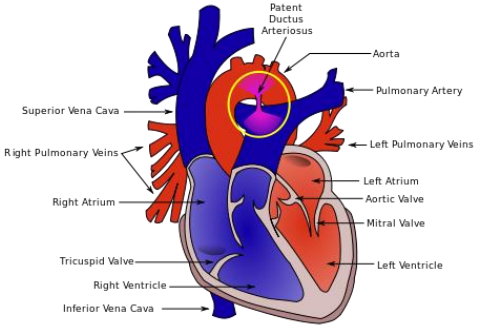
CARDIOVASCULAR SYSTEM - 1

PROF. DR. M. TARIQ JAVED

Department of Pathology,
Faculty of Veterinary Science,
University of Agriculture, Faisalabad,
Pakistan.

CARDIOVASCULAR MALFORMATIONS

PATENT DUCTUS ARTERIOSUS



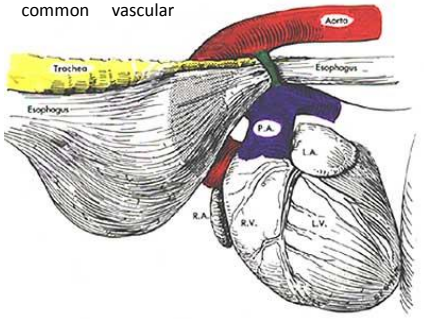
PATENT DUCTUS ARTERIOSUS

- Arises from the left sixth aortic arch.
- In fetal life **takes blood from the pulmonary artery to the aorta.**
- Functional closure — within minutes or hours after birth.
- Anatomical closure — 6th or 7th day after birth.
- After closure ---- ligamentum arteriosum persist.
- Failure to close — **persistent or patent ductus arteriosus**
- In Patent Ductus Arteriosus part of the **arterial (aortic) blood is pumped into the pulmonary artery.**
  - This is **left to right shunting**
  - In addition, blood reaching the systemic circulation is decreased.
  - However, if pulmonary vascular resistance is high — **right-to-left shunt**

- Large patencies may result in **right** and/or left heart failure within a few weeks or months
- **Smaller patencies may permit survival until maturity**
- Significant clinical signs include
  - cyanosis,
  - fatigue,
  - lack of stamina,
  - dyspnoea,
  - hind leg weakness, and
  - weight loss.
- A **"continuous" or "machine-like" murmur**
- Necropsy findings include those changes described for congestive heart failure **(generalized venous congestion, hepatomegaly, ascites, etc.).**

PERSISTENT RIGHT AORTIC ARCH (Vascular ring anomaly)

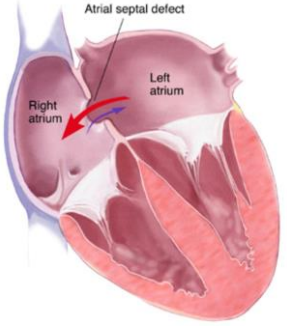
- In dogs, a persistent right aortic arch is a common vascular anomaly.



- The right aortic arch persists, resulting in displacement of the esophagus and trachea to the left.
- Both the trachea and esophagus become locked up in a vascular ring formed by the arch of the aorta, the pulmonary artery, the base of the heart, and the ligamentum arteriosum **(or ductus arteriosus).**
- **Persistent right aortic arch has been** reported in dogs, cats, cattle, and horses.
- In the German Shepherd dog, the condition is considered to be hereditary.
- Significant clinical signs include
  - dysphagia and regurgitation since the vascular ring encircles and compress the esophagus and trachea.
  - At necropsy, the portion of the esophagus anterior to the obstruction is usually dilated.

ATRIAL SEPTAL DEFECT

- **Patent Foramen Ovale**

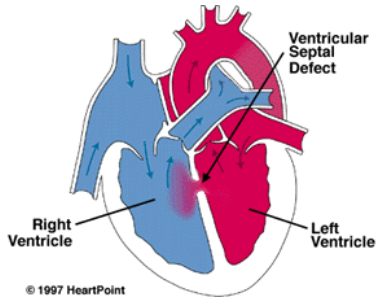


Patent Foramen Ovale

- There usually is a left to right shunt.
- A systolic murmur result.
- If the pressure between the two atria equalizes, the flow through the shunt may diminish, and may reverse leading to cyanosis.

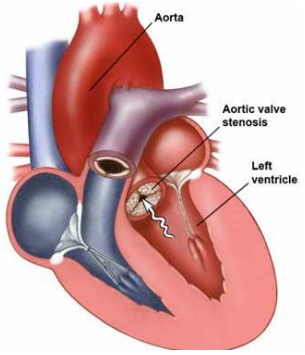
VENTRICULAR SEPTAL DEFECT

- The majority of these defects occur in the upper membranous portion **(high septal defect)**



- Such defects are commonly referred to as **"subaortic septal defect".**
  - In young animals, the blood flow is entirely from **left to right**
  - **congestive heart failure**
- Small defects are usually well tolerated; large defects may result in hypertension and eventual cyanosis.
- A systolic murmur is best heard on the right side.

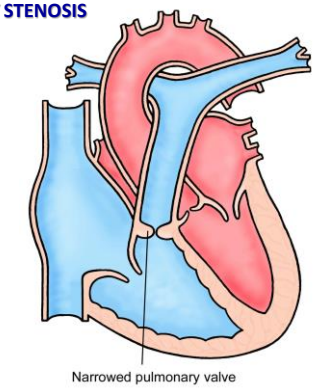
AORTIC STENOSIS



AORTIC STENOSIS

- Stenosis obstructs the flow of blood into the aorta.
- The involvement may be valvular or subvalvular
- Subvalvular aortic stenosis is most common.
- It leads to an accumulation of blood in the left ventricle with left ventricular dilatation and hypertrophy.
- Subsequently, signs of **pulmonary congestion, edema, etc.**
- Often, there is post-stenotic dilatation of the ascending aorta.

