Right to Left Heart Shunts

Shunts are one category of congenital heart disease, and the many manifestations are sorted by the primary direction of blood flow through the shunt. This Picmonic describes the right-sided to left-sided shunts, also known as the cyanotic heart defects. All congenital heart defects occur at a higher rate in premature births.

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The 5 Ts
(5) Hand with Tea
There are five right to left heart shunts; all of the names begin with the letter T and can be collectively recalled as “The 5 T’s”. These are truncus arteriosus, transposition of the great vessels, tricuspid atresia, tetralogy of fallot, and total anomalous pulmonary venous return (TAPVR).

Truncus Arteriosus
Trunk of tree with Arteries
This defect occurs when the aorticopulmonary septum fails to form due to improper migration of neural crest cells. Both the right and left ventricle pump mixed blood into the pulmonary and systemic circulation via the single vessel.

Transposition of the Great Vessels
Great Vessels changing Position
In transposition of the great vessels, the aorta will arise from the right ventricle while the pulmonary artery stems from the left ventricle. A commonly tested maternal risk factor for this defect is diabetes mellitus.

Tricuspid Atresia
Tricycle-cupid with Atresia-tree
In tricuspid atresia, there is a complete absence of the tricuspid valve. With no connection between the right atrium and ventricle, the right ventricle is hypoplastic and there is no way for returning venous blood to be oxygenated in the lungs or distributed to the body. To be compatible with life, both an atrial septal defect (ASD) and a ventricular septal defect (VSD) must accompany tricuspid atresia. The ASD allows blood to be pumped into the left ventricle, while the VSD allows blood to travel to the pulmonary arteries.

Tetralogy of Fallot
Tetris-logs Flowing
The most common right to left shunt, TOF refers to a constellation of 4 defects which include: Pulmonary infundibular or valvular stenosis, VSD, right ventricular hypertrophy, and an overriding aorta. The severity of TOF is measured by the degree of pulmonary valve stenosis. When pulmonary circulatory pressure increases (i.e. physical activity, crying) and exacerbates the shunt, children with TOF learn to squat down to increase their systemic vascular resistance and temporarily reverse their shunt by pushing left sided blood into pulmonary circulation.

Total Anomalous Pulmonary Venous Return (TAPVR)
TAPE-Vampire with TAPVR
Pulmonary veins normally return oxygenated blood from the lungs to the left atrium so it can be distributed. With TAPVR (total anomalous pulmonary venous return), the pulmonary veins connect with the right side of the heart (right atrium, vena cavae, etc.), leading to a closed loop of venous blood flow. Thus, the oxygenated blood leaving the pulmonary veins is not circulated to the left side of the heart. An atrial septal defect (ASD) must be present for TAPVR to be compatible with life.

Associations

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Cyanosis at Birth

Cyan-crayon with Newborn

These heart defects often manifest as “blue babies” at birth due to oxygen-poor blood from the right heart being distributed systemically by the left heart, dropping total oxygen saturation (SaO2) of the child’s blood.

May Require PDA

Patent Duck Archer

Patent ductus arteriosus (PDA) is a type of left to right heart shunt, and in the case of right to left shunts, maintaining its patency temporarily with prostaglandins, or permanently with surgery, is cardioprotective. Maintaining the patency of a PDA allows for oxygenated blood to reach systemic circulation.

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