Research Article

Maternal Congenital Aortic Stenosis-Successful Management of Pregnancy

Emily M Williams[1*], Tara N Daming[1], Sarah Hostetter[1], Karen Florio[1,3], Anna Grodzinsky[2], John Lee[2], Anthony Magalski[2], Valerie Rader[2], Laura Schmidt[2]

[1]University of Missouri Kansas City, Missouri, USA

[2]Saint Luke's Mid America Heart Institute, Cardiovascular Research, Missouri, USA

[3]Saint Luke's Maternal Fetal Medicine Specialists, Missouri, USA

[*]Corresponding Authors: Emily M Williams, University of Missouri Kansas City, 2310 Holmes Street, HHC #713, Kansas City, MO 64108, Missouri, USA, Tel: 602 295-3754; E-mail: Williams.Emily.M@gmail.com

Received: 09 July 2020; **Accepted:** 22 July 2020; **Published:** 10 August 2020

Citation: Emily M Williams, Tara N Daming, Sarah Hostetter, Karen Florio, Anna Grodzinsky, John Lee, Anthony Magalski, Valerie Rader, Laura Schmidt. Maternal Congenital Aortic Stenosis-Successful Management of Pregnancy. Cardiology and Cardiovascular Medicine 4 (2020): 414-417.

Abstract

Aortic stenosis provides a unique management challenge during pregnancy and has historically been associated with a high maternal mortality risk. We describe our experience with pregnancies in patients with aortic stenosis at a single center over a 13 year period. When managed by an experienced, multidisciplinary, cardio-obstetrics team, these pregnancies are more likely to reach term with good outcomes.

Keywords: Pregnancy; Aortic stenosis; Cardio-obstetrics team

1. Introduction

Maternal cardiovascular disease is associated with higher rates of maternal and neonatal complications. In valvular heart disease, and left-sided stenotic disease in particular, the physiologic changes that occur in pregnancy may precipitate cardiac decompensation. In aortic stenosis, the increases in plasma volume, heart rate, stroke volume and cardiac output can exaggerate the pressure load on the left ventricle [1-3]. Additionally, the decreased systemic vascular resistance of pregnancy can compound these effects as a stenotic aortic valve may not allow the compensatory blood flow necessary to fill the resultant dilated peripheral vasculature. Combined, these physiologic

changes and failure of normal compensatory mechanisms can lead to the development of peripheral underfilling, left ventricular hypertrophy and dysfunction, arrhythmias, syncope, heart failure and death. Prenatally diagnosed aortic stenosis (AS) has been historically associated with high maternal mortality with reported rates as high as 10-20%, although more recent data have suggested that these risks may be lower [1, 3, 4, 5]. We describe our experience managing patients with aortic stenosis in pregnancy at a quaternary care center by a multidisciplinary cardio-obstetrics team.

2. Methods

We conducted a retrospective review of patients with prenatally diagnosed aortic stenosis who delivered at a single quaternary center over a 13 year period. Patients were identified using hospital records cross-referenced with our perinatal database. Patients were included if they had a diagnosis code of aortic stenosis and a confirmatory echocardiogram. Women with other valvular disease, pulmonary hypertension, or termination of pregnancy were excluded. Maternal and newborn data were extracted from the electronic medical record.

3. Results

There were 1203 pregnancies between 2005 and 2018 who presented for consultation in the cardiology department or multidisciplinary Heart Disease in Pregnancy Program. Fourteen of these pregnancies were identified for inclusion in this series. One pregnancy was excluded due to termination at 17 weeks who also had concurrent pulmonary hypertension. Three other pregnancies were excluded due to other comorbidities or surgical correction with no evidence of residual stenosis on echocardiogram. Ten women with aortic stenosis were included in this report (seven with a bicuspid aortic valve and three with a subaortic membrane). All patients received care from a multidisciplinary cardio-obstetrics team, including cardiologists, maternal fetal medicine specialists, and anesthesiologists.

Four of these pregnancies occurred in women with severe AS and the remaining six women were categorized as having moderate AS. The average peak gradient across the aortic valve was 64 ± 18.5 mmHg (range 35-87 mmHg), with an average mean gradient of 35.5 ± 10.5 mmHg (range 21-51 mmHg). Average cardiac output by Doppler echocardiography in the third trimester was 6.2 ± 1.1 L/min (range 5.2-8.2 L/min). Four patients had symptoms consistent with NYHA functional class I at the time of presentation and the remaining six had NYHA class II symptoms (Table 1). Three patients progressed to a higher NYHA functional class during the course of their pregnancy. One patient with moderate AS progressed from class I to II in the third trimester. Another patient with severe AS progressed from class II to class III in the third trimester. A third patient with severe AS progressed from class II to IV with the development of decompensated heart failure in the second trimester. She required antepartum hospitalization for treatment and stabilization. Three patients required cardiac medications during their pregnancy: two required beta blockers, two required diuretics, and one required anticoagulation.

NYHA Functional Class	Baseline (n=10)	Final (n=10)
I	4	3
II	6	5
III	0	1
IV	0	1

Table 1: Patients' baseline and final New York Heart Association (NYHA) functional classification.

