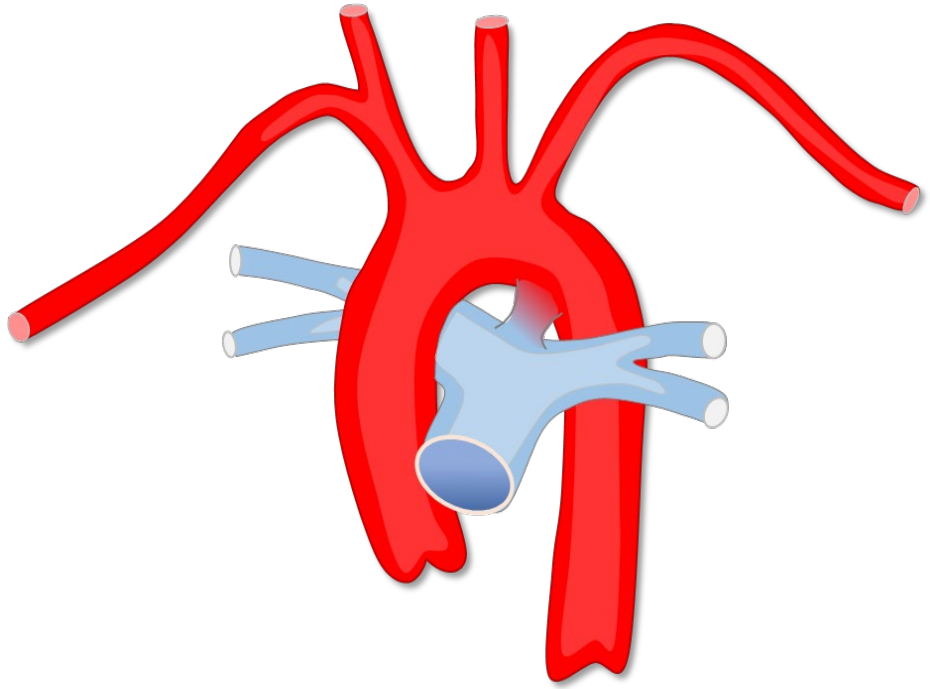
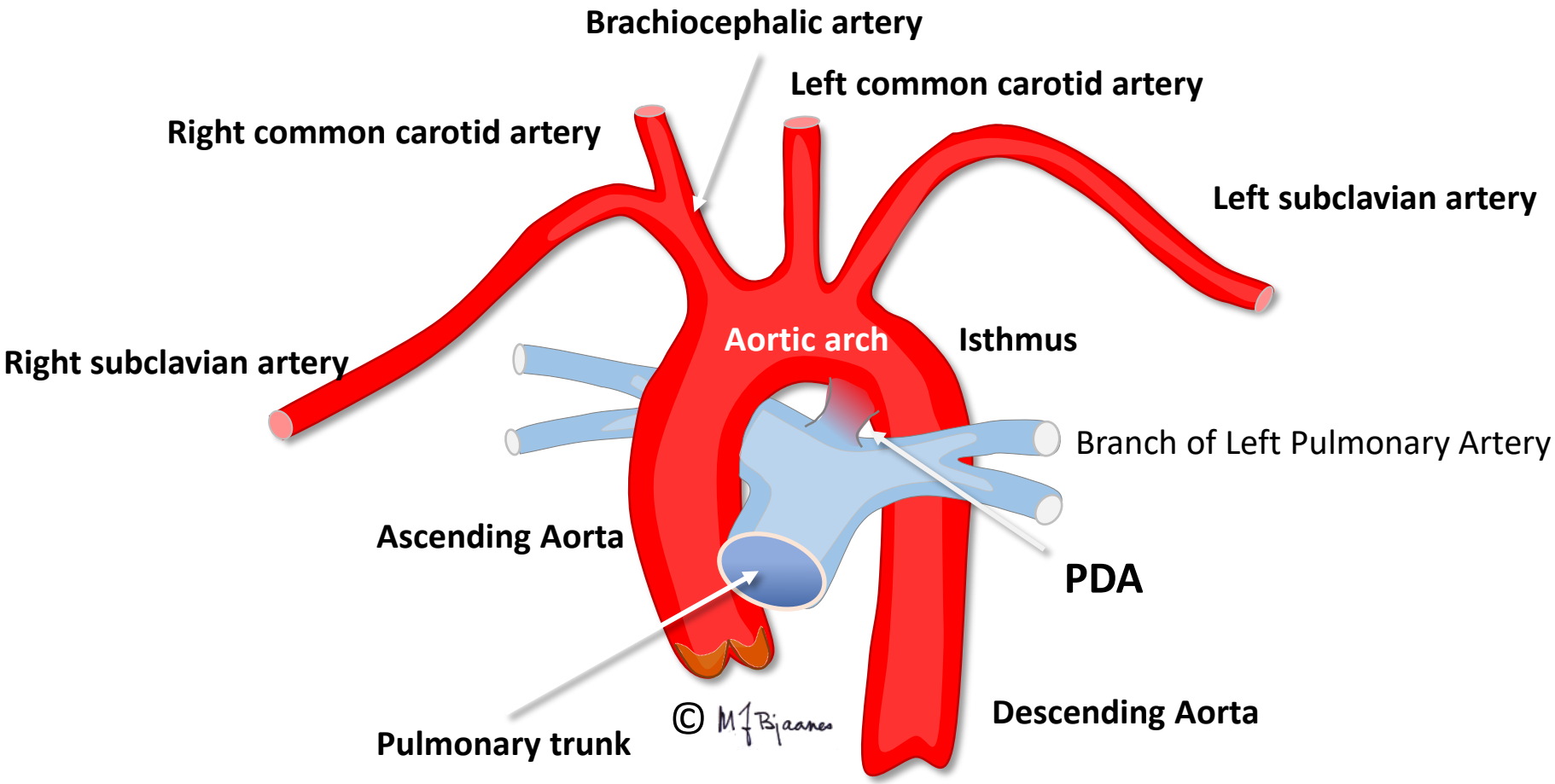
PDA Introduction



