

# Journal Pre-proof

Detection of SARS-COV-2 in Placental and Fetal Membrane Samples

Christina A. Penfield, MD, MPH, Sara G. Brubaker, MD, MS, Meghana A. Limaye, MD, Jennifer Lighter, MD, Adam J. Ratner, MD, MPH, Kristen M. Thomas, MD, Jessica Meyer, MD, Ashley S. Roman, MD, MPH



PII: S2589-9333(20)30076-8

DOI: <https://doi.org/10.1016/j.ajogmf.2020.100133>

Reference: AJOGMF 100133

To appear in: *American Journal of Obstetrics & Gynecology MFM*

Received Date: 28 April 2020

Accepted Date: 3 May 2020

Please cite this article as: Penfield CA, Brubaker SG, Limaye MA, Lighter J, Ratner AJ, Thomas KM, Meyer J, Roman AS, Detection of SARS-COV-2 in Placental and Fetal Membrane Samples, *American Journal of Obstetrics & Gynecology MFM* (2020), doi: <https://doi.org/10.1016/j.ajogmf.2020.100133>.

This is a PDF file of an article that has undergone enhancements after acceptance, such as the addition of a cover page and metadata, and formatting for readability, but it is not yet the definitive version of record. This version will undergo additional copyediting, typesetting and review before it is published in its final form, but we are providing this version to give early visibility of the article. Please note that, during the production process, errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

© 2020 Elsevier Inc. All rights reserved.

## **Detection of SARS-COV-2 in Placental and Fetal Membrane Samples**

Christina A. Penfield, MD, MPH<sup>1</sup>; Sara G. Brubaker, MD, MS<sup>1</sup>; Meghana A. Limaye, MD<sup>1</sup>;  
Jennifer Lighter, MD<sup>2</sup>; Adam J. Ratner MD, MPH<sup>3</sup>; Kristen M. Thomas, MD<sup>4</sup>; Jessica Meyer,  
MD<sup>1</sup>; Ashley S. Roman, MD, MPH<sup>1</sup>

<sup>1</sup> Department of Obstetrics & Gynecology, Division of Maternal Fetal Medicine, NYU Langone Health

<sup>2</sup> Department of Infection Prevention and Control and Pediatrics, Division of Pediatric Infectious Diseases, NYU Langone Health

<sup>3</sup> Department of Pediatrics and Microbiology, Division of Pediatric Infectious Diseases at Hassenfeld Children's Hospital at NYU Langone Health

<sup>4</sup> Department of Pathology, NYU Langone Health

The authors report no conflict of interest and no funding for the study

Corresponding Author:

Christina A. Penfield, MD, MPH

NYU Langone Health

Department of Obstetrics and Gynecology

Division of Maternal-Fetal Medicine

150 E 32<sup>nd</sup> St.

New York, NY 10016

Christina.penfield@nyulangone.org

(619) 966-8906

Word count: 600

1 **Detection of SARS-COV-2 in Placental and Fetal Membrane Samples**

2 A Research Letter

3

4 **Condensation:** Detection of SARS-CoV-2 RNA RT-PCR in placental and membrane  
5 samples after delivery

6

7 **Short Title:** SARS-COV-2 in Placenta and Fetal Membranes

8

9

10

11

12

Journal Pre-proof

13 **Introduction:** Since the first reports of the emergence of the novel coronavirus SARS-  
14 CoV-2 and its associated disease (COVID-19), concerns remain about whether the virus  
15 is transmissible in pregnant women from the mother to the fetus during either the  
16 antepartum period or the process of labor and delivery. One recent review reported that  
17 in a small number of cases, two PCR swabs of the placenta were sent in addition to  
18 neonatal and cord blood testing, and both placental PCR swabs were negative.<sup>1</sup> Other  
19 studies have demonstrated the finding of SARS-CoV2 IgM in neonates born to mothers  
20 diagnosed with COVID-19 during pregnancy,<sup>2,3</sup> findings that may indicate vertical  
21 transmission of the virus in utero. We report our experience with placental/membrane  
22 SARS-CoV2 RNA PCR swab results after delivery to a series of symptomatic mothers  
23 with confirmed COVID-19 infection in pregnancy.

24 **Methods:** IRB approval was obtained. All pregnant patients diagnosed with COVID-19  
25 who gave birth between March 1, 2020 and April 20, 2020 at NYU Langone Health were  
26 identified by a search of the electronic medical record. Charts were reviewed for  
27 documentation of SARS-CoV-2 RNA RT-PCR testing sent from either the placenta or  
28 membranes within 30 minutes following delivery. PCR testing for SARS-COV-2 was  
29 performed using the cobas SARS-CoV-2 assay (Roche) or the Cepheid Xpert Xpress  
30 assay. Placental swabs were obtained from the amniotic surface after clearing the surface  
31 of maternal blood (placental PCR). Membrane swabs were obtained from between the  
32 amnion and chorion after manual separation of the membranes (membrane PCR).

