353 SARS-CoV-2 pulmonary vasculitis and Takotsubo myocarditis syndrome. Hypoxia, endothelial dysfunction, and inflammation are the trigger?

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Aims: Nowadays the spread of respiratory infection caused by SARS-CoV-2 results in a global pandemic. The World Health Organization (WHO) declared about 450 000 deaths in more than 200 countries, until June 2020. SARS-CoV-2 pneumonia develops a stress condition through systemic hypoxygenation with activation of adrenergic pathways. Takotsubo syndrome is characterized by a temporary wall motion abnormality of the left ventricle (LV) and has common features with acute coronary syndrome (ACS), representing a form of myocardial infarction without coronary arteries thrombosis. Among possible causes there are several stress conditions, including physical, psychological, and illnesses, for example interstitial pneumonia.
Methods and results: A 54-years-old man, previous smoker, was admitted to emergency room (ER) complaining of dyspnoea and fever, initially treated with ceftriaxone. Physical examination was characterized by tachypnoea (respiratory rate 30 acts/min), tachycardia and hypotension (arterial pressure 90/60 mmHg), and hypoxaemia at transcutaneous saturation (Sat O_2 85%). High-resolution computed tomography (HRCT) showed bilateral interstitial pneumonia with ground glass opacities (visual involvement of 80% of pulmonary parenchymal) (Figure 1). Nasopharyngeal swab was positive for SARS-CoV-2 and ECG revealed Atrio-Ventricular Nodal Reentrant Tachycardia (AVRNT) with heart rate of 140 b.p.m., partially responsive to Valsalva manoeuver (Figure 2). Echocardiogram showed severe ventricular dysfunction [ejection fraction (EF): 30–35%] with hypokinesia of apical region associated with hyperkinesia of medio-basal segments, mild mitral regurgitation, and slight pericardial effusion (Figure 2). Laboratory tests were TnI hs 10 ng/l first detection – 26 ng/l second detection (normal range: 2.3–17.8 ng/l), PCR >250 mg/l (normal range 0.5–5 mg/l), D-dimer 1893 ng/ml (normal range: <500 ng/ml), PCT 3.10 ng/ml (normal range: 0–0.5 ng/ml). The worsening of clinical condition needed an orotracheal intubation and a transfer to Intensive Care Unit (ICU). The patient was treated with many antiviral drugs (darunavir, ritonavir), tocilizumab, steroid therapy, colchicine,

and plasmapheresis. We observed a progressive clinical and echocardiography improvement, evidenced by partial recovery of EF (45%). CT scan revealed a normal coronary tree. The patient underwent cardiac magnetic resonance (CMR) that showed typical Takotsubo cardiomyopathy characterized by thinning and hypoakinesias of apical wall of left ventricle ('apical ballooning') and normokinesis of basal/medium segments; no late gadolinium enhancements (LGEs); no oedema in T2 weighted images (Figure 3). Follow-up echocardiogram confirmed recovery of EF (50%) associated with mild hypokinesia of apical segments. Acute myocardial injury, as evidenced by elevated levels of cardiac biomarkers or electrocardiogram abnormalities, was observed in 7–20% of patients with COVID-19 in early studies in China (4). In a multicentre cohort study of 191 patients with COVID-19, 33 patients (17%) had acute cardiac injury, of whom 32 died. Whether typical clinical features of myocarditis were present in patients, who had elevated levels of cardiac troponins during the course of COVID-19 is unclear because most of the early studies did not include echocardiography or MRI data. By contrast, several case reports have described typical signs of myocarditis in patients with COVID-19. A woman aged 53 years with myocardial injury, as evidenced by elevated levels of cardiac biomarkers and diffuse ST segment elevation on the electrocardiogram, had diffuse biventricular hypokinesis on cardiac MRI, especially in the apical segments, in addition to severe LV dysfunction (LVEF = 35%). MRI data also revealed marked biventricular interstitial oedema, diffuse LGE and circumferential pericardial effusion, features that are consistent with acute myocarditis. Furthermore, in a man aged 37 years with chest pain and ST segment elevation, echocardiography revealed an enlarged heart. The Lake-Louise Criteria gave good diagnostic accuracy in patients with suspected myocarditis, evaluating the principle tissue targets in myocarditis, including: myocardial oedema, using T2-based imaging; hyperaemia and capillary leak, using early gadolinium enhancement (EGE) imaging; and myocyte necrosis and fibrosis, using LGE imaging [14]. The presence of myocardial injury was associated with a significantly worse prognosis. In the initial report of 41 patients with COVID-19 in Wuhan, five patients had myocardial injury with elevated levels of high-sensitivity cardiac troponin I (>28 pg/ml), and four of these five patients were admitted to an ICU. Histological evidence of myocardial injury or myocarditis in COVID-19 is also limited. An autopsy of a patient with COVID-19 and ARDS who died of a sudden cardiac arrest showed no evidence of myocardial structural involvement, suggesting that COVID-19 did not directly impair the heart. By contrast, another case report described a patient with low-grade myocardial inflammation and myocardial localization of coronavirus particles (outside of cardiomyocytes), as measured by endomyocardial biopsy, suggesting that SARS-CoV-2 might infect the myocardium directly. In this case report, CMR showed typical Takotsubo cardiomyopathy (with hypokinesis of apical wall of left ventricle and normokinesis of basal/medium segments), but it showed no oedema in T2-weighted images, no hyperaemia nor capillary leakage (no myocardial EGE), no signs of necrosis or fibrosis (no LGE), no pericardial effusion. This case-report CMR images demonstrated the absence of typical myocardial injury caused by myocarditis, evidenced by the absence of the main tissue markers.

Conclusions: Therefore, the ventricular dysfunction, presented with Takotsubo syndrome typical pattern, could hypothetically be secondary to systemic hypoxygenation and stress condition caused by the systemic inflammation and endothelial dysfunction developed by SARS-CoV-2 interstitial pneumonia. About the current diagnostic possibilities, CMR is a valuable option for the assessment of inflammatory heart diseases.