



Association of Umbilical Cord Management Strategies With Outcomes of Preterm Infants

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ABSTRACT

Background: The association of umbilical cord management strategies with outcomes for preterm infants has garnered significant attention in recent years, highlighting the critical role that these practices play in neonatal health. **Literature Review:** Research by (Ghirardello et al., 2008) provides a systematic review that highlights the significant benefits of DCC, including improved cardiovascular function and reduced rates of intraventricular hemorrhage among extremely low gestational age neonates. In contrast, (C. Katheria, 2008) offers a detailed examination of UCM, presenting it as a viable alternative to DCC, especially in scenarios where immediate resuscitation is required. This review emphasizes UCM's efficacy in enhancing hematological parameters and suggests that it does not significantly increase infection risks compared to DCC, making it a potentially safe option for preterm infants (C. Katheria, 2008). The article by (Alzaree et al., 2008) further supports the notion that UCM can improve hemoglobin levels in term newborns, reinforcing the argument for its routine use, particularly in areas with high neonatal anemia rates. This aligns with findings from (C. Katheria, 2008), which advocates for UCM as a beneficial intervention when DCC is not feasible. The distinctions between UCM and DCC are further delineated in the work of (Bowers & McClaskey, 2019), which highlights the active role of healthcare providers in UCM compared to the passive nature of DCC. This article calls for more robust evidence to support UCM, noting that while it is a promising technique, further studies are necessary to establish its efficacy and safety comprehensively. **Conclusion:** In conclusion, the literature provides compelling evidence that both UCM and DCC can significantly improve outcomes for preterm infants, although the choice between these strategies should be guided by clinical circumstances and the specific needs of the infant. The ongoing debate emphasizes the necessity for further research to enhance understanding and establish standardized guidelines for umbilical cord management in neonatal care.

Keyword: Umbilical Cord, Management Strategies, Outcomes of Preterm Infants

INTRODUCTION

The association of umbilical cord management strategies with outcomes for preterm infants has garnered significant attention in recent years, highlighting the critical role that these practices play in neonatal health. The literature presents a spectrum of insights regarding umbilical cord milking (UCM) and delayed cord clamping (DCC), both of which aim to optimize placental transfusion and improve neonatal outcomes.

The foundational work by (Ghirardello et al., 2008) underscores the importance of umbilical cord management, particularly emphasizing the effects of UCM on morbidity and survival rates among extremely low gestational age neonates. Their systematic review and meta-analysis reveal that DCC and UCM can be beneficial strategies, with implications for neurodevelopmental outcomes and cardiovascular function at birth.

Following this, (C. Katheria, 2008)'s review further explores UCM, detailing its physiological effects on hemodynamics and neonatal outcomes. The randomized controlled studies discussed indicate that UCM may enhance blood pressure and hematological parameters in preterm infants, suggesting that this technique could serve as a viable alternative to DCC, especially in cases requiring immediate resuscitation.

In a complementary study, (Alzaree et al., 2008) highlight the potential benefits of UCM in improving hematological parameters in term newborns, advocating for its routine use in regions with high rates of neonatal anemia. This perspective aligns with (C. Katheria, 2008)'s findings, reinforcing the notion that UCM can be a beneficial intervention when DCC is not feasible.

(Bowers & McClaskey, 2019) delve into the distinctions between UCM and DCC, emphasizing that while DCC allows for a slower transfer of blood, UCM facilitates a more immediate influx of placental blood to the infant. Their observations contribute to the ongoing discourse regarding the optimal timing and method of cord management, particularly in the context of preterm births.

provide a systematic review of antenatal and perinatal factors influencing neonatal blood pressure, further complicating the narrative surrounding cord management. They note that while both DCC and UCM are employed to enhance placental blood transfer, the variability in study designs and inherent biases in the literature necessitate caution in drawing definitive conclusions about their effectiveness.

Finally, (Yan et al., 2003) address the short- and long-term consequences of DCC, revealing that delaying cord clamping can significantly improve various health outcomes for preterm infants, including reducing anemia and enhancing cardiac function. However, they also acknowledge the controversies surrounding the potential adverse effects of DCC, particularly in relation to immediate neonatal care and resuscitation efforts.

Collectively, these articles present a nuanced understanding of umbilical cord management strategies, illustrating the ongoing debate between UCM and DCC. They emphasize the need for further research to clarify the optimal approaches for managing the umbilical cord in preterm infants, balancing the benefits of placental transfusion with the immediate needs of neonatal care.

