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RESEARCH ARTICLE

VALVULAR HEART DISEASE AND PREGNANCY

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Abstract

Valvular heart disease during pregnancy is a high-risk situation for both the parturient and the fetus. Indeed, Cardiovascular changes during pregnancy can decompensate heart disease. The tolerance of pregnancy depends on the severity of the heart disease and the management of pregnancy in a patient with significant cardiac involvement is a challenge and requires a multidisciplinary approach.

Introduction:-

Pregnancy causes significant hemodynamic changes, with an increase in cardiac output of 30 to 50% (1). These changes are generally poorly tolerated in patients with cardiac disease. Indeed, cardiac involvement is responsible for 10 to 15% of maternal mortality [2].

The management of pregnancy in a patient with significant cardiac involvement is a challenge and requires a multidisciplinary approach. The objective of this article is to discuss the impact of physiological changes observed during pregnancy on parturient with significant valvular heart disease and the therapeutic implications.

Hemodynamic changes in the maternal cardiovascular system during pregnancy:

During a normal pregnancy, cardiovascular changes occur to meet the metabolic needs of the mother and the fetus. Maternal heart rate gradually increases by 15-25% and reaches its maximum in the third trimester [2]. Cardiac output increases by 40-50% [2].

The increase in cardiac output (CO) is therefore secondary to two phenomena [2]:

1. The increase in circulating volume increases ventricular preload, leading to an increase in systolic ejection volume gradually until the end of the second trimester.
2. During the second trimester, the increase in CO becomes more and more dependent on the elevation of heart rate. Proportionally to the increase in cardiac output during pregnancy, plasma volume grows more than erythrocyte mass, thus explaining the physiological anemia observed during pregnancy. Furthermore, the increase in plasma concentration of prostaglandins (PGI2 and PGE2) is associated with a decrease in the vasoconstrictive response to angiotensin II, allowing for the maintenance of an increased intravascular volume in the presence of normal blood pressure. Delivery is an additional hemodynamic stress, as cardiac output can double during uterine contractions during vaginal delivery. These changes depend on the delivery method and are attenuated in case of epidural analgesia and, of course, cesarean section. These changes lead to maternal hemodynamic deterioration in the presence of cardiac disease, particularly valvular heart disease.

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Native valvular heart disease:
Although chronic rheumatic valvulopathies are declining in Western countries, their incidence remains high in developing countries. Their management during pregnancy will depend on the affected valve and the severity of the hemodynamic repercussion.

Mitral stenosis:
Rheumatic mitral stenosis (MS) is the most common organic valvulopathy in developing countries. In the case of tight mitral stenosis, even well-tolerated previously, the risk of decompensation is high during pregnancy. The increase in cardiac output is the main factor likely to decompensate mitral stenosis. As the gradient across the valve is proportional to the cardiac output and the latter increases during the second half of pregnancy, the transvalvular gradient increases by about 25% [3]. On the other hand, tachycardia that accompanies the increase in output dangerously shortens diastole and thus decreases anterograde flow [3]. Therefore, this state of hypervolemia associated with tight mitral stenosis leads to an increase in left atrial pressures and pulmonary capillary pressures, constituting a bed for maternal-fetal complications [4]. Acute pulmonary edema and arrhythmias are the most frequent maternal complications [5,6]. Regarding fetal complications, prematurity is the most observed fetal complication [7]. Maternal mortality ranges from less than 1% for NYHA stages I-II to 7% for stages III and IV, fetal mortality is 30% for NYHA stage IV and the most critical period is during labor and delivery [8]. Ideally, to avoid the occurrence of complications, MS should be diagnosed and treated before pregnancy, and in the case of tight MS, even asymptomatic, an exercise test should be performed before pregnancy, but 40% of mitral stenoses are discovered during pregnancy. During pregnancy, echocardiographic evaluation of mitral stenosis is mainly based on planimetry (independent of loading conditions). In the event of symptoms [9], medical treatment based on beta-blockers should be initiated first, followed by small doses of diuretics that can be associated if symptoms persist. Anticoagulant therapy is only indicated in the case of atrial fibrillation or a history of embolism [10]. When a woman remains symptomatic despite well-conducted medical treatment or if she presents systolic pulmonary arterial pressures> 55mmHg, the risk of fetal and especially maternal complications during delivery justifies intervention on the mitral valve during pregnancy. The method of choice is percutaneous mitral dilatation, which should be performed in a reference center by a trained team, surrounded by special precautions, and proposed from the 20th week of gestation [10].

