

## Delayed Umbilical Cord Clamping

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### Abstract

Currently performing delayed clamping of the umbilical cord (DCC) has become an essential component of labor management and immediate newborn care, the World Health Organization (WHO) recommends delayed clamping of the umbilical cord, no earlier than 1 minute, after birth to improve nutritional and health outcomes for both mother and baby. This volume supports the process of fetal to neonatal physiologic circulatory transition compared with immediate cord clamping, which deprives neonates of a significant volume of blood to support the major changes in the pulmonary and umbilical circulations, especially in preterm neonates. The main problem is when a newborn is born who needs support during resuscitation, that is, they did not breathe or cry at birth, which is why this review will attempt not only to deepen the physiological conditions that improve the binomial and to establish which newborns are candidates to carry out this procedure.

**Keyword:** *Newborn; Delayed Clamp; Umbilical Cord; Preterm Label*

### Introduction

In these days has become delayed umbilical cord clamping (DCC) an essential component of labour management and immediate newborn care [1]. The World Health Organization (WHO) recommends Delayed umbilical cord clamping, not earlier than 1 min, after birth to improve maternal and infant health and nutrition outcomes. Other authors mention it should clamp after de pulsation stops [2]. This volume supports the physiological fetal to neonatal circulatory transition process compared to immediate cord clamping, which

deprives newborns of an important volume of blood to endure the major changes in pulmonary and umbilical circulations, especially in preterm neonates [3]. Different methods enhancing placental transfusion were used, including deferred umbilical cord clamping and successive umbilical cord milking (UCM) or stripping [4]. The beneficial impacts of DCC compared to immediate cord clamping occur through increasing the circulatory blood volume [5]. This leads to better blood pressure, a reduced need for inotropes, a reduced need for transfusion, and a reduced incidence of necrotizing enterocolitis (NEC), intraventricular hemorrhage (IVH), and early death before discharge [6]. DCC is an intervention recommended by the Royal College of Obstetricians and Gynecologists for both full-term and premature neonates [7]. Similarly, the American College of Obstetricians and Gynecologists recommends DCC for all preterm newborns [8].

### Fetal circulation

Throughout pregnancy, the fetal-placental blood volume is approximately 110 to 115 mL/kg of fetal weight [9]. After receiving only 8% of the cardiac output during pregnancy, the pulmonary circulation must increase at birth to 40% to 55% of the cardiac output [10]. An unclamped umbilical cord allows the newborn to equilibrate blood volume, oxygen levels, and pH through ongoing placental exchange [11]. Closure of the umbilical arteries occurs later than previously thought, whereas the remaining uterine contractions may help to squeeze additional blood through the umbilical vein. During the fetal stage the circulation is composed of two circuits which will be covered in the left and right heart, and up to 50% of the cardiac output (CO) flows into the placenta via the umbilical vessels throughout pregnancy, resulting in the same amount of venous return from this low-resistance system [12]. Umbilical cord clamping and the onset of ventilation at birth represent cornerstone events that trigger the fetoneonatal cardiopulmonary transition. Immediately after birth, the placental circulation maintains the peripheral vascular resistance low while blood flow through the pulmonary system progressively increases as a result of spontaneous breathing efforts, shifting from a parallel to a serial cardiovascular circuitry [13]. Most of our understanding of this transition has been derived from animal studies given clinical, methodological, and ethical issues in human studies, and even though the principles of circulation and hemodynamics are similar across species, there are significant differences that challenge our ability to fully comprehend this event [14].

### Cord content

The residual placenta blood is body temperature and oxygenated with about 15 to 20 mL/kg of red blood cells, several million to a billion stem cells, and 10 to 15 mL/kg of plasma. The amount of iron provided by the placental transfusions is enough for a 3 to 8 months' supply for a term infant [15]. The large amount of stem cells represents an autologous transplant, which may reduce the infant's susceptibility to both neonatal and age-related diseases [16]. Progesterone levels in term infants at birth are higher than the mothers' levels, and this high level may support the incorporation of the large volume of placental transfusion. In addition, there are numerous cytokines, growth factors, and important messengers in cord blood that most likely support and drive the process of transition [17]. Recent research has shown associations between delayed CC and fewer oxidation reactions<sup>30</sup> as well as a decrease in cord blood lipids and an augmented antioxidant activity, which may moderate inflammatory-mediated effects induced during delivery [18]. Placental transfusion enhancement secures an additional 10 to 30 mL/kg of blood and approximately 20 to 30 mg/kg of iron for preterm neonates, in term newborns [19].

