Two-step delivery: Head to Body Interval & Shoulder Dystocia

SRPC ESS/OSS Conference
Banff AB, Jan 16th, 2020

Andrew Kotaska MD, FRCSC
Yellowknife, NT, Canada
Learning Objectives

After this session, participants will be able to:

- Describe ‘one-step’ vs. ‘two-step’ delivery
- Discuss the role of head to body interval in neonatal outcome
- Explain the relationship between cord gases and fetal hypoxic ischemic encephalopathy in shoulder dystocia
- Revise the definition of shoulder dystocia
- Discuss implications for the management of shoulder dystocia
Presenter Disclosures

• In the past two years I have received teaching stipends from U of T, U.B.C., Karolinska University, and the Vancouver Island Health Authority.
• I have no commercial relationships to disclose.
• I will not be discussing of-label use of any medication (without regulatory approval).
• I received no financial or in-kind support to develop this presentation.
• I have not received payment or in-kind support from a commercial organization to present at this event.
Definitions

- HBI = Head to body interval
- HIE = Hypoxic ischemic encephalopathy
- SD = Shoulder dystocia
“One-step”

“Most often, the shoulders appear at the vulva just after external rotation and are born spontaneously. If delayed, immediate extraction may appear advisable. The sides of the head are grasped with two hands, and gentle downward traction is applied until the anterior shoulder appears under the pubic arch.”

William’s Obstetrics, 23rd Ed.
“Two-step”

“Once crowned, the head is born by extension. . . . During the resting phase before the next contraction, the midwife may check that the cord is not around the baby’s neck . . . Restitution and external rotation of the head maximizes the smooth birth of the shoulders . . .”

Myles Midwifery 15th Ed.
Which way?
Head to Body Interval (HBI), a one-step approach (1973)

Wood et. al. randomized 22 women to:

• “Rapid delivery” = early episiotomy, directed pushing, supine-lithotomy, early forceps for any delay, versus

• “Normal delivery” (not described)

Wood C, Ng K, Hounslow D, Benning H. Time, an important variable in normal delivery. J Obstet Gynaecol Br Comm 1973;80(4);295-300
Wood’s (1973) Conclusion:

“(an) upper time limit of … 40 seconds for delivery of the trunk (is) ideal… Unless the obstetrician can be certain that the fetus is in good condition, it may die or suffer brain damage from added asphyxiation as a result of delay during normal birth.”
HBI, HIE, & Shoulder Dystocia

• Retrospective audit of 200 S.D. births:
  • Risk of HIE with HBI < 5 min = 0.5%
  • Risk of HIE with HBI ≥ 5 min = 23.5%

(Leung T, et al. BJOG 2011;118:474–479)
HBI & Shoulder Dystocia

- UK Confidential Enquiry into shoulder dystocia deaths:
  - 35/56 had HBI 5 minutes or longer
  - 21/56 had HBI less than 5 minutes

(Hope P. et al. BJOG 1998;105:1256–61)
Shoulder Dystocia

Incidence in series varies from \( \frac{1}{4}\% \) to 6\%. Why?
Shoulder Dystocia Definition

HBI > 60 seconds alone suggested as an objective criteria for shoulder dystocia.

(Spong et al. An objective definition of shoulder dystocia: Prolonged head-to-body interval and/or the use of ancillary obstetric maneuvers. Obstet Gynecol 1995;86:433–6)
‘Worry & Hurry’

- If head doesn’t deliver right away, it could be SD.
- If head takes longer than 60s, it is SD.
- In SD, increased HBI = poorer outcome.

Therefore:
- increased HBI is dangerous in every birth,
- Better to always deliver the body immediately after the head.
Two-step delivery  (Locatelli et al. 2011)

- Prospective study of HBI in 1231 vaginal births
- Followed maternal urge to push in position of choice
- Awaited restitution without manipulation following delivery of the head
- Waited for next uterine contractions to accomplish spontaneous delivery of the shoulders & body
- Turtle sign observed in 15 cases →
  - Prophylactic McRoberts position
  - Shoulders spontaneously delivered with maternal effort with next contraction in 15/15
Two-step delivery (Locatelli et al. 2011)

• Mean HBI was 88 s +/-60 s
• Only 20% delivered fetal head and body in 1 contraction
• In 15 women, HBI was > 4 minutes (max = 6 min)
• Shoulder dystocia in 3/1231 = 0.24% (very low)
• 2 of 3 SD occurred in precipitous births

→ Two-step approach may reduce the incidence of shoulder dystocia.