PULMONARY STENOSIS



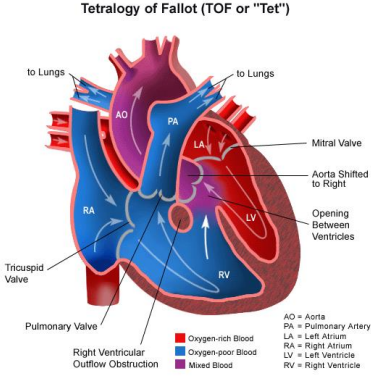
PULMONARY STENOSIS

- Stenosis obstructs ---- right ventricle to the pulmonary artery
- The stenosis may be
  - Valvular
  - Subvalvular
  - Valvular stenosis is most frequent in dogs
- Blood accumulates in the right ventricle leading to ventricular dilatation and hypertrophy.
- Subsequently, **congestive heart failure**
- In addition, post-stenotic dilatation of the pulmonary artery may occur, producing a rounded enlargement of the vessel resembling an aneurysm.

TRANSPOSITION OF THE GREAT VESSELS

- The aorta and pulmonary artery may be transposed
- aorta arising from the right ventricle and
- pulmonary artery from the left ventricle.
- arterial side of the heart on the right and the venous side on the left
- No significant clinical signs are encountered.
- However, if the aorta originates from the venous side and the pulmonary artery from the arterial side, death occurs.

TETRALOGY OF FALLOT

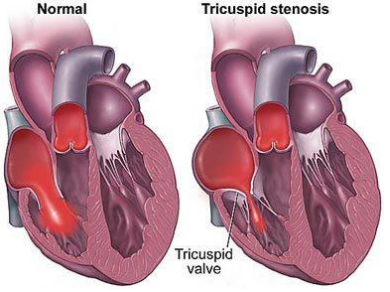


TETRALOGY OF FALLOT

- Several individual anomalies occurring together. These include:
  - **Pulmonary stenosis (usually sub-valvular).**
  - **Ventricular septal defect (VSD - usually high).**
- An overriding, dextro-positioned aorta (that receives blood from both the left and right ventricles).
- Right ventricular hypertrophy **(which is secondary to the other defects).**
- Tetralogy of fallot has been reported in dogs, cats, horses, and cattle.

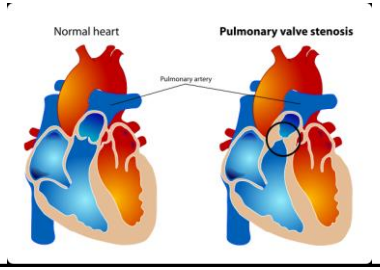
Stenosis /Insufficiency of the Tricuspid Valve

- Leads to incomplete filling of the **right ventricle**
- Leads to an accumulation of blood in the **right atrium**
- right atrial dilatation and hypertrophy
- generalized venous congestion

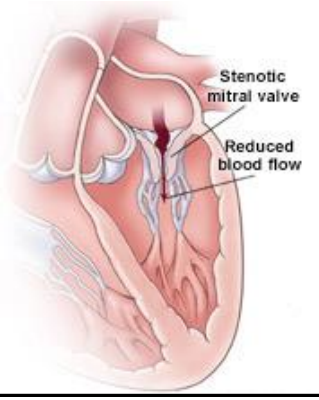


Stenosis/Insufficiency of the Pulmonary Valve

- Leads to a return of blood from the pulmonary artery into the **right ventricle**
- blood accumulates in the right ventricle -> right ventricular dilatation and hypertrophy -> blood accumulates in the right atrium -> generalized venous congestion occurs.



Stenosis / Insufficiency of the Mitral Valve

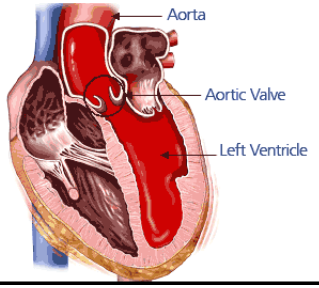


Stenosis / Insufficiency of the Mitral Valve

- incomplete filling of the **left ventricle**
- Leads to an accumulation of blood in the **left atrium**
- left atrial dilatation and hypertrophy
- congestion of the pulmonary veins
- congestion, edema, and induration of the lung
- eventually, congestion of the pulmonary artery occurs which leads to an accumulation of blood in the right ventricle
- right ventricular dilatation and hypertrophy
- an accumulation of blood in the right atrium with dilatation and hypertrophy
- generalized venous congestion.

Stenosis / Insufficiency of the Aortic Valve

- Leads to a return flow of blood from the aorta into the left ventricle during **diastole**
- Leads to an accumulation of blood in the **left ventricle**
- **Left ventricular dilatation and hypertrophy (with subsequently the same results as in insufficiency of the mitral valve).**



Ectopia cordis

- Heart is outside of the thoracic cavity
- Most frequently seen in cattle - (subcutis, neck)
- Usually secondary to sternal cleft or failure of thoracic cavity to close normally
- Some animals can survive for several days to months

Dextrocardia

- Heart is on the right side rather than the left
- Often associated with total or partial situs inversus (mirror image of normal left to right symmetry) - Ciliary Dyskinesia (impairment of voluntary movements resulting in jerky motions),
  - Dextrocardia and situs inversus (a congenital abnormality characterized by lateral transposition of the viscera as of the heart or the liver)
  - Total lack of rhythmic, sweeping movement
  - Usually fatal

References:

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- http://www.mercyangiography.co.nz/PatientInfo/OurProcedures/PAVR.aspx
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