Case report

Micro-emboli secondary to deep vein thrombosis as a cause of oxygen desaturation in COVID-19 in pregnancy

J T N Senevirathne[a], P H P de Silva[b], D Amarasekara[c], Y J Costa[d]

Abstract

COVID-19 infection in pregnancy has become a management challenge when it gets complicated with multi-system involvement. Multi-disciplinary inputs with expert opinion play a vital role in managing such patients and to decide the best time for the delivery. In the context of desaturation with absence of deterioration of the pneumonia, micro-emboli from deep vein thrombosis should be suspected early and treated promptly to improve the maternal outcome.

In this article, we hope to report a case of SARS-COV2 infection in pregnancy with multi-system involvement and to discuss our approach to the challenges we faced.

Key words: covid, pregnancy, desaturation, thrombosis, micro-emboli

Case report

A 22 year old, previously healthy, averagely built primiparous woman was presented to us at 34 weeks of period of gestation with one-day history of fever, headache, malaise and mild difficulty in breathing. Clinical examination revealed few crackles in the lung bases with normal haemodynamic parameters and oxygen saturation level of 99% on room air. There was no cough or anosmia. The septic screening revealed highly elevated inflammatory markers (C Reactive Protein 227mg/dl) with a negative antigen test for dengue fever and a positive rapid antigen test for SARS-COV2. She has completed the vaccination schedule for COVID-19 with 3rd booster dose from the Pfizer-BioNTech vaccine.

Fetal parameters were normal, with gestation-appropriate estimated fetal weight. With the diagnosis of sepsis due to possible covid pneumonia, she was commenced on treatment with intravenous antibiotics (Meropenum). However, after few hours of admission, she developed tachypnoea and dyspnoea with normal

Sri Lanka Journal of Obstetrics and Gynaecology 2022; **44:** 239-243

DOI: http://doi.org/10.4038/sljog.v44i4.8075

[a] *Trainee in MD in Obstetrics and Gynaecology (2nd year registrar), Obstetrics and Gynaecology Unit, Colombo North Teaching Hospital, Ragama, Sri Lanka.*

[b] *Clinical Professor in Obstetrics and Gynaecology, Obstetrics and Gynaecology Unit, Colombo North Teaching Hospital, Ragama, Sri Lanka.*

[c] *Consultant Physician, Clinical Medicine Unit, Colombo North Teaching Hospital, Ragama, Sri Lanka.*

[d] *Consultant Haematologist, Clinical Haematology Unit, Colombo North Teaching Hospital, Ragama, Sri Lanka.*

Correspondence: JTNS, e-mail: tharikanadee@gmail.com

https://orcid.org/0000-0003-2993-4555

Received 7th February 2023
Accepted 9th February 2023

haemodynamic parameters. Her oxygen saturation level dropped to 96% on air requiring oxygen via face mask. Considering the fair maturation of the fetus and the maternal condition with the likelihood of being deteriorating further, we decided to deliver the fetus by a caesarean delivery along with consultation of necessary multidisciplinary inputs. She maintained oxygen saturation level with face mask oxygen throughout the intra-operative period. The baby with the APGAR score of 1^{10}, 5^{10}, 10^{10}, weighing 2150 grams, was taken over to the neonatology unit for care and observation.

The mother was taken to ICU for care with strict monitoring along with universal precautions to avoid cross-infection amidst the background of covid infection.

Her respiratory symptoms and dyspnoea improved following the delivery, and oxygen saturation levels were maintained at 99% with venturi mask oxygen (25L/min). However, after a few hours from delivery, she developed signs of shock. Though the initial chest x-ray imaging revealed insignificant changes, she was managed as a case of organ dysfunction shock due to COVID-19 pneumonia with vasopressors and hydration.

She was commenced on low dose low molecular weight heparin (enoxaparin) for thrombo-prophylaxis on post-partum day two. The venous duplex scans were normal on the second day of surgery.

Concomitant Urosepsis was diagnosed when the results of initial cultures were available. Urosepsis settled with antibiotic therapy. Once the septic shock was on course for resolution, on the postpartum 3rd day, her oxygen saturation levels started to deteriorate with increasing dyspnoea. (SpO_2 94% on 24L/min of oxygen)

Then she was started on high-flow oxygen therapy. Serial chest imaging by x-rays and high-resolution CT imaging didn't show remarkable deterioration of pneumonic consolidation accounting for the deterioration of the oxygen saturation.

