

## The correlation of anti-heart antibodies levels with clinical manifestations and outcomes in patients with COVID-19

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**Purpose:** To evaluate the blood level of anti-heart antibodies (AHA) and its correlation with clinical outcomes in patients with severe and moderate COVID-19.

**Methods:** The study included 34 patients (11 females and 23 males, mean age 58.3±17.6 years, from 20 to 87 years) who underwent treatment for moderate and severe COVID-19 at the Sechenov University hospital in April-June 2020. The diagnosis was confirmed by 50% using nasopharyngeal smears. In other cases, the diagnosis of COVID-19 was based on the following criteria: contact with a serologically confirmed COVID-19 patient, persistent fever of at least 38 degrees Celsius, typical CT findings of viral pneumonia, typical changes in blood tests in the absence of evidence for other diseases. Besides standard medical examination the AHA blood levels by immunoassay were observed, including antinuclear antibodies (ANA), antiendothelial cell antibodies (AECA), anti-cardiomyocyte antibodies (AbC), anti-smooth muscle antibodies (ASMA) and cardiac conducting tissue antibodies (CCTA). Median hospital length of stay was 14 [13; 18] days.

**Results:** AHA levels were increased in 25 (73.5%) patients. The patients were divided into the five groups: 1. Patients with previous chronic myocarditis who had already been receiving immunosuppressive therapy at the admission (n=4). Moderate titer increase was noted only in one patient. 2. Patients with severe COVID-19 and high inflammatory activity, in

whom the degree of AHA increase matched the general disease activity. 3. Patients with severe COVID-19 and high inflammatory activity without AHA increase. 4. Patients with moderate COVID-19, in whom high AHA titers may reflect chronic latent myocarditis not associated with SARS-Cov2. 5. Patients with moderate COVID-19 and nearly normal / normal AHA titers. Significant correlation ( $p < 0.05$ ) of AHA levels with cardiovascular manifestations ( $r = 0.459$ ) was found. AbC levels correlated significantly with pneumonia severity ( $r = 0.472$ ), respiratory failure ( $r = 0.387$ ), need for invasive ventilation ( $r = 0.469$ ), chest pain ( $r = 0.374$ ), low QRS voltage ( $r = 0.415$ ) and high levels of CRP ( $r = 0.360$ ) and LDH ( $r = 0.360$ ). ASMA levels were found to correlate significantly with atrial fibrillation ( $r = 0.414$ ,  $p < 0.05$ ). ANA and AbC levels correlated significantly with pericardial effusion ( $r = 0.721$  and  $r = 0.745$  respectively,  $p < 0.05$ ). The lethality rate was 8.8%. AbC and ASMA levels correlated significantly with lethality ( $r = 0.363$ , and  $r = 0.426$  respectively,  $p < 0.05$ ) and were prognostically important.

**Conclusion:** Elevated titres of AHA were found in 73.5% of patients. AHA correlated with lethality, in most cases reflecting the overall activity and severity of the disease and may be considered within the systemic immune and inflammatory response in COVID-19. At the same time, the correlation with signs of myocardial injury and pericardial effusion, confirms the direct role of AHA in the inflammatory heart disease (myopericarditis).