Use of dexamethasone, remdesivir, convalescent plasma and prone positioning in the treatment of severe COVID-19 infection in pregnancy: A case report

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Abstract

Severe infection with COVID-19 virus in pregnancy offers unique management challenges for the obstetrician and critical care specialist. We report the case of a woman at 26 weeks of gestation with acute respiratory distress syndrome secondary to COVID-19 infection treated with dexamethasone, remdesivir, convalescent plasma and mechanical ventilation. Cesarean delivery was performed at 29 weeks due to worsening maternal status. This case offers insight into the assessment and successful use of treatment strategies, including dexamethasone, remdesivir, convalescent plasma, early prone positioning, conservative fluid management, permissive hypoxia and low tidal volume parameters with ventilator support for pregnancies affected by severe COVID-19 infection.

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1. Introduction

The mainstay of intensive care treatment for acute hypoxic respiratory failure due to severe COVID-19 infection is supportive with supplemental oxygen or invasive mechanical ventilation, judicious fluid management, systemic corticosteroids, and early use of vasoactive medications. Patients are monitored closely for the development of viral myocarditis, thrombotic events, and superimposed bacterial pneumonia. Several experimental drug and other therapies are currently being studied, including remdesivir, lopinavir-ritonavir, tocilizumab, azithromycin, Bacillus Calmette–Guérin vaccine and convalescent plasma [1–3].

Severe infection with COVID-19 virus in pregnancy offers unique management challenges for the obstetrician and critical care specialist. Special consideration must be undertaken regarding oxygenation and respiratory support, fluid management, use of corticosteroids and experimental therapeutics, anticoagulation, and fetal monitoring, often with limited evidence-based recommendations. This case offers insight into the assessment and use of these management strategies, most specifically the use of dexamethasone and critical care strategies with early prone positioning in those requiring ventilator support.

2. Case Presentation

A 42-year-old woman, G8P6016, presented to an outside hospital in acute hypoxic respiratory failure at 26 weeks of gestation. She had no underlying medical history. She presented with a week of increasing dyspnea and a productive cough; a PCR test for COVID-19 the day prior was positive. She was febrile with an oxygen saturation (SpO2) of 78% on room air, and respiratory rate of 50–60. Her SpO2 remained in the 80s by pulse oximetry despite 15 L of oxygen by non-rebreather mask and ABG showed a pH 7.42, pCO2 24.3, PaO2 46.7, HCO3 15.7, Base deficit –8.7 and O2 saturation 84.3. Chest x-ray demonstrated diffuse bilateral consolidations and clinical exam revealed coarse, diminished breath sounds. She was intubated and transferred to a tertiary care center.

Upon arrival, SpO2 remained 85% on FiO2 of 100% and PEEP of 12 but improved to 93–95% with placement in prone position, paralysis and sedation, and adjustment of ventilator settings to 6 cc/kg with increased PEEP. A low tidal volume strategy was employed for lung protection in the setting of acute respiratory distress syndrome (ARDS) [4]. The patient remained in prone positioning for 16–18 h daily to assist with ventilation [5,6]. She received dexamethasone 20 mg IV for 5 days followed by 10 mg IV for 5 days then 100 mg every 24 h for 9 days [1], and convalescent plasma [2] on HD2. She received azithromycin and ceftriaxone for empiric treatment of possible superimposed bacterial pneumonia [3]. Bilateral upper and lower
extremity Doppler and coagulation studies were completed to assess for hypercoagulability. Therapeutic enoxaparin was initiated after identifying a basilic vein thrombosis near the upper extremity PICC site. She was eventually transitioned to a heparin infusion to allow reversal of anticoagulation in case of urgent delivery. She required an insulin infusion to maintain euglycemia through the day of delivery, suggesting both steroid-induced hyperglycemia and some degree of undiagnosed gestational diabetes. Continuous external fetal monitoring (EFM) was performed from admission to delivery. Fetal status remained reassuring throughout her hospitalization except for a period of prolonged, 8-min fetal heart rate (FHR) deceleration occurring during maternal positioning change from prone to supine, but recovered with standard intrauterine resuscitation measures.

