TRANSPOSITION OF GREAT ARTERIES (TGA)

Abstract

An old proverb says that "a healthy heart, defines a healthy you"; this context aligns with the growing heart disease affecting the health of an individual. Heart diseases have been getting more common these days with the major proposition for the maximum mortality rate across the globe. However, natal issues have been even significant these days that need to be crucially identified so that future measures could be effectively taken. One such issue, that majority of the children faces is during the embryological development of heart that is majorly named to be blue-baby syndrome that causes almost 400 per million live births of the baby. This paper hence aligns with similar thoughts to identify the issues and concern of the increasing the cases for (TGA) or the Transposition of Great Arteries in child.

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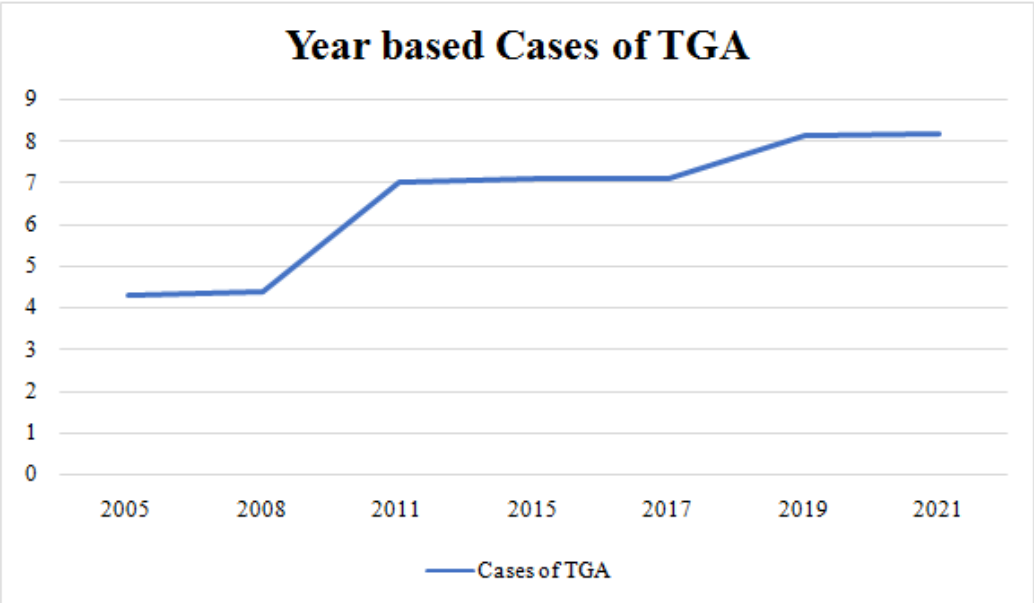
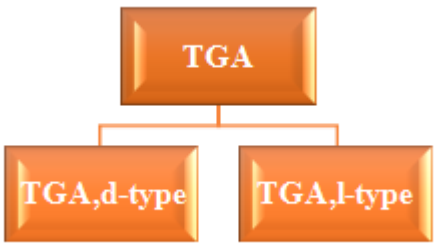
I. INTRODUCTION

Total transposition of great arteries (TGA) has been considerably an anomaly from the spectrum of Congenital Cardiac system. At the first instance, the great arteries within these anomalies refer to aorta and pulmonary artery. Considering the abnormal development of foetal heart during first 8 weeks of the pregnancy, it could be evident that large arteries transport blood away from the heart towards the lungs. On contrary, these issues may even appear if the body, are improperly connected. TGA leads to several issues such as cardiological pathologies even referred to as the "blue-baby syndrome" due to the low amount of oxygen provided to the body.

Epidemiology: Currently TGA has been exponentially rising with around 4.7 per 10,000 live births. On the other hand, TGA detects around 3% of all CHD and 20% of cyanotic heart disease. In accordance with, Centers for Disease Control and prevention (CDC) it could be estimated that around 1,153 babies have been born with TGA every year in the US.



