COVID-19 deaths can be reduced – simply and safely!

Both the US and UK are still struggling with high death toll numbers from Corona Virus Disease 2019 (COVID-19). This is happening because no effective treatment has been offered for COVID-19 patients hospitalized because of severe hypoxia. A typical case history by an anesthetist at a London hospital is that a patient who attended Accident & Emergency said she felt cold. Oxymetry showed her saturation to be 30%. The patient was placed on a ventilator and survived for about a week before dying. "I have had a few patients like this.".[1] Many professionals treating COVID-19 patients have been raising the fundamental questions about how the virus attacks the lungs, and whether there could be more effective ways of treating such patients.

Harch[2] summarized several Chinese reports dealing with clinical outcomes of six COVID-19 patients. Four had less severe respiratory distress (but bilateral ground glass opacities), one had pneumonia, and one acute respiratory distress syndrome (ARDS). All had been on ventilation-oxygen treatments for several days but their oxygen saturation levels had not improved. When the patients were placed on hyperbaric oxygen treatment (HBOT) therapy, the oxygenation had immediately started to improve and with just 3–8 HBOTs the patients were successfully discharged from hospital. The authors also suggested that HBOT applied earlier in the disease process would prevent the severe COVID-19 infection. We fully agree this conclusion and also suggest that placing the COVID-19 patient with verified hypoxia, but not rapidly responding to the ventilation-oxygen therapy, on HBOT might be a prophylactive procedure, preventing the progression of pulmonary disease.

Essentially, it is the lack of oxygen (hypoxia) in the tissues, and particularly in the brain, that gives the first signs of COVID-19 disease leading to hospitalization. Our view is that this early hypoxia is apparently caused by the dysfunction of our breathing apparatus, but the ultimate cause is not in the lungs, but in the brain. The brain's respiration regulating neural networks cease to send the usual commands to the lungs to breathe appropriately. The end result is brain hypoxia. Placing such patients on a ventilator is not of great help. Ventilator-oxygen treatment can increase oxygen saturation in the blood, but correct tissue hypoxia very little. On the contrary, in the pathogenesis of ARDS, the contribution of a ventilator-associated lung injury, at least if invasive ventilation is used, may be a crucial factor.

According to the prevailing pathophysiological concept the COVID-19 is a one-organ pulmonary disease caused by the SARS-CoV-2 attacking the lungs. The one-organ-concept, however, was based on research and clinical experience from the 2002/2003 severe acute respiratory syndrome (SARS) epidemic. Recent research indicates that the concept of COVID-19 also being primarily a pulmonary disease may no longer be valid. Having reviewed earlier published and the most recent literature, we have concluded that COVID-19 affects the upper respiratory tract, but often, and may be earlier than the upper respiratory tract, also the central nervous system, and that pulmonary involvements are a later manifestation.[3] This pathophysiological concept indicates that therapeutically, the most important focus should be to correct the early hypoxia, using all possible means to support the patient's spontaneous breathing.

HBOT is a safe, effective, and non-invasive medical treatment with which the tissue hypoxia can be corrected. In hyperbaric conditions the oxygen plasma tension increases from values of 95 mmHg to over 2000 mmHg, thus increasing the gradient or the transfer of oxygen into tissues by a factor of 20. HBOT allows more oxygen to be dissolved in blood plasma. HBOT is also much safer than any of the currently tested drugs because serious side-effects of HBOT are, in practice, non-existent.

There are multiple studies reporting that HBOT increases the parasympathetic (vagal) activity and have a powerful anti-inflammatory effect. Thus, in fact, HBOT could be beneficial and all stages of COVID-19.

It is now known that the parasympathetic vagal system (through central autonomic network) effectively regulates respiration and the vagus nerve contains sensory neurons that critically regulate respiration rate, airway tone and defense and evoke cough.[4] All the early extrapulmonary symptoms of COVID-19 can be due to sympathetic dominance (and reduced parasympathetic function). In addition, both central nervous system and pulmonary diseases are probably caused, and the pulmonary infection accentuated, through inflammatory reflex mechanism because on inadequate immunological defense by the neuro-immune axis.[5] Excessive inflammation plays an important role in the pathogenesis of common and debilitating diseases including septic shock.[6] There are several reports describing the worsening of the current COVID-19 pulmonary disease, including ARDS, along with decrease of the viral load, indicating an exaggerated inflammatory response as the pathogenetic mechanism of the disease.

To summarize, we propose that the two fundamental pathophysiological phenomena making COVID-19 to be a serious, potentially lethal disease are as follows. Firstly, the early viral invasion to the central nervous system and involvement of the central autonomic network associated with its severe dysfunction and reduction of the parasympathetic activity lead to brain hypoxia. Secondly, excessive inflammation arises, particularly in lungs, due to inadequate immunological defense by the neuro-immune axis.

Both these features can be treated: HBOT corrects brain hypoxia (and maybe returns breathing back to normal) and can have a positive influence on autonomic imbalance. Reduced parasympathetic activity could also be corrected by behavioral and bioelectrical methods of the vagal nerve stimulation.

We have been wondering why HBOT has not been used, for example in USA although there are more than 1350 hospitals offering HBOT. There are ongoing several randomized clinical trials on the use of HBOT in severe COVID-19 disease (ClinicalTrials.gov). However, the optimal benefit of HBOT might be achievable if HBOT is given at an early stage of the disease. It can also be questioned whether a sham therapy given to critically ill COVID-19 patients is ethically acceptable. In fact, we feel that to use HBOT for COVID-19 disease is comparable to that given, without any randomized clinical trials, for Diver's disease. If offered HBOT, the COVID-19 patients had nothing to lose, only win.

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