Considerations Anesthesia Management for Cesarean Section in Pregnancy With COVID 19 - Severe ARDS:A Case Report

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Abstract

Background: Corona Virus Disease 2019 (COVID-19), caused by Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2), was labeled a Public Health Emergency of International Concern (PHEIC) by the World Health Organization (WHO) on January 30, 2020. SARS-CoV-2, a new type of enveloped RNA RNA virus, can be transmitted from human to human through droplets and contact. As of May 27, 2020, more than 5.6 million confirmed cases have been documented globally, with over 350,000 deaths. Anatomical, physiological changes in pregnancy, especially in the cardiorespiratory system, make pregnant women more susceptible to COVID-19 infection and cause more serious complications. Severe ARDS is a form of manifestation that often occurs in the peripartum period. Severe complications in pregnancy such as premature birth, fetal death in utero, intensive care unit have been reported. **Case:** A 31 Year old female with 3rd pregnancy, 26-27 weeks of gestation, accompanied by a locus minoris, a former cesarean section infected with severe COVID-19 with ARDS, complaining of reduced fetal movement after undergoing treatment in the covid isolation room for 24 hours and successful management of anesthesia with regional subarachnoid block anesthesia. **Conclusion:** In perioperative management, especially in optimizing the cardiorespiratory system, professionals in anesthetic management and multidisciplinary cooperation are important in managing this patient.

Keywords: Anesthesia, cesarean delivery, COVID-19, pregnancy, spinal anesthetic.

1. Introduction

World Health Organization (WHO) declared the outbreak of COVID-19 on January 30, 2020. The coronavirus SARS-CoV-2 made the respiratory disease a sixth public health concern international emergency international (Akhtar et al., 2020). Decreased immunity women's pregnancy and their fetuses are more susceptible to COVID-19 infection. The UK Obstetric Surveillance System (UKOSS) reports cases of COVID-19 in pregnant women presenting to the hospital. One hundred forty-eight pregnant women with COVID-19 came to the hospital, 63% with clinical symptoms and 5% requiring intensive care, with a mortality rate of 2.2-2.4 per 100,000 pregnancies (Knight et al., 2020). Maternal mortality with COVID-19 infection is partly due to respiratory complications during delivery, and neonatal and intrauterine deaths have been reported in several studies (Karimi-Zarchi et al., 2020; Zaigham and Andersson, 2020).

During pregnancy, the immune system has a risk of susceptible infection to maternal and neonatal complications, which can be coagulopathy intravascular, premature birth, endotracheal intubation,

spontaneous abortion, restriction of intrauterine growth, and hospitalization in the intensive care unit, renal failure, and transmission to the fetus or newborn. Knowledge of the pathogenesis, disease progression, and the effects of COVID on pregnancy is a challenge in managing anesthesia during cesarean section delivery (Harenberg et al., 2020).

This case report describes the success of perioperative management and regional anesthesia of subarachnoid block in a female patient in the third trimester of pregnancy infected with COVID-19 with severe ARDS who underwent cesarean section. This case report aims to obtain additional information regarding perioperative considerations and anesthesia in pregnant patients with severe COVID-19 infection.

2. Case Report

The patient is a 31-year-old female with 3rd pregnancy, 26-27 weeks of gestation, accompanied by a locus minoris, a former cesarean section infected with severe COVID-19 with ARDS, complaining of reduced fetal movement after undergoing treatment in the covid isolation room for 24 hours. The patient also complained of shortness of breath ten days before entering the hospital and getting better since being hospitalized. On perioperative physical examination, he was aware of compost mentis, blood pressure 124/70 mmHg, pulse rate 98x per minute, lifting strength, respiratory rate 24 times per minute, symmetrical chest wall movement, 96% peripheral saturation, breath sounds with crackles in both lung fields. The blood gas analysis results were PH 7.40, PCO2 25.6 mmHg, PO2 107.30 mmHg, BE -9.4 mmol/L, HCO3 15.40 mmol/L, SO2 98% with HFNC FiO2 70% with a flow of 30 liter/minute. Cito Bed obtained pneumonia, cardiomegaly, deformity of the right clavicle 1/3 lateral suggest an old fracture meaning.

