Delayed cord clamping
Heba Hamam

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Delayed vs Early Cord Clamping

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• Physiology of placental transfusion.
• Definitions.
• Fetal outcome, delayed versus early cord clamping.
  • Term neonates.
  • Preterm neonates.
• Maternal outcome, delayed versus early cord clamping.
• Summary.

• At birth, blood flow in the umbilical vein usually continues for a few minutes.
• This blood contains: (Mercer et al. 2012)
  • Volume and red blood cells.
  • Stem cells.
  • Immune cells.

• Delayed clamping or cord milked, placental transfusion. (Merser et al. 2012)
• Provides essential life support during the fetal-to-neonatal transition. (Skovgaard et al. 2008)
• Has roles: (Molitoris et al. 2004)
  • Opening the lungs.
  • Increasing pulmonary perfusion.
  • Enhancing lung fluid clearance.
  • Improving oxygen delivery to the infant’s tissues.

• The position of the infant in relation to the placenta influence placental transfusion. (Yao et al. 1974)
• Infant’s position: (Wardrop et al. 1995)
  • level of or 40 cm below the introitus,
  • For 30-60 s, placental transfusion of 80ml.
  • Increase the newborn’s volume by 15–20%,
• Placental transfusion was negligible if the infant was held 50–60 cm above the introitus.

Factors that increase blood transfusion in the infant. (Mercer & Erickson-Owens, 2012)

<table>
<thead>
<tr>
<th>Factors</th>
<th>Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Timing of umbilical cord clamping</td>
<td>A delay in the time of cord clamping results in more blood being transferred to the infant.</td>
</tr>
<tr>
<td>Gravity</td>
<td>This results in the infant’s blood volume being increased.</td>
</tr>
<tr>
<td>Uterine contractions</td>
<td>Suggested to be an effective in terms of accelerating placental transfusion</td>
</tr>
<tr>
<td>Cord milking</td>
<td>Suggested to be an effective in terms of accelerating placental transfusion</td>
</tr>
<tr>
<td>Uterine drugs</td>
<td>Have been found to speed up the placental transfusion but do not increase the cord’s volume.</td>
</tr>
</tbody>
</table>
## Delayed cord clamping

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### Definition

- **Early cord clamping:**
  - Full-term neonates, immediately after birth or within the first minute. (Nelson NM et al. 1980; Goehlmann RM et al. 1974, Gupta R et al. 2002)
  - Preterm neonates, not precisely defined in any study, performed 5-30 s after birth.
  - Apply clamping while active circulation. (D.J et al. 2012)

- **Late cord clamping:**
  - Full-term neonates, is usually defined at 2 or 3 min after birth or once it stops pulsating. (Nelson NM et al. 1980; Exhumed MO et al. 2004, van Rheenen et al. 2007)
  - Preterm infants, 30 and 45 s after birth. (Saigal S et al. 1973, Rabe H et al. 2000)
  - When physiological closure have been completed. (D.J et al. 2012)
  - Absent in 95% after 5 min. (Farrar et al. 2011)

### Fetal outcome, delayed versus early cord clamping.

- Almost 25% to 60% of the fetal–placental circulation is found in the placental circulation.
- During the first six months of life, infants are largely dependent on the iron supply present at birth for growth and hemoglobin (Hgb) production. (Kleigmam RM et al. 2007)
- The optimal time to clamp the umbilical cord after birth has been a controversial issue for more than 200 years.

### Possible benefits of delayed cord clamping:

- Higher mean neonatal hematocrit around 6 h after birth, at 24-48 h after the time of delivery and at age 5 days and 12 months,
  - no significant differences were found in hematocrit at age of 6 months. (Hutton et al. 2007)
- Higher mean neonatal hemoglobin level around 7 h after birth,
  - no significant differences were found at ages of 2, 3 and 6 months.

### Umbilical cord milking:

- Less red blood cell transfusion.
- Higher hemoglobin value and the mean blood pressure.
- Shorter time for supply O2 and mechanical ventilation. (Hosono et al. 2009)
- Improve cardiac function and left ventricular preload. (Takami et al. 2012)

### Full term neonates.

- Eleven randomized controlled trials of the effect of timing of cord clamping (1966-2008).
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• Higher blood volume during the first 2–4 h of life.
• Higher ferritin levels at ages 2–3 months.
• Decreased risk of anemia at 24–48 h after birth and at ages 2–3 months.
• Improved both the short- and long-term hematologic and iron status of full-term infants.

