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Anaesthetic Management in a pregnant patient with Acute Type B Aortic Dissection; A case report

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ABSTRACT

Aortic dissection is rare but fatal disaster during pregnancy, which is principally caused by the physiologic changes in pregnancy. It needs to make a integrative treatment strategy and define the time and method of procedure to save the life of mother and fetus. We present a healthy young pregnant woman in the early second trimester, diagnosed as a aortic dissection type B. She underwent a successful emergent termination of pregnancy under general anesthesia and then followed up by medical therapy that led uneventful postoperative course.

Key words: Aortic dissection, Pregnancy, General anesthesia, Hysterotomy

INTRODUCTION

Aortic dissection in pregnancy is extremely rare but It can threaten both mother and fetus's life, and can be undiagnosed until the lethal event. [(1)] prevalence of Aortic dissections in pregnant women account for 0.1–0.4% of all dissections and was reported 0.0004% of all pregnancies. [(2)] Type B aortic dissection (TBAD) accounts for 30% of AD during pregnancy. [(3)] Fifty percent of these events in pregnancy occur in women under 40 years of age, particularly in the third trimester, or in the postpartum period.[(4)] However aortic complications usually associated with collagen diseases such as; Marfan syndrome, Ehlers-Danlos syndrome, bicuspid aortic valve, and Turner syndrome; inflammatory disorders leading to vasculitis like giant cell arteritis, Takayasu arteritis, rheumatoid arthritis; and a family history of aortic dissection and preexisting aortic aneurism.[(4,5)] , but it can occur in the pregnant women without any established risk factors. [(6)] In this regard prompt diagnosis and treatment are essential for improvement of mother and fetus outcome.

Case report

We presented a 37-year-old woman gravid 1-para 0 at 17 weeks of gestation presented with a spontaneous onset of chest pain that was associated with breathlessness. On arrival the hospital her blood pressure was 140/90 mmHg, oxygen saturation was 93% on room air, and other vital signs were normal. Electrocardiography showed sinus rhythm, and laboratory data were in the normal range. The patient hand not past medical history, but there is an indeterminate cardiac disease in her family.

Transthoracic echocardiography, led to preserved systolic function, normal ejection fraction (EF = 50%), no AI no AS, diameter of the aorta= 3.9 cm and aortic root was 2.9cm, but a dissection flap was seen in the

abdominal aorta.

Computed tomography angiography (CTA) showed intimal flap that originated from proximal of descending thoracic aortic to distal of abdominal aorta artery**.(figure-1)** Furthermore, this flap expanded to origin of common iliac artery in two sides and supra mesenteric artery (SMA). **(figure-2)** Moreover CTA demonstrated that origin of the celiac artery trunk and the left renal arteries were not from anterior lumen (false lumen) and the right renal was not originated from posterior (true lumen). Furthermore ascending aorta, arch of aorta and its branches were totally normal.**(figure-3)**

There was evidence of pregnancy in the two trimester by CTA **(figure-4)** and then ultrasonography revealed a live fetus and gestational age of 17 weeks with normal heart rate(140/ minute).

