Review Article :

Optimizing placental transfusion by milking umbilical cord towards baby and its outcome

Pawar Manisha*, Mohanty Nimain**, Gavhane Jeetendra**, N. Rewathi**

MGM College of nursing*, Department of Pediatrics,MGM Medical college**, Kamothe, Navi Mumbai.
nimain.mohanty@gmail.com

ABSTRACT :

Contrary to recommendations it is common practice by obstetricians to clamp umbilical cord immediately after birth (immediate cord clamping or ICC). A brief delay in clamping the umbilical cord results in an additional placental transfusion that supplies the infant with a major source of iron stores for the first few months of life. Cord circulation continues for several minutes after birth and placental transfusion results in approximately 30% more blood volume. Recent evidence suggests that newborns, particularly in low-resourced settings, would benefit greatly from a policy of delayed cord clamping. With decreased risks of childhood anemia, subsequent sequelae and the need for iron supplementation. In term infants, umbilical cord clamping between 30 and 180 seconds after birth results in higher concentrations of hemoglobin and hematocrit during neonatal period, and increased serum ferritin levels and a lower incidence of iron-deficiency anemia at 4-6 months of age. These are important benefits for children in low and middle income countries where iron-deficiency anemia is highly prevalent, very relevant to India.

The rationale of cord clamping practice for this shift in timing of umbilical cord clamping to include a possible decreased risk of postpartum haemorrhage, the need for resuscitation of the newborn and sampling of cord blood for stem cells and cord blood analysis. Many professional organizations and experts recommend at least a 30 seconds delay before clamping the umbilical cord. Milking or stripping of umbilical cord blood immediately at birth of the unclamped umbilical cord toward the infant has similar beneficial effects. This intervention also seems to reduce the rate of neonatal anemia. This practice has been shown to be safe and should be implemented. The value of this practice for term births in resource-rich settings has not been evaluated. Current evidence on delayed cord clamping and some reasons for the disconnect between the evidence and practice are discussed along with recommendations from inconsistencies about this practice.

Key Words:

Milking of umbilical cord (MUC), placental transfusion, hematocrit, delayed cord clamping, neonatal jaundice, and polycythemia.

INTRODUCTION:

The timing of the umbilical cord clamping at birth is still controversial. In recent times it appears that often the umbilical cord is clamped and cut soon after birth to allow for resuscitation manoeuvres as well as decisions related to collection of cord stem cells and umbilical cord blood for blood gas analysis; despite mounting evidence that there may be health benefits to the baby.(1,2). Milking the umbilical cord five times at birth is associated with decreased risk for iron-deficiency anemia.(3) This evidence is extremely important for low-resourced countries. Because of positive effect DCC can have on iron stores, fewer infants could potentially avoid suffer iron-deficiency anemia4. The additional volume that the baby receives during DCC can be up to 80 - 100 ml of blood 5. A recent Cochrane review documented evidence in favour of delaying cord clamping for at least two minutes to improve long-term outcomes for infants6. In this article, we have reviewed the available literature briefly, with an emphasis on the physiological rationale pertaining to timing of umbilical cord clamping and the need for Milking the Umbilical Cord towards the baby soon after birth.

Timing of umbilical cord clamping:

The timing of umbilical cord clamping will affect the amount of blood volume transferred to the infant via placental transfusion. The average term infant weighs approximately 3500 g at birth, and has a blood volume of 80-85 ml/kg which equates to approximately 290 ml of blood volume7. During placental transfusion, an additional 15-40 ml of blood volume per kg birth weight is transferred from the placenta to the infant through the umbilical cord. Therefore, waiting to clamp the umbilical cord and allowing placental transfusion to complete can increase a term neonate's blood volume by approximately 30-50% (8,9). Approximately 25% of the transfer occurs in the first 15-30 seconds after birth, 50-78% by one minute and the remaining by three minutes10. Providing the neonate with additional blood volume by delaying umbilical cord clamping has many subsequent effects on child and maternal health outcomes. The results from two recently published meta-analyses performed to compare early and delayed umbilical cord clamping on a variety of outcomes (6,11) are presented in Table 2..

