Clamping mechanisms pdf

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Number 814 (Replaces Committee Opinion 684, January 2017)Committee on Obstetric Practice The American College of Nurse-Midwives endorse this document. This Committee on Obstetric Practice in collaboration with committee members Maria A Mascola, MD; T. Flint Porter, MD; and Tamara Tin-May Chao, MD. INTERIM UPDATE: The content in this Committee Opinion has been updated as highlighted (or removed as necessary) to reflect a limited, focused change in the data and language regarding cord milking. ABSTRACT: Delayed umbilical cord clamping appears to be beneficial for term and preterm infants. In term infants, delayed umbilical cord clamping increases hemoglobin levels at birth and improves iron stores in the first several months of life, which may have a favorable effect on developmental outcomes. There is a small increase in the incidence of jaundice that requires phototherapy in term infants undergoing delayed umbilical cord clamping. Consequently, obstetrician-gynecologists and other obstetric care providers adopting delayed umbilical cord clamping in term infants, delayed umbilical cord clamping is associated with significant neonatal benefits, including improved transitional circulation, better establishment of red blood cell volume, decreased need for blood transfusion, and lower incidence of necrotizing enterocolitis and intraventricular hemorrhage. Delayed umbilical cord clamping was not associated with an increased risk of postpartum hemorrhage or increased blood loss at delivery nor was it associated with a difference in postpartum hemoglobin levels or the need for blood transfusion. Given the benefits to most newborns and concordant with other professional organizations, the American College of Obstetricians and Gynecologists now recommends a delay in umbilical cord clamping in vigorous term and preterm infants for at least 30-60 seconds after birth. The ability to provide delayed umbilical cord clamping may vary among institutions and settings; decisions in those circumstances are best made by the team caring for the mother-infant dyad. The American College of Obstetricians and Gynecologists' Committee on Obstetric Practice makes the following recommendations regarding the timing of umbilical cord clamping after birth: In term infants, delayed umbilical cord clamping is associated with significant neonatal benefits in preterm infants, including improved transitional circulation, better establishment of red blood cell volume, decreased need for blood transfusion, and lower incidence of necrotizing enterocolitis and intraventricular hemorrhage. Given the benefits to most newborns and concordant with other professional organizations, the American College of Obstetricians and Gynecologists now recommends a delay in umbilical cord clamping. Consequently, obstetriciangynecologists and other obstetric care providers adopting delayed umbilical cord clamping in term infants should ensure that mechanisms are in place to monitor and treat neonatal jaundice. Delayed umbilical cord clamping does not increase the risk of postpartum hemorrhage. Before the mid 1950s, the term early clamping was defined as umbilical cord clamping within 1 minute of birth, and late clamping more than 5 minutes after birth. In a series of small studies of blood volume changes after birth. In a series of small studies of blood volume changes after birth. In a series of small studies of blood volume changes after birth. transfer was achieved within the first few breaths in healthy term infants 3. Because of these early observations and the lack of specific recommendations regarding optimal timing, the interval between birth, usually after birth, usually af within 15–20 seconds. However, more recent randomized controlled trials of term and preterm infants as well as physiologic studies of blood volume, oxygenation, and arterial pressure have evaluated the effects of immediate versus delayed umbilical cord clamping (usually defined as cord clamping at least 30–60 seconds after birth) 4 5. Delayed umbilical cord clamping appears to be beneficial for term and preterm infants. In term infants, delayed umbilical cord clamping increases hemoglobin levels at birth and improves iron stores in the first several months of life, which may have a favorable effect on developmental outcomes. In preterm infants, rates of intraventricular hemorrhage and necrotizing enterocolitis are lower, and fewer newborns require transfusion when delayed umbilical cord clamping is employed. This growing body of evidence has led a number of professional organization recommends that the umbilical cord not be clamped earlier than 1 minute after birth in term or preterm infants who do not require positive pressure ventilation. Recent Neonatal Resuscitation Program guidelines from the American Academy of Pediatrics recommend delayed umbilical cord clamping for at least 30-60 seconds for most vigorous term and preterm infants. The Royal College of Obstetricians and Gynaecologists also recommends deferring umbilical cord clamping for healthy term and preterm infants for 2–5 minutes after birth 6. The universal implementation of delayed umbilical cord clamping has raised concern. Delay in umbilical cord clamping may delay timely resuscitation efforts, if needed, especially in preterm infants. However, because the placenta continues to perform gas