

PDA

## :Objectives

- .Define the patent ductus arteriusus.1
- .Recognise clinical manifestations of PDA.2
- .Recognise the pathophysiology of PDA.3
- .Describe the investigations and management of PDA.4

## **Patent Ductus Arteriosus •**

### **Prevalence •**

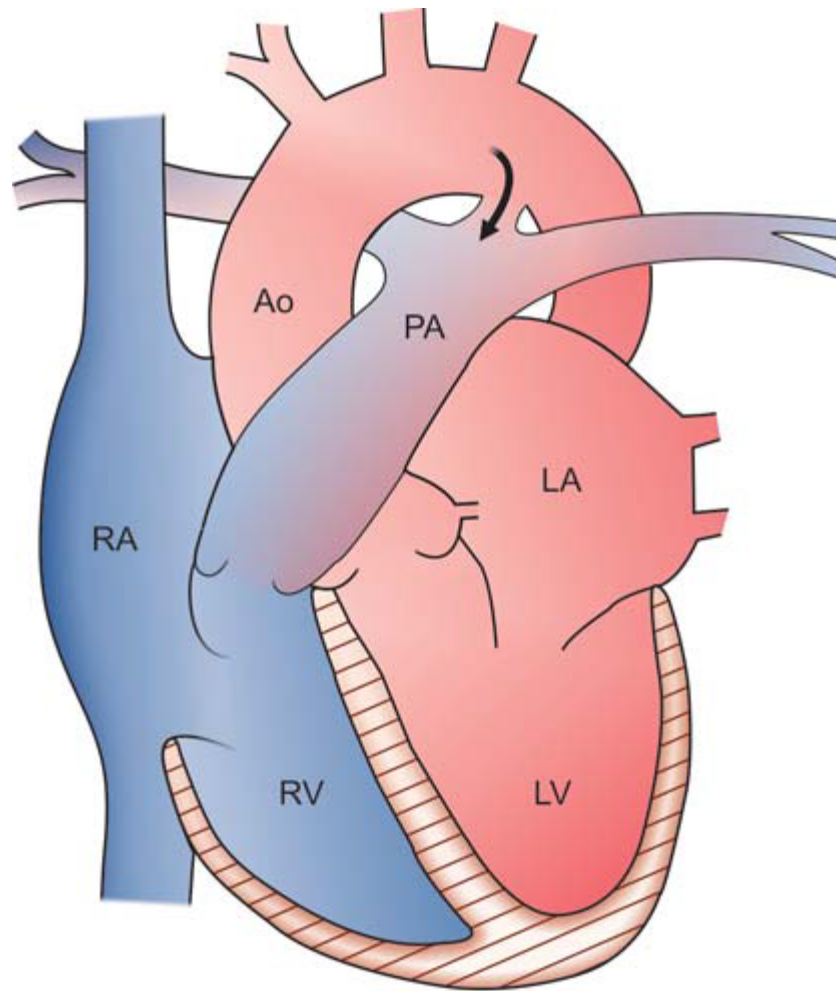
Patent ductus arteriosus occurs in 5% to 10% of •  
all CHDs, excluding premature infants. It is more  
common in females than in males (male-to  
female ratio of 1:3). PDA is a common problem in  
premature infants. The incidence of PDA is high in  
infants born with low birth weight; with maternal  
.rubella syndrome and at high altitude

# Pathology

There is a persistent patency of a normal fetal. 1 structure between the pulmonary artery and the descending aorta, that is, about 5 to 10 mm distal to .the origin of the left subclavian artery

The ductus is usually cone shaped with a small. 2 orifice to the PA, which is restrictive to blood flow.

The ductus may be short or long, straight, or tortuous. Functional closure starts by 12 hours and becomes complete in most of the cases within 24 hours. In some cases it may be delayed for 2-3 days or more and on occasional cases closure may take up .to 3 months



# Clinical Manifestations

## History

Patients are usually asymptomatic when the ductus is . 1  
.small

A large-shunt PDA may cause a lower respiratory tract. 2  
infection, atelectasis, and CHF

.Exertional dyspnea may be present. 3

**Physical Examination** 1. Tachycardia and tachypnea may  
.be present in infants with CHF

.Bounding peripheral pulses with wide pulse pressure. 2

With a large shunt, the precordium is hyperactive. A. 3  
systolic thrill may be present at the upper left sternal  
border. The P2 is usually normal, but its intensity may be  
accentuated if pulmonary hypertension is present. A grade  
1 to 4 of 6 continuous (“machinery”) murmur is best  
audible at the left infraclavicular area or upper left sternal

