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Anesthesia Management for a Twin Pregnancy with Type B Aortic Dissection: A Case Report

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Abstract

Pregnancy complicated by aortic dissection is relatively rare, and the mortality rate among pregnant women with aortic dissection is extremely high, posing a significant challenge to surgeons and anesthesiologists. This case reports the pathogenesis, surgical timing, anesthetic selection, anesthetic monitoring, induction, and management considerations of type B aortic dissection in twin pregnancies.

Keywords

Aortic Dissection, Twin Pregnancy, Cesarean Section, Anesthetic Management, High-Risk Obstetrics

Introduction

Aortic dissection is a cardiovascular disease with a very high mortality rate. It refers to the tearing of the aortic intima, which can be caused by various factors. This leads to blood entering the cystic intermediate layer of the aorta through the opening in the vascular intima, causing the aorta to peel and tear upwards or downwards, forming a dissection hematoma. Further expansion may cause the aorta to rupture. Daily et al. of Stanford University classified thoracic aortic dissection into two types: Type A, which involves the ascending aorta regardless of the origin of the dissection, and Type B, which originates from the descending thoracic aorta and does not involve the ascending aorta. According to the statistics of the European Heart Association, the annual incidence rate of aortic aneurysm and aortic dissection is 5/100000–10/100000, and the global case fatality rate is about 2.78/100000 [1-3].

Pregnancy complicated by aortic dissection is relatively rare, with an incidence rate of 0.4/100000 [4]. However, this condition is dangerous and progresses rapidly, resulting in extremely high maternal and neonatal mortality rates. Anesthesia for pregnant women requires careful consideration of maternal and fetal safety, as well as the selection of appropriate drugs and doses, taking into account physiological changes in the mother. Therefore, the anesthetic management of pregnant women complicated by aortic dissection is very important.

Case Presentation

A 37-year-old female patient (weight: 85 kg; height: 159 cm) with a twin pregnancy at 32 weeks' gestation

was admitted to the hospital due to radiation pain in her lower back lasting 10 hours. Aortic dissection CT revealed an aortic dissection with an initial tear in the aortic arch and suspected involvement of the origin of the left subclavian artery superiorly, as well as the thoracoabdominal aorta extending to the bifurcation of the abdominal aorta inferiorly. The true lumen was small, while the false lumen was large. The abdominal aorta, mesenteric artery, and left renal artery all originated from the false lumen. The right renal artery originated from a mixed lumen, while the superior mesenteric artery originated from the true lumen. Left renal perfusion was delayed.

A full abdominal MRI scan revealed that the intimal flap of the abdominal aorta had moved inwards, presenting as a double lumen with a small true lumen and a large false lumen. The dissection appeared to extend to the bifurcation of the abdominal aorta. It was unclear from the MRI plain scan whether major branches such as the celiac trunk, superior mesenteric artery, bilateral renal arteries, bilateral common iliac arteries, and internal and external iliac arteries were involved in the dissection. Notably, the patient's mother had died of aortic dissection. The patient was found to have elevated blood pressure four days prior and was now diagnosed with a twin pregnancy and aortic dissection at 32 weeks' gestation. Following consultations with multiple departments—including Anesthesia, Vascular Surgery, Cardiac Surgery, Radiology, Obstetrics, and Neonatology—it was concluded that the patient had Stanford type B aortic dissection and may require a caesarean section.

Once in the operating room, the patient's heart rate was monitored using an electrocardiogram, while oxygen saturation and non-invasive blood pressure were monitored using a separate device. The baseline heart rate was 82 beats per minute (bpm), the oxygen saturation was 99%, and the blood pressure was 138/83 mmHg. Humanistic care was provided to reduce the patient's anxiety and maintain emotional stability.

After a local anesthetic containing lidocaine had been administered, ultrasound-guided arterial and venous punctures were performed while the patient inhaled pure oxygen through a mask to ensure adequate oxygenation and nitrogen removal. Anesthetic, rescue, and vasoactive medications were prepared, and the anesthesia machine, suction device, and laryngoscope were checked to ensure they were in working order. Meanwhile, the obstetrician prepared the surgical supplies. Neonatologists and cardiac surgeons were on standby in the operating theatre throughout the procedure to ensure the safety of the patient and fetus.

Once preparations were complete, the anesthetist performed a rapid sequential induction and administered 80 mg of propofol intravenously. Once the patient had lost consciousness, 100 mg of succinylcholine and 100 μg of remifentanil were administered intravenously in sequence. After the muscle relaxant had taken effect, a visual laryngoscope was used to fully expose the glottis, and a 7.0 mm reinforced tracheal tube was inserted. A continuous infusion of propofol and remifentanil was used to maintain anesthesia, ensuring sedation and analgesia throughout the surgery.

