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Delayed Cord Clamping: A Review of Benefits and Risks

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Abstract

The yolk sac and the allantois give rise to and are preserved in the umbilical cord. By the fifth week of development, it has formed and is the embryo's new source of nutrition, taking the place of the yolk sac. The cord joins the placenta, which transports substances to and from the mother's blood without allowing them to directly mix, rather than being directly attached to the mother's circulatory system. The umbilical cord can be clamped at various times, although postponing it until at least one minute after delivery improves results, provided that the minor risk of jaundice can be treated if it does occur. Clamping is followed by a painless cord cutting procedure because there are no nerves present. Out of those 20 studies, only 5 studies discuss the risk associated with delayed cord clamping, 2 studies discuss the benefit associated with good nutritional status, 2 studies discuss the benefit associated with good neurodevelopment, and the remaining studies discuss the increase in hemoglobin due to delayed cord clamping.

Keywords: Umbilical Cord; Delayed Cord Clamping; Risks; Benefits.

INTRODUCTION

The yolk sac and the allantois give rise to and are preserved in the umbilical cord. By the fifth week of development, it has formed and is the embryo's new source of nutrition, taking the place of the yolk sac. The cord joins the placenta, which transports substances to and from the mother's blood without allowing them to directly mix, rather than being directly attached to the mother's circulatory system. During pregnancy, the fetus's crown-to-rump length is roughly equivalent to the length of the umbilical cord. A full-term newborn's umbilical cord is typically 50 centimeters (20 in) long and 2 millimeters (0.75 in) in diameter. This diameter rapidly shrinks inside the placenta. The fully patent umbilical artery is composed of two layers: the outer layer, which is made up of smooth muscle cells arranged in a circle, and the inner layer, which is made up of cells that are loosely and irregularly oriented and is stained meta chromatically with a lot of ground substance. Since the layer's smooth muscle cells are not very well differentiated and only have a few microscopic myofilaments, they are unlikely to actively contribute to the process of post-natal closure.[1]

The umbilical cord enters the developing fetus through the belly, at the location that will eventually separate to form the umbilicus (or navel). The umbilical vein continues inside the fetus

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until it divides into two at the liver's transverse fissure. One of these branches connects to the left branch of the hepatic portal vein, which delivers blood into the liver. The inferior vena cava, which transports blood to the heart, receives the second branch, also known as the ductus venosus, which avoids the liver. The internal iliac arteries give rise to the two umbilical arteries, which divide to enter the umbilical cord on either side of the bladder and complete the circuit back to the placenta. By the time the infant is three weeks old, the umbilical cord stump will have dried up and fallen off after birth. After three weeks, if the stump has not yet split, there may be an underlying issue, such as an infection or immune system dysfunction.[2]

The umbilical cord can be clamped at various times, although postponing it until at least one minute after delivery improves results, provided that the minor risk of jaundice can be treated if it does occur. Clamping is followed by a painless cord cutting procedure because there are no nerves present. The rope requires anespecially sharp instrument to cut since it is so tough, like thick sinew. There usually isn't much venous or arterial blood lost after severing the cord, even though umbilical severance may not occur until the cord has stopped beating (1-3 minutes after birth). The American Congress of Obstetricians and Gynecologists' (ACOG) recommendations state that the research currently available neither supports nor contradicts delaying the cutting of the cord.[3]

There are umbilical cord clamps that have a knife built in. With these clamps, one can apply the cord clamp first, then cut the umbilical cord, which is safer and faster. The newborn wears a plastic clip on the navel area after the cord is clamped and cut until the compressed portion of the chord has properly dried and sealed. Depending on the practice, different lengths of umbilical cord are sometimes left attached to newborns; in most hospital settings, the length of cord left attached after clamping and cutting is modest. However, in the United States, a lengthier portion of the cord up to 18 cm (7 in) in length is left attached to the newborn when the birth took place outside of a hospital and an emergency medical technician (EMT) clamps and cuts the cord. Up to 10 days pass as the remaining umbilical stub dries and eventually falls out.[4]

In Contrast to Delayed Cord Clamping

Delay in cord clamping (between one and three minutes after birth) is "likely to be beneficial as long as access to treatment for jaundice requiring phototherapy is available," according to a Cochrane review published in 2013. A poor Apgar score and no difference in the likelihood of severe maternal postpartum hemorrhage or neonatal mortality were the results of delayed clamping in this study as opposed to early clamping. Delaying clamping, on the other hand, led to an average rise in birth weight of roughly 100g and an average increase in hemoglobin concentration of 1.5 g/dL, with a halving of the risk of iron deficiency at three and six months, but an increased risk of jaundice necessitating phototherapy.[3]