Table 1:
Description of outcomes of meta-analyses comparing early and delayed umbilical cord clamping

First Author, Year	McDonald 2008	Hutton 2007
# of studies; % RCT	15 studies; 53% RCT	11 studies; 100% RCT
Location of included studies	Canada, Germany, UK, Sweden, United States, Argentina, Libya, Egypt, Guatemala, India, Mexico	Argentina, Mexico, Libya, India, UK,Canada, United States, Zambia Unspecified for 2 studies
Definition of DCC/ECC	DCC = > 1 minute; ECC = < 1 minute	DCC = ≥ 2 minutes; ECC = Immediately after birth (in most trials)
Positive neonatal outcomes of DCC	-Higher Hb levels at birth and up to 24 hours -Lower prevalence of anemia at 6 hours and 24-48 hours of life -Higher ferritin levels at 3 and 6 months	-Higher Hct at 6, 24-48 hours, 5 days and 2 months -Higher Hb levels at 7 hours -Increased ferritin levels at 2-3 and 6 months -Lower prevalence of low ferritin (<50μg/L) -Increased blood volume at 2-4 hours of life -Decreased risk of anemia at 24-48 hours and at 2-3 months -Higher blood viscosity in first 2-4 hours and at 5 days
Negative neonatal outcomes of DCC	-More infants required phototherapy for jaundice -Lower levels of cord Hb -Lower rate of breastfeeding at 1 month	-Increased risk of polycythemia at 7 hours and 24-48 hours of life
Outcomes not associated with DCC	-APGAR score -Admission to special care baby nursery or neonatal intensive care unit -Respiratory distress -Clinical jaundice -Polycythemia -Hb levels at 2-4 and 6 months -Anemia at 4 months -Rate of breastfeeding at discharge or at 2-4 and 6 months -Maternal postpartum hemorrhage -Maternal mean blood loss -Maternal postpartum Hb levels -Maternal need for blood transfusion -Need for manual removal of placenta -Length of third stage of labour -Therapeutic uterotonics	-Hct levels at 6 months -Mean Hb levels at 2-3 and 6 months -Mean serum bilirubin levels in first 24 and 72 hours -Plasma viscosity at 24 hours and 5 days after birth -Proportion of infants with elevated bilirubin levels that require use of phototherapy -Neonatal jaundice in first 24-48 hours of life and at 3-14 days after birth -Risk of tachypnea -Risk of respiratory grunting -Admission to neonatal intensive care unit

In summary, the major benefit of delayed umbilical cord clamping (DCC) was reported to be more favourable iron status of the infant at birth, which appears to be sustained over the long term. The only negative consequence is a potential increased risk of jaundice requiring phototherapy. This warrants further investigation. It should be noted that meta-analyses on this topic are difficult to conduct for three major reasons. First, there is significant variability in the definitions of early (ECC) and delayed umbilical cord clamping (DCC) across studies. The definition of ECC varies between immediately following delivery up to the first minute following delivery, and the definition of DCC varies from greater than 30 seconds to up to 10 minutes. Second, the starting point for timing the duration between deliveries and clamping varies widely among studies. Some studies use head crowning as the start point, others use delivery of shoulders, and many do not specify a start point. These factors make interpretation and comparison of results among studies difficult. Lastly, the large variability in specific outcomes ascertained creates difficulties in performing a meta-analysis. Although many studies have documented hematological effects, the same specific indicator (eg. hematocrit, hemoglobin, ferritin) may not always be reported.

Hematological effect of timing of UCC:

The greatest benefit of delayed umbilical cord clamping is its association with an improved hematological status in the newborn when compared to ECC. Allowing placental transfusion to complete can provide the infant with an additional 30-50 mg of iron which will increase iron reserves and decrease the risk for iron deficiency anemia later in infancy (4, 8). Several studies have recently investigated the effect of DCC. A summary of the randomized controlled trials (RCTs) conducted on this topic can be found in Table 3.

Table-2: Haematological outcomes

First Author, Year	Site	Study Population	Sample Size	Def of randomized intervention	Loss to Follow-up	Hematological Outcome(s)		Blinding	Significant Measure of Effect(s)
						Type	Time point		
Strauss 2008	United States	Preterm infants (30-36 weeks)	105 ECC: 2 - 5 sec.; DCC: 60 sec.;	Not specified	0%	Serial Hct	< 24 hours of birth; between 48-72 hours after birth; day 7, 14, 21, 28	Laboratory staff blinded Hct significantly different between groups at day 7 (p= 0.005);	day 14 (p<0.000); day 21 (p<0.000); day 28 (p<0.000)
Jahazi 2008	Iran	Women with un-complicated vaginal pregnancies between 38-42 weeks gestation	64 ECC: 30 sec.; DCC: 3 min.;	T0 = complete delivery of infant	0%	Cord blood Hct; neonatal Hct	Cord blood: after clamping; Neonatal blood: at 2 and 18 hours of life	Double-blind	No significant effect found