The advice of the Physician with very good experience in managing complicated COVID-19 patients in the earlier two waves of the pandemic was taken as a part of the morning multi-speciality care team meeting.

The possibility of pulmonary micro-embolism was postulated. She was then referred for a repeat venous duplex scan on the fourth day postpartum. This showed evidence of bilateral femoral vein thrombosis; proximal deep vein thrombosis (DVT). It confirmed the suspicion of micro pulmonary embolism. She was started on high-dose (therapeutic) enoxaparin therapy at 1mg/kg/day, administered 12 hours apart. (55mg twice daily).

Steroid in the form of dexamethasone was started on the 5th day of postpartum when the sepsis was under control and continued for ten days. She was taken to the ward following seven days of ICU care, and was maintaining oxygen saturation >97% on room air. The baby was handed over for her care and breastfeeding after 2 more days.

Deep vein thrombosis didn't progress any further, and she became clinically well with the initiation of therapeutic enoxaparin. Enoxaparin was gradually bridged with warfarin to keep the target INR at 2.5.

Following 22 days of inward care since the presentation, she was discharged on warfarin along with the healthy baby.

Discussion

COVID-19 infections have recently become a management challenge in pregnancy in the background of the pandemic. Though several guidelines have been introduced and discussed, still the management of complicated cases is in a dilemma[1]. The immunomodulated status of the pregnancy contributes to the higher risk of progression of the illness into infection with adverse complications[1,2]. In addition to that, women with Asian-black ethnicity, body mass index of >25kgm^{-2}, and pre-existing co-morbidities like Diabetes or Gestational Diabetes on Insulin are found to be at increased risk of getting severe illness[1,3,4].

The risk of severe illness rises towards the latter part of the pregnancy. The UKOSS study has shown that the maternal mortality rate is estimated to be increased by 20% in the UK with regard to the pandemic. It has been shown that the number of ICU admissions and adverse outcomes are higher among pregnant women compared to non-pregnant women[5,6]. Therefore consensus on the management of complicated cases with severe multi-organ involvement must be aided by case reports where experienced clinicians have managed different presentations with different approaches[1,7,8].

In this article, we hope to report a case of SARS-COV2 infection in pregnancy with multi-system involvement and to discuss our approach to the challenges we have faced.

Our case highlights the importance of recognising the unpredictable but high chance of deterioration of a patient's condition and resorting to early delivery, where we have a chance to go for less complicated delivery.

When a pregnant patient becomes tachypnoeic and develops early hypoxia with COVID-19 pneumonia, she will experience difficulty compensating for it due to reduced respiratory volumes and functional residual capacity of the lungs due to the gravid uterus. These effects are more pronounced in the third trimester of pregnancy. In the third trimester, the diaphragm gets pushed up due to an expanding gravid uterus making her more vulnerable to the development of hypoxia[1,3,4,5,6,7,8,9,10,11]. This patient, complicated by progressing sepsis (Urosepsis / Pneumonia), had a high chance of developing severe complications like multi-organ failure with shock and death. In such a context, with the possibility of maternal physiology in pending jeopardy, delivery of the fetus was an option as the baby was 34 weeks mature and good enough to survive outside the uterus.

INTERCOVID multinational cohort study has shown that compared to non-pregnant women, pregnant women with COVID-19 infection have a significantly high rate of maternal morbidity, mortality and neonatal complications[3]. As anticipated, our patient, following the delivery, developed signs of septic shock with a progressive decline in blood pressure and urine output. She was progressing to an acute kidney injury with evidence of multi-organ dysfunction.

Had we continued the pregnancy, the fetus would also get affected by possible hypoxia resulting from reduced placental perfusion and would have ended up as a case of an adverse fetal outcome. As we delivered her when she was haemodynamically stable, managing her with no burden from the gravid uterus and fetus was easier for the caring team. They were free to manage the mother only. The baby was healthy and was unaffected by hypoxia which would have developed later.

