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THE USE OF BIOPHYSICAL THERAPIES TO TREAT COVID-19 PATIENTS

EPIDEMIOLOGICAL INTRODUCTION

The epidemic, and successive pandemic, caused by the Coronavirus **SARS-Cov-19** has put serious pressure- and still does- on the healthcare systems of the entire world, both because of the aggressiveness of the disease in its acute phase, which caused a high mortality rate (different based on age and co-pathology factors), and also because of the several systemic and local effects on the infected organs, which still need to be investigated.

Knowledge of the pathophysiological process at the cellular level of the settlement and replication of the virus, and of the involvement of the immune system allows – and will allow – to understand

1) the **behaviour of viral particles inside the cells** of various systems (not just the respiratory one);

2) the **damages caused by the immunological response**, often defined as “cytokine storm”, which causes the release of high levels of pro-inflammatory cytokines, among which IL6 seems particularly relevant, and

3) most importantly, the **disease pattern typical of Covid-19 patients**.

Between 21 April 2020 and today the **Humanitas Mater Domini Medical Centre** (HMD) admitted 199 patients suffering from pneumonia and respiratory distress syndrome caused by interstitial pneumonia, who had tested positive to Coronavirus 19 following the nasopharyngeal

swab test. We tested 500 out of the 3,500 patients who accessed A&E (the number of swab tests we could perform was 50% less compared to the same time period in 2019). Many patients were released from the hospital and sent to local healthcare services with medical therapy and health surveillance programs. We recorded 49 deaths that occurred in patients older than 82 years old.

These data – still unprocessed – were extrapolated from the clinical and statistical review that assesses all aspects of the current clinical experience at HMD with several epidemiological, clinical, social and socioeconomical analysis related to the impact of the pandemic on the Health System of the HMD Medical Centre.

The aim of this abstract is to discuss the clinical importance of integrating biophysical treatments with **magnetic field therapies**, which our Medical Centre uses for the treatment of pelvic floor pathologies and cartilage and skin lesions.

It's important to discuss the primary clinical discovery of the Covid-19 respiratory infection, especially during the emergency crisis that put most A&Es to their knees due to the high death rate that impacted certain groups of patients only after a few hours from the onset of symptoms. Deaths were initially attributed to the devastating interstitial pneumonia that patients suffered from despite attempts of mechanical ventilation or intubation following ARDS. However, after autopsies took place the cause of death was linked to **inflammatory cell infiltration with monocytes and macrophages, massive fibrosis**, widespread thromboembolic phenomena with massive PE (pulmonary embolism), and acute myocarditis or acute myocardial infarctions.

The scientific world keeps updating clinical guidelines based on these premises and we follow these to treat our patients.

We discussed the phlogistic implications for the endothelium that is affected by the viral infection and we decided to supplement the existing clinical protocols with **magnetic field (MF) therapy**. 20 patients from the A3 ward, who suffered with the infection from Covid, interstitial pneumonia with intermediate respiratory distress and with oxygen therapy without mechanical ventilation, received magnetic field therapy twice a day.

Scientific data on the use of MFs in **Pulsed ElectroMagnetic Field** (the so-called PEMF)

therapy show that it allows the regulation of cellular damage, for example by reducing oxidative stress and stimulating the antioxidant system of the body. When utilised to reduce oedemas and inflammations, as well as treating pain syndromes, PEMF therapy works by **increasing vascular microcirculation**, which causes a faster removal of toxic substances and metabolites from cells. It also **activates the parasympathetic nervous system** and the flow of Ca^{2+} ions, which leads to vascular muscle relaxation (particularly the pre-capillary sphincters) and the resulting vasodilation. PEMF therapy also acts on the polarisation of the **positively charged red blood cells** that, by getting wider (vasodilation), favour an optimal supply of sufficiently oxygenated blood and suitable nutrients to the tissues.

OTHER ACTIVE BENEFITS OF PEMF THERAPY

Besides having an anti-inflammatory effect, **PEMF therapy** brings other positive results, such as a better blood circulation and the possible regulation of the autonomic nervous system.

The biophysical mechanism behind the efficacy of PEMF therapy works by utilising the electrochemical properties of the cellular membrane: the PEMF seems to increase the intracellular calcium (Ca^{2+}) levels, which in turn binds with calmodulin. This bond activates calmodulin, which increases the endothelial nitric oxide synthase (eNOS), an enzyme responsible for the synthesis of nitric oxide (NO), citrulline from L-arginine and O_2. NO activates an anti-inflammatory response that diminishes the lymphocytes from the blood and causes vasodilation, with the resulting increase in local blood flow and lowered hypoxia. NO also regulates the cGMP signalling pathways that favour angiogenesis and the regeneration of tissue.

The patients were treated by our physiotherapists twice a day and in **absolute safety**, as the **Cellvital HC- Professionell** device was sanitised between each patient and was utilised for 8 to 10-day cycles on each patient. Particular attention was placed on certain respiratory symptoms and aspects such as dyspnoea and breathing rate, fever, the need for oxygen, widespread myalgia and joints pain.

The patients, who were reassessed every day, reported a progressive improvement of the overall symptoms, compared to the patients who did not receive the MF therapy; however, this was not statistically significant due to the low number of patients treated (20 out of 199). We are currently assessing the patients' journals to better describe the trend of symptoms improvement that was observed.

CONCLUSIONS

MF therapy, integrated to the pharmacological therapy of patients suffering with Covid-19 pneumonia can **reduce the overall symptoms** and can accelerate their improvement thanks to its demonstrated anti-inflammatory effect. It acts on the endothelial dysfunction and on the shrinking of the dilated arterioles, improving their elasticity, creating a corresponding vascular tone and improving the blood flow- thanks to the almost complete dissolution of the aggregation of erythrocytes, the reduction of oedemas and the possible activation of the parasympathetic nervous system.