

## Early cord clamping – is it dangerous for the baby ?

David J R Hutchon FRCOG [djrhutchon@hotmail.co.uk](mailto:djrhutchon@hotmail.co.uk) [www.hutchon.net](http://www.hutchon.net)

I hope that by the end of the presentation I will have shown enough evidence that you will realise that cord clamping is not of minor significance and sometimes can be serious for the baby. Who is or should be responsible for the decision about the timing of cord clamping ? Obviously there needs to be co-operation but I cant think of any other area of medicine when the responsibility for an individual's care is transferred so suddenly from one specialty to another. As obstetricians and midwives **we** clearly have to carry out the action of cord clamping. There is likely to be a considerable number of midwives who are trained in neonatal resuscitation and do so from time to time but I doubt there are many obstetricians who ever do so. It s good practice to agree with the paediatrician the management of a preterm birth or a baby with a congenital abnormality, but I wonder if anyone here ever discussed the timing of cord clamping with their paediatric colleague.

There is very good research good evidence from randomised controlled trials of the harm caused by early cord clamping but I suspect you may already know most of it and I am not going to go through it in any detail. Essentially all the research for term babies shows a minor degree of iron deficiency and anaemia which is logically the result of a lower blood volume at birth. What I would like to do is show you that the harm to the baby may be much greater than this but has not been shown in any of the RCT's because of the way they were conducted.

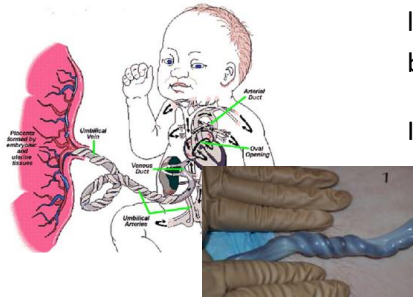
This evidence has been sufficient to persuade a number of institutions around the world to advise **delayed cord clamping**. ILCOR in its 2010 recommendation states that cord clamping should be delayed by **at least one minute** in the term baby not needing resuscitation. But of course it is the obstetrician or midwife who has to make the decision about the condition of the baby and ILCOR are very specific about how this should be done. The heart rate should be assessed with a stethoscope on the baby's chest – so does this mean the obstetrician needs to be wearing a stethoscope. An alternative method recommended is with a pulse oxymeter. And they also recommend that the initial assessment will take 30 seconds. – so this puts clamping off by at least 30 seconds.

Although NICE still includes early clamping as part of active management of the third stage, this has been withdrawn by the WHO. The RCOG changed its guideline last year as it was clear that early cord clamping is not necessary to prevent PPH. They also recommended that the timing be recorded.

And FIGO and the ICM have also recommended delayed clamping for the sake of the baby. This was endorsed by PAHO who make the point that delayed cord clamping and skin to skin immediately after birth can be safely combined.

So the proven harm of early cord clamping is less blood volume, anaemia , and in preterm babies the need for transfusion, iron deficiency, intraventricular haemorrhage and late onset sepsis in preterm babies, and obviously there will be fewer stem cells. The recent RCT by Andersson I think eliminates concern for any increased need for phototherapy.

Lets look at a physiological transition at birth for the baby transferring from placental breathing to lung breathing. Note how full and tense the cord vessels are at birth.



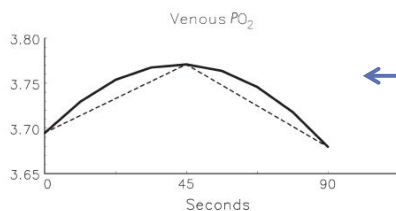
It is often claimed and taught that the placenta stops working as soon as the baby is born. This is clearly not the case. We all know that the cord continues to circulate blood for several minutes after birth and the recent work of Wiberg shows that there is a very useful level of oxygen in the blood

coming back from the placenta - 3.77kPa for at least 90 seconds. This is low for us but only slightly lower than the fetus has been used to for 9 months. It is a lot more than is needed to keep a man

## Placental circulation after birth

The placental circulation **continues for several minutes** until stopped by **vasospasm** in the umbilical arteries and vein.