In pregnancy, the body's clotting mechanisms are shifted towards a hypercoagulability state[12,13]. With the background of major surgery, she was at high risk of internal bleeding from the surgical site. On the other hand, in the context of covid infection and reduced mobility due to unstable haemodynamic status and desaturation, the thrombosis risk was high[14,15]. It has been shown that pregnant women with severe Covid disease have a 6% risk of developing thromboembolic events[16]. However, taking everything into account and further discussions with the multi-disciplinary team, we started thrombo-prophylaxis with low molecular weight enoxaparin on the second postoperative day.

Though we started enoxaparin, she developed bilateral femoral DVT on the 4th day of post-partum, during which she was having a progressive desaturation needing non-invasive positive pressure ventilation. It raised suspicion of the possibility of pulmonary embolus. CTPA imaging and the serial X-ray imaging were negative, excluding a large thrombus in the pulmonary tree. This was in favour of our suspicion of the possibility of micro-emboli in the pulmonary venous system causing Ventilation – Perfusion imbalance. Therefore, we increased the dose of enoxaparin to 1mg/kg two times a day[12,13,15,17]. With that, her condition started to improve gradually, and the femoral DVT also got settled.

This highlights the importance of co-operation among clinicians and the usefulness of past experience in managing similar complex cases. These further highlight the need for thrombo-prophylaxis early when it comes to pregnant women with severe covid infection.

During the course of the illness, another challenging decision was the timing of the commencement of dexamethasone for COVID-19 pneumonia and thrombo-prophylaxis and the decision on the appropriate dose.

Steroid drugs, such as prednisolone, hydrocortisone and dexamethasone, have been shown to improve clinical outcomes in covid pneumonia in the RECOVERY trial[18,19]. The multi-disciplinary team met another challenge regarding the timing of the commencement of steroids in this patient since she had ongoing urosepsis. In the background of the immuno-modulated status of the pregnancy towards suppression of cell-mediated immunity, additional immuno-suppressive action of steroids can lead to a deadly outcome. We had to wait till clinical signs and inflammatory biomarkers start declining in order to commence steroids. Here we used 4mg of dexamethasone per day with an eye on blood sugar control.

Another sticking point noted from the above case is that the management of this patient is done with multi-disciplinary inputs. The senior Obstetrician led and coordinated the team with Senior Physician, Respiratory Physician, Intensivist, Anaesthetist, Haematologist, Nephrologist, Microbiologist and Radiologist. They were involved together in evaluating the patient and decision-making. Several studies and guidelines recommend a multi-disciplinary approach to manage pregnant women with severe illness[1,2,8].

In conclusion COVID-19 infection with multisystem involvement in the background of a pregnancy is a challenging scenario to tackle, which essentially needs a multi-disciplinary approach and several clinical expert inputs. In a clinical scenario such as our case decision on delivery should be contemplated by balancing the maturity of the fetus and the possibility of maternal deterioration (the burden of pregnancy increase the chances of deterioration, and the deterioration damages the fetus). It is paramount to check for secondary causes of sepsis. Sepsis should be looked at, assessed, and treated appropriately.

In case of discrepancy between oxygen desaturation and radiological features of covid pneumonia, the possibility of micro-emboli in pulmonary vasculature becomes an important differential diagnosis. It may not always be possible to identify the focus of emboli when the pelvic veins are the site of thrombosis. Our experience shows that DVT should be suspected and treated early despite normal imaging findings in the absence of other explanations for oxygen desaturation, and there are no contraindications for anticoagulation to facilitate recovery and improve maternal outcomes.

Acknowledgements

All the team members in Multi-disciplinary team for contributing with valuable expert opinions in managing the patient. All the doctors, nursing and health care assistant staffs who were involved in the patient's care. Neonatology team for caring the pre-term baby. Patient and her family members.

Disclosure of interest

None.

Authors contributions

Dr J. T. N. Senevirathne involved in the management of the patient and reporting the case. Dr P. H. P. de Silva was the Senior Obstetrician and Gynaecologist who managed the patient and led the Multi-Disciplinary Team. Dr D. Amarasekara was the Senior Clinical Physician and Dr Y. J. Costa was the Senior Haematologist who were involved in the management.

Details of ethical approval

Not obtained as this is a case report. The consent of the patient was obtained by the authors, following detailed explanation of the publications ensuring that her privacy is preserved.

Funding

None.

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