Aortic stenosis:
Aortic stenosis during pregnancy is most often due to aortic bicuspidity with or without aortic dilatation or coarctation [11]. Maternal and fetal prognosis essentially depends on the degree of severity of stenosis and the integrity of left ventricular function. If an exercise test is normal before pregnancy, pregnancy is generally well-tolerated. The occurrence of angina, heart failure, or even sudden death are possible complications [11]. The severity of aortic stenosis involves the usual parameters for assessing valve damage, but the gradient will be overestimated by the increased cardiac output.

If the diagnosis of severe aortic stenosis is made before pregnancy, surgical correction should be performed before pregnancy [12]. If the diagnosis is made after pregnancy, medical treatment involves loop diuretics during the congestive phase. Intervention is rarely necessary during pregnancy. It concerns patients who remain very symptomatic, in class III or IV of the NYHA, or who present signs of congestive heart failure. Aortic valve replacement surgery should be avoided due to fetal risk, leading to a preference for percutaneous aortic dilatation. This leads to transient hemodynamic improvement allowing for delivery under good conditions and should be followed by aortic valve replacement after delivery [13]. A caesarean section may be considered from the outset to avoid the risk of hemodynamic instability during labor.

Regular follow-up is required by an experienced team in severe aortic stenosis, with monthly or bimonthly cardiac assessments, including echocardiography, recommended.

Mitral and aortic regurgitation:
Mitral and aortic valve regurgitation during pregnancy can have a congenital, rheumatic, or, less commonly, degenerative origin. Severe regurgitation associated with symptoms or LV dysfunction poses a high risk of heart failure during pregnancy. In such cases, treatment should be primarily medical, mainly with diuretics, avoiding high doses that may compromise fetal perfusion. Surgery under cardiopulmonary bypass should only be considered during pregnancy in situations that compromise the mother's life prognosis. These rare indications may be encountered in acute regurgitation, particularly in cases of infective endocarditis. Regular monitoring by an

experienced team in severe valvular disease, with monthly or bimonthly cardiac assessments, including echocardiography, is recommended.

Tricuspid regurgitation:
Tricuspid valve regurgitation during pregnancy is mainly due to functional tricuspid regurgitation, but can also be caused by infectious endocarditis or Ebstein's anomaly. The maternal prognosis depends on the left ventricular function and the pressure in the pulmonary artery. Even if complicated by heart failure, tricuspid regurgitation should be managed medically. If surgery is necessary for left heart valve disease, tricuspid annuloplasty should be considered in moderate tricuspid regurgitation with annular dilation (> 40mm).

Operated valvulopathies:
The management of valvular heart disease in young women of childbearing age is crucial. Despite its excellent hemodynamic profile and advantage of durability, mechanical valves are associated with an increased risk of maternal and fetal mortality due to the need for therapeutic anticoagulation during pregnancy [14]. On other hand, a bioprosthetic valve at this age is associated with a high risk of deterioration but nevertheless allows for a pregnancy with minimal maternal and fetal risk.

Anticoagulant treatment modalities:
The risk of prosthetic thrombosis is increased during pregnancy, and the management of anticoagulant treatment is particularly difficult during pregnancy [14]. The most effective treatment to prevent prosthetic thrombosis is vitamin K antagonists, but they are associated with a high teratogenic risk when prescribed during the first trimester. On the other hand, unfractionated heparin and low molecular weight heparins (LMWH) have the advantage of not crossing the placenta, but they offer less protection against thromboembolic risk [15]. The European Society of Cardiology recommends continuing vitamin K antagonists throughout the entire pregnancy, including the first trimester, until the thirty-sixth week when the warfarin dose is less than or equal to 5 mg/24 h [16]. A switch to heparin during the first trimester should be considered only when the warfarin dose is greater than 5 mg/24 h [16]. LMWH should be prescribed in two daily injections. It is necessary to monitor anti-Xa activity weekly, which should be between 0.8 and 1.2 U/ml. The pharmacokinetics of LMWH are profoundly altered during pregnancy, and the increased thromboembolic risk requires dose adjustments for a greater anticoagulant effect than in the general population. The hemorrhagic risk during delivery justifies the interruption of vitamin K antagonists around the thirty-sixth week, and earlier in the case of a risk of premature delivery, with a switch to LMWH. [15]

Conclusion:-
valvular heart disease is a high-risk situation for complications during pregnancy. Rheumatic valvulopathy is the most common etiology in developing countries. A preconception consultation is mandatory to assess the severity of valvular disease and the need for surgical management before conception. If valvular disease is diagnosed during pregnancy, medical or percutaneous management is preferred, and surgery is only indicated in situations where maternal prognosis is at risk.

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