PREPARATION

MOC Preparation: Maternal Valvular Heart Disease in Pregnancy

Beginning in 2008, anyone who became board certified in general obstetrics-gynecology since 1986 is required to register for the Maintenance of Certification (MOC) examination. Part III is the Cognitive Expertise portion of the MOC process—a "closed book" written examination expected to consist of 100 multiple-choice questions. Are you ready?

Spot check your knowledge base by taking this month's MOC preparation quiz prepared by Dr Alvin Schamroth of ExamPro Advanced, the nation's leader in OB/GYN board prep services. For more valuable products and services to help you pass the MOC, go to www.examproadvanced.com.

> 1. A woman who experiences symptoms with physical activity that is slightly less than her normal daily routine would be categorized in which New York Heart Association (NYHA) class?

A. Class I	C. Class III
B. Class II	D. Class IV

- 2. Which of the following are normal physiological changes in pregnancy?
 - A. Increased cardiac output, but not stroke volume
 - B. Increased cardiac output and stroke volume
 - C. Increase is systemic vascular resistance
 - D. Slight increase in mean arterial pressure
- 3. Epidural is acceptable in a patient who is on therapeutic lowmolecular-weight heparin provided the last dose was given at least how many hours previously?
 - **A.** 12 hours **C.** 36 hours
 - **B.** 24 hours **D.** 48 hours
- 4. Which cardiac murmurs are typically problematic in the pregnant patient?
 - A. Systolic murmurs
 - **B.** Diastolic murmurs
 - C. Both systolic and diastolic murmurs
 - D. Neither systolic or diastolic murmurs
- 5. Which mild valvular lesions are more likely to be made worse by pregnancy?
 - A. Regurgitant lesions C. Both stenotic and regurgitant lesions
 - B. Stenotic lesions D. Neither stenotic nor regurgitant lesions

Answers found on page 44.



MOC Preparation: Answers and Review

Someone who experiences symptoms with physical activity that is slightly less than her normal daily routine would be categorized in this NYHA class:

Answer: C, Class III.

Normal physiological changes in pregnancy are:

Answer: B, Increased cardiac output and stroke volume.

Epidural is acceptable in a patient who is on therapeutic low-molecular-weight heparin provided the last dose was given at least:

Answer: **B**, **24 hours earlier**.

Cardiac murmers that are typically problematic in the pregnant patient are:

Answer: **B**, **Diastolic murmers**.

The mild vulvular lesions that are more likely to be made worse by pregnancy are:

Answer: **B**, Stenotic lesions.

This case presentation provides the opportunity to extensively review maternal valvular heart disease in pregnancy. Although the incidence of maternal cardiac disease is only 5%, it represents about 15% of maternal mortality.

Severity is based on the NYHA Functional Classification System:

- Class I: asymptomatic
- Class II: symptoms with ordinary activity
- Class III: symptoms with less than ordinary activity
- Class IV: symptoms at rest
 - Class 1-2 regarded as mild, Class 3-4 as severe

CVS physiological changes in:

- Pregnancy
 - Increase in blood volume 50%
 - Decreased systemic vascular resistance (SVR) of about 20%
 - Hypercoagulable state
 - Increased resistance to protein C
 - Decreased protein S
 - Increased clotting factors

- Increased cardiac output (CO)
 - 50% by 28 weeks
 - Also major increases in CO occur with each uterine contraction
- Pulse rate increases by 15%
- Stroke volume increases by 25%
- Mean arterial pressure (MAP)
 - Declines by 28 weeks (mostly due to decreased diastolic, as opposed to systolic pressure)
 - Returns to pre-pregnancy level at term
- Labor
 - CO and MAP increase by 50%
 - Supine position will compress the inferior vena cava and decrease CO (and should be avoided)
 - Pain can elevate CO, pulse, and MAP
- Postpartum (within first hour postpartum)
 - CO and stroke volume increases by 60% due to involution of uterus
 - This, in essence, represents an autotransfusion causing bradycardia and subsequent diuresis
 - Pre-pregnancy status is achieved by 6 weeks postpartum
- Valvular anatomical changes
 - The valvular roots are enlarged (dilated) resulting in an increased incidence of regurgitation. This can cause dyspnea which is acceptable provided:
 - It begins in the first half of pregnancy
 - Does not occur at rest
 - Is not associated with chest pain or syncope
 - General rule
 - Systolic murmurs are typically physiological
 - Diastolic murmurs are typically pathological

Specific valvular lesions

- Mitral stenosis
 - Most common valve lesion, and virtually always due to rheumatic fever
 - The stenosis causes a backup of blood with resultant elevated left atrial pressure (with chamber enlargement if chronic) and pulmonary edema
 - Evaluation comprises:
 - Echocardiogram (to assess left atrial size, valve anatomy, and surface area)
 - $^{\circ}$ 4-6 cm = normal valve
 - < 1 cm = severe stenosis