exchange after delivery, sick and preterm infants are likely to benefit most from additional blood volume derived from continued placental transfusion. Another concern is that a delay in umbilical cord clamping could increase the potential for excessive placental transfusion. To date, the literature does not show evidence of an increase the potential for excessive placental transfusion. criteria for phototherapy in term infants. Given the benefits to most newborns and concordant with other professional organizations, the American College of Obstetricians and Gynecologists now recommends a delay in umbilical cord clamping for at least 30–60 seconds after birth in vigorous term and preterm infants. Physiologic studies in term infants have shown that a transfer from the placenta of approximately 80 mL of blood occurs by 1 minute after birth, reaching approximately 100 mL at 3 minutes after birth, reaching approximately 100 mL at 3 minutes after birth, reaching approximately 100 mL at 3 minutes after birth of a proximately 100 mL at 3 minutes after birth of a proximately 100 mL at 3 minutes after birth of a proximately 100 mL at 3 minutes after birth of a proximately 100 mL at 3 minutes after birth of a proximately 100 mL at 3 minutes after birth of a proximately 100 mL at 3 minutes after birth of a proximately 100 mL at 3 minutes after birth of a proximately 100 mL at 3 minutes after birth of a proximately 100 mL at 3 minutes after birth of a proximately 100 mL at 3 minutes after birth of a proximately 100 mL at 3 minutes after birth of a proximately 100 mL at 3 minutes after birth of a proximately 100 mL at 3 minutes after birth of a proximately 100 mL at 3 minutes after birth of a proximately 100 mL at 3 minutes after birth of a proximately 100 mL at 3 minutes after birth of a proximately 100 mL at 3 minutes after birth of a proximately 100 mL at 3 minutes after birth of a proximately 100 mL at 3 minutes after birth of a proximately 100 mL at 3 minutes after birth of a proximately 100 mL at 3 minutes after birth of a proximately 100 mL at 3 minutes after birth of a proximately 100 mL at 3 minutes after birth of a proximately 100 mL at 3 minutes after birth of a proximately 100 mL at 3 minutes after birth of a proximately 100 mL at 3 minutes after birth of a proximately 100 mL at 3 minutes after birth of a proximately 100 mL at 3 minutes after birth of a proximately 100 mL at 3 minutes after birth of a proximately 100 mL at 3 minutes after birth of a proximately 100 mL at 3 minutes after birth of a proximately 100 mL at 3 minutes after birth of a proximately 100 mL at 3 minutes after birth of a proximately 100 mL at 3 minutes after birth of a proximately 100 mL at 3 minutes after birth of a proximately 100 mL at 3 minutes after birt ultrasonography during delayed umbilical cord clamping 11 showed a marked increase in placental transfusion during the initial breaths of the newborn, which is thought to be due to the negative intrathoracic pressure generated by lung inflation. This additional blood supplies physiologic quantities of iron, amounting to 40–50 mg/kg of body weight. This extra iron has been shown to reduce and prevent iron deficiency during the first year of life 12. Iron deficiency during infancy and childhood has been linked to impaired cognitive, motor, and behavioral development that may be irreversible 13. Iron deficiency during infancy and childhood has been linked to impaired cognitive, motor, and behavioral development that may be irreversible 13. Iron deficiency during infancy and childhood has been linked to impaired cognitive, motor, and behavioral development that may be irreversible 13. Iron deficiency during infancy and childhood has been linked to impaired cognitive, motor, and behavioral development that may be irreversible 13. Iron deficiency during infancy and childhood has been linked to impaired cognitive, motor, and behavioral development that may be irreversible 13. 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Iron deficiency during infancy and childhood has been linked to impaired cognitive, motor, and behavioral development that may be irreversible 13. Iron deficiency and childhood has been linked to impaired cognitive, motor, and behavioral development that may be irreversible 13. Iron deficiency and childhood has been linked t high-income countries, where rates range from 5% to 25% 13. A longer duration of placental transfer of immunoglobulins and stem cells, which are essential for tissue and organ repair. The transfer of immunoglobulins and stem cells may be particularly beneficial after cellular injury, inflammation, and organ dysfunction, which are common in preterm birth 14 15. The magnitude of these benefits requires further study, but this physiologic reservoir of hematopoietic and pluripotent stem cell lines may provide therapeutic effects and benefit for the infant later in life 16.A 2012 systematic review on timing of umbilical cord clamping in preterm infants analyzed the results from 15 eligible studies that involved 738 infants born between 24 weeks and 36 weeks of gestation 4. This review defined delayed cord clamping as a delay of more than 30 seconds, with a maximum of 180 seconds, and included some studies that also used umbilical cord milking in addition to delayed cord clamping. Delayed umbilical cord clamping was associated with fewer infants; relative risk [RR], 0.61; 95% confidence of