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An aortopathy dilemma in pregnancy: A rare case report

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Case Report

Abstract

BACKGROUND: The most dramatic diseases in the aorta are aortic dissection and aneurysm, which both of them are common in pregnant women with Marfan syndrome (MFS). According to recommendations in existing guidelines, pregnancy is not recommended in patients with severe dilation of the aorta and patients with MFS with aortic dilation > 45 mm should have prophylactic aortic repair before pregnancy.

CASE REPORT: In this rare and unique report, we described a 34-year-old pregnant woman with marfanoid feature who had an approximate aortic root of 60 mm and severe aortic insufficiency. She denied terminating the pregnancy at her first prenatal visit and continued it until 30 weeks of gestation and the pregnancy terminated in the cardiac operating room due to multiple episodes of chest pain. No complication occurred during her close observation before surgery. The aortic repair was performed for her after the cesarean section.

CONCLUSION: Pregnancy with severe aortic root dilation is high-risk for all patients; however, if it occurs, when the mother denies an abortion, inform the patient about its risk and continue the pregnancy with close observation and tight blood pressure (BP) control until the fetus becomes viable.

Keywords: Aorta; Pregnancy; Fibrillin-1 Protein; Case Reports; Marfan Syndrome

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Introduction

Aortopathy is a general concept in the medical literature. The two most prevalent conditions are aortic aneurysm and aortic dissection/rupture. The aortic aneurysm is an enlargement of the aorta to greater than 1.5 times its normal size. They do not have any serious signs/symptoms except when left untreated until being sufficiently enlarged. They can lead to aortic rupture and hemorrhage, which have high mortality and morbidity rate. Although these events are rare in pregnancy (0.05-1.39 per 100000 persons yearly), they can cause high maternal mortality (between 21%-53%), which is mainly happening in the third trimester.[1] The typical syndrome associated with aortic dissection is Marfan syndrome (MFS). The diagnosis of MFS is based on Ghent nosology.[2] In the absence of family history, aortic root diameter (Z-score ≥ 2) with systemic score ≥ 7 is MFS and in the presence of family history, either aortic root diameter (Z-score ≥ 2) or systemic score ≥ 7 is sufficient for MFS.[2] Unfortunately, MFS often remains undiagnosed until the patient becomes pregnant or it will be recognized only after facing life-threatening complications that occur in pregnancy or after the delivery.[1-5] The most serious complication in MFS during pregnancy is cardiovascular problems, especially aortic dissection due to the dilation of the aortic root.[2-6]

2018 European Society of Cardiology (ESC) guideline for pregnancy in MFS categorized the aortic root dilation into World Health Organization (WHO) class II to IV.[6] The 2018 Canadian Cardiovascular Society (CCS) recommended that women with an aortic diameter above 45 mm

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should be strongly discouraged to become pregnant without aortic repair. Aortic diameter below 40 mm is not associated with complications, although no diameter is considered completely safe. The 2010 thoracic aortic disease guidelines recommend not to become pregnant if the aortic root diameter is > 40 mm and suggest elective aortic root replacement in those who desire pregnancy.[1-5] Pregnancy should be avoided in patients with MFS with an aortic root diameter of > 45 mm, as there is an increased risk of dissection. When the aorta is 40-45 mm, other factors should be considered, such as the family history of dissection and the rate of aortic growth. According to the above facts, there is not any clear statement for patients who are pregnant and have a large aortic root without confirming MFS.

The aim of presenting this case report was to introduce one of our cases with possible MFS and massive aortic root dilation who was pregnant and came for prenatal care when it was too late and finally delivered her baby safely.

Case Report

A 34-year-old woman, gravida three (G_3), parity two (P_2), live one (L_1), and death one (D_1, due to aortic rupture) was referred to the Alzahra University Hospital of Isfahan, Iran, due to her diastolic murmur heard in routine cardiac examination and history of sudden cardiac death in her daughter. No further evaluations were conducted on her daughter to find the exact etiology; however, the forensic physician reported marfanoid features on the body. No medical document was present when she was interviewed. After taking a full history and performing a head-to-toe physical examination, she had vital signs as follows: systolic and diastolic blood pressure (BP) of 130 and 70 mmHg, respectively, heart rate (HR) of 113 beats per minute (bpm), respiratory rate of 19 times per minute, and temperature of 36.8 °C (axillary). An electrocardiogram (ECG) from the mother's heart and a non-stress test (NST) from the fetus were obtained and then she was referred to the cardiology clinic for further investigations. She had a marfanoid feature, 2.03 m height, 90 kg weight, and 2.67 m arm span. She neither complained of eye or vision problems nor our expert ophthalmologist found any pathology. Echocardiography was done by one of the expert cardiologists of our center and it showed an aortic root of at least 60 mm to a maximum of 65 mm (various in different positions) (Figure 1) (Z-score = 9.55) and a severe aortic valve insufficiency (+3) with no other pathology. Therefore, according to her high systemic score for MFS and high Z-score, MFS was her most likely diagnosis, although we did not perform its specific genetic evaluation due to being expensive. Her gestational age (GA) at admission was 25 weeks + 3 days according to her last menstrual period and 25 weeks + 5 days by her first-trimester sonography. The NST was normal and reactive, the amniotic fluid index (AFI) was in the reference range, and no obstetrical or gynecological problem was found. Routine blood markers of pregnancy-induced hypertension (PIH) and pre-eclampsia were sent to the central laboratory of our center and came back negative.