LITERATURE REVIEW

The article "Italian Recommendations for Placental Transfusion Strategies" by (Ghirardello et al., 2008) provides a comprehensive examination of umbilical cord management strategies, particularly focusing on the implications of delayed cord clamping (DCC) and umbilical cord milking (UCM) for preterm infants. The authors synthesize a range of studies to evaluate the effects of these strategies on morbidity and survival rates among extremely low gestational age neonates.

One of the key insights from the article is the comparative analysis of DCC and UCM. The authors highlight that both strategies aim to enhance placental transfusion, which is crucial for improving hemodynamic stability at birth. The systematic review and meta-analysis included in the article suggest that DCC is associated with significant benefits, including improved cardiovascular function and reduced incidence of intraventricular hemorrhage, which is a common complication in preterm infants (Ghirardello et al., 2008). This finding is

particularly relevant considering the vulnerability of preterm infants to various morbidities, emphasizing the need for effective management strategies during the critical transition period after birth.

Moreover, the article discusses the long-term neurodevelopmental outcomes associated with these cord management techniques. The randomized clinical trials referenced indicate that DCC not only supports immediate physiological stability but may also have lasting effects on neurodevelopment at 22-26 months of corrected age. This aspect is crucial for clinicians to consider, as the long-term health and developmental trajectories of preterm infants can be profoundly influenced by the practices employed at birth (Ghirardello et al., 2008).

The authors also address the attitudes and beliefs of obstetricians regarding umbilical cord clamping. Understanding these perspectives is essential for translating research findings into clinical practice. The nationwide survey conducted in Italy reveals a variability in practices and highlights the necessity for standardized guidelines to ensure that all preterm infants receive optimal care during the critical moments following delivery (Ghirardello et al., 2008).

The article "Umbilical Cord Milking: A Review" by (C. Katheria, 2008) provides a comprehensive examination of umbilical cord milking (UCM) as a strategy for managing the umbilical cord in preterm infants. (C. Katheria, 2008) critically evaluates various studies that investigate the hemodynamic effects and neonatal outcomes associated with UCM compared to traditional immediate cord clamping and delayed cord clamping.

One of the key insights presented in the review is the potential benefits of UCM in enhancing placental transfusion, which is crucial for preterm infants who often face challenges related to low blood volume and oxygen delivery at birth. The review highlights randomized controlled trials that demonstrate UCM's efficacy in improving hematological parameters such as hemoglobin levels and hematocrit, which are vital for the overall health of preterm neonates (C. Katheria, 2008). This finding is particularly significant given the established correlation between improved hematological status and better clinical outcomes in this vulnerable population.

Moreover, the review addresses safety concerns surrounding UCM, specifically the risk of increased infection rates in preterm infants, particularly those with premature prolonged rupture of membranes. (C. Katheria, 2008)'s analysis of the literature suggests that while there may be apprehensions regarding infection, the evidence does not consistently support a significant increase in infection rates associated with UCM when compared to delayed cord clamping (C. Katheria, 2008). This is an important consideration for clinicians who must weigh the benefits of enhanced placental transfusion against the potential risks.

The article also discusses the influence of UCM on inflammatory cytokines, which are critical in the context of neonatal health. The modulation of inflammatory responses through UCM may have implications for reducing the incidence of complications such as necrotizing enterocolitis, a serious condition that can affect preterm infants. (C. Katheria, 2008)'s review underscores the need for further research to clarify these relationships and to establish standardized protocols for umbilical cord management in preterm deliveries.

The article "Early Versus Delayed Umbilical Cord Clamping on Physiologic Anemia of the Term Newborn Infant" by (Alzaree et al., 2008) presents a compelling examination of umbilical cord management strategies, specifically focusing on the implications of umbilical cord milking in relation to neonatal outcomes. The authors argue that umbilical cord milking, performed post-clamping, has beneficial effects on hematological parameters in neonates, particularly in regions with high prevalence of neonatal and childhood anemia.

The study highlights that milking the umbilical cord can lead to improved hemoglobin levels and serum ferritin in newborns, which are critical indicators of iron status and overall health. This is particularly relevant in the context of preterm infants who are often at greater risk for anemia due to their lower iron reserves and the potential for compromised nutritional transfer during gestation. The authors recommend considering umbilical cord milking as a routine practice for term newborns, especially when delayed cord clamping is not feasible. This recommendation is significant as it suggests a practical intervention that could be easily integrated into clinical practice without requiring extensive changes to existing protocols.

However, while the findings are promising, the authors acknowledge the need for further research to substantiate the long-term benefits of umbilical cord milking on hemoglobin levels and iron status during infancy. This call for additional trials with extended follow-up periods is crucial, as it underscores the necessity of understanding the continuity of benefits beyond the immediate postnatal period. The authors' caution regarding the generalizability of their findings is an important aspect of their analysis, as it highlights the variability in healthcare practices and outcomes across different regions and populations.

