UNDERSTANDING SINGLE VENTRICLE PHYSIOLOGY

Dr. Ahmed Mokhtar, MD.
Anesthesia Department Faculty of Medicine, Cairo University, Egypt

Introduction: Single ventricle anatomy (SVA) is the term used to describe a functional single ventricle regardless of anatomic subtype.[1]

Physiology: Ratio of pulmonary blood flow to systemic blood flow. The newborn with single-ventricle physiology has mixing of systemic and pulmonary venous return, and the total cardiac output is partitioned into Qp and Qs based on the amount of anatomic obstruction or vascular resistance to flow in the respective circuits.

Manipulation of delivered oxygen: The goal of management in single-ventricle physiology is to ensure adequate DO2, not to maximize SaO2. Optimization of DO2 requires maintenance of cardiac inotropy while balancing Qp and Qs and maintaining adequate blood pressure and SaO2. [2]

Bidirectional cavopulmonary anastomosis: Three significant aspects separate the physiology of the bidirectional cavopulmonary anastomosis from that of a normal circulation or newborn single-ventricle physiology. First, the driving force for Qp is SVC pressure. Second, Qp must pass through two separate and highly regulated vascular beds: the cerebral vasculature and the pulmonary vasculature. Finally, the bidirectional cavopulmonary anastomosis removes the left-to-right shunt and thus the volume load from the single ventricle. Qp is largely dependent on the resistance of two highly but differentially regulated vascular beds. The cerebral and pulmonary vasculatures have opposite responses to changes in carbon dioxide, acid-base status, and oxygen. [3]

Total cavopulmonary anastomosis: Qp is dependent on systemic venous pressure, and all Qp is effective. Important issues when there is elevated pulmonary artery pressure. This elevation can occur either because the PVR is high or when myocardial dysfunction raises pulmonary venous atrial pressure.

References