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Case Report

Perinatal management of a pregnant woman with COVID-19: A case report from Japan

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Objective: Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has caused the coronavirus disease 2019 (COVID-19) pandemic. Owing to limited information, the impact and clinical course of COVID-19 in pregnant women and newborns remain unclear. Here, we report the clinical course of a full-term pregnant woman with COVID-19 and her newborn.

Case report: A 27-year-old pregnant woman with a fever and sore throat was diagnosed with COVID-19. To prevent and control SARS-CoV-2 infection to the newborn and medical staff, delivery was performed via cesarean section. Reverse-transcription quantitative polymerase chain reaction results of the placenta, umbilical cord, cord blood, amniotic fluid, vaginal fluid, breastmilk, newborn anal wipes, and nasopharyngeal samples were negative for SARS-CoV-2. An acute increase in maternal blood pressure and HELLP syndrome-like blood data fluctuations were observed after delivery.

Conclusion: Perinatal management of patients with COVID-19 could be safely performed for medical staff and newborns under adequate infection control measures.

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Introduction

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) result in coronavirus disease 2019 (COVID-19), characterized by severe respiratory infections [1]. However, the effects of a SARS-CoV-2 infection on pregnant women and newborns is not well known. Vertical transmission of SARS-CoV-2 is presumed rare [2]. COVID-19 in pregnancy may lead to the development of obstetric complications, such as intrauterine fetal death and fetal growth restriction in the third trimester of pregnancy [3]. A case study of 19 mothers with COVID-19 reported that SARS-CoV-2 was not detected in breastmilk [2], but is shed in breastmilk samples [4]. It is essential to protect medical staff from infection and manage delivery safely.

The number of patients with COVID-19 in Japan is relatively low compared with those in Southeast Asia, Europe, and North America [5]. Furthermore, there have been no reports of full-term pregnant women with COVID-19 in Japan. We report a case of a full-term pregnant woman with COVID-19 who had acute onset severe hypertensive disorder of pregnancy (HDP) after birth. Several samples, including the placenta, umbilical cord, cord blood, amniotic fluid, and breastmilk, were examined for SARS-CoV-2.

Case presentation

A 27-year-old primigravid woman presented with fever (>37.5 °C), sore throat, joint pain, runny nose, and loss of smell at 37 and 3/7 weeks gestation. She had no comorbidities, did not undergo fertility treatment, and was non-obese (body mass index, 20 kg/m²). Prior to her symptoms, her husband experienced similar symptoms during the previous week. She consulted a local hospital at 38 weeks gestation and was suspected to have COVID-19. She underwent a nasopharyngeal swab for loop-mediated isothermal amplification, and tested positive for SARS-CoV-2. Because our hospital is a referral center for patients with COVID-19 including pregnant women, she was referred to the obstetrics department for perinatal management. She was asymptomatic during admission.
Physical examination was unremarkable (temperature, 36.7 °C; blood pressure, 108/60 mmHg; pulse rate, 70 beats/min; respiratory rate, 17 breaths/min; and oxygen saturation, 99% in ambient air). Ultrasonography revealed no apparent abnormal findings in the fetus and amniotic fluid. A nonstress test revealed a reactive pattern, and uterine contractions were absent. Maternal blood tests revealed thrombocytopenia, mild increase in aspartate transaminase levels, and normal urinalysis findings (Table 1). Positive results were obtained for repeat maternal nasopharyngeal swab and reverse-transcription quantitative polymerase chain reaction (RT-qPCR) for SARS-CoV-2 with a threshold cycle of 25.2. RT-qPCR was performed as previously described [6] and targeted the E gene of SARS-CoV-2. To protect the medical staff and the newborn from SARS-CoV-2 infection, the mother consented to undergo a cesarean section. The delivery management of full-term pregnant women with COVID-19 in our hospital is based on cesarean delivery to reduce the risk of droplet infection, but vaginal delivery can be considered depending on patient and medical staff consensus. Because of the non-emergent condition (primigravid patient with a low Bishop score, and not in active labor), the procedure was delayed for several days for further viral load reduction.

We performed a cesarean section at 38 and 4/7 weeks of gestation with no platelet transfusion under spinal anesthesia. All medical staff used appropriate personal protective equipment, including N95 masks, in a negative pressure isolation operating room with two obstetricians, one anesthesiologist, and two nurses. A healthy male newborn weighing 3104 g was delivered, and was immediately handed to a midwife and transferred to an adjacent room for newborn evaluation and routine care by a pediatrician (Fig. 1). The umbilical artery blood gas pH at birth was 7.33, and the Apgar scores at 1 and 5 min were 8 and 9, respectively. The operation was uneventful with a total blood loss of only 440 ml.

