Views and counter views A view on why immediate cord clamping must cease in routine obstetric delivery

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Key content:

- There is good evidence that immediate cord clamping can harm the newborn baby.
- Delaying cord clamping for at least 30 seconds is possible in all deliveries.

Learning objectives:

- To increase awareness of the need for routine delayed clamping by obstetricians and midwives.
- To explore the practice in the presence of fetal distress and nuchal cord.

Ethical issues:

- How can a balance be struck between the legal drive for cord blood measurements at birth, which requires immediate cord clamping, and the therapeutically driven delay in cord clamping?

Keywords anaemia / delayed cord clamping / fetal distress / hypovolaemia / nuchal cord

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COMMENTARY
Delayed cord clamping

Active management of the third stage, involving the use of oxytocics, early cord clamping and controlled cord traction, has undoubtedly helped to reduce haemorrhagic morbidity for mothers worldwide. The role of early cord clamping in this, however, has been accepted into clinical practice without much consideration or evaluation of the potential harm to the baby. Perhaps because the vast majority of term neonates are healthy with no obvious problems, the practice has been accepted without thought. Recent studies indicate that most staff will cut and clamp the cord within 1 minute of delivery – often with the baby on the mother's abdomen.

We are now in an age where even our most deeply entrenched beliefs are being re-evaluated in the context of providing a strong evidence base for all of our practice. Rightly, the issue of early versus delayed cord clamping is under the microscope. As is often the case, we are currently hampered by a lack of good evidence. In light of recent papers in the *BMJ* and even BBC coverage, David Hutchon's article is timely. A balance of risks exists between the need to prevent harm to the mother and the healthy baby and the need to allow resuscitation of the baby. Clearly, there are some cases where resuscitation should not be delayed or delivery is impossible without the division of a tight nuchal cord but these are exceptions. Many still remain unconvinced of the true benefits of delayed clamping. If this article is not convincing enough to encourage a change of practice at this stage, it may raise the profile of the discussion. Even as we write, plans are afoot for a multicentre UK-based randomised controlled trial on the subject.

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Introduction

The controversy about the best time to clamp the cord at birth started over 2000 years ago with Aristotle,[1] who observed that:

> 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 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.

In 1773, when discussing the complex changes from fetal to adult circulation that take place at birth, the eminent Manchester obstetrician, Charles White,[2] asked: 'Is it possible that this wonderful alteration in the human machine should be properly brought about in one instant of time, and at the will of a by-stander?'. His message was reinforced in 1801 by Erasmus Darwin,[3] Charles Darwin's grandfather:

> 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, a portion of the blood being left in the placenta, which ought to have been in the child.

And in 1842, Meigs[4] wrote:

> Regarding clamping a cord around the neck … I have known an accoucheur's capability called harshly into question upon this very point of practice. I have never felt it necessary to do it but once. The cord should not be cut until the pulsations have ceased.

More recently, *Williams Obstetrics*[5] advised: 'Whenever possible, clamping or ligating the umbilical cord should be deferred until its pulsations wane or, at least, for one or two minutes'.

Without doubt, immediate cord clamping is not physiological. It is interesting to note that equine veterinary practice forbids interfering with physiology by early cord clamping in newborn foals. Term newborn foals subjected to immediate cord clamping often develop a convulsive syndrome very similar to respiratory distress syndrome of the newborn in humans.[6]

Physiology

The physiological transformation from placental to pulmonary respiration takes place over several minutes. Resistance in the fetal pulmonary circulation is high and, in the term neonate, blood flow is approximately 75 ml/min/kg before the first breath. Soon after the lungs are expanded, the resistance falls and most of the output from the right ventricle (250 ml/min/kg) passes thorough the lungs. Oxygenation in the neonate's lungs results in much higher oxygen tension in the blood; this stimulates constriction of the ductus arteriosus, cord arteries and arterioles. As less blood is pumped out into the placental circulation, more is available to fill the pulmonary vascular tree. The constriction to placental flow is gradual and takes place on the arterial side, only

allowing venous return to continue. Applying a clamp to the cord before placental circulation has ceased results in an abrupt obstruction of this part of the vascular tree, a sudden rise in blood pressure and a loss of the normal venous return from the placenta.