- 0.0078 per minute
Normal Birth ≠ Shoulder Dystocia

- In normal birth,
  - Head to body interval is usually longer than 60s;
  - Cord pH is not altered by the head to body interval;
  - Allowing mother to follow her instincts results in lowest reported incidence of SD in the literature.
HBI, HIE, & Shoulder Dystocia

- Retrospective audit of 200 S.D. births:
  - Risk of HIE with HBI < 5 min = 0.5%
  - Risk of HIE with HBI ≥ 5 min = 23.5%

(Leung T, et al. BJOG 2011;118:474–479)

- 0.011 per minute
Table 4. Clinical details of the five cases suffering from hypoxic ischaemic encephalopathy (HIE)

<table>
<thead>
<tr>
<th>Case</th>
<th>Parity</th>
<th>Gestation (weeks)</th>
<th>DM</th>
<th>Nonreassuring fetal heart rate pattern</th>
<th>Mode of delivery</th>
<th>HBDI (minutes)</th>
<th>Birth weight (kg)</th>
<th>Art. pH</th>
<th>Art. BE</th>
<th>Ven. pH</th>
<th>Ven. BE</th>
<th>AS5</th>
<th>HIE</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>39</td>
<td>No</td>
<td>No</td>
<td>Instrumental</td>
<td>5</td>
<td>4.285</td>
<td>7.151</td>
<td>-15.20</td>
<td>7.155</td>
<td>-14.40</td>
<td>5</td>
<td>1</td>
<td>Recovered</td>
</tr>
<tr>
<td>2</td>
<td>0</td>
<td>40</td>
<td>No</td>
<td>Yes</td>
<td>Instrumental</td>
<td>4</td>
<td>3.940</td>
<td>7.199</td>
<td>-9.20</td>
<td>7.233</td>
<td>-9.40</td>
<td>8</td>
<td>1</td>
<td>Recovered</td>
</tr>
<tr>
<td>3</td>
<td>0</td>
<td>41</td>
<td>No</td>
<td>No</td>
<td>Instrumental</td>
<td>5</td>
<td>3.560</td>
<td>7.195</td>
<td>-7.20</td>
<td>7.245</td>
<td>-8.20</td>
<td>2</td>
<td>1</td>
<td>Recovered</td>
</tr>
<tr>
<td>4</td>
<td>0</td>
<td>41</td>
<td>No</td>
<td>No</td>
<td>Instrumental</td>
<td>9</td>
<td>4.360</td>
<td>7.074</td>
<td>-8.60</td>
<td>7.268</td>
<td>-4.30</td>
<td>0</td>
<td>1</td>
<td>Recovered</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
<td>39</td>
<td>No</td>
<td>No</td>
<td>Instrumental</td>
<td>14</td>
<td>3.635</td>
<td>7.182</td>
<td>-9.50</td>
<td>7.197</td>
<td>-10.30</td>
<td>0</td>
<td>2</td>
<td>Died 3 years</td>
</tr>
</tbody>
</table>

Art., arterial; AS5, Apgar score at 5 minutes; BE, base excess; DM, diabetes; HBDI, head-to-body interval; Ven., venous.

HBI & Shoulder Dystocia

- Case series of 8000+ births
- 134 cases of shoulder dystocia compared with the general obstetric population
- HBI was not associated with a ... change in cord pH.

HBI & Shoulder Dystocia

- Among cases lasting $\geq$ 3 min., mean pH = 7.26
- Among cases of neonatal injury, mean pH = 7.23
- Among cases requiring $> 2$ maneuvers, cord pH was also normal

Perinatal Asphyxia =

- Arterial cord pH < 7.0
- Arterial cord base deficit > 12
- Early evidence of moderate to severe hypoxic neurological injury (eg. seizures)
- Evidence of multiple organ system hypoxic injury
How does shoulder dystocia cause fetal brain damage despite normal cord gases?
Intrauterine Pressure

Between Contr. = 10-20 mm Hg
During Contr. = 50-70 mm Hg
Contr. + Valsalva = 120 mm Hg
Outside pressure = 0 mm Hg
Intrauterine Pressure

Between Contr. = 10-20 mm Hg

Outside pressure = 0 mm Hg
Intrauterine Pressure

Contr. + Valsalva = 120 mm Hg

Outside pressure = 0 mm Hg
Summary

- Allowing a physiological pause between delivery of head and body is not harmful because intrauterine pressure is low (*caveat);
- Including HBI $> 60$ in a definition of SD will increase the incidence of ‘imaginary’ SD;
- Two-step delivery may prevent ‘real’ SD;
- If delivery not accomplished spontaneously with next contraction, SD is present.
*Caveat

An abnormal FHR is evidence of fetal compromise

→ fetal status is deteriorating!