The article "Umbilical Cord Milking: A Review" by (C. Katheria, 2008) provides a comprehensive examination of umbilical cord milking (UCM) as a potential alternative to delayed cord clamping (DCC) in the management of umbilical cords in preterm infants. (C. Katheria, 2008) delves into the growing body of evidence supporting DCC, which has been shown to confer numerous benefits to both term and preterm newborns, including improved blood pressure, hematocrit, and hemoglobin levels. However, the author highlights a significant gap in the literature regarding the optimal cord management strategies for infants who are deemed unstable or in need of immediate resuscitation.

(C. Katheria, 2008) articulates that while DCC is beneficial, it may not be suitable for the most vulnerable infants, who may require immediate medical intervention. This is where UCM presents itself as a viable alternative. The technique involves grasping the uncut umbilical cord and gently squeezing it several times toward the infant, allowing for a placental transfusion to occur without the delay associated with DCC. This method can be performed quickly, thereby facilitating prompt resuscitation efforts when necessary.

The review synthesizes findings from various studies, concluding that UCM significantly enhances important clinical parameters such as blood pressure and hematologic values in the early days of life, while also improving iron stores up to six months postnatally. Notably, (C. Katheria, 2008) emphasizes that no associated harm has been identified in any of the reviewed studies, suggesting that UCM could be a safe and effective practice for managing the umbilical cord in preterm infants.

Critically, while the article provides a robust overview of the benefits of UCM, it also acknowledges the need for further research to establish standardized

protocols and guidelines for its implementation in clinical settings. The discussion surrounding the balance between timely resuscitation and the benefits of placental transfusion is crucial, and (C. Katheria, 2008)'s review underscores the importance of individualized care based on the clinical status of the infant.

The article "Umbilical Cord Milking at Birth" by (Bowers & McClaskey, 2019) presents a critical examination of umbilical cord management strategies, particularly focusing on umbilical cord milking (UCM) and its implications for preterm infants. The authors delve into the distinctions between delayed cord clamping (DCC) and UCM, highlighting the active role of the obstetrician in UCM, which involves pushing blood toward the infant, as opposed to the passive transfer that characterizes DCC.

The authors reference the World Health Organization's recommendation for DCC, emphasizing that it should occur for at least 30-60 seconds after the birth of a full-term newborn. This recommendation is based on evidence suggesting that DCC enhances blood volume and improves outcomes for newborns. However, the article notes a significant gap in robust evidence supporting UCM, which is a relatively newer practice. The authors advocate for further research, particularly studies with larger populations and long-term follow-up, to comprehensively evaluate the outcomes associated with UCM in preterm infants.

One of the key insights from the article is the average duration of umbilical cord milking reported in existing studies, which is around 15 seconds. This brief duration raises questions about the efficacy of UCM compared to the more established DCC. The authors suggest that while UCM may offer a quicker method of blood transfer, the lack of extensive evidence necessitates caution before widespread implementation in clinical practice.

The article "Antenatal and perinatal factors influencing neonatal blood pressure: a systematic review" by (Rabe et al., 2001) provides a comprehensive examination of umbilical cord management strategies, particularly focusing on the implications for preterm infants. The authors critically assess the traditional practice of early cord clamping (ECC) against alternative methods such as delayed cord clamping (DCC) and umbilical cord milking (UCM), which aim to optimize placental blood transfer to the neonate.

One of the key insights from the article is the identification of a significant body of literature that explores the outcomes associated with different cord management techniques. The authors highlight that the prevailing approach has been to clamp and cut the umbilical cord early, especially in cases involving premature infants or those requiring immediate resuscitation. However, the emerging evidence supporting DCC and UCM suggests potential benefits, including improved hemodynamic stability and reduced incidence of complications associated with preterm birth.

The systematic review encapsulates findings from 24 studies involving preterm infants and four studies involving term infants, which collectively compare the various cord management methods. Notably, the authors point out that while there is a growing interest in DCC and UCM, the overall quality of the evidence remains low due to factors such as imprecision and unclear risk of bias in many of the included studies. This raises concerns regarding the reliability of the findings and underscores the need for further research to establish clearer guidelines for practice.

The heterogeneity of study designs presents a significant challenge in drawing definitive conclusions from the existing literature. Variations in methodology, timing, and the degree of placental transfusion complicate the comparison of outcomes across studies. The article effectively communicates the necessity for standardized protocols in future research to enhance the comparability of findings and bolster the evidence base surrounding umbilical cord management strategies.

