Ophthalamic Anesthesia

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Case: A 30-year-old woman presented on third day postpartum with severe headache; patient healthy and pregnancy uneventful until 36th wk, when routine labs revealed platelet count 12,000/μL and mildly elevated liver function tests; patient underwent cesarean delivery with no complications; differential diagnosis includes optic neuritis, tumor, pituitary adenoma, meningoencephalitis, venous sinus thrombosis, stroke, exacerbation of preexisting disease (especially diabetic retinopathy), and retinal disorders (eg, central serous retinopathy, hypertensive retinopathy, retinal detachment); fundoscopic examination revealed multiple serous retinal detachments bilaterally, as well as some areas of hemorrhage; multiple retinal detachments attributed to hemoysis, elevated liver enzymes, and low platelet count (HELLP) syndrome (severe form of preeclampsia that can result in disseminated intravascular coagulation [DIC], abruptio placenta, acute renal and hepatic failure, pulmonary edema, and cerebral hemorrhage; many of these conditions can affect vision)

Preeclampsia: pathophysiology — placenta secretes proinflammatory cytokines into maternal circulation, which causes systemic endothelial dysfunction; increased vascular resistance and vascular permeability as well as decreased oncolytic pressure contribute to cycle of further decrease in maternal circulating volume and placental perfusion; in response, placenta produces increased antian- tissue, blood flow to choroid, and thickness of choroid may be observed; in preeclampsia, vasoconstriction and hema-

Educational Objectives

The goals of this program are to improve outcomes of anesthesia in pregnancy and in patients being treated for cardiovascular disease. After hearing and assimilating this program, the clinician will be better able to:

1. Explain the pathophysiology of preeclampsia and its potential effect on the eye.
2. Recognize the role of new imaging modalities of the choroid in the assessment of preeclampsia.
3. Consider fundoscopic findings in assessing the risk for eclampsia.
4. Optimize hemodynamic management to protect structures of the eye.
5. Evaluate the potential risks of administering β-blockers for prophylaxis in the perioperative setting.

Faculty Disclosure

In adherence to ACCME Standards for Commercial Support, Audio Digest requires all faculty and members of the planning committee to disclose relevant financial relationships within the past 12 months that might create any personal conflicts of interest. Any identified conflicts were resolved to ensure that this educational activity promotes quality in health care and not a proprietary business or commercial interest. For this program, members of the faculty and planning committee reported nothing to disclose.
of single OCT slices, which may not accurately represent complex changes that occur in different disease processes.

**Loss of vision in patient with preeclampsia:** may be sign of impending eclampsia; patient in case study suffered seizure on postpartum day 4, developed DIC, and died; debate ongoing about whether maternal or fetal outcomes worse in patients with abnormal findings on fundoscopic examination; studies have shown significant associations between grade of retinopathy and maternal levels of uric acid, maternal degree of proteinuria, and fetal birth weight, which suggests that severity of maternal retinopathy may reflect state of placental vasculature (and thereby correlate with severity of preeclampsia and resulting morbidity and mortality of fetus and mother).

**Relevance to anesthesiologist:** correlation exists between mean arterial pressure and extent to which fluid in eye leaks, and therefore optimal antihypertensive and fluid management necessary for recovery of vision and prevention of worsening retinal detachment; key role for epidural analgesia to prevent reflex sympathetic hypertension secondary to pain; primary obstetric team should recognize visual symptoms promptly and consult ophthalmologist; ophthalmologic consultation should be undertaken quickly; retinal detachments can develop in absence of other signs of hypertensive retinopathy (numerous reports document patients with preeclampsia initially presenting to ophthalmologist).

**Beta Blockers**

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**Pathogenesis of perioperative myocardial infarction (MI):** type 1 involves rupture of plaque; type 2 involves imbalance of myocardial oxygen supply and demand; tachycardia, hypertension, vasoconstriction, and hypotension causing inadequate myocardial perfusion, anemia, and hypoxemia in perioperative period; 2 autopsy studies demonstrated that type 2 most common type of perioperative MI; β-blockers may have cardioprotective effect (ie, by reducing heart rate, wall tension, myocardial contractility, and incidence of arrhythmias).

