



Delayed umbilical cord clamping (DCC) compared to early cord clamping (ECC) in preterm infants

Madelynn Fretto, MMS (c)

Faculty Advisor: Allison "Sadie" Ermol, PA-C, MMS

Department of Medical Science

Abstract

Early cord clamping (ECC) versus delayed cord clamping (DCC) has been studied in preterm infants. The question that was researched is, in pregnant women who are giving birth [P], does delayed umbilical cord clamping (DCC) [I] as compared to early cord clamping [C] improve outcome of preterm infants born before 37 weeks gestation [O]? Results showed preterm infants with DCC had increased hematocrit and hemoglobin, decreasing their risk of anemia. There was not a significant difference in the incidence of jaundice between the two groups. Results suggested DCC has long-term neuroprotective effects. There were no significant differences in intraventricular hemorrhage (IVH) and late onset sepsis (LOS).

Introduction

- Standard practice clamps the umbilical cord within about 15-20 seconds, however, delayed cord clamping (DCC) has been studied.
- Studies have found that in the first 3 minutes after birth, 80-100 mL of blood goes to the infant from the placenta. Iron stores are also increased.
- A recent review determined that the benefit of increased iron stores outweighs the risk of developing jaundice.
- Benefits include decreased need of respiratory support/resuscitation.
- DCC for preterm infants has not become the standard of care for multiple reasons, including the limitation of research studies pertaining specifically to this population.
- The actual implementation of DCC is limited by hundreds of years of tradition and lack of specific time limits that define "early" versus "delayed."

Methods

- Literature search performed in November 2018 using:
 - PubMed & Google Scholar
- Search terms: "delayed cord clamping" AND "preterm infants"
- Publication dates within past 5 years (PubMed) & in 2018 (Google Scholar)
- Exclusion criteria:
 - 1) Studies that were not controlled trials, randomized controlled trials, or meta analyses
 - 2) Evaluation of other interventions, such as respiratory support/ventilation, cardiac u/s, inotrope use, iron, fetal surgery, tactile stimulation, necrotizing enterocolitis, PPH.
 - 3) Evaluation of umbilical cord milking
 - 4) DCC in term infants

Results

- 1) Mercer JS, Erickson-Owens DA, Vohr BR, et al.**
DCC improves motor outcomes at 18-22 month f/u. DCC did not alter the rate of IVH or LOS.
- 2) Song D, Jegatheesan P, DeSandre G, Govindaswami B.**
Hct in the 60-75s group higher at <2h. Hct at 12-36h higher for infants <28 weeks in the 60-75s group. Infants born <28 weeks, IVH lower in the 60-75s group. No significant difference between the 2 groups with LOS.
- 3) Oh W, Fanaroff AA, Carlo WA, Donovan EF, McDonald SA, Poole WK.**
Hct higher in the DCC group at discharge and 2, 4, and 6 weeks. However, differences were not statistically significant. The amount of blood transfused during the hospital stay higher in ECC group, but not statistically significant.
- 4) Mercer JS, Vohr BR, Erickson-Owens DA, Padbury JF, Oh W.**
BSID-II Mental Developmental Index & Psychomotor Developmental Index scores at 7 months similar in both groups. LOS & oxygen use at 36 weeks lowered motor scores. Male infants with DCC had higher scores than females or infants with ECC when other variables controlled.
- 5) Ranjit T, Nesargi S, Rao PN, et al.**
Hct on delivery day higher in DCC group. More infants had anemia on delivery day in ECC group. Hct & ferritin levels at 6-week f/u higher in DCC group. Infants in DCC group needed longer phototherapy treatments.
- 6) Ibrahim HM, Krouskop RW, Lewis DF, Dhanireddy R.**
MBP higher at 4 hours old in DCC group. Peak serum bilirubin comparable between the two groups. In DCC group, initial mean spun Hct, Hgb, & RBC counts higher. Mean number of blood transfusions lower in the DCC group.

Study	Hct	Hgb	MBP	IVH	Peak Bilirubin	PDA	LOS	BSID
Ibrahim HM, Krouskop RW, Lewis DF, et al.	S	S	S	NS	NS	NS	NA	NA
Mercer JS, Erickson-Owens DA, Vohr BR, et al.	NS	NA	NS	NS	NS	NA	NS	S
Mercer JS, Vohr BR, Erickson-Owens DA, et al.	NA	NA	NA	NS	NA	NA	S	NS
Oh W, Fanaroff AA, Carlo WA, et al.	NS	NA	NA	NA	NA	NA	NA	NA
Ranjit T, Nesargi S, Rao PN, et al.	S	NA	NA	NS	NS	NS	NS	NA
Song D, Jegatheesan P, DeSandre G, et al.	S	NA	NA	S	NS	NA	NS	NA

Key:
 *S: results statistically significant (p<0.05); NS: results not statistically significant (p>0.05); NA (not available)
 *Hct: hematocrit; Hgb: hemoglobin; MBP: mean blood pressure; IVH: intraventricular hemorrhage; PDA: patent ductus arteriosus; LOS: late onset sepsis; BSID: Bayley Scales of Infant Development Scores

Discussion

- 5/6 studies: randomized controlled trials (RCT). 1/6 study: prospective observational study.
- Strengths**
- ECC groups in the 5 RCT studies consistent with clamping <10 seconds.
 - 2 studies had long-term follow-ups of 7 and 18 months.
 - 5 studies measured hematocrit (Hct) as a primary outcome. 3 of these studies found the results statistically significant.
- Limitations**
- Discrepancies between times for the DCC group in the studies: 20 seconds-2 minutes.
 - 3 RCT studies had shorter follow-up of 4-6 weeks.
 - Variety of sample sizes, ranging from 32-353.
 - 2 studies had hospital staff timing with the stopwatch. Human error could alter the validity of the study.
 - Outcomes included in each study varied, making it difficult to compare studies.
- Future Research**
- Studies like the Song study that compared 2 different DCC groups can determine appropriate DCC duration.
 - Larger sample sizes. It is difficult to base the standardization of an entire practice on small sample sizes.
 - Longer follow-up periods.

Conclusion

- Results show significance with hematological outcomes.
- The results were not overwhelmingly in favor of DCC in terms of other outcomes (IVH, PDA, & LOS).
- The findings suggest DCC has long-term neuroprotective effects. There must be multiple studies with larger sample sizes before it can be definitively stated that DCC has long-term neurological benefits.
- Before standardizing DCC, a specific duration of time that the obstetrician would need to wait before clamping must be determined.
 - Song study compared two different ranges for DCC. There will need to be more studies with this type of design to determine the exact delay time.
- When implementing a new protocol to an institution, specifically DCC, there must be communication and coordination between the obstetrics and neonatology teams during the delivery. Practice scenarios would require monitoring to ensure mistakes in technique and protocol are corrected.
- Despite the current limitations in research for DCC in preterm infants, the studies that were analyzed show that DCC can be an effective and beneficial practice for infants with long-term positive outcomes.