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ASSESSMENT OF CHANGES AND COMPLICATIONS CAUSED BY CORONAVIRUS INFECTION IN THE LUNGS USING COMPUTED TOMOGRAPHY

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ABSTRACT: Pathogenetically COVID-19 is characterized by viremia, local and systemic immuno-inflammatory process, hyperactivity of the coagulation cascade, endotheliopathy, hypoxia, which leads to the development of micro- and macrothrombosis; proceeds from asymptomatic to clinically pronounced forms with intoxication, fever, vascular endothelium damage, lungs, heart, kidneys, gastrointestinal tract, central and peripheral nervous systems with the risk of complications (ODN, ARDS, PE, sepsis, shock, SPON). The main target of SARS CoV-2 is the lungs. In pathogenesis, 2 mechanisms should be distinguished that mutually burden each other and can lead to the development of ARDS (pathomorphologically diffuse alveolar damage): direct viral damage to alveocytes with the development of immuno-inflammatory syndrome; the development of micro- and macrothrombosis of pulmonary vessels and obstructive thrombo-inflammatory syndrome. Therefore, the disease was named microCLOTS – microCOVID Lung Obstructive Trombovascular Syndrome¹. As in the whole world, the incidence of COVID 19 pneumonia in the Republic of Uzbekistan is more than 193,000 people, while there is a steady increase [1.3.5.7.9].

KEYWORDS: endotheliopathy, macrothrombosis, alveocytes, COVID-19, syndrome.

INTRODUCTION

The severity and severity of the clinical manifestations of COVID-19 depends on the massiveness of infection (the infecting dose of the virus) on the one hand and the individual characteristics of the macroorganism on the other (age, gender, strength of the immune response, the presence of concomitant diseases-risk factors, etc.). In radiation diagnostics, various variants of changes in the lungs in patients with confirmed coronavirus pneumonia detected using various methods of medical imaging (computed tomography, magnetic resonance imaging, X-ray and ultrasound diagnostics) during primary radiation examination are considered.

The existing ideas about the possibilities of various methods of radiation diagnostics, knowledge of terminology and understanding of the radiation picture allow doctors of clinical specialties to increase the effectiveness of using medical imaging in the examination of patients with coronavirus pneumonia. Computed tomography is generally considered to be the main method of assessing the lesion of the pulmonary parenchyma, but MRI also provides informative data on the presence of changes characteristic of coronavirus pneumonia, and can be used as an alternative [2.4.6].

Magnetic resonance imaging is an informative and minimally invasive imaging method that does not carry a radiation load on the patient. In the diagnosis of coronavirus infection, MRI can be performed as an alternative method of examination in the absence of the technical possibility of CT, as well as in a contingent whose exposure to radiation exposure is undesirable (pregnant women and children), in cases where there are no absolute contraindications to the use of this method (MR incompatible metal prostheses, artificial pacemakers, etc.)

According to numerous foreign authors, CT pictures of coronavirus pneumonia, the most frequent and characteristic sign is the presence of a “frosted glass” symptom, while the symptoms of “cobblestone pavement”, halo, reticular changes and consolidation are manifested in patients depending on the duration and severity of the disease and the presence of an attached bacterial infection (Richard Ha. with co-author, 2015; Kirsi Holli-Helenius. with co-author, 2017; Li Qinmei. et al., 2019; Wei Li. et al., 2019) [10.11].

The aim of the study is to study the relationship between the results of chest CT and the clinical manifestations of COVID-19 pneumonia.

Objectives of the study:

- to study changes in the lungs associated with coronavirus infection based on radiological criteria
- to evaluate the stages and characteristics of the degree of changes in the lungs associated with coronavirus infection based on CT signs
- optimize CT and X-ray methods in the presence of COVID 19 pneumonia in cases where the PCR test result is negative.
- to determine the indications for the use of CT diagnostics for changes in the lungs associated with coronavirus infection.

The object of the study were 56 patients examined at the Bukhara Infectious Diseases Hospital.