### Complication and special conditions

Furthermore, the optimal cord clamping practice in situations of depressed infants needing resuscitation or in higher-risk delivery situations, such as placental abruption, intrauterine growth restriction (IUGR), multiple gestation, chorioamnionitis, maternal human immunodeficiency virus (HIV) syndrome/hepatitis or maternal general anesthesia is often debated. In preterm newborn a baby who doesn't breath immediately after being born [20]. Neonatologists work with obstetricians and provide guidance on performance of DCC in complex delivery situations. Moreover, newborn providers play a major role in preparation of institutional placental transfusion

guidelines, caring for infants and reporting outcomes [21]. The objective of this survey, specifically aimed at neonatologists working in the US was to identify and describe current cord clamping practices [22]. Remember that in neonatal resuscitation the basis for an adequate supply of oxygen is breathing and crying, and despite the numerous benefits of incorporating late clamping, these do not outweigh the neurological damage that comes with not providing advanced resuscitation maneuvers when they are necessary [23].

### Hypothermia

In the labor room, our real concern in the short term is the presence of hypothermia in the newborn, secondary to lack of heat. However, there are techniques to prevent this from happening, therefore it is important to carry out all the corresponding steps when performing late clamping, which are: provide heat immediately with maternal attachment and, if possible, initiate immediate breastfeeding, perform the initial steps of resuscitation during attachment, drying with pre-heated towels to reduce heat loss [24].

### Preterm morbidity in premature newborn

#### Morbidity in the premature newborn

In recent years, even more so since late clamping became more popular, it was studied whether it has any beneficial impact on the most common pathology of premature infants: intraventricular hemorrhage, necrotizing enterocolitis, and bronchopulmonary dysplasia [25]. In multiple randomized studies and meta-analyses, it has not been shown that it increases the incidence of pathologies related to morbidity and mortality in premature babies, however, it has not been shown that it provides any type of protection, at least for these three very frequent pathologies in premature babies [26].

### Hemoglobin levels

#### Preterm baby

Premature neonates are susceptible to anemic problems. Multiple control trials had demonstrated that DCC was associated with an increased hematocrit level and an increased neonatal circulating blood, as well as the red blood cell volumes of preterm infants whose gestation ages varied from 24 to 36 weeks among these studies [27]. Clinicians should advocate for the implementation of DCC as a part of the resuscitative process for preterm neonates [28]. Future studies with long term follow-up for the infant hemoglobin levels are required for recommendations [29].

#### Term babies

Existing research on DCC had proven its beneficial value not only in term infants but also in premature infants [30]. For term infants, several randomized controlled trials had reported beneficial effects of DCC on infant hemoglobin at birth or at a different duration of follow-ups and demonstrated a subsequent reduction of anemia without unacceptable side effects [31]. But one study from Japan reported that the higher hemoglobin values by DCC increased neonatal jaundice in healthy newborns [32].

### Long term benefits

For the last several years there has been an increasing focus on the importance of delayed cord clamping at birth for reduction of anemia [33]. After birth, the body takes 3 months to produce red blood cells again, hence the well-known anemia of the infant. In developing countries where these infants still die from malnutrition and infectious diseases, anemia is a major morbidity [34]. Anaemia affects approximately 293 million preschool age children globally, with 68 % of these cases in low and middle-income countries (LMICs). Anemia in children results in increased morbidity and mortality [35]. The morbidity associated with anemia is costly because of the prolonged hospital stays and increased mortality associated with the disease. Midwives and obstetricians have an important role to play in reducing anemia in children, by embracing cost effective preventive measures, a primary-one of which is delayed umbilical cord clamping at birth. In recent years, there is mounting evidence that delaying cord clamping for 180 s is associated with reduction of anemia in infants

because of the benefits that come with placental transfusion. Iron deficiency in infants will impair neurodevelopment [36]. The effects of DCC on the neurobehavior of preterm infants remained unclear. One study from Nepal demonstrated that DCC in late preterm and term infants had reduced infant anemia, and thereby improved infants' and children's neurodevelopment [37]. A brief delay of 30 - 60s in cord clamping was beneficial in improving short-term neurobehavioral outcome of late preterm infants (34 - 36 weeks), who showed a higher score in both motor development vigor (MDV) and alertness orientation at 37 weeks post-conceptual age [38].

### Conclusion

Taken together, DCC was a cost free, safe, and effective intervention to reduce anemia and should be implemented in the term infants, especially in resource-poor settings and in developing countries, which might offer a sustainable strategy to reduce early infant anemia risk [39].

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