Objectives

1. Review history of cord clamping
2. Review current expert guidelines
3. Discuss benefits of delayed cord clamping in term and preterm neonates
4. Discuss risks of delayed cord clamping

The Umbilical Cord

Two Arteries
One Vein
Average length: 55 cm
Blood flows from the placenta through the umbilical vein to the fetus
Blood exits the fetus in the two umbilical arteries
"Frequently the child appears to be born dead, when it is feeble and when, before the tying of the cord, a flux of blood occurs into the cord and adjacent parts. Some nurses who have already acquired skill squeeze (the blood) back out of the cord (into the child’s body) and at once the baby, who had previously been as if drained of blood, comes to life again."

Aristotle 384-322 BC

Timeline of Cord clamping & cutting

- Described in 1688
- Routine practice by the 19th century
  - In 1801, Erasmus Darwin wrote, ‘Another thing very injurious to the child, is the tying and cutting of the navel string too soon; which should always be left till the child has not only repeatedly breathed but till all pulsation in the cord ceases. As otherwise the child is much weaker than it ought to be.’
  - Budin in 1875 measured the amount of blood left in the placentas of the after early vs. late ligation & found 92 more cubic centimeters available to the infant
Immediate Cord Clamping
Common practice to clamp early, typically within 30s of birth.

Modern Day Cord clamping
- Early
  - Clamping within 1 minute of delivery
- Late
  - Clamping more than 5 minutes after delivery
- Studies showing that 90% of blood volume was achieved within the first few breaths the infant took after birth
- Most practitioners clamped the cord within 15-20s of delivery

What is delayed cord clamping?
- Delayed umbilical cord clamping is prolongation of the time between delivery of a neonate and clamping of the umbilical cord.
- Immediate umbilical cord clamping is typically performed within 15 seconds of delivery, whereas delayed umbilical cord clamping is performed 25 seconds to 5 minutes after delivery.
Gorilla Birth

- Gorilla Birth -- Urban Gorilla

5 Benefits Of Delayed Cord Clamping

Delayed Umbilical Cord Clamping May Benefit Children Years Later
## Guidelines

- **ACOG**
  - Committee Opinion 2012
  - No good evidence to support or refute benefits of delayed cord clamping in term infants
  - Evidence does support delayed cord clamping in preterm infants

- **WHO**
  - 2012
  - Delayed umbilical cord clamping (not earlier than 1 min after birth) is recommended for improved maternal and infant health and nutrition outcomes

## How much blood is given to the baby by delaying cord clamping?

- Delayed cord clamping may increase the neonate’s blood volume by as much as 8% to 24%.
  - 80ml of blood at 1 minute
  - 100ml of blood at 3 minutes

- Transfusion of blood from placenta to baby through the cord

## Simkin video

- Blood demonstration
What are the benefits?

- Increase blood volume
- Decreased need for transfusion
- Decreased intracranial hemorrhage in preterm infants
- May prevent iron deficiency in the 1st year of life
- Longer duration of placental transfusion after birth may be beneficial because this blood is enriched with immunoglobulins and stem cells, which provide the potential for improved organ repair and rebuilding after injury from disorders caused by preterm birth.

What is the risk?

- Timely resuscitation
- Excessive placental transfusion
  - Jaundice?
- Excessive maternal hemorrhage
- Technical difficulties
  - Warming of infant during cesarean section
  - Parents who desire cord blood banking

What does the data show?

- Preterm infants and Term infants have different benefits and risks
Risks specific to preemies?

- Increased risk of:
  - Temperature dysregulation
  - Hypotension
  - Blood transfusion

Preemies

- Systematic review of 15 studies that included 738 neonates delivered between 24 weeks' and 36 weeks' gestation.
  - The timing of delayed umbilical cord clamping ranged from 25 seconds to a maximum of 180 seconds after delivery.
  - The majority of the studies had a delay of 30–45 seconds
  - Fewer transfusions for low blood pressure and anemia
  - Better circulatory stability
  - Less intraventricular hemorrhage (all grades)
  - Lower risk of necrotizing enterocolitis
  - Higher peak bilirubin concentrations
  - There were no statistically significant differences in death, severe intraventricular hemorrhage (grades 3 or 4), or periventricular leukomalacia
Long term???