intraventricular hemorrhage (ultrasonographic diagnosis, all grades) (10 trials, 539 infants; RR, 0.59; 95% CI, 0.41–0.85) as well as necrotizing enterocolitis (five trials, 241 infants; RR, 0.62; 95% CI, 0.43-0.90) compared with immediate umbilical cord clamping group, but there was no statistically significant difference in the need for phototherapy between the groups. For outcomes of infant death, severe (grade 3-4) intraventricular hemorrhage, and periventricular leukomalacia, no clear differences were identified between groups; however, many trials were affected by incomplete reporting and wide confidence intervals. Outcome after discharge from the hospital was reported in a small study in which no significant differences were identified between groups; however, many trials were affected by incomplete reporting and wide confidence intervals. reported between the groups in mean Bayley II scores at age 7 months (corrected for gestational age at birth and involved 58 children) 4. In another study, delayed umbilical cord clamping among infants born before 32 weeks of gestation was associated with improved motor function at 18–22 months (corrected age 17.A 2013 Cochrane review) assessed the effect of timing of umbilical cord clamping at less than 1 minute after birth and late umbilical cord clamping at less than 1 minute or when cord pulsation ceased. The reviewers found that newborns in the early umbilical cord clamping group had significantly lower hemoglobin concentrations at birth (weighted mean difference, -2.17 g/dL; 95% CI, -4.06 to -0.280) as well as at 24-48 hours after birth (mean difference, -2.17 g/dL; 95% CI, -1.78 to -1.21). In addition, at 3-6 months of age, infants exposed to early umbilical cord clamping were more likely to have iron deficiency compared with the late cord clamping group (RR, 2.65; 95% CI, 1.04-6.73). There was no difference in the rate of polycythemia between the two groups, nor were overall rates of jaundice different, but jaundice requiring phototherapy was less common among those newborns who had early umbilical cord clamping (2.74% of infants in the early cord clamping group; RR, 0.62; 95% CI, 0.41–0.96). However, the authors concluded that given the benefit of delayed umbilical cord clamping in term infants, delayed cord clamping is beneficial overall, provided that the obstetrician-gynecologist or other obstetric care provider has the ability to monitor and treat jaundice. Long-term effects of delayed umbilical cord clamping have been evaluated in a limited number of studies. In a single cohort, assessed from 4 months to 4 years of age 13 18 19, scores of neurodevelopment did not differ by timing of umbilical cord clamping among patients at 4 months and 12 months of age. At 4 years of age, children in the early umbilical cord clamping group had modestly lower scores in social and fine motor domains compared with the delayed umbilical cord clamping group had modestly lower scores in social and fine motor domains compared with other strategies of active management in the third stage of labor in an effort to reduce postpartum hemorrhage. Consequently, concern has arisen that delayed umbilical cord clamping may increase the risk of maternal hemorrhage. However, recent data do not support these concerns. In a review of five trials that included more than 2,200 women, delayed umbilical cord clamping was not associated with an increased risk of postpartum hemoglobin level or need for blood loss at delivery, nor was it associated with a difference in postpartum hemoglobin level or need for blood loss at delivery, nor was it associated with a difference in postpartum hemoglobin level or need for blood loss at delivery, nor was it associated with a difference in postpartum hemoglobin level or need for blood loss at delivery, nor was it associated with a difference in postpartum hemoglobin level or need for blood loss at delivery, nor was it associated with a difference in postpartum hemoglobin level or need for blood loss at delivery, nor was it associated with a difference in postpartum hemoglobin level or need for blood loss at delivery, nor was it associated with a difference in postpartum hemoglobin level or need for blood loss at delivery, nor was it associated with a difference in postpartum hemoglobin level or need for blood loss at delivery, nor was it associated with a difference in postpartum hemoglobin level or need for blood loss at delivery, nor was it associated with a difference in postpartum hemoglobin level or need for blood loss at delivery, nor was it associated with a difference in postpartum hemoglobin level or need for blood loss at delivery, nor was it associated with a difference in postpartum hemoglobin level or need for blood loss at delivery, nor was it associated with a difference in postpartum hemoglobin level or need for blood loss at delivery, nor was it associated with a difference in postpartum hemoglobin level or need for blood loss at delivery, nor was it associated with a difference in postpartum hemoglobin level or need for blood loss at delivery, nor was it associated with a difference in postpartum hemoglobin level on the difference in postpartum hemoglobi delayed umbilical cord clamping need to be balanced with the need for timely hemodynamic stabilization of the woman Table 1.Delayed umbilical cord clamping is a straightforward process that allows placental transfusion of warm, oxygenated blood