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Timing of the Cord Clamping with Breathing

American College of Obstetrics and Gynecology currently recommends delayed cord clamping (at least 30-60 seconds after birth) in term and preterm infants [1] because of its reported benefits. A recent meta-analysis also showed improved mortality among the preterm infants with delayed cord clamping [2].

Physiologically, the timing of clamping should depend on whether the baby has established breathing. During fetal life, only 10% of the circulation is flowing through the lungs. However, soon after birth, it should increase to 50% not just to fill the expanding lungs but to become the only source of preload to the left ventricle through the pulmonary venous return. This substantial increase in pulmonary venous return occurs over the first few minutes after birth.

As soon as the cord is clamped, systemic vascular resistance increases impacting the left ventricular output. In the meantime, as baby begins to breathe, pulmonary vascular resistance decreases, and pulmonary flow should increase from 10% to 50%. However, as the placental flow to the baby is now interrupted, right ventricular filling and therefore, the pulmonary blood flow becomes sub-optimal leading to decreased pulmonary venous return adversely affecting left ventricular output, and consequently, the cerebral blood flow.

When cord clamping is delayed until breathing is established, placental blood flow through umbilical venous return continues to fill the right side of the heart ensuing adequate pulmonary vascular filling over several breathing cycles. This preserves the optimal pulmonary venous return thus maintaining the left ventricular preload and the cardiac output permitting smoother extrauterine transition of the cardiorespiratory system.

Recently, the impact of a physiological approach to cord clamping in preterm lambs was studied [3]. It was shown that immediate cord clamping before ventilation

increased systemic vascular resistance with a consequent rise in carotid artery blood flow followed by a drop in the carotid blood flow and a gradual rise subsequently [4]. This contrasted with the smooth maintenance of carotid and cerebral blood flow with delayed cord clamping after ventilation was established. These rapid fluctuations in cerebral blood flow may explain why some preterm infants suffered intraventricular hemorrhages in the early clamping group.

A sophisticated computer model developed by Carnegie-Mellon University group also concluded similarly supporting the physiological approach to cord clamping after the ventilation was established [5]. Hence, it may be better not only to delay the cord clamping but also to ensure that baby has established breathing for a smoother extra-uterine cardio-respiratory transition. This concept needs to be validated in clinical studies on humans.

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