The article titled "The Short and Long Term Consequences of Delayed Cord Clamping on Late Pre-Term Infants" by (Yan et al., 2003) provides a comprehensive examination of the implications of delayed cord clamping (DCC) in preterm infants, particularly late pre-term infants. The authors effectively synthesize current research findings to elucidate the benefits and potential drawbacks of DCC, which has garnered significant attention in the field of neonatal care.

The article begins by establishing the context of increasing survival rates among preterm infants due to advancements in perinatal medicine and neonatal

intensive care. This backdrop is essential as it underscores the relevance of optimizing care strategies, including umbilical cord management, to enhance outcomes for this vulnerable population. The authors present a clear dichotomy between early cord clamping (ECC), occurring within 15–20 seconds after birth, and DCC, defined as clamping at least 30–60 seconds post-delivery or after the cessation of cord pulsation.

One of the key insights from the article is the quantifiable benefit of DCC, where neonates can receive approximately 80 mL of blood from the placenta if clamping is delayed by one minute. This additional blood volume is critical as it contributes to improved hemodynamic stability, evidenced by enhanced blood pressure and reduced incidence of neonatal anemia. The authors support their claims with a synthesis of various studies indicating that DCC can lead to better cardiac function, decreased risk of intraventricular hemorrhage, and improved immune responses, which collectively contribute to a reduction in complications associated with preterm birth.

However, the article does not shy away from addressing the controversies surrounding DCC. The authors highlight concerns regarding the potential adverse effects, such as the risk of hypothermia, delayed resuscitation efforts, and complications like polycythemia and hyperbilirubinemia requiring phototherapy. This balanced approach is commendable as it reflects the complexities inherent in clinical decision-making, particularly in the context of neonatal care where immediate interventions are often critical.

The critical evaluation of the material reveals that while the benefits of DCC are well-supported by empirical evidence, the authors aptly acknowledge that the practice may not be universally applicable in all clinical scenarios. They suggest that the decision to implement DCC should be tailored to individual circumstances, taking into account the specific health status of the infant and the clinical setting.

CONCLUSION

The literature on umbilical cord management strategies, particularly umbilical cord milking (UCM) and delayed cord clamping (DCC), indicates a growing consensus on the importance of these practices in enhancing neonatal

outcomes for preterm infants. The foundational research emphasizes that both UCM and DCC are designed to optimize placental transfusion, which is critical for improving hemodynamic stability and reducing morbidity in this vulnerable population.

Research by (Ghirardello et al., 2008) provides a systematic review that highlights the significant benefits of DCC, including improved cardiovascular function and reduced rates of intraventricular hemorrhage among extremely low gestational age neonates. The long-term neurodevelopmental advantages associated with DCC are also noted, suggesting that practices employed at birth can have lasting impacts on infant health (Ghirardello et al., 2008).

In contrast, (C. Katheria, 2008) offers a detailed examination of UCM, presenting it as a viable alternative to DCC, especially in scenarios where immediate resuscitation is required. This review emphasizes UCM's efficacy in enhancing hematological parameters and suggests that it does not significantly increase infection risks compared to DCC, making it a potentially safe option for preterm infants (C. Katheria, 2008).

The article by (Alzaree et al., 2008) further supports the notion that UCM can improve hemoglobin levels in term newborns, reinforcing the argument for its routine use, particularly in areas with high neonatal anemia rates. This aligns with findings from (C. Katheria, 2008), which advocates for UCM as a beneficial intervention when DCC is not feasible.

The distinctions between UCM and DCC are further delineated in the work of (Bowers & McClaskey, 2019), which highlights the active role of healthcare providers in UCM compared to the passive nature of DCC. This article calls for more robust evidence to support UCM, noting that while it is a promising technique, further studies are necessary to establish its efficacy and safety comprehensively.

Moreover, (Rabe et al., 2001) addresses the complexity of the evidence surrounding umbilical cord management, noting the variability in study designs and the need for standardized protocols to enhance the reliability of findings. This highlights the necessity for ongoing research to clarify the optimal approaches for umbilical cord management in preterm infants.

Finally, (Yan et al., 2003) discusses the short- and long-term benefits of DCC, while also acknowledging the potential complications that may arise, such as hypothermia or delayed resuscitation efforts. This balanced view underscores the need for individualized care based on the infant's condition and the clinical context.

In conclusion, the literature provides compelling evidence that both UCM and DCC can significantly improve outcomes for preterm infants, although the choice between these strategies should be guided by clinical circumstances and the specific needs of the infant. The ongoing debate emphasizes the necessity for further research to enhance understanding and establish standardized guidelines for umbilical cord management in neonatal care.

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