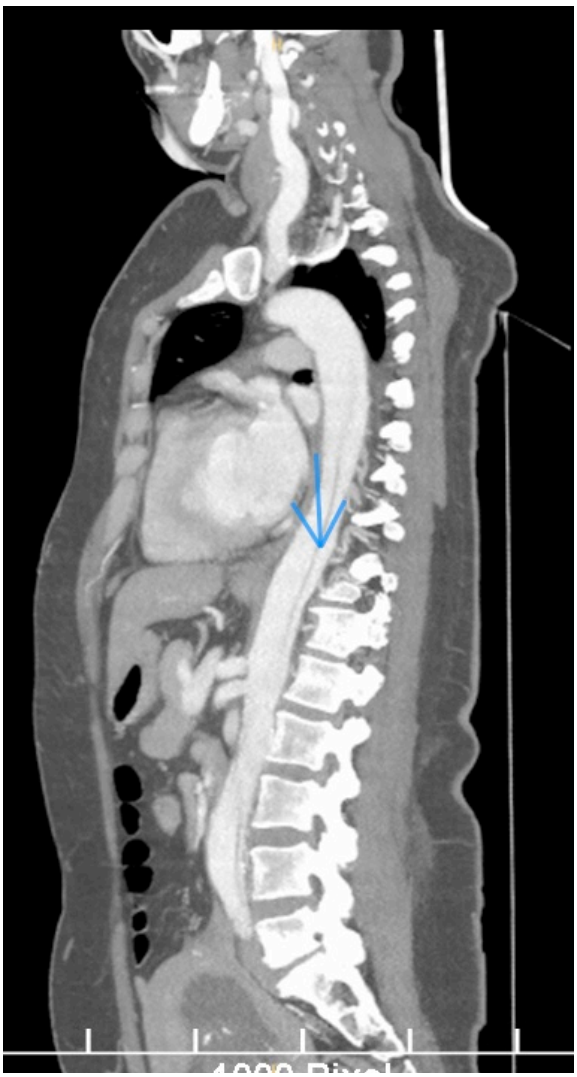

Figure-1;CT sagital image of dissection flap from descending aorta to abdominal aort (Type Debakey III, Type Stanford B), (blue arrow)

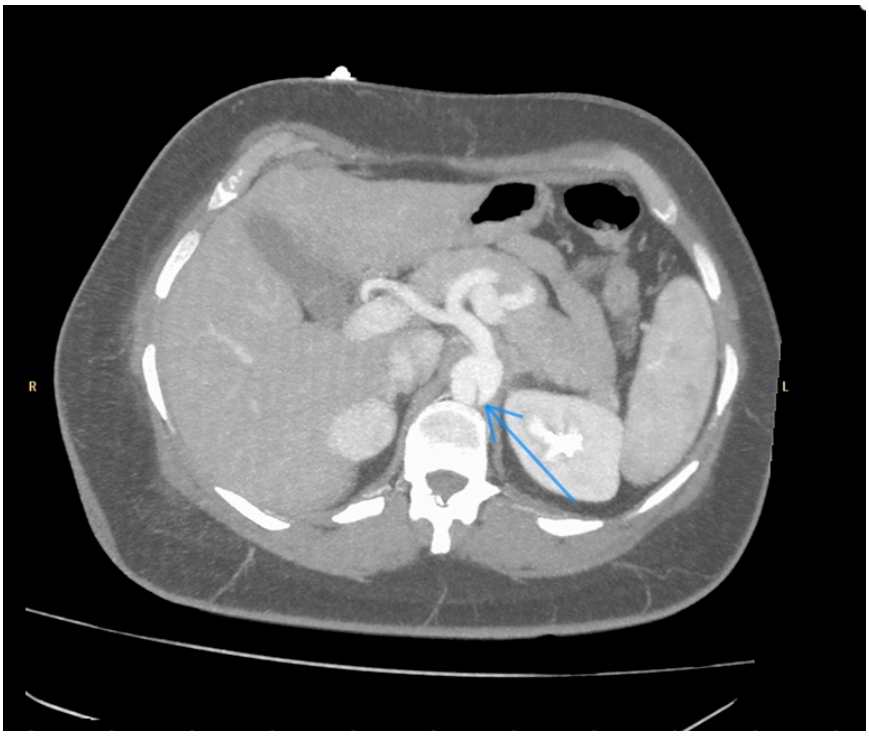

Figure-2;CT axial image abdominal aorta dissection flap that stretched to origin of common iliac artery and SMA

