SHORT COMMUNICATION

Vaginal delivery report of a healthy neonate born to a convalescent mother with COVID-19

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Abstract
The outbreak of the infection of 2019 novel coronavirus disease (COVID-19) has become a challenging public health threat worldwide. Limited data are available for pregnant women with COVID-19 pneumonia. We report a case of a convalescing pregnant woman diagnosed with COVID-19 infection 37 days before delivery in the third trimester. A live birth without severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection was performed successfully via the vagina. The findings from our case indicate that there is no intrauterine transmission in this woman who developed COVID-19 pneumonia in late pregnancy.

KEYWORDS
COVID-19, delivery, infection, vertical transmission

1 | INTRODUCTION

The outbreak of the infection of 2019 novel coronavirus disease (COVID-19) has become a challenging public health threat worldwide.1,2 The clinical characteristics and mother-to-child vertical transmission potential of COVID-19 pneumonia in pregnant women are still unclear.3–5 Answers to these questions are urgent to prevent and control COVID-19 pneumonia in children and pregnant women and will help formulate the principles of obstetric treatment for pregnant women with COVID-19.6 Here, we report a newborn without severe acute respiratory syndrome coronavirus 2 infection born to a convalescing mother with COVID-19 pneumonia and assess the mother-to-child intrauterine vertical transmission potential of COVID-19. The findings from our case indicated that there was no intrauterine transmission in this woman who developed COVID-19 pneumonia in late pregnancy.

2 | METHODS

Clinical records and laboratory results were retrospectively reviewed for the pregnant woman with COVID-19 admitted to Beijing YouAn Hospital, Capital Medical University (Beijing, China), confirmed based on symptoms, chest X-ray and positive real-time reverse transcriptase-polymerase chain reaction (RT-PCR) results. The study was reviewed and approved by the Ethics Committee of Beijing YouAn Hospital, Capital Medical University. Written consent to publish was obtained.

The infection status of the mother was accessed by RT-PCR for SARS-CoV-2 nucleic acid (RT-PCR Kit; BioGerm, China) of throat swabs and computed tomography scan (CT). Related samples were collected from the mother at delivery and neonate at birth. RT-PCR tests were conducted on maternal cervical secretion, maternal rectal swab, breast milk, amniotic fluid, neonatal throat swab, and neonatal rectal swab. Maternal and neonatal sera samples were used to test for immunoglobulin G (IgG) and immunoglobulin M (IgM) antibodies (SARS-CoV-2 Antibody Detection Kit; INNOVITA, China). Pathological analysis of the placenta was performed (Anti-2019-nCoV Nucleoprotein; AbMax, China).

3 | RESULTS

On 29 January, a 25-year-old primiparous woman (33 weeks 1 day of gestation) was hospitalized for suspected SARS-CoV-2 infection and...
transferred to fever ward for isolation, due to developing a fever of 38°C, with dry cough and shivering, 9 days after she arrived at Beijing from Wuhan. The maternal chest X-ray showed thickened lung texture, the lower lobe of the left lung was scattered with spots of patchy shadow. The temperature returned to normal later on the same day. On 30 January, the RT-PCR test of her throat swab was found positive. She was transferred to Beijing YouAn Hospital, Capital Medical University (Beijing, China) and received antiviral, anti-infection, and corticosteroid therapies and recovered following the treatment. On 4 February, she was discharged. Two times follow-up RT-PCR tests were all negative and no abnormality was observed on chest CT. Virus-specific IgG and IgM in maternal venous blood were positive (Table 1).

On 7 March (38 weeks 4 days), a baby boy weighed 3070 g was delivered by vaginal delivery 6 hours after the premature rupture of membranes. The birth process was smooth. The newborn's vital signs were stable, without asphyxia or deformity. The Apgar scores of 1, 5, and 10 minutes were 9, 10, and 10 points, respectively. Related specimens were collected immediately from the newborn at birth in the delivery room. The RT-PCR on amniotic fluid, neonatal throat swab, and rectal swab were all negative. Neonatal IgG and IgM antibodies to SARS-CoV-2 were both negative (Table 1). Additionally, no inflammation was observed, and N protein of SARS-CoV-2 detection was negative in the placenta. The newborn and his mother were discharged on 10 March.

4 | DISCUSSION

We report a case that a newborn without SARS-CoV-2 infection was delivered successfully via the vagina. The mother was a convalescing pregnant woman who developed COVID-19 pneumonia in the third trimester. The maternal vital signs were stable and the monitoring results of mother and infant were good during the treatment, so the pregnancy continued. Considering she was a convalescing pregnant woman, vaginal delivery was chosen finally. SARS-CoV-2-specific IgG and IgM were positive in maternal sera, whereas the same test in neonatal sera showed negative. As we know, the detection of IgM antibodies tends to indicate recent exposure to SARS-CoV-2, whereas the detection of COVID-19 IgG antibodies indicates virus exposure some time ago. Combined with the RT-PCR test results, we believe that the mother had been convalescing from infection and the neonate was absent from SARS-CoV-2 infection. Moreover, the N protein of SARS-CoV-2 was not observed in the placenta by immunohistochemical analysis. Therefore, we concluded that the newborn was not infected with SARS-CoV-2 in the womb. In other words, the results showed that intrauterine vertical transmission was not observed in our case.

This study is limited by the single case, and the analysis of additional cases infected in different gestational weeks of pregnancy is necessary to determine if this remains true.

| TABLE 1 | Laboratory results for the mother and the neonate |
|---------|-----------------------------------------------|
| Laboratory test | Time | Reference range |
| White blood cell count, ×10⁹/L | 29 Jan | 15.5 | 3.5-9.5 |
| Neutrophil ratio, % | 30 Jan | 87.4 | 40.9-75 |
| Lymphocyte ratio, % | 31 Jan | 12.3 | 20-50 |
| PCT, ng/mL | 31 Jan | 0.13 | <0.1 |
| C-reactive protein, mg/L | 31 Jan | 21.8 | <3 |
| ALT, U/L | 2 Feb | 15 | 7-40 |
| AST, U/L | 2 Feb | 21 | 13-35 |
| ALB, g/L | 3 Feb | 28.1 | 40-55 |
| PCR of throat swab | 3 Feb | + | - |
| PCR of cervical secretion | 3 Feb | - | - |
| PCR of rectal swab | 3 Feb | - | - |
| PCR of breast milk | 3 Feb | - | - |
| PCR of amniotic fluid | 3 Feb | - | - |
| SARS-CoV-2 IgG | 3 Feb | + | - |
| SARS-CoV-2 IgM | 3 Feb | + | - |
| N protein of SARS-CoV-2 | 3 Feb | - | - |

Note: Values out of reference range are indicated in bold. Abbreviations: ALB, albumin; ALT, alanine transaminase; AST, aspartate aminotransferase; IgG, immunoglobulin G; IgM, immunoglobulin M; PCR, polymerase chain reaction; PCT, procalcitonin; SARS-CoV-2, severe acute respiratory syndrome coronavirus 2; -, negative; +, positive.
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CONFLICT OF INTERESTS
The authors declare that there are no conflict of interests.

AUTHOR CONTRIBUTION
QC and QP made substantial contributions to the study concept and design. QC and XX were in charge of the manuscript draft. XX and HW took responsibility for obtaining written consent from patients, obtaining ethical approval, collecting samples, and confirming data accuracy. HW made substantial contributions to data acquisition, analysis, and interpretation. JC was in charge of the laboratory tasks.

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