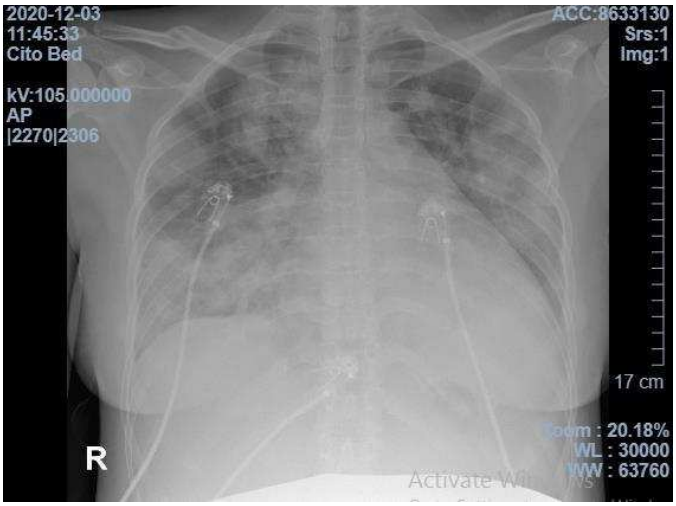

Figure 1. AP Patient's Thorax Photos

The process of transporting patients from the isolation room to the operating preparation room has met the standard using PPE level 3. During the perioperative evaluation in the preparation room, blood pressure

was 123/78 mmHg, pulse 92 x/minute, respiratory rate 23 x/minute, SpO2 98% with HFNC FiO 70%, flow 30 pm, fetal heart rate 162 x/minute and ensure that the infusion flows smoothly. Routine preparation of STATICS, anesthesia machine, emergency medicine, anesthetic drugs, ready-to-use blood, spinal sets, warmer infusion in the operating room was carried out. The patient was predated on ondansetron 4 mg intravenously and ranitidine 50 mg intravenously. Subarachnoid block was performed at L2-L3 with bupivacaine heavy 0.5% 12.5 mg sitting by maintaining optimal oxygenation. Administration of other drugs oxytocin 40 IU IV drip and tranexamic acid 1000 mg IV.

The operation lasts for 1 hour 20 minutes, hemodynamic fluctuations in blood pressure 98 - 116 / 67 - 83 mmHg, pulse frequency: 82-93 x / minute, respiratory rate: 26-29 x / minute, SpO2: 97 - 99% with fluid intake crystalloids: 1500 mL and 500 ml of fluid come out in the form of bleeding, 50 ml of urine output. The baby girl was born prematurely with an Apgar score of 7/8 birth weight of 1270 grams and die after 24 hours of treatment in the NICU (Neonatal Intensive Care Unit). After Postoperation, the patient was again treated in the isolation room with 20 mg of oxycodone in 20 ml of 0.9% NaCl at a 0.6 ml/hour rate via an IV syringe pump and 500 mg of paracetamol every 6 hours orally. During treatment in the isolation room, the patient's condition improved, and she was then sent home on the 14th day

Figure 2. Process regional subarachnoid block anesthesia to patient

3. Discussion

This report a 31-year-old woman with G3P2002, 26-27 weeks with COVID-19 infection with ARDS. Patients with complaints of shortness of breath ten days before admission to the hospital accompanied by fever, dry cough, nausea, and vomiting were then treated in the isolation room. During treatment, the patient complained of decreased fetal movement. Examination of the fetal heart rate showed a fetal heart rate of 170x/minute and a non-reactive NST, then termination by cito operation cesarean section.

COVID-19 infection in two-thirds of pregnancies is asymptomatic. Severe symptoms are more often seen in late pregnancy (trimester 3). The UK Obstetric Surveillance System (UKOSS) study studies mostly pregnant women hospitalized in the peripartum period. Symptomatic COVID-19 was mostly diagnosed in the

3rd trimester: 83% at 28 weeks, 52% at 37 weeks. Most of the symptoms of COVOD-19 infection in pregnant women were cough (41%), fever (40%) and some small with difficulty breathing (14%), myalgia (14%), loss of taste (15%), and diarrhea (6%) (Chen et al., 2020).