Aorta and the Pulmonary Artery

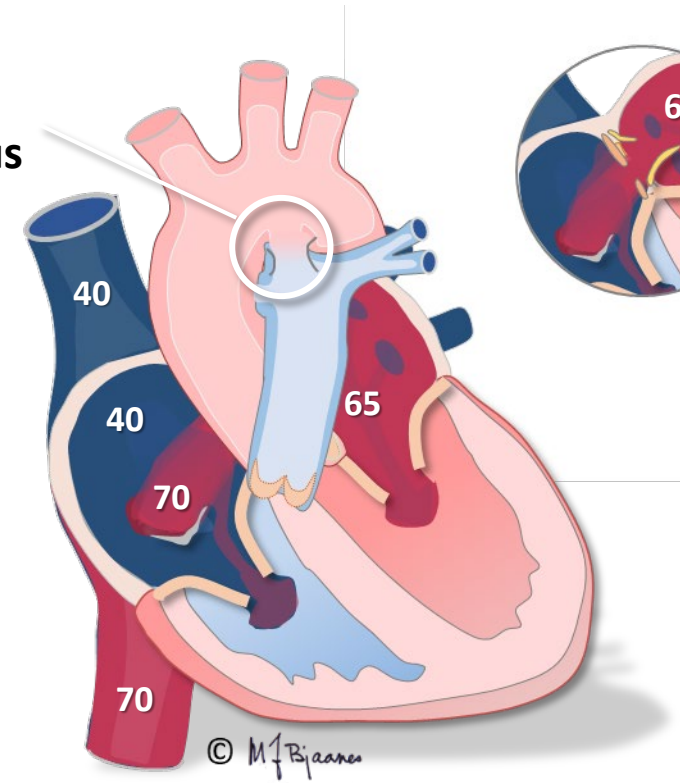
Anatomy



Fetal shunts

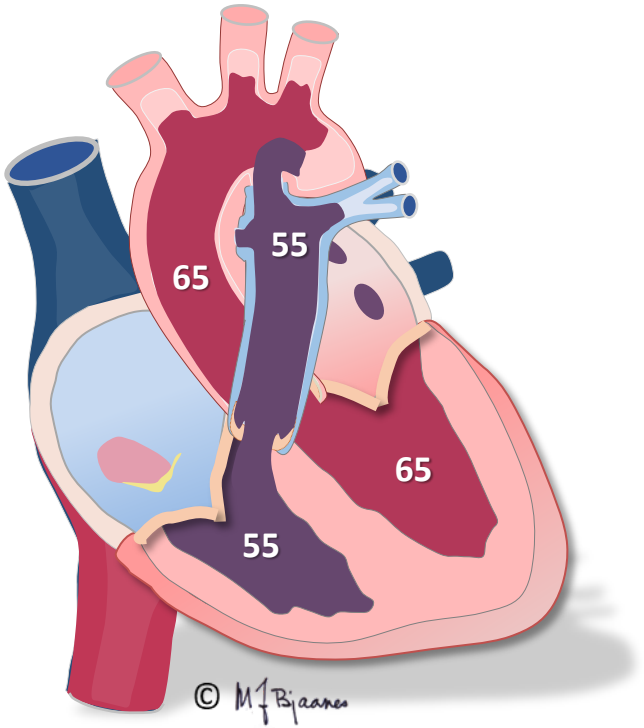
Foramen ovale / Ductus arteriosus

Ductus Arteriosus



Foramen Ovale

These shunts normally close within few days after birth



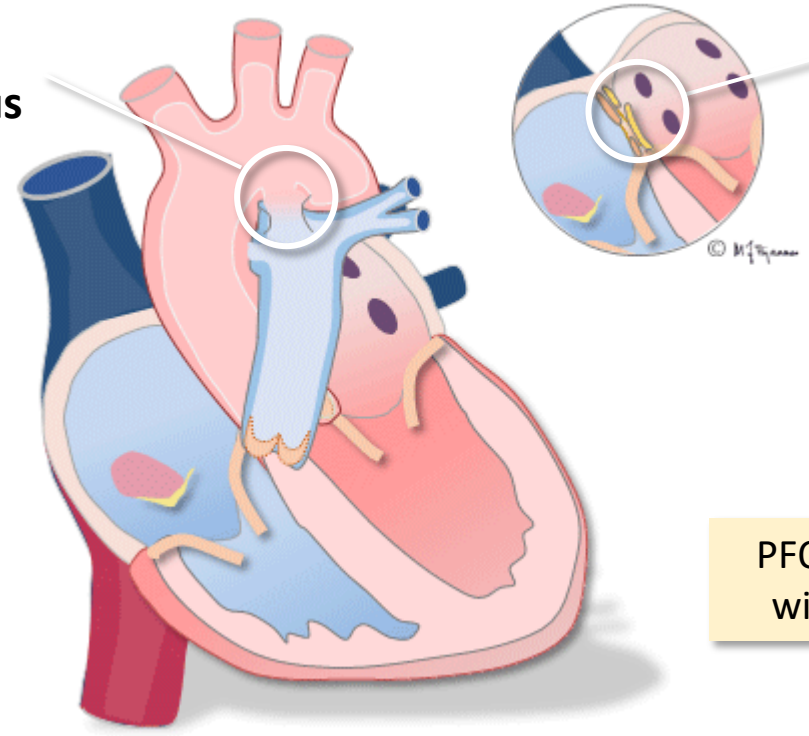
Diastole

Systole

Fetal Shunts

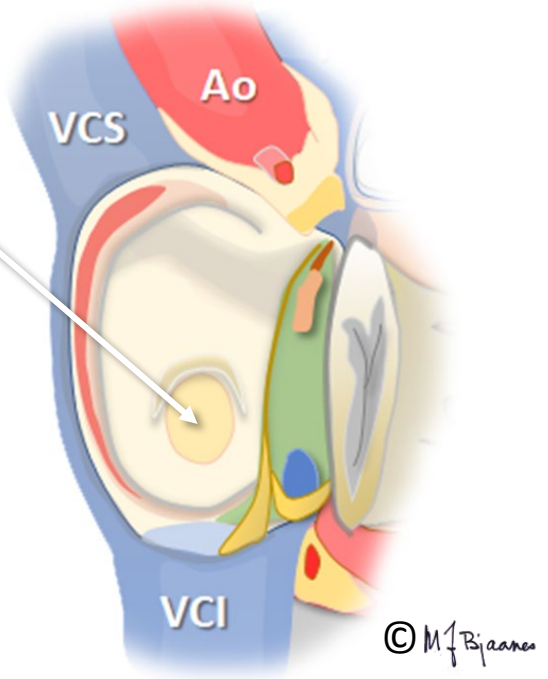
Foramen ovale / Ductus arteriosus

Ductus arteriosus



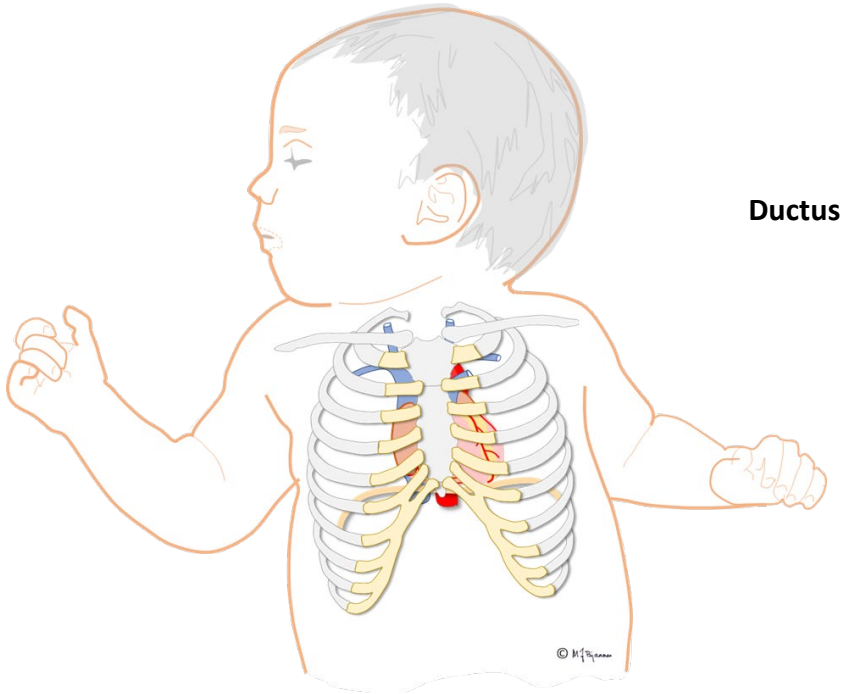
Foramen ovale

Right atrium and atrial septum



PFO and PDA normally close within few days after birth

Normal physiology – pulmonary artery changes after birth

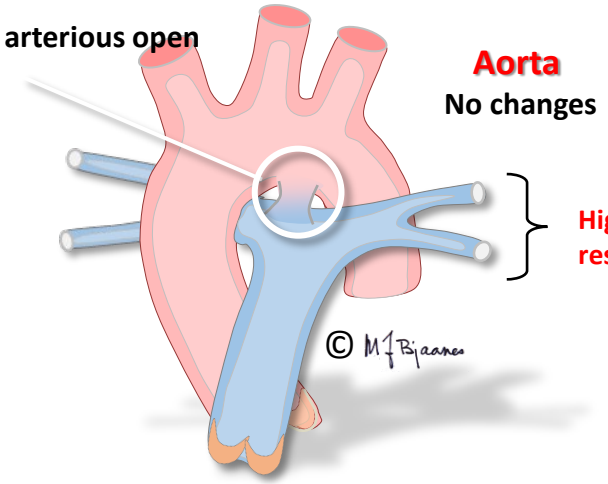


Newborn

Ductus arterious open

Aorta

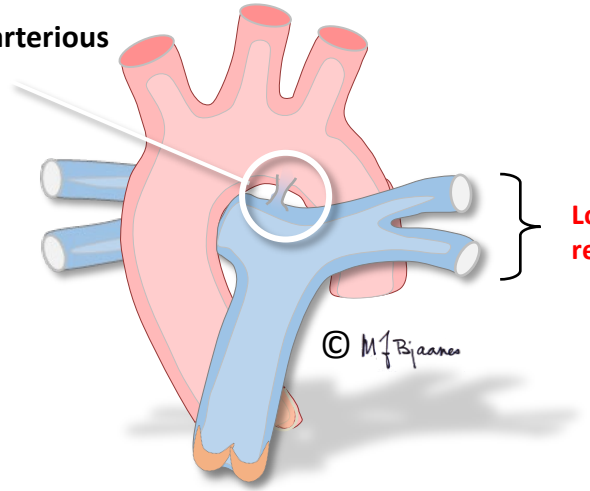
No changes



High resistance

Within first week after birth

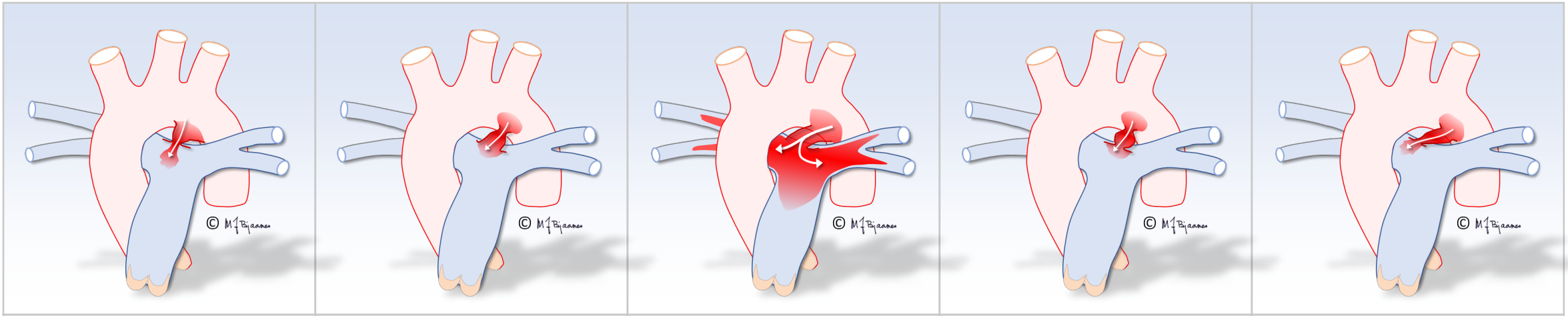
Ductus arterious closed



Low resistance

Lungs are inflated and Pulmonary arteries acommodate the full cardiac output.
PVR drops as lung tissue is expanded and PA arteriolar wall thickness regresses.