A normal circulating blood volume is important in maintaining the ventilation and perfusion in the lungs. A network of distended alveolar capillaries supports the alveolar surface and, together with the presence of surfactant, helps to prevent collapse of the alveoli at the end of respiration.

Benefits of delayed cord clamping

Considerable grade I evidence supports the benefits of delayed cord clamping. Immediate clamping of the cord at birth leads to hypovolaemia[7] and anaemia[8] of the neonate, with serious consequences in preterm neonates.[9] A delay in cord clamping of as little as 30 seconds reduces the need for neonatal transfusion and the incidence of anaemia. There is also a lower incidence of intracranial haemorrhage.[10] Before the widespread antenatal use of corticosteroids in preterm births, Dunn[11] showed that delivery of the baby and placenta together at caesarean section, followed by resuscitation of the preterm infant *before* clamping the cord, led to a four-fold reduction in neonatal mortality.

A baby that breathes within 2 minutes of birth usually survives. If the process is interrupted by cord clamping, which obstructs the placental circulation, survival can be compromised. A baby that does not breathe within 2 minutes of delivery is unlikely to survive at all unless resuscitative measures are put in place; their success depends on the condition of the baby. Resuscitation commenced after immediate cord clamping can result in hypovolaemia, a condition that may not be treated for many hours. By this time, irreversible damage may have occurred. The Newborn Life Support guidelines[12] point out that hypovolaemia needs to be considered in any baby that fails to respond to normal resuscitation measures.

There are three situations where immediate clamping is current practice: I believe it has serious consequences and should be avoided.

Preterm birth

All babies need to be protected from hypothermia but the preterm baby is particularly vulnerable. At preterm birth, the neonate should be wrapped in a warm towel and held at the level of the placenta for at least 30 seconds before clamping the cord. Another approach is to place the baby immediately in a polythene bag to prevent hypothermia.

Following publication of the 2004 Cochrane review[9] of cord clamping, the BBC reported that only half of maternity units in the UK wait before clamping the cord, and added: 'premature babies often have trouble breathing, so doctors aim to move them to special care baby units where they are helped to breathe, which requires the umbilical cord to be clamped and cut quickly.'[13] A survey taken at the British Fetal & Maternal Medicine Society meeting in 2005 suggested that the percentage of obstetricians practising delayed cord clamping was considerably lower than 50% and the main reason given was practical difficulties.[14]

The 2005 Newborn Life Support resuscitation guidelines, published by the Resuscitation Council (UK),[12] state that cord clamping can be delayed by about 1 minute after birth for the term baby who is not pale or limp. The recommendation is that if the baby is not breathing after 90 seconds they are moved to the resuscitation area. This is sufficient time for the recommended delayed cord clamping. Inexplicably, they do not recommend this delay in the significantly preterm infant, although all the evidence points to benefit in this group. In the controlled study by Kimmond *et al.*,[15] delayed cord clamping was demonstrated to have definite benefits for preterm babies delivered vaginally between 27 and 33 weeks of gestation. The only exclusions in this study were babies with major congenital malformations or haemolytic disease.

Caesarean section

Delayed cord clamping is particularly important in all caesarean births, as time is needed for the uterus to contract and compress the placenta, returning more blood to the neonate. Some of these babies will also be preterm. In a randomised controlled study of very preterm infants of 25–31 weeks' gestation, Mercer *et al.*[10] showed a marked benefit to the delayed clamping group, with a lower incidence of intraventricular haemorrhage and late onset sepsis. Forty percent of these babies were delivered by caesarean section. Exclusions included major congenital abnormalities, multiple gestations, intention to withhold treatment and placenta praevia.