to flow passively into the newborn. The position of the newborn during delayed umbilical cord clamping generally has been at or below the level of the placenta, based on the assumption that gravity facilitates the placental transfusion 20 21. However, a recent trial of healthy term infants born vaginally found that those newborns placed on the maternal abdomen or chest did not have a lower volume of transfusion compared with infants held at the level of the introitus 22. This suggests that immediate skin-to-skin care is appropriate while awaiting umbilical cord is clamped. During delayed umbilical cord clamping, early care of the newborn should be initiated, including drying and stimulating for first breath or cry, and maintaining normal temperature with skin-to-skin contact and covering the infant with dry linen. Secretions should be cleared only if they are copious or appear to be obstructing the airway. If meconium is present and the baby is vigorous at birth, plans for delayed umbilical cord clamping can continue. The Apgar timer may be useful to monitor elapsed time and facilitate an interval of at least 30-60 seconds between birth and cord clamping should not interfere with active management of the third stage of labor, including the use of uterotonic agents after delivery of the newborn to minimize maternal bleeding. If the placental circulation, immediate cord clamping is appropriate. Similarly, maternal hemodynamic instability or the need for immediate resuscitation of the newborn on the warmer would be an indication for immediate umbilical cord clamping may vary among institutions and settings; decisions in those circumstances are best made by the team caring for the mother-infant dyad. There are several situations in which data are limited and decisions regarding timing of umbilical cord flow may be compromised, a discussion between neonatal and obstetric teams can help weigh the relative risks and benefits of immediate or delayed umbilical cord pH measurements. Two studies suggest a small but statistically significant decrease in umbilical artery pH (decrease of approximately 0.03 with delayed umbilical cord clamping) 23 24. However, a larger study of 116 infants found an increase in umbilical cord clamping 25. These studies included infants who did not require resuscitation at birth. Whether the effect of delayed umbilical cord milking or stripping has been considered as a method of achieving increased placental transfusion to the newborn in a rapid time frame, usually less than 10-15 seconds. It has particular appeal for circumstances in which the 30-60-second delay in umbilical cord clamping may be too long, such as when immediate infant resuscitation is needed or maternal hemodynamic instability occurs. However, umbilical cord milking has not been studied as rigorously as delayed umbilical cord clamping. A recent meta-analysis 26 of seven studies that involved 501 preterm infants compared umbilical cord milking with immediate cord clamping (six studies) or with delayed umbilical cord milking varied considerably in the trials in terms of the number of times the cord was milked, the length of milked cord, and whether the cord was clamped before or after milking. The analysis found that infants in the umbilical cord-milking groups had higher hemoglobin levels and decreased incidence of intraventricular hemorrhage with no increase in adverse effects. Subgroup analysis comparing umbilical cord milking directly with delayed umbilical cord clamping was not able to be carried out because of small numbers in those groups. Several subsequent studies have been published. A 2015 trial in term infants comparing delayed umbilical cord milking found that the two strategies had similar effects on hemoglobin and ferritin levels 27. Another 2015 trial evaluating infants born before 32 weeks of gestation found that among those infants born by cesarean delivery, umbilical cord milking was associated with higher hemoglobin levels and improved blood pressure compared with those in the delayed umbilical cord clamping group, but the differences were not seen among those born vaginally 28. Long-term (at age 2 years and 3.5 years) neurodevelopmental outcomes evaluated in one small study showed no difference between preterm infants exposed to delayed umbilical cord milking 29. A 2019 study of umbilical cord milking 29. A 2019 study of umbilical cord milking was halted early, with 474 infants enrolled, because extremely preterm infants (23-27 weeks of gestation) in the cord milking arm more often developed intraventricular hemorrhage compared with similar infants in the delayed cord clamping group 30. Given this most recent data, cord milking in fants in the delayed cord clamping group 30. Given this most recent data, cord milking in fants (less than 28 weeks of gestation), and there is insufficient evidence to either support or refute umbilical cord milking in infants born at 32 weeks of gestation or more, including term infants. Many of the clinical trials that evaluated delayed umbilical cord clamping did not include multiple gestations; consequently, there is little information with regard to its safety or efficacy in this group. Because multiple gestations; consequently, there is little information with regard to its safety or efficacy in this group. to the newborn, these neonates could derive particular benefit from delayed umbilical cord clamping. Theoretical