Types: Consecutively there are two types of TGA commonly evident

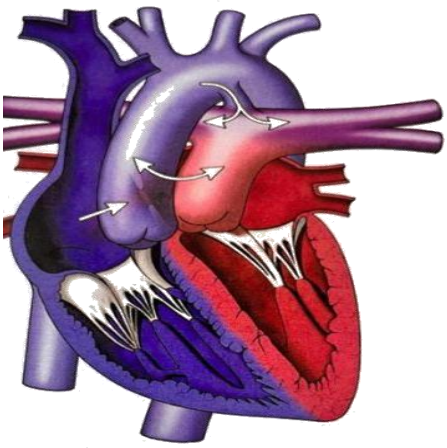


1. TGA-D or the Transposition of Great Arteries dextro type:

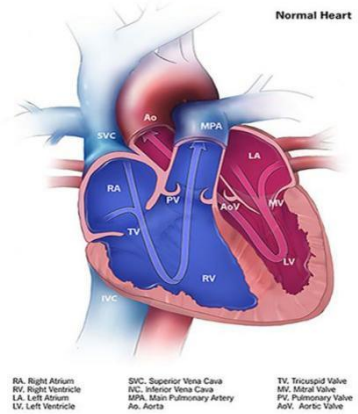
In this defect it has been accounted for around 5% of the cases of CHD, a discordant relationship has been evident in case of ventricular-arterial relationship is. Aorta has been

anterior and to the right relative to the pulmonary artery and arises from the right ventricle. Apparently, Pulmonary Artery begins from the left ventricle (LV). On the other hand, Ventricular septal defect (VSD), pulmonary stenosis, and Coarctation of the aorta, left (VOTO) Ventricular Outflow Tract Obstruction, as well as the mitral and tricuspid valve abnormalities, coronary artery anomalies have been highly common in this defect.

***Pathophysiology*:** In Dextro-Transposition of Great Arteries (D-TGA), the aorta begins from the (RV) Right Ventricle as well as returns the de-oxygenated blood back to the systemic circulation. On the other hand, the pulmonary artery begins from the left ventricle as well as returns back the oxygenated blood to the pulmonary circulation.



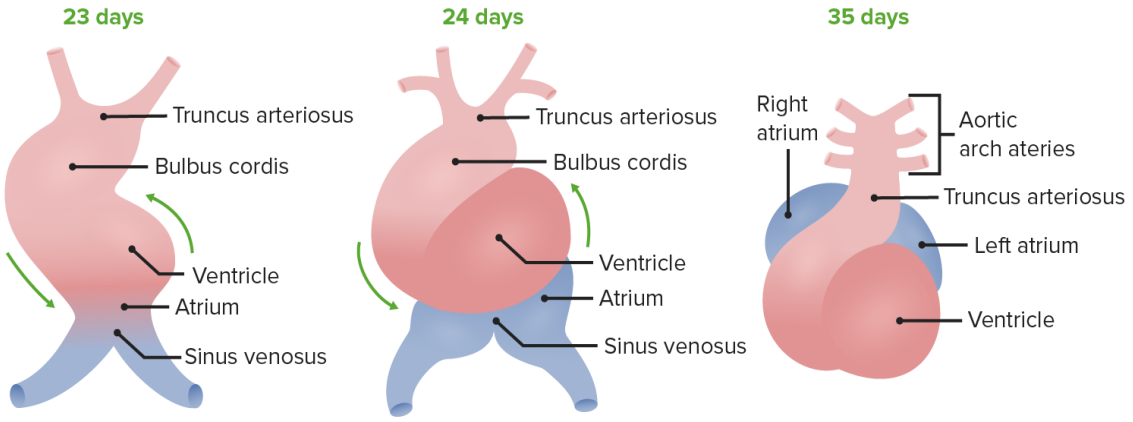
TGA-D



Heart in any healthy Normal individual

The above two image describes the difference that has been evident in an apparently healthy individual and the heart of any patient suffering with TGA-D. Mainly adequate systemic oxygenations are dependent on mixing of blood that is oxygenated from the pulmonary circulation along with the deoxygenated blood passing from the systemic circulation. This happens at region of arterial septum via Patent Foramen Ovale (PFO) as well as within the the great artery level via PDA (patent ductus arteriosus). The arterial communication leading to significant systemic cyanosis and may be restricted.

Embryology:

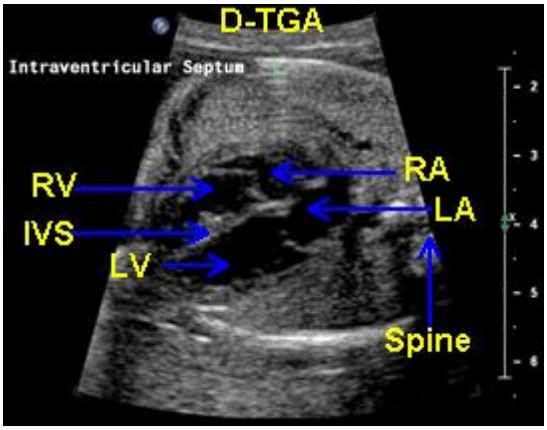


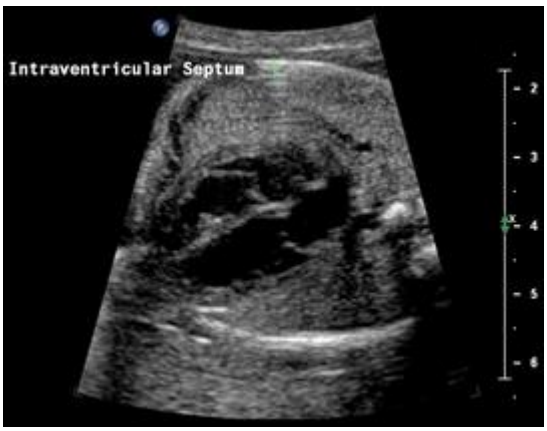
Primitive Heart Tube development in foetal stage

The development of cardiovascular system has appears within the embryo from the beginning of the fourth week where development of placenta is unable to meet the need for growing embryo. Moreover, the development of heart begins from the primate heart tube occurring on the USG graphs from the 23rd week of the pregnancy by the second trimester of the pregnancy. However, clear appearance of the ventricle and atrium are absent whereas sinus venosus and truncus arteriosus supports the overall function of the heart.

The ductus arteriosus are a hole flanked by the pulmonary artery as well as the aorta in the foetus that allows blood in order to mix within the uterus. The ductus arteriosus shuts off at the time of birth therefore oxygenated as well as the deoxygenated blood could not mix as the lungs inflate in order to oxygenate blood. In the d-TGA form the arteries connect to the wrong sides of the heart. Instead of blood leaving pulmonary system and going to the aorta it returns back to the lungs. Infants with d-TGA risk organ failure due to not receiving the oxygenated blood and nutrients for their function of organs.

Diagnosis





The above two images counter-indicate the imaging system where Dextro-TGA could be found to be normal from the Four-chamber view whereas on radiological imaging through five chamber view could aid in positive diagnosis of the case. On contrary, if great vessels have been arising from the left ventricle branches, the practitioner could define the pulmonary artery and the great vessels such as Aorta are transposed from the right ventricle instead of the left ventricle.

2. Transposition of Great Arteries, Levo type

It is an abnormality of the arterial-ventricular discordance as well as ventricular-arterial discordance that occurs due to ventricular inversion. It is a form of congential heart disease where blood circulation flows in the way it should. However, serious problem exist where deoxygenated blood from the right atrium goes to the left ventricle and pumped to the lungs with the aid of pulmonary artery. In addition, red or oxygenated blood are carried from left atrium to the right ventricle and pumped to the major artery of the body.

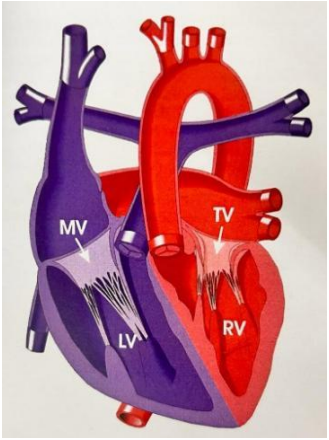
The anatomic right atrium connects to a morphologic right sided left ventricle via a mitral valve, and has pulmonary artery as an outlet. The left atrium connects via the tricuspid valve to morphologic left sided right ventricle with the aorta as the outlet. Aorta lies anterior and the left of the pulmonary artery.

This disease could be associated with other heart defects such as the VSD or ventricular septal defect, abnormal tricuspid valve that are connected to the right ventricle (Ebstein's anomaly) and pulmonary stenosis. Other than this, l-Transposition of great arteries could be even associated with heart block or Atrio-ventricular Tachycardia.

***Pathophysiology*:** The patient with isolated L-Transposition of Great Arteries may be completely asymptomatic. Significant tricuspid insufficiency and systemic ventricular dysfunction could even occur.

