Mitral stenosis in pregnant patients

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Youssef
Dr. Ghada Sayed Youssef

As the most common cause of mitral stenosis is rheumatic heart disease, which is a disease of the young, it is not surprising to find many female patients with mitral stenosis of child-bearing age preparing for their marital and maternal life. Premarital counselling is of utmost importance, because some of these patients may require correction of mitral stenosis before considering pregnancy. Severe mitral stenosis is poorly tolerated during pregnancy and, if encountered, it needs a multidisciplinary approach and a planned Caesarean section. Echocardiography is the best tool for diagnosis and follow-up of mitral stenosis.

Cardiovascular Surgery

Interventional Cardiology and Cardiovascular Surgery

Introduction

Mitral stenosis (MS) represents an obstruction to left ventricular inflow. When MS is severe enough, it leads to diminished cardiac output to the left ventricle with a subsequent increase in left atrial volume, left atrial pressure, back pressure changes over the lungs, pulmonary congestion and, eventually, pulmonary hypertension, right-sided dilatation and tricuspid regurgitation. Untreated MS contributes to significant morbidity and mortality [1] and thus represents a significant burden on the healthcare system, especially in developing countries.

In pregnancy

Mitral stenosis is occasionally encountered in pregnant women, especially in developing countries, where rheumatic fever is endemic. During pregnancy, there is a progressive increase in blood volume, heart rate and cardiac output which reach their peak levels at 28-32 weeks of gestation. These normal physiological changes are needed to cope with the new requirements of the growing baby. Because MS represents a fixed obstruction to left ventricular inflow, the haemodynamic changes of pregnancy usually cause decompensation of a previously asymptomatic MS [2].

In the European Registry of Pregnancy and Cardiac diseases (ROPAC), the prevalence of native MS during pregnancy, either isolated or with mitral regurgitation, was 70%; 39.2% of patients had moderate and 19.8% had severe MS [3]. The prevalence is even higher when including patients with percutaneously or surgically corrected MS.

Patients with mild MS usually tolerate pregnancy and delivery well, while patients with asymptomatic moderate or severe MS commonly develop symptoms of heart failure,

especially in the second trimester of pregnancy, when the peak haemodynamic effects take place. Pre-pregnancy moderate or severe MS, even if asymptomatic, should be corrected before considering pregnancy [3]. That is why pre-pregnancy counselling is of the utmost importance for these patients. In some developing countries, with a poor healthcare system and poor public health awareness, where the luxury of pre-pregnancy counselling is not always present, these patients are usually encountered at an advanced stage of pregnancy, mostly because of resistant heart failure symptoms. They may need correction of their MS during pregnancy, either by surgical or by percutaneous intervention [2]. The most suitable timing for intervention is after the fourth month of pregnancy [4].

With echocardiography currently being the main diagnostic tool for valvular heart diseases, the role of auscultation in the diagnosis of MS is diminishing, even though the auscultatory findings of MS are usually diagnostic. While the first and second heart sounds are usually accentuated during normal pregnancy (because of the hyperdynamic circulation), diastolic murmurs are infrequent and usually indicate abnormal structural heart disease [5,6]. On the other hand, the systolic murmur of mitral regurgitation gets softer or even disappears during pregnancy. This reflects the decrease in regurgitation volume caused by the reduction of the systemic vascular resistance [7].

The most critical clinical aspect of MS patients is the heart rate. Rapid heart rate shortens diastolic filling time, increases the left atrial pressure and the pulmonary venous pressure and causes heart failure symptoms. That is why controlling the rapid heart rate greatly improves the symptoms. If there is a reversible cause of tachycardia, it should be corrected first before considering dromotropic agents. Many drugs are used to control the heart rate and are considered relatively safe during pregnancy. Beta-blocker drugs are FDA drug class B and C and can be used during pregnancy; however, they may cause intrauterine growth retardation and foetal bradycardia [8]. Verapamil, diltiazem and digoxin are labelled FDA category C and may also be used so long as the benefit outweighs the risks. Amiodarone is FDA category D and should not be used during pregnancy. This FDA drug classification labelling system is gradually being replaced by the recently developed pregnancy and lactation labelling rule (PLLR) [9].

