

hypovolemia, vasodilators, phosphodiesterase inhibitors, and  $\beta$ -adrenergic agonists as well as diligent attention to volume repletion and selective use of  $\alpha$ -adrenergic agonists. Patients with HCM are at significant risk for development of perioperative hypotension, CHF, and arrhythmias and should be monitored closely.

### Congenital Heart Disease

Studies have demonstrated that patients who have left-to-right cardiac shunts with residual hemodynamic abnormalities after surgical repair experience decreased cardiac output in response to stress. Vigorous treatment of ongoing CHF is required for such patients before noncardiac surgery. Patients with a large left-to-right shunt but only a slight increase in pulmonary artery resistance should undergo cardiac repair before noncardiac surgery. Patients with irreversible pulmonary artery hypertension have an extremely high risk associated with noncardiac procedures and should not undergo such procedures unless there is absolutely no alternative. Patients with prior repair of coarctation of the aorta have a significant risk for sudden death during follow-up, caused by residual cardiac defects with CHF, rupture of a major vessel, dissecting aneurysm, or complications arising from severe atherosclerosis. Such patients also have a high incidence of residual hypertension. Therefore, these patients require careful preoperative assessment and close hemodynamic monitoring during the intraoperative and postoperative periods. Patients with tetralogy of Fallot are also prone to sudden cardiac death. Monitoring and aggressive prevention and treatment of life-threatening arrhythmias such as ventricular tachycardia or atrioventricular block are needed for such patients in the perioperative period.

Surgery in patients with cyanotic congenital heart disease and right-to-left shunts poses several unique problems. Most cyanotic patients are polycythemic and therefore prone to thrombotic complications. Use of diuretics should be avoided in such patients because dehydration may increase blood viscosity, which increases the tendency for thrombosis, particularly cerebral thrombosis. Patients with a hematocrit greater than 70% should be considered for plasmapheresis before noncardiac surgery. Phlebotomy is not advisable in this circumstance because it can decrease intravascular blood volume and thus increase cyanosis. Patients with a hematocrit between 55% and 65% should receive intravenous fluids starting the night before the surgery. Patients with congenital heart disease should also receive appropriate prophylaxis for bacterial endocarditis. One retrospective report suggested that, with careful monitoring and precautions as outlined previously, and with careful attention not to introduce air into the vascular system, patients with right-to-left shunts can undergo noncardiac surgery with relatively few complications.

### SUMMARY


CAD accounts for most deaths in patients undergoing noncardiac surgery, and perioperative MI is associated with high mortality rates in these patients. The success of standardized evidence-based preoperative and postoperative cardiac risk reduction strategies in patients undergoing noncardiac surgery depends on collaborative teamwork and sound communication

among surgeons, the anesthesiologist, the patient's primary care physician, and the consultant.

The risk for a perioperative cardiac complication varies with the severity of the surgical procedure and with RCRI stratification. A systematic, stepwise approach for preoperative cardiac risk assessment in patients undergoing noncardiac surgery facilitates a decision as to whether the risk for perioperative cardiac events is sufficiently low to proceed with the surgery. Active cardiovascular conditions, including severe aortic stenosis and symptomatic mitral stenosis, may need to be addressed preoperatively. Preoperative noninvasive cardiac testing should be based on a discrete clinical risk categorization, and the choice among noninvasive tests should be based on the need for coronary, valvular, or ventricular function assessment and which test is most reliable and available locally. Preoperative noninvasive cardiac testing should be considered if the results of such testing could inform the decision for angiography or modify management, regardless of the planned surgery.

Although unambiguous practice recommendations for the use of perioperative  $\beta$ -blockade are lacking, preexisting therapy with  $\beta$ -blockers should not be withdrawn, and newly initiated and titrated therapy may be beneficial in appropriately selected higher-risk patients.

Optimal postoperative patient care involves assessment and treatment of modifiable cardiac risk factors, including pain, hypertension, hyperlipidemia, smoking, obesity, hyperglycemia, and physical inactivity. Finally, patients who sustain a nonfatal perioperative MI or develop evidence of ischemia should be carefully investigated because they are at substantial cardiac risk over the subsequent months and years.

 For a deeper discussion on this topic, please see Chapters 431, "Preoperative Evaluation," and 433, "Postoperative Care and Complications," in Goldman-Cecil Medicine, 25th Edition.

### SUGGESTED READINGS

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