## **Electrocardiography**

The ECG findings in PDA are similar to those in VSD. A normal ECG or LVH is seen with small to moderate PDA. BVH is seen with large PDA. If pulmonary vascular obstructive disease develops, RVH is present

## **Radiography**

.Radiographs are also similar to those of VSD

.Chest radiographs may be normal with a small-shunt PDA. 1

Cardiomegaly of varying degrees occurs in moderate-to large-shunt. 2

PDA with enlargement of the LA, LV, and ascending aorta. Pulmonary

.vascular markings are increased

With pulmonary vascular obstructive disease, the heart size becomes. 3

.normal, with a marked prominence of the PA segment and hilar vessels

## Natural History

Unlike PDA in premature infants, spontaneous closure of a PDA is. 1  
rare in full-term infants and children. This is because the PDA in term  
infants results from a structural abnormality of the ductal smooth  
muscle rather than a decreased responsiveness of the ductal smooth  
.muscle to oxygen

.CHF or recurrent pneumonia develops if the shunt is large. 2

Pulmonary vascular obstructive disease may develop if a large PDA. 3  
.with pulmonary hypertension is left untreated

Although rare, an aneurysm of PDA may develop and possibly. 4  
.rupture in adult life



## **Medical**

Unlike in premature infants with PDAs, indomethacin is ineffective in term infants and should not be used

## **Medical Management**

Patients having small PDA are asymptomatic and lead a normal life except the risk of developing infective endarteritis. Previously it was left as such but now a days PDA is closed either by catheter closure (device or coil closure) or by surgical ligation mainly to prevent the deadly complication of infective endarteritis. Infants with CHF are treated with decongestive therapy before closure of ductus

No exercise restriction is needed in the absence of pulmonary hypertension

Nonsurgical occlusion of PDA has become a standard of care at many centers except in patients with very low birth weight

Small ductus (<3 mm in diameter) are closed by various kinds of coils and larger ones by the Amplatzer PDA device

For larger PDA but smaller than 12 mm in diameter, specialized devices, such as the Amplatzer duct occluder, are available for catheter-based closure. The devices are implanted antegrade from .the femoral vein

## **Surgical Closure**

Surgical closure is reserved for patients in whom a nonsurgical closure technique is not .considered applicable

## **Patent Ductus Arteriosus in Preterm Neonates**

### **Prevalence**

Clinical evidence of PDA appears in 45% of infants with a birth weight less than 1750 g and in about 80% of infants with a birth weight .less than 1200 g

Significant PDA with CHF occurs in 15% of premature infants with a birth weight less than 1750 g and in 40% to 50% of those with a .birth weight less than 1500 g

## **Pathophysiology**

PDA is a special problem in premature infants who are 1 recovering from hyaline membrane disease. With improvement in oxygenation, the PVR falls rapidly, but the ductus remains patent because its responsiveness to oxygen is immature in premature newborns. The resulting large left to-right shunt makes the lung stiff, and weaning the infant from the ventilator and oxygen therapy becomes difficult.

Premature infants with significant left-to-right shunt may 2 suffer from the consequences of prolonged hypoperfusion to many organs, which may include intracranial hemorrhage, renal dysfunction, myocardial ischemia, and necrotizing enterocolitis. Early recognition and appropriate management of PDA are key to improving the prognosis of these infants.

## **Clinical Manifestations**

Premature infants commonly develop respiratory distress syndrome. As the infant recover from respiratory distress the clinical evidence of the ductus becomes apparent by high volume pulse, loud second sound and a systolic murmur heard over left upper sternal border. Initially this systolic murmur varies with intensity or may be absent, only after some weeks of birth it is persistently audible. If the ductus remains patent gradually the murmur extends into diastole overlapping the second sound, giving rise to a continuous murmur

## **Management**

For symptomatic infants, either pharmacologic or surgical closure of the ductus is indicated

### **Medical**

Fluid restriction to 120 mL/kg per day and a. 1 diuretic (e.g., furosemide, 1mg/kg two to three times a day) may be tried for 24 to 48 hours, but these regimens have a low success rate. Digoxin is not used because it has little hemodynamic benefit

Pharmacologic closure of the PDA can be achieved. 2 with indomethacin (a prostaglandin synthetase inhibitor). One popular approach is to give indomethacin (Indocin) 0.2 mg/kg intravenously every 12 hours for up to three doses in selected cases. A second course of indomethacin treatment is occasionally necessary to achieve adequate ductal closure.



## **Surgical**

If medical treatment is unsuccessful or if the use of indomethacin is contraindicated, surgical ligation of the ductus is indicated.

The standard operative approach to PDA is .through a posterolateral thoracotomy