CHAPTER 4

CARDIAC RISK ASSESSMENT AND THE USE OF PERIOPERATIVE BETA-BLOCKERS IN THE PODIATRIC SURGICAL PATIENT

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More than a million patients each year develop cardiovascular complications arising from noncardiac surgery in the United States.[1] The pathogenesis of postoperative cardiovascular complications relates to either prolonged myocardial ischemia or rupture of unstable coronary plaques. Early postoperative myocardial infarction (MI) (within 3 days of surgery) is more likely to be associated with plaque rupture, while a later MI is more likely associated with prolonged myocardial ischemia. It is the latter group of patients that is most likely to benefit from perioperative beta-blockade.[2]

Beta-blockers function by decreasing heart rate and cardiac contractility, thereby improving the myocardial oxygen balance, as well as decreasing the incidence of cardiac arrhythmias, particularly in the face of myocardial ischemia. Beta-blockers also serve a role in limiting inflammation, preventing platelet aggregation, modulating the coagulation cascade, and decreasing nociception, which may contribute to the benefits seen in patients who have coronary artery disease (CAD).[3] Noncardiac surgery is also associated with an increase in catecholamines, which results in an increase in blood pressure, heart rate, and free fatty acid concentrations. Beta-blockers suppress the effects of increased catecholamines and as a result may prevent perioperative cardiovascular events.

Many studies have evaluated the use and effectiveness of perioperative beta-blocker therapy in routine clinical practice. Current studies suggest that beta blockers reduce perioperative ischemia and may reduce the risk of MI and death in high-risk patients. Most studies have shown that perioperative beta-blocker therapy is associated with a reduced risk of in-hospital death among high-risk patients undergoing noncardiac surgery. Conversely, the same studies have shown that there is no benefit of beta-blockers, and is possibly harmful, to the low-risk patient.[4] This makes understanding the cardiovascular risk of the individual patient critical.

Although podiatric surgery is generally considered low- to intermediate-risk, it is not uncommon for the podiatric physician to encounter high-risk patients that necessitate surgery. Preventing complications is often the rationale for preoperative medical consultation. The podiatric physician often refers their high-risk patients to the primary care physician or cardiologist for medical and cardiac clearance. Although these other physicians are generally responsible for the prescribing of perioperative beta-blockers to the appropriate patients, it is important for the podiatric surgeon to recognize which of their surgical patients may be candidates for perioperative beta-blocker therapy, as well as those that are not. This will allow for the podiatric surgeon to be maintained as an integral part of the overall medical treatment and care of their patients.

The clinician must integrate information from the history, physical examination, and electrocardiogram in order to develop an initial estimate of perioperative cardiac risk. The 2002 American College of Cardiology/American Heart Association (ACC/AHA) concluded that 3 elements must be assessed to determine the risk of cardiac events. These include patient specific clinical variables, exercise capacity, and surgery-specific risk. An assessment of cardiac functional status should also be performed. Functional status is expressed in metabolic equivalents (METs). One MET is defined as 3.5 mL O2 uptake/kg per minute, which is the resting oxygen uptake in a sitting position. A functional capacity of 1 MET is a patient that can take care of themselves, such as eat, dress, or use the toilet. A patient who can walk up a flight of steps or a hill is said to have a functional status of 4 METs. Perioperative cardiac and long-term risk is increased in patients unable to meet a 4-MET demand during normal daily activities.[5]

The surgery-specific risk is another variable that is considered when stratifying a patient's risk of perioperative cardiac complications. Podiatric surgery is generally categorized with orthopedic surgery, which is considered by the ACC/AHA guidelines as low to intermediate risk, depending on the procedure. This correlates with a reported cardiac risk, generally less than 5%. High risk surgery would include vascular surgery, those resulting in large blood loss, and emergency operations. Low risk surgery includes endoscopic and superficial procedures.

Clinical predictors derived from the history, physical examination, and resting ECG, are also related to the perioperative risk of cardiac complications. Major predictors include a recent MI (within 6 months) or angina, recent percutaneous coronary intervention (PCI), significant arrhythmias, decompensated heart failure, and severe valvular disease. These require intensive management and may delay surgery. Intermediate predictors include mild angina, prior MI by history or pathologic Q waves, compensated or prior heart failure, diabetes mellitus, and renal insufficiency (preoperative creatinine >2.0 mg/dL). Minor predictors have not been proven to independently increase perioperative risk of cardiovascular complications. These include advanced age, abnormal ECG, rhythm other than sinus, such as atrial fibrillation, low functional status, history of stroke, and uncontrolled hypertension.[4]

