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Contributors' Statement:

Dr Sinelli conceptualized and designed the study, drafted the initial manuscript, reviewed and revised the manuscript.

Dr Paterlini, Citterio, Di Marco and Fedeli collected data, carried out the analysis, reviewed and revised the manuscript.

Dr Ventura designed the data collection instruments, coordinated and supervised data collection, and critically reviewed the manuscript.

All authors approved the final manuscript as submitted and agree to be accountable for all aspects of the work.

Abstract

We describe a case of neonatal SARS-CoV-2 infection, diagnosed 3 days after birth, and manifesting with silent hypoxemia, requiring respiratory support.

Background

In December 2019, an emergent new coronavirus was detected in Wuhan, China as the cause of severe pneumonia¹. The virus, named SARS-CoV-2, causes a disease named COVID-19 and has become pandemic². At the end of February, a cluster of cases was identified in Northern Italy. Since then, SARS-CoV-2 has been responsible for more than 80,000 infections among Italian adults, with about 10 neonatal cases detected. The disease seems to be mild in children and, to date, there are few reports in neonatal population. It is still not clear if there is vertical transmission of virus from mother to newborn and there is not a consensus on the appropriate infection control precautions to be used in the care of the newborn. We report a case of COVID-19 infection in a term newborn who required respiratory support after a vaginal delivery.

Case report

The baby was born at term after an uneventful pregnancy. On admission, mother was asymptomatic and afebrile. An uncomplicated vaginal delivery ensued resulting in an appropriate for gestational age male infant. Delayed cord clamping and skin-to-skin contact were performed, as part of the routine care. Apgar scores were assigned as 9 and 10 at 1 and 5 minutes, respectively. On the second day after delivery, the mother became febrile with no respiratory symptoms. Her nasopharyngeal swab was positive for SARS-CoV-2 (qualitative PCR), while other causes of fever were ruled out. A nasopharyngeal swab obtained that same day on the infant was also positive for SARS-CoV-2. On examination, the infant's clinical condition was good and he demonstrated no signs of lung or organ system disease. The infant and the mother were not separated and they were both transferred to an airborne-isolation zone to continue the follow-up. However, 48 hours after isolation, the newborn developed perioral cyanosis and poor sucking without signs of respiratory distress. Oxygen saturation on room air was 88%, respiratory rate was 15-20

per minute, heart rate was 120 bpm, and blood pressure was normal range. Arterial blood gas analysis demonstrated moderate hypoxia (Table 1). A complete blood count and differential and C-reactive protein were normal. An echocardiogram excluded any cardiac abnormalities. Empiric treatment with ampicillin and gentamicin was initiated but discontinued when blood and urine culture were sterile. Qualitative PCR on the nasopharyngeal swab specimen was negative for other respiratory virus (influenza A and B, parainfluenza, respiratory syncytial virus, adenovirus, metapneumovirus, rhinovirus, enterovirus, bocavirus and minor type of Coronavirus). The baby was admitted to the neonatal intensive care unit and placed on 30% inspired oxygen via high-flow nasal cannula. Chest radiograph showed mild bilateral ground-glass opacities and lung ultrasound did not reveal consistent abnormalities (Figure 1). After 36 hours, a chest CT-scan did not show major abnormalities. The infant's condition improved, respiratory support was discontinued 50 hours after admission to the neonatal intensive care unit. The infant was fed maternal expressed milk by nasogastric tube for 48 hours, after which he was able to be fully bottle fed. The infant was discharged in good condition on day 18 of life. On days 15 and 21 of life, his qualitative PCR for COVID-19 remained positive.

Discussion

This report details a case of neonatal Sars-CoV-2 infection that presented on day of life 5 with clinically significant hypoxemia without overt signs of respiratory distress that required oxygen therapy (Figure 2). Although clinical manifestations of COVID-19 among pediatric patients are generally less severe than those of adults,³ the proportion of severe and critical cases reported in children is inversely correlated with their age, with more severe cases in infants less than 1 year old.⁴ Nonetheless, early Chinese case series of newborns were reassuring, reporting either asymptomatic courses with only radiologic finding of disease⁵ or very rarely symptomatic and uncomplicated diseases.⁶

Our case demonstrates, however, that significant hypoxemia can occur in newborns with early SARS-CoV-2 infection. In these cases, diagnosis can be challenging because clinical manifestation of respiratory failure, such as polypnea or respiratory distress, may be absent.

Despite the large number of people with confirmed COVID-19 infection, very few cases have occurred in newborn infants. Data are not sufficient at this time to allow a clear evidence-based recommendation for optimal infection control measures in newborns of mothers with COVID-19 infection. Our case report suggests that a newborn infected with SARS-CoV-2 may not demonstrate signs of respiratory distress but may have significant hypoxia that requires treatment. Pulse oximetry monitoring may be advisable prior to the discharge of healthy appearing infants with positive testing for SARS-CoV-2. In addition, parents should be trained to recognize signs of possible hypoxemia, such as poor sucking or changes in baby's skin color.

