

### 2.1 Morphology

The common secundum atrial septal defects are defects in the fossae ovalis caused by deficiency of the atrial septum primum. The primum atrial septum defect is due to failure in fusion of atrial septum primum with endocardial cushions and is often associated with developmental anomalies of AV (atrioventricular) junction, and is grouped under AV septal or AV canal defects.

The secundum atrial septal defects vary in size and location. The defects measure ranging from 1 cm to a complete absence of the septum, but a common defect averages 3 cm in size.

#### Locations of Defects in the Atrial Septum

Mid septum: Most are located in the mid portion of the atrial septum.

Low Defects: Occur near the IVC (inferior vena caval) opening.

*High defects:* Occur at the junction of the SVC (superior vena caval) opening and atrium, called as sinus venosus defects. Majority of these are associated with anomalous pulmonary venous drainage from the right upper lobe into the SVC. Rarely, the anomalous vein may drain directly into the posterior atrium or much rarely into the IVC. The latter anomaly may be associated with hypoplasia of right lung and anomalous origin of pulmonary artery from the aorta. The radiological shadow produced by anomalous pulmonary vein lying parallel to the right border of heart resembles 'scimitar'.

Secundum atrial septal defect is much rarely associated with either mitral stenosis *(Lutembacher's syndrome)* or mitral insufficiency. Both these lesions markedly increase left to right shunting.



### 2.2 Pathophysiology

The mean left atrial pressure of 10 mm Hg over mean right atrial pressure of 4 mm Hg favors left to right shunting of blood from left atrium (LA) to right atrium (RA) through an atrial septal defect. The normal pressure gradient between the atria is dependent on the right and left ventricular wall thickness and distensibility (diastolic compliance). Due to equal thickness of both the ventricles in infants and young children, the septal defect produces only a minimal shunting of blood until child is > 2 years of age when the magnitude of the shunt increases. The shunt may amount to 1 liter to 20 liters of blood / minute with a large septal defect. The pulmonary blood flow (PBF) increases 2 to 3 times of systemic blood flow. The fall in systemic blood flow may result in growth failure, but in adults the cardiac index is at lower limits of normal, only with a slight fall in systemic oxygen saturation (95 to 96%) due to mixed shunting. In atrial septal defect, the increased PBF with reciprocal decrease in pulmonary vascular resistance would not lead to development of pulmonary hypertension and pulmonary vascular disease for many years. The development of pulmonary vascular resistance in atrial septal defects may be independent of pulmonary blood flow and age, and is determined by an individual variation. Increased pulmonary resistance observed in only 33% before 20 years of age. Once the pulmonary resistance increases, it might progressively increase with a reversal of shunt at the atrial level with decreased PBF and development of hypoxia.

# 2.3 Surgical Treatment

Closure is done in all asymptomatic or symptomatic children if Qp/Qs > 1 or 1.5. Ideally, the procedure is done before the school going age in children (5 to 6 years).

If SVR/ PVR is > 0.5 (i.e. pulmonary vascular resistance increases > 50% of systemic vascular resistance), the risk of surgery increases with a little benefit of operation though the surgery offers only a hope.

# 2.4 Surgical Technique

The procedure is performed under CPB (cardiopulmonary bypass) with moderate hypothermia (32-34 °), using the standard aortic and bicaval venous cannulation either with antegrade cardioplegic arrest of the heart or a non-arrested heart.

All defects are closed with a pericardial or a Dacron patch, especially in older children and adults, except that a small defect is closed primarily. Anomalous pulmonary veins are re-directed to LA by a baffle patch.

### 2.5 Postoperative Management

The postoperative course is usually benign. The hospital stay averages four to six days.

#### 2.5.1 Invasive Monitors

Arterial and central venous catheters.

#### 2.5.2 Vasoactive Drug Infusions

Rarely are required for hemodynamic management.

#### 2.5.3 Arrhythmias & Conduction Abnormalities

Rare and transient atrial arrhythmias may occur and as well as transient AV block.

(May be related to stretching of the area of coronary sinus and is avoided by a patch closure of the defect in older children and adults).