risks exist for unfavorable hemodynamic changes during delayed umbilical cord clamping, especially in monochorionic multiple gestations. At this time, there is not sufficient evidence to recommend for or against delayed umbilical cord clamping in multiple gestations. The effect of delayed umbilical cord blood bank setting (31). The authors found that delayed umbilical cord blood bank setting (31). The proportion of units that met initial screening criteria decreased significantly from 39% with immediate cord clamping. In cases in which a patient and family are planning donation of umbilical cord clamping. In cases in which there was a 60-second delay in umbilical cord clamping may increase the yield of cord blood obtained. However, in the absence of directed donation, the benefits to the infant of transfusion of additional blood volume at birth likely exceed the benefits of banking that volume for possible future use. Families who are considering banking of umbilical cord blood should be counseled accordingly. Although many randomized controlled trials that involved term and preterm infants have compared the benefits of delayed umbilical clamping with those of immediate cord clamping, the ideal timing for umbilical cord clamping in specific circumstances warrants further investigation. For example, infants requiring resuscitation may benefit considerably from placental transfusion, but their need for immediate attention raises questions about whether they should undergo immediate or delayed umbilical cord clamping and whether umbilical cord clamping and whether they should undergo immediate or delayed umbilical cord clamping and whether they should undergo immediate or delayed umbilical cord clamping and whether they should undergo immediate or delayed umbilical cord clamping and whether they should undergo immediate or delayed umbilical cord clamping and whether they should undergo immediate or delayed umbilical cord clamping and whether they should undergo immediate or delayed umbilical cord clamping and whether they should undergo immediate or delayed umbilical cord clamping and whether they should undergo immediate or delayed umbilical cord clamping and whether they should undergo immediate or delayed umbilical cord clamping and whether they should undergo immediate or delayed umbilical cord clamping and whether they should undergo immediate or delayed umbilical cord clamping and whether they should undergo immediate or delayed umbilical cord clamping and whether they should undergo immediate or delayed umbilical cord clamping and whether they should undergo immediate or delayed umbilical cord clamping and whether they should undergo immediate or delayed umbilical cord clamping and whether they should undergo immediate or delayed umbilical cord clamping and whether they should undergo immediate or delayed umbilical cord clamping and whether they should undergo immediate or delayed umbilical cord clamping and whether they should undergo immediate or delayed umbilical cord clamping and whether they should undergo immediate or delayed umbilical cord clamping and whether they should undergo immediate or delayed umbilical cord clamping and whether they should umbilical cord clamping and whether they should umbilical cord clamping and the sh birth in relation to umbilical cord clamping needs further study, as does the optimal practice in multiple gestations and pregnancies with risk factors for neonatal polycythemia. Finally, the value of enhanced stem cell and plasma transfusion associated with delayed umbilical cord clamping with respect to immediate and long-term immunity, host defense, and repair is another important area for future research. Term and preterm infants appear to derive benefit from delayed umbilical cord clamping for at least 30-60 seconds is recommended in term and preterm infants except when immediate umbilical cord clamping is necessary because of neonatal or maternal indications. In term infants, delayed umbilical cord clamping increases hemoglobin levels at birth and improves iron stores in the first several months of life, which may have a favorable effect on developmental outcomes. There is a small increase in jaundice requiring phototherapy in term infants undergoing delayed umbilical cord clamping. Consequently, obstetrician-gynecologists and other obstetric care providers adopting delayed cord clamping in term infants. Delayed umbilical cord clamping is associated with significant neonatal benefits in preterm infants, including improved transitional circulation, better establishment of red blood cell volume, decreased need for blood transfusion, and lower incidence of necrotizing enterocolitis and intraventricular hemorrhage. In terms of maternal outcomes, delayed umbilical cord clamping does not increase the risk of postpartum hemorrhage or the need for blood transfusion. Additionally, postpartum maternal hemoglobin levels are not affected by delayed compared with immediate umbilical cord clamping. Yao AC, Moinian M, Lind J. Distribution of blood between infant and placenta after birth. Lancet 1969; 2:871 -3. Article Locations: Linderkamp O. Placental transfusion: determinants and effects. Clin Perinatol 1982; 9: 559 – 92. Article Locations: Philip AG, Saigal S. When should we clamp the umbilical cord?. Neoreviews 2004; 5: e142 – 54. Article Locations: Philip AG, Saigal S. 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