Table 1

| Variable                        | Reference range (in house) | On admission |
|---------------------------------|---------------------------|--------------|
| White-cell count (per mm3)      | 3300–8600                 | 4600         |
| Differential count (%)          |                           |              |
| Neutrophils                     | 40.6–76.4                 | 68.3         |
| Lymphocytes                     | 16.3–49.5                 | 28.9         |
| Monocytes                       | 2.0–10.0                  | 2.6          |
| Eosinophils                     | 0.0–8.5                   | 0.0          |
| Basophils                       | 0.0–2.5                   | 0.2          |
| Hemoglobin (g/dl)               | 11.6–14.8                 | 12.3         |
| Hematocrit (%)                  | 35.1–44.4                 | 35.3         |
| Platelet count (per mm3)        | 158,000–348,000           | 83,000       |
| Protein (g/dl)                  |                           |              |
| Total                           | 6.6–8.1                   | 6.0          |
| Albumin                         | 4.1–5.1                   | 3.0          |
| Aspartate aminotransferase (U/l)| 13.0–30.0                 | 33.0         |
| Alanine aminotransferase (U/l)  | 7.0–23.0                  | 12.0         |
| Alkaline phosphatase (U/l)      | 100.0–122.0               | 469.0        |
| Bilirubin (mg/dl)               |                           |              |
| Total                           | 0.4–1.5                   | 0.5          |
| Direct                          | 0.0–0.3                   | 0.1          |
| Lactate dehydrogenase (U/l)     | 124.0–222.0               | 198.0        |
| Uric acid (mg/dl)               | 2.6–5.5                   | 5.3          |
| Creatinine (mg/dl)              | 0.46–0.79                 | 0.63         |
| C-reactive protein (mg/l)       | 0.14–1.0                  | 1.63         |
| Sodium (mmol/l)                 | 138.0–145.0               | 136.0        |
| Potassium (mmol/l)              | 3.6–4.8                   | 4.2          |
| Chloride (mmol/l)               | 101.0–108.0               | 104.0        |
| D-dimer (µg/ml)                 | 0.0–1.0                   | 4.0          |
| Fibrinogen (µg/ml)              | 150.0–400.0               | 500.0        |

Approximately 1 h postoperatively, the maternal blood pressure increased rapidly to ~180/120 mmHg. Only the oxytocin drip infusion was maintained to produce strong uterine contractions. We administered intravenous magnesium sulfate (1 g/h) to prevent eclampsia and intravenous nifedipine (2 mg–3 mg/h) to decrease her blood pressure. Subsequently, her blood pressure normalized and treatment was continued for 24 h. After cesarean section, levels of aspartate transaminase, alanine aminotransferase, and lactate dehydrogenase were increased and peaked on the third day. Platelet counts increased after the operation and normalized on the third day with no treatment. The newborn was admitted to the neonatal intensive care unit for isolation. Postpartum chest computed tomography of the mother revealed ground-glass attenuation findings in both lungs despite being asymptomatic. Since no desaturation was observed throughout her admission, follow-up chest computed tomography and X-ray was not performed.

Both the mother and newborn were tested several times via RT-qPCR per hospital infection control protocols. This repeated testing provided a better understanding of the maternal–fetal relationship of COVID-19 during pregnancy. Sampling for RT-qPCR was performed multiple times at different sites. Intraoperatively, we collected vaginal fluid, placental tissue, cord tissue, cord blood, and amniotic fluid samples. Postoperatively, we collected breastmilk samples for three days, newborn anal wipes, and nasopharyngeal samples. All samples tested negative for SARS-CoV-2 (Table 2). No antibody tests for COVID-19 was performed on the mother or newborn. RT-qPCR of the maternal nasopharyngeal sample was negative for SARS-CoV-2 at 17 days postoperatively. Additionally, RT-qPCRs of breastmilk samples, including the colostrum, were all negative for SARS-CoV-2. Expressed breastmilk was promptly given from the 7th postpartum day after confirming the breastmilk was negative for SARS-CoV-2. Rooming-in and direct breastfeeding were allowed 14 days postpartum after negative newborn RT-qPCR confirmation and permission from the infection control team. The mother-newborn dyad was discharged on the 18th hospital day. The newborn and all medical staff remain asymptomatic of COVID-19 one month postoperatively.

Discussion

We described a case of a full-term pregnant woman with COVID-19. RT-qPCR for SARS-CoV-2 was performed on the placenta, umbilical cord, cord blood, amniotic fluid, breastmilk, and maternal and newborn nasopharyngeal swabs. All samples, except the maternal nasopharyngeal swab, were negative for SARS-CoV-2. None of the medical staff involved in this case developed symptoms of COVID-19.

Vertical transmission of COVID-19 may not occur [2], but congenital infection of SARS-CoV-2 is possible [7]. Several studies have reported placental infection [8,9], including a case of a newborn with neurological compromise [10]. Large-scale studies are necessary to determine the impact of COVID-19 on pregnancy. Preventing horizontal spread and decreasing vertical transmission between infected mothers and non-infected newborns should be the focus of future studies.

