

Pregnancy and Valvular Heart Disease

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ABSTRACT

Heart disease can affect anyone at any time, and pregnant women are not exceptions. Some type of cardiac pathologic disease can be seen in 1% to 2% of all pregnant women. Because of the high fetal mortality rate and the high relative rate of maternal mortality in surgery, medical management is the first line of treatment. Nevertheless, when medical treatment fails, cardiac surgery may be necessary. Here we present such a case of cardiac valvular disease complicated by pregnancy. Current decision-making, treatment, and trends are reviewed.

CASE PRESENTATION

A 32-year-old woman gravida III para II was complaining at 20 weeks gestation of shortness of breath and dyspnea on exertion. She was seen for her prenatal evaluation and found to have a grade 3 diastolic murmur. The patient was referred to a cardiologist and underwent transthoracic echocardiography. The echocardiogram revealed severe mitral stenosis with mild mitral regurgitation and a valve gradient of 10 mm Hg. The tricuspid valve also demonstrated severe stenosis with a valve gradient of 20 mm Hg and mild to moderate regurgitation with a peak velocity of the tricuspid regurgitation jet of 4.4 m/sec. Pulmonary artery pressures were also elevated with a mean of 42 mm Hg. The left and right atria were enlarged. The fetus was also evaluated via ultrasound examination. Multiple longitudinal and transverse sections revealed a singleton intrauterine pregnancy with normal growth of the fetus in a breech position.

The patient was not in distress, and it was decided to wait until the pregnancy was further along before attempting any intervention and to continue maximum medical management. The patient started to become more symptomatic at around 30 weeks' gestation with increased shortness of breath and dyspnea on exertion, and the decision was made to go ahead with elective surgery.

In a coordinated approach with high-risk obstetrics/gynecology, the patient was taken to the operating room, placed under general anesthesia on cardiopulmonary bypass with bicaval cannulation, and cooled to 32°C. The aorta was

cross-clamped, and potassium cardioplegia was infused into the aortic root and then in a retrograde manner via the coronary sinus. The right atrium was opened to evaluate the tricuspid valve, and the left atrium was opened. The patient had a typical rheumatic mitral valve with a very tight stenosis, as well as some regurgitation and subvalvular disease. The anterior leaflet and a portion of the posterior leaflet were excised. A No. 29 Mosaic (porcine) valve (Medtronic, Minneapolis, MN, USA) was sewn in place with 2-0 multifilament sutures reinforced with Teflon (DuPont, Wilmington, DE, USA) pledgets. The left atrium was closed with a running 3-0 Prolene suture (Ethicon, Somerville, NJ, USA). The atrium was left partially open for later deairing as the tricuspid valve was explored. The patient had an organic tricuspid stenosis with a 1.5-cm fixed orifice, as well as tricuspid regurgitation with rolled edges of the valve and some shortening of the subvalvar apparatus. A portion of the anterior leaflet was excised, and a No. 29 Mosaic valve was then sewn in place with 2-0 monofilament sutures reinforced with Teflon pledgets. The right atrium was closed with a running 3-0 Prolene suture reinforced with strips of Teflon felt. Air was evacuated from the heart, and the patient was rewarmed and weaned from cardiopulmonary bypass.

The patient's cardiac index preoperatively was 1.4 L/min per m²; postoperatively, it was 2.6 L/min per m². The chest was then closed in the usual manner.

The fetus was monitored throughout the procedure. The fetal heart rate remained at approximately 145 to 155 during the procedure. The patient did have intermittent contractions, but examination of the cervix revealed that the cervix remained at 3-cm dilation, both preoperatively and postoperatively.

The patient was taken back to the intensive care unit in satisfactory condition on multiple pressors. In the following hours, the patient became hemodynamically unstable with a mean arterial pressure of 40 mm Hg and a metabolic acidosis. The fetal heart tones had also decelerated to the 70s.

The patient was taken emergently back to the operating room for an emergency cesarean section. An infraumbilical vertical skin incision was made, and a baby girl weighing 1230 g was delivered atraumatically. The placenta was removed, and the uterus was exteriorized and closed in the usual manner.

Following the delivery, the patient regained hemodynamic stability, was transported back to the intensive care unit, and was noted to be in stable condition. The baby was transported to the neonatal intensive care unit.

In the following days, the patient was weaned off inotropic support and extubated. She continued to gain strength, and on postoperative day 9 she was discharged to home.