*Mangan et al (1996):* double-blind randomized controlled trial (RCT) included 200 patients with known coronary artery disease (CAD) or at risk for CAD undergoing noncardiac surgery; patients randomized to atenolol vs placebo 1 hr before surgery and during inpatient stay; at 2-yr follow-up, 21 patients in placebo group had died (including 12 deaths related to cardiac events) and 9 patients in atenolol group had died (including 4 deaths related to cardiac events); 55% reduction in all-cause mortality and 65% reduction in mortality related to cardiac events seen in atenolol group; authors concluded that administration of perioperative atenolol in patients with or at risk for CAD can reduce mortality and cardiovascular complications for ≤2 yr following noncardiac surgery; *critique*—Eagle et al (2002) noted significantly more patients in atenolol group received preoperative β-blockers, diuretics, and other antihypertensive agents (ie, atenolol group may have been more optimized than placebo group); preoperative β-blockers stopped at time of surgery in 8 patients randomized to placebo group, possibly increasing vulnerability to inflammatory response and surgical stress.

**Dutch Echocardiographic Cardiac Risk Evaluation Applying Stress Echocardiography (DECREASE 1) trial:** unblinded multicenter RCT of 112 patients with stress-induced ischemia undergoing vascular surgery; patients randomized to standard care vs bisoprolol; exclusion criteria included prior treatment with β-blockers; rate of cardiac death or nonfatal MI within 30 days of surgery higher in standard care group than in bisoprolol group (34% vs 3.4%); *critique*—event rate high in standard care group (although inclusion criteria included failed stress test); trial stopped early by safety committee because of profound differences between groups, which may have confounded statistical conclusions; lack of blinding can introduce bias; Committee for Scientific Investigation of Data Integrity found faulty data in subsequent trials (DECREASE 2, 3, and 4), which raised concern about data from DECREASE 1.

**Consequences of RCTs:** in 2001, Agency for Healthcare Research and Quality identified perioperative use of β-blockers in intermediate- and high-risk patients as clear opportunity to improve safety; 2003 National Quality Forum included use of β-blockers in high-risk patients undergoing surgery on list of 30 safe practices for better health care; American College of Cardiology/American Heart Association (ACC/AHA) endorsed use of β-blockers because they may reduce risk for MI and death in high-risk patients.

**Diabetic Postoperative Mortality and Morbidity (DIPOM) study:** prospective double-blind RCT included 921 patients with diabetes undergoing noncardiac surgery; patients randomized to extended-release metropolol 50 mg (titrated to 100 mg) vs placebo starting evening prior to surgery and continuing through hospitalization (maximum 7 days); results demonstrated no difference between metropolol group and placebo group in all-cause mortality, acute MI, unstable angina, or CHF at 30 days, 6 mo, and 18 mo; *conclusion*—evidence does not support use of β-blockers based on sole indication of diabetes in perioperative period; *critique*—mean duration of receiving β-blocker 4.6 days (ie, patients may not have achieved steady state); population appeared to be healthy despite diabetes; rate of in-hospital events only 1%, and rate of long-term events only 10%.

**Metropolol after Vascular Surgery (MaVS) study:** double-blind RCT of 496 patients randomized to metropolol vs placebo 2 hr prior to vascular surgery; rates of intraoperative hypotension and bradycardia significantly higher in metropolol group; authors concluded that the widespread use of β-blockers not indicated in patients undergoing vascular surgery; *critique*—638 patients taking β-blockers not included, which may have eliminated confounding effect of withdrawal from β-blockers but also may have excluded sickest patients and those likely to benefit most from perioperative β-blockers; population relatively healthy, with only 10% of patients having Revised Cardiac Risk Index (RCRI) score ≥3.

**Perioperative Ischemic Evaluation (POISE) trial:** RCT of >8000 patients; patients randomized to extended-release metropolol 200 mg vs placebo 2 to 4 hr prior to noncardiac surgery and continuing for 30 days; inclusion criteria included age ≥45 yr and either history of CAD, peripheral vascular disease, CHF, undergoing major vascular surgery, or 3 of 7 risk factors including diabetes, chronic kidney disease, age ≥70 yr, transient ischemic attack, undergoing emergency surgery, and intraperitoneal or intrathoracic surgery; metropolol associated with significant decrease in nonfatal MI, total MIs, and need for cardiac revascularization, as well as decrease in incidence of new-onset atrial fibrillation; however, metropolol also associated with significant increase in hypotension and bradycardia, as well as increase in nonfatal stroke, total strokes, and total mortality.