Based in large part on evidence that it lowers the risk of intraventricular hemorrhage in these children by 50%, the American College of Obstetricians and Gynecologists officially endorsed delaying clamping of the umbilical cord for 30-60 seconds with the newborn held below the level of the placenta in all cases of preterm delivery in 2012. In the same committee statement, ACOG also notes a number of additional potential advantages for preterm children, including "improved transitional circulation, better establishment of red blood cell volume, and decreased need for blood transfusion." According to studies, term newborns benefit from higher hemoglobin levels through out the newborn period and greater iron storage during the first few months of life, which may lead to better developmental outcomes. In January 2017, a revised Committee Opinion expanded the recommendation to term infants. With the recommendation that procedures be put in place to monitor for and treat newborn jaundice, ACOG noted a slight rise in the prevalence of jaundice in term infants with delayed cord clamping. The ACOG also said that there is no link between a delayed cord clamp and a higher risk of postpartum hemorrhage.[5]

Delaying the clamping of the umbilical cord in full-term newborns for at least two minutes after birth has been shown to be beneficial for the infant's hematocrit, iron status as determined by ferritin concentration and stored iron, as well as a decreased risk of anemia (relative risk, 0.53; 95% CI, 0.40-0.70). A 2008 study also discovered a decline. Although the hemoglobin level is higher at two months, this impact did not last into six months. After a baby is born, not clamping the chord for three minutes leads to better results at age four. Infants with anemia are less likely to have their umbilical cord clamped within three minutes of birth.[6]

Delaying cord clamping has drawbacks, such as an elevated risk of polycythemia. Studies showed that this disease was nonetheless benign. A greater rate of neonatal jaundice requiring phototherapy was seen in babies whose cords were clamped

more than 60 seconds after birth. In situations where the baby needs resuscitation and is not breathing well, delayed clamping is not advised. The recommendation is to do cardiopulmonary resuscitation and clamp and cut the cord right away. The baby may not be getting enough oxygen despite the umbilical cord pulsing.[7]

Advantages of Delayed Cord Clamping

Delaying clamping might make it easier for the placenta and the infant to receive blood transfusions. Fewer transfusions for anemia were linked to delayed cord clamping.[8] Infants who had delayed clamping exhibited higher hemoglobin levels after multiple imputation analysis (10.4 vs. 10.2 g/dL; difference, 0.2 g/dL; 95% CI, 0.1 to 0.4 g/dL).[5] According to delayed cord clamping decreased the prevalence of anemia. The amount of placento-fetal blood transfusion obtained by milking the cord four times was comparable to that obtained by delaying clamping the cord for 30 seconds.[9] The hematocrit does not rise when cord stripping is added to the delayed cord clamp.[10] Although there was no increase in staff workload due to delayed cord clamping, it was a procedure adjustment for the nurses and doctors. The group made suggestions to streamline the procedure and strike a balance between efficiency and safety.[11] Compared to infants in the group that had their cords clamped within one minute, DCC after three minutes was related with an improvement in the infants' overall neurodevelopment as measured at 12 months of age. Ages and Stages, Improved neurodevelopment, and delayed umbilical cord clamping.[12]

Death before discharging due to intraventricular hemorrhage (IVH) was measured in a study. 15 of 135 newborns (11.1%) who were given clamping times of less than 20 seconds and 7 of 135 infants (5.2%) who were given clamping times of less than 2 minutes both passed away.[13] Additionally, there were decreases in intraventricular hemorrhage, necrotizing enterocolitis, and deaths that occurred before leaving the hospital.[14] Infant nutrition and hemoglobin were enhanced by delaying umbilical cord clamping. For Kenyan medical facilities, determining the ideal timing to clamp the umbilical cord is vital. At 24 to 48 hours, infants randomly assigned to DCC had greater hemoglobin levels (19.4 against 17.8 gdl, P=0.002) and considerably lower RPBV (20.0 versus 30.8 ml kg1, P0.001) than infants assigned to ICC. There was no difference in bilirubin levels.[15]

A 2 minutes cord clamping delay resulted in an increase of 27–47 mg in 6 months iron reserves.[16] Infants with delayed cord clamping have higher levels of early hemoglobin and iron reserves. As long as there is access to phototherapy for the treatment of jaundice, delaying cord clamping is likely to be advantageous.[17] We proved that 5 minutes DCC was safe to conduct without endangering the ability to perform CPR, and that it was also associated with higher StO_2, lower FTOE, and higher BP at 12 hours of life. Newborns who didn't need extra oxygen or positive pressure breathing showed immediate gains in the postnatal transition, such as higher SpO_2.[18] Optimizing the time to CC may have an impact on neurodevelopment in a low risk group of infants born in a high income country. Delayed CC compared with early CC enhanced scores at 4 years of age in the fine motor and social domains, notably in boys.[19] According to a study, premature newborns who had their umbilical cords clamped later than those in a similar group who had them clamped earlier had better clinical outcomes. According to regression analysis, a delayed umbilical cord clamping was the best indicator of a greater hematocrit and fewer resuscitations in the delivery room.[20]