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The baby girl was extubated on day of life 2 and remained in the neonatal intensive care unit until day of life 25. The baby girl was then discharged to home with the mother on day of life 43 with a weight of 2280 g.

DISCUSSION

The first reports of cardiac surgery during pregnancy were published in 1952 and consisted of data involving 11 closed mitral commissurotomy [Cooley 1952]. The first report of cardiopulmonary bypass in a pregnant woman was in 1959 in association with a pulmonary valve commissurotomy and repair of an atrial septal defect [Dubourg 1959]. During the last 4 decades, there have been many published reports on cardiac surgery during pregnancy, and except for historical reviews most of these have been case reports.

The incidence of maternal heart disease during pregnancy has been estimated to be 1.5% [Szekely 1974]. Most of the pregnant women with heart ailments seen at referral centers are women with congenital heart disease. The next largest group includes women with rheumatic heart disease [Siu 2001]. In Latin America and Third World countries, rheumatic valve disease is the primary cause of 60% to 75% of the heart disease in pregnant women [Messe 1973].

Cardiac surgery during pregnancy has played a limited but defined role alongside the accepted medical management in the overall care of the patient. Maternal mortality associated with cardiac surgery varies from 1.5% to 4.2%, compared with the fetal mortality rate of 9.5% to 33% [Bernal 1986]. The maternal mortality rate parallels that of the nonpregnant woman undergoing cardiac surgery, but the mortality rate to the fetus is high. There have been no prospective randomized studies looking specifically at why the mortality rate of the fetus is so high. The gestational age of the fetus is important in the timing of surgery; congenital malformations have been shown to occur more commonly when cardiopulmonary bypass is performed during the first trimester [Lapiedra 1986]. There are now many reports of fetal survival to term after operations performed in the second or third trimesters [Bernal 1986], but the optimum timing of surgery relative to fetal survival has not been shown.

In pregnancy, the most common valvular problem is seen in patients with rheumatic heart disease, and the most common valve involved in the general population is the mitral valve [Bernal 1986]. The hemodynamic changes encountered in pregnancy are tolerated with mild to moderate mitral stenosis. However, in cases with lesions that are moderate to severe, complications due to pulmonary artery hypertension (PAH) and volume overload can result in sudden and unexpected deterioration.

When confronted with moderate to severe mitral valve disease, the surgeon should make intensive efforts to control symptoms. However, when symptoms are not controlled with maximal medical therapy, patients will require further intervention. The next step for the surgeon confronted with this situation is percutaneous balloon valvuloplasty (PBV). Multiple reports have shown that during pregnancy PBV is both safe and effective with a low rate of mortality for both mother

and fetus. One report demonstrated up to a 95% success rate with the use of PBV of the mitral valve in pregnancy cases [de Souza 2001].

The course of management is less obvious when the surgeon is faced with a pregnant patient with severe mitral valve disease and severe PAH. The reported mortality rate in patients with mitral stenosis and severe PAH undergoing PBV, open commissurotomy, or surgical valve replacement is as high as 5.6% [Alfonso 1993]. PBV is considered difficult to perform in patients with severe PAH because of the patient's precarious hemodynamic status and the difficulty involved in crossing a tighter mitral stenosis.

Open mitral commissurotomy also carries high risks in patients with PAH secondary to cardiopulmonary bypass [Engelman 1999]. Closed mitral commissurotomy has been shown to be an effective procedure for patients with isolated mitral stenosis associated with severe PAH with little or no calcium on the leaflets, but this procedure currently is rarely done [Sajja 2001].

When confronted with both severe mitral and tricuspid valvular disease with significant PAH in the pregnant patient, the surgeon's persistence with nonsurgical treatment is not justifiable. After all medical treatments have been exhausted, surgery is the only option with severe multivalvular disease combined with PAH. All measures should be taken to protect mother as well as the fetus. Multiple reports have outlined strategies to decrease fetal mortality and/or morbidity associated with maternal cardiac surgery [Kawkabani 1999].

CONCLUSION

Cardiac surgery during pregnancy can be performed safely on cardiopulmonary bypass. Maternal risks are related to the specific procedure performed, and the risks to the fetus need to be further evaluated. Therefore, cardiopulmonary bypass should be reserved for patients with PAH combined with severe valvular disease, when all of the medical modalities of treatment have been exhausted.

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