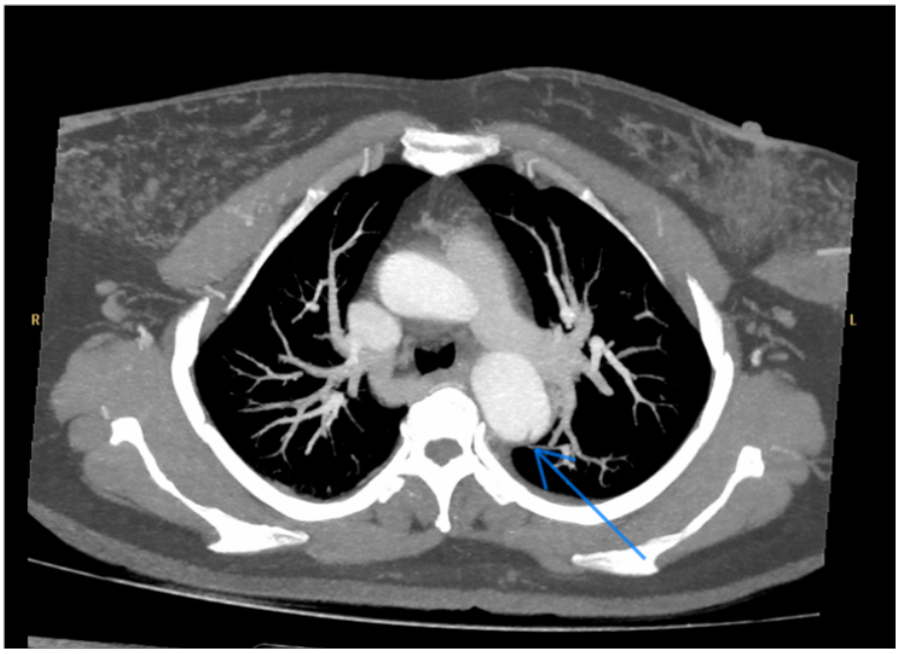

Figure-3; CT axial image of the dissection flap only in descending aorta (blue arrow)

Figure-4;CT axial image evidence of fetus in uterus cavity

After diagnosis of Stanford Type B(De Bakey Type III) aortic dissection, the patient was admitted to close follow-up in the intensive care unit of the cardiovascular surgery. Cardiologist started some drugs as Captopril when (blood pressure>130/85mmHg),Bisoprolol and Spironolactone for prevention of hypertension and tachycardia or arrhythmia. She remained asymptomatic after a few days of hospitalization. Since the risk of continuing the pregnancy was high, Maternal fetal medicine service, cardiologist and vascular surgeon recommended pregnancy termination at the first, and then decision-making about the definitive therapy.

The procedure (hysterotomy)was performed under general anesthesia. In the preoperative checking, hemoglobin was 12.5 g dL-1, platelet count was 195 mL-1, INR was 1, fasting glucose 90 mg dL-1 and ECG was normal. Before the surgery the patient was taken up under high-risk consent for anesthesia. Blood loss was anticipated and blood products were cross-matched. The patient was taken to the surgery with an ASA score of III-E, owing to the risk of a probable rupture and hemodynamic collapse in the perioperative period, a team of Cardiovascular Surgeons and an operating room were present. In operating room, at first we established two large-bore peripheral venous access for volume resuscitation, in addition to standard monitoring, invasive hemodynamic monitoring was done through right radial arterial cannulation before onset anesthesia, and right internal jugular central venous access after induction. Therewith, we prepared Nitroglycerin infusion for prevention of hypertension, Norepinephrine and dopamine intravenous infusions, vasopressor drugs (ephedrine, Phenylephrine) for prevention of hypotension, and Labetalol in case of occurance tachycardia. General anesthesia was performed with sufentanyl,15mcg, midazolam,2mg, propofol,100mg and succenilcholine,100mg, and care was taken to avoid any hemodynamic fluctuations during laryngoscopy and intubation by carrying it out under an adequate depth of anesthesia avoiding pressor response as well as postinduction hypotension. Maintenance of anesthesia accomplished by infusion of propofol,100 mcg/kg/min plus remifentanil infusion at 0.5mcg/kg/min and intermittent injection of cisatracurium .A total of 1000 mL of crystalloids were infused. No complication occurred during operation period. Emergence of anesthesia was without any problem and patient extubated in OR. She was transferred to the intensive care unit of cardiovascular surgery for postoperative follow-up. she was discharged home after 5 days with Enoxaparin 40 mg daily, Cloripa 10 mg daily Bisoprolol 2.5 mg twice on the day, and Captopril 12 mg daily, Spironolactone 25 mg daily, all of which she had tolerated during her hospitalization.

