

Management of Neonatal Sepsis with COVID-19 Infection in a Premature New Born: A Case Report

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Case Report

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ABSTRACT

Introduction: Neonates appear to be less affected by COVID-19 than adults. The overall challenge has been for all medical specialties, including neonatal intensive care. Unfortunately, current knowledge about Severe Acute Respiratory Distress Syndrome of Coronavirus 2 (SARS-CoV-2) infection is limited. This case report explains how COVID-19 neonatal sepsis can be treated with immunomodulatory agents.

Case presentation: In this report, we present an ill premature new-born (male) who was born from a mother with negative nasopharyngeal swab test for SARS-CoV-2. On the 5th day of life, the baby developed respiratory distress. Nasopharyngeal swab test for SARS-CoV-2 was positive. Intubation and intratracheal surfactant was implemented. Patient was treated with intravenous immunoglobulin and corticosteroid over a period of 14 days.

Conclusion: The basis of treatment in neonatal COVID-19 is supportive care. Some studies have treated infants with various drugs such as Hydroxychloroquine, Favipiravir, and Remdesivir. In our case, we used corticosteroids and IVIg to treat a 5-day-old baby. We got good results after 2 weeks of treatment with dexamethasone 0.3 mg/kg per day and IVIg 2 gram/kg/day (for 3 days). It seems that these treatments, along with adjuvant ventilation and the use of endotracheal surfactants, can improve the patient's general condition.

INTRODUCTION

According to scientific reports (at the time of writing), neonates appear to be less affected by COVID-19 than adults [4]. The overall challenge has been for all medical specialties, including neonatal intensive care. Unfortunately, current knowledge about severe acute respiratory distress syndrome of Coronavirus 2 (SARS-CoV-2) infection is limited. Based on studies and case series, most of newborn with this infection have an asymptomatic or mild illness, but a small percentage of patients require Neonatal Intensive Care Unit (NICU). Due to the lack of a global guideline at the beginning of the epidemic, many of these infected infants were admitted to the NICU, but as the experience of health workers gradually increased, several local guidelines were introduced. But in some cases, supportive care and antibiotics had no improvement so we have to take additional therapies to improve the babies. In the next section, we introduce an infant with COVID-19 infection in Iran. The baby's parents completed a written consent form regarding the patient's report.

CASE PRESENTATION

A preterm (gestational age=34 weeks+3days) infant boy was born *via* caesarian section on October 13, 2020, in Tehran Iran from an Iranian parents. His Apgar scores were 9 and 10 in 1 and 5 minute after birth, respectively. Moreover, the weight after birth was 1610 grams. His 45-years-old mother had 3 previous abortions (one in 8 weeks of gestational age, another one aborted medically due to Down syndrome in 18 weeks of gestational age and the last in 16 weeks of gestational age due to PPRM at 2015) and this pregnancy (gravid 4) was in the result of donated egg and IVF. She had no signs and symptoms since 14 days before delivery (also 14 days after delivery) and had negative nasopharyngeal swab test for SARS-CoV-2 (by RT-PCR assay). At first, the baby was well but gradually became ill during the first day of his life. He got mild respiratory distress and sometimes needed oxygen hood (some rales on chest auscultation), therefore the patient was transferred to NICU of Bahrami hospital. Laboratory tests and imaging was performed and antibiotic therapy was started (Ampicillin+Cefotaxime). The baby's respiratory distress gradually improved from the second day of birth and did not need oxygen, and low-volume feeding began. With increasing daily feeding volume, the baby developed respiratory distress and crackles (chest auscultation) and mottling and decrease in pulse pressure on the fifth day of his life again. Subsequently, he was intubated due to progressive respiratory condition. After intubation and supportive cares, suddenly patient had status seizures (tonic clonic movement+upward gaze) that were not controlled with one loading dose of Levetiracetam and two loading doses of Phenobarbital infusion. Finally one Phenytoin loading dose infusion suppressed seizure clinically. Again Lab tests were performed and antibiotics were leveled up (Vancomycin+Meropenem). Patient had hypokalemia, hypocalcaemia, respiratory acidosis, lymphopenia, elevated LDH, thrombocytopenia and elevated INR (Table 1).

