Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Detection of severe acute respiratory syndrome coronavirus 2 in placental and fetal membrane samples

OBJECTIVE: Since the first reports of the emergence of the novel coronavirus (severe acute respiratory syndrome corona virus 2 [SARS-CoV-2]) and its associated disease (coronavirus disease 2019 [COVID-19]), concerns remain about whether the virus can be transmitted from the mother to the fetus either during the antepartum period or during the process of labor and delivery. In a previous review involving a small number of cases, 2 placental swabs for polymerase chain reaction (PCR) testing were sent in addition to neonatal and cord blood testing, and the PCR results of the swabs returned negative.[1] Other studies have reported findings of SARS-CoV-2 immunoglobulin M in neonates born to mothers who received a diagnosis of COVID-19 during pregnancy,[2,3] findings that may indicate vertical transmission of the virus in utero. In this study, PCR assays were performed to detect the presence of SARS-CoV-2 RNA in placental and membrane samples. Samples were obtained after delivery from a series women who received a diagnosis of COVID-19 during pregnancy.

STUDY DESIGN: Institutional Review Board approval was obtained for this study. All pregnant patients who received a diagnosis of COVID-19 and who delivered between March 1, 2020, and April 20, 2020, at NYU Langone Health were included. Participants were identified by searching through the electronic medical record. Charts were reviewed for documentation of reverse transcription polymerase chain reaction (RT-PCR) testing of placental or membrane samples for SARS-CoV-2 RNA within 30 minutes after delivery. PCR testing for SARS-CoV-2 was performed using the Cepheid Xpert Xpress SARS-CoV-2 assay (Roche, Basel, Switzerland) under Emergency Use Authorization. Results obtained in this study were for "Research Use Only." Placental swabs were obtained from the amniotic surface after clearing the surface of maternal blood (PCR of placental sample). Membrane swabs were obtained from between the amnion and chorion after manual separation of the membranes (PCR of membrane sample). Maternal COVID-19 status was categorized as mild, severe, or critical.[4] The time interval from maternal diagnosis of COVID-19 to delivery was calculated in days. Infants were tested for SARS-CoV-2 using PCR of nasopharyngeal swabs between day 1 of life and day 5 of life during hospitalization. Furthermore, the infants were assessed for clinical signs and symptoms of COVID-19, such as fever, cough, and nasal congestion.

RESULTS: There were 32 pregnant patients with COVID-19 who delivered in this study, 11 of which had placental or membrane swabs performed (Table). Three of the 11 swabs returned positive for SARS-CoV-2. However, none of the infants tested positive for SARS-CoV2 on day 1 of life to day 5 of life, and none demonstrated symptoms of COVID-19.

CONCLUSION: Of 11 placental or membrane swabs sent for testing after delivery, 3 swabs returned with positive results for SARS-CoV-2, all in women with severe to critical COVID-19 at time of delivery. This is the first study to find the presence of SARS-CoV-2 RNA in placental or membrane samples. Although there were no clinical signs of vertical transmission, the findings indicate the possibility of intrapartum viral exposure. Given the mixing of maternal and fetal fluid and tissues at the time of delivery, the origin of the detected SARS-CoV-2 RNA in this study is unclear. The source may be from maternal blood, amniotic fluid, or fetal membranes and amniotic sac. For those infants who were delivered vaginally, vaginal secretions is also a possible source; however, previous studies have not been able to demonstrate the presence of SARS-CoV-2 in vaginal secretions.[5]

Although the neonates in this study tested negative in the first 5 days of life, many were born through cesarean deliveries with decreased length of exposure to these tissues, which may be associated with a decreased likelihood of vertical transmission. In addition, if the exposure occurred at the time of delivery, the virus may require a longer incubation period before test swabs show positive results. As a consequence, nasopharyngeal testing immediately after delivery may not be the ideal approach to evaluate vertical transmission. In summary, the presence of viral RNA in placental and membranes samples by RT-PCR at the time of delivery indicates the need for further research into the possibility of vertical transmission and use of multiple testing methods for neonates after birth. ■

Christina A. Penfield, MD, MPH
Division of Maternal-Fetal Medicine
Department of Obstetrics and Gynecology
150 E 32nd Street
NYU Langone Health
New York, NY 10016
christina.penfield@nyulangone.org

Sara G. Brubaker, MD, MS
Meghana A. Limaye, MD
Division of Maternal-Fetal Medicine
Department of Obstetrics and Gynecology
NYU Langone Health
New York, NY

Jennifer Lighter, MD
Division of Pediatric Infectious Diseases
Department of Infection Prevention and Control and Pediatrics

TABLE
Summary of PCR results of placental or membrane samples from patients with COVID-19

Patient no.	Age, y	Gestational age	Interval from diagnosis of COVID-19 to delivery, d	Mode of delivery	PCR result of placental sample	PCR result of membrane sample	COVID-19 status	PCR results of infants				
								DOL1	DOL2	DOL3	DOL4	DOL5
1	37	36wk 6d	2	CD	N/A	Pos	Critical	—	Neg	—	Neg	—
2	36	26wk 5d	1	CD	N/A	Pos	Critical	Neg	—	—	—	Neg
3	38	38wk 3d	0	CD	N/A	Neg	Critical	Neg	—	Neg	—	—
4	40	34wk 2d	1	CD	Pos	N/A	Severe	Neg	—		Neg	Neg
5	26	37wk 6d	0	NSVD	N/A	Neg	Severe	Neg	—	Neg	—	—
6	34	37wk 1d	10	NSVD	N/A	Neg	Mild	—	—	Neg	Neg	—
7	23	41wk 3d	1	NSVD	N/A	Neg	Mild	—	Neg	—	—	—
8	23	40wk 5d	8	NSVD	N/A	Neg	Mild	—	Neg	—	—	—
9	35	39wk 6d	15	NSVD	N/A	Neg	Mild	Neg	—	—	—	—
10	34	40wk 0d	5	NSVD	N/A	Neg	Mild	Neg	—	—	—	—
11	22	41wk 0d	15	NSVD	N/A	Neg	Mild	—	Neg	—	—	—

CD, cesarean delivery; *COVID-19*, coronavirus disease 2019; *DOL*, day of life; *N/A*, not available; *Neg*, negative; *NSVD*, normal spontaneous vaginal delivery; *PCR*, polymerase chain reaction; *Pos*, positive.

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NYU Langone Health
New York, NY

Adam J. Ratner, MD, MPH
Division of Pediatric Infectious Diseases
Department of Pediatrics and Microbiology
Hassenfeld Children's Hospital
NYU Langone Health
New York, NY

Kristen M. Thomas, MD
Department of Pathology
NYU Langone Health
New York, NY

Jessica A. Meyer, MD
Ashley S. Roman, MD, MPH
Division of Maternal-Fetal Medicine
Department of Obstetrics and Gynecology
NYU Langone Health
New York, NY

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