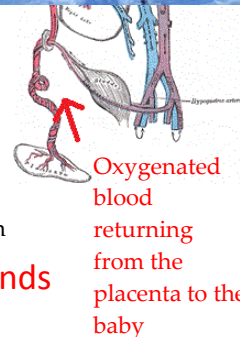
There is a **significant oxygen content 3.7 to 3.77 kPa** in the blood returning to the baby.



← Umbilical vein  
**90 seconds**



full capable at the top of Everest as the recent Caudwell Extreme Expedition showed their arterial oxygen was only 2.55kPa !



The first thing that happens after the baby is born is that it takes its first few breaths. Why it takes its breaths is not fully understood, it may be an extension of

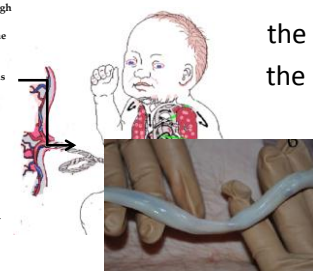
fetal breathing movements. The breathing movement now results in air entering the lungs. It may be the cold and stimulation or a combination. Geoffrey Dawes the father of our understanding of fetal and neonatal physiology stated that the fundamental change in the circulation occurs when the baby breathes and the resistance within the pulmonary circulation falls dramatically, which results in a large increase in the pulmonary blood flow.

The lungs now fill with blood. As the lung circulation opens up the placental circulation closes down.

These changes in blood flow were shown by Dawes. And as the lungs begin to function and fill the blood with oxygen which now reaches the umbilical arteries together with bradykinins or other substances released from lungs, the umbilical arteries constrict and finally close down placental circulation. The umbilical cord is now flaccid and white.

Physiological mechanisms close down the placental circulation, closing down the arterial flow before the venous return so that

As the lungs begin to function, the high oxygen tension in blood reaching the umbilical arteries is a major stimulus to arterial vasospasm, and bradykinins released from the lungs, in addition to handling and cold.



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the baby part of the circulation ends up with a larger volume of blood. So what happens when the cord is clamped before this has occurred ?

The label “ placental transfusion “ is used to describe the redistribution of blood but it is not really an accurate description. In a transfusion the blood starts from outside the body and is transfused in. This blood has never been out of the baby’s circulation. It is not even equivalent to an autologous transfusion.

Weighing the baby for the first few minutes after birth is a very simple and accurate way of measuring this placental transfusion or redistribution. Here the work of Yao was repeated by Farrar using very accurate scales and computers.

No-one dies from an average blood loss at caesarean section. With blood volumes it is not usually the average which is important but the maximum. So we can see here that one baby gained 214gm. That is equivalent to 204mls of blood.

**One baby gained at least 214 gms,  
equivalent to 204 mls blood volume**

If this baby had an immediate cord clamping it would have been severely hypovolaemic.

3225	101 (36-167)	0.0
3332	96 (38-154)	-0.9
3504	139 (64-214)	-0.6
3530	122 (69-174)	7.0
2913	93 (-17-204)	0.0
3426	87 (64-111)	
3613	79 (57-100)	

Dawes recognised that there was a risk of blood being trapped in the placenta. “It can result from elevation of the fetus above the mother” and we need to ensure this is not done at caesarean section. And it can also occur when there is cord compression as he explains.

Lets just have a look at a normal birth. Cord compression can often occur during labour.

Cord compression results in a block in the return of oxygenated blood from the placenta but the high pressure arterial flow out to the placenta continues and the baby loses blood.

### Somersault manoeuvre



If the cord is clamped at this stage the blood will be permanently trapped in the placenta and the result will be a pale baby with low blood pressure.

This is a situation which is quite common in the labour ward. A prolonged deceleration and an emergency delivery. It is often due to a nuchal cord.