Mode of delivery was determined based on severity of disease, symptoms, and routine obstetrical indications. Half of the patients were delivered in the cardiovascular intensive care unit. The mode of delivery was vaginal for six patients and cesarean in the remaining four. All vaginal deliveries were performed under epidural anesthesia. Two multiparous patients with asymptomatic moderate AS underwent spontaneous vaginal deliveries, which required minimal maternal expulsive effort. Four operative vaginal deliveries were performed, three of which were forceps-assisted and one of which was vacuum assisted. Two of these operative vaginal deliveries were performed in patients with asymptomatic severe AS. Of the four patients who underwent cesarean delivery, two were performed for patients with moderate AS for routine obstetric indications and two were performed under general anesthesia for cardiac indications in the setting of symptomatic severe AS. Patients' postpartum/postoperative courses were uncomplicated overall. A single patient developed pulmonary edema secondary to excessive IV fluid hydration perioperatively which was responsive to treatment with diuretics.

Average gestational age of delivery was 37.5 ± 1.9 weeks. The average birth weight was in the 45th ± 26 percentile. There was only one growth restricted infant in a pregnancy, which was also complicated by chronic hypertension. There were two neonatal intensive care stays, both related to prematurity. There were no fetal, neonatal, or maternal deaths.

4. Discussion

Given advances in treatment of congenital heart disease, more affected women are reaching reproductive age and desiring pregnancy. Many of these women were previously cautioned against childbearing as valvular heart disease, and aortic stenosis in particular, has historically been associated with poor maternal outcomes, including a reportedly high rate of maternal morbidity and mortality, as well as increased risks of fetal complications such as fetal growth restriction and preterm birth. More recent studies have suggested that the rates of adverse outcomes, even in cases of moderate to severe disease, may be much lower than previously reported [1, 4, 5]. In the modern era, with close monitoring by an experienced, multidisciplinary cardio-obstetrics team, aortic stenosis may be better tolerated in pregnancy than previously reported.

Furthermore, cesarean section is often recommended as the mode of delivery for patients with cardiovascular disease due to concerns of maternal intolerance of Valsalva and hemodynamic decompensation during the second stage of labor. As such, rates of cesarean section are higher in this group than in the general population, further increasing risks of surgery related morbidity [6, 7]. However, more recent studies have suggested that delivery by cesarean

section does not significantly decrease the burden of adverse cardiovascular events for women affected by cardiovascular disease [6, 7]. Our experience supports these findings. With careful planning and intrapartum monitoring, vaginal delivery may be successfully achieved for the majority of patients with AS, even some patients with severe disease.

We have described the course and outcomes of ten patients with moderate to severe aortic stenosis in pregnancy. We found low rates of maternal and fetal complications. While successful obstetric outcomes may be achieved, even for patients with severe disease, prospective US-based registries enrolling patients with valvular heart disease in pregnancy are warranted.

5. Conclusions

With multidisciplinary management, pregnancies in patients with hemodynamically significant aortic stenosis are more likely to reach term with good obstetric, maternal, and neonatal outcomes.

Funding/Disclosures

No funding sources or other financial disclosures to report.

References

1. Nanna M, Stergiopoulos K. Pregnancy Complicated by Valvular Heart Disease: An Update. Journal of the American Heart Association 3 (2014).
2. Rick A Nishimura, Catherine M Otto, Robert O Bonow, Blase A Carabello, John P Erwin III, Robert A Guyton, et al. 2014 AHA/ACC Guideline for the Management of Patients With Valvular Heart Disease. Circulation 129 (2014): 57-185.
3. Resnik R, Lockwood CJ, Copel JA, Moore TR, Silver RM, Greene MF. Creasy and Resnik's maternal-fetal medicine: principles and practice. Philadelphia: Elsevier (2019).
4. Stefan Orwat, Gerhard-Paul Diller, Iris M van Hagen, Renate Schmidt, Daniel Tobler, Matthias Greutmann, et al. Risk of Pregnancy in Moderate and Severe Aortic Stenosis. Journal of the American College of Cardiology 68 (2016): 1727-1737.
5. Sing-Chien Yap, Willem Drenthen, Petronella G Pieper, Philip Moons, Barbara JM Mulder, Bianca Mostert, et al. Risk of complications during pregnancy in women with congenital aortic stenosis. International Journal of Cardiology 126 (2008): 240-246.
6. Sarah Rae Easter, Caroline E Rouse, Valeria Duarte, Jenna S Hynes, Michael N Singh, Michael J Landzberg, et al. Planned Vaginal Delivery and Cardiovascular Morbidity in Pregnant Women with Heart Disease. Am J Obstet Gynecol 222 (2020): 77 e1-11.
7. Annelieke HJ Petrus, Britt L Jongert, Philippine Kiès, Marieke Sueters, Monique RM Jongbloed, Hubert W Vliegen, et al. Evaluation of Mode of Birth in Pregnant Women with Heart Disease. European Journal of Obstetrics and Gynecology and Reproductive Biology 248 (2020): 150-155.