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Ocena zmian w płucach w badaniu ultrasonografii przekłatkowej u chorych po przeżytym zakażeniu SARS CoV-2

Summary

SARS-CoV-2 causes an acute, highly contagious respiratory disease entitled COVID-19. According to the situation report of WHO, to date, over 750 million cases have been confirmed in 192 countries, including over 6.8 million deaths. SARS-CoV-2 has the ability to replicate in the lower respiratory tract and can cause severe pneumonia. In the most serious cases, it is accompanied by acute respiratory distress syndrome. In addition to computed tomography (CT), currently recognized as the "gold standard" of radiological imaging in COVID-19, there is growing evidence regarding the usefulness of transthoracic lung ultrasonography (LUS) as a diagnostic tool. Some of the persistent radiological manifestations described in the chest CT in the convalescent phase of COVID-19 are recognized as typical radiological signs of interstitial lung fibrosis - a complication that may occur after COVID-19 pneumonia.

The main purpose of this study included evaluation of the radiological findings obtained from LUS in COVID-19 survivors, description of the association of both CT and LUS, determination of the usefulness of lung ultrasound in monitoring the course of the disease and assessment of the sensitivity of lung ultrasound in detecting pulmonary fibrosis in patients after recovering COVID-19 pneumonia.

This single-centre prospective observational study evaluated 72 COVID-19 survivors who were diagnosed in the 1st Department of Lung Diseases of the National Tuberculosis and Lung Diseases Research Institute in the period from 01.01.2021 to 30.09.2022 in order to evaluate persistent clinical symptoms (dyspnoea, cough, chest pain). 115 pairs of transthoracic ultrasound examinations were performed (examinations were performed with a linear transducer) with the simultaneous performance of the "gold standard", i.e. chest CT. Patients qualified for the study were subjected to assessment I for an average of 205 ± 173 days, to assessment II for an average of 364 ± 154 days and to assessment III for an average of 496 ± 179 days apart from the onset of COVID-19. The chest CT scans were assessed both quantitatively using a computer program that determined the percentage of lung involvement by ground glass opacities, and qualitatively, in terms of

identifying patients with pulmonary fibrosis. In the transthoracic ultrasound examination of the lungs, an original scale was introduced in order to assess the severity of changes in the lungs. Each of the 12 chest areas were assigned a score from 0 to 3 points, depending on the pathological artifacts described. The total LUS score varied from 0 to 36 points.

Regarding lung ultrasound findings, the most frequent abnormalities found in both I and II examinations were irregular pleural line, subpleural consolidations $>2,5\text{mm}$ $<10\text{mm}$ and B-lines. The most common abnormalities found in chest CT in this study were ground glass opacities, which occurred in 75% of examinations in the assessment I and, respectively, in 62% of the assessment II. Fibrotic-like changes (traction bronchiectasis, honeycombing) were visualized in 37.6% of patients in the assessment I and 32% in the assessment II. For all 115 pairs of LUS and chest CT scans, the lung ultrasound score was strongly correlated with percentages of lung involvement in ground glass opacities ($r=0,702$). Moreover, the LUS score higher than 13 points characterized the percentage of more than 10% of ground glass opacities in chest CT with a sensitivity of 0.964 and a false positive value of 0.262. Based on the analysis of the study results, a good correlation between the radiological regression - seen on the chest CT (decrease in the percentage of ground glass opacities) and the decrease in the ultrasound score, was established with a correlation coefficient of $r=0.69$. In addition, the transthoracic lung ultrasonography score was statistically significantly higher in the group of patients with fibrotic-like changes described in the chest CT. A LUS score higher than 13 points characterized the fibrotic-like changes confirmed in the chest CT with a sensitivity of 0.911 and a false positive value of 0.26.

Based on the results of the study, lung ultrasound should be considered as a diagnostic method in the follow-up examination in patients with persistent clinical symptoms after recovering from COVID-19. The results of transthoracic ultrasonography of the lung may suggest the presence of the radiological signs of lung fibrosis.