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Pregnancy- Associated Myocardial Infarction: A Report of Two Cases and Review of the Literature

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Abstract

Background: Myocardial infarction in pregnancy carries high morbidity. Spontaneous coronary artery dissection is one etiology of infarction, and up to one third of cases may arise in the third trimester of pregnancy or within three months postpartum.
Case: We report two cases of spontaneous coronary artery dissection, one at 34 weeks gestation and one postpartum. Both patients were diagnosed with angiography and treated medically and one required percutaneous coronary intervention, with good obstetric outcome and return of cardiac function.
Conclusion: Myocardial infarction, and particularly spontaneous coronary artery dissection, should be in the differential diagnosis of pregnant women presenting with cardiac-type symptoms, despite perceived lack of risk factors. Angiography will aid in diagnosis, and multiple therapeutic modalities exist.

Introduction

Myocardial infarction (MI) during pregnancy and the puerperium is a rare but potentially devastating event. Acute myocardial infarction complicates approximately 1 per 10 000 pregnancies. It clearly causes an increment in both maternal (45%) and fetal mortality, especially reaching the highest levels in the third trimester (50%). (1) Historically, the etiology of these events has been poorly understood. With increased use of coronary angiography, trends in coronary lesions are beginning to be identified, and risk factors assessed. Nonetheless, care of these patients continues to prove challenging, as few guidelines exist to direct management, and mortality rates remain high. We report two cases of MI secondary to spontaneous coronary artery dissection, one intrapartum and the other postpartum, and review the etiology and management of pregnancy-associated MI.

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Case 1

A 32 year old Caucasian gravida 12 para 2092 at 34 weeks gestation was referred to high risk obstetrics secondary to a history of multiple abdominal surgeries. While eating lunch in the hospital cafeteria prior to her first appointment, she developed the sudden onset of shortness of breath, diaphoresis, and chest pressure radiating to the right arm described as 10/10 in severity. She was immediately transferred to the emergency department where sublingual nitroglycerin provided some relief.

Her antenatal course was remarkable for chronic hypertension controlled by methyldopa, hydralazine and nifedipine. Additional medications included hydroxyzine and famotidine, while allergies include an anaphylactic reaction to labetalol. Her history was significant for asthma, gastroesophageal reflux, and migraine headaches, as well as multiple surgeries, including appendectomy, cholecystectomy, ventral herniorraphy, abdominoplasty, two cesarean sections and three dilation and curettage procedures. She reported nine first trimester losses with three partners. She was a smoker and smoked one half pack year, and had a family history of hypertension.

On further history, the patient noted that she had experienced intermittent chest pressure during the preceding months. On physical examination, blood pressure was 157/96 in both arms, and pulse was 113. Jugular-venous pressure was normal, heart examination showed regular rhythm with a II/VI systolic ejection murmur, lungs were clear, extremities revealed trace edema, and deep tendon reflexes were normal. Physical exam was otherwise unremarkable. All initial laboratories were within normal limits; however, electrocardiogram revealed an ectopic atrial rhythm and hyperdynamic T waves in leads V4 through V6, which normalized after nitroglycerin. A limited echocardiogram demonstrated mild left ventricular enlargement with a focal area of anterior wall hypokinesis and a normal ejection fraction.

The patient was transferred to the Coronary Care Unit for blood pressure control, anticoagulation, and overnight desensitization to metoprolol. In addition to her home medications, she received clopidogrel, heparin, aspirin, and nitrates. Cardiac biochemical markers rose overnight, with the third set peaking at CPK 517 units/L, CK-MB 57 units/L , and troponin T 119 ug/L .The decision was made to perform cardiac catheterization with preparations for potential complications requiring emergent cesarean section. Angiography was then performed via the femoral approach, revealing a proximal dissection of the left anterior descending artery without evidence of coronary artery disease and normal coronary flow. (Figure 1)

Over the next 48 hours the patient was stabilized, her medications were changed to diltiazem, metoprolol, nitrates, aspirin, and heparin infusion. Intermittent fetal heart monitoring remained reassuring, and she was transferred to the Maternal Special Care Unit for the remainder of her pregnancy. Her hospital course was remarkable for repeat echocardiogram showing resolution of the wall motion abnormality, and for consistently reassuring fetal testing. At 38 weeks, a scheduled cesarean section and tubal ligation were performed, to delivery of a 3200g infant with Apgar scores of 9 and 9. All hospital medications were continued after delivery, with the

exception of heparin, which was replaced by clopidogrel. Both mother and infant were discharged home on post-partum day four. Postpartum evaluation revealed no evidence of any thrombophilia.

Case 2

A 32 year old Caucasian gravida 1 para 1 presented to the Emergency Department nine weeks post-partum with the acute onset, one hour prior, of substernal chest pain radiating to the left arm. Her pregnancy had been complicated only by preterm rupture of membranes with delivery at thirty-two weeks gestation. She had no medical problems or surgical history, did not smoke or use drugs, and her only medication was multivitamins. Her father had had coronary angioplasty at age fifty-five.

On examination, the blood pressure was 120/60 in both arms, and pulse was 60. The initial physical examination and laboratory analysis were within normal limits, with the exception of a troponin T of 0.5 ug/L (normal less than 0.4 ug/L), and an electrocardiogram showing nonspecific ST abnormalities. She was monitored in the emergency room until a second set of cardiac markers returned, this time showing a rise in the CPK from 95 to 428 units/L, in the MB fraction from 2.3 to 65.6 units/L, and an increase in troponin T to 16.5 ug/L. Over the same period, T-wave inversions were seen to evolve in V2. Therapy with a glycoprotein IIb/IIIa inhibitor was initiated, and diagnostic angiography was performed, revealing noncritical lesions in the mid left anterior descending and circumflex arteries, as well as focal hypokinesis of the mid anterior and lateral walls, and a mildly depressed ejection fraction of 40 percent. Normal flow was seen in both branches of the left coronary artery and she was pain free, therefore no further intervention was performed. Treatment was continued with eptifibatide, heparin, clopidogrel, metoprolol, nitroglycerin, and atorvastatin. The third set of markerss peaked at a CPK of 601 units/L, MB fraction of 104 units/L, and troponin T of 22.3 ug/L.

