Delayed Cord Clamping: What’s it All About?

Judith T. Bishop CNM MPH
AIM Course
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Cord Clamping History:

- Aristotle and Hippocrates apparently approved of waiting before tying
- Subject of immediate tying seen in writings of 1600’s (blamed on introduction of male midwives, forceps use)
- First commercial cord clamp “Magennis (1899)” came with strict instructions not to use until cord stopped pulsating

History

- 1942 Midwifery text: “…the importance of waiting a few minutes before tying the cord is evident.”
- Delaying cord clamping is a pretty standard Birth Plan request…
- Obstetrics and Gynecology Beckman et al, 2002: “Once the newborn has been delivered it is transported to the warming unit”

Disclosure

- Nothing to disclose
Immediate cord clamping (ICC)

- Has for decades been common practice in hospital settings around the world
- This turns the “doing nothing” act of delayed cord clamping (DCC) into the “intervention”
- But this decade has found us cycling around for another look at a more physiologic approach to transition from intrauterine to extra uterine life and benefits that may come with that

Placental transfusion

- Yao, 1969

Yao, 1969
30% more blood volume
50–60% more red blood cells
(millions of stem cells)

Placental transfusion, “complete”

Physiological effects

- Higher circulating blood volume
- Better systemic blood pressure
- Increased blood flow in superior vena cava
- Increased left ventricular output
- Higher cerebral oxygenation index
**Benefits of DCC Preterm**

- Reduced need for transfusion
- Decreased incidence of IVH (up to 50% lower)
- Reduced respiratory distress
- Decreased late onset sepsis

In context of no harms (no long term studies) (Hofmeyer, Ibrahim, Kinmon, Mercer, Nelle, Rabe)

**Benefits of DCC at term**

Primary measurable benefit, well documented by RCT’s and meta-analyses

- Newborn:
  - Increased hct/hgb
  - Decreased anemia

- 3–6 Months
  - Increased ferritin and total body iron stores
  - Decreased anemia/iron deficiency

(Andersson 2011, Hutton 2007, McDonald 2008)

**Benefits of DCC Preterm**

Ob’s and Peds coming together to make changes in management based on this data

- UCSF (2012)
- ACOG (2012)

Have developed recommendations/protocols in support of a 30–120 sec delay for preterm

**Effects of anemia on growth and development**

- Iron essential to aspects of brain development

- Lasting cognitive delays, impaired motor development, behavioral effects from iron deficiency with or without anemia

- Although anemia less common in developed world (3–10%), iron deficiency is high (26%)
Benefits of DCC at term
Neurodevelopmental outcomes?
- Potential that increased iron stores can improve neurodevelopmental outcomes for term infants
- 2012 NIH & Bill & Melinda Gates funded The Infant Brain Study
- 5 year study following effects of placental transfusion on structure and functioning of brain in term infants
- PI is Judith S. Mercer, CNM PhD

Benefits of DCC at term
Value of stem cells?
- Potential value of increased stem cell transfusion from DCC to have long and short term effects on immunity, host defense, and repair

(Raju 2012)

Benefits of DCC at term
Other reported outcomes
- Increased birth weight (McDonald, 2013)
- Reduction of weight loss in first days after birth (Indraccolo, 2013)
- Increased duration of breastfeeding (Mercer 2001, 2006)

Benefits of DCC
Term
- Term have less risk of transfusion, IVH, late onset sepsis – …
- Still potential for improvement in/support of smoother, more physiologic transition
- (And what’s the harm?…)
Risks of DCC?

Concerns about:
- Maternal hemorrhage
- Hypothermia
- Polycythemia & jaundice

DCC

Maternal blood loss?
- ICC no longer a formal part of Active Management of Third Stage Protocol
- Administering uterotonic = only component w/ evidence (Cotter 2001)
- No evidence that ICC contributes to reduced maternal blood loss
- No studies reporting on blood loss find increase in maternal hemorrhage with DCC

Neonatal hypothermia?
- Now generally accepted that babies don’t automatically need radiant warmers but in fact do better skin to skin with their mothers
- No evidence in any studies reporting on temperature implicating DCC as cause for hypothermia – not even with premies

Polycythemia & jaundice?
- Most cited by obs, nurses, and peds alike as reason to avoid DCC
- None of the RCTs since 1980 show a significant association between DCC, clinical jaundice or symptomatic polycythemia
- Hutton and Hassan’s 2007 Meta-analysis of controlled trials (1972–2006) no significant difference in mean bili at 24 or 72 hours
DCC at term
Polycythemia and jaundice?

2008, 2013 Cochrane review findings
- Polycythemia: No difference between groups
- Clinical jaundice: No difference between groups
- Jaundice requiring phototherapy: sig more in DCC
  - 3% of ICC group, 5% of DCC
  - Risk difference of 2% (2008)

Lower risk (<2%) but still significant in 2013 update

DCC and Jaundice?

