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Normal cardiovascular adaptations at birth

Significant changes occur in the new born cardiovascular system after delivery. This is due to removal of the low resistance placenta as the source of fetal gas exchange and nutrition. Understanding cardiovascular adaptation postnatally is based on mostly sheep studies. Most important is an increase in the cardiac output that is necessary to support increased basal metabolism, work of breathing, and thermoregulation. Postnatally circulation changes from "parallel" to "series". The combine cardiac output nearly doubles from about 450 mL/kg/min as a fetus to about 700 mL/kg/min. In the fetal circulation, the umbilical cord and ductus venosus deliver oxygenated blood from the placenta. The better oxygenated stream of blood from the ductus venosus enters the right atrium from the inferior vena cava and is directed preferentially to the left atrium by the foramen ovale so that oxygen rich blood reaches the brain and the coronary circulation. The cardiac output from the fetal right ventricle reaches the descending aorta via the ductus arteriosus and very little blood enters the pulmonary circulation. Postnatally with the first breath and removal of the placenta, pulmonary blood flow increases. This is followed by functional closure of the patent ductus arteriosus. In the fetus, high pulmonary vascular resistance is primarily due to low oxygen tension and low pulmonary blood flow. After birth, with ventilation and oxygenation, nitric oxide and prostaglandin I₂ is elevated leading to rapid fall in pulmonary vascular resistance. Corticosteroids play an important role in postnatal cardiovascular transition. Prenatal corticosteroids improve cardiac function in premature babies with augmentation of postnatal contractility, cardiac output and eventually blood pressure. Fetal left ventricular oxygen saturation is about 65%. Soon after birth in term infant, the pre-ductal oxygen saturation is above 90% at 8 minutes of age and reaches above 95% for both pre-ductal and post-ductal by 24hr of age. The understanding of the transitional cardiovascular changes will help the physicians involved in the neonatal care to provide optimum care and support to the new born and timely intervention if necessary.

Biography: Prasad Ravi is a pediatric and fetal cardiologist. He is a clinical assistant professor and interim director of fetal cardiology program at Banner Cardon Children's Medical Center in Mesa, USA. His special interest in fetal diagnosis of congenial heart defects, transitional circulation and neurodevelopmental outcomes in children born with congenital heart defects. He conducts periodic fetal cardiology conference at his home institution and also presents his work at national and international conferences.

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