On HD1, ventilator requirements gradually increased after a period of initial stabilization and SpO2 of 95% or higher could not be maintained without risking barotrauma. After interdisciplinary discussion, this goal was adjusted to maintain SpO2 of 90% or higher if fetal wellbeing was reassuring. This adjustment was well tolerated and allowed the pregnancy to be continued for an additional week. The evening of HD16, she was noted to have progressive hypoxia, declining lung compliance and increasing plateau pressures, requiring increasing ventilator support parameters and diuresis with furosemide to maintain SpO2 at 90%. On HD17, Critical Care and Maternal-Fetal Medicine (MFM) discussed the therapeutic option of ECMO support in concert with cardiothoracic surgery but ultimately this was deemed to be higher risk than proceeding with cesarean delivery. Anticoagulation was held and primary cesarean delivery was performed at 29 weeks 1 day via vertical incision and low transverse hysterotomy. Cesarean delivery was performed from admission to delivery. Fetal status remained reassuring throughout her hospitalization except for a period of prolonged, 8-min maternal position change from prone to supine, but recovered with standard intrauterine resuscitation measures.

The question of vertical transmission of COVID-19 in pregnancy is still under investigation. COVID-19 cultures were collected from the amniotic fluid and placenta at delivery and returned negative; however, it is worth noting that due to novel testing and laboratory processing procedures, these specimen sources have not yet been validated at our institution. Subsequent negative neonatal testing in this case does, however, strengthen their reliability.

On HD11, ventilator requirements gradually increased after a period of initial stabilization and SpO2 of 95% or higher could not be maintained without risking barotrauma. After interdisciplinary discussion, this goal was adjusted to maintain SpO2 of 90% or higher if fetal wellbeing was reassuring. This adjustment was well tolerated and allowed the pregnancy to be continued for an additional week. The evening of HD16, she was noted to have progressive hypoxia, declining lung compliance and increasing plateau pressures, requiring increasing ventilator support parameters and diuresis with furosemide to maintain SpO2 at 90%. On HD17, Critical Care and Maternal-Fetal Medicine (MFM) discussed the therapeutic option of ECMO support in concert with cardiothoracic surgery but ultimately this was deemed to be higher risk than proceeding with cesarean delivery. Anticoagulation was held and primary cesarean delivery was performed at 29 weeks 1 day via vertical incision and low transverse hysterotomy. Cesarean delivery was performed from admission to delivery. Fetal status remained reassuring throughout her hospitalization except for a period of prolonged, 8-min maternal position change from prone to supine, but recovered with standard intrauterine resuscitation measures.

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4. Conclusion

Dexamethasone may provide significant maternal benefit and decrease mortality in pregnant women with severe COVID-19 infection requiring mechanical ventilation and at the same time promote fetal lung maturity. Neonatal concerns regarding its use in pregnancy include hyperglycemia with resulting neonatal hypoglycemia as well as the potential for the development of adrenal insufficiency. Generally, maternal benefit of this protocol outweighs risks of adrenal harm in the critically ill patient. None of the experimental clinical therapeutics are considered contraindicated and compassionate use of these therapeutics should be considered in pregnant women with severe illness due to COVID-19.

Lung protective ventilator strategies for COVID-related ARDS are well tolerated in the pregnant patient. Use of prone positioning in the pregnant patient was achieved safely, with oxygenation benefit and no prolonged distress to the fetus noted over routine 16 to 18 h of prone positioning. When supine, a left lateral tilt was employed to avoid compression of the inferior vena cava and aorta by the gravid uterus. A conservative fluid management approach with ARDS as well as diuresis can safely be used in pregnancy. Fetal heart rate tracing can offer an additional clinical indicator of maternal oxygenation status and should be employed in the critically ill pregnant patient. Permissive hypoxia may be considered to advance fetal maturity and minimize barotrauma, but this approach should be undertaken with caution and only with continuous EFM to ensure fetal tolerance.

Contributors

Jennifer Jacobson drafted the paper and is the lead author. Kathleen Antony contributed to critical revision of the paper. Michael Beninati contributed to critical revision of the paper. William Alward contributed to critical revision of the paper. Kara K. Hoppe contributed to critical revision of the paper.

Conflict of Interest

The authors declare that they have no conflict of interest regarding the publication of this case report.
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