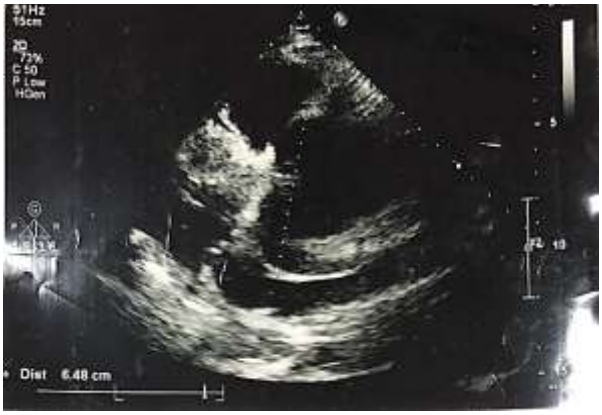

Figure 1. Echocardiography of aortic root with its noticing diameter (64 mm)

Because of her poor prenatal control and long distance to the first referral hospital, she was admitted to the hospital and we suggested three options to her:

1) Terminating pregnancy immediately due to the large aortic root diameter, then performing elective cardiac surgery to repair the aorta

2) Strict BP and HR monitoring until the fetus becomes viable (28 weeks in our hospital), then performing the cardiac surgery

3) Elective cardiac surgery during pregnancy, which is associated with a high risk of fetal loss

First of all, we recommended surgical treatment with the fetus in the uterus because the fetus was not viable at that time and the risk of continuing the pregnancy was high. Furthermore, we recommended pregnancy termination and then performing the aortic surgery in a special center and after that trying to become pregnant one more time, but she decided to continue the pregnancy by accepting all of the risks.

Thus, she was discharged and clinically managed simultaneously by an expert

obstetrician/gynecologist and an expert cardiologist. The obstetric/gynecologic team was trained for perinatology and was an expert in managing pregnant women with cardiac disease. According to the latest guideline,[6] she was treated with 50 mg of metoprolol every 12 hours (class C category for pregnancy), amlodipine 5 mg every night (class C category for pregnancy), and hydrochlorothiazide 12.5 mg (class B category for pregnancy) every day to maintain and control her BP between 110-120 mmHg and her HR between 60-70 bpm. Surveillance echocardiography for monitoring aortic root diameter was performed every 3 weeks. She was sufficiently informed about her drugs and their side effects, possible alarm signs of her disease, and when to come to the emergency room or labor departments for her condition. As she was referred to the hospital in 2nd trimester of the pregnancy, it was not possible to predict whether the fetus was influenced or not. Although fetal echocardiography was performed and revealed no pathology, it could not certainly rule out the MFS. She was screened for gestational diabetes mellitus (GDM) at 28 weeks and GDM was detected, and then she was treated with lifestyle modification and special nutritional consultation. No oral drug treatment or insulin was needed for diabetes during her follow-ups. Echocardiography was done before her final admission and no further dilation was detected. We offered her to terminate the pregnancy at 28 weeks of gestation, but she refused and suggested continuing the pregnancy to more than 30 weeks.

Finally, after 5 weeks of strict follow-ups, the pregnancy was terminated by cesarean section at 30 weeks + 1 day emergently in the cardiac surgery operation room, because she had multiple episodes of sudden onset of dyspnea and chest pain. The neonate was a healthy baby boy weighing 1980 grams, admitted to the neonatal intensive care unit (NICU) because of prematurity and fetal respiratory distress. No complication occurred during or after the surgery. 2 months after the delivery, she had successful elective Bentall surgery, replacing the aortic valve and root in the Chamran Heart Center affiliated to Isfahan University of Medical Sciences, Isfahan. This case report was prepared after getting informed written consent from the patient.

Discussion

MFS is an autosomal dominant connective tissue disease caused by a mutation in the gene encoding fibrillin-1 (FBN1) on chromosome 15 (locus 15q.21.1), an extracellular matrix protein. The incidence of classic MFS is about 2-3 per 10000 people, affecting both genders equally.[1] MFS is a multi-system disorder, which primarily involves the musculoskeletal, cardiovascular, and ocular systems but usually not simultaneously. Due to the multi-system involvement, its diagnosis may be challenging and needs a multi-disciplinary approach as well as clinical genetics consultation. The most serious life-threatening complication is cardiovascular, especially aortic dissection, and its risk increases during pregnancy because of hyperdynamic hypervolemic circulatory state, mostly in the last trimester or within a week after delivery.[3] Mucopolysaccharides in tunica media of aorta are decreased due to the effects of estrogen and progesterone in pregnancy, which can cause aortic root dilation of up to 1 mm in healthy women, but aortic root can increase at least 3 mm during pregnancy in patients with MFS.[5]

To manage pregnant patients with MFS, the multi-disciplinary team should take action. This team should have an expert obstetrician/gynecologist, cardiologist, anesthesiologist, expert midwife, and neonatologist.[4]

Patients with bicuspid aortic root diameter < 45 mm can tolerate pregnancy well and should visit bi-monthly and take echocardiography each trimester, but in MFS, even women with an aortic root of < 40 mm are at risk of 1% dissection. If the aortic root diameter is > 45 mm or increases progressively during pregnancy, patients should be discussed to terminate the pregnancy and have elective cardiac surgery as soon as possible. When the aorta is 40-45 mm, other factors should be evaluated, such as the family history of dissection and rate of aortic growth according to their previous echocardiography.