Possible harms of delayed cord clamping:

• Increased risk of polycythemia (hematocrit >65%) after birth at 7, 24 and 48 h.
  • all cases, polycythemia was asymptomatic
• Increased risk of jaundice requiring phototherapy. (McDonald et al. 2008)
• RCT, no impact for the need of phototherapy (Andersson et al. 2011)
• No significant differences:
  • Tachypnea or respiratory grunting,
  • Admission to the neonatal intensive care unit (NICU).

• In full-term neonates, there is sufficient evidence to delay umbilical cord clamping for at least 2 min after birth.
• Improving iron status which may be of clinical value particularly in infants where access to good nutrition is poor, although delaying clamping increases the risk of jaundice requiring phototherapy.
• Iron deficiency even without anaemia associated with impaired development, benefit full term infants in regions with low prevalence of iron deficiency anaemia. (Oal et al. 2011)

• It is estimated that up to 50% of children in developing countries become anemic at 12 months. (WHO, 2001)
• Fariba Shirvani et all, 2010. Imam Hossein Hospital, Tehran, Iran.
  • 100 mother-infant pairs were divided into two groups,
  • Early cord clamp time within 15 s (n=70) or delayed cord clamp time 15 s after delivery (n=30).
  • The groups had similar demographic and biomedical characteristics at baseline.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Less than 15s</th>
<th>More than 15s</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mother’s age</td>
<td>22.6±5.0</td>
<td>23.6±7.6</td>
<td>0.9</td>
</tr>
<tr>
<td>Range</td>
<td>17 - 30</td>
<td>17 - 33</td>
<td></td>
</tr>
<tr>
<td>Mother’s weight</td>
<td>71.2±13.6</td>
<td>75.1±11.8</td>
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<tr>
<td>Range</td>
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<td>43 - 112</td>
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<tr>
<td>Mother’s height</td>
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<td>161±17</td>
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<tr>
<td>Range</td>
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<td>155 - 165</td>
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<tr>
<td>Number of prevulmin</td>
<td>1.0±0.3</td>
<td>1.3±1.3</td>
<td>0.5</td>
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<tr>
<td>Range</td>
<td>0.3 - 3.4</td>
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<tr>
<td>Birth weight</td>
<td>3553±263.4</td>
<td>3758±647.2</td>
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<tr>
<td>Range</td>
<td>2401 - 4208</td>
<td>2588 - 4400</td>
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<tr>
<td>Age at delivery</td>
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<td>37.6±13.7</td>
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<tr>
<td>Range</td>
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<td>26 - 41</td>
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</table>

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<th>Variables</th>
<th>Less than 15s</th>
<th>More than 15s</th>
<th>P-value</th>
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</thead>
<tbody>
<tr>
<td>Cord length</td>
<td></td>
<td></td>
<td>0.001</td>
</tr>
<tr>
<td>Vaeuc (SD)</td>
<td>14.3±6.4</td>
<td>20.4±5.9</td>
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</tr>
<tr>
<td>Range</td>
<td>10 - 15</td>
<td>16 - 30</td>
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<tr>
<td>Neonate weight</td>
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<tr>
<td>Vaeuc (SD)</td>
<td>14.5±6.4</td>
<td>16.9±6.5</td>
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</tr>
<tr>
<td>Range</td>
<td>11 - 19</td>
<td>12 - 21</td>
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<tr>
<td>Neonate length</td>
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<tr>
<td>Vaeuc (SD)</td>
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<tr>
<td>Range</td>
<td>35.6±7</td>
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<td>Neonate BMI</td>
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<td>Vaeuc (SD)</td>
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</tr>
<tr>
<td>Range</td>
<td>20 - 40</td>
<td>23 - 75</td>
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**Early cord clamping in term newborns results in a decrease of 20 to 40 mL/kg of blood, which is equivalent to 30 to 35 mg of iron.**

**Delayed CC has significant 47% reduction in risk of anemia and 33% reduction in risk of having deficient iron stores at ages 2–3 months.**

**Delaying cord clamping increases the red cell mass in term infants. It is a safe, simple and low cost delivery procedure.**

**Preterm neonates**

**Gemma Archa, et al. 2010. Hospital of Barcelona, Spain.**

**Nine controlled trials (1974-2008).**

**Early cord clamping has been used because of concerns about not delaying resuscitation.**

**Higher circulating blood volume during the first 24 h of life, less need for blood transfusions and less incidence of intraventricular hemorrhage.** (Rabe et al. 2004)