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- Electrocardiogram (EKG) looking for:
 - Left atrial enlargement and fibrillation, and with the backup effect, of right ventricular hypertrophy as well. This would suggest pulmonary hypertension.
- Complications
 - Heart failure, pulmonary edema, and arrhythmias: Due to the mild tachycardia (normal in pregnancy), diastole is shorter and thus time for the left ventricle to fill is less. This, coupled with a stenotic valve can result in heart failure, pulmonary edema, and arrhythmias.
 - Embolism from a valve thrombus
- Management
 - Avoid tachycardia (for reason mentioned above), beta blocker if necessary (especially in labor)
 - Terbutaline contraindicated (due to side effect of causing a tachycardia)
 - Diuretics for pulmonary edema
 - Avoid fluid overload while maintaining adequate preload (requires hemodynamic monitoring)
 - Deliver via assisted vaginal delivery and avoid Valsalva
- Mitral regurgitation
 - Pathophysiology
 - The decreased SVR actually allows more forward flow (as opposed to regurgitation) of blood across the valve and thus pregnancy is beneficial
 - Evaluation
 - Echocardiogram
 - EKG
 - Complications
 - Rare
 - Management
 - Diuretic if pulmonary edema develops
 - Inotropes if compromised left ventricular function

FOCUS**POINT**>

Cardiac valvular disease has very specific issues that must be considered when managing such a patient in pregnancy. These include the type of valve lesion, cardiac status, anticoagulation, and subacute bacterial endocarditis prophylaxis.

- Anticoagulation (if severely decreased ejection fraction)
- Aortic stenosis
 - Pathophysiology
 - Fixed cardiac output requires increased left ventricular pressure to push blood past the valve, causing similar symptoms of left ventricular failure. Inadequate perfusion can be life threatening.
 - Evaluation
 - Echocardiogram
 - EKG
 - Complications
 - Angina
 - Decreased physical capacity and heart failure
 - Management
 - Correct lesion prior to pregnancy
 - Epidural is acceptable (but be weary of hypotension)
 - Assisted second stage is preferred
- Aortic regurgitation
 - Rarely problematic and pregnancy tends to assist the pathophysiologic problem by reducing SVR, thus encouraging forward flow and reducing the degree of regurgitant flow
- Pulmonary and tricuspid stenosis and regurgitation
 - Rarely clinically problematic
- Valve replacement
 - Provides significant benefit, although pregnancy carries a 3% mortality for those with mechanical valves
 - Mechanical (but typically not biological) valves require lifetime anticoagulation (typically warfarin) to avoid thrombosis
 - Warfarin is associated with a 30% risk of Fetal Warfarin Syndrome if given at 7 to 12 weeks gestation (causing nasal bridge hypoplasia, congenital heart defects, and stippled epiphyses).
 - Those on therapeutic low-molecular-weight heparin should be transitioned to therapeutic unfractionated heparin at 36 weeks gestation. If transition has yet not occurred before the patient goes into labor, epidural analgesia should be delayed:
 - 24 hours following the last dose of therapeutic low-molecular-weight heparin
 - 12 hours following the last dose of prophylactic low-molecular-weight heparin
 - A delay of at least 24 hours is required prior to epidural placement

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- After 6 hours postpartum, resume low-molecularweight heparin or unfractionated heparin and continue till warfarin reestablished and INR > 2.5
- Both valve types (mechanical and biologic) have increased risk of endocarditis
- Risk factors for increased morbidity and mortality in pregnancy are:
 - Myocardial infarction, stroke, arrhythmia or cardiac failure prior to pregnancy
 - NYHA Class II prior to pregnancy
 - Aortic valve stenosis < 1.5 cm^2 or mitral valve stenosis < 2 cm^2
 - Left ventricular ejection fraction < 40%

General management

- Preconception: Assess cardiac status and consider anticoagulation needs
- Antepartum: Manage in conjunction with maternal-fetal medicine, cardiology, and anesthesia
- Intrapartum
 - Monitor fluid balance
 - Supplemental O₂
 - Active use of oxytocin or misoprostol (avoid methergine which causes hypertension)
- Postpartum
 - Observe for 24 hours in the intensive care unit and be aware for heart failure potential
 - Discuss contraception options
- Subacute bacterial endocarditis (SBE) prophylaxis: Artificial valves are an indication for SBE prophylaxis. Treatment for any coexistent infection should also cover for SBE prophylaxis.

Source: Roeder HA, Kuller JA, Barker PC, James AH. Maternal valvular heart disease in pregnancy. *Obstet Gynecol Surv.* 2011;66(9):561-571.

DISCLAIMER: The questions and review were not developed by the American Board of Obstetrics and Gynecology (ABOG), and the developers of this material have no association with the ABOG. These questions are to be used as a study guide to test knowledge on subjects that may or may not be covered in the recertification examination.