- One small study showed no difference in infant development at 7 months
- Current trial going on in Australia for infants delivered at <30 weeks gestation -- Australian Placental Transfusion Study [APTS]

Term infants

- Cochrane Review -- 15 randomized trials of delayed cord clamping in term neonates, including 3911 women
  - Higher neonatal hemoglobin concentration at 24 to 48 hours of life
  - Lower likelihood of iron deficiency at 3–6 months
  - Increased risk of jaundice requiring phototherapy

Jaundice

- The risk of jaundice must be weighed against the risk of iron deficiency.
- “In developed nations where phototherapy is widely available, delayed umbilical cord clamping to increase iron stores has low potential for morbidity.” -- SMFM
Delivery position of baby?

No difference in volume of placental transfusion placed on mom’s chest or held at the level of the vagina.

How about risks to the mother?
- Theoretical risks include delaying delivery of the placenta delays uterine contraction and increases blood loss.
- In cesarean deliveries, maternal blood loss also occurs through the hysterotomy incision, and delaying closure may lead to increased risk of hemorrhage.

Maternal risks
- Very few studies
  - Cochrane Review 2008
    - 2989 mothers
    - No difference in rates of postpartum hemorrhage
    - no differences were seen in mean blood loss, need for transfusion, postpartum hemoglobin concentration, or need for manual removal of the placenta.
“Milking” the cord

- Squeezing the blood down the cord to the baby
  - Typically, the delivering provider will “strip” a segment of the umbilical cord toward the fetal umbilicus 3–4 times before clamping the umbilical cord
  - Rapid bolus of blood to the infant

“Milking”

- One small trial involving infants born between 24 and 28 weeks looked at milking vs. immediate clamping
  - Higher initial Hb concentration
  - Higher mean systemic blood pressure
  - Reduced need for blood transfusion
  - Higher urine output during the first 72 hours
  - Shorter duration of mechanical ventilation and supplemental oxygen

Contraindications

- Infants
  - Congenital anomalies
  - Reversed or absent end diastolic flow
  - Severe depression

- Maternal
  - Placental abnormalities with increased risk of hemorrhage
    - Acreta, previa, abruption
  - Severe anemia
SMFM recommendations

<table>
<thead>
<tr>
<th>Recommendations</th>
<th>Grade*</th>
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<tbody>
<tr>
<td>1. We recommend delayed umbilical cord clamping be utilized in preterm to attenuate following birth vaginal and intraventricular hemorrhage.</td>
<td>B Ranging recommendation, Moderate quality evidence</td>
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<tr>
<td>2. We do not recommend routine delayed umbilical cord clamping in term neonates.</td>
<td></td>
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<tr>
<td>3. We recommend that “vaginal” or “spitting” NOT be used as a replacement for delayed umbilical cord clamping.</td>
<td>B Ranging recommendation, Moderate quality evidence</td>
</tr>
<tr>
<td>4. We recommend that delayed umbilical cord clamping NOT be utilized in setting of maternal depression or concern for well-being or in situations with risk of intraventricular hemorrhage such as abnormal placental (eg, placenta previa or accreta).</td>
<td>Best practice</td>
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How do we implement delayed cord clamping in the preemie delivery room?

1. **Recruit Leadership/Champions**
   - Obstetricians
   - Neonatologists
   - Nursing staff
2. **Strategize protocol according to your institution**
3. **Educate key players & allow time for feedback and questions**
4. **Finalize protocol**
5. **Simulate**
6. **Implement**
7. **Study outcome data**

Sample Protocol for Preterm Delivery

1. Prior to delivery, establish a consensus that cord clamping will be delayed for a specified duration (range 30–60 sec).
2. Prepare two warm sterile towels for transfer of the infant from the obstetrician to the neonatologist.
3. An assigned timekeeper starts a timer as soon as the infant is delivered from the womb, and thereafter announces the time in 15-second intervals.
4. **DCC:** Upon delivery, the infant is held in the warm towel by the obstetrician and cord clamping is delayed for the specified interval.
5. When the delay interval has been reached, the obstetrical provider clamps the umbilical cord in standard fashion and calls out “Cord clamped!”
6. During the DCC interval, it is appropriate to call out any possible safety concerns as they may arise.
7. The infant is transferred to the neonatologist’s warm towel and routine newborn resuscitation is performed per current NRP guidelines.
8. The duration of DCC is recorded in the electronic medical record.
Term delivery – Vaginal Delivery

Term Delivery – Cesarean Section

References