

Cardiac Fetal Changes Associated with Maternal Infection by SARS-CoV-2: Case Report

Haroldo Teófilo De Carvalho^{1*}, Maria Paz Lozano Chiquillo², Stella Naomi Tanaka², Ana Cândida Arruda Verzola de Castro³, Lana Kummer² and Meliza Goi Roscani¹

¹Federal University of São Carlos (UFSCar), Department of Medicine, São Carlos, SP, Brazil

²Federal University of São Carlos (UFSCar), São Carlos, SP, Brazil

³University Hospital of the Federal University of São Carlos - SP (UH), Brazil

***Corresponding Author:** Haroldo Teófilo De Carvalho, Federal University of São Carlos (UFSCar), Department of Medicine, São Carlos, SP, Brazil.

Received: December 08, 2021; **Published:** December 29, 2021

DOI: 10.31080/ecpe.2022.11.01077

Abstract

After more than 1 year of pandemic, infection by the new coronavirus is still a serious public health problem, and its pathophysiological mechanisms and clinical repercussions are still not fully elucidated. Recent studies have suggested that pregnancy may be a risk factor for new coronavirus infection when compared to non-pregnant women of the same age, and is associated with an increased number of preterm deliveries and caesarean sections, most often secondary to worsening symptoms maternal. We present the case of a pregnant woman whose fetus had structural and cardiac rhythm alterations related to maternal coronavirus infection. The objective of this report is to alert the reader to the possibilities of cardiac alterations in children of mothers contaminated by SARS-CoV-2 and the need for early diagnosis and adequate treatment when necessary.

Keywords: Coronavirus Disease; Gestation; Fetus; Heart Disease

Introduction

In December 2019, a series of cases of severe and highly lethal pneumonia was reported by the Chinese government to the World Health Organization (WHO). After the alert, a task force identified SARS-CoV-2 as the cause of the state of emergency, prompting the WHO to declare a pandemic in March 2020. After more than 1 year, infection by the new coronavirus is still a serious public health problem, and its pathophysiological mechanisms and clinical repercussions are still not fully elucidated, with no specific therapies with proven efficacy found, especially for children and adolescents [1-3].

Despite the scarcity of information about the involvement of SARS-CoV-2 in pregnant women and fetuses, evidence accumulated since before the pandemic demonstrates a greater susceptibility of pregnant women to viral infections, resulting in increased maternal morbidity and mortality, and severe fetal repercussions [4,5]. Recent studies have suggested that pregnancy may be a risk factor for infection caused by the new coronavirus when compared to non-pregnant women of the same age. However, it was not possible to conclude whether this condition could increase the risk of progression to severe forms of the disease [6,7].

The SARS-CoV-2 infection was also associated with an increase in the number of preterm deliveries and cesarean sections, most often secondary to the worsening of maternal symptoms. Thus, the gestational care of mothers contaminated by the coronavirus demands a

greater number of prenatal consultations, frequent laboratory tests, fetal cardiac assessment and vitality evaluation. However, the association between cardiac fetal abnormalities and maternal disease has not yet been established, and most cases available in the literature are based on reports and series of cases [8].

The objective of this report is to alert the reader to the possibilities of cardiac alterations in children of mothers contaminated by SARS-CoV-2 and the need for early diagnosis and adequate treatment when necessary.

Case Report

A 27-year-old first time pregnant woman, previously healthy, presenting small amounts of fluid loss via vaginal, showing no changes in the obstetric morphological ultrasound. At 23 weeks and 6 days of gestation, she started presenting headaches, generalized myalgia, fatigue and diarrhea, evolving to dyspnea on great exertion. She performed a PCR-RT test for SARS-CoV-2 with a positive result.