In Levo-TGA (L-TGA), the left ventricle is positioned to the right of the right ventricle. The main point of consideration has been the ventricles on opposite sides of the heart. The pulmonary trunk and aorta go through in anatomically correct orientations, since the RV and LV are reversed, aorta is fused with the RV, and the pulmonary trunk is combined with the LV. Therefore, anatomically deoxygenated blood enters corrected right atrium, passes through the mitral valve into LV, and is pumped into pulmonary trunk to

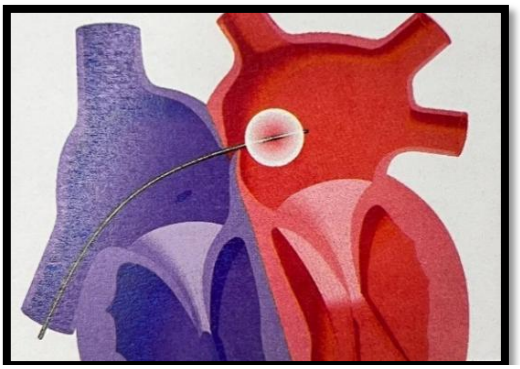
lungs. From the lungs, the oxygenated blood enters the left atrium, passes through the tricuspid valve, and into the RV blood is pumped into aorta.



Levo-TGA or even suggested as congenitally corrected TGA

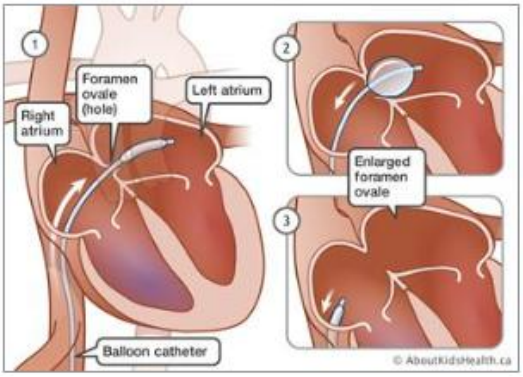
Therapy: In L-Transposition, the Great Arteries as well as significant tricuspid insufficiency or systemic ventricular dysfunction, tricuspid valve replacement could be performed effectively. In selected cases a "double switch" procedure where a Senning Procedure with an arterial switch procedure has been attempted in order to make the morphologic left ventricle into the systemic pumping chamber. In some cases, this complex procedure requires preconditioning of the left ventricle with a pulmonary artery band before it can handle the systemic after load.

Therapy

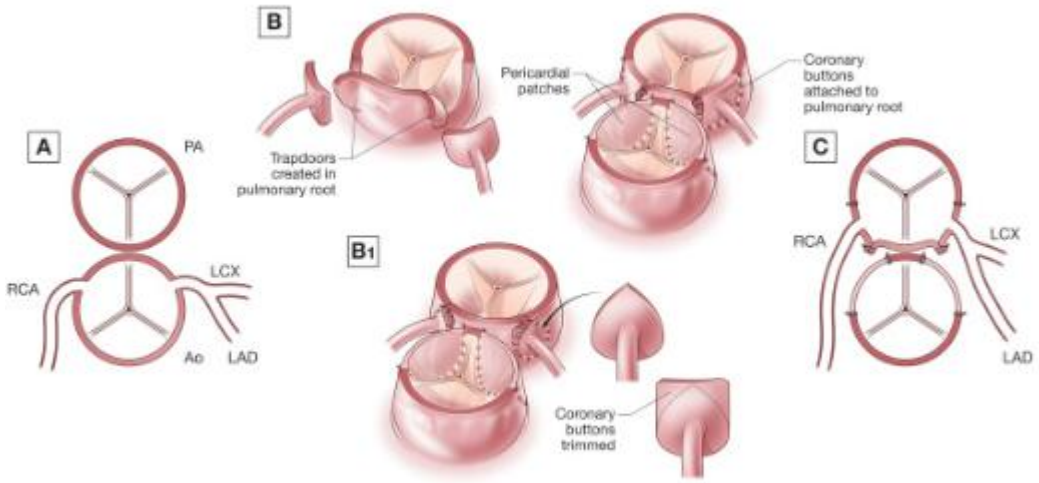


Balloon Atrial Septostomy

After the birth of the infant, initially it has been palliated with a Prostaglandin infusion in order to maintain ductal patency. If the PFO has been found to be restrictive then an inadequate atrial mixing occurs that needs to be enlarged through Balloon Septostomy.



Hence, this is a procedure used in order to expand the ASD as well as improve the process of oxygenation of blood. This surgery is guided by the ultrasonography process or within a special process referred as the cardiac catherisation laboratory. This defect will require surgery, usually during the first week after the delivery/birth of child.



Trapdoor technique for ASO (Arterial Switch Operation)

The ASO has been one of the greatest achievements across the paediatric cardiac surgery providing appropriate palliative operations including the atrial switching required within the TGA patients. In this technique, trapdoors are created in the pulmonary root considering the transposition of the great arteries.

References

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