

# Pulse Therapy with Corticosteroids in Covid-19 Pneumonia: A Case Report

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## Abstract:

**Introduction:** The leading cause of death in patients infected with SARS-COV-2 is a combination of acute respiratory distress syndrome (ARDS) and disseminated intravascular coagulation (DIC), which leads to a fatal outcome in 11 to 15% of hospitalized patients. The present study reports a case of successful high dose corticosteroids in the treatment of severe covid pneumonia.

**Case presentation:** A 25-year-old patient with shortness of breath and a diagnosis of COVID-19 referred to the emergency department of Peymanieh Hospital in Jahrom. Patient was complaining of shortness of breath and cough that started 7 days ago that had gradually peaked. At arrival, saturation level (O<sub>2</sub>sat) was 77% without fever. Lung computerized tomography (CT) revealed more than 90% involvement of lung lobes. Due to the patient's condition and hypoxia, and the patient's arterial blood gases, he was transferred to the intensive care unit (ICU). Four days later he was intubated due to worsened breathing pattern and arterial gas analysis. The patient received 500 mg of methylprednisolone intravenously from 3rd day of ICU stay for three days, and 125 mg methylprednisolone daily from the 7th to the 9th day of ICU care, and 8 mg daily dexamethasone for the rest of the administration. Patient was extubated on 10th day of ICU stay and was discharged with an improved lung CT scan on the 20th day of administration.

**Conclusion:** Pulse therapy with corticosteroids with high doses of methylprednisolone was associated with rapid elimination of respiratory failure and improvement in clinical manifestations and reversal of pulmonary CT changes in a patient with COVID-19 with more than 90% lung involvement.

**Keywords:** Pulse, Corticosteroids, Pneumonia, COVID-19

## Introduction

At the end of 2019, a number of patients with unknown symptoms of pneumonia were observed in Wuhan (1). The disease caused by this virus called COVID-19 with an average incubation period of 3-7 days is in most cases asymptomatic or with mild symptoms (80%) while cases of severe disease

require oxygenation (15%) and some cases of disease with consequences. There are also serious people who need a ventilator (5%) (2). The leading cause of death in infected patients worldwide is a combination of ARDS and Disseminated intravascular coagulation (DIC), leading to a fatal

outcome in 11 to 15% of hospitalized patients (3-4). Therefore, it is essential to develop an effective treatment strategy to control the spread of the virus and prevent cytokine storms. Corticosteroids can be used to suppress the cytokine storm and have been used in some patients (5-8). The present study reported a case of corticosteroids in the treatment of severe covid pneumonia.

### Case presentation

A 25-year-old patient with shortness of breath and a diagnosis of COVID-19 presented to the emergency department (ED) of Peymaniyeh Hospital. Clinical examination and history taking revealed that the patient's shortness of breath and cough started 7 days ago and gradually symptoms peaked. Oxygen saturation (O2Sat) on arrival was 77% without fever and a family history of COVID-19. A positive Polymerase chain reaction (PCR) nasal swab for COVID-19 was obtained last week of presentation to ED. A lung computerized tomography (CT) was requested along with laboratory investigations of complete blood count (CBC), blood urea nitrogen (BUN), creatinine, blood electrolytes, Creatine phosphokinase (CPK), Lactate Dehydrogenase (LDH), blood sugar, liver function test, Prothrombin Time Test and INR (PT/INR), D dimer, fibrinogen level, and arterial blood gases (ABG) test. Lung CT scan showed more than 90% involvement of both lungs with ground glass opacities. He was requested to receive an intravenous serum therapy of 2500 cc of normal saline per day with 6-8 liters of oxygen supplementation per hour by mask. Administration of remdesivir and Dexamethasone was started at hospitalization. Also, acyclovir was started, and the patient was admitted to the ICU to be monitored according to his condition .

Enoxaparin and ivermectin were started and cardiac and nutritional consultation was conducted. Blood culture was sent. Due to the lack of methylprednisolone in pharmacy, physicians

started dexamethasone for the patient and received extra normal saline due to low urinary output.

A cough cocktail containing salbutamol spray, serotonin spray, diphenhydramine and dextromethorphan was added to the patient's medication, which was discontinued due to the patient's hypersensitivity to diphenhydramine.