In an obstetric consult, Azithromycin and Prednisolone were prescribed, with complete regression of symptoms after one week. After 20 days of diagnosis, already asymptomatic, she attended the routine consult for an obstetric ultrasound, which showed fetal tachycardia (240 fetal heartbeats). She was admitted for monitoring and fetal echocardiography, which showed enlarged atrial chambers (image 1 to 6) and sustained tachycardia, with results confirmed in a second comparative examination. Propranolol 120 mg/day was started, with regularization of the heart rate. She was discharged from the hospital after one week, being followed up weekly, and scheduled for a new fetal echocardiography at 32 weeks of gestation. In this exam, the heart rate was adequate, and the dimensions of the atria were within normal limits, allowing the discontinuation of the medication. The pregnancy was conducted up to 38 weeks, with no new cardiac fetal changes, and the cesarean delivery was uneventful. At birth, transthoracic echocardiography was performed in the newborn, which found *ostium secundum* atrial septal defect of 6 millimeters, without signs of hemodynamic repercussions, and mild pulmonary hypertension, which can be explained by the fact that the test was performed less than 24 hours after birth (Image 7-9).

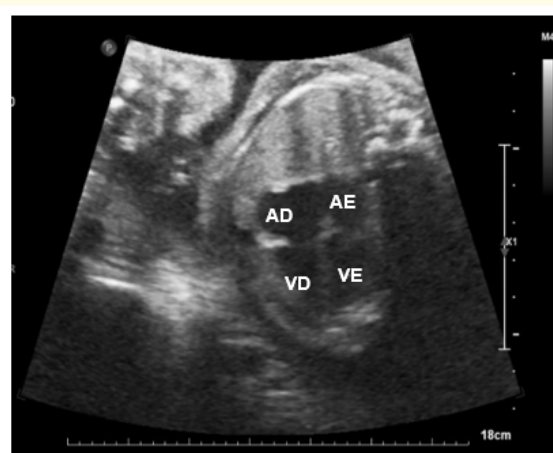


Image 1: Fetal echocardiogram performed after admission, showing enlarged atrial chambers.

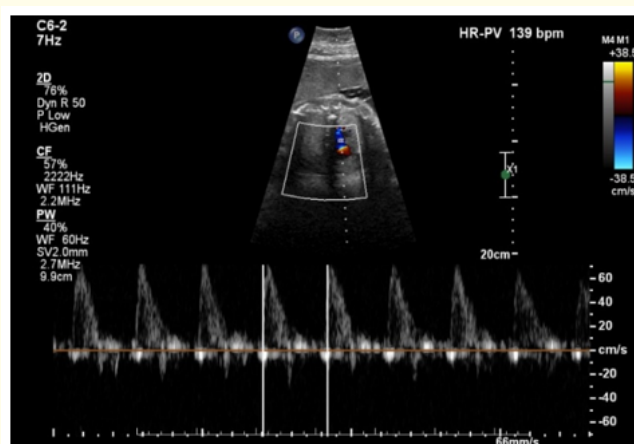


Image 2: Heart rate assessment after beta-blocker use.

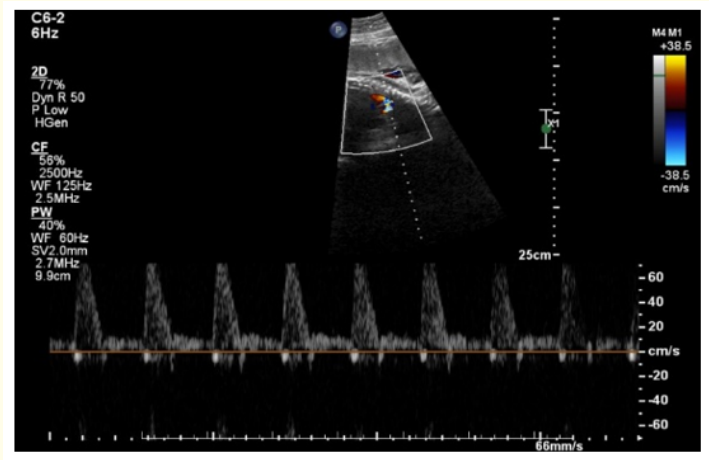


Image 3: Color flow mapping in the ductal arch region.