Table 1. Antibiotics used in different stages to determine patient condition.

Stages	Patient condition	Medicine
At first	Respiratory distress	Ampicillin+Cefotaxime
Second	Developed Respiratory distress and Crackles	Levetiracetam and Phenobarbital infusion
Final stage	Increased symptoms, Seizures	Vancomycin+Meropenem

FFP and platelet was transfused and patient treated with more potassium and calcium supplementations. Chest X-ray showed diffuse opacities in both lungs. He was injected by surfactant twice through endotracheal tube. Therefore baby improved somewhat due to early intervention and ventilation support. Considering the COVID-19 pandemic, in the fifth day of his life, nasopharyngeal swab was sampled for SARS-CoV-2 that the result was positive thus we isolated him in a separate room. We also implemented strict protective protocols for his nurses. On the next day, sudden severe respiratory distress occurred and chest tube was inserted in regard of pneumothorax. Chest ultrasonography reported mild pleural effusion.

The patient was treated with daily oral Sildenafil due to increased pulmonary artery hypertension (according to echocardiography). Lumbar puncture showed normal values and negative CSF culture so bacterial meningitis was ruled out. Both blood and urine culture tests results was negative. During the following weeks, according to neurological consultation, Phenytoin and Phenobarbital was discontinued but maintenance treatment with Levetiracetam was continued. His brain ultrasonography was normal.

Infectious disease specialist suggested treatment with corticosteroid and IVIG for COVID-19 disease, so we treated him with Dexamethasone 0.3 mg/kg/day intravenously (twice a day) for following 14 days and IVIG 1 gram/kg/day for 3 days (A total of 6 grams). After 4 days of Sildenafil treatment (age: 10 days old), echocardiography reported normal pulmonary artery pressure. Repeated Chest X-ray had better aeration and some opacity was diminished.

During the following days, ventilator settings were reduced and we weaned the patient; then, he underwent NIPPV therapy and after 3 day we removed the chest tube (age: 19 days old). We repeated nasopharyngeal swab test for SARS-COV-2 that the result was negative. Serologic lab test result was negative (IgM an IgG against SARS-CoV-2). Gradually we tapered Dexamethasone over 5 days. Then little by little, the patient began to be fed with breast milk. Finally patient discharged from hospital at age 30 days old. At age 28 days old, patient had ROP, stage I in Zone III. In follow up, ROP examination had normal report. Also ABR test was normal. At the present, he has a normal neurologic state, normal EEG and normal brain ultrasonography after 6 months and antiepileptic therapy (Levetiracetam) is tapering.

RESULTS AND DISCUSSION

There is no consensus on the vertical transmission of COVID-19. Some studies have founded mother-to-child transmission of COVID-19 impossible. Furthermore, some studies claim that vertical transmission is possible [2]. In our case, mother had no signs and symptoms of infection and his nasopharyngeal swab test was negative. Although there is some report of possible vertical transmission of COVID-19 infection from mother that they had history of disease in 6 weeks before delivery. Also with epidemic condition of COVID-19, we could not exclude the transmission of COVID-19 from asymptomatic carrier mother to fetus.

