

LETTER TO THE EDITOR



Letter to the Editor: Pulmonary circulation abnormalities in post-acute COVID-19 syndrome and acute vascular distress syndrome

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Dear Editor,

We read with interest the recent study by Mohamed I. et al published in *European Radiology* [1]. In this retrospective, non-interventional observational study, the authors described the morpho-functional changes at the level of the pulmonary circulation in 79 patients who remained symptomatic more than 6 months after hospitalization for SARS-CoV-2 pneumonia. COVID-19 is well known for inducing not only pulmonary alveolar lesions but also pulmonary vascular ones [2]. At the acute phase, the pulmonary perfusion abnormalities are mixed and varied, including areas of hypoperfusion related or not to pulmonary embolism and areas of increased perfusion [3]. At the post-acute phase, it is interesting to note that the most frequent pulmonary perfusion abnormalities observed by Mohamed I. et al were areas of increased perfusion [1]. Such areas were found in 59 patients (74.9%), always superimposed on areas of GGO (58/59), areas of band-like opacities (51/59), and/or areas of vascular tree-in-bud (5/59). Lung vascular impairments

are known to be specific of COVID-19 infection that leads to a typical pulmonary neoangiogenesis [4] with increased pulmonary blood flow [3] and volumes [5]. All these changes result in a characteristic intrapulmonary shunt (as observed in hepatopulmonary syndrome [6]) which explains the singular presentation of the disease (happy hypoxia, preserved pulmonary compliance, efficacy of prone position despite absence of pulmonary recruitment, relative inefficiency of pulmonary vasodilators, efficiency of pulmonary vasoconstrictors, etc.). Thus, as COVID-19 infection appears more a vascular than a pulmonary disease, we proposed the acronym “AVDS” (for acute vascular distress syndrome) to designate the specific increased lung blood flow (arterial and pulmonary) that leads to a symptomatic intrapulmonary shunt [7]. Contrast-enhanced transthoracic echocardiography and/or transcranial Doppler ultrasound is able to detect this specific COVID-19-related intrapulmonary shunt that we found in more than 40% of patients hospitalized for COVID-19 pneumonia in intensive care unit (ICU) (personal data, submitted). COVID-19 symptoms usually persist less than 4 weeks and presumably also the intrapulmonary shunt. In this context, we reported significant PaO₂:FiO₂ ratio improvement in ICU COVID-19 patients despite worsened or stable chest imaging variables [8]. However, in their study, Mohamed I. et al did not find any association between the finding of areas of increased perfusion and quartiles of time elapsed between the date of hospitalization and chest CT examination ($p = 0.58$) [1]. In a symptomatic 44-year-old patient, a persistent right-to-left shunt has been found 45 days after a COVID-19 infection [9] but, to the best of our knowledge, data from Mohamed I. et al are the first

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to support the hypothesis that COVID-19-related angiogenesis can persist for a longer time (16 CT findings of areas of increased perfusion in quartile 4: 8.8 months) [1]. In these patients, it would be of interest to propose a contrast-enhanced transthoracic echocardiography to check the relationships between the persistent vascular abnormalities and the presence of a symptomatic intrapulmonary shunt. If such examinations were not proposed (as we believe), DLCO can be also useful to answer this point as DLCO is known to be decreased not only in case of pulmonary sequelae (fibrosis) but also in case of intrapulmonary shunt [10]. In their study, the authors found that 49.2% of their cohort had decreased DLCO. The proportion of patients with decreased DLCO appeared greater among patients with abnormal perfusion ($n = 29$; 53%) compared with patients with normal perfusion ($n = 1$; 14%) [1]. It will also be interesting to compare DLCO between patients with areas of increased perfusion alone and patients with normal perfusion.

To conclude, according to the high proportion of increased perfusion areas observed by Mohamed I. et al (> 70%) [1], we propose to perform a contrast-enhanced transthoracic echocardiography in patients who remain symptomatic ≥ 3 months after a COVID-19 infection, even in absence of initial lung infiltration or complete resolution of parenchymal lung lesions. In case of persistent AVDS-related intrapulmonary shunt, the treatment is currently not known (3 months anticoagulation and/or steroids therapy?).

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Declarations

Guarantor

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Conflict of interest

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Informed consent

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Methodology

• Letter to the Editor

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