Seminars in Perinatology 38 (2014) 304–308

Available online at www.sciencedirect.com

ScienceDirect

www.elsevier.com/locate/semperi

Ischemic heart disease in pregnancy

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ARTICLE INFO

Keywords:
maternal morality
ischemic cardiac disease
maternal morbidity

ABSTRACT

While ischemic heart disease in reproductive-age women is rare, cardiac disease is a leading cause of maternal mortality. In turn, coronary artery disease is one of the most common causes of maternal cardiac death. The incidence of coronary artery disease in pregnancy may be rising due to the increasing prevalence of comorbid risk factors. Diagnosis and clinical management of ischemic cardiac disease is largely similar in the pregnant and non-pregnant patient, and the majority of medications and diagnostic and interventional procedures are compatible with pregnancy with a few important exceptions. Care for ischemic cardiac disease in pregnancy may be suboptimal because: (1) diagnosis is delayed because many symptoms of ischemic cardiac disease are common in pregnancy, (2) a diagnostic workup is insufficiently thorough, and/or (3) consultants may be hesitant to perform diagnostic and interventional procedures in obstetric patients. Obstetric providers should be aware of the possibility of ischemic cardiac disease in pregnancy, particularly in patients with comorbid risk factors. If ischemic cardiac disease is suspected, a thorough workup should be performed.

Introduction

Ischemic heart disease, also referred to as coronary heart disease, is relatively uncommon in premenopausal women. However, cardiac disease is a leading cause of maternal mortality in the developed world that has been increasing in incidence over the past 2 decades.[1,2] Ischemic heart disease in turn is one of the most common cardiac causes of maternal death.[2,3] With increasing prevalence of risk factors such as advanced maternal age, obesity, and medical co-morbidities, myocardial infarction during pregnancy has become more common.[4] Given the increasing clinical importance of ischemic cardiac disease in pregnancy, this review will address the following topics: (1) epidemiology of ischemic cardiac disease in pregnancy, focusing on myocardial infarction; (2) screening for and diagnosis of coronary artery disease; (3) medical and interventional management of acute and prior ischemic cardiac events during pregnancy; and (4) intrapartum and postpartum management of women with ischemic heart disease.

Epidemiology of ischemic cardiac disease in pregnancy

Reported incidence of ischemic heart disease in pregnancy varies based on the following: (1) whether conditions other than acute myocardial infarction are included, (2) if postpartum events are included in the analysis, and (3) methods of data ascertainment. In the United States, 2.0 cases of acute myocardial infarction (MI) occurred per 100,000 delivery hospitalizations between 2008 and 2009 based on data from the Nationwide Inpatient Sample. During this same period, 4.2 cases of acute MI occurred per 100,000 postpartum

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http://dx.doi.org/10.1053/j.semperi.2014.04.020
0146-0005/

hospitalizations.[4] Administrative data from California between 1991 and 2000 demonstrated that myocardial infarction occurred in 1 in 35,700 pregnancies.[5] The triennial *Saving Mothers' Lives* report from the United Kingdom found that from 2006 to 2008 0.48 deaths per 100,000 pregnancies (95% confidence interval: 0.27–0.87) occurred due to ischemic cardiac disease. The majority of deaths in the UK occurred postpartum and almost half involved substandard care.[2]

Common risk factors associated with ischemic heart disease in pregnancy include maternal age greater than 35 years, obesity, smoking, hypertension, hyperlipidemia, family history of cardiac disease, and diabetes.[2,5–8] Many of these risk factors are becoming increasingly prevalent in the pregnant population. In the United States in 2011–2012, 31.8% of women between the ages of 20 and 39 years were obese according to the Centers for Disease Control and Prevention.[9] The incidences of hypertension and diabetes have increased in younger as well as older women. The birthrate for women between the ages of 40 and 44 years approximately doubled between 1990 and 2012 and increased nearly 50% for women between the ages of 35 and 39 years.[10] All of the women in the UK triennial *Saving Mothers' Lives* report who died from ischemic cardiac disease between 2006 and 2008 had at least one identifiable risk factor.[2] A large case series of obstetric myocardial infarction further validated these risk factors and found high rates of hypertension, smoking, diabetes, hyperlipidemia, and family history in patients with MI during pregnancy.[11] Chronic cardiac disease is another major epidemiologic risk factor for myocardial infarction during pregnancy. Data from the Nationwide Inpatient Sample from 2004 to 2006 demonstrated that 64.5% of cases of MI during pregnancy were associated with chronic cardiac disease.[12]

