A Case of Severe Infant-to-Placenta Hemorrhage in Association with Prolonged Delayed Cord Clamping

Authors' Contribution:
Study Design A
Data Collection B
Statistical Analysis C
Data Interpretation D
Manuscript Preparation E
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Patient:	**Male, newborn**
Final Diagnosis:	**Hemorrhage**
Symptoms:	**Hemorrhagic shock • respiratory distress**
Medication:	**—**
Clinical Procedure:	**Blood transfusion • CPAP treatment • head scan • saline bolus**
Specialty:	**Pediatrics and Neonatology**

Objective: **Unusual clinical course**

Background: Delayed cord clamping is a well-established and evidence-based clinical practice which has improved the outcomes of many infants. Because of the positive effects of delayed cord clamping, non-evidence-based practices, including delaying cord clamping for up to 1 h until complete non-severance of the placenta, are becoming more widespread.

Case Report: A full-term infant, born vigorous and well at a hospital, was hypotonic and poorly perfused at 50 min of age. Lab tests at 2 h of age showed metabolic acidosis with a pH of 6.95 and base excess of −18. The hemoglobin level decreased from 226 g/L in the umbilical cord at birth to 108 g/L in the infant at 12 h of age. Infection, cardiac malformation, and internal hemorrhage were ruled out. Review of the perinatal history revealed the cord was deliberately not clamped until the infant was about 50 min old and the placenta was placed below the level of the child during this time. The infant was considered to have lost a large volume of blood into the placenta, causing a hypovolemic shock.

Conclusions: Different medical societies recommend delayed cord clamping from at least 30 sec up to 3 min, and there is no evidence of additional benefits after the placenta has been delivered and cord pulsations have ceased. This case report shows that extremely late cord clamping can be acutely dangerous to the infant. It is important to discourage from this practice, and if parents reject cord clamping, the positioning of the placenta may be important.

MeSH Keywords: **Acidosis • Hypovolemia • Parturition • Placenta • Term Birth • Umbilical Cord**

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Background

In the early 2000s, the common practice was to clamp and cut the umbilical cord within 15 to 20 sec after birth [1]. Since then, many studies have shown advantages for the infant when cord clamping is delayed for at least 1 to 3 min, and likely even until pulsations in the cord have ceased and the placenta is delivered [2–4]. Delayed cord clamping improves iron status at 4 months of age [4], reduces anemia at 8 and 12 months of age [3], and improves long-term neurodevelopmental outcomes [5,6]. In preterm infants, delayed cord clamping reduces hospital mortality and the proportion of infants having blood transfusion by 10% [7]. There have been concerns about the increased risk of hyperbilirubinemia and polycythemia associated with delayed clamping; however, the benefits have been judged to exceed the risks [7,8].

In vigorous-term and preterm infants, delayed cord clamping of at least 30 to 60 sec after birth is recommended by the American College of Obstetricians and Gynecologists, for 1 to 3 min by the WHO, and until the cord is flat and pulseless by the Pan American Health Organization [1,9,10]. In Sweden, the practice of delaying cord clamping for 1 to 3 min has been recommended since 2008 [11].

The best timing of cord clamping is a topic of discussion. One argument for clamping the cord within 1 to 2 min is that later cord clamping may affect blood gas analysis, although some authors argue that blood gas sampling without clamping the cord could prevent this problem [12,13]. Additionally, there is no scientific evidence for delaying cord clamping after pulsations have ceased, the placenta has been delivered, or after 3 to 5 min after birth. On the contrary, there is evidence that most of the transfusion happens within the first 1 to 3 min of life [14].