Following the delivery of the fetus, 30 μg of sufentanil and 8 mg of vecuronium bromide were administered. Vasoactive drugs were used during the procedure to maintain the patient's blood pressure within ±20% of the baseline level. Following surgery, the patient was admitted to the intensive care unit (ICU) for monitoring, while the newborn was admitted to the neonatal ICU for further treatment. While in the ICU, the patient was successfully extubated, with blood pressure fluctuating between 120 and 140 mmHg. A postoperative ultrasound scan showed that the aortic dissection had not worsened since the preoperative scan.

Discussion

The mortality rate among pregnant women with aortic dissection is extremely high, presenting a significant challenge to surgeons and anesthetists. It is crucial to prioritize the safety of both the mother and the fetus. The aim is to maximize fetal development and maturation in the uterus while ensuring maternal safety. The timing of surgery is critical and depends on the maturity of the fetus, the type of aortic dissection, and whether the mother has hemodynamic changes or symptoms of organ ischemia [5]. Stephanie L et al. recommend performing a caesarean section and aortic

surgery simultaneously after 30 weeks of gestation. Before 28 weeks of gestation, the decision to repair or replace the aortic dissection should be based on fetal preservation. Between 28 and 30 weeks of gestation, the decision to terminate the pregnancy and initiate appropriate treatment should be based on the impact of the condition on both the mother and fetus [2].

In this case, the patient's aortic dissection is Stanford type B, with no hemorrhage, bifurcation, or organ ischemia. However, the patient had symptoms of hypertension and chest pain, and the fetus was at 32 weeks' gestation with lung maturation completed. Therefore, only caesarean section was performed, and aortic dissection repair surgery was not undertaken at this time.

During pregnancy, a mother's body undergoes significant anatomical and physiological changes to carry and nourish the fetus. Studies have shown that pregnancy can exacerbate aortic dissection due to increased circulating blood volume (by approximately 50% at 34 weeks) and weakening of the aortic connective tissue caused by elevated estrogen levels [6,7]. During childbirth, severe fluctuations in blood pressure may result from multiple factors, including maternal anxiety, increased venous return during uterine contractions, blood pressure elevations from surgical stimulation and pain, and increased intrathoracic pressure from breath-holding. These changes can further tear the aorta, leading to rupture. Therefore, maintaining stable hemodynamics and avoiding significant circulatory fluctuations is paramount in the perioperative period.

Regional and general anesthesia have both been used for emergency caesarean sections in patients with aortic dissection [8-10]. In this case, general anesthesia was rapidly induced, and intubation was performed using visualization technology. Due to anatomical changes in pregnancy, there is a high risk of reflux aspiration during induction of general anesthesia, and structural changes in the oral and pharyngeal cavities may result in difficult airways. Intubation under visualization improves vocal cord exposure, reduces patient stimulation, and minimizes hemodynamic fluctuations.

It is important to note that the choice of general anesthetic agents directly influences surgical outcomes for the mother and the incidence of respiratory depression in the fetus. Therefore, short-acting agents with rapid onset and short half-life that do not easily cross the placenta should be preferred. In this case, propofol, succinylcholine, remifentanil, and sufentanil were used to block the sympathetic response during intubation and surgical incision.

During induction, hemodynamic instability and volume depletion may occur. Therefore, we performed invasive arterial monitoring and established large-bore IV access under local anesthesia and ultrasound guidance prior to induction. Given the low likelihood of requiring vasoactive drugs during this surgery—and considering that central venous puncture may exacerbate aortic dissection—we decided against performing a central arterial puncture. A neonatologist remained present throughout the operation, ready to perform neonatal cardiopulmonary resuscitation in the event of fetal respiratory depression.

Surgery for caesarean sections involving pregnancies complicated by aortic dissection is complex and high-risk. It requires anesthetists to work closely with multidisciplinary teams—such as those specializing in cardiology, obstetrics, neonatology, and intensive care—to develop personalized treatment plans. Anesthesia for this type of surgery must prioritize the safety of both the mother and the fetus. Appropriate anesthetic techniques and drugs should be selected to stabilize the mother's aortic dissection while minimizing the risk of postpartum respiratory depression in the fetus. Visualization technology should be employed to reduce the harmful stimulation caused by endotracheal intubation, arterial puncture, and venipuncture. Maintaining stable hemodynamics is vital to ensure a safe outcome for both the mother and the fetus during this critical period.

Contribution

Dr. Xueli Zou contributed significantly to Data collection and literature search, and shares equal responsibility for the core findings of this work. Their contributions merit shared first authorship alongside "Zou Qian".

Conflict of Interest

The authors have read and approved the final version of the manuscript. The authors have no conflicts of interest to declare.

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