The patient after discharge from ICU taken up medical therapy for three months, and after this period, conclusive method (whether medical or surgical) would be chosen.

Discussion

Aortic dissection (AD) occurs when the inner layer of aorta (intima) is torn, allowing blood to flow between the layers of aortic wall and create a false lumen a new channel within aorta). [7]

We describe a patient who presented with chest pain and shortness of breath in the early of second trimester and was diagnosed a aortic dissection type B. Aorta dissection in pregnancy is a rare but it is a life-threatening event with significant maternal-fetal morbidity and mortality. [1] based on some studies, acute aortic dissection is about three cases per 100000 populations. [8] Maternal mortality for acute Stanford type A and B dissection corresponds to 21% and 23%, with fetal death rates of 10.3% and 35%, respectively. [9]

Despite that AD usually occurs due to a congenital or an acquired risk factor, Pregnancy itself can be an outstanding independent risk factor for aortic dissection. The reasons for the development of aortic dissection at high frequencies in pregnancy can be listed as follows: hemodynamic associated with an increased stroke volume and heart rate cause an increased cardiac output. In addition, there may be reduction in systemic vascular resistance and an increase in left ventricular muscle mass [10]. At the same time, changes in serum progesterone and estrogen levels may result in structural remodeling aortic wall such as reduction in the amount of acid mucopolysaccharide and elastic fiber disorganization with fragmentation of reticululin [10,11]. All of this may predispose to architectural imparement with aneurysmal dilatation and the potential for dissection.

AD is mainly diagnosed by clinical manifestations such as chest, back, arm, or abdominal pain, or shortness of breath and even circulatory collapse, and imaging examinations. (2,12) For pregnant women complicated with AD, transthoracic echocardiography (TTE) can be used as a first screening test considering its high safety and technical popularity. Gao Shuang et al [13] retrospectively analyzed the data of 16 pregnant patients

with AD and found that the detection rate, and classification accuracy of the disease with TEE was 100%. Patients with indeterminate diagnosis by TTE or with high suspicion of AD are recommended to undergo further thoracoabdominal aortic angiography (CTA) or magnetic resonance angiography (MRA). The sensitivity and specificity of CTA and MRA for diagnosis of AD is as high as 100%. advantage of MRA is that there is no influence of ionizing radiation and contrast agents. [14]. However, MRA examinations take a long time and may be unbearable for patients with severe pain.

In the other hand, Transesophageal echocardiography (TEE) is the ideal choice for pregnant women as it's similar to CTA in sensitivity and specificity [12].

But it seems the most important imaging examination for diagnosis is CTA, including thoracoabdominal aorta CTA and pulmonary artery CTA. CTA can clearly identify the location and classification of the tear, and the length and range of the vessels involved by the dissection but there is with some radiation effect. [15]

In our study TEE was demonestrated a flap in the abdominal aorta and then thoracoabdominal aorta dissection was confirmed by CTA.

