Intravenous Infusion of Mesenchymal Stem Cells for Adjuvant Treatment of a 44-year-old Critically Ill Patient with Covid-19 Presenting Lung Fibrosis: A Case Report.

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Background

Patients with severe/critical COVID-19 usually present a hyperinflammatory state characterized by cytokine storm up to acute respiratory distress syndrome (ARDS) with multi-organ failure and death. In patients who survive ARDS, fibrotic outcomes may persist, with the development of diffuse pulmonary fibrosis. Mesenchymal stromal cells (MSC), thanks to their potent immunomodulatory capacity, may have beneficial effects on the prevention or mitigation of cytokine storm. They have been shown to migrate to damaged tissues, exert anti-inflammatory and immunoregulatory functions, promote the regeneration of damaged tissues and inhibit tissue fibrosis.

Case presentation (Fig.1)

A 44-year-old female patient with a history of bilateral prophylactic adnexitis, class I obesity (BMI 30) and bronchial asthma in childhood, was admitted to ICU with severe ARDS due to COVID-19 infection.

The patient was initially treated with high flow nasal oxygen (HFNC), non-invasive ventilation (NIV) and pronation to sustain SpO2, but did not respond, and orotracheal intubation was performed. Chest CT scan showed worsening of the CT images with the appearance of pneumomediastinum and limited opacification defect of thromboembolic nature and fibrosis (**Fig. 5A**). Laboratory testing showed the presence of cytokine storm, with decreased lymphocyte count, increased C-reactive protein (CRP), D-dimer, fibrinogen and ferritin. No indication for ECMO support and failure of Novalung support, which was removed for onset of septic shock with severe coagulopathy and thrombocytopenia.

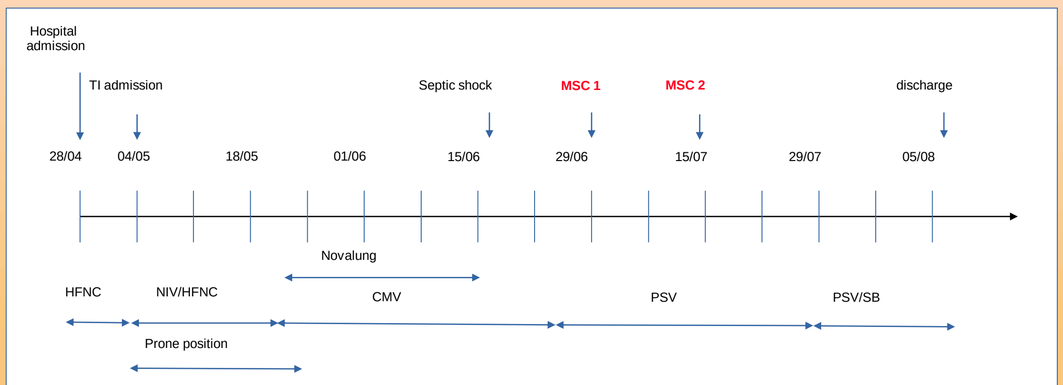

Fig.1 Time line

CT imaging showed subsequently ARDS pattern with increase in the diffuse areas of parenchymal thickening which subtotally affected both lungs (**Fig. 5B**). A cell therapy protocol with BM-MSCs was then applied on a compassionate use basis, and the patient was treated with bone marrow derived MSCs [1x10⁶ MSC/Kg (2 doses 17 days interval)]. After the second MSC administration we observed a progressive improvement in gas exchange (**Fig. 2-3**) and radiologic picture (**Fig.5 C-D**), as well as an increased white blood cell count (decreased neutrophils and increased lymphocytes, **Fig.4**). The patient was discharged from the ICU 22 days after the treatment, 93 days from admission. The patient is currently followed up in our follow-up clinic and presents an almost total regression of respiratory symptoms in three months after the discharge from the ICU.

