Dexamethasone in severe COVID-19 infection: A case series

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1. Introduction

Dexamethasone, a synthetic potent long-acting broad-spectrum corticosteroid, has been recently debated to reduce mortality in severely ill COVID-19 infections [1]. The protective role of dexamethasone is primarily related to its anti-inflammatory properties that contain the cytokine storm related worsening of the disease [2]. Fifteen to 30% of patients with COVID-19 infections present with severe illness resulting in acute respiratory distress syndrome (ARDS) that is associated with mortality of around 65% [3]. Dexamethasone use in ARDS patients has shown to reduce the risk of mortality with the age-adjusted risk ratio of 0.83 [95% confidence intervals: 0.74–0.92] [4]. Several clinical trials evaluating the role of dexamethasone in severe COVID-19 patients are ongoing [5,6]. World Health Organization has even urged to scale-up the production of dexamethasone by pharmaceutical industries as the demand is likely to increase [7]. In light of the emerging role, we wish to share our experience in using dexamethasone in five COVID-19 infected patients with acute respiratory distress syndrome.

2. Case 1

A 38-year-old woman, a known case of Down syndrome was admitted on May 28, 2020 with COVID-19 pneumonia. She deteriorated and was transferred to intensive care unit (ICU) on June 12, 2020 due to type 1 respiratory failure. Her acute lung injury score was 2.5 and she was diagnosed with moderate-to-severe lung injury. She was mechanically ventilated and she was commenced lopinavir/ritonavir, ribavirin, meropenem, low-molecular weight heparin, linezolid and doxycycline on the same day. She did not meet the criteria for receiving tocilizumab and there was no availability of convalescent plasma that was compatible for the patient. Intravenous dexamethasone 6 mg once daily was initiated on June 18, 2020. The patient improved gradually and she was extubated on June 22, 2020 and was put on high-frequency nasal canula at 60%. Amongst the laboratory biomarkers, C-reactive protein (CRP) declined from 227.6 to 17.5 mg/L; D-dimer (DD) from 21.55 to 4.94 μg/ml; lactate dehydrogenase (LDH) from 577 to 486 U/L; interleukin-6 (IL-6) from 15.2 to 11.39 pg/ml; and total white blood cell (WBC) count from 13.14 to 8.62 × 10^9/L. She was discharged from ICU on June 27, 2020.

3. Case 2

A 44-year-old woman with co-morbid systemic hypertension and obesity was diagnosed with COVID-19 pneumonia with type 1 respiratory failure on June 13, 2020. Her arterial oxygen saturation was 84% with the acute lung injury score of 3 and she was diagnosed with ARDS. She was initiated on high-flow nasal canula at 80% and was commenced on intravenous dexamethasone 6 mg once daily on June 18, 2020. Regarding the laboratory profiles, CRP declined from 69.4 to 14.4 mg/L; DD from 6.7 to 4.3 μg/ml; and IL-6 from 15.2 to 11.39 pg/ml. She improved in 5 days and was discharged from ICU on June 27, 2020.

Article Info
Keywords:
Dexamethasone
Corticosteroids
COVID-19
Coronavirus

Abstract
Evidence supporting the use of dexamethasone in severe COVID-19 patients is emerging. In this case series, we share our experience in using dexamethasone in five COVID-19 infected patients with acute respiratory distress syndrome.
4. Case 3