**Criticale:** 4000 patients naive to β-blockers given large dose of metropolol; only three-quarters of metropolol group took 80% of study drug, and 13% discontinued study drug because of bradycardia and hypotension; *analysis of adverse events*—strokes occurred in 40 patients in metropolol group and 20 in placebo group; multivariate analysis showed that sepsis and infection significantly more common in metropolol group and contributed to morbidity and mortality; symptoms of early sepsis may have been masked in patients receiving β-blockers, with resulting delay in diagnosis and treatment; through multivariate analysis, hypotension identified as potential mechanism through which β-blockers could increase risk for stroke; authors concluded that perioperative metropolol had potential risks and benefits; *additional critique*—data from 752 patients from Iran and 195 patients from Colombia excluded because of fraudulent activity.
Suggested Reading


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Lindauer et al (2005): retrospective review of >600,000 patients undergoing noncardiac surgery; study focused on association between β-blockers and risk of in-hospital death; patients receiving β-blockers matched to patients not receiving β-blockers based on CRCI score; increased risk for in-hospital death observed in patients with CRCI score of 0 who received β-blockers; decreased risk for in-hospital death observed in patients with CRCI score of 3 or 4 who received β-blockers; authors concluded that β-blockers associated with significant reduction in mortality among patients with high CRCI scores; patients with low CRCI scores received no benefit; limitations of study — patients receiving β-blockers preoperatively not identified; long-term mortality not addressed; type of β-blocker and dosing schedule unknown

2014 meta-analysis: ACC/AHA performed meta-analysis of 17 trials and concluded that perioperative β-blockers prevent non-fatal MI but increase risk for stroke, death, hypotension, and bradycardia; subsequent analysis excluding DECREASE trial showed that benefit of perioperative β-blockers still significant, but magnitude of benefit significantly reduced

Conclusions: patients on β-blockers should continue with medication while undergoing elective noncardiac surgery; benefits of perioperative β-blockers in high-risk patients unknown; even if β-blockers beneficial, optimal timing of initiation, dosing schedule, and duration of administration unknown

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1. The choroid receives _______ of blood flow to the eye.
   (A) 20%     (B) 40%     (C) 60%     (D) 80% 

2. Ischemia of the choroid is evidenced by yellow-white focal lesions at the level of the:
   (A) Retinal pigment epithelium       (C) Ciliary body
   (B) Fovea                             (D) Sclera

3. Which of the following allows for the most accurate imaging of the choroid?
   (A) Fluorescein angiography
   (B) Indocyanine green angiography
   (C) Swept-source ocular coherence tomography
   (D) B-mode ultrasonography

4. Studies show that the choroid in normal pregnant women is _______ than that in nonpregnant women, and the choroid in women with preeclampsia is _______ than that in women without preeclampsia.
   (A) Thinner; thinner
   (B) Thicker; thicker
   (C) Thinner; thicker
   (D) Thicker; thinner

5. In a randomized controlled trial by Mangano et al (1996), atenolol was associated with a _______ reduction in all-cause mortality and a _______ reduction in mortality related to cardiac events.
   (A) 25%; 35%     (B) 35%; 45%     (C) 45%; 55%     (D) 55%; 65%

6. In the Dutch Echocardiographic Cardiac Risk Evaluation Applying Stress Echocardiography (DECREASE 1) trial, rate of death from cardiac cause or nonfatal myocardial infarction was reduced from 34% in the placebo group to _______ in the bisoprolol group.
   (A) 3.4%     (B) 8.1%     (C) 15.3%     (D) 22.6%

7. In the Perioperative Ischemic Evaluation (POISE) trial, 13% of participants discontinued the study drug (metoprolol) because of:
   (A) Nonfatal myocardial infarction
   (B) Hypotension and bradycardia
   (C) New-onset atrial fibrillation
   (D) Stroke

8. In a retrospective study of >600,000 patients by Lindauer et al (2005), use of β-blockers was associated with reduced in-hospital mortality in patients with a Revised Cardiac Risk Index score of:
   (A) 0     (B) 1     (C) 2     (D) 3

9. The 2014 American College of Cardiology and American Heart Association meta-analysis of 17 trials found that β-blockers administered perioperatively were associated with a decreased risk for:
   (A) Hypotension
   (B) Stroke
   (C) Nonfatal myocardial infarction
   (D) Death

10. In which of the following populations is the use of perioperative β-blockers indicated?
    (A) Patients with diabetes
    (B) Patients already receiving β-blockers
    (C) Patients with a Revised Cardiac Risk Index score of 0
    (D) Patients undergoing vascular surgery

Answers to Audio Digest Anesthesiology Volume 57, Issue 23: 1-A, 2-A, 3-B, 4-A, 5-B, 6-D, 7-D, 8-A, 9-A, 10-C