**Protect VLBW infants from intraventricular hemorrhage and late-onset sepsis.** (Mercer R, et al. 2006)

**Decrease the need of treatment for hypotension and hypovolemia.** (Oh W, et al. 2002)

**Decrease mechanical ventilation and oxygen therapy.** (Hartik et al. 2004)

**Protective against motor disability for VLBW at 7 months age.** (Mercer et al. 2010)

**Significant higher SVC blood flow.** (Sommers et al. 2012)

**No relationship between delayed clamping of the umbilical cord and pathological jaundice or polycythemia was found.** (Ultee CA, et al. 2008)

**SOGC (2009)**

**Delaying cord clamping by at least 60 seconds is preferred in premature newborns (< 37 weeks' gestation) since there is less intraventricular hemorrhage and less need for transfusion in those with late clamping.**

**For term newborns, the possible increased risk of neonatal jaundice requiring phototherapy must be weighed against the physiological benefit of greater hemoglobin and iron levels up to 6 months of age conferred by delayed cord clamping.**


**Cord clamping should be delayed for at least 1 minute in babies not requiring resuscitation. There is insufficient evidence to recommend a time for clamping in babies who require resuscitation.**

**WHO (2012), delay CC for all infant in low-income and middle-income countries.**

**EAPM (2010), delay CC for 30-45s, baby held below the mother to promote placento-fetal transfusion.** (Grade A)
Maternal outcome, delayed versus early cord clamping.

- Postpartum hemorrhage is a major cause of maternal mortality worldwide.
- Active vs expectant management of the third stage of labor.
- Uterotonic agents, controlled cord traction, umbilical cord clamping and uterine massage after placental delivery.

McDonald SJ et al, 2009. Review of 11 trials of 2989 mothers and their babies, no significant differences between early and late cord clamping were seen for:
- Postpartum hemorrhage or severe postpartum hemorrhage.
- Postpartum hemoglobin level, need of blood transfusion.
- Duration of the third stage of labor and need to administer an uterotonic with birth.

- Maternal ferritin levels at delivery, however, were significantly higher in the early clamping group than in the late clamping group.

Prendiville WJ et al, 2009. Review of five randomised trials:
- Comparing active and expectant management of the third stage of labor.
- Active management:
  - Prophylactic oxytocic before delivery of the placenta.
  - Early cord clamping and cutting.

- Reduced risk of maternal:
  - Blood loss.
  - Postpartum hemorrhage of more than 500ml.
  - Third stage of labor.

Chaparro CM et al. 2007. Randomized trial for 476 patients, assigned to delayed clamping (2 min after delivery of the infant’s shoulders) or early clamping (around 10 s after delivery).

- No significant differences for postpartum maternal bleeding at delivery.
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- Ceriani JM et al. 2006.
- A review of five randomised, controlled trial of the effect of timing of cord clamping:
  - Postpartum maternal blood loss volume
  - Maternal hematocrit value 24h after delivery.
  - 15 s (Group 1), at 1 min (Group 2) or at 3 min (Group 3).
  - No significant differences.

CMNRP Perinatal Perspectives (2013)

- Benefits: Term infants
  - Higher hemoglobin concentration levels, 2 to 3 months of age.
  - Higher total body iron stores, 2 to 6 months of age.
  - Higher circulating ferritin level, 2 to 6 months of age.
  - Lower incidence of iron-deficiency anemia.

- Benefits: Preterm infants
  - Increased blood volume.
  - Better circulatory stability.
  - Reduced need for blood transfusions.
  - Reduced incidence of intraventricular hemorrhage (all grades).
  - Reduced incidence of necrotizing enterocolitis.

- Adverse outcomes: Preterm and term infants
  - Increased incidence of jaundice requiring phototherapy.
  - Increased incidence of asymptomatic polycythemia.

- Unchanged maternal and neonatal outcomes
  - Incidence of postpartum hemorrhage.
  - Incidence of retained placenta.
  - Incidence of other obstetric outcomes (e.g. duration of the third stage of labor, use of uterotonic medications, maternal blood transfusion).
  - Infant Apgar scores, need for resuscitation, or umbilical cord pH values.
  - Frequency of respiratory distress in the newborn.

Thank U!