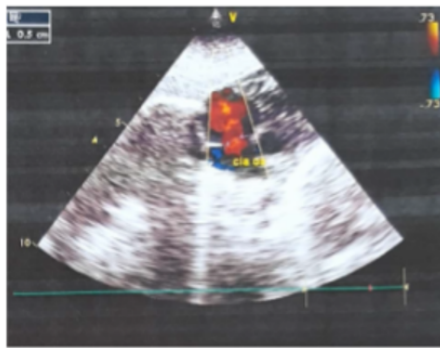


Image 4

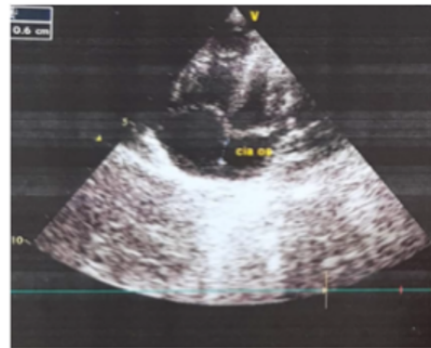


Image 5

Image 4,5: Transthoracic echocardiogram: flow is observed through the atrial septum, left-right, compatible with ostium secundum atrial septal communication of moderate size (6 mm).

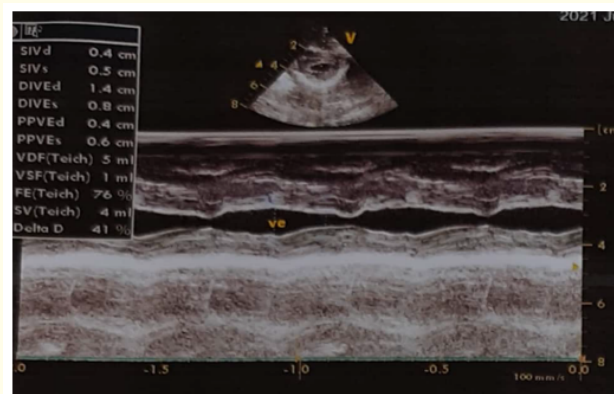


Image 6: Transthoracic echocardiogram: the estimated systolic pressure in the pulmonary artery is 45 mmHg and is considered mild PAH.

Discussion

COVID-19 is a disease resulting from viral infection, with manifestations mainly in the respiratory system, but which, in its severe form, can evolve with multisystemic involvement. The entry of Sars-CoV-2 and its viral replication in cells occurs through its binding with angiotensin converting enzyme II (ACE 2) receptors, found in greater quantities in cardiac and lung tissue, which may explain the evolution to severe acute respiratory syndrome, myocarditis and myocardial dysfunction [9,10].

In the heart, the involvement of these receptors causes a negative regulation and an imbalance of these enzymes, with angiotensin II predominating over angiotensin 1, promoting the production of free radicals and inflammation, endothelial damage, hypoxia and myocardial interstitial fibrosis. In some cases, myocardial damage results from both direct and indirect damage to cardiomyocytes, caused by the systemic inflammatory reaction, resulting in myocarditis, reduced systolic function and tachyarrhythmias [10,11].

As for the immune system, the predominance of the immune response of T-helper 2 cells over T-helper 1 increases the susceptibility to viral infections during pregnancy. They also cause tissue thromboplastin release, venous stasis and decreased fibrinolytic activity, predisposing thromboembolic events, which can be accentuated by cardiorespiratory changes typical of this period. The combination of these phenomena, added to an accentuated inflammatory process in COVID-19, result in an overall risk of maternal and fetal complications, such as premature birth, increased number of cesarean sections, pre-eclampsia, structural changes, fetal heart rhythm and perinatal death [9-12].

In the case reported here, the absence of fetal echocardiography during maternal symptoms may have delayed the diagnosis, performed 3 weeks after the onset of symptoms. However, the period of convalescence of COVID-19 is uncertain, especially in this population, as well as its possible repercussions, which may justify the evolution of cardiac fetal alterations despite the remission of the maternal clinical condition. The use of propranolol was useful in controlling heart rate, and we believe that it has also been useful in preventing the progression of cardiac damage [12,13].

Another fact that draws attention in this report is the fact that the pregnant woman did not develop the severe form of the disease, which requires oxygen supplementation, mechanical ventilation, or anticoagulants. However, the fetus had serious and potentially fatal repercussions, which could have gone unnoticed given the remission of maternal symptoms. Therefore, pregnant women diagnosed with COVID-19 should be considered high-risk patients, accompanied by qualified professionals, receiving frequent reassessments and adequate laboratory evaluation. Despite the good sensitivity of obstetric morphological ultrasonography in screening for cardiovascular alterations, fetal echocardiography is essential in the onset of symptoms, in the convalescence phase, and for control when alterations are identified [14].