PDA – Different Morphologies



A Conic / ampulla shaped PDA, narrowed at PA end
(Restrictive PDA)

B Short PDA (window-shaped) narrowed close to the Aorta.
(Restrictive PDA)

C Elongated large PDA w/o constrictions.

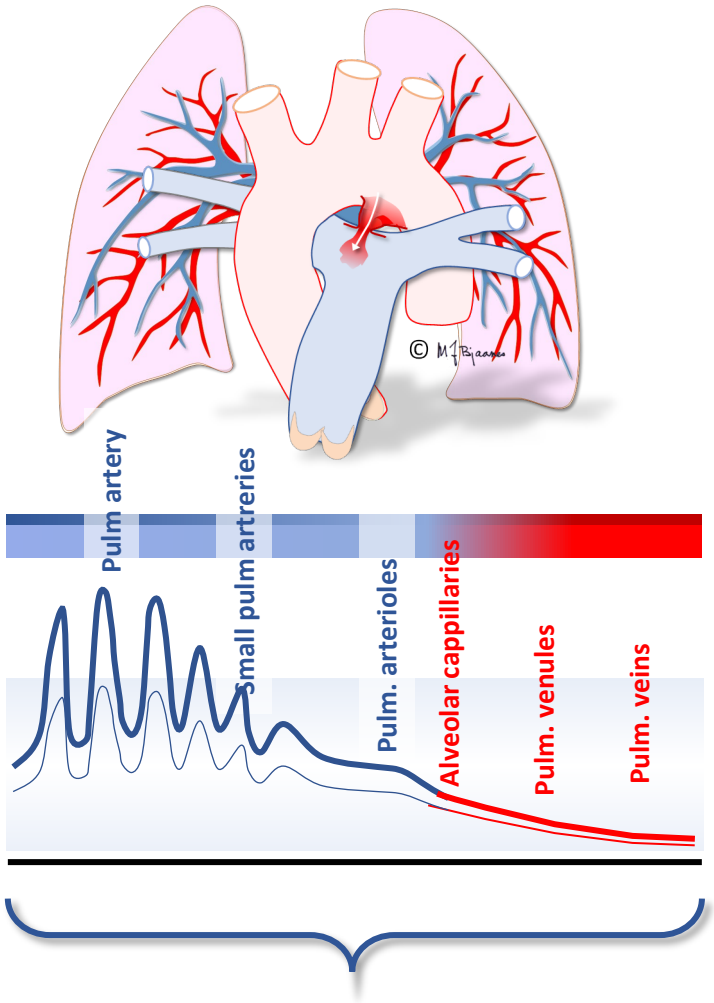
(Non-restrictive PDA)

D Complex PDA with several constrictions

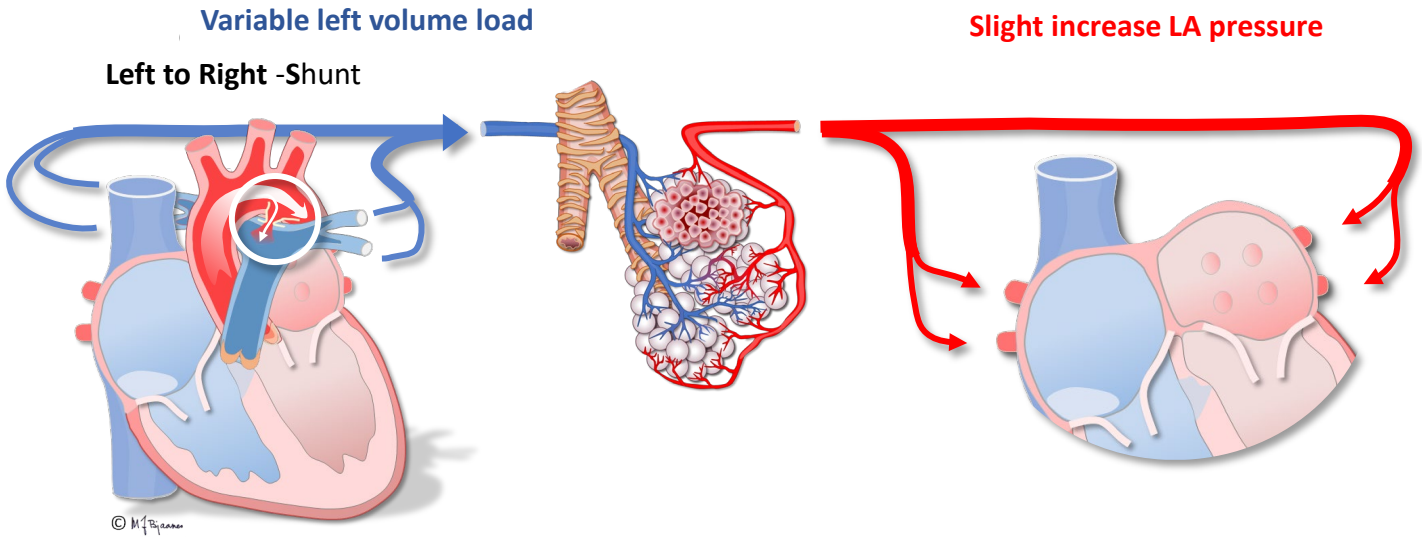
(Restrictive PDA)

E Long PDA with constriction at pulmonary end
(Restrictive PDA)

Restrictive PDA



Pasient is often asymptomatic

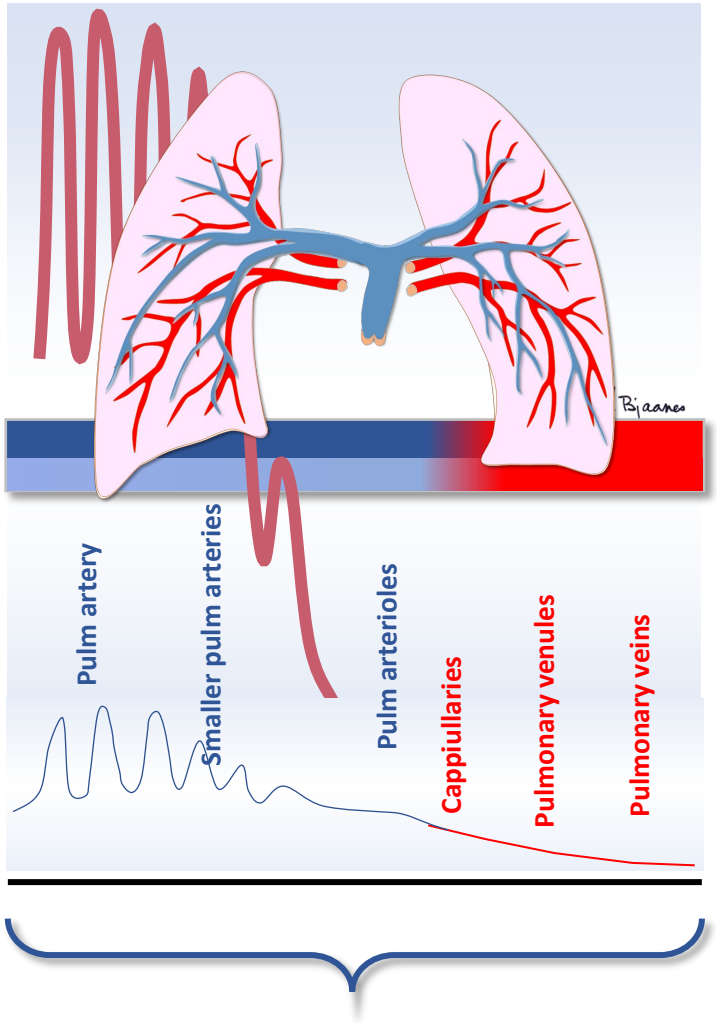


Determinants of pressure drop/flow through PDA:

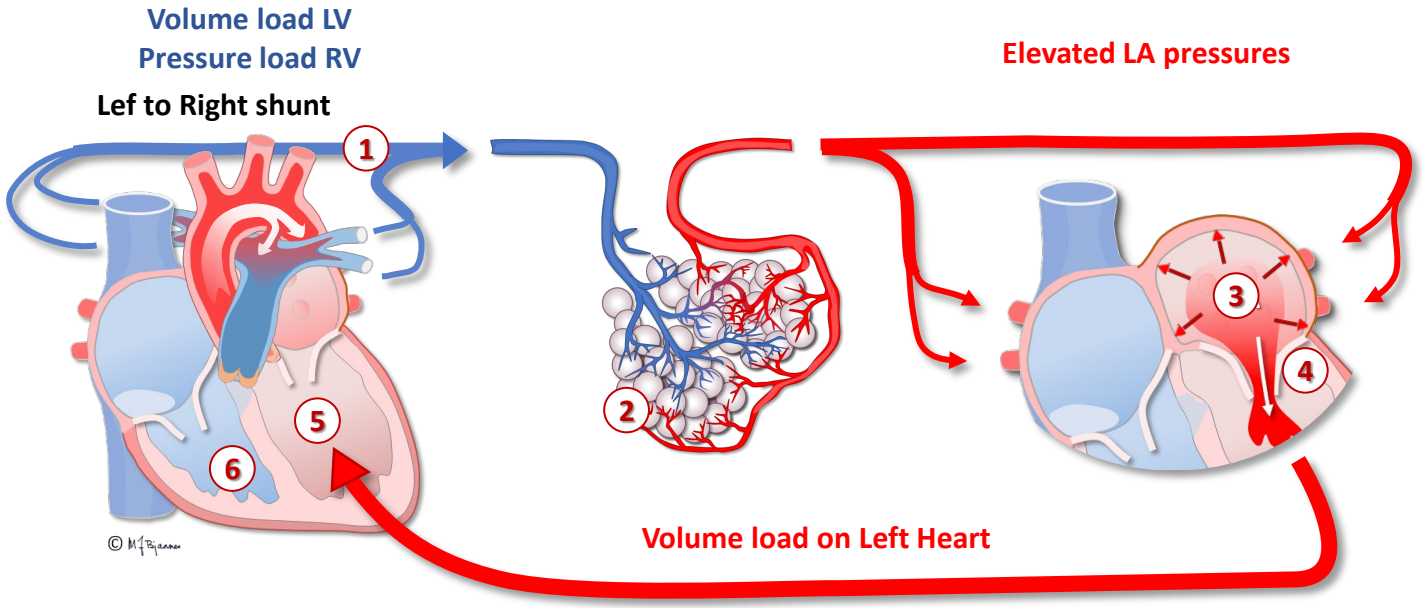
1. Form, length og width of PDA
2. Tissue elasticity
3. Elevated PVR
4. LV and RV function

Large non-restrictive PDA

laminar flow



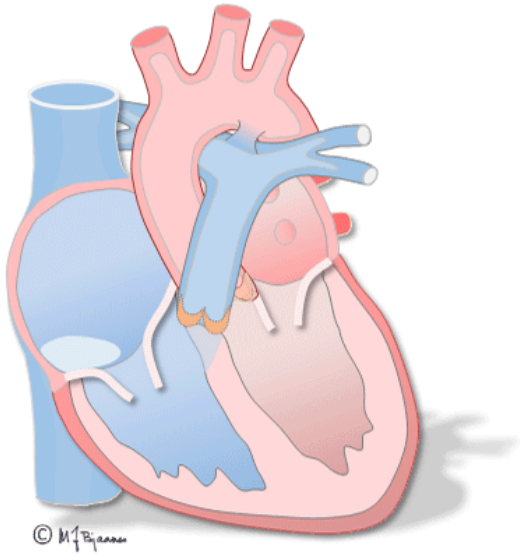
Pulmonary Circulation



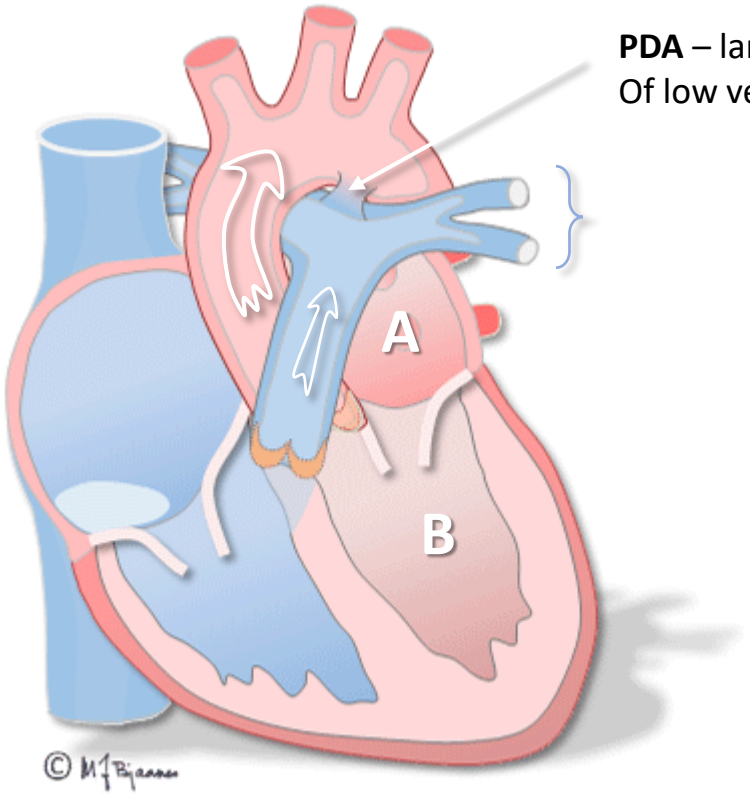
With time hyperflow and pressure may damage:

1. Pulmonary arteries (loss of compliance)
2. Pulmonary arterioles – wall thickening
3. Alveoli og capillaries (dysfunctional respiratory unit)
4. Left atrium dilatation (arrhythmia risk)
5. Mitral Valve Annulus dilatation (regurgitation)
6. RV pressure load (hypertrophy and RV failure)

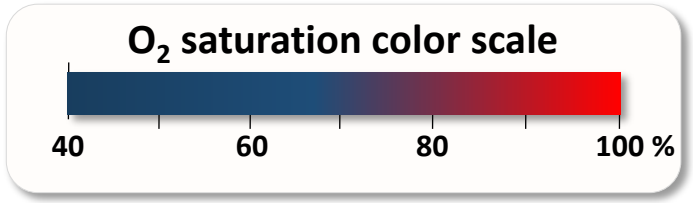
Pathophysiology



Normal heart with PDA (Left to Right-Shunt)



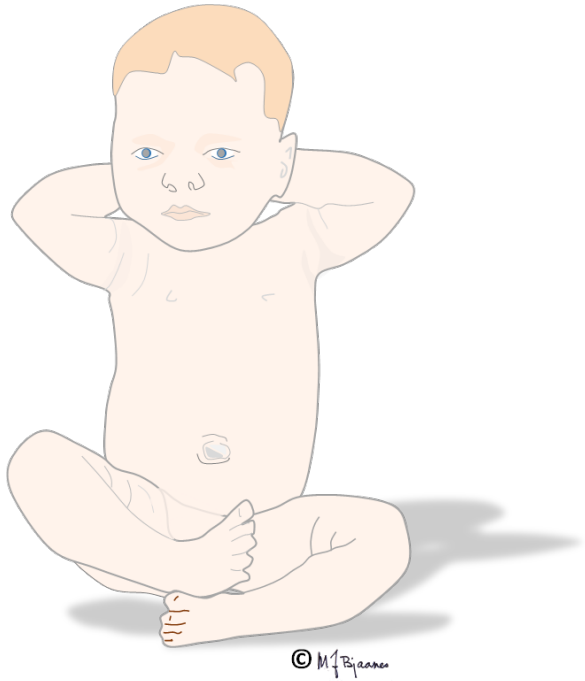
PDA – large non-restricitve PDA with left to right shunt
Of low velocity