Some evidence shows that pregnancy may increase the overall risk of MI; however, not all studies have supported this relationship.[6,13] The majority of cases of MI in pregnancy are anterior in distribution; one large series of 103 patients demonstrated anterior MI in 78% of cases. Evaluation of coronary arteries in this series found that stenosis (41%) and dissection (28%) were the most frequent anatomical findings.[11] Etiologies for MI include atherosclerosis, thromboembolism, coronary artery dissection, and coronary artery spasm. Myocardial infarction is associated with a mortality rate of 10–20% with the majority of deaths occurring within 2 weeks of infarction or postpartum. The majority of fetal deaths occur secondary to maternal death.[14]

Screening and diagnosis

Preconceptional evaluation

Women at risk for ischemic heart disease should undergo a thorough assessment of cardiovascular status prior to conception. Screening for atherosclerosis should be performed for high-risk women, as this is the leading underlying cause of acute coronary syndrome in pregnancy.[14] Women with a history of mantle radiation may be at a particularly high risk for coronary artery disease.[15] Similar to non-pregnant patients, the workup may include electrocardiogram, echocardiogram, stress testing, cardiac MRI, and cardiac catheterization as indicated. If evidence of ischemic heart disease is found, the patient should be referred for medical therapy and optimization of cardiovascular status. While there is little data on maternal risk to guide recommendations for women with prior MI or other known ischemic heart disease, coronary status and left ventricular function may be important factors in patient counseling. Coronary arteriography can be performed to confirm normal coronary arteries or to allow diagnosis and revascularization, if critical coronary stenosis is found.[14] Patients with persistent heart failure secondary to prior myocardial infarction, significant dysfunction of the left ventricle, and ischemia at rest or provoked by mild exertion should be counseled that pregnancy and labor pose a significant risk.

Diagnosis in pregnancy

While the diagnosis of ischemic heart disease during pregnancy is based on many of the same criteria outside of pregnancy, including ischemic symptoms, electrocardiogram (ECG) and echocardiogram findings, and elevations in cardiac biomarkers, there are several important considerations in the evaluation of the pregnant patient with suspected MI. In pregnant women without known heart disease, the diagnosis of ischemic cardiac events may be delayed as presenting symptoms can be difficult to distinguish from common pregnancy-related complaints such as gastrointestinal reflux, musculoskeletal pain, vomiting, dizziness, and physiologic dyspnea of pregnancy.[14] Markers of cardiac ischemia are interpreted differently in pregnancy. Serum total creatine phosphokinase and its MB isoenzyme increase during normal labor and vaginal delivery and may not be diagnostic of myocardial ischemia.[16] Troponins are followed serially in pregnant patients with suspected cardiac ischemia and are a more reliable marker of true myocardial damage during the peripartum period.[11] ECG interpretation may be complicated by pregnancy. ST depression mimicking ischemia may be present during cesarean section.[11,17,18] While consultants may be hesitant to perform cardiac catheterization and interventional procedures because of the radiation involved, exposure to the fetus is less than 1 rad with shielding, well below the threshold considered to be harmful.[14]

The triennial UK *Saving Mothers' Lives* report includes in-depth reviews of maternal death cases and found that of women who died from cardiac ischemia, care was substandard in 46% of cases. Key clinical management points drawn from the review of maternal deaths include the following[2]:

- Failure to consider ischemic cardiac disease as a cause of symptoms led to inadequate evaluations.
- ECGs can be normal when a patient with ischemic cardiac disease is not symptomatic; evaluation for chest pain should include serial ECGs and troponins.
- A normal echocardiogram does not exclude myocardial infarctions, in particular non-ST elevation Mis.
- It is possible that cardiologists were reluctant to perform coronary angiograms because of pregnancy.

Given this care quality data, obstetric providers should be aware of the possibility of ischemic cardiac disease in