First Author, Year	Site	Study Population	Sample Size	Definition of randomized intervention	Loss to Follow-up	Hematological Outcome(s)		Blinding	Significant Measure of Effect(s)
						Type	Time point		
Ultee 2008	Not specified	Infants with gestational age between 34 - 37 weeks delivered vaginally to Caucasian women	34 (at10 weeks); 37 (at 1 hour)	ECC: ≤ 30 sec.; DCC: >180 sec.; T0 not specified	7.3%	Hb, ferritin	Hb: 1 hour after birth; Hb & Ferritin: 10 weeks	Outcome accessor blinded	Significantly higher Hb in DCC than ECC group at 1hr and 10 weeks ($p<0.05$)
Kugelman 2007	Israel	Premature infants (gestational age between 24 - 34.9 weeks)	65 ECC: <10 sec.; DCC: 30-45 sec.;	T0 = delivery of infant	0%	Venous Hct	At admission; During first 24 hours in NICU	Not clearly stated Vaginal deliveries: Hct higher in DCC group at admission	($p = 0.03$) & at 24 hours ($p = 0.03$) - adjusted for birth weight and gestational age
Van Rheenen 2007	Zambia	Women delivering full-term	91 (1 day pp); 84 (2 months); 78 (4 months); 72 (6 months) ECC: ≤ 20 sec.; DCC	T0 > delivery	21%	Hb from finger-prick	2,4,6 months	Partially blinded	Decrease in Hb levels between 4 months. Cord blood less in DCC group: Difference = 1.1g/dL (95% CI: 0.2 - 2.1)
Chaparro 2006	Mexico	Full-term, reported at advanced labour, didn't opt C/S	358 ECC: 10 sec.; DCC: 2 min.;	T0 = delivery of the infant's shoulders	25%	Venous Hb, Hct and ferritin	6 months	Outcome accessors / statistician blinded	At 6 months, mean ferritin, stored iron, and body iron significantly higher in DCC group than ECC.

First Author, Year	Site	Study Population	Sample Size	Definition of randomized intervention	Loss to Follow-up	Hematological Outcome(s)		Blinding	Significant Measure of Effect(s)
						Type	Time point		
Ceriani 2006	Argentina	Women with uneventful vaginal or C/S with singleton pregnancy	272 ECC: ≤ 15 sec.; DCC: 1)1 min., 2) 3 min.;	To not specified	1.4%	Venous Hct	6 hours after birth; 24-48 hours after birth	Outcome accessors blinded	At 6 hours: prevalence of anemia higher in ECC (8.9%) vs. 1 min.(1%) and in ECC vs. 3 min.(0%); At 24-48 hours: anemia higher in ECC (16.9%) vs. 1 min.(2.3%) and in ECC vs. 3 min.(3.3%)
Emhamed 2004	Libya	Women whose infants birth weight was ≥ 2500g, at term, singleton	102 ECC: ≤ 10 sec.; DCC: >cord stopped pulsating;	T0 = complete expulsion of the infant	2%	Cord Hb and Hct; Venous Hct	Cord blood: after clamping; Venous blood: 16-24 hours after birth (at discharge)	Not mentioned	At 24 hours: Hct levels significantly higher in DCC group ($p = 0.0037$), Hb levels significantly higher in DCC group ($p=0.0005$)
Gupta 2002	India	Hospital term infants born vaginally to pregnant women with Hb <100 g/L at time of delivery	58	ECC: immediately; DCC: after placenta had descended into vagina; T0 not specified	43%	Cord ferritin/Hb; Venous ferritin/Hb Cord blood:	at birth; Venous blood: at 3 months	Not mentioned	At 3 months, significantly higher Hb ($p<0.001$) and ferritin ($p=0.02$) in DCC group; At 3 months, risk of anemia significantly lower in DCC (OR = 7.7), and risk of low iron stores significantly lower in DCC (OR = 10.67)