Nuchal cord

At delivery in a sitation of fetal distress associated with nuchal cord, every effort should be made to relieve the compression on the cord before clamping it. Cord compression results in an engorged placenta and a hypoxic and hypovolaemic neonate.[16] If cord compression is relieved and pulmonary respiration has commenced before the cord is clamped, both these problems are reversed. Mercer[17] explains a somersault technique previously described by Schorn and Blanco in 1991, that can be used to relieve nuchal cord compression when the cord cannot be loosened enough to pass over the head or

body. Cerebral palsy is considered a consequence of cutting the nuchal cord before delivery.[18]

A practical approach to delayed cord clamping

The level of the baby relative to the placenta affects the rate at which blood returns from the placenta to the neonate. The baby should be at or below the level of the uterus during the delay and when the cord is clamped to maximise placental transfusion. Holding the baby up to 20 cm below the uterus results in a more rapid transfer of blood.

In most births, a delay of 30 seconds before clamping, dividing the cord and passing the baby over to the care of the paediatrician should not pose significant problems. In spite of this, even a wait of 30 seconds is not normally met. In the infant with respiratory depression, or in the baby with a nuchal cord, resuscitation with the cord intact is the ideal. With a little preparation, there should be no problem in bringing pressure-controlled oxygen and suction from the Resuscitaire® (Dräger Medical AG & Co. KG, Lübeck, Germany) to the baby on the delivery table. For caesarean delivery, sterile tubing is passed from the operating table to the Resuscitaire; sterile neonatal face-masks, endotracheal tubes and laryngoscopes are available. At caesarean section, the paediatrician needs to be gowned and gloved. Mask ventilation, or even endotracheal intubation, is quite feasible.[19] A Laerdal® self-inflating resuscitation bag (Laerdal Medical, Kent, UK) can be gas sterilised and made available in the obstetric theatre. If preparations have not been made for an oxygen supply, the inflation bag can be used to ventilate the baby with air. 'Cord milking' is sometimes carried out as a compromise to delay. Recent evidence suggests that there may be some merit in this approach.[20]

It is essential that the interval in seconds from delivery to cord clamping is documented in the notes. Ideally, the time should be counted out in 10-second intervals.

Contraindications

Placenta praevia and vasa praevia can result in fetal blood loss. In these conditions, the cord should be clamped as soon as possible after delivery. Arrangements for immediate transfusion, possibly with the residual placental blood, can be considered.

Counter views

While there is no doubt that immediate cord clamping is not physiological, concerns are sometimes expressed about polycythemia, hyperbilirubinaemia and hypothermia. Polycythemia was not identified as a problem in any of the recent trials, although, as expected, neonatal haemoglobin levels were higher. Physiological jaundice was more common but did not cause any actual problems. Breastfeeding is rightly encouraged, although it is known to make physiological jaundice more common. Temperature control is easily overcome with commonsense measures. There is no interference with active management of the third stage of labour, which involves cord clamping at 1 minute.

Medico-legal defence

For medico-legal reasons, the Royal College of Obstetricians and Gynaecologists (RCOG) and the American College of Obstetricians and Gynecologists recommend taking cord blood samples at delivery for acid-base assessment. Delayed clamping can alter cord blood gases, rendering their measurement unsuitable for defence evidence, should this be required. This possibility should not alter the optimal treatment of the neonate.

Cord blood banking

There may be insufficient blood remaining in the placenta for stem cell collection if delayed cord clamping is carried out. The RCOG offers the specific recommendation that there should be no alteration in the 'usual management' of the third stage when cord blood banking is done.[21]

Conclusion

Although the obstetrician or midwife carries out the cord clamping, care of the neonate is managed by the paediatrician. Support for delayed cord clamping needs to be voiced by paediatricians and heeded by obstetricians. Delayed cord clamping approaches the normal physiology of birth and has definite advantages for the preterm and term infant. Practical obstructions can be overcome. With preparation and forethought, the baby can be resuscitated, if necessary, with the cord intact at both vaginal and caesarean delivery. This should be standard practice and the interval in seconds from delivery to cord clamping documented.

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