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Review Article

Valvular heart disease in pregnancy: A review

Mehrunnissa Khanom ^{a,*}, Akram Hossain ^b^a Assistant Professor, Department of Medicine, Southern Medical College and Hospital, Chittagong, Bangladesh^b Consultant Cardiologist, CSCR Hospital, Chittagong, Bangladesh

ARTICLE INFO

Article history:

Received 5 December 2014

Accepted 3 May 2015

Available online 30 May 2015

Keywords:

Valvular heart disease

Pregnancy

Maternal mortality

ABSTRACT

Pregnancy is associated with significant hemodynamic changes that can aggravate valvular heart disease and increase the risk of thrombo-embolic events. Risk during pregnancy is dependent on the valve lesion, its severity, maternal pre-pregnancy functional capacity and the degree of left ventricular systolic function. For stenotic lesions, maternal and fetal risk increases when mitral or aortic valve area is less than 1.5 cm². Pregnancy is usually well tolerated in women with chronic left sided valve regurgitation without left ventricular dysfunction. In patients with heart valve prostheses, hemodynamic tolerance is generally good, the issue is with anticoagulation. Many women with valvular heart disease can be successfully managed throughout pregnancy, labor and delivery with conservative medical measures designed to optimize intravascular volume, systemic loading conditions, blood pressure and rhythm. High risk patients require multidisciplinary close follow-up, so that any deterioration in symptom can be detected early and managed in a timely way.

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1. Introduction

Pregnancy with valvular heart disease is an important cause of maternal mortality and poses many challenges in the management. Pregnancy is associated with significant hemodynamic changes; including 30 to 50 percent increases in both cardiac output and blood volume, an increase in heart rate, averaging 10 to 20 beats per minute. Endogenous hormones cause a fall in systemic vascular resistance with a disproportionately greater lowering of diastolic blood pressure and a wide pulse pressure. Inferior vena caval obstruction from a gravid uterus in the supine position can result in an abrupt decrease in cardiac preload, which leads to

hypotension with lightheadedness; these symptoms resolve quickly with a change in position.^{1,2}

There is an abrupt rise of blood pressure and heart rate during delivery, partially attributed to associated pain and anxiety. Each uterine contraction results in displacement of 300–500 ml of blood in the general circulation. Stroke volume increases, with a resultant rise in cardiac output by an additional 50% with each uterine contraction. Delivery of the placenta increases afterload by removing the low-resistance vascular bed, and rapidly increases preload with increased venous return of blood to the maternal circulation; blood loss may result in further decrease in the hematocrit.^{3,4} The resultant effect on woman with valvular heart disease is essential for risk identification and subsequent management

* Corresponding author.

E-mail address: drmehrun.k@gmail.com (M. Khanom).<http://dx.doi.org/10.1016/j.jicc.2015.05.005>

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of these patients. The periods of greatest risk for cardiac events during pregnancy are early third trimester, delivery and immediate post partum period. Patients with valvular heart disease may present for the first time during pregnancy as the increasing demands on the heart lead to decompensation and heart failure. The diagnosis is not always easy as the symptoms of pregnancy (tiredness, shortness of breath and palpitation) can mask those of deteriorating symptoms.

The current article provides an overview of pathophysiology and management of different valvular heart diseases in pregnancy.

2. Risk assessment for different valvular lesions

Risk stratification is crucial in decision making. Tables 1 and 2 summarize different valvular lesions according to association with maternal and fetal risks.

3. Valvular lesions that contra-indicate pregnancy

The following valvular lesions severely threaten maternal and fetal well-being, hence pregnancy is contra-indicated under those conditions (See Table 3).

4. Prevalence of valvular heart disease in pregnancy

The advance in medical and surgical management of valvular lesions has increased the number of those reaching adulthood and childbearing age. In the European Registry on Pregnancy and Heart Disease, mitral valve lesion was the most common type of valvular pathologies (63%), followed by aortic valve disease (23%). Women with severe symptomatic mitral stenosis hospitalized in a tertiary care center in Africa experienced a nearly 50% mortality rate, most of which occurred postpartum.⁵

Table 1 – Valvular heart diseases associated with high maternal and/or fetal risk during pregnancy.^a

1. MS with NYHA functional class II–IV symptoms
2. Severe AS with or without symptoms
3. AR with NYHA functional class III–IV symptoms
4. MR with NYHA functional class III–IV symptoms
5. Aortic and/or mitral valve disease resulting in severe pulmonary hypertension (pulmonary pressure greater than 75% of systemic pressures)
6. Aortic and/or mitral valve disease with severe LV dysfunction (EF less than 40%)
7. Marfan syndrome with or without AR
8. Mechanical prosthetic valve requiring anticoagulation

(MS, mitral stenosis; AS, aortic stenosis; AR, aortic regurgitation; MR, mitral regurgitation; EF, ejection fraction; LV, left ventricular; and NYHA, New York Heart Association.)

^a Modified from: Bonow et al. ACC/AHA VHD Guidelines: 2008 Focused Update Incorporated. JACC 2008; 52:e78.

Table 2 – Valvular heart diseases associated with low maternal and/or fetal risk during pregnancy.^a

1. Mild MS (MVA greater than 1.5 cm², gradient less than 5 mm Hg) without severe pulmonary hypertension
2. Asymptomatic AS (with mean pressure gradient less than 25 mm Hg and aortic valve area greater than 1.5 cm²) in presence of normal LV systolic function (EF greater than 50%)
3. NYHA functional class I or II AR with normal LV systolic function
4. NYHA functional class I or II MR with normal LV systolic function
5. MVP with no MR or with mild to moderate MR with normal LV systolic function
6. Mild to moderate pulmonary valve stenosis

(MVA, mitral valve area; MVP, mitral valve prolapse).

^a Modified from: Bonow et al. ACC/AHA VHD Guidelines: 2008 Focused Update Incorporated. JACC 2008; 52:e78.

5. Hemodynamics and presentations of different valvular lesions in pregnancy

5.1. Mitral stenosis (MS)

Despite an overall decline in the incidence of rheumatic heart disease in developed countries, rheumatic mitral stenosis is still the commonest valvular lesion in pregnancy worldwide. In mitral stenosis, there is reduced left ventricular filling, increased left atrial pressure, increased heart rate with shortened diastole, reduced cardiac output and sometimes, overt cardiac failure. Typically, patients develop exertional dyspnoea in second trimester, progressing to orthopnoea and paroxysmal nocturnal dyspnoea as pregnancy advances. There may be frequent acute deterioration due to an arrhythmia, usually atrial fibrillation. About 40% of women with mitral stenosis experience some symptomatic decline in cardiac function in pregnancy.^{6,7} Predictors of adverse maternal outcome include the severity of mitral stenosis (valve area <1.5 cm²), New York Heart Association (NYHA) functional class more than II⁸ and the presence of pulmonary hypertension.

5.2. Aortic stenosis (AS)

Most of the causes of aortic stenosis in young women are congenital and less frequently, rheumatic when it is usually associated with mitral stenosis. Cases with subvalvular and supra-aortic stenosis have also been described in pregnancy.⁹ There is an abnormal rise in left ventricular filling pressure with resultant increased gradient across aortic valve and

Table 3 – Valvular heart diseases contra-indicating pregnancy.^a

1. Severe aortic stenosis
2. Severe mitral stenosis
3. Severe mitral or aortic regurgitation with poor LV function
4. Severe mitral or aortic regurgitation with history of heart failure.

^a These are high risk patients who should be counseled against pregnancy and given appropriate contraceptive advice.

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