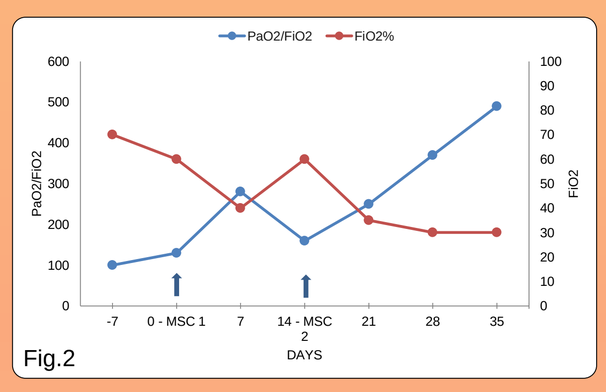

Fig.2

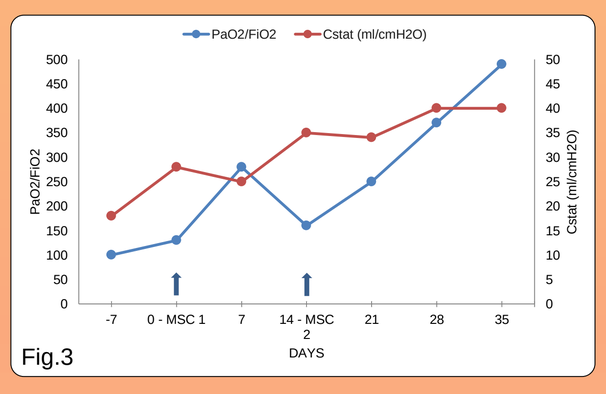

Fig.3

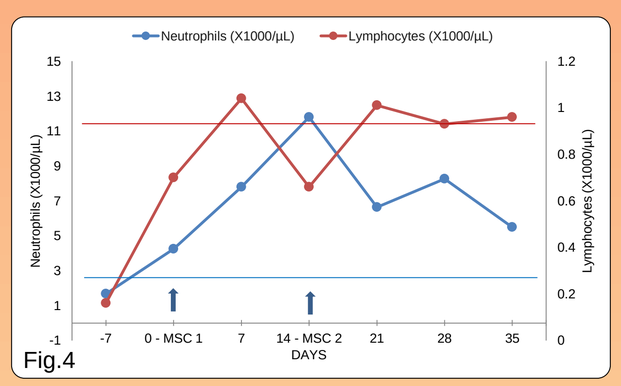

Fig.4

Conclusions

The regenerative and anti-inflammatory abilities of mesenchymal stem cells can be an innovative approach in repairing damaged organs that improve recovery times and survival rates for critically ill COVID-19 patients.

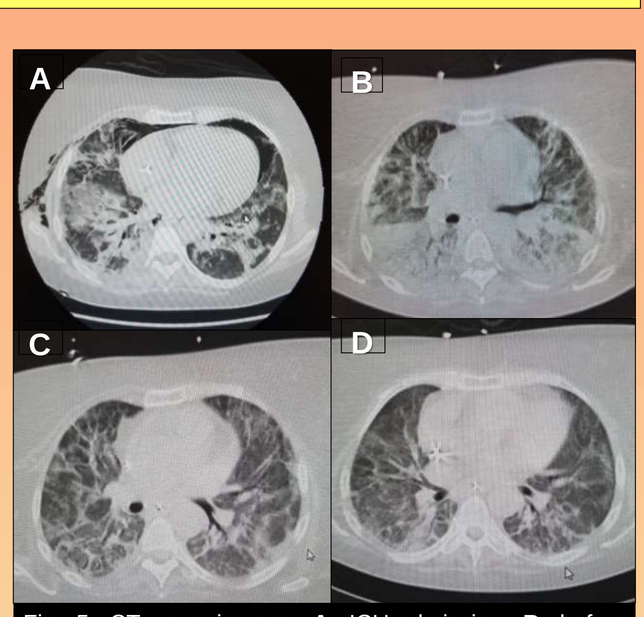

Fig. 5. CT scan images. **A**. ICU-admission; **B**. before MSC treatment; **C**. After MSC administration; **D**. ICU-discharge.

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