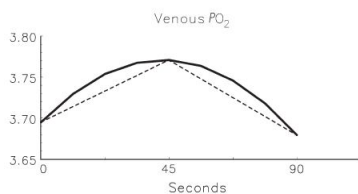
It is very rarely necessary to clamp a nuchal cord and the baby can nearly always be delivered with the cord intact

using the **Somersault manoeuvre**.

Just have a look at these results in case 14. Pathological CTG. Cord pH 7.01 Base excess minus 14.9 One minute Apgar score of 4.

Clearly a baby in need of resuscitation. But this baby did not get traditional resuscitation. It got the natural resuscitation from the continuing placental function. (Wiberg et al)

## Placental resuscitation



So what do ILCOR say ? Babies who do not need resuscitation can be allowed to have a continued supply of oxygen from the placenta but babies who do need resuscitation should have it cut off ! In cardiac surgery you would not stop the heart until you were certain the bypass machine could take over immediately. ILCOR says there is no evidence about

**Table 3.** Cases with low arterial pH at T<sub>0</sub> and/or T<sub>90</sub>. First value represents T<sub>0</sub> and second T<sub>90</sub>. For definition of abnormal values, see text

Case number	Gestational week	CTG	Apgar score at 1, 5, 10 min	pH	PaCO <sub>2</sub> (kPa)	BE (mmol/l)	Lactate (mmol/l)
14	40	Pathological	4-8-10	7.01*-7.01*	11.2*-11.7*	-14.9* to -14.6*	13.3*-13.2*
42	41	Intermediate	8-10-10	7.19-7.07*	6.96-9.9*	-9.7 to -11.5	10.3-11.6*
54	40	Pathological	8-9-10	7.06*-7.02*	10.0*-10.2*	-12.7* to -15.5*	12.2*-12.8*

\*Abnormal value according to reference values.

Ref: Wiberg N, Kallen K, Olofsson P. Delayed umbilical cord clamping at birth has effects on arterial and venous blood gases and lactate concentrations. BJOG 2008;115:697-703.

24/03/2012

what to do about cord clamping when the baby needs resuscitation. However there cannot be any evidence until there is a facility to resuscitate a baby with the cord intact. Patrick van Rheenen showed recently in the BMJ editorial that it is perfectly possible to initiate resuscitation between the mother's legs at a normal delivery.

Thus we have developed the **BASICS** trolley. It is mobile and adjustable so that it can get close to the delivery table, lowered down for vaginal deliveries and over the table for normal deliveries and caesarean section. It is heated to keep the baby warm and with a Neopuff, blender and suction. This will be available commercially for research projects to use.

Up till now I have only mentioned the effects of sudden occlusion of the venous circulation of the placenta. However sudden occlusion of about 40% of the combined cardiac output of the neonatal heart will have a dramatic effect on the remaining circulation. This was recognised by Hofmeyr.

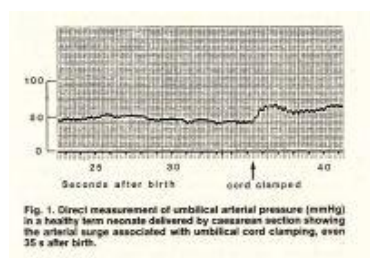
## Effects of cord clamping

.Venous occlusion

.Arterial occlusion (40% of CCO)

Fig 1. Direct measurement of the umbilical arterial pressure in a healthy term neonate delivered by caesarean section showing the arterial surge associated with umbilical cord clamping even 35 s after birth.

Hofmeyr G J. et al  
Periventricular/intraventricular haemorrhage and umbilical cord clamping. S Afr Med J 1988 73 104



24/03/2012

Such an invasive investigation of the neonate would not be permitted nowadays but it is perfectly possible to simulate what must happen to the circulation and we have developed a computer simulation which clearly shows a sudden increase in the cerebral blood pressure and flow when the cord is clamped. It is well accepted that sudden changes in a neonates blood pressure and blood flow is dangerous and needs to be avoided.