RNA virus transmitted by droplet from SARS COVID-19 is an encapsulated, direct contact, and aerosol. The nose enters and then infects lung cells by binding to the angiotensin-converting enzyme 2 (ACE2) receptor and using transmembrane serine protease 2 (TMPRSS2) as priming protein S. SARS-Cov-2 infection is followed by viral replication and release. The virus then causes severe inflammation of the host cell, causing a cytokine storm, resulting in the failure of multiple organ systems. Inflammation is caused by the entry of the virus and then attracts cluster differentiation 4 T cells (Th1 CD4 +) to prevent the spread and replication of the virus. In addition, the virus will also inhibit neutralizing antibodies and macrophages that neutralize apoptotic fiber viruses by phagocytosis (Chen et al., 2020).

Physiological changes and immunological responses are caused by anatomical, immunological, and hormonal changes during pregnancy. During pregnancy, the immune system adapts to allow for semi-allogenic fetal growth, resulting in an altered immune response to infection (Chen et al., 2020). A shift in CD4 (Th1<Th2) cells, a decrease in natural killer (NK) cells, a decrease in plasmacytoid dendritic cells (pDcs) that produce Th1, an increase in the hormone progesterone, which suppresses virus- and CD8-specific antibodies, and changes in the innate immune system occur during pregnancy. This is thought to make pregnancy more susceptible to SARS virus infection (Wastnedge et al., 2021; Xia et al., 2020).

Anatomical and hormonal changes cause changes in the physiology of the respiratory system in pregnancy. Respiratory resistance increases while respiratory conductance decreases during pregnancy. Lung and airway resistance tend to decrease in late pregnancy due to the smooth muscle relaxation of the tracheobronchial tree induced by the hormone progesterone in pregnancy. In the third trimester, diaphragmatic elevation is compensated by an increase in the anteroposterior diameter of the chest cavity so that diaphragmatic movement is limited, resulting in decreased expiratory reserve volume and then 20% FRC. Increased hydrostatic pressure from 14% to 21% consumed oxygen made infection COVID-19 to severe complications in pregnancy (Chen et al., 2020; Dennis and Solnordal, 2012; LoMauro and Aliverti, 2015).

On physical examination, investigations, and the PaO2/FiO2 ratio, it was concluded that this patient had severe ARDS. Deaths in COVID-19 are mostly caused by acute respiratory distress syndrome (ARDS). As many as 33% of pregnant women infected with COVID-19 experienced ARDS, of which 20% showed severe ARDS symptoms (Chong et al., 2020; Pelayo et al., 2020). Emerging evidence suggests that pulmonary endothelial cell dysfunction has an important role in the onset and progression of ARDS.

In the perioperative period in the isolation room, the patient showed tachypnea with a respiratory rate of 24 breaths per minute, oxygen saturation of 98%, wet crackles in both lung fields using HFNC FiO 70%, and flow of 30 pm. HFNC is highly efficient at preventing intubation and complications. Caroline et al. reported 47.5% of COVID-19 patients with ARDS did not require ventilatory support with low mortality, so the use of HFNC is the main choice in the management of ARDS (Panadero et al., 2020).

Besides ARDS damage to the pulmonary capillary endothelium, patients infected with COVID-19 risk thromboembolism, namely pulmonary embolism, and Deep Vein Thrombosis (DVT). A meta-analysis study reported that pulmonary embolism and DVT occurred in 16.5% and 14.8% of patients infected with COVID-19. Some patients with PE had DVT.(Goldhaber and Piazza, 2012) Increasing cytocine proinflamation classic

TNF-α and IL-1β, which have prominent effects on the endothelium, where TNF-α facilitates the development of a procoagulant endothelium by increasing the expression of endothelial cellular adhesion molecules and genes critical for coagulation, such as tissue factor and decreased thrombomodulin, resulting in a pro-thrombotic state Pregnancy with COVID-19 has additional or synergistic risk factors for thrombosis. This hypothesis is supported by a case report describing the death of a 29-week gestational woman with COVID-19 from large pulmonary embolism and basilar artery embolism. Gestational thrombocytopenia occurs in pregnancy caused by increased circulation (hemodilution) and increased destruction, followed by severe compensation, namely an increase in clotting factors (factors VII, VIII, IX, and fibrinogen) by more than 100% (Zhao et al., 2020).