One-step delivery is indicated!
Implications for SD Management

- Don’t PANIC or PULL

Why?
Implications for SD Management

- Don’t PANIC or PULL
- Mother should NOT PUSH between contractions ➔
- Relaxed uterus between contractions:
  - maximizes fetal cerebral perfusion and
  - enhances the effectiveness of SD maneuvers
Two-Step Delivery May Avoid Shoulder Dystocia: Head-to-Body Delivery Interval Is Less Important Than We Think.


Andrew Kotaska, MD, FRCSC
Kim Campbell, RMRN, MN
Intact Cord Resuscitation: Much more than hemoglobin

SRPC ESS/OSS Conference
Banff AB, Jan 16th, 2020

Andrew Kotaska MD, FRCSC
Yellowknife, NT, Canada
Learning Objectives

After this session, participants will be able to:

• Describe the physiology of fetal respiratory and metabolic acidosis
• Discuss the physiology and benefit of placental auto-transfusion post delivery
• List the benefits of delayed cord clamping for term and preterm infants
• Describe practical options to achieve intact cord resuscitation
Acid-base physiology: case

- Healthy 25 y/o G₂P₁ @ 40 weeks gest⁰
- Spontaneous normal labour; normal IA
- Deep variable decelerations late 2⁰ stage, with good recovery
- Terminal bradycardia x 7 minutes
- Tight nuchal cord – delivered through loop
- Flat baby
- Cord gases?
Umbilical cord artery

A:
- pH = 6.99
- pCO$_2$ = 90
- Lactate = 4

B:
- pH = 6.99
- pCO$_2$ = 51
- Lactate = 11
Umbilical cord artery

A:
- pH = 6.99
- $pCO_2 = 90$
- Lactate = 4

B:
- pH = 6.99
- $pCO_2 = 51$
- Lactate = 12
Acid-base physiology:
Respiratory acidosis

<table>
<thead>
<tr>
<th>Umbilical artery</th>
<th>Umbilical vein</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH = 6.99</td>
<td>pH =</td>
</tr>
<tr>
<td>pCO₂ = 90</td>
<td>pCO₂ =</td>
</tr>
<tr>
<td>Lactate = 4</td>
<td>BD =</td>
</tr>
</tbody>
</table>
## Acid-base physiology: Respiratory acidosis

<table>
<thead>
<tr>
<th>Umbilical artery</th>
<th>Umbilical vein</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH = 6.99</td>
<td>pH = 7.32</td>
</tr>
<tr>
<td>pCO₂ = 90</td>
<td>pCO₂ = 44</td>
</tr>
<tr>
<td>Lactate = 4</td>
<td>Lactate = 2.5</td>
</tr>
</tbody>
</table>
Acid-base physiology case: my management

- Delivery of flat baby;
- Cord clamped immediately;
- Baby to Paediatrician & resuscitation bay;
Acid-base physiology: case

- Delivery of flat baby;
- Cord clamped immediately;
- Baby to Paediatrician & resuscitation bay;
- Successful resuscitation with PPV;
Acid-base physiology: case

- Delivery of flat baby;
- Cord clamped immediately;
- Baby to Paediatrician & resuscitation bay;
- Successful resuscitation with PPV;
- Slow transition: poor tone, lethargic, pale

Why?
“Serial blood volume measurements were made in 27 normal full-term newborn infants using iodinated human albumin. At the moment of birth the newborn infant was estimated to have a blood volume of 78 ml/kg with a venous hematocrit of 48 %. When the cord-clamping was delayed for 5 minutes the blood volume increased by 61 % to 126 ml/kg. This placental transfusion amounted to 166 ml for a 3500 g infant, one-quarter of which occurred in the first 15 seconds, and one-half within 60 seconds of birth.”