Regardless of the lack of evidence of its benefits, there is a trend toward even later cord clamping. The most extreme practice is called the Lotus birth. In a Lotus birth, or umbilical non-severance, the cord is kept attached to the child until it falls off naturally, which can take from several days to weeks [15]. The practice was named after Clair Lotus Day who, in 1974, imitated the practice of anthropoid apes of not severing the umbilical cord, and never cut the cord of her newborn. This is promoted as a natural way to keep the skin-to-skin contact uninterrupted between mother and child after birth and is a part of a holistic approach to childbirth [15]. Reported negative side effects of the Lotus birth are neonatal hepatitis [16] and sepsis/endocarditis [17]. This practice is also advised against by health professionals [18]. A less extreme way to improve bonding and support uninterrupted skin-to-skin contact between a mother and her newborn infant is to wait to clamp and cut the cord until all care of the mother is done. In this case, the placenta is placed next to the mother and kept attached to the baby until the time to cut the cord seems right, taking anywhere from 15 min to 3 h. Some argue that the health effects of delayed cord clamping are enhanced with this practice. These 2 practices have not been scientifically proven to have advantages but are nonetheless spread through internet sites.

Case Report

A full-term male infant (gestational age 40^{+0}) was born vaginally with a birth weight of 4138 g (+1 standard deviation). He was vigorous and well and had an Apgar score of 9-10-10. An arterial blood gas measurement taken from the umbilical cord within minutes after birth showed a pH of 7.24, base excess (BE) of –6.2, and hemoglobin level of 226 g/L. He was placed skin-to-skin on his mother's chest after birth. To avoid interrupting the mother and newborn infant interaction, the umbilical cord was left unclamped and uncut, although this was not requested by the parents. Pulsations in the cord were not monitored. After the placenta was delivered, it was put into a plastic bag next to the mother on the bed and at a lower level than the infant. While the mother was being sutured, the infant was crying and rooting for the breast.

At 50 min of age, the infant was pale and hypotonic. The midwife brought him to the nearby resuscitation room, applied continuous positive airway pressure (CPAP) with a Neopuff infant resuscitator, and started glucose gel administration. When the neonatologist arrived, the infant had fast, shallow breathing, pale and greyish color, capillary refill of about 4 seconds, and cold extremities. His oxygen saturation was above 90%. The capillary blood glucose, checked at around 1 h of age, was 4.0 mmol/L. The infant was believed to be in a probable septic shock. He was taken to the neonatal ward and antibiotics were started. The first blood gas on the infant at 2 h of age showed a pH of 6.95, BE of -18, lactate of 13.9 mmol/L, blood glucose of 7.6 mmol/L, and hemoglobin of 143 g/L. The infant was given a saline bolus of 10 mL/kg to treat the metabolic acidosis and hypovolemic shock. An echocardiogram was performed to rule out cardiac malformation and showed a structurally normal heart, persistent ductus arteriosus with a bidirectional shunt, and signs of hypovolemia.

On the subsequent blood tests, hemoglobin levels continued to decrease to 131, 113, and 108 g/L, at 12 h of age. The lactate level decreased from 14 to 1.4 mmol/L. Due to the circulatory shock and decreasing hemoglobin levels, the infant was believed to have lost a large amount of blood, with circulatory failure as a consequence. At approximately 12 h of age, the infant was given an erythrocyte transfusion of 15 mL/kg. The next day, the infant was clinically well, CPAP treatment was ceased, and the infant was fed enterally.

The etiology of the large hemorrhage was investigated. Ultrasound of the brain, abdomen, kidneys, and adrenal glands showed no signs of hemorrhage. A chest X-ray showed no signs of hemorrhage, and the infant's hemoglobin level was stabilized after a blood transfusion. The baby had no signs of a bleeding disorder except for a platelet count in the low range, which was thought to be from the large blood loss. A test of the mother for fetal hemoglobin was negative, contradicting fetomaternal transfusion. The placenta was sought but had been discarded before it could be examined. Blood culture results were negative, and antibiotics were stopped after 48 h. There was a slight increase in liver enzyme and creatinine levels, which was thought to be from hypovolemic shock and poor perfusion. The level of magnesium, which had initially been low, improved spontaneously, as did the low platelet count. The infant had a normal newborn examination at discharge from the neonatal ward.

