



## **Functionality Directs Anatomy and Growth and Development– The Basis - A Perspective**

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The concept of usage trophy (troph – Development y – The process of) and disuse atrophy has evidenced again and again that functionality directs anatomy in all biological systems

When we consider the foetal adjustment of various systems at birth especially the circulatory system once the umbilical cord is ligated, the placental circulation stops. Blood flow through umbilical vein ceases causing contraction of ductus venosus within one to three hours after the birth. The systemic vascular resistance increases as the pressure in the LA (left atrium), LV (left ventricle) and aorta increases.

Clamping of the umbilical vein causes asphyxia which in turn activates the respiratory centre generating a signal causing expansion of the lungs. This decreases the pulmonary vascular resistance. Closure of umbilical vessels increases peripheral resistance increasing the blood pressure. Left atrial reserve is raised above the volume of the blood present in the inferior vena cava and right atrium due to increased flow from the lungs. Decreased flow of blood to the right atrium occurs. Occlusion of the umbilical artery increases the resistance to the left ventricular output.

Change in pressure gradients across the atria abruptly close the valve of the foramen ovale. Later gradually the interatrial septum closes. The pulmonary arterial pressure decreases significantly due to decreased pulmonary vascular resistance. This along with increased aortic pressure reverses the flow of blood to the ductus arteriosus. Constriction of ductus arteriosus starts within a few minutes and is completed in one to two days after birth. Then on, the right ventricular wall thickness decreases whereas the left ventricular wall thickness increases.

Changes in pressure are directing the anatomical changes in the heart as well as the anatomy of the various blood vessels. Even after birth, during development, every milestone attained is a functional need of the infant. The baby tries to respond to the environment and its surroundings. In trying to do so, it is developing eye fixation, neck holding, grasp reflex, crawling, toddling, walking etc. The whole growth and development of an individual is guided by his needs which in turn are directing certain functions and those functions directing the anatomical development of the parts involved. Best exemplified by synaptic contiguities developing with in a period of minutes to hours and changing to signalling

cascades over a period of months to years. We also tend to forget tasks which are non-repetitive. Repetition is the basis of deriving the phenotypical and anatomical frameworks from genetic frameworks.

Therefore, there is a stratified stability of genetically developed anatomical structures at each level in evolution. Over and above the further functionality of that particular organ or system is directing the anatomical parts.