On the fourth day, patient developed acute respiratory distress with partial pressure of oxygen PO<sub>2</sub> of 42.2 mm Hg. The patient was intubated by an anesthesiologist and propofol was prescribed for sedation. A urinary catheter and nasogastric tube (NG tube) were attached to the patient. Methylprednisolone was started for the patient, but due to its unavailability, the patient has given dexamethasone every 8 hours and meropenem every 8 hours. After examining the patient's ABG, a PEEP of 10 was given to the patient and feeding to the patient was started at 50 cc every four hours with NG. Morphine and acetaminophen were started. Azithromycin, vancomycin and Islamovir antibiotics were added to the patient's drugs and chest physiotherapy was prescribed daily to better clear the infections from the lungs. Dimethicone, acyclovir, gabapentin, sertraline, and azithromycin were discontinued, and ketotifen was added to improve sputum secretion. On 7<sup>th</sup> day, a hemoptysis happened and the pulmonologist insisted on finding methylprednisolone for the patient and finally medication was provided and started. The patient received 500 mg of methylprednisolone intravenously in from 3<sup>rd</sup> day of ICU stay for three days, and 125 mg methylprednisolone daily from the 7<sup>th</sup> to the 9<sup>th</sup> day of ICU care, and 8 mg daily dexamethasone for the rest of the administration. Patient was extubated on 10<sup>th</sup> day of ICU stay and was discharged with improved lung CT scan on 20<sup>th</sup> day of administration. Proper oral corticosteroids were prescribed for tapering.

## Discussion

The most common complication of COVID-19 is ARDS. The incidence of ARDS in critically ill patients is reported to be up to 67%. When faced with a complex scenario of patients with severe COVID-19 disease, a variety of protocols developed in different countries support complementary therapies, such as antiviral therapy, recombinant human interferon, and corticosteroids (9). Several studies have reported that the use of corticosteroids in diseases caused by other coronaviruses (such as SARS-CoV-1 and MERS-CoV) will not be beneficial (10-11). The present study reported a case of corticosteroids in the treatment of severe COVID-19 pneumonia. So et al. reported a group of seven intubated COVID-19 patients treated with a 3-day pulse of corticosteroids (500 mg or 1 g of methylprednisolone). All patients were extubated after treatment with corticosteroid pulse (2 to 7 days of mechanical ventilation) and discharged from hospital (12). Pulse therapy with methylprednisolone is often used in situations where it is necessary to quickly achieve an immunosuppressive effect (13-16). If we use the equivalent dose of prednisone of more than 100 mg per day (so-called pulse corticosteroids), we get the maximum effect from the genomic pathway and additional responses faster than the "non-genomic pathway". These non-genomic mechanisms include membrane dysfunction in all immune cells (including lymphocytes) that produce ATP by delaying the flow of calcium and sodium channel membranes. Other non-genomic effects are attributed to medicine binding to membrane GCR in T cells (17) or release of the Src protein from the complex multigrain cGCR that all contribute to potential anti-inflammatory effects. This action is fast (in hours) (18). In the present study, the patient received 500 mg of methylprednisolone ampoule for the first three days of pulse therapy, 125 mg of methylprednisolone for the fourth to sixth days, and 8 mg of dexamethasone for the seventh day. While

the patient had more than 90% lung involvement, he recovered and was discharged home without secondary infection. Zhao et al. compared four treatments for patients with SARS-CoV pneumonia, including different antibiotics, antivirals, and in some cases, corticosteroids in different doses. Only patients who received methylprednisolone in doses above 160-1000 mg per day for 5 to 14 days had no mortality and no need for mechanical ventilation (19). In a clinical trial, 34 patients with COVID-19 pneumonia were randomly selected to receive methylprednisolone 250 mg daily for three days in comparison to 34 patients under standard care. Patients with clinical improvement in the methylprednisolone group were higher than the standard care group and the mortality rate was lower in the methylprednisolone group (20). Yin Wang reported that intravenous administration of methylprednisolone at a dose of 1 to 2 mg / kg / day for 5-7 days in COVID-19 patients with severe pneumonia was associated with a faster improvement in clinical symptoms and an increase in SpO<sub>2</sub> (21), which is consistent with the results of the present study. However, in the reported patient, corticosteroid doses of 500 mg were used.

## Conclusion:

Pulse treatment with high doses of methylprednisolone was associated with rapid elimination of respiratory failure and improvement in clinical manifestations and reversal of pulmonary CT changes in the COVID-19 patient evaluated with more than 90% of lung involvement. While higher levels of evidence are needed for use of this treatment strategy in clinical setting.

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#### **Conflict of interest:**

There are no conflicts of interest for any listed authors.

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#### **Learning points:**

- Pulse therapy with corticosteroids with high doses of methylprednisolone could improve ARDS quickly.
- Pulse therapy might be considered for such cases not responding to other treatments.

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