A. Increased pulmonary venous return
B. Increased work load on Left Ventricle

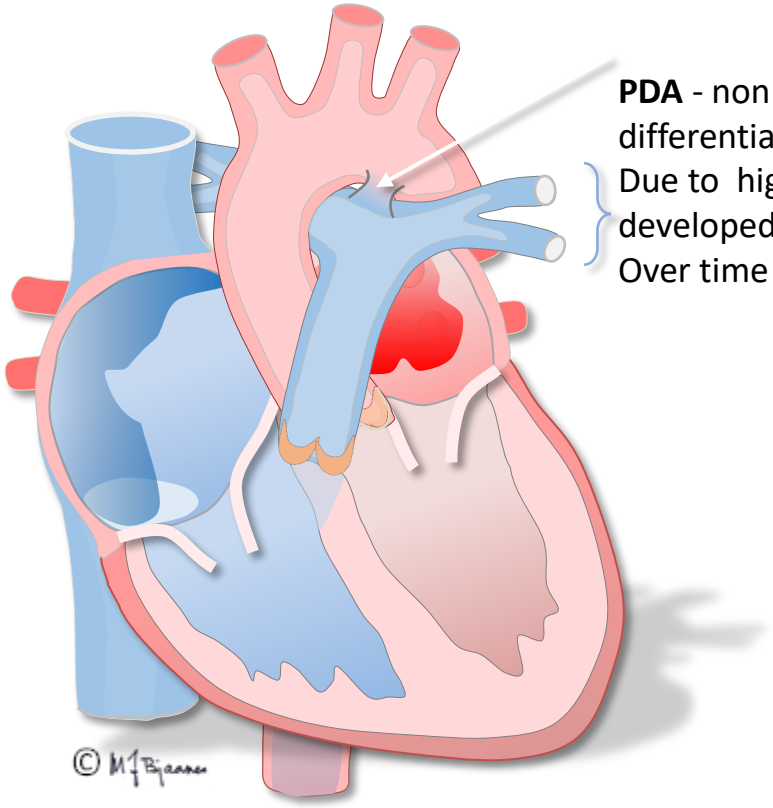
IF no PDA closure – Eisenmenger may occur

Non-cyanotic condition

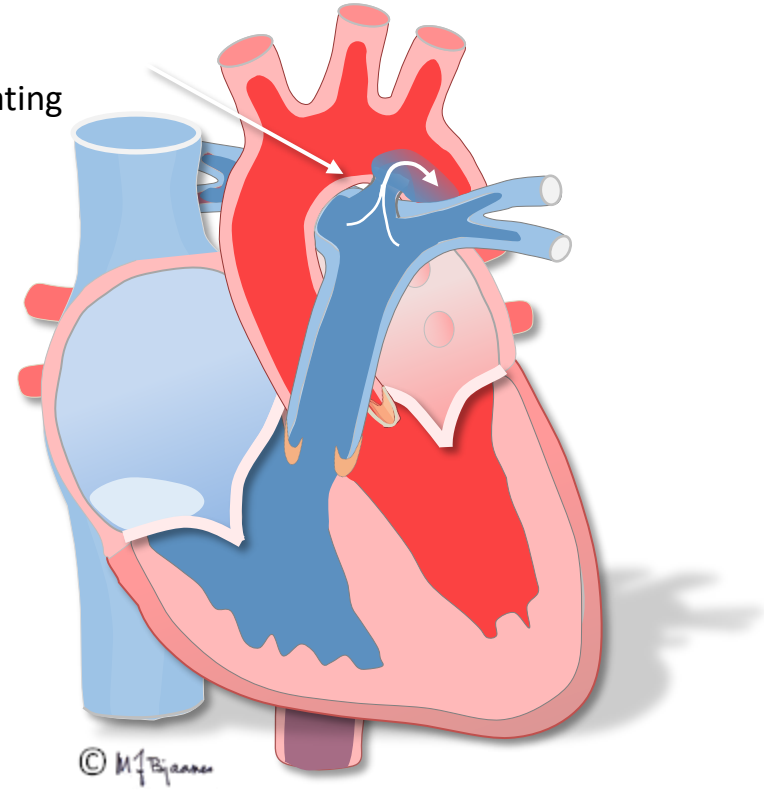


Non restrictiv PDA with Right to Left –Shunt (Eisenmenger PDA)

Reversed PDA shunt

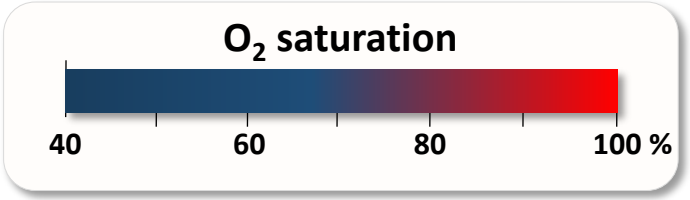


PDA - non restrictive Right to Left shunt creating differential postductal cyanosis.
Due to high pulmonary vascular resistance developed from systemic pressure exposure Over time

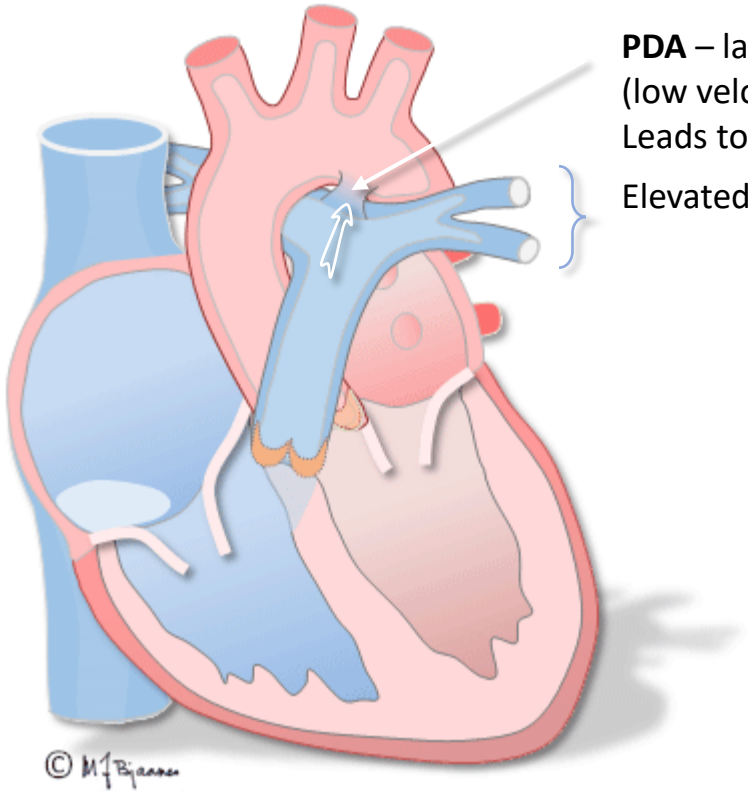


Diastole

Systole

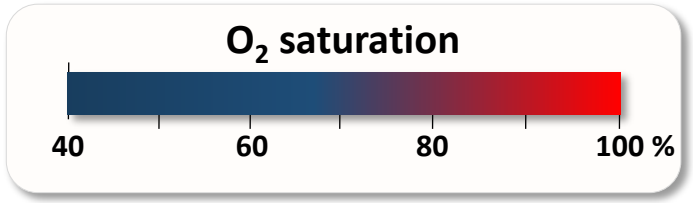


Eisenmenger PDA (Right to Left Shunt)



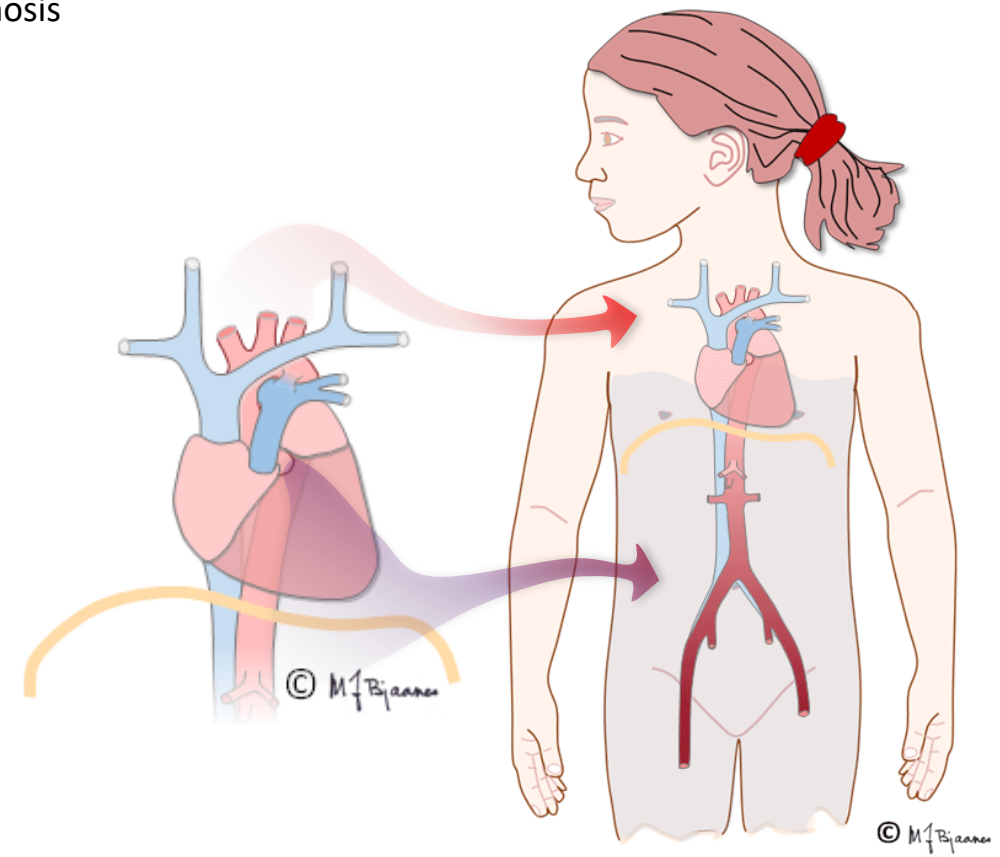
PDA – large, non-restrictive **Right to Left-S**hunt (low velocity)
Leads to differential cyanosis