Patients with MS are dependent on atrial contraction. That is why development of atrial fibrillation (AF) is problematic. The rapid irregular heart rate increases the left atrial pressure and precipitates heart failure symptoms. The treatment of AF in pregnant women with MS is challenging, because the drugs used to control the heart rate and the anticoagulant drugs carry potential hazards to the foetus. Anticoagulation should follow the standard guidelines, which are to continue on warfarin throughout pregnancy if the daily dose required to reach the target INR (2.0-3.0) is less than or equal to 5 mg/day. If the dose exceeds 5 mg/day, then patients should switch to low molecular weight heparin (LMWH) or unfractionated heparin (UFH) in the first trimester, switch back to warfarin till the 36th week of gestation, from which point LMWH/UFH should be used until delivery [10,11]. In case of haemodynamic instability, a rhythm control policy should be adopted: electrical cardioversion can be used to restore normal sinus rhythm, with low risk to the mother and the foetus [12].

About 50% of patients with severe MS will develop heart failure symptoms during pregnancy. Shortness of breath NYHA Class ≥II is an independent predictor of maternal

cardiac events during pregnancy [3]. Volume overload symptoms are treated by diuretics such as furosemide, which should be prescribed cautiously for a short period of time (Class IIb recommendation), together with restriction of dietary salt intake [11]. Excess diuresis can reduce the amniotic fluid volume and causes foetal distress.

Echocardiography is safe and is needed for diagnosis and follow-up of MS during pregnancy [13]. Echocardiography provides information regarding the area of the mitral valve, the size of the left atrium, the size and function of the left ventricle and right-sided chambers. Doppler examination provides information about the gradients across the mitral valve, the presence of other associated valve lesions and the severity of pulmonary hypertension [14].

Pregnant women with symptomatic severe MS are at high risk of developing pulmonary oedema during vaginal delivery, which is why a planned Caesarean section is the preferred mode of delivery. In case of mild and asymptomatic MS, vaginal delivery with epidural analgesia is appropriate. Antibiotics for endocarditis prophylaxis are not recommended at the time of delivery [4].

Maternal mortality is greatest during labour and during the immediate post-partum period. The sudden increase in preload immediately after delivery may flood the circulation, resulting in pulmonary oedema [14].

The incidence of poor foetal outcomes including foetal growth retardation, low birth weight and preterm delivery increase with increasing severity of MS [15,16]. Good collaborative medical care (cardiologist, obstetrician and anaesthesiologist) should be given during pregnancy and delivery to reduce maternal and foetal morbidity and mortality.

Conclusion

Mitral stenosis during pregnancy is problematic and needs good collaborative medical care. Patients with severe MS tolerate pregnancy poorly and should be advised against pregnancy until correction of their mitral valve disease. Reduction of heart rate and treatment of heart failure should be considered, using the commercially available drugs, taking into consideration their safety profile during pregnancy. Maternal and foetal hazards increase with increasing severity of MS. Maternal care should be extended to the first few days after delivery, because there is an increased risk of pulmonary oedema.

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Notes to editor

Author:

Ghada Sayed Youssef, MD

Lecturer in Cardiovascular Medicine, Kasr Al Ainy Hospitals, Cairo University, Cairo, Egypt and Moderator of high-risk pregnancy unit, Cairo University, Cairo, Egypt.

Address for correspondence:

Dr Ghada Sayed Youssef, Kasr Al Ainy Hospitals, Cardiovascular Department, Cairo University, Cairo, Egypt.

E-mail: ghadayoussef@kasralainy.edu.eg

Mobile: (002) 011 511 889 99

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