Delayed Cord Clamping Risks

When compared to the early group, the heart rate in the delayed group was 9 beats lower at 1 minute and 3 beats lower at 5 minutes (p 0.001). According to Kc *et al.* 2019 delayed umbilical cord clamping in premature neonates is linked to fewer transfusions of red blood cells, higher levels of hemoglobin and hematocrit, and a lower risk of intraventricular hemorrhage and necrotizing enterocolitis 2019.[12] Time of first breath and regular breathing were established earlier in babies who had cord clamping at 180 seconds or more.[21] Delayed clamping had the potential to cause polycythemia and hyperbilirubinemia.[22] In comparison to earlier research, the proportion of newborns who required phototherapy was not high, and the bilirubin metabolism was linked to the risk factors for hyperbilirubinemia.[23] The infant in the DCC group who had hyperbilirubinemia displayed asymptomatic polycythemia. Three newborns in the DCC group had to be admitted to the NICU due to temporary tachypnea. However, in order to fully understand the hazards and advantages of DCC in this population of newborns, studies with a bigger sample size and long-term follow-up are needed. [24]

METHODOLOGY

In this study, the accepted methodology for a

systematic literature review was used. From May 2023 to June 2023, the search was conducted. The methods and reporting were cutting edge and done in a methodical manner.

Source of Literature

This was based on published material found in the electronic databases of Academic Search Complete, Cumulative Index to Nursing and Allied Health (*Cinahl*), Global Health, *Medline* Web of Knowledge, and Scopus, and was supplemented by looking through the reference lists of the papers that were selected for evaluation. All research is completed between 2015 and 2023.

Keyword Phrases

The umbilical card clamping advantages and risk factors were searched for using different Boolean operators.

Criteria for Inclusion and Removal

A set of inclusion and exclusion criteria based on the wellness of the newborn and mother as well as the clamping of the umbilical cord were used to evaluate the suitability of research for evaluation.

Selection of Studies and Data Extraction

Duplicate citations were deleted from studies that were exported to full review after being acquired from databases. The study question and the country of the study were taken into consideration when screening abstracts. The whole text of the publications were evaluated in order to apply all additional inclusion and exclusion criteria. Studies that were chosen for inclusion were converted to a Microsoft Excel spreadsheet so that setting, population, technique, and theme analysis data could be extracted.

Quality Evaluation

The effectiveness of the included studies was evaluated using qualitative and quantitative methodologies, evaluating the study's design, methodology, and analysis. Based on criteria established within two separate tools the Critical Appraisal Skills Programme (CASP) and the Effective Public Health Practice Project (EPHPP) tools studies were categorized as strong, moderate, or weak.

Syntheses of Findings

Various parameters pertaining to this topic were used to synthesize the results. The outcomes pertaining to components were systematically combined based on the degree of support for the advantages and disadvantages of delayed cord clamping.

RESULTS

The search method turned up 100 studies. Following the application of the selection method, 20 studies were included for evaluation. The studies that were chosen for review were from reference nations. The researcher concentrated more on the Indian study.

DISCUSSION

Delay in cord clamping has been validated by numerous studies. They showed the advantages increased hemoglobin, hematocrit, neurodevelopment, good nutrition, and fewer odds of anemia while only a few research hinted at the risks such as asymptomatic polycythaemia of delaying cord clamping. Out of those 20 studies, only 5 studies discuss the risk associated with delayed cord clamping, 2 studies discuss the benefit associated with good nutritional status, 2 studies discuss the benefit associated with good neurodevelopment, and the remaining studies discuss the increase in hemoglobin due to delayed cord clamping.

CONCLUSION

The umbilical cord can be clamped at various times, although postponing it until at least one minute after delivery improves results, provided that the minor risk of jaundice can be treated if it does occur. Clamping is followed by a painless cord cutting procedure because there are no nerves present. Out of those 20 studies, only 5 studies discuss the risk associated with delayed cord clamping, 2 studies discuss the benefit associated with good nutritional status, 2 studies discuss the benefit associated with good neurodevelopment, and the remaining studies discuss the increase in hemoglobin due to delayed cord clamping.

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