In some cases, a correlation was found between thrombocytopenia and COVID-19 infection. A third of patients infected with COVID-19 experienced thrombocytopenia, and a reduced number of platelets correlated with the severity of COVID-19 infection in these patients (Ramanathan et al., 2020). The acute viremia in Coronavirus disease causes the enactment of monocytes/macrophages that produce cytokines, for example, interleukin-6 (IL-6) and growth corruption factor (TNF), which might set off the blood coagulating course. Immunothrombosis depicts the cycle by which an incendiary response, hypoxia, and nearby articulation of tissue factor result in pneumonic microvascular apoplexy, which is possible a supporter of the dynamic respiratory brokenness that creates in patients with SARS-CoV-2 disease.

The pregnancy vascular maternal adaptation is critical for optimal pregnancy outcomes. Peripheral vascular resistance will decrease since the beginning of the first trimester, which is part of uteroplacental shunting and decreased pressure response due to sodium retention by up-regulation of renin-angiotensin II (Adam, 2017). The uteroplacental circulation increases maternal blood volume and heart rate, increasing stroke volume and cardiac output by 30-50% and decreasing vascular resistance. In the early phase of COVID-19 infection, peripheral resistance increases due to increased production of inflammatory mediators and production of norepinephrine due to sympathetic overstimulation and downregulation of angiotensin II and then later in his journey experiencing vasodilation caused by suppressed production of endothelial nitric oxide synthase and cyclooxygenase 1 by TNF-α (Hajjar et al., 2021; Liu et al., 2020). Damage to the vascular endothelium caused by the inflammatory process will increase the permeability of the vessels so that there is a shift of fluid from intravascular to extracellular, which causes a decrease in intravascular volume (hypovolemia). Uncorrected hypovolemia will lead to organ hypoperfusion and exacerbate thrombin formation leading to severe coagulopathy in COVID-19. So it is very important to do a fluid test response assessment (Hajjar et al., 2021; Samji and K R, 2020). Patients who report no fluid response tests assess fluid adequacy with clinical and laboratory parameters that indicate these patients are normovolemic. In the case reported showing a stable hemodynamic stable durante surgery then with vascon up to 0.2 mcg/kgBB/minute intravenously up to 72 hours.

Current guidelines recommend that all pregnant women with confirmed COVID-19 undergo thromboprophylaxis up to 10 days postpartum (Bauer et al., 2020). Considering the long duration of action of the drug, fewer side effects of thrombocytopenia, easier monitoring, and less exposure to health care providers, LMWH administration is the method of choice for thromboprophylaxis (Fonseca et al., 2020). In this case report, the results of the d-dimer examination increased three times above normal, which means thrombosis has occurred, then homeoprophylaxis with LMWH Lovenox 0.6 every 12 hours subcutaneously from the first day of hospital admission until ten days after surgery.

Consideration of the choice of anesthetic technique gets special attention in the action of cesarean section in pregnancies with COVID-19 infection with severe ARDS. Choosing an anesthetic technique for a cesarean section is based on various factors. Ensuring adequate oxygen transport to the tissue level without compromising the performance of cardiovascular and pulmonary functions and suppressing transmission to the operating team is very important to note. Regional neuraxial central anesthesia is the anesthetic technique of choice. So far, there are no absolute contraindications. A regional anesthetic subarachnoid block is preferred to avoid aerosol contact and reduce pain scores and opioid requirements, reducing the risk of nausea and vomiting, aspiration, and difficulty in airway management compared to general anesthesia (Hutton et al., 2018). The risk of transmitting upper airway infection to health care workers is 6.6 times greater in intubation than without endotracheal intubation (Tran et al., 2012). Omar et al. reported in an observational study. There were no significant differences in pulse rate, systolic blood pressure, diastolic blood pressure, mean arterial pressure, and the birth of a COVID-19 positive baby with subarachnoid block action in cesarean section COVID-19 compared to the group control (Ababneh et al., 2022). Antiplatelet administration before subarachnoid block action needs attention, where a subarachnoid block is safe to do 4-6 days after unfractional heparin administration and 12 hours after LMWH administration. In this patient, the subarachnoid block was performed more than 12 hours after LMWH administration, with platelets, PT, APTT, and INR still within normal limits.