First Author, Year	Site	Study Population	Sample Size	Definition of randomized intervention	Loss to Follow-up	Hematological Outcome(s)		Blinding	Significant Measure of Effect(s)
						Type	Time point		
Rabe 2000	Not specified	Single preterm infants of <33 weeks gestation	39	ECC: 20 sec.; DCC: 45 sec.	Not clearly stated	Requirement of donor PRCT	During first 6 weeks of life	Unclear	Mean numbers of PRCT greater in ECC than DCC (2.4 vs. 1.2, p<0.05)
Grajeda 1997	Guatemala	Women delivering vaginally in hospital, infant birth weight ≥ 2000g, gestational age ≥ 37 weeks, singleton birth	69	ECC: immediately; DCC: 1) cord stopped pulsating with infant at level of the placenta; 2) cord stopped pulsating with infant below level of placenta	22%	Venous Hct; Venous Hb; Serum ferritin	24 hours in a subsample (last 41 subjects recruited) for Hct; At 2 months for all subjects for Hct, Hb, ferritin	Follow-up staff and laboratory personnel blinded	2 months: both DCC groups had higher Hct compared to ECC (p = 0.001 for both), significant difference in Hb levels between group 1 (ECC) and group 2 (infant placed at level of placenta with DCC) (p=0.0 3)
Geethanath 1997	India	Hospital-born term infants born vaginally to women with un-complicated pregnancies with Hb>10g/dL	107	ECC: immediately; DCC: after placenta had descended into vagina.	0%	Cord ferritin/ Hb; Serum ferritin, Hb	Cord blood: after birth; Venous blood: 3 months	Not mentioned	No significant effect found

Of the 12 RCTs presented, 10 documented at least one positive effect on the hematological status of the infant following delayed umbilical cord clamping compared to early umbilical cord clamping (12-21). The remaining two trials failed to show a statistically significant effect (22, 23). The effect of DCC on infant's iron status had been documented both in term as well as in preterm babies (15-19). Interestingly, possible modification of the documented effect has been proposed for maternal iron status, infant birth weight and infant feeding practices16. They found that delayed umbilical cord clamping had a greater effect when infants were born to mothers with low ferritin levels compared to mothers with normal ferritin levels; in infants with birth weights between 2500 – 3000 g compared to infants with birth weights >3000 g; in infants still breastfeeding at six months compared to infants no longer breastfeeding at six months; and in infants receiving iron-fortified formula or milk at six months compared to those not receiving such products16. Additionally, The study19 which only included anemic women, found that the odds of developing anemia (Hb < 11 g/L) was 7.7 times higher in infants born with early cord clamping compared to infants born with delayed cord clamping (OR = 7.7; 95% CI: 1.84 – 34.9). Because this odds ratio is large, they concluded that infants born to anemic mothers may benefit more from delayed umbilical cord clamping than those born to non-anemic mothers.19 Interaction effects influencing the timing of umbilical cord clamping require further investigation. The most common limitations that occurred among these trials were small sample size leading to underpowered analyses, volunteer and loss to follow-up biases. Also there was lack of multivariate analyses to control for relevant confounders that were not evenly distributed between the intervention groups. Only one of the trials had been performed in South America17.

The studies reviewed here include randomized trials, systematic literature reviews, observational studies and practice recommendations. The recent studies reviewed are from 2006-2013 were included.

Table-3: Neuro-developmental outcome

Author	Type	Population	Outcome	Other
Andersson et al., (2013).	RCT of full-term infants to have cord clamped at >3 minutes (DCC) or <10 seconds (ECC)- effects on neurodevelopment and infection at four months of age	N= 400 DCC- 168 ECC- 166	DCC did not appear to affect overall neurodevelopment or symptoms of infection at 4 months.	May be an impact on specific neuro- -developmental domains. DCC is a safe alternative for infants born at term.
Kohn (2013).	Literature Review on DCC/ICC and PPH		Lack of agreement on definition of ICC and DCC. Examined articles on term and preterm infants and role of PPH.	DCC may be beneficial in areas where iron deficiency is prevalent. No increased risk of PPH.
Scheans, (2013).	Literature review article, describing the neonatal benefits of DCC (1-3 min or until cord stops pulsating)		DCC results in improved iron stores	Asymptomatic polycythemia after birth was more common with DCC, but did not result in significant differences in bilirubin level
Tonse (2013).	Literature review of current evidence and recommendations		Follow guidelines from professional bodies, recommend waiting at least 30 seconds to clamp cord.	Need more information regarding position of baby at birth, especially in Cesarean birth.
Bhatt, et al., (2013).	RCT animal study of effects of DCC on CV function of preterm lambs	N=12 Exp=6 Control=6	Delaying cord clamping until the onset of ventilation improves CV stability	The benefits of DCC may not result from increased blood volume, but from a more stable CV transition to pulmonary respiration.