In our patient, nasopharyngeal swab remained positive for more than two weeks, unlike previous reports showing rapid virologic clearance.⁶ Together with previous reports of frequent asymptomatic infections, our finding suggests that newborns could be a source of horizontal transmission of the infection and should be managed accordingly.

In conclusion, it is important to remind that in the case of neonatal Sars-Cov-2 infection, especially if it occurs in an early period of life, the disease might have insidious onset. Based on our report, we suggest to strictly monitor infants born from infected mothers in the first week of life.

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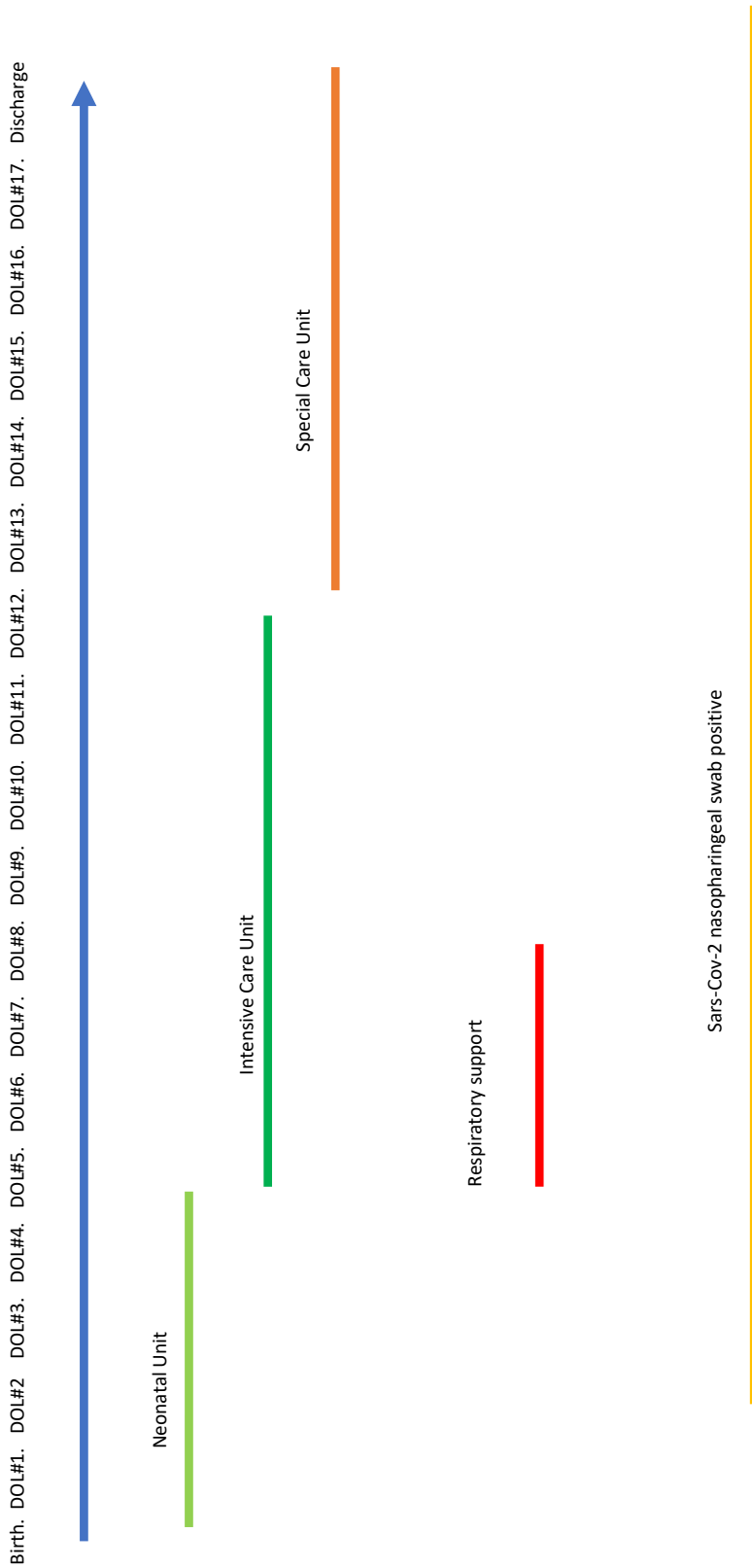
Table 1. Baby's blood test (DOL, days of life)

Time	DOL #5 h12	DOL#5 h 18	DOL#6 h 2
ph	7.49	7.40	7.45
paCO2 mmHg	31	39.5	29.1
paO2 mmHg	48	48.2	93.9
HCO3- mmol/L	23	24	19.6
BE	1.1	-0.5	-2.6
CRP mg/dl	0.1		0.06
WBC /mm3	6.800		
Hemoglobin g/L	17.2		
Platelets /mm3	456.000		
Neutrophil count %	28%		
Lymphocyte count %	56%		

Figure 1. Chest x-ray of the newborn obtained on DOL#3 showing mild bilateral ground-glass opacities



Figure 2. Timeline of our case report from birth to discharge



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