Review of the antenatal and perinatal history revealed that the mother had a high body mass index (38) and was a smoker at the beginning of the pregnancy. She was treated with metformin orally and insulin injections because of gestational diabetes during the pregnancy. She was also given iron parenterally once during the pregnancy for low iron levels. The delivery was induced in gestational week 40^{+0} because of the diabetes and a large fetus, which measured to +22%. The induction had started 5 h before the delivery.

Discussion

The baby was born vigorous with a normal hemoglobin level of 226 g/L and a normal pH level. After 50 min of continued connection between baby and placenta, the baby showed signs of acute hypovolemic shock and decreasing hemoglobin levels, indicating a large postnatal hemorrhage. Fetomaternal transfusion and internal hemorrhages were ruled out. It was decided that the likely etiology of the blood loss was that the infant had lost a large volume of blood into the placenta as an effect of the prolonged delayed cord clamping. The placenta was placed below the infant, which may have increased the risk of an infant-to-placenta transfusion. The infant was also crying, which could have increased the intrathoracic pressure and theoretically reduced venous return from the placenta. The placenta was unfortunately discarded before it could be examined or weighed, which could have strengthened this theory. Some of the decrease in hemoglobin level can be explained by the saline bolus the infant was given; however, this is only a partial explanation since the hemoglobin level had decreased from 226 g/L to 146 g/L before the saline bolus was given. Even though the infant could have had unknown risk factors that increased the risk of blood loss, the timing of the cord clamping was most likely the cause of the hemorrhage.

Delayed cord clamping, defined as waiting 1 to 3 min after birth, has been recommended in Sweden since 2008 [11]. The initial recommendation to hold the baby below or at placenta level for at least 30 sec was abandoned in accordance with results from later studies showing no differences in placental transfusion when the infant was placed on the mother's chest for skin-to-skin contact [19,20]. However, early studies on placental blood transfusion showed that the position of the placenta was of importance, indicating that the level may be important in some individuals [21]. There are no studies in the literature showing what happens with vascular resistance in the placenta after it has been delivered and the energy supply has stopped, but theoretically, there could be a relaxation of the vessels. Such relaxation may be of greater importance if the placenta is on a lower level than the infant.

In our literature review, we found no scientific evidence that delaying cord clamping beyond the time of the placenta delivery or the cessation of pulsations in the cord has any advantages. In contrast, most of the placental transfusion seems to happen within the first 3 min of age [14], although uterine contractions seem to benefit placental transfusion, indicating that cord clamping before placenta delivery could decrease placental transfusion [22].

Even though there are no known benefits to improved placental transfusion, there may be other objectives for not disturbing the infant and mother after birth. Early skin-to-skin contact between mother and child promotes breastfeeding [23] and, at least in preterm infants, has shown long-term benefits in neurodevelopment and growth, indicating its positive effects [24,25]. Interventions to support skin-to-skin contact are likely to be beneficial for both mother and child. In certain situations, the interruption of the mother-to-infant interaction that is necessary when cutting the cord close to the infant could disturb this important bonding. We argue that clamping the cord close to the placenta would be as safe as clamping it close to the infant. The cord could then be cut shorter at a later time.

In cases when parents reject cord clamping, such as in a Lotus birth, it is crucial that the parents are informed about what risks this practice may have, including the risk of large blood loss. If the parents persist in their wish, proper positioning of the placenta after birth may decrease the risk of infant-to-placenta transfusion.

Conclusions

Delayed cord clamping of 1 to 3 min is beneficial for the newborn infant, but there is no evidence that further prolonged delay has any positive effects. This case report shows that

waiting too long may even cause dangerous consequences for the newborn infant. Our recommendation is to clamp the cord according to the recommendations, and at the latest on the delivery of the placenta or when cord pulsations have ceased. If the parents reject cord clamping, positioning of the placenta may be of importance.

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