Elevated PVR



Differential cyanosis

Aggravated lower body desaturation with activity



PDA Closure

PDA – Medical Treatment

Medications used

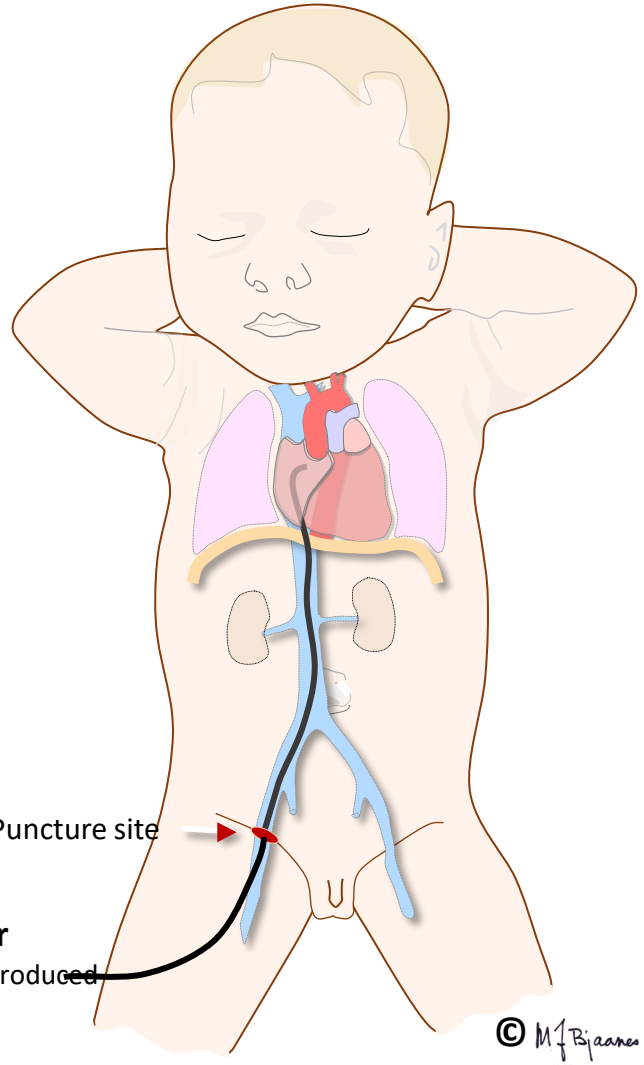
In premature children – a significant PDA will first be treated medically

- Ibuprofen oral
- Indomethacin iv
- Paracetamol iv or oral

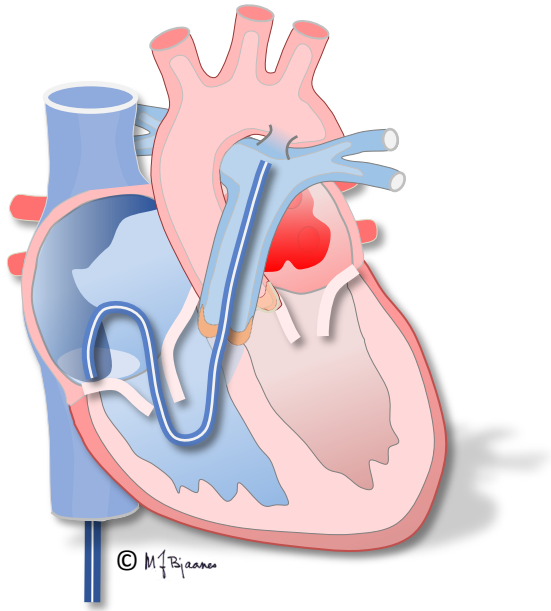
Echocardiography to assess treatment effect

PDA Treatment – Interventional

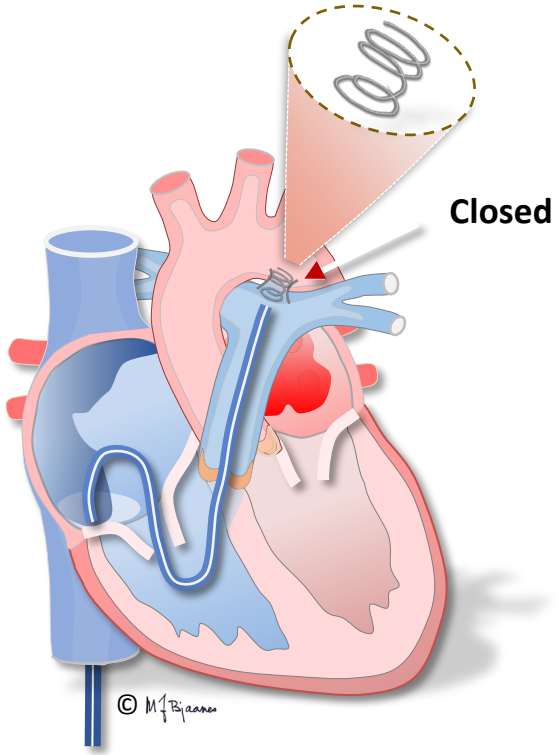
Percutaneous PDA closure



Catheter
a coil is introduced
Into PDA



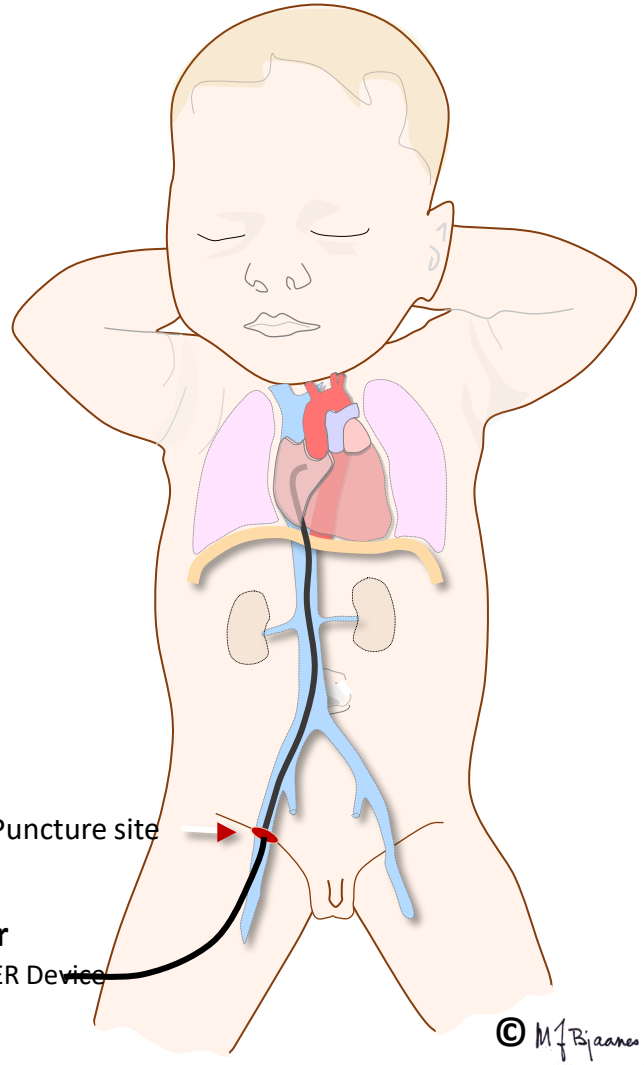
The Catheter
From the femoral vein through the right atrium, the right ventricle, the pulmoanry artery and into the PDA

