

RESPIRATORY SYSTEM FUNCTIONAL STATUS IN PATIENTS WITH DYSPNEA WHO HAVE EXPERIENCED NON-HOSPITAL ACQUIRED PNEUMONIA ASSOCIATED WITH COVID-19

L. I. Konopkina, O. O. Shchudro

Dnipro State Medical University, Dnipro, Ukraine

Abstract. The aim of the study was to assess the ventilatory function of the lungs and lung diffusing capacity in the subacute period of COVID-19 in patients with dyspnea who had community-acquired pneumonia associated with COVID-19 and to determine the effectiveness of treatment in the presence of bronchial obstructive changes.

Materials and methods. We examined 102 patients with dyspnea in the subacute period of COVID-19 (at 47 (38; 62) days from the onset of the first symptoms of the disease) who suffered community-acquired pneumonia associated with COVID-19 in April–November 2021. The average age was (54.5 ± 9.5) years, and there were 49 (48.0 %) men. Depending on the severity of COVID-19 in the acute period, the main group was divided into three subgroups: subgroup 1 included 41 patients (mean age — (56.3 ± 5.5) years; men — 16 (39.0 %)) who had a moderate severity of the acute period of the disease; subgroup 2 — 46 patients (mean age — (54.7 ± 7.3) years, men — 26 (56.5%)) who had a severe severity of the acute period of COVID-19; subgroup 3—15 patients (mean age — (57.2 ± 6.2) years, men — 7 (46.7 %)) who had a critical course of the acute period of COVID-19. Methods of the study: general clinical methods, modified Borg dyspnea scale, spirometry, body plethysmography, determination of lung diffusing capacity. The group of patients with obstructive disorders were treated with combined bronchodilator (phenoterol + ipratropium bromide - dosage 20 and 50 mcg, respectively). The effectiveness of the therapy was evaluated after one month of treatment.

Results. The level of a dyspnea in the whole group was (4.3 ± 2.8) points: in subgroup 1 — (1.1 ± 0.6) points, in subgroup 2 — (2.5 ± 1.0) points, in subgroup 3 — (4.7 ± 1.8) points. The correlation analysis showed that the level of dyspnea in subgroups of patients in the subacute period of COVID-19 depended on the severity of the acute period of the disease ($r = 0.56$ ($p < 0.001$)). In addition to dyspnea, 54 (52.9 %) patients complained of mild cough. In subgroup 1, 23 (56.2 %) patients had neither spirometric (numerical values) nor spirographic (flow-volume curve visualisation) changes. The remaining patients in this subgroup had mild obstructive impairment (by FEV_1 and FEV_1/FVC) or spirographic changes in the flow-volume curve (in the form of incisura) (in 11 (26.8 %) and 7 (17.0 %) patients, respectively). There were no patients with restrictive or mixed types of disorders. In subgroup 2, less than half (21 (45.6 %) of 46) had no ventilation disorders. In 16 (34.8 %) patients, ventilation disorders of the restrictive type of moderate severity were detected; in 6 (13.0 %) patients, obstructive disorders of mild severity were detected; in 1 (2.2 %) patient, mixed disorders with predominance of restrictive changes; in 2 (4.4 %) patients, visualization changes in the flow-volume curve (in the form of incisura). In subgroup 3, only 20.0 % of patients had no ventilation disorders, while 10 patients (66.7 %) had restrictive changes and 2 (13.3 %) had mixed disorders with predominance of restrictive changes; no other types of ventilation disorders were detected. In 9 (23.0 %) patients of subgroups 1 and 2, visualization (spirographic) changes in the flow-volume curve with the presence of incisura were detected and body plethysmography was performed, which registered an increase in bronchial resistance (R_{aw} and sR_{aw} values were 215 (170; 350) and 240 (190; 378) % of the normal values, respectively), which confirmed the presence of bronchial obstruction. The treatment group consisted of 26 (25.5 %) patients who in the subacute period had dyspnea due to bronchial obstructive syndrome: subgroup 1_t included 17 patients with signs of bronchial obstruction according to digital data of spirometric parameters FEV_1 and FEV_1/FVC ; subgroup 2_t — 9 patients with signs of bronchial obstruction according to visualization data of the flow-volume curve and body plethysmography. One month after treatment, dyspnea completely disappeared in 10 (58.8 %) of 17 patients in subgroup 1_t and in all patients in subgroup 2_t; cough was a concern in only 3 of 16 (18.8 %) patients in subgroup 1_t and 1 of 6 (16.7 %) patients in subgroup 2_t. In subgroup 1_t, the levels of spirometric indicators of bronchial obstruction improved (FEV_1 and FEV_1/FVC increased from 77 (69; 83) to 91 (85; 101) % of the normal values and from 0.69 (0.58; 0.81) to 0.80 (0.75; 0.84), respectively ($p < 0.05$)), and in subgroup 2_t — the levels of body plethysmographic indicators of bronchial obstruction (R_{aw} and sR_{aw} decreased from 215 (170; 350) to 117 (110; 134) % of the normal values and from 240 (190; 378) to 119 (109; 142) % of the normal values, respectively ($p < 0.05$)). Impaired lung diffusing capacity was recorded in 52 (68.4 %) of the subjects. In subgroup 3, 100 % of patients had impaired lung diffusing capacity, and in subgroups 1 and 2 — 52.0 and 67.5 %, respectively ($p < 0.05$). The DL_{CO} level was the lowest in patients of subgroup 3 and the highest in subgroup 1 (47.6 ± 9.8) and (64.3 ± 10.8) %, respectively ($p < 0.05$)).

Conclusions. The severity of dyspnea in the subacute period of COVID-19 depends on the severity of the disease in the acute period. In 46.1 % of patients with dyspnea in the subacute period of COVID-19, various types of ventilation disorders are observed: in moderate acute disease — broncho-obstructive changes (43.8 % of cases); in severe disease — obstructive (17.4 % of cases), restrictive (34.8 % of cases) and mixed (2.2 % of cases) disorders; in critical disease — restrictive (66.7 % of cases) and mixed (13.3 % of cases) disorders. Obstructive disorders in the subacute period of COVID-19 are manifested by changes in such spirometric parameters as FEV_1 and/or FEV_1/FVC , with a mild degree of severity (60–85 % of the normal value and 0.6–0.7, respectively), or changes in the flow/volume spirographic curve (with visualization of incisura). If the spirometric values of FEV_1 and FEV_1/FVC are normal, but there is an incisural flow-volume curve, it is advisable to perform body plethysmography to verify bronchial obstruction by increasing bronchial resistance. Patients with dyspnea in the subacute period of COVID-19 caused by bronchial obstruction should be prescribed bronchodilators for at least one month. Decreased lung diffusion capacity (by DL_{CO}) is the most common disorder of external respiratory function in patients with dyspnea in the subacute period of COVID-19, which is observed in 52.0 % of cases in the moderate severity of the acute period of the disease, in 67.5 % of cases in the severe course, and in 100 % of cases in the critical severity, with the lowest level of the index (47.6 ± 9.8 %).

Key words: coronavirus disease, COVID-19, community-acquired pneumonia, dyspnea, post-COVID period, ventilation function, lung diffusion capacity, DL_{CO} , body plethysmography, bronchial obstruction.