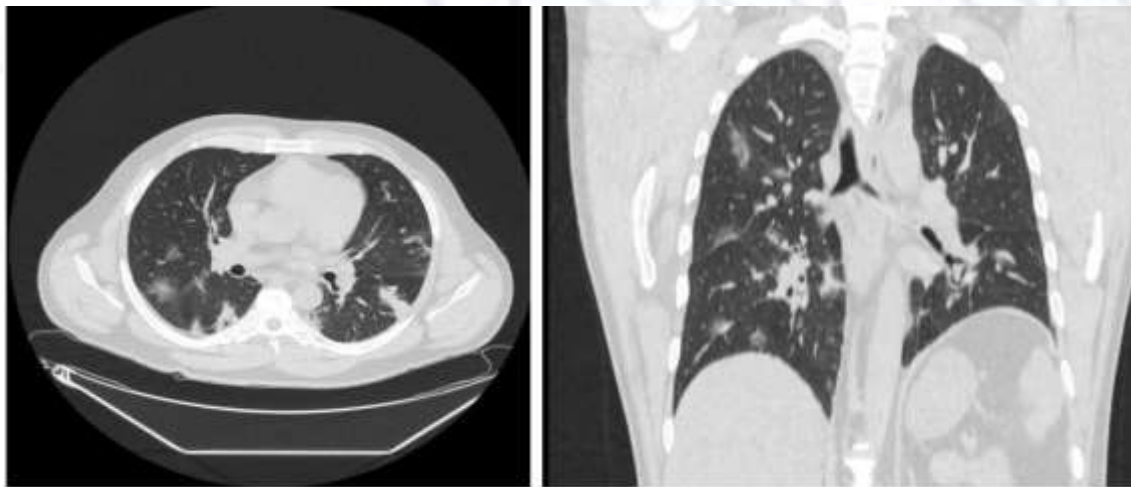
The subject of the study was the results of radiography, and computed tomography, as well as PCR studies in patients with pneumonia associated with coronavirus infection.

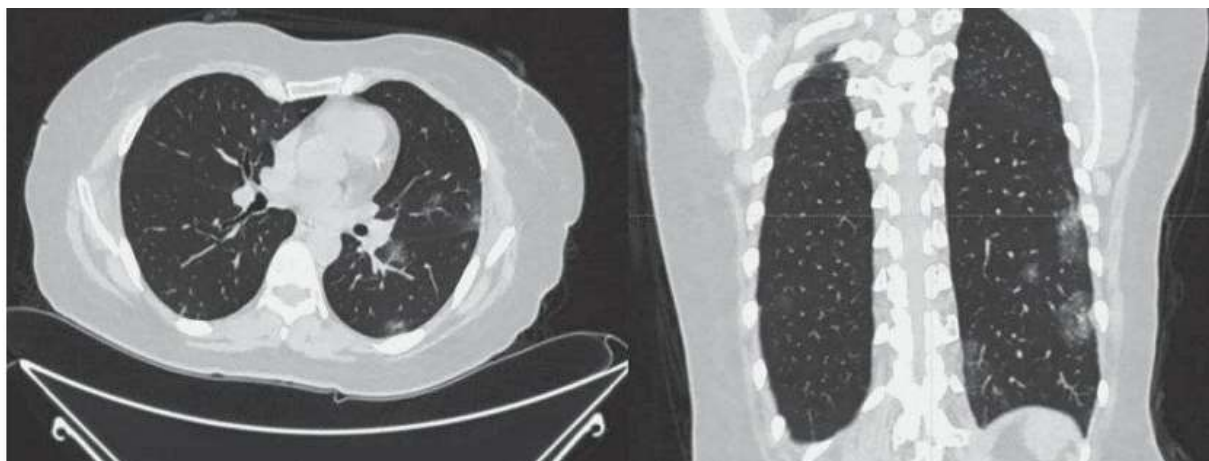
Research methods. X-ray, computed tomography, laboratory and statistical methods of research were used in the performance of the work.

- indications for the appointment of chest CT in addition to radiography in the examination of patients with clinical suspicion of pneumonia were determined;
- the possibility of examining patients with pneumonia caused by a new coronavirus infection has been established, which, in turn, serves to more accurately determine the patient's further treatment tactics;
- an algorithm for the application of radiation examination methods for the diagnosis of pneumonia with the association of coronavirus infection is proposed.

The CT picture of lung damage was compared with the severity of clinical symptoms (fever, dry cough, nasal congestion, weakness, etc.). In 3 (2.7%) patients at the time of CT, there was no clinical picture of the disease, despite the CT signs of COVID-19-associated pneumonia and confirmation of the presence of SARS-CoV-2 by polymerase chain reaction.