Despite continued antithrombotic therapy, she had two further episodes of chest pain relieved by nitroglycerin leading to repeat angiography. At that time, a critical lesion of the circumflex artery was identified. Intravascular ultrasound (IVUS) confirmed a dissection in the media extending to the adventitia, and compromising the vessel lumen. The lesion was stented, and IVUS confirmed that there was no residual dissection.

The patient did well, and was discharged home on hospital day four, on clopidogrel, ramipril, metoprolol, atorvastatin, aspirin, and folate. A thrombophilia work-up was negative for coagulopathy, and a follow-up echocardiogram performed at six weeks showed a normal ejection fraction. A stress echocardiogram done at 6 months showed mild hypokinesis of the distal lateral wall.

Comment

Myocardial infarction (MI) during pregnancy or the puerperium is uncommon, but carries a high risk of morbidity and mortality for both mother and fetus. The etiol-

ogy of cardiac events in otherwise healthy young women is unclear, making cardiac complications difficult to predict. Surveys of case reports suggest that approximately one-quarter of affected women are hypertensive or smoke, but half have been found to have no cardiac risk factors. Multiparity and advanced maternal age may be risk factors. Atherosclerosis, thrombosis, vasospasm, and dissection have all been identified as precipitating coronary lesions, though the relative frequency of each is not yet well established. Regardless of etiology, it is clear that the vast majority of pregnancy-related cardiac events occur in the third trimester or postpartum (2–4).

Spontaneous coronary artery dissection (SCAD) was identified as the cause of MI in both of the cases that we review here. In building upon the review by Koul, et al. (3), we were able to identify a total of only 22 cases of intrapartum SCAD, and 54 cases of postpartum SCAD reported over the last fifty years. Overall, eighty-percent of SCAD cases occur in women, and one-third of those arise in the third trimester of pregnancy or within three months postpartum (4–6). The basis of this relationship has yet to be clearly elucidated, but observational studies suggest that hormonal changes associated with pregnancy along with the hemodynamic stresses present during labor and delivery could trigger an intimal disruption(7, 8). Maeder et al proposed pregnancy-related hypercholesterolemia as a contributory factor for pregnancy related coronary artery dissection (9). There is one reported case of coronary artey dissection during hemodialysis due to a recent abortion and consequent curettage at first trimester of her pregnancy (10). Diagnosis is typically confirmed through angiography, though intravascular ultrasound has proven to be an important adjunct technique.

Establishing the coronary lesion in pregnancy, which then may direct therapy, will depend upon the gestational age of the fetus. Angiographic interventions are becoming more common in pregnancy, though prior to fourteen weeks gestation, the need for angiography must be balanced against the risk of radiation during organogenesis. Fortunately, risk is reduced late in pregnancy or postpartum, when most cardiac events occur. Preparation for angiography should include all efforts to lessen radiation exposure to the fetus regardless of gestational age. Basic preparations include appropriate shielding and minimizing procedure time. Additionally, the obstetric team should be readied for emergent cesarean section in the catheterization suite should expeditious delivery become necessary. Fewer angiographic interventions are performed during pregnancy, though case reports on the use of intravascular stents in pregnancy have suggested these interventions can be successful (11, 12). In the case of thrombotic lesions, both revascularization and thrombectomy have been employed.

Medical treatment will depend on the type of lesion seen, as well as on the hemodynamic status of the patient. Heparin, beta-blockers, diuretics, nitrates, and low-dose aspirin are considered safe in pregnancy, and can be used with appropriate hemodynamic and fetal monitoring. More experience is also being gained with the use of glycoprotein IIb/IIIa inhibitors, and thienopyridines, which are frequently used as an adjunct to angioplasty. We used a short course of clopidogrel without

any complications. Glycoprotein IIb/IIIa inhibitors vary greatly in their half-lives, and those with a shorter duration of action are preferred when delivery is imminent. When angiography is contraindicated, consideration may be given to the treatment of large infarcts with thrombolytics such as streptokinase, though pregnancy is a relative contraindication to systemic thrombolysis. With spontaneous dissection, anticoagulation may be appropriate to prevent thrombus formation at the site of the lesion, though a potential concern that anticoagulation may cause increased bleeding into damaged vessels also exists.

Coronary artery bypass grafting has also been successfully performed during pregnancy and in the post-partum period (13). Coronary bypass typically remains an option of last resort, as cardiovascular surgery during pregnancy carries unique risks. Fetal risks of insult or death are greater than with other surgeries, and importantly, these outcomes appear to be unpredictable. However, when surgery is performed in conjunction with delivery, maternal outcomes appear to worsen (14). Paez M and collegues report the case of a post-partum woman with dissection of left coronary trunk who was treated with revascularization surgery, ventricular assistance and a successful heart transplant (15).

Broader recognition of the risk of MI in pregnancy should lead to more rapid diagnosis and treatment. However, our understanding of the etiology and risk factors of this disorder is incomplete, and until further research in this area is performed, cases are unlikely to be prevented. Thus, MI should be in the differential diagnosis of every pregnant patient who presents with symptoms suspicious for cardiac event, particularly those in the third trimester or postpartum, despite any perceived lack of cardiac risk factors.

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