Author	Type	Population	Outcome	Other
Hutton et al., (2013).	Observational study	N=98 women	Timed clamping of cord in large tertiary care center in Canada. Over half (56.5%) of infants cords clamped within 15 seconds	There was a change in policy guidelines at the center to delay cord clamping. Study should be repeated to determine compliance.
Committee on Obstetric Practice, 2012.	Literature review describing timing of umbilical cord clamping and the associated benefits of DCC		Clamping the umbilical cord in all births should be delayed for at least 30-60 seconds, with the infant maintained at or below the level of the placenta.	Benefits of DCC include increased blood volume, reduced need for blood transfusion, decreased incidence of intracranial hemorrhage in preterm infants, and decreased frequency of iron deficiency in term infants.
Erickson-Owens et al., 2012	RCT of ICC (<10 s) and UCM (milked x 5 by the obstetrical provider) in women delivering by cesarean section	N= 24 Exp= 12 Control= 12	UCM results in higher Hct levels at 36 to 48h of age when compared to ICC	No significant differences between two groups in regards to symptomatic polycythemia, incidence of clinical jaundice, or hyperbilirubinemia
Gyorkos et al., 2012	RCT	207 women	A change in hospital policy toward DCC is effective in improving hemoglobin levels and anemia status of 8-month old infants.	No difference in hematological status between the pre- and post-intervention groups at 4 months of age perhaps because only after 4-6 months of life that the distribution of iron content approaches stability.
Blouin et al., (2011)	Pre/post study design of a two component intervention on mean time of cord clamping	N= 234 112-preinetervention 112-postintervention.	All deliveries were observed after 3 day training of "best practices" related to cord clamping and a hospital directive. Following interventions mean times to clamping increased to 168.9 seconds from 56.8 seconds.	It is possible to change hospital practice from ECC to DCC with a training program and hospital directive. May help to combat infant anemia in low resource settings.

Author	Type	Population	Outcome	Other
Mercer et al., 2010	Meta-analysis	72 infants	Male infants with DCC had Psychomotor Developmental Index (PDI) scores an average of 18 points higher compared with infants with ICC.	A Main Effects Regression Model was used to predict the PDI as a continuous variable for VLBW infants with ICC or DCC, controlling for gestational age, male sex, IVH, oxygen use at 36 weeks and sepsis.
Duley et al., (2009).	Royal College of Obstetricians and Gynecologists (RCOG) Opinion paper		Evidence suggests that ECC lowers neonatal hemoglobin and lowers iron stores. Impact on term and preterm infants remain unclear.	More substantive RCTs are required comparing outcomes and long term follow up for mother and baby.
Coggins, M., Mercer, J., 2009	Literature review, recommendations for practice		DCC improves iron stores and lessens risk of developing anemia in term infants. DCC in preterm infants is associated with better respiratory function and improved cerebral oxygenation.	DCC not associated with clinical jaundice, polycythemia, or PPH. A delay in cord clamping until pulsation stops is recommended.
Jahazi et al., 2008	RCT of ECC (30 sec) and LCC (3 min) on neonatal hematocrit	N= 64 Exp= 34 Control= 30	Neonatal hematocrit at 2h of life and 18h did not significantly differ between the two groups	In the LCC group, PRBV was lower and ENBV was higher, with no significant difference for polycythemia
Weckert et al., 2008	Literature Review		Babies with DCC had 32% greater blood volumes with increased packed cell volumes, additional iron stores, hemoglobin levels, and ferritin levels up to 6 months old.	Hyperbilirubinemia has not been demonstrated to be exclusively due to delayed cord clamping.
Andersson et al., 2007	RCT; Secondary analysis of DCC (>3 min) and ECC (<10 s) on PPH.	N= 400 Exp= 200 Control= 200	No significant difference between ECC and DCC in regards to PPH	Infants with DCC had 45% higher mean serum ferritin concentrations and a reduced prevalence of iron deficiency at 4 months