Based on the analysis of the data obtained, various CT signs of viral pneumonia caused by SARS-CoV-2 were identified. In the initial study, "frosted glass" prevailed. Thus, a frequent common symptom in lung CT was "frosted glass" in all subjects. This sign is represented by a small compaction of the parenchyma without its volumetric change, with partial preservation of pneumatization, due to which bronchial and vascular structures are observed. In some foci, areas of high density were formed, clearly standing out against the background of "frosted glass".





High-resolution computed tomograms of the lungs. The patient is 55 years old. The dorsal parts of the lungs are more affected. The PCR test is positive.

When analyzing the images, we determined the change in the transparency of the lung tissue: the presence of emphysematous bloating, hypo- and hyperventilation zones. Along with pulmonary changes, the presence of ribbon-like seals reflecting scarring changes, as well as damage to the pleura: its thickening, compaction and the presence of pleuropulmonary adhesions were determined. Particular attention was paid to the assessment of peribronchial and perivascular changes: deformation of the bronchi and thickening of their walls, the presence of bronchiectasis, signs of bronchiolitis in the form of uneven pneumatization, centrilobular seals, interstitial interstitial infiltration. The following changes in the vascular pattern were revealed: its impoverishment at the periphery and displacement of vessels by bullae, deformation and dilation of vessels, an increase in the ratio of segmental artery /bronchus more than 1

To assess the diagnostic effectiveness of the methods used, sensitivity and specificity indicators were used; for which each individual result was classified as true-positive, false-positive, true-negative and false-negative. Statistical studies were conducted on the basis of standard clinical recommendations.

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The CT semiotics of COVID-19 viral pneumonia described in the literature (numerous peripheral compaction of lung tissue by the type of "frosted glass", consolidation of lung tissue, reticular changes, thickening of the pleura, subpleural enlightenment (by the type of air bands), symptom of an air bronchogram, thickening of the interlobular interstitium by the type of "cobblestone pavement" (Eng. "crazy-paving" sign), "halo", the reverse "halo" was clearly traced in our patients.

The different prevalence and semiotics of COVID-19-associated pneumonia indicate a different body response to infection. The need to comply with certain methodological requirements during MSCT in patients with pneumonia caused by SARS-CoV-2 is emphasized. The effect of an air bronchogram against the background of consolidations in our patients has always been preserved. That is, the bronchi and bronchioles in COVID-19 are passable and are almost not involved in the process in the absence of bacterial infection[8.9.10.11].

It should be borne in mind that CT signs of COVID-19-associated pneumonia may lag behind or outstrip the clinical symptoms of the disease in time of manifestation. According to a number of authors, the pathomorphological substrate of changes in the lungs in the first days of the development of pneumonia against the background of SARS-CoV-2 infection is dilation and stagnation in the capillaries of the alveoli, fluid exudation into the alveolar cavity, swelling of the interlobular interstitium, which is displayed on the MSCT in the form of single or multiple changes of the "frosted glass" type.

The most typical CT signs of pneumonia associated with coronavirus infection are dilation and stagnation in the capillaries of the alveoli, fluid exudation into the alveolar cavity, swelling of the interlobular interstitium, which is displayed on the MSCT in the form of single or multiple changes in the type of "frosted glass", mesh seal of the interstitium, drain characteristic changes and the appearance of foci of high density on the background "frosted glass".. CT sensitivity in the detection of breast cancer was 98.3%, specificity -96.3%, diagnostic accuracy – 95.0%.

The diagnostic capabilities of MRI in breast cancer differentiation are significantly increased when using, in addition to anatomical MRI, a functional study with dynamic contrast enhancement, in which breast cancer is more often, in 87.1%, manifested by type III curve, which is characterized by rapid achievement of the maximum of the MR signal after contrast administration, followed by its rapid decrease, less often, in 12.9% type II – plateau after reaching the maximum. In patients with benign tumors of the mammary glands, type I of the curve of a constant increase in the intensity of the signal of formations after administration of a contrast agent was mainly observed. The multimodal approach in radiation diagnostics to assess the stages and complicated pneumonia with the association of coronavirus infection provides for the modification of the use of various imaging methods and allows us to formulate the most complete conclusion in the diagnosis of complications of pneumonia.

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