Auto-transfusion = serious volume & oxygen carrying capacity

- Delaying cord clamping 1 minute allows ~ 90 cc auto-transfusion from placenta to fetus, or 20 - 25 ml per kg birth weight.
- The proportionate equivalent in an adult would be 1 L of whole blood
- Further delay of 2-4 minutes results in another ~ 70 cc transfusion
- Total transfusion equivalent in an adult = 1800 cc
Placental Transfusion (Farrar BJOG 2010)

Figure 1. Weight change from birth to cord clamping.
Fetal Circulation
Auto-resuscitation

- If fetal metabolic acidosis is absent, residual placental blood has:
  - High oxygen content,
  - Low CO\textsubscript{2},
  - Normal pH.

→ Auto-transfusion improves brain and cardiac perfusion & function within 45 seconds.
Auto-transfusion: benefits

- Auto-resuscitation from respiratory acidosis
- Hemodynamic filling of pulmonary vasculature → improved transition
- Improved iron stores
- Decreased infant anemia
Auto-transfusion: harms?

- Delays resuscitation measures - unless logistical modifications to allow NRP with cord intact for 1-2 minutes
Intact Cord Resusc. 2.0
Intact Cord
Resusc. 3.0
Bedside Assessment, Stabilisation and Initial Cardio respiratory Support (BASICS) mobile trolley at Liverpool Women’s Hospital
Intact Cord Resusc. 5.0

LifeStart Neonatal Resuscitation Unit
## DCC Benefits – Term Infants

Uwins & Hutcheon  Pediatric Health, Medicine and Therapeutics 2014

### Table 1 Benefits of delayed cord clamping for term infants

<table>
<thead>
<tr>
<th>Term infants ≥37 weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delaying cord clamping for at least one minute</td>
</tr>
<tr>
<td>Higher early hemoglobin concentration</td>
</tr>
<tr>
<td>Increased iron reserves up to 6 months after birth</td>
</tr>
<tr>
<td>No difference in PPH rates</td>
</tr>
<tr>
<td>Higher birth weight</td>
</tr>
<tr>
<td>No statistically significant increase in jaundice or polycythemia</td>
</tr>
</tbody>
</table>

Abbreviation: PPH, post partum haemorrhage.
# DCC Benefits – Preterm Infants

Uwins & Hutcheon  Pediatric Health, Medicine and Therapeutics 2014

## Table 2 Benefits of delayed cord clamping for preterm infants

<table>
<thead>
<tr>
<th>Preterm infants 24–37 weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Providing additional placental blood to the preterm baby by delaying cord clamping by 30–120 seconds resulted in</td>
</tr>
<tr>
<td>Fewer babies needing transfusions for anemia</td>
</tr>
<tr>
<td>Better circulatory stability</td>
</tr>
<tr>
<td>Reduced risk of intraventricular hemorrhage (all grades)</td>
</tr>
<tr>
<td>Reduced risk of necrotizing enterocolitis</td>
</tr>
<tr>
<td>Reduced late-onset sepsis</td>
</tr>
</tbody>
</table>
Fetal Lamb Physiology
(Bhatt et. Al. J Physiol 2013)
DCC Benefits – Preterm Infants

Randomised trial of cord clamping and initial stabilisation at very preterm birth

Lelia Duley, 1 Jon Dorling, 2 Angela Pushpa-Rajah, 3 Sam J Oddie, 4
Charles William Yoxall, 5 Bernard Schoonakker, 6 Lucy Bradshaw, 1 Eleanor J Mitchell, 1
Joe Anthony Fawke, 7 on behalf of the Cord Pilot Trial Collaborative Group

DCC Benefits – Preterm Infants

- 135 infants cord clamped ≥2 min
- 135 infants cord clamped ≤ 20 sec
- Median gestation 28.9 and 29.2 weeks.
- Median time to clamping 120s and 11s.
- NN death:
  - 7/135 infants with intact cord care (5.2%)
  - 15/135 infants clamped cord care (11.1%)
  - risk difference (RD) −5.9%; NNT = 17
**FIGURE 3**

