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LETTER TO THE EDITOR

Pulmonary toxicity by oxygen and COVID-19☆

Toxicidad pulmonar por oxígeno y COVID-19

To the Editor,

Pulmonary toxicity by oxygen has been known for over a century. Exposure to a fraction of inspired oxygen (FiO_2) of 0.7 causes progressive pulmonary lesion and the intensity of the lesions is associated with the concentration and duration of hyperoxia.[1] Lesion manifests just a few hours after the administration of oxygen in high concentrations causing an increased alveolar-capillary patency and a complex cellular response including epithelial, endothelial, proinflammatory cells, and platelets that induce the destruction of alveolocapillary membranes with increased air spaces, vascular obstruction due to microthrombi, and cellular infiltration that eventually leads to the loss of alveolar architecture and, in the long run, to pulmonary fibrosis. All oxygen-induced lesions are similar to those due to acute respiratory distress syndrome (ARDS). Also, in patients with established ARDS, hyperoxia can worsen clinical results.[2] Finally, many of the pathological characteristics reported in hyperoxia occur also in ARDS due to COVID-19 since it has been reported that in these patients' lungs increased air spaces following the destruction of alveolar septa, alveolar swelling, capillary thrombosis, perivascular infiltrates, and fibrosis have been found.[3]

The appearance of COVID19 has challenged respiratory support, and the need for applying elevated fractions of inspired oxygen has been a constant in many patients whether through high-flow nasal oxygen (HFNO) therapy or concomitantly to ventilation systems. However, the high mortality rates reported in cases of ARDS—an average of 39%—is indicative that, at least in some cases, the application of elevated concentrations of oxygen is worsening or triggering COVID-19[3]-related ARDS-like lesions. It could even cause a vicious circle that would create the need to increase the concentration of oxygen gradually in the air breathed in thus causing greater pulmonary impairment.

This possibility—together with data obtained by other authors[4] that most patients with moderate-to-severe acute respiratory failure due to COVID-19, and even cases with radiological findings and compatible gas exchange with ARDS recovered with CPAP and FiO_2 between 0.4 and 0.6, should, in own opinion, make us reconsider or detail the current strategy of respiratory support. Therefore, following the plan established by current recommendations,[5] although the next step towards conventional oxygen therapy can still be HFNO when FiO_2 > 0.6 would be needed respiratory support like CPAP should be attempted to recruit more alveolar units before increasing FiO_2 to levels that can be toxic to an already damaged lung. Even under certain safety and monitoring conditions, the saturation target currently established at around 95% in the aforementioned current recommendations could be reduced down to 92% to stop FiO_2 from going > 0.6.

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