In addition to perioperative management, anesthesiologists should prevent the spread of infection from the mother to hospital staff and her baby (Nasr, 2021). Adequate precautions have been taken to prevent the spread of infection when transferring patients to and from the dedicated OR/perioperative room. All personnel wears appropriate biosafety level 3 (BSL 3) protective clothing during operations, including protective clothing, N95 masks, disposable caps, goggles, and rubber gloves by preparing a personal protective equipment checklist. The reception and recovery rooms should be negative pressure rooms. Prepare a COVID-19 kit in the operating room to prevent contamination of drugs used during surgery (uterotonic agents, vasopressors, narcotics for intrathecal administration, and antiemetics). Deep sedation is avoided in these patients to avoid airway manipulation. Giving antiemetics to prevent vomiting in patients with a cesarean section with COVID-19 is highly considered considering aerosol transmission can occur during choking and vomiting.

As is known, the influence of anatomical and hormonal changes will reduce pH and inhibit gastric emptying. Female sex, not smoking, hypotension, use of opioids, use of uterotonic drugs, manipulation of the uterus and peritoneum, up-regulation of parasympathetic, motion sickness are the things that cause nausea and vomiting threshold of pregnant women to be lower. In addition to fasting in the perioperative period, premedication H2 blockers and metoclopramide were given. The patient was given ondansetron 4 mg and ranitidine 50 mg intravenously. As is known, the influence of anatomical and hormonal changes will reduce pH and inhibit gastric emptying. Female sex, not smoking, hypotension, use of opioids, use of uterotonic drugs, manipulation of the uterus and peritoneum, up-regulation of parasympathetic, motion sickness are the things that cause nausea and vomiting threshold of pregnant women to be lower. In addition to fasting in the perioperative period, premedication H2 blockers and metoclopramide were given. The patient was given ondansetron 4 mg and ranitidine 50 mg intravenously. As is known, the influence of anatomical and hormonal changes will reduce pH and inhibit gastric emptying.

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Durante surgery meets the patient's oxygen needs using HFNC 70% 30 liters per minute. STATIC equipment is applied if necessary during the operation. Endotracheal intubation is necessary if the mother has the following conditions: the patient becomes restless or loses consciousness, the patient feels uncomfortable, the respiratory effort increases >30 breaths/minute, the pulse increases >120 beats/minute, excessive use of accessory muscles of respiration. From the assessment of oxygenation using HFNC >30 liters/minute or NIV and FiO2 >60% unable to maintain SpO2 >92% (95% with comorbid). In this case, the operation lasted for 1 hour 20 minutes, and the cardiovascular and respiratory conditions were stable during the operation.

Postoperative pain management in COVID-19 patients includes local infiltration, transversus abdominis plane block, epidural analgesia, or paracetamol are suggested (Jennifer L, 2020)In this patient, continuous intravenous opioids were given, and paracetamol was given orally. The use of opioids in pain management in patients infected with COVID-19 is still controversial. However, some studies state that in vivo and in vitro administration of opioids is immunosuppressive through different mechanisms.

4. Conclusion

The number of COVID-19 cases globally reached 1.963.943 globally and caused 123.635 deaths. Pregnant women have a high risk of being infected with a fairly high case fatality rate for the mother and fetus. This is caused by anatomical, physiological, and hormonal changes, especially those related to immunity, respiratory function, cardiovascular, and hematology. WHO-China report of 147 COVID-19 cases with pregnancy, 8% had severe respiratory disorders (tachypnea with RR more than 30 breaths per minute, oxygen saturation less than 93%, and Pao2/FiO2<300 mmHg) (Ramanathan et al., 2020).

The management of perioperative anaesthetics and consideration of the selection of anaesthetic techniques requires attention, for the safety of patients and the operating team. As long as respiratory function can be maintained optimally, which is considered sufficient to deliver oxygen to tissue levels in pregnancy with ARDS, central neuraxial blocks such as subarachnoid blocks are preferred over general anesthesia because of the increased risk of transmitting upper airway infection to the operating team.

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