Mercer vs. McDonald!
- Mercer argues significance only appears when weight of an unpublished 1996 dissertation of McDonald’s is included
- (McDonald is first author of this Cochrane review)
- With that study removed, no significant difference in need for treatment appears
- Dissertation was included again in 2013 review

DCC
Polycythemia and jaundice

- No studies showing significant difference between ICC and DCC in risk for clinically significant polycythemia
- No studies showing significant difference in clinical jaundice
- Increased risk for phototherapy due to DCC is a strongly held belief, not well supported and by inconsistent data

DCC
Polycythemia and jaundice

- Worst case scenario appears to be a <2% additional risk for phototherapy without difference in outcome
- Cochrane Conclusion: “A more liberal approach to [DCC] in healthy term infants appears to be warranted..”
DCC at term – Changing practice

“Other” issues/concerns interfering with DCC
- Nuchal cord
- Collecting cord blood –
  - for gases,
  - for storage, for studies
- Getting infants to the warmer / pediatric team if resuscitation seems indicated

Nuchal cord
- Changed view of “automatic” cutting of nuchal cord
- Danger if cut and delivery does not then proceed
- Danger of hypovolemia from tight cord – exactly situation where returning volume (by not cutting) would be an important resuscitative measure

Somersault

Collecting cord gases cord intact
- Gases, if required, can be obtained from cord while still attached (Andersson, 2012)
Collection of cord blood for Stem cell banking

- ACOG has stated in Committee Opinion #399, 2008 that: “collection should not alter routine practice for the timing of umbilical cord clamping”

- “A child is not allowed to be a blood donor in this country” (Mercer 2012)

- No studies looking at long term consequences infant “donation” of large amounts of placental blood

Collection of cord blood for stem cell banking

- Stem cell banks could be motivated to find other methods to collect the large volume of stem cells left in the placenta (Hutchon 2012)

DCC and need for resuscitation

- Maintaining placental circulation viewed as a part of resuscitation (Dunn 984, Hutchon & Thakur 2008, Mercer & Bewley 2009, Van Rheenen 2011)

- Changing workflow to accommodate assessment and initial resuscitative measures at bedside
  - NRP changes – eg with mec
  - “BASICS” trolley
    (Bedside Stabilization and Initial Cardiorespiratory Support)

Milking vs. delay
When you really can’t wait?

- 20–30 cm length of cord

- milking 10 cm/sec, x3–4 times

- 30 sec delay = milking in terms of volume of blood transfused in preterm infants (Rabe 2011)

Position of baby during “delay”

- Gravity has an effect
- Raising or lowering by ≥15–20 cm has effect (Raising or lowering by 10 cm does not) (Gunther1957, Yao 1969)
- Complete placental transfusion can occur in 30 sec at 40 cm below introitus (Linderkamp 1982, Yao1969)

Skin to Skin

- Evidence that skin to skin
  - Improves physiologic stability of mother & baby
  - Promotes normal brain development
  - Improves successful breastfeeding
  - Facilitates mother infant bonding

(MooreER 2012)

Erickson–Owens (2011)

- Blood left in placenta, infant skin to skin

Position of baby during “delay”

- 2012 Cochrane review on this subject found no studies that met inclusion criteria
- Recommend supporting women’s choices in position and time of clamping (but keeping baby below 20 cm above introitus until cord is cut)
Position and timing of delay
NE Vain et al 2014

- Multicenter, RCT
- 190+ in each group, DCC for 2 min
- Randomised to held at introitus vs. on mother’s abdomen/chest

- No sig difference between groups using weights as proxy for placental transfusion volume

DCC at term – guidelines

- WHO 2012–(approx 3 min)
- Vanderbilt 2011–(minimum of 2 min)
- International Consensus on Cardiopulmonary Resuscitation & Resuscitation Council (UK) 2010– (at least 1 min)

Conclusions

- ICC is an intervention without rationale or evidence of benefit
- DCC appears to have benefits for Preterm and Term infants with evidence of safety
- Concerns for harms, including increased treatment for jaundice and symptomatic polycythemia are unsupported

- Delaying cord clamping for preterm infants
  - Significant positive short term outcomes
  - Increasing institutional and organizational support

DCC at term Conclusions

Delivering clamping for term newborns

- Provides opportunity to affect much larger number with evidence of safety
- Supports smooth physiological transition
- Substantially increases iron stores in infancy
- Keeps baby with the mother
- Many other benefits may flow from these?
DCC at term
Conclusions

› Circumstantial barriers can be worked around

› Collaboration between all providers required to make a change in routine practice

*Seeing ICC as the intervention in need of defense*