INTRODUCTION

This talk will describe an approach to the patient with heart disease who is undergoing non-cardiac surgery. Emphasis will be placed on the pathophysiology of the lesion, the pre-operative evaluation, anesthetic goals and pertinent therapeutic options. Because of the time limitations of the presentation, not all cardiac conditions will be addressed. Instead, this talk will focus on five important lesions that have been chosen because of their severity and prevalence: aortic stenosis, hypertrophic obstructive cardiomyopathy, rheumatic mitral stenosis, and mitral valve prolapse. In managing patients with valvular heart disease there are two important philosophies to remember. First, "the enemy of good is better." Most valvular lesions cannot be completely treated by medical management. In other words, don't over-treat these patients; aim for stability, not "normal" hemodynamics. Second for the reasons that will become clearer in the discussion of aortic stenosis, in patients with multiple valvular lesions which may suggest contradictory anesthetic goals, always give the highest priority to the aortic stenosis.

AORTIC STENOSIS

Aortic stenosis derives its position as the most important valvular lesion because of its potential for sudden death (15-20%), and because of the inability to obtain adequate systemic perfusion by external cardiac massage during a cardiac arrest. The three main etiologies of aortic stenosis are congenital, senile calcification and rheumatic disease. The normal aortic valve is 2-3 cm². As the valve orifice narrows, resistance to flow develops and a pressure gradient across the valve also occurs. This pressure gradient leads to a pressure overload of the left ventricle.

There is compensatory concentric hypertrophy to normalize the wall stress, but other abnormalities persist: increased oxygen demand, reduced oxygen delivery, and reduced diastolic relaxation and compliance. Symptoms ,
i.e., angina, CHF, syncope, and sudden death, usually begin to occur when the valve area falls below 1 cm$^2$. Preoperative evaluation of a systolic ejection murmur will generally begin with an echocardiogram, and if the symptoms or echo indicate, cardiac catheterization will be performed. The important measurements obtained during catheterization are the aortic valve gradient, the aortic valve area, LVEDP, and LVEF. The main anesthetic goals are to maintain normal sinus rhythm, adequate intravascular volume, and systemic vascular resistance. Perioperative mortality in patients with critical aortic stenosis (AVA<.6cm$^2$) has been reported as high as 11%. In addition to the usual pharmacologic agents, there are two additional interventions to consider. One is the preoperative placement of an IABP to improve coronary perfusion, and the other option in patients who are not candidates for aortic valve replacement, is to perform percutaneous valve replacement to reduce the stenosis prior to non-cardiac surgery.

**Hypertrophic Obstructive Cardiomyopathy (HOCM)**

One rationale for including this lesion is that like aortic stenosis, HOCM can precipitate sudden death. It is also included because of its unique dynamic physiology and unusual treatments. HOCM results in obstruction to LV ejection in the LV outflow tract. Like aortic stenosis it also causes a pressure overload of the LV. In addition to the pressure overload, systolic anterior motion (SAM) of the mitral valve induced by a Venturi effect, often precipitates mitral regurgitation. Another possible physiologic mechanism of the LVOT obstruction relates to the position of the papillary muscles. It is believed that the muscles can become anteriorly displaced and this moves the mitral valve apparatus into the LVOT.

Factors such as hypovolemia, tachycardia, systemic vasodilation, and increased contractility all exacerbate the obstruction. The clinical presentation includes angina, CHF, syncope and sudden death. Preoperative evaluation includes baseline and provocative (Valsalva, or nitrates) echocardiography. The important measurements are the LVOT diameter, the gradient across the LVOT, and the severity of the mitral regurgitation. The main anesthetic goals are to maintain normal sinus rhythm, intravascular volume, systemic vascular resistance, and to avoid hypercontractile states. In the acute perioperative period therapy is limited to pharmacologic agents, but in the chronic care of HOCM, the synchronous contractile pattern induced by pacing may be therapeutic.

[Image of echocardiogram]
Pulmonary Hypertension

Pulmonary hypertension (PHTN) can occur from a variety of causes including pulmonary disease, valvular heart disease, and intrinsic vascular disease. Patients undergoing non cardiac surgery with pulmonary hypertension usually do well intraoperatively but frequently have severe postop morbidity and mortality. In a retrospective review of 145 patients with PHTN, there was a 7% periop mortality. Also the investigators identified several factors that dramatically increased risk: history of pulmonary embolism, >class II NYHA, intermediate and high risk surgery, and operations lasting more than 3 hours.

Rheumatic Mitral Stenosis

Mitral stenosis is a narrowing of the mitral valve orifice that results in left atrial hypertension, limited filling of the LV, pulmonary congestion, and in moderate to severe cases, pulmonary arterial hypertension and right ventricular pressure overload. Dyspnea is the most common presenting symptom, and many of the patients are in atrial fibrillation. Echocardiography can demonstrate left atrial enlargement, mitral valve fibrosis and calcification, and a gradient across the mitral valve. Cardiac catheterization will also determine the gradient across the valve, the mitral valve area, LV function, and the right sided pressures. The anesthetic goals for patients with mitral stenosis are to control the heart rate and if possible restore and preserve sinus rhythm, insure adequate intravascular volume, and to prevent systemic arterial vasodilation. Additionally in patients with pulmonary hypertension, hypercarbia and hypothermia, which may exacerbate the increased PVR should be avoided. Several special therapeutic options for these patients exist. Balloon valvuloplasty may be performed, and cardioversion for atrial fibrillation may be useful. There are also some new pharmacologic agents for treatment of refractory severe pulmonary hypertension: inhaled prostacyclin and nitric oxide.

Mitral Valve Prolapse Syndrome (MVP)

MVP is the most common valvular abnormality occurring in 3 to 8 % of the population. Anatomically it is characterized by billowing of one of the mitral valve leaflets into the left atrium. There may be minimal or significant mitral regurgitation associated with this condition. In addition to the valvular abnormalities, there may be an increased risk of autonomic dysfunction. Patients experience palpitations, chest pain, dyspnea, fatigue, and orthostatic hypotension. Though there is some debate over the exact criteria to diagnose MVP, echocardiography is still the diagnostic method of choice. Because of the leaflet abnormalities some of these patients receive anti-platelet or other anticoagulant therapy. Other than infective endocarditis prophylaxis for those patients with abnormal leaflets, there are few defined anesthetist goals for these patients.

References

2. Cardiac Anesthesia, ed J.A. Kaplan, W.B. Saunders, Phila, PA 1993


Disclosure

This speaker has indicated that he or she has no significant financial relationship with the manufacturer of a commercial product or provider of a commercial service that may be discussed in this presentation.