Aortic diameter > 50 mm in bicuspid aortic valve and > 45 mm in MFS is extremely high-risk for maternal mortality; thus, pregnancy is contraindicated in these patients and if occurs unintentionally, termination should be discussed immediately.[1-5]

Vaginal delivery is safe in patients with aortic root diameter < 40 mm, but the elective cesarean section is safer in women with aortic root diameter > 45 mm or with progressive dilation of aorta during the pregnancy, due to decreasing the risk of aortic dissection secondary to the hemodynamic changes (significantly increasing BP).[4] According to the 2018 ESC guideline, in patients with an aortic root of 40-45 mm, vaginal delivery with epidural anesthesia and an accelerated second stage should

be considered (2A recommendation).[6]

BP and HR are the important parts of managing most of the cardiovascular-related conditions and diseases. Different classes of drugs have been introduced to achieve these goals: sympathetic antagonists and calcium-channel blockers can reduce HR, BP, or both; diuretics affect mostly BP; and renin-angiotensin-aldosterone system (RAAS) modulators are one of the important anti-hypertensive classes, which work on BP only. Besides the pharmacokinetics and pharmacodynamics of these drugs, the safety of using these drugs during the pregnancy should be noted according to their classification. Except for RAAS suppressors which are prohibited during pregnancy (X class), other drugs should be prescribed according to the pregnancy category (A, B, C, or D) and their associated risk-benefit balance. Beta-blockers (e.g., metoprolol) can cause bradycardia, hypoglycemia, and intrauterine growth restriction (IUGR) in the fetus, but they can be used to decrease HR. Amlodipine and nifedipine are used for BP control, but they are class C category and should not be combined with magnesium sulfate because it can decrease BP devastatingly. Hydrochlorothiazide is one of the safe diuretics during pregnancy for reducing BP (class B).[6]

According to this reported case, if the aortic root is > 45 mm (WHO IV) and the fetus is not viable or has a GA of fewer than 20 weeks, induced abortion due to the safety of the mother should be discussed with the patient and her family as a good possible option. However, if the mother refuses to abort or if the fetus is viable or is above 20 weeks of gestation, the pregnancy can be continued. Until then, after informing the patient and accepting of being at a high-risk situation, we can decrease the risk of pregnancy with a multi-disciplinary team and by strict BP and HR control with multiple medications, avoiding physical activity and stress, regular aortic root diameter monitoring, regular physician visits, and making decision on the termination time. Furthermore, the patient and her family should be aware of the risks of continuing pregnancy and know the alarm signs to go to the emergency or labor department if one of them occurs.

According to the existing guidelines for pregnancy in patients with MFS and dilated aortic root, pregnancy should be avoided in patients with an aortic root diameter of > 45 mm; however, if it occurred, abortion would be the next option. If the mother refused an abortion and decided to continue the pregnancy, despite being in a high-risk situation, pregnancy can be continued with strict BP and HR control and close observation until the fetus becomes viable.

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Conflict of Interests

Authors have no conflict of interests.

References

1. Judge DP, Dietz HC. Marfan's syndrome. Lancet 2005; 366(9501): 1965-76.
2. Baumgartner H, Bonhoeffer P, De Groot NM, de HF, Deanfield JE, Galie N, et al. ESC Guidelines for the management of grown-up congenital heart disease (new version 2010). Eur Heart J 2010; 31(23): 2915-57.
3. Houston L, Tuuli M, Macones G. Marfan syndrome and aortic dissection in pregnancy. Obstet Gynecol 2011; 117(4): 956-60.
4. Regitz-Zagrosek V, Blomstrom Lundqvist C, Borghi C, Cifkova R, Ferreira R, Foidart JM, et al. ESC Guidelines on the management of cardiovascular diseases during pregnancy: The task force on the management of cardiovascular diseases during pregnancy of the European society of cardiology (ESC). Eur Heart J 2011; 32(24): 3147-97.
5. Smith K, Gros B. Pregnancy-related acute aortic dissection in Marfan syndrome: A review of the literature. Congenit Heart Dis 2017; 12(3): 251-60.
6. Regitz-Zagrosek V, Roos-Hesselink JW, Bauersachs J, Blomstrom-Lundqvist C, Cifkova R, De Bonis M, et al. 2018 ESC Guidelines for the management of cardiovascular diseases during pregnancy. Eur Heart J 2018; 39(34): 3165-241.