Maternal blood pressure was significantly elevated after cesarean section despite normal levels before and during surgery, and blood data showed HELLP syndrome-like fluctuations. There has been no evidence of vasculopathy-associated preeclampsia in patients with COVID-19 [6]. COVID-19 can cause vascular endothelial damage in several organs, resulting in microcirculatory systemic disorders [11]. The vascular endothelium regulates vascular tone and maintains homoeostasis [12]. HDP and COVID-19 share similar pathogenesis of vascular endothelial cell injury. Placental histology...
show maternal vascular malperfusion, often seen in patients with HDP [13]. Thus, COVID-19 may cause maternal hypertension. Therefore, the relationship between HDP and COVID-19 should be investigated in future studies.

Cesarean section was performed to prevent the medical staff from being infected with SARS-CoV-2. During vaginal delivery, there is a risk of SARS-CoV-2 containing droplets from the mother that might be dispersed in the environment while straining or pushing. SARS-CoV-2 infectivity might decrease or disappear after six days from COVID-19 onset [14]. Our patient was admitted six days after COVID-19 onset. Since the vaginal and amniotic fluids did not contain SARS-CoV-2, vaginal delivery could have been possible with appropriate personal protective equipment.

A concern in COVID-19 postpartum management is newborn isolation and breastfeeding practices. We isolated the newborn from the mother until negative RT-qPCR results for SARS-CoV-2 were obtained. Additionally, breastfeeding was not started until the breastmilk was negative for SARS-CoV-2. Early mother–child interaction and breastfeeding are essential in the relationship of the dyad and infant nutrition. The Center for Disease Control and Prevention (CDC) guidelines recommend breastfeeding at birth and non-separation of the mother-baby dyad even if the mother has COVID-19 [15]. Recent evidence suggests a low risk of SARS-CoV-2 vertical transmission. Furthermore, data suggest no difference in the risk of SARS-CoV-2 infection to a roomed-in newborn or isolated in a separate room. SARS-CoV-2 transmission to the newborn may occur via contact with infectious respiratory secretions from the mother, medical staff, or other infected persons, including just before the individual develops symptoms when viral replication may be high. Thus, all medical staff should practice infection prevention and control measures before and while caring for a newborn. Mother-infant contact and initiation of breastfeeding will remain a major issue post-COVID-19 pandemic. COVID-19 protocols and guidelines are still rapidly changing; therefore, it is necessary to adapt the protocols of our facility in an individualized manner and per the latest guidelines.

In summary, we report a case of a full-term pregnant woman with COVID-19 who underwent cesarean section that did not result in SARS-CoV-2 infections in the newborn and medical staff. SARS-CoV-2 was not detected in the placenta, umbilical cord, cord...

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### Table 2
Results of RT-qPCR test for SARS-CoV-2 collected from several samples.

| Samples       | Number of days after birth |
|---------------|----------------------------|
|               | Day 0 | Day 1 | Day 2 | Day 3 | Day 4 | Day 6 | Day 7 | Day 10 | Day 14 | Day 17 |
| Mother        |       |       |       |       |       |       |       |        |        |
| Nasopharyngeal| NT    | NT    | NT    | NT    | NT    | **Positive** | NT    | **Positive** | NT    | NT    |
| Vaginal fluid | Negative | NT | NT    | NT    | NT    | NT    | NT    | NT    | NT    | NT    |
| Breastmilk    | NT    | Negative | NT | NT    | NT    | Negative | NT    | NT    | NT    | NT    |
| Newborn       |       |       |       |       |       |       |       |        |        |
| Nasopharyngeal| Negative | NT | NT    | NT    | NT    | NT    | NT    | NT    | NT    | NT    |
| Vaginal fluid | NT    | NT    | NT    | NT    | NT    | NT    | NT    | NT    | NT    | NT    |
| Breastmilk    | NT    | NT    | NT    | NT    | NT    | NT    | NT    | NT    | NT    | NT    |
| Others        |       |       |       |       |       |       |       |        |        |
| Placenta      | Negative | NT | NT    | NT    | NT    | NT    | NT    | NT    | NT    | NT    |
| Cord          | Negative | NT | NT    | NT    | NT    | NT    | NT    | NT    | NT    | NT    |
| Cord blood    | NT    | NT    | NT    | NT    | NT    | NT    | NT    | NT    | NT    | NT    |
| Amniotic fluid| Negative | NT | NT    | NT    | NT    | NT    | NT    | NT    | NT    | NT    |

NT: Not Testing.

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Fig. 1. A to G indicate the medical staff. All medical staff should use appropriate personal protective equipment, including N95 masks. Both rooms were maintained at a negative pressure. After receiving the newborn, F (Midwife) carries the newborn to an adjacent room for pediatrician assessment and management.
blood, amniotic fluid, vaginal fluid, and breastmilk. Our results support the current CDC guidelines promoting non-separation of the mother-baby dyad and breastfeeding immediately after birth. Postpartum hypertension observed here necessitates investigations of COVID-19-related obstetric complications.

Ethics approval and consent to participate

The Jikei University Ethics Committee approved this study. Written informed consent was obtained from the patient for publication.

Declaration of competing interest

None declared.

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