Meta-analyses showing effect of delayed clamping on mortality

<table>
<thead>
<tr>
<th>Study or Subgroup</th>
<th>Delayed Events</th>
<th>Delayed Total</th>
<th>Early Events</th>
<th>Early Total</th>
<th>Weight</th>
<th>Risk Ratio M-H, Fixed, 95% CI</th>
<th>Risk Ratio M-H, Fixed, 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Armanian 2017</td>
<td>2</td>
<td>32</td>
<td>1</td>
<td>31</td>
<td>0.9%</td>
<td>1.94 [0.18, 20.30]</td>
<td></td>
</tr>
<tr>
<td>Backes 2016</td>
<td>2</td>
<td>18</td>
<td>2</td>
<td>22</td>
<td>3.1%</td>
<td>0.61 [0.13, 2.96]</td>
<td></td>
</tr>
<tr>
<td>Baenziger 2007</td>
<td>0</td>
<td>15</td>
<td>1</td>
<td>24</td>
<td>2.3%</td>
<td>0.22 [0.01, 4.04]</td>
<td></td>
</tr>
<tr>
<td>Datta 2017</td>
<td>2</td>
<td>60</td>
<td>0</td>
<td>60</td>
<td>0.4%</td>
<td>5.00 [0.25, 102.00]</td>
<td></td>
</tr>
<tr>
<td>Duley 2016</td>
<td>7</td>
<td>135</td>
<td>15</td>
<td>135</td>
<td>12.8%</td>
<td>0.47 [0.20, 1.11]</td>
<td></td>
</tr>
<tr>
<td>Hofmeyr 1993</td>
<td>5</td>
<td>24</td>
<td>0</td>
<td>14</td>
<td>0.5%</td>
<td>6.60 [0.39, 111.10]</td>
<td></td>
</tr>
<tr>
<td>Hofmeyr 1992</td>
<td>1</td>
<td>40</td>
<td>0</td>
<td>46</td>
<td>0.8%</td>
<td>1.15 [0.07, 17.80]</td>
<td></td>
</tr>
<tr>
<td>Kinmond 1992</td>
<td>0</td>
<td>17</td>
<td>0</td>
<td>19</td>
<td></td>
<td>Not estimable</td>
<td></td>
</tr>
<tr>
<td>Kugelman 2007</td>
<td>0</td>
<td>30</td>
<td>1</td>
<td>35</td>
<td>1.2%</td>
<td>0.39 [0.02, 9.16]</td>
<td></td>
</tr>
<tr>
<td>McDonnell 1997</td>
<td>0</td>
<td>23</td>
<td>0</td>
<td>23</td>
<td>2.1%</td>
<td>0.20 [0.01, 3.95]</td>
<td></td>
</tr>
<tr>
<td>Mercer 2003</td>
<td>0</td>
<td>16</td>
<td>0</td>
<td>16</td>
<td></td>
<td>Not estimable</td>
<td></td>
</tr>
<tr>
<td>Mercer 2006</td>
<td>0</td>
<td>36</td>
<td>1</td>
<td>36</td>
<td>3.0%</td>
<td>0.14 [0.01, 2.67]</td>
<td></td>
</tr>
<tr>
<td>Rabe 2000</td>
<td>0</td>
<td>19</td>
<td>0</td>
<td>19</td>
<td>1.2%</td>
<td>0.35 [0.02, 8.10]</td>
<td></td>
</tr>
<tr>
<td>Ranjit 2015</td>
<td>0</td>
<td>44</td>
<td>0</td>
<td>50</td>
<td>4.4%</td>
<td>0.10 [0.01, 1.81]</td>
<td></td>
</tr>
<tr>
<td>Strauss 2003</td>
<td>0</td>
<td>45</td>
<td>0</td>
<td>60</td>
<td></td>
<td>Not estimable</td>
<td></td>
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<tr>
<td>Tanprasertkul 2016</td>
<td>0</td>
<td>42</td>
<td>0</td>
<td>44</td>
<td></td>
<td>Not estimable</td>
<td></td>
</tr>
<tr>
<td>Ultee 2008</td>
<td>0</td>
<td>18</td>
<td>0</td>
<td>19</td>
<td></td>
<td>Not estimable</td>
<td></td>
</tr>
<tr>
<td>WTM APTS 2017</td>
<td>58</td>
<td>784</td>
<td>79</td>
<td>782</td>
<td>67.3%</td>
<td>0.73 [0.53, 1.01]</td>
<td></td>
</tr>
</tbody>
</table>

Total events (95% CI): 1398 [1436, 100.0%]

Total events: 77 [115]

Heterogeneity: Chi² = 10.28, df = 12 (P = 0.59); I² = 0%

Test for overall effect: Z = 2.75 (P = 0.006)

ARR = 2.7%

NNT = 37

Meta-analyses showing effect of delayed vs early cord clamping on risk ratio for hospital mortality in 18 trials in 2834 infants < 37 weeks’ gestation (top) and 3 trials in 996 infants ≤ 28 weeks’ gestation (bottom).