Conclusion

Although there are still no specific therapies with proven efficacy for the treatment of SARS-CoV-2 infection and its repercussions, especially in pregnant women, the early diagnosis of fetal alterations and the adequate treatment when available is essential to change the prognosis and evolution of the pregnancy in these patients.

Bibliography

1. Carvalho HT, *et al.* "Diagnóstico e tratamento da síndrome inflamatória multissistêmica temporalmente relacionada à COVID-19 em adolescente: relato de caso". *Residência Pediátrica* 11.1 (2020): 1-5.
2. Ramos RT, *et al.* "Aspectos respiratórios da COVID-19 na infância: o que no pediatra precisa saber?" *Residência Pediátrica* 10.2 (2020): 1-15.

3. Yagnin PJ, *et al.* "Pediatric characteristics of 2019 novel coronavirus: review of available published literature". *Clinical Pediatrics* 59.9-10 (2020): 849-852.
4. Badr DA, *et al.* "Are clinical outcomes worse for pregnant women at ≥ 20 weeks' gestation infected with coronavirus disease 2019? A multicenter case-control study with propensity score matching". *American Journal of Obstetrics and Gynecology* 223 (2020): 764.
5. Metz TD, *et al.* "Disease Severity and Perinatal Outcomes of Pregnant Patients With Coronavirus Disease 2019 (COVID-19)". *Obstetrics and Gynecology* 137 (2021): 571.
6. Qeadan F, *et al.* "The risk of clinical complications and death among pregnant women with COVID-19 in the Cerner COVID-19 cohort: a retrospective analysis". *BMC Pregnancy Childbirth* 21 (2021): 305.
7. Schwartz DA. "An Analysis of 38 Pregnant Women With COVID-19, Their Newborn Infants, and Maternal-Fetal Transmission of SARS-CoV-2: Maternal Coronavirus Infections and Pregnancy Outcomes". *Archives of Pathology and Laboratory Medicine* 144.7 (2020): 799-805.
8. Organização Pan-Americana da Saúde / Organização Mundial da Saúde. Alerta Epidemiológico Complicações e sequelas da COVID-19. 12 de agosto de 2020, Washington, D.C.: PAHO/WHO (2020).
9. Avila WS and Carvalho RC. "COVID-19: A New Challenge in Pregnancy and Heart Disease". *Arquivos Brasileiros De Cardiologia* 115.1 (2020): 1-4.
10. Scholz JR, *et al.* "COVID-19, Renin-Angiotensin System, Angiotensin-Converting Enzyme 2, and Nicotine: What is the Interrelation?" *Arquivos Brasileiros De Cardiologia* 115.4 (2020): 708-711.
11. Allotey J, *et al.* PregCOV-19 Living Systematic Review Consortium. "Clinical manifestations, risk factors, and maternal and perinatal outcomes of coronavirus disease 2019 in pregnancy: living systematic review and meta-analysis". *BMJ* 370 (2020): m3320.
12. Lokken EM, *et al.* Washington State COVID-19 in Pregnancy Collaborative. "Disease severity, pregnancy outcomes, and maternal deaths among pregnant patients with severe acute respiratory syndrome coronavirus 2 infection in Washington State". *American Journal of Obstetrics and Gynecology* 225.1 (2021): 77.e1-77. e14.
13. Panagiotakopoulos L, *et al.* "SARS-CoV-2 Infection Among Hospitalized Pregnant Women: Reasons for Admission and Pregnancy Characteristics - Eight U.S. Health Care Centers, March 1-May 30, 2020". *Morbidity and Mortality Weekly Report* 69.38 (2020): 1355-1359.
14. De Carvalho HT, *et al.* "Accuracy of obstetric ultrasonography compared to fetal echocardiography in diagnosis of congenital heart disease at a secondary level hospital in Brazil: A pilot study". *Progress in Pediatric Cardiology* (2021): 101420.

Volume 11 Issue 1 January 2022

©All rights reserved by Haroldo Teófilo De Carvalho, *et al.*