The first treatment option in acute dissection is providing adequate hemodynamic control [16]. The choice of clinical management only or the need for surgical intervention before or after the pregnancy interruption should concede the type of dissection **(Table-1)** and fetal viability.[2,17] After 32 weeks of pregnancy, the fetus is basically matured, and the pregnancy can be terminated by cesarean section first followed by surgery. The prognosis of patients with onset in the second trimester is often poor. Since the disease itself will limit fetal growth or even cause intrauterine fetal death, patients with late onset tend to have a better prognosis. [18]Surgery is preferred for type A, and conservative treatment is usually recommended for type B AD. But, emergent conditions need immediate surgical intervention as soon as possible [2]. It was reported that type B dissections could be followed-up with success until term, and dissection repair could be made after birth.[16]

Table 1. De Bakey and Stanford Classifications (2)

De Bakey	
Type I	Intimal tear in the ascending aorta and dissection extending along the whole aorta.
Type II	Intimal tear in the ascending aorta and dissection limited to the ascending aorta
Type III A	Intimal tear in the proximal descending thoracic aorta and dis section limited to the thoracic aorta
Type III B	Intimal tear in the proximal descending thoracic aorta and dissection in the abdominal aorta or dissection extending to the aortoiliac bifurcation
Stanford	
Type A	Intimal tear in the proximal descending thoracic aorta and dis section limited to the thoracic aorta.
Type B	Intimal tear in the proximal descending thoracic aorta and dissection in the abdominal aorta or dissection extending to the aortoiliac bifurcation

Wang et al. suggested that women with type B dissection in the third trimester should undergo TEVAR prior to delivery. They believe that there is a risk of dissection may be due to the increased pressure on the aortic wall caused by the increased blood volume returning to the heart after delivery. [19]

Our patient was in early of second trimester, and mother and fetus had not good prognosis. Thus cardiologist teams decided to ceases the pregnancy and then treatment followed by medical therapy.

The optimal anaesthesia management that should be used in such patients during cesarean section is not clear. The patients on anticoagulant medication may receive general anaesthesia; however, it was reported that this might increase cardiovascular stress associated with hypertensive response due to intubation and surgical stimuli, and rupture risk. [20]

Haas and colleagues [21] performed deep general anaesthesia for caesarean section, along with high dose opioids in a pregnant hypotensive woman at 34 weeks gestation, who developed Stanford Type A dissection. After anaesthesia induction the patient required norepinephrine, and underwent aortic repair using extracorporeal bypass after caesarean section. The neonatal team had been informed about the case, and as the Apgar score after birth was 3, the baby was intubated and was extubated at 12 hours in the maternity ward without any problem. Haas et al. [21] reported that although deep anaesthesia induction along with opioids leads to respiratory depression in the neonate, it is a method that can be used in this life-threatening condition.

Chauhan etal, performed an successful urgent thoracic endovascular aortic repair (TEVAR) on a 22-year-old at 23 weeks of gestation under general anaesthesia that it was with improved mother condition. [22]

Gülay Erdoğan Kayhan etal reported the anaesthetic management of a 36 year-old pregnant woman who developed acute type B aortic dissection in the 30th gestational weeks and scheduled for caesarean section under combined-spinal epidural anaesthesia without major problem for mother and baby .[23]

Chahwala *et al.*[24] reported a case at 22 weeks of gestation with an unruptured thoracic aortic aneurysm undergoing TEVAR, under general anaesthesia and utilizing measures to minimize radiation exposure and finally the patient recovered well and proceeded to a normal delivery.

In this study we by consider of no viability of the fetus, prevention of side effect owing to sympatric block that caused by regional anesthesia like that bradycardia and hypotension, likely need to surgical repair of dissection, and to allow better control of hemodynamic and ventilation, decided to perform hysterotomy under general anaesthesia. Fortunately we had not any complication during surgery and in intensive care unit.

Conclusion:

Pregnancy itself may be a prominent risk factor for aortic dissection. Clinicians must maintain a high level of suspicion in pregnant patients with chest pain even in the absence of predisposing factors. A multidisciplinary team is essential for favor outcomes. The timing of fetal delivery and afterward aorta repair requires the evaluation of maternal status and gestational age. Anesthetic management necessitates careful hemodynamic and ventilation preservation.

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