APTS, Australian Placental Transfusion Study; CI, confidence interval; M-H, Mantel-Haenszel.


Fogarty et al AJOG 2018
FIGURE 5
Cumulative meta-analysis of effect of delayed clamping on hospital mortality

<table>
<thead>
<tr>
<th>Study</th>
<th>Risk Ratio</th>
<th>95% Confidence Interval</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hofmeyr 1988</td>
<td>6.60</td>
<td>0.39-111.11</td>
<td>0.19</td>
</tr>
<tr>
<td>Kinmont 1992</td>
<td>6.60</td>
<td>0.39-111.11</td>
<td>0.19</td>
</tr>
<tr>
<td>Hofmeyr 1993</td>
<td>3.34</td>
<td>0.52-21.51</td>
<td>0.20</td>
</tr>
<tr>
<td>McDonnell 1997</td>
<td>1.40</td>
<td>0.38-5.16</td>
<td>0.61</td>
</tr>
<tr>
<td>Rabe 2000</td>
<td>1.13</td>
<td>0.35-3.61</td>
<td>0.84</td>
</tr>
<tr>
<td>Mercer 2003</td>
<td>1.13</td>
<td>0.35-3.61</td>
<td>0.84</td>
</tr>
<tr>
<td>Strauss 2003</td>
<td>1.13</td>
<td>0.35-3.61</td>
<td>0.84</td>
</tr>
<tr>
<td>Mercer 2006</td>
<td>0.74</td>
<td>0.27-2.04</td>
<td>0.56</td>
</tr>
<tr>
<td>Kugelman 2007</td>
<td>0.70</td>
<td>0.27-1.81</td>
<td>0.46</td>
</tr>
<tr>
<td>Baenziger 2007</td>
<td>0.60</td>
<td>0.24-1.47</td>
<td>0.26</td>
</tr>
<tr>
<td>Ultee 2008</td>
<td>0.60</td>
<td>0.24-1.47</td>
<td>0.26</td>
</tr>
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<td>0.46</td>
<td>0.20-1.05</td>
<td>0.07</td>
</tr>
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<td>0.48</td>
<td>0.20-1.05</td>
<td>0.07</td>
</tr>
<tr>
<td>Duley 2016</td>
<td>0.48</td>
<td>0.25-0.84</td>
<td>0.01</td>
</tr>
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<td>0.48</td>
<td>0.27-0.84</td>
<td>0.01</td>
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<td>Datta 2017</td>
<td>0.54</td>
<td>0.32-0.92</td>
<td>0.02</td>
</tr>
<tr>
<td>Armanian 2017</td>
<td>0.57</td>
<td>0.34-0.96</td>
<td>0.04</td>
</tr>
<tr>
<td>APTS 2017</td>
<td>0.68</td>
<td>0.52-0.90</td>
<td>0.006</td>
</tr>
</tbody>
</table>

Favours delayed clamping  | Favours early clamping

Cumulative meta-analysis of effect of delayed vs early cord clamping on risk ratio (RR) of primary outcome of hospital mortality, in 18 trials arranged in order of publication.  

APTS, Australian Placental Transfusion Study; CI, confidence interval; RR, Risk ratio (i.e. relative risk).

“Clamping the functioning umbilical cord at birth is an unproved intervention”

David J R Hutchon
“In 2010, the International Liaison Committee on Resuscitation recommended that UCC be delayed for at least 1 min in healthy term infants not requiring intervention…

it is recommended that the asphyxic infant (be) separated from the placenta and transferred to a resuscitation table for urgent resuscitation, although this recommendation is not based on scientific or clinical evidence.

Indeed, it could be argued that these infants would receive the greatest benefit from DCC, especially if delayed until respiration is initiated.”

(Bhatt et al. Frontiers in Pediatrics 2014)