




Clinical Notes

A 26 week preterm infant delivered by a mother on extracorporeal membrane oxygenation for COVID-19

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Coronavirus disease 2019 (COVID-19), caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), has caused an unprecedented pandemic. There are few reports on infants delivered by mothers on extracorporeal membrane oxygenation (ECMO) for COVID-19. We report the case of a 26-week-old infant with an extremely low birthweight (990 g), delivered by a mother on ECMO for COVID-19-induced severe acute respiratory distress syndrome.

The mother was a 42-year-old woman with gestational diabetes. During gestational week 24 she presented with a cough after exposure to a COVID-19 patient. Polymerase chain reaction test was positive for SARS-CoV-2. She was admitted to hospital and given supplemental oxygen and prednisolone. COVID-19-specific drugs were not used because their effects on the fetus have not been sufficiently investigated. On day 9 of hospitalization the patient required non-invasive positive pressure ventilation because of acute respiratory failure. The patient received methylprednisolone and heparin for anticoagulation. On day 20 of hospitalization (26 weeks and 6 days of gestation), her condition worsened. Therefore, tracheostomy was performed for further ventilation support. The patient was referred to our center, which is equipped with a level 4 neonatal intensive care unit, because she was at risk for preterm delivery and required ECMO. Vasopressors were given because the patient's respiratory and hemodynamic instability worsened. These, however, were ineffective, and the patient developed severe acute respiratory distress syndrome, with a $\text{PaO}_2/\text{FiO}_2$ of 72 mmHg. Venovenous ECMO was given for resuscitation in the intensive care unit despite fetal prematurity. After 90 min of ECMO the patient was transferred from the intensive care unit to the operation room for cesarean delivery to increase her tidal volume and prepare for respiratory support. She was sedated with midazolam, propofol,

fentanyl and rocuronium; consequently, fetal movement decreased. Heparin was given continuously throughout to enable anticoagulation.

The neonatologists wore personal protective equipment and remained a suitable distance from the COVID-19-positive mother to reduce infection risk in the same room. A male infant was born with hypotonia, pallor and primary apnea. He required positive pressure ventilation. His condition did not improve, probably due to the sedatives given to the mother. He was therefore intubated and chest compressions were performed. Intratracheal epinephrine was also given. His APGAR scores were 1, 1 and 6 at 1, 5 and 10 min of life, respectively. He was transferred to the neonatal intensive care unit, and a conventional ventilator was used. Surfactants were used to treat hypoxic respiratory failure.

Because of hypotension the infant required an epinephrine drip for 24 h after birth. His hypotonia gradually improved. He had no clinical symptoms of COVID-19, and his polymerase chain reaction test was negative on day 1 and day 3 of life. However, the placenta and amniotic fluid were not examined. On admission the infant received fresh frozen plasma for coagulation abnormalities. The fibrinogen level increased from 87 to 106 mg/dL. During his neonatal intensive care unit stay, he was managed for prematurity, apnea, retinopathy of prematurity, and patent ductus arteriosus. The brain magnetic resonance imaging was normal for his term-corrected gestational age. At 110 days of age (postconception age, 42 weeks and 4 days), the infant no longer required domiciliary oxygen therapy and tubal feeding, therefore, he was discharged. His weight at discharge was 3,806 g. His mother's condition gradually improved, and she was decannulated from ECMO on postpartum day 8. She was discharged without respiratory support on postpartum day 20.

The survival rates of pregnant women and fetuses on ECMO are 75–80% and 65–70%, respectively.¹ ECMO during pregnancy is associated with a high risk of maternal and fetal bleeding complications.¹ The present infant developed disordered coagulation, probably because of the underlying illness of his mother and his prematurity; however, his coagulation normalized with fresh frozen plasma transfusion.

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Reports of maternal–fetal vertical transmission of COVID-19 are rare.² The infant in the present case did not contract COVID-19.

Extracorporeal membrane oxygenation for pregnant women during the COVID-19 pandemic is challenging because of the limited data. In the present case the infant was discharged without serious complications (i.e., he did not have intraventricular hemorrhage or periventricular leukomalacia caused by the influence of ECMO on coagulation and circulation). Although his long-term prognosis remains unknown, most previous studies have reported that the infants survived.^{3,4} This case shows that the neonatal outcomes after delivery by a mother on ECMO for COVID-19 were consistent with those associated with prematurity.

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Disclosure

The authors declare no conflict of interest.

Author contributions

T.I. designed the case report and wrote the manuscript draft. K.K., C.K., M.K., and M.S. critically revised the manuscript. All authors read and approved the final manuscript.

Informed consent

Informed consent was obtained from the patient's family for the publication of this manuscript.

References

- 1 Sharma NS, Wille KM, Bellot SC, Diaz-Guzman E. Modern use of extracorporeal life support in pregnancy and postpartum. *ASAIO. J.* 2015; **61** (1): 110–4.
- 2 Dumitriu D, Emeruwa UN, Hanft E *et al.* Outcomes of neonates born to mothers with severe acute respiratory syndrome coronavirus 2 infection at a large medical center in New York City. *JAMA Pediatr.* 2021; **175** (2): 157–67.
- 3 Balasundaram P, Louis S, Thompson-Branch A. Preterm neonate delivered to COVID-19 positive mother on ECMO support. *J. Neonatal Perinat. Med.* 2021; **15** (2): 1–4.
- 4 Barrantes JH, Ortoleva J, O'Neil ER *et al.* Successful treatment of pregnant and postpartum women with severe COVID-19 associated acute respiratory distress syndrome with extracorporeal membrane oxygenation. *ASAIO. J.* 2021; **67** (2): 132–6.