SHORT COMMUNICATION

Effect of late vs early clamping of the umbilical cord (on haemoglobin level) in full-term neonates

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Abstract

Sixty term infants delivered vaginally were assigned randomly to one of the two management groups; early cord clamping (ECC) or delayed cord clamping (DCC). Six months after delivery, the children in both groups were called back for follow-up. Blood samples were obtained for measuring haemoglobin (Hb), haematocrit (Hct), mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH), serum iron (SI), transferrin saturation (TS) and serum ferritin (SF) levels. The mean Hb, HCT, SI and TS at 6 months were significantly higher in the DCC group (95% confidence interval (CI); $p<0.001$, $p<0.001$, $p<0.024$ and $p<0.009$). The mean SF at 6 months was also higher in the DCC group but it was not significant ($p<0.071$). Polycythaemia, jaundice and other undesirable side-effects of DCC were not seen.

Keywords: Placental transfusion, Delayed cord clamping, Early cord clamping, Anaemia, Infant.

Introduction

Umbilical cord clamping is one of the oldest interventions that humans have done. It may be early cord clamping (ECC) (clamp of cord $\leq$10 seconds after delivery) or delayed cord clamping (DCC) (clamp of cord 30-180 seconds after delivery).[1,2] DCC is generally considered a new or unproven intervention. All mammals must transfer from placental to pulmonary respiration at birth. Ventilation of the lungs is followed by closure of the placental circulation. That is why obstetricians and midwives still rush to clamp the cord and avoid DCC.[3] Allowing placental transfusion after birth can provide the newborn with a 30% increase in blood volume and up to a 60% increase in red blood cells (RBCs).[4] Several theories about the potential benefits and risks of delaying the clamping of the umbilical cord have been postulated and studied in recent years. Some benefits of DCC are increased haemoglobin (Hb) and haematocrit (Hct) levels for the neonate with a subsequent reduction in rates of anaemia and iron deficiency that may extend into the infancy period.[5]

DCC seems to protect very low birth weight (VLBW) infants from intra-ventricular haemorrhage, late onset sepsis and motor disability.[6,7] On the other hand, DCC may increase rates of hyperbilirubinaemia, polycythaemia, and transient tachypnoea in the newborn or maternal haemorrhage.[8,9] Some studies showed that DCC does not lead to a significant difference in the haematocrit level of the neonate or neonatal polycythaemia.[10,11] Some other studies, however, showed polycythaemia in the DCC group.[12,13] Some studies indicated that 30% of infants seen in a Public Health Service Clinic had anaemia, and approximately 25% had iron deficiency, compared to 8% who had anaemia and 11% who were iron-deficient at some private practice.[14,15] Infants are at high risk of iron deficiency and iron-deficiency anaemia that may cause poorer cognitive, motor and social-emotional function, as well as persisting neurophysiologic differences.[16] The current study was planned to assess cord blood clamping, which tends towards ECC in most labour rooms, and high levels of anaemia that present in young infants in many countries worldwide.

Methods and Results

Sixty term infants born at 40±2 weeks of gestational age delivered through normal vaginal delivery (NVD) were assigned to either DCC (n=30) or ECC (n=30) groups. All deliveries were observed and the time between delivery of the first shoulder and clamping of the umbilical cord was measured with a digital stopwatch. In the ECC group, the cord was clamped immediately after delivery, while in the DCC group it was clamped 50-60 seconds after delivery. The infant was held as low as the cord length permitted after delivery. Six months after delivery, right before the introduction of iron-fortified complementary foods, children were called back for follow-up, and, if there was no exclusion markers such as non-exclusive breastfeeding, past medical history of hospitalisation, abnormal bleeding, thalassemic parents, glucose 6

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Table: Hb, Hct, MCV, MCH, Iron, TIBC, T.S and Ferritin levels in ECC and DCC groups.

	Groups	N	Mean±SD	Max	Min	P value
Hb	ECC	30	10.683±0.16	12.3	8.9	0.001
	DCC	30	11.557±0.17	13.6	9.7	
Hct	ECC	30	31.36±0.39	36	27	0.000
	DCC	30	34.26±0.49	39	29	
MCV	ECC	30	72.355±1.21	80.6	54.9	0.118
	DCC	30	75.221±1.33	83.2	56.2	
MCH	ECC	30	24.697±0.55	28.9	18.2	0.380
	DCC	30	25.386±0.49	28.3	18.4	
Iron	ECC	30	48.97±3.34	91	19	0.024
	DCC	30	62.54±4.76	125	16	
TIBC	ECC	30	397.4±12.96	639	273	0.134
	DCC	30	360.19±20.7	642	30	
T.S	ECC	30	12.76±1.02	26	5	0.009
	DCC	30	18.11±1.66	44	2	
Ferritin	ECC	30	29.200±3.86	71.2	2.9	0.07
	DCC	30	41.946±5.01	120.8	7.6	

ECC: Early cord clamping.
DCC: Delayed cord clamping.
Hb: Haemoglobin.
Hct: Haematocrit.
MCV: Mean corpuscular volume.
MCH: Mean corpuscular haemoglobin.
TIBC: Total iron binding capacity.
TS: Transferrin saturation.

phosphate dehydrogenase deficiency, and cyanotic congenital heart disease, the infants' blood samples were collected for measuring haemoglobin (Hb), haematocrit (Hct), mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH), serum iron (SI), transferrin saturation (TS) and serum ferritin (SF) levels. Data was analysed using SPSS 16 and $p<0.05$ was considered significant. Statistical comparison was performed by Independent-Samples T Test.

The two groups were comparable for maternal age, parity, cord blood Hb-Hct, infants' birth weight, gestation and gender. The mean Hb, Hct, SI and TS at 6 months were significantly higher in the DCC group than in the ECC group (95% CI; $p<0.001$, $p<0.000$, $p<0.024$ and $p<0.009$). The mean SF at 6 months was also higher in the DCC group, but it was not significant ($p<0.071$). The mean MCV and MCH in the DCC group was higher but the difference was not significant. There were no significant polycythaemia, hyperbilirubinaemia and tachypnoea in the DCC newborns. Maternal haemorrhage was not seen in the DCC group either. Only 1(3.3%) patient in the ECC group was polycythaemic because of suffering from cyanotic congenital heart disease.

Discussion and Conclusion

The study, like others, showed that DCC increases term infants' Hb concentrations, Hct, serum iron and TS at 6 months of age. Our findings could be attributable to the proportionate transfer of red blood cells and plasma from placenta to infant in the two groups. Unlike some studies that measured Hb and Hct only 48 hours after delivery, we measured them after delivery and at 6 months.

The results of some studies were not the same as our study and that may be due to the difference in the level of newborns to the placenta and difference in the time of cord clamping. We held the newborns lower than the placenta as soon as possible after delivery. Perhaps in our setting, using gravity for added blood transfusion would be particularly beneficial in order to ensure the maximum amount of placental blood reaching the newborn. Polycythaemia in the DCC group. It may be due to the differences in delay times for cord clamping. In our study, DCC, compared to ECC, resulted in improved iron status and reduced prevalence of iron deficiency at 6 months of age, and reduced prevalence of neonatal anaemia without demonstrable adverse effects. As iron deficiency in infants even without anaemia has been associated with impaired development, DCC seems to benefit full-term infants. DCC is simple, safe and effective and should be implemented in all deliveries, with very few exceptions. However, more studies should be done to design the best time for cord blood clamping. To do better intervention in

umbilical cord clamping, training workshops on birthing and hospital policy may be needed to achieve successful transformation from early to delayed umbilical cord clamping.

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