Author	Type	Population	Outcome	Other
Cernadas, et al., 2006	RCT of effects of ECC (<15 s) and DCC (1 and 3 min) on venous hematocrit levels	N=276 ECC= 93 DCC 1 min=83 DCC 3 min=83	DCC resulted in higher hematocrit values and fewer incidences of anemia	No significant differences between the groups in regards to bilirubin levels or polycythemia.
Chaparro et al., 2006	RCT of ECC (<20 s) and DCC (>90 s) on infant iron status	N=358 Exp=171 Control=157	Iron status at 6 months of age was significantly higher in the DCC group	No significant differences between groups in regards to incidence of clinical jaundice or polycythemia. DCC had greater effect on iron status of infants at greater risk for iron deficiency.
Yao et al., 1969	Case control study- rate of placental transfusion	111 full term newborns	Within one minute of birth 50% of placental volume infused to newborn. Additional 20-35ml/kg transfused if cord is not clamped for 3 minutes.	Holding the newborn 40cm below the placenta- transfusion completed in 30 seconds. Transfusion takes longer if infant held higher, but is still completed

Milking of the Umbilical Cord:

Four clinical trials report the findings of MUC three were in preterm infants (23-29) and one in term 30. For this procedure, either the obstetrician or the pediatrician, after infant delivery, 'milks' approximately a 20-cmsegment of the umbilical cord two to four times toward the baby. As the number of infants in the MUC groups studied has been small (<100), only general conclusions can be made. Cord milking results in increased placental transfusion and offers benefits of similar magnitude to delayed clamping, summarized in Table 3. The authors of all studies on cord milking conclude that MUC may be an option in lieu of delayed clamping, especially when the healthcare team deems it necessary to implement immediate resuscitation measures. There are many unanswered questions about cord milking(1), how fast and how often should one milk the cord (2), what is the optimal length of the cord to be milked (3), does it vary depending upon infant's gestational age(4), is manual milking of the cord physiologically similar to the pulsatile flow of blood from the placenta? More physiological and clinical studies are needed to address these unresolved issues.

The research has shown several inconsistencies while reflecting upon maternal and neonatal effects of DCC .One major inconsistency is that of the optimal position of the infant after delivery in order to receive the abundance of nutrient-rich placental blood.26 It Suggests that the protocol at birth require the infant to be held approximately 10 to 15 inches below the placenta while delaying of the cord clamping. However this is discounted in a recent randomized trial2 which suggest that the immediate position of the baby after birth does not affect the volume of placental transfusion.

Another inconsistency is that of whether or not infants with DCC are at an increased risk for jaundice thus requiring phototherapy6. However, this is inconsistent with the findings of other studies included in this review. These findings26 conclude to be inconclusive due to the fact that the author's findings were based mostly on an unpublished doctoral thesis that only included one trial. This trial was done in the 1990s, and therefore had different criteria for initiating phototherapy than criteria used today.

The final and most significant inconsistency would have to be that of the timing and terminology. This literature review has determined from the available evidence that ECC/ICC would be defined as clamping of the umbilical cord less than 20 seconds following birth of the infant, whereas DCC/LCC would be greater than 30 seconds and/or until the cord stops pulsating.

Conclusions:

The current preference for ECC appears based on provider preference and concerns for immediate resuscitation. More strong evidence is appearing that demonstrates the neonate benefits from the placental transfusion occurring with DCC and there are short and long term benefits including increased iron stores which can last for up to two years32. Risks to the mother or neonate of instituting a DCC protocol appear small. In low-resourced countries, DCC appears to contribute to neonatal health and lowers the risk of anemia35. There is a risk of bias inherent in any systematic review due to the differing nature, quality and analysis of studies presented. Iron is essential for brain function and development, and plays a major role in assisting the myelination of the cells in the central nervous system. Iron deficiency is associated with several cognitive deficits, such as altered affective responding and impaired motor development. In addition, several neurobehavioral effects, like altered temperament and abnormal neurologic reflexes have been associated with neonatal iron deficiency.24,25 The 26meta-analysis noted that male infants with DCC scored an average of 18 points higher on the Psychomotor Developmental Index than infants with ICC. The improved iron stores associated with DCC also contribute to higher levels of hemoglobin and hematocrit for the newborns, lessening the risk of developing anemia. More research with larger randomized trials may finally and conclusively answer the posited question. "DCC can provide one to three months of iron storage, with protection from anemia and iron deficiency for up to six months24." A newborn who receives a placental transfusion at birth, either from cord milking or delayed cord clamping, obtains about 30%more blood volume than the newborn whose cord is cut immediately.35,36 Milking the cord can be done quickly within the current Neonatal Resuscitation Program guidelines. Health care providers need to become informed of this issue and develop a consensus with obstetricians and neonatologists that will allow placental transfusion in form of milking the umbilical cord 3 times towards baby, within first one minute of birth.

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