33 Maternal COVID-19 illness was categorized as mild, severe, or critical.<sup>4</sup> The time  
34 interval from maternal diagnosis of COVID-19 to delivery was calculated in days. Infants  
35 were tested with nasopharyngeal swabs for SARS-CoV-2 PCR between days of life 1 and

36 5 while hospitalized. Hospitalized infants were also assessed for clinical signs and  
37 symptoms, including fever, cough, and nasal congestion.

38 **Results:** Of 32 COVID-19 positive pregnant patients who gave birth in this timeframe,  
39 placental or membrane swabs were sent from 11 patients (Table). Three of 11 swabs were  
40 positive. None of the infants tested positive for SARS-CoV2 on days of life 1 through 5,  
41 and none demonstrated symptoms of COVID-19 infection.

42 **Discussion:** Of 11 placental or membrane swabs sent following delivery, 3 swabs were  
43 positive for SARS-CoV-2, all in women with moderate to severe COVID-19 illness at  
44 time of delivery. This is the first study to demonstrate the presence of SARS-CoV-2 RNA  
45 in placental or membrane samples. While there were no clinical signs of vertical  
46 transmission, our findings raise the possibility of intrapartum viral exposure. Given the  
47 mixing of maternal and fetal fluid and tissue at time of delivery, the origin of the detected  
48 SARS-CoV-2 RNA in our series is unclear. It may represent contamination from  
49 maternal blood, amniotic fluid, or COVID-19 infection of the membranes and amniotic  
50 sac. For those infants who were delivered vaginally, contamination with vaginal  
51 secretions is also a possible source, although prior studies on vaginal secretions have  
52 failed to demonstrate the presence of COVID-19.<sup>5,6</sup>

53 Although all of our neonates tested negative in the first 5 days of life, many were born via  
54 cesarean deliveries with decreased length of exposure to these tissues, which may be  
55 associated with a decreased likelihood of vertical transmission. Additionally,  
56 nasopharyngeal testing immediately after delivery may not be the ideal approach to  
57 evaluate vertical transmission if exposure occurs at the time of delivery, as the virus may  
58 require a longer incubation period before these swabs convert to positive. In summary,

59 the presence of viral RNA by RT-PCR in placenta/membranes at the time of delivery

60 suggests the need for further research into the possibility of vertical transmission.

61

62

63

64

65

Journal Pre-proof

## 66 References

- 67 1. Schwartz DA. An Analysis of 38 Pregnant Women with COVID-19, Their  
68 Newborn Infants, and Maternal-Fetal Transmission of SARS-CoV-2: Maternal  
69 Coronavirus Infections and Pregnancy Outcomes. *Arch Pathol Lab Med.* 2020.
- 70 2. Zeng H, Xu C, Fan J, et al. Antibodies in Infants Born to Mothers With COVID-  
71 19 Pneumonia. *JAMA.* 2020.
- 72 3. Dong L, Tian J, He S, et al. Possible Vertical Transmission of SARS-CoV-2 From  
73 an Infected Mother to Her Newborn. *JAMA.* 2020.
- 74 4. Wu Z, McGoogan JM. Characteristics of and Important Lessons From the  
75 Coronavirus Disease 2019 (COVID-19) Outbreak in China: Summary of a Report  
76 of 72314 Cases From the Chinese Center for Disease Control and Prevention.  
77 *JAMA.* 2020.
- 78 5. Qiu L, Liu X, Xiao M, et al. SARS-CoV-2 is not detectable in the vaginal fluid of  
79 women with severe COVID-19 infection. *Clinical Infectious Diseases.* 2020.
- 80 6. Cui P, Chen Z, Wang T, et al. Clinical features and sexual transmission potential  
81 of SARS-CoV-2 infected female patients: a descriptive study in Wuhan, China.  
82 *medRxiv.* 2020:2020.2002.2026.20028225.

83

84

85 Table. Summary of placental or membrane COVID-19 PCR result by patient

86

Patient	Age	Gestational Age	Interval from COVID diagnosis to delivery (days)	Mode of delivery	Placental PCR	Membrane PCR	COVID Status	Infant PCR results				
								DOL 1	DOL 2	DOL 3	DOL 4	DOL 5
1	37	36w6d	2	CD	N/A	Pos	Critical		Neg		Neg	
2	36	26w5d	1	CD	N/A	Pos	Critical	Neg				Neg
3	38	38w3d	0	CD	N/A	Neg	Critical	Neg		Neg		
4	40	34w2d	1	CD	Pos	N/A	Severe	Neg			Neg	Neg
5	26	37w6d	0	NSVD	N/A	Neg	Severe	Neg			Neg	
6	34	37w1d	10	NSVD	N/A	Neg	Mild			Neg	Neg	
7	23	41w3d	1	NSVD	N/A	Neg	Mild		Neg			
8	23	40w5d	8	NSVD	N/A	Neg	Mild		Neg			
9	35	39w6d	15	NSVD	N/A	Neg	Mild	Neg				
10	34	40w0d	5	NSVD	N/A	Neg	Mild	Neg				
11	22	41w0d	15	NSVD	N/A	Neg	Mild		Neg			

87

DOL= Day of Life, CD= Cesarean delivery, NSVD= Normal spontaneous vaginal delivery

88

89

90

91