Isolated ventricular septal defect (VSD) is the most common congenital cardiac defect, with an incidence of approximately 2 per 1000 live births. Isolated VSD accounts for 25% of all congenital heart disease. The wide range of physiology and natural history of VSDs necessitates careful consideration of operative indications and timing. Understanding of the anatomic variations and applicable surgical techniques is necessary to achieve the excellent results that are possible today.

Indications for Surgery

The indications for surgery of VSDs are influenced by the wide variation in natural history. Some defects close or decrease in size early in life. Approximately one-third of all defects will spontaneously close, and another third will become smaller during the first 2 years of life. Other defects follow a benign course for many years. However, some follow a course of congestive heart failure (CHF), failure to thrive, recurrent pulmonary infections, or development of pulmonary vascular disease. Timely intervention with surgical treatment is necessary in the latter group to prevent development of irreversible pulmonary vascular disease or death secondary to CHF.

Infants with clinically small defects should be followed. Infants with CHF should have medical treatment instituted and the response assessed. Those who have persistence of CHF or intractable respiratory distress should have early catheterization and surgery. Those with good response to medical treatment should be followed, at least until age 6 months, to determine whether there is any evidence of spontaneous closure or decrease in the size of the defect. It must be remembered that clinical evidence of decreasing left-to-right shunt may also be caused by development of infundibular stenosis or rising pulmonary vascular resistance (PVR). Echocardiography is useful for following these patients.

If evidence of a large shunt persists or rise in pulmonary artery
pressure is suggested, catheterization should be performed. Patients with shunts less than 2:1 and pulmonary artery pressure less than one-third systemic pressure should be managed conservatively. Patients with shunts over 2:1 must be carefully considered for surgery, taking into account their overall clinical status and pulmonary vascular resistance.

Older children or adults with VSD should undergo closure if a pulmonary-to-systemic flow ratio of 2:1 or more is present. Patients with a smaller shunt should also be considered for surgery under some circumstances, such as recurrent bacterial endocarditis, fear of progressive aortic insufficiency with supracristal defects, or where there is a disparity between symptoms and calculated shunt.

Choice of Operation

The high mortality during the 1950s and early 1960s of open repair of VSD in infancy prompted the adoption of two-stage management, consisting of initial palliation by pulmonary artery banding followed by later open closure of the VSD and debanding of the pulmonary artery. This approach became inappropriate once excellent results could be achieved by primary total correction, regardless of age or size. Pulmonary artery banding for isolated VSD is obsolete. However, in unusual situations, such as multiple VSDs or complex anomalies, we continue to employ pulmonary artery banding on a selective basis.

Surgical Strategy

Method of Cardiopulmonary Bypass

The technique of profound hypothermia and low flow is used for most infants weighing less than 6 kg. In all other patients, standard cardiopulmonary bypass with moderate systemic hypothermia is used (Chapter 4).

Myocardial Preservation

Cold blood cardioplegia is the method in all cases (Chapter 5).

Management of Aortic Insufficiency

The association of aortic insufficiency (AI) with VSD is rare, with a reported incidence of 2%-4%. The AI is most often caused by prolapse of the right coronary cusp. Hypotheses regarding causation of the AI include trauma to the valve by the surge of blood through the VSD and a deficiency in anatomic structures supporting the aortic valve anulus and the sinus of Valvesalva.

Many approaches to management of aortic insufficiency have been recommended, from doing nothing to the valve to replacement of the valve. Although minimal AI may be corrected by simply closing the