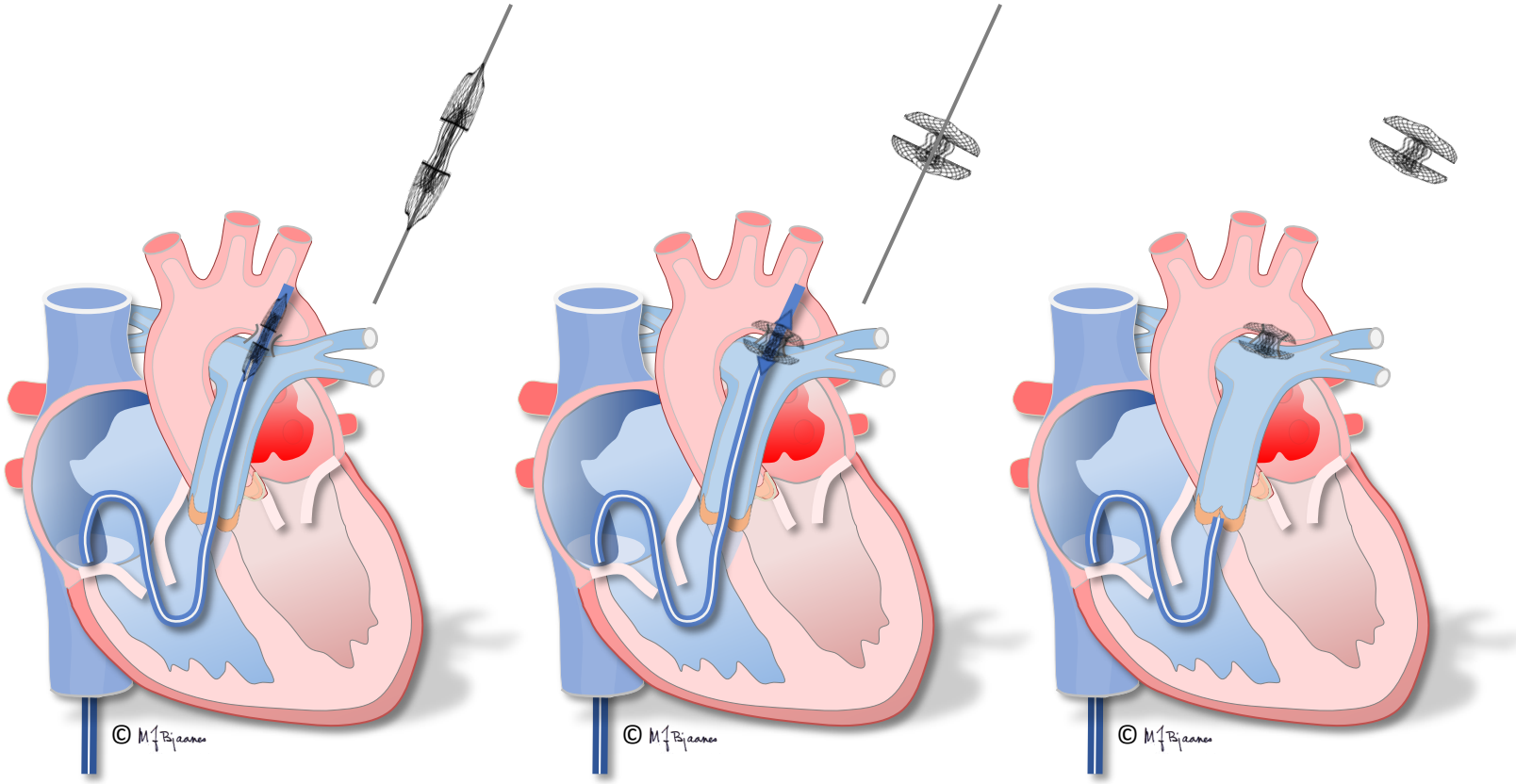


A metal coil or plug device
Is deployed exactly to occlude the PDA . Aortic and branch PA obstruction is avoided

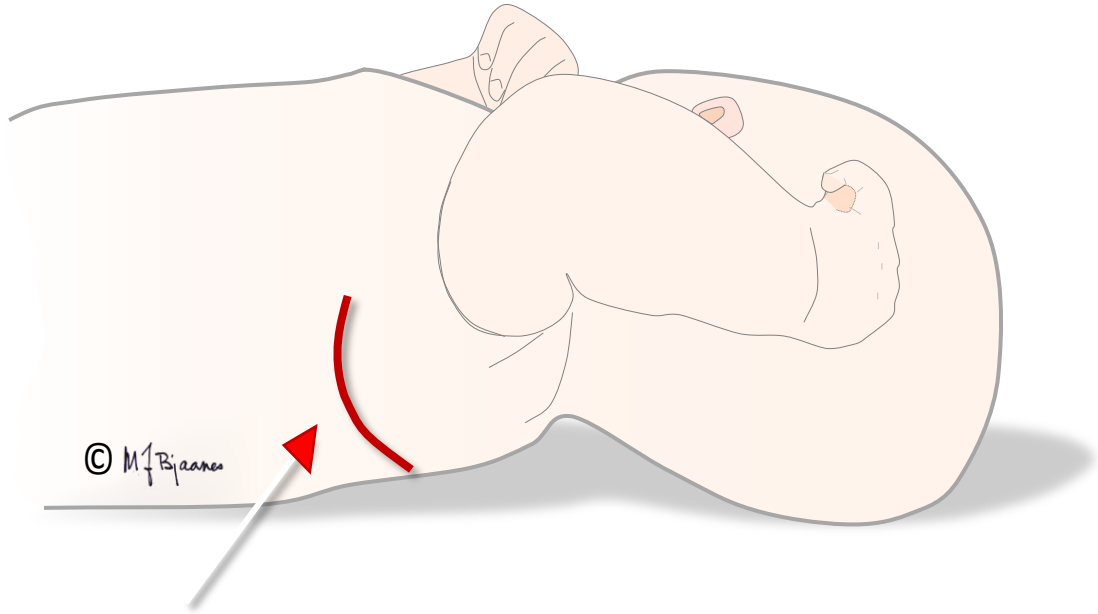
PDA Treatment – Interventional

Percutaneous PDA closure





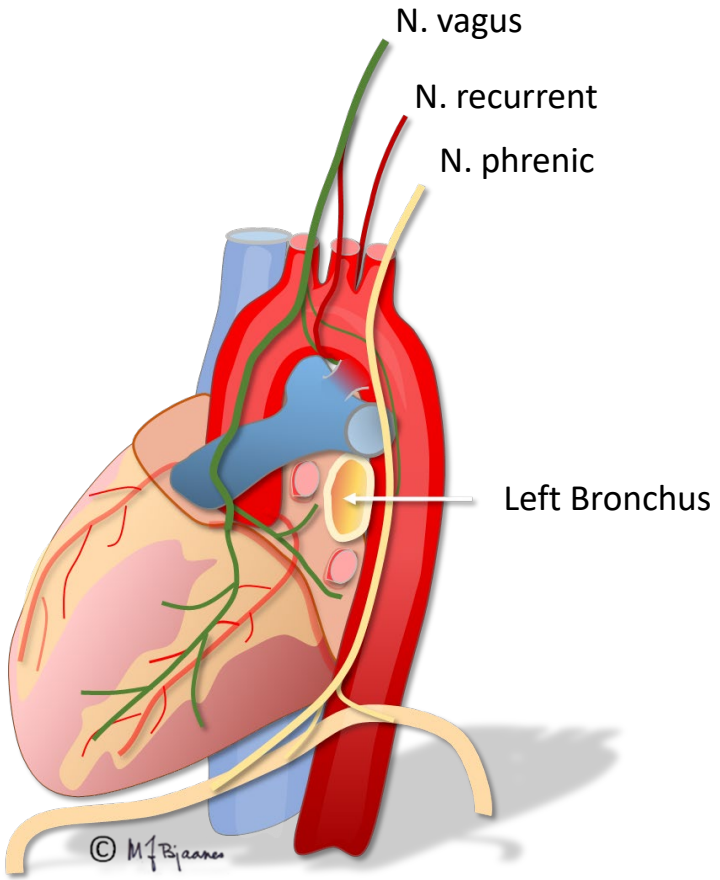
PDA Treatment – Surgical Closure



Normal access is posterolateral thorachotomy in the 4th intercostal space

Treatment

Surgical PDA ligation – look out for these nerves



Left side of the heart

Damage to:

Vagal Nerve

Normally keeps HR down. Damage can create permanent tachycardia

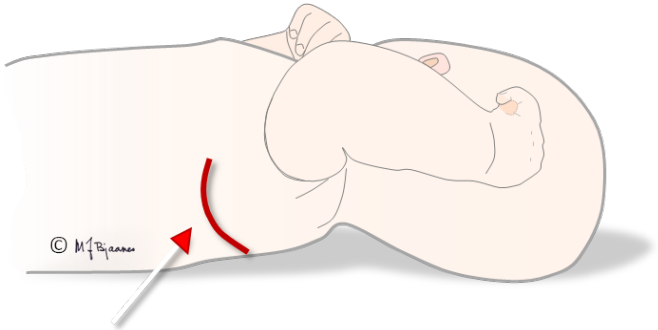
Recurrent Laryngeal Nerve

Passes around the PDA to left vocal chord muscles. Damage creates hoarseness voice and/or stridor