An 85-year-old woman with co-morbid systemic hypertension, hyperlipidemia and hypothyroidism was diagnosed with COVID-19 pneumonia on June 21, 2020. Her acute lung injury score was 2.5 and she was diagnosed with ARDS. She was started on lopinavir/ritonavir, interferon-β, linezolid and meropenem. Her oxygen saturation continued to deteriorate and she was kept on non-rebreather mask with 10 L of oxygen. Computed tomography chest revealed bilateral pulmonary embolism and she was commenced on enoxaparin. The desaturation continued and she was moved to high frequency nasal canula with 100% 40 L/min oxygen on June 26, 2020 and stayed on this for two days. She was initiated injection dexamethasone 6 mg once daily intravenously on June 26, 2020 and on the same day she received two doses of convalescent plasma therapy. The desaturation continued and she was moved to high frequency nasal canula with 100% 40 L/min oxygen on June 26, 2020 and on the same day she received two doses of convalescent plasma therapy. She required non-invasive positive pressure ventilation 70% and was mechanically intubated on June 29, 2020. She succumbed on June 29, 2020. Her laboratory profiles were as follows: CRP continued to increase from 31.2 to 276.8 mg/L; DD decreased from 14.3 to 3.16 μg/ml; LDH increased from 312 to 539 U/L; and WBC increased 12.1 to 14.3 × 10^9/L.

5. Case 4

A 45-year-old woman without any significant past history was diagnosed with COVID-19 pneumonia on June 19, 2020. Initially, she was receiving nasal oxygen at 4 L/min but gradually deteriorated. Her acute lung injury score was 3 and she was diagnosed with severe lung injury (ARDS) and was transferred to ICU on June 26, 2020. She was kept on high-flow nasal canula 100% and she was commenced on ribavirin, enoxaparin, piperacillin/tazobactam, doxycycline and also two doses of convalescent plasma therapy. Due to continued desaturation, she was initiated on intravenous dexamethasone 6 mg once daily. She was kept on bilevel positive airway pressure for one day and was discharged on July 2, 2020. Her laboratory parameters were as follows: CRP declined to 70.96 from 32.9 mg/L; and LDH changed from 535 to 540 U/L.

6. Case 5

A 71-year-old woman presented with 3-day history of fever, cough and bilateral chest infiltrates and was diagnosed as COVID-19 pneumonia on June 25, 2020. Her acute lung injury score was 1.25 and was diagnosed with mild-to-moderate lung injury. During her hospital stay, she developed acute kidney injury that resolved spontaneously. She was initiated on lopinavir/ritonavir, interferon-β, ribavirin, piperacillin, doxycycline and enoxaparin. Intravenous dexamethasone 6 mg once daily was commenced and the patient was discharged on June 29, 2020. CRP declined to 70.96 from 30.6 mg/L.

The changes in the laboratory profiles of the patients are depicted in Fig. 1.

7. Discussion

Until now five observational studies were published evaluating the utility of dexamethasone in COVID-19 infection with controversial results; and only one randomized clinical trial that showed a decrease in the mortality by 35% in patients with mechanical ventilation and by 20% in others with supplemental oxygen [8]. In the present case series, two patients were mechanically ventilated and received dexamethasone of which one survived while three on supplemental oxygen survived. Dexamethasone suppresses lymphocytes that are vital in suppressing the coronavirus. Hence it is vital to avoid corticosteroids in the initial, stable, mild-to-moderate patients with COVID-19 infections [9]. However, one out of five patients with COVID-19 land up in ARDS due to massive release of various inflammatory cytokines such as interleukin-1β, IL-2, IL-6, IL-7, IL-8 and tumor necrosis factor-α [10]. Dexamethasone is also indicated for treating severe immune thrombocytopenic purpura in COVID-19 patients [11]. Methylprednisolone is an alternative.

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**Fig. 1.** Changes in the laboratory profiles of cases.
corticosteroid recommended in some Chinese guidelines for use in severe COVID-19 pneumonia [12]. Società Italiana di Malattie Infettive e Tropicali recommend high dose of dexamethasone initially at 20 mg/day for 5 days followed by 10 mg/day for another 5 days [13]. However, in the present case series, dexamethasone was used at low dose (6 mg/day). More studies are warranted in exploring the dose-dependent response of dexamethasone in severe COVID-19 patients. We could not compare the clinical outcomes with those who received standard of care without dexamethasone. To conclude from this case series, it is possible that dexamethasone has protective effect in severe COVID-19 infections with ARDS. However, large-scale clinical trials that are ongoing might throw light on the clinical effectiveness of corticosteroids in COVID-19 infection.

Funding

None.

Declaration of competing interest

None.

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