreas become hypertrophied. Pancreatic hypertrophy is determined by a free wall thickness of more than 5 mm in the apical four-chamber projection. One of the first anatomical elements to undergo hypertrophy is the moderator stripe. In healthy people, it is thin and difficult to see, but in patients with LH it is clearly visible. Unlike other conditions affecting the pancreas (for example, right ventricular infarction or arrhythmogenic cardiomyopathy of the right ventricle), where there are regional violations of wall movement, an assessment of contractility in LH shows a general violation of the right ventricle. Based on these three parameters (dilation, hypertrophy and contractility), it was possible to carry out a qualitative assessment of pancreatic function and its mild, moderate or severe impairment. It has been shown that in patients with PAH, pancreatic dilation is associated with an unfavorable clinical outcome (an increase of >0.25 of the absolute value of the pancreatic sphericity index, i.e. the ratio of the short axis to at the mid-ventricular level of the pancreas to the long axis of the pancreas at the end of the diastole and mortality (diameter of the pancreas >36.5 mm)). Some anatomical features make it difficult to study the pancreas in detail, especially when using two-dimensional (2D) echocardiography. In particular, determining the boundaries of the pancreas was difficult due to the highly trabecular structure of the myocardium, and the available image windows were limited due to the retrosternal position. In patients with IPAH, the pressure in the right ventricle increases, causing the interventricular septum to flatten into a systole when the pressure in both ventricles begins to converge. Eventually, when the pancreas becomes heavily loaded with pressure, the septum may even protrude into the LV cavity. These changes also affected both systolic and diastolic LV function. Another change observed in the pancreas in LH was ventricular remodeling, which appeared to be the result of chronic progressive stress. Initially, this occurred in the form of hypertrophy, and then in the form of dilation. Remodeling led to progressive contractility impairment, low cardiac output and, ultimately, right ventricular failure. Dilation of the right ventricle also led to dilation of the tricuspid ring and to significant regurgitation of the tricuspid valve.

When this is combined with a decrease in systolic dysfunction of the right ventricle and an increase in afterload, it led to a further decrease in stroke volume in the small circle of blood circulation and, as a result, a decrease in cardiac output. The additional volume load due to

tricuspid regurgitation led to a deterioration in the diastolic function of the pancreas, an increase in end-diastolic pressure in the pancreas and displacement of the LV. Progressive deterioration of pancreatic function is a determining factor in exercise tolerance, symptoms and prognosis, therefore, assessment of pancreatic function is a key component of the examination of a patient with IPAH. Characteristic vascular signs of idiopathic pulmonary arterial hypertension detected by CT were dilation of the central pulmonary artery, usually in the absence of detectable intraluminal thrombi; small convoluted peripheral vessels representing plexogeni c arteriopathy; and a sharp decrease in the caliber of segmental and subsegmental arteries. Blood clots attached to the wall formed in the central pulmonary arteries in severe cases of idiopathic pulmonary arterial hypertension and were usually accompanied by massive dilation of the trunk of the pulmonary artery, right and left pulmonary arteries. Additional CT results included enlargement of the right heart, pericardial effusion, and a mosaic pattern of attenuation in the lung parenchyma. The detection of pericardial effusion increased with the severity of pulmonary hypertension, and the presence of pericardial effusion suggests a worse prognosis. A mosaic pattern of attenuation caused by regional changes in pulmonary perfusion was also often found. Idiopathic pulmonary hypertension is a common clinical diagnosis associated with high morbidity and mortality of patients. Diseases that can lead to ILH often overlap a wide range of CT signs, and for a final diagnosis, a correlation of CT results with clinical, echocardiographic, histopathological and angiographic data will be required. To ensure proper therapeutic treatment, knowledge of the various nosological units associated with pulmonary hypertension and knowledge of the full range of their imaging features are necessary.

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Conclusions. Thus, radiation diagnostic methods play a crucial role in the diagnosis and monitoring of further treatment. Despite the diagnostic value of numerous model approaches, it is rarely necessary to perform all the studies for each patient. The diagnostic algorithm involves the use of a multimodal approach to ensure a correct diagnosis, with a series of studies ranging from a thorough clinical assessment using non-invasive imaging techniques to right ventricular catheterization, which is considered the "gold standard" for the diagnosis of hypertension.

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