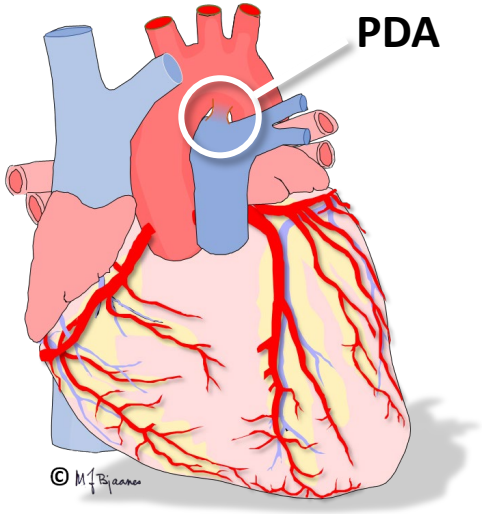
Phrenic Nerve

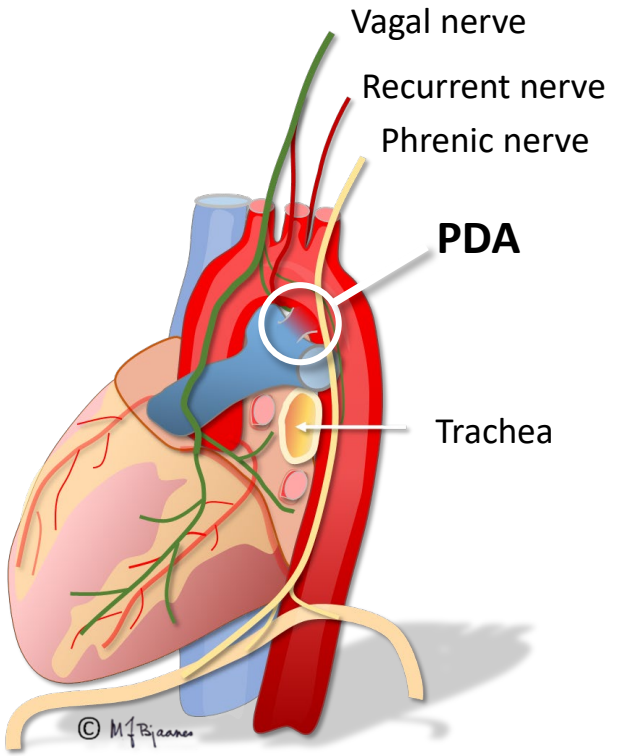
Damage leads to diaphragm palsy

Surgical PDA closure

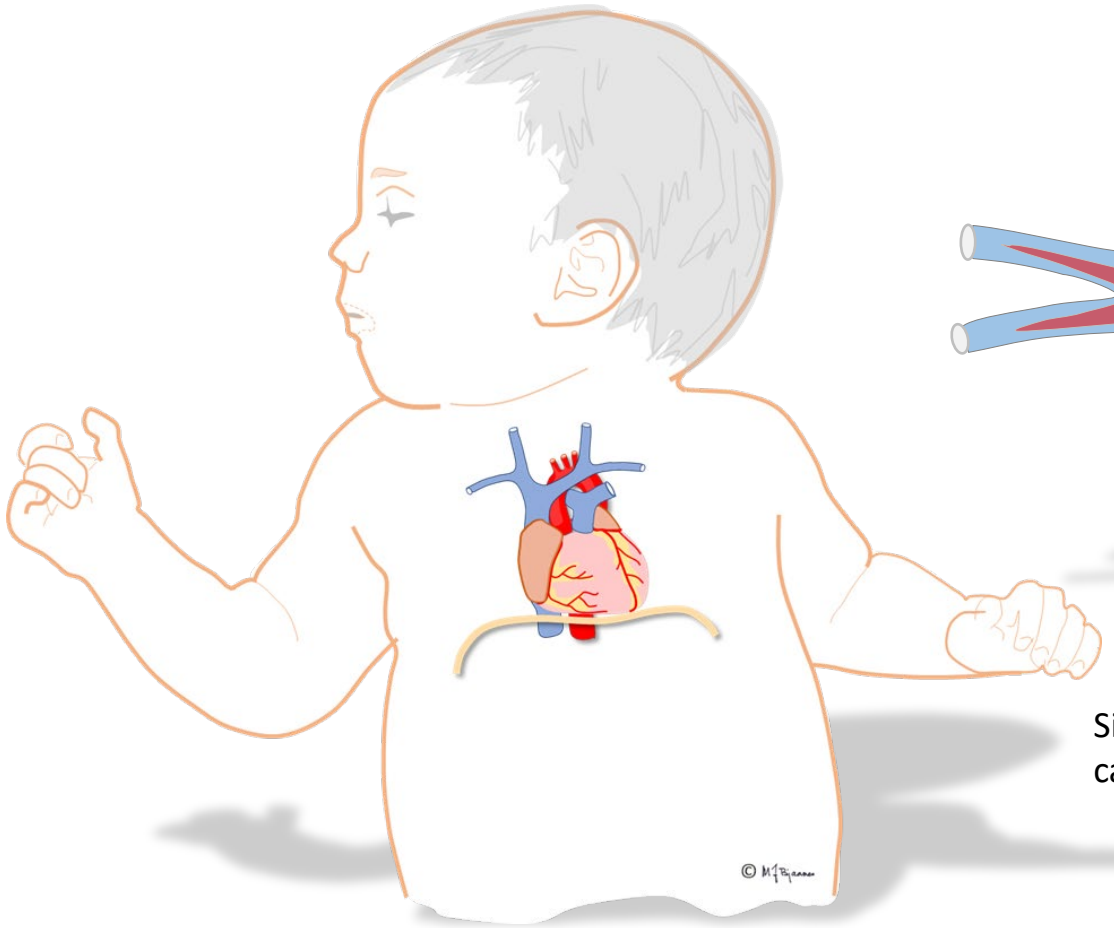


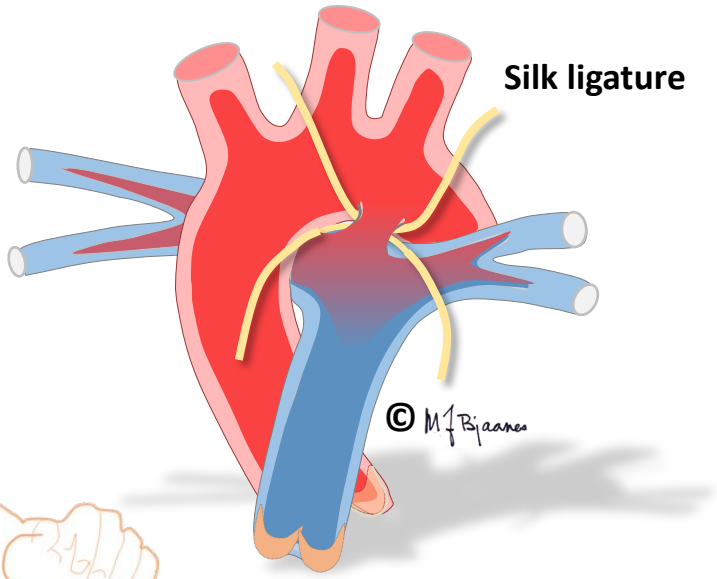
Standard access is posterolateral thoracotomy in the 4th left intercostal space



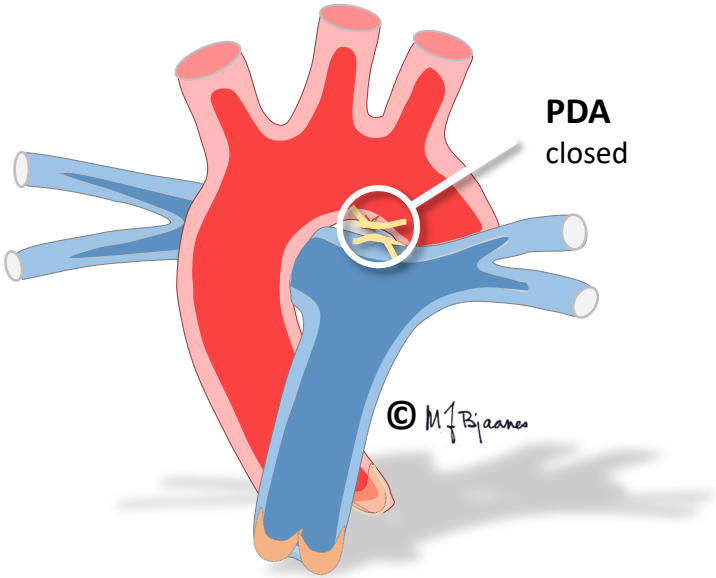


Surgical PDA ligation





Silk ligatures can be placed carefully around the PDA



Ligatures are then tied and the PDA cut between them.