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Tetralogy of Fallot palliation in a COVID-19 positive neonate



In December 2019, a novel coronavirus, known as Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2), causing severe pneumonia was identified in patients in Wuhan, China, leading to the syndrome known as Coronavirus Disease 2019 (COVID-19) [1]. Although severe multisystemic manifestations have been defined in adults, there is limited data on the disease burden of COVID-19 in infants. We present the case of a 15-day-old infant who was born with Tetralogy of Fallot (TOF), and was found to be COVID-19 positive. Among symptomatic children, 5% have dyspnea or hypoxemia, and 0.6% progress to acute respiratory distress or multi organ dysfunction [2]. This TOF infants' acute degeneration in clinical presentation and the need for urgent surgical palliation may have been confounded by a positive COVID-19 diagnosis. The patient's family provided informed consent to publish this manuscript.

A 15-day-old baby girl, born at 37-weeks, weighing 1.9 kg, was diagnosed with TOF prenatally. The infant's mother was diagnosed with COVID-19 after experiencing fever and shortness of breath postpartum. On day 7 of life, the infant experienced desaturation to SpO₂ 60–65%, tachypnea, worsening cyanosis, feeding intolerance and increasing lethargy. Chest radiography revealed bilateral pulmonary granular opacities and reduced lung volumes. A COVID nasopharyngeal swab was positive; and the infant exhibited frequent Tet spells requiring supplemental oxygen and recurrent fluid boluses. The infant was intubated due to repeated apneic episodes.

Due to sustained hypoxemia with SpO₂ between 55 and 65%, the decision for surgical palliation of TOF with a systemic-to-pulmonary shunt was made. The patient arrived to the operating room for Blalock-Taussig (BT) shunt placement on day 15 of life. Weighing 2.3 kg, she was transported to a dedicated operating room, with a Pyxis machine situated outside so as not to contaminate its' contents. A high efficiency particulate air filter was in place distal to the endotracheal tube (ETT) along with a second filter attached to the expiratory limb of the anesthesia circuit. Standard ASA monitors were applied and a left femoral arterial line was placed under ultrasound guidance.

The infant arrived intubated with a 3.0 uncuffed ETT; 1 µg/kg fentanyl and 2 mg/kg rocuronium were bolused following arterial line placement. Shortly thereafter, ventilation became challenging and a significant ETT leak was appreciated. Double filters also added to circuit dead space and capnography waveform yielded an end tidal CO₂ < 10 mmHg. The uncuffed ETT was replaced with a cuffed ETT to enable more effective ventilation and reduce aerosolization of viral particles. A C-MAC® video laryngoscope was utilized with a Miller 0 blade and the cuff was inflated immediately after direct visualization of appropriate endotracheal placement. An in-line suctioning system was placed to prevent aerosolization during suctioning. Modified BT shunt placement proceeded without complication and the patient was transferred to the ICU intubated in stable condition, on a phenylephrine infusion at 0.2 µg/kg/min. The patient was extubated on postoperative

day 6 in stable condition; repeat testing for COVID-19 was negative.

Vertical transmission of SARS-CoV-2 is unlikely, as it has not been detected in umbilical cord blood, amniotic fluid, placental tissue, vaginal swabs, or breast milk and maternal viremia rates are 1% in a study by Wang et al. [3] Although elevated immunoglobulin M, cytokine levels, and lymphocyte counts may be suspicious of in utero infection, current data suggests early neonatal infection is most likely due to postnatal contact with caregivers. Only 2 cases of neonates with positive real-time polymerase chain reaction testing after delivery have been described [4], but these cases lack clinical data and information about appropriate isolation precautions.

Options for surgical management of TOF include initial palliation with a modified BT shunt, stenting of the right ventricular outflow tract or early primary repair (EPR). The advantages of EPR include quicker resolution of right ventricular hypertrophy, prevention of prolonged cyanosis, reduced myocardial fibrosis and arrhythmias, and improved exercise tolerance [5]. Concern for coagulopathy, delayed sternal closure, and prolonged hospital stay in this infant following a cardiopulmonary bypass run were instrumental in the decision to proceed with a BT shunt as opposed to EPR. In the face of this sustained public health crisis, the concomitant occurrence of SARS-CoV-2 with pediatric congenital heart disease mandates guidance to ensure patient safety.

Declaration of competing interest

The authors declare that there is no conflict of interest.

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