Currently there are many risk indices used to take the above information and stratify the cardiovascular risk for a specific patient. One of the most popular indices used is the Revised Cardiac Risk index (RCRI). To determine the RCRI score, 1 point is assigned for each risk factor. Major cardiac events are seen in 11% of patients categorized as a Class IV, or those with 3 or more points based on the RCRI. Class III patients have 2 points and are associated with a 6.6% risk of major cardiac events. Class II patients with 1 point and Class I patients with no points based on the RCRI are at a 0.9% and 0.6% risk of cardiac events respectively. According to the RCRI, high risk procedures are considered to be one risk factor and include intraperitoneal, suprainguinal vascular, or intrathoracic surgery. Another risk factor is a history of ischemic heart disease, including history of MI, positive exercise test, recent angina, use of nitrate therapy, and pathologic Q waves. A history of congestive heart failure, including pulmonary edema, paroxysmal nocturnal dyspnea, bilateral rales or S3 gallop, and chest radiograph showing pulmonary vascular redistribuation are also considered risk factors. Other risk factors include history of transient ischemic attack or stroke, preoperative treatment with insulin, and serum creatinine >2.0 mg/dL. The RCRI considers major cardiac events to include MI, pulmonary edema, ventricular fibrillation, primary cardiac arrest, and complete heart block.

Regardless of the index used, it is imperative to determine what the risk of cardiac complications is for a patient in order to accurately determine whether or not beta-blocker therapy is indicated perioperatively. One retrospective analysis by Lindenauer et al[4] looked at over 700,000 patients undergoing noncardiac surgery without contraindications to beta-blockers. Of these, 18% received a beta-blocker perioperatively. A history of ischemic heart disease, higher RCRI score, and hypertension were the characteristics most strongly associated with beta-blocker treatment. Their results showed that perioperative administration of beta-blockers was associated with clear and clinically significant reductions in mortality among the 2% of surgical patients at highest risk (RCRI score of 3 or greater) and appeared to be beneficial to the 10% of patients with an RCRI score of 2, but was of no benefit and was possibly harmful among patients with RCRI scores of 0 or 1.

The Multicenter Study of Perioperative Ischemia Research Group randomly assigned 200 male veterans with known CAD or 2 or more risk factors to receive atenolol or placebo before undergoing major noncardiac surgery, and reported that within several months after discharge, treated patients had a significant survival advantage.[6] In another study, 112 patients with 1 or more cardiac risk factors and a positive dobutamine stress echocardiogram result, scheduled to undergo vascular surgery, were randomly assigned either to perioperative bisoprolol or placebo. In this high risk group, bisoprolol treatment produced a significant reduction in death from cardiovascular causes and MI at 30 days.[7] The Diabetic Postoperative Mortality and Morbidity trial enrolled type 2 diabetics who were to undergo surgery, randomizing them to either metoprolol or placebo, and looking at the outcome of major cardiac complications. No significant difference was reported, concluding that type 2 diabetes, alone, is

not an indication for perioperative beta blocker therapy.[8]

The ACC/AHA published their updated recommendations for the use of perioperative beta-blocker therapy in June 2006. They recommend that beta blockers be continued in patients undergoing surgery who are receiving beta blockers to treat angina, symptomatic arrhythmias, or hypertension. It is also recommended that beta blockers be given to patients undergoing vascular surgery at high risk owing to the finding of ischemia on preoperative testing (Class I recommendation). According to the recommendations, beta blockers are probably recommended for patients in whom preoperative assessment identifies coronary heart disease or high cardiac risk as defined by the presence of multiple clinical risk factors and who are undergoing intermediate- or high-risk procedures (Class IIa recommendation). Beta blockers may be considered for patients who are undergoing intermediate- or high-risk surgery in whom preoperative assessment identifies intermediate cardiac risk as defined by the presence of a single clinical risk factor (Class IIb recommendation).[9]

The use of beta-blockers in the perioperative setting appears to be safe and has relatively few absolute contraindications. Based on currently available data, it is impossible to precisely define all aspects of optimal use of perioperative beta-blockers. In general, it is recommended that beta-blockers are initiated 1 to 2 weeks prior to surgery. The goal heart rate with a beta blocker is within the 60 to 80 bpm range. Metoprolol is often the perioperative beta-blocker of choice, and is started at 25 to 50 mg by mouth, twice daily, based on baseline heart rate and blood pressure. Beta-blockers should be continued for at least 1 week postoperatively.[10] And although the podiatric surgeon will rarely be the prescribing physician of beta-blockers, it seems that an understanding by the podiatric surgeon of which patients may require these medications in the perioperative setting is paramount in optimizing patient care and reducing postoperative complications.

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