There were several studies that reported diagnosis and management of COVID-19 sepsis in neonates. In China reported that COVID-19 presented clinically in 9% of neonate as early-onset sepsis [3]. Suggested that SARS-COV-2 in neonate can cause respiratory distress, thrombocytopenia or abnormalities in liver function tests or maybe death on neonates [4]. In our study, newborn had respiratory distress, lymphopenia, elevated LDH, hypocalcaemia, hypokalemia, thrombocytopenia and elevated INR at 5th day of life. CRP level did not rise. Saeedi, et al. showed in infants, unlike adults, elevated inflammatory markers are less common, CRP does not increase in neonates, and leukopenia and lymphopenia are less common [5]. Serology test (IgM and IgG against SARS-COV-2) was negative. It has been reported that a significant proportion of neonates with positive RT-PCR results had negative antibody tests, maybe due to host factors that effect on the immune response to SARS-CoV-2 [4,5]. In our case, radiographic

findings were nonspecific, also due to instability of the patient, we were not able to get chest CT scan (computed tomography). Some studies showed that radiographic findings in neonates could be normal and may show thickened lung texture, mild pulmonary infection, ground glass opacity, and patchy shadow under pleura, and in the chest CT scan, we may see sub pleural lesions with localized inflammatory infiltration [6].

During this pandemic, there are few reports of neonatal infection of SARS-CoV-2. Up to now, no valid guideline for the treatment of COVID-19 disease in neonates has yet been published. Therefore, the management of COVID-19 disease in neonates is usually different in each hospital and in each country; medical groups have been developed guidelines for the neonatal COVID-19 disease (guideline models in Italy, United Kingdom, United State, Islamic Republic of Iran addressed at reference). Undoubtedly, these are urgent steps against the pandemic, but due to constant updates and some controversial data, health systems have difficulty in determining the best guidelines. In addition, it is clear that our knowledge about infection of SARS-COV-2 is incomplete in many ways [7-11].

In this paper, we report our experience about use of corticosteroid and IVIg in COVID-19 pneumonia in one neonate. There is no specific drug for COVID-19. The principle of care is supportive (including oxygen therapy, electrolyte maintenance, acid-base balance, nutritional support). Most of studies for newborns with severe acute respiratory distress syndrome implemented surfactant, nitric oxide, mechanical ventilation. According to some studies, recommended ventilation in neonates with COVID-19 is high-frequency oscillating ventilation. In our study, at first we used intratracheal surfactant and Assist Control (A/C) mode ventilation then Synchronized intermittent mandatory ventilation (SIMV) mode ventilation until exudation. Some studies had different experience. Sagheb reported good outcome of using Hydroxychloroquine in treatment of COVID-19 pneumonia in two cases [12,13]. Kamala used Oseltamivir in a 15 day old neonate and baby discharged with good condition however; there is insufficient data to suggest any benefit of this medication. Coronado et al used Hydroxychloroquine and azithromycin for a 3-week-old patient. Moolasart treated a 47-day-old male newborn with Favipiravir, Hydroxychloroquine, and Lopinavir/Ritonavir. He claimed that a Favipiravir-based regimen may be the drug of choice for coronavirus disease 2019 pneumonia in the newborn.

CONCLUSION

Hopwood used Remdesivir and corticosteroid and plasma in a 4 day old neonate that had good outcome in our case, we used corticosteroid and IVIG for treatment of 5 day old neonate. IVIG has been used in some pediatric with COVID-19. In special conditions. We achieved good results after 2 week treatment of Dexamethasone 0.3 mg/kg/day and 2 gr/kg/day IVIG (for three days). It seems that this treatment, along with adjuvant ventilation and the use of intratracheal surfactants, was able to improve the patient's lung and pleural involvement.

DISCLOSURES

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Authors' contributions

KM is the chief manager of Bahrami hospital NICU and he managed this newborn medically. SSM prepared the primary draft of the manuscript and the laboratory tests. Again KM reviewed and edited the text. Both of authors read and approved the submitted manuscript and have critical roles in caring and treatment of the patients

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Availability of data and materials

All data including patients' medical records, images and laboratory data are kept in our hospital for the minimum of 10 years based on the local regulations.

Ethics approval and consent to participate

Not applicable

Consent for publication

Written informed consent was obtained from the patient's legal guardian for publication of this case report and any accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal.

Competing interests

All the authors declare no competing interest in this manuscript.

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