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Effects of delayed cord clamping on the third stage of labour, maternal haematological parameters and acid–base status in fetuses at term

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ABSTRACT

Objective: To compare the time in the third stage of labour, differences in maternal hematologic parameters 48 h after birth and acid–base status in the umbilical cord between the early cord clamping (ECC) and delayed cord clamping (DCC).

Study design: 97 healthy pregnancies at term and a spontaneous vertex delivery at Clinic University Hospital "Virgen de la Arrixaca" (Murcia, Spain), were randomized to ECC group (<10 s post-delivery) or to DCC group (2 min post-delivery). Duration of the third stage of labour was measured. Samples for acid–base status were taken both from the umbilical artery and vein. Blood samples were taken from the mothers 48 h after birth.

Results: No statistical differences were found in the time of the third stage of labour ($p = 0.35$). No statiscally significant differences were found between the number of red cells ($p = 0.25$), hemoglobin ($p = 0.08$) or hematocrit ($p = 0.15$) in mothers. Umbilical acid–base status or gas analysis did not show any differences between the two groups

Conclusions: Delayed cord clamping does not affect significantly the time of the third stage of labour. It does not show either any effect on the hematological parameters in the mother 48 h after birth.

Introduction

The optimal timing of cord clamping has been controversial ever since Erasmus Darwin wrote: "Another thing very injurious to the child is the tying and cutting of the navel string too soon" in 1801 [1].

Systematic reviews [2,3] of clinical trials have shown that clamping the umbilical cord 30–180 s after delivery has important health benefits (e.g. a lower incidence of iron-deficiency anaemia in the first months of life and physiological advantages for the cardiovascular and cerebrovascular system) related to increased placental transfusion after delayed cord clamping (DCC). However, this is not widely known among midwives and obstetricians, mainly due to concerns that this delay could interfere with neonatal resuscitation [4].

The 1960s brought many improvements in neonatal and obstetric care, among them active management of the third stage of labour in routine obstetric and midwifery practice to reduce postpartum haemorrhage and placental retention [2]. Initially, this included the use of uterotonic drugs and umbilical cord traction to deliver the placenta. For unknown reasons, early cord clamping (ECC) was also incorporated, perhaps due to paediatrician access to the labour ward. Nevertheless, no benefits have been shown for the mother or the newborn [2,5,6]. In contrast, expectant management involves waiting for spontaneous placenta separation and delivery [6].

For prevention of postpartum haemorrhage, the World Health Organisation (WHO) has stated the following: "Late cord clamping (performed after 1–3 min after birth) is recommended for all births while initiating simultaneous essential newborn care" and "Early cord clamping (<1 min after birth) is not recommended unless the neonate is asphyxiated and needs to be moved immediately for resuscitation" (strong recommendation, moderate-quality evidence for both) [7].

Acid–base and cord blood gas analyses are recommended in all high-risk deliveries [8], although this is already routine practice after every delivery in some centres. These analyses are highly relevant to clinicians, since they yield information on the condition of the newborn before and at birth. Although a low umbilical cord pH and a good 5-min Apgar score does not indicate an adverse

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outcome, evidence of normal acid–base and gas analysis of the umbilical vein and artery can be useful if an intrapartum hypoxic-ischemic event is suspected [9].

We hypothesize that the duration of the third stage of labour, maternal haematological parameters and acid–base status would not significantly differ between cords clamped at 10 s and at 2 min post-delivery in healthy and full-term neonates, allowing delayed clamping to be practiced without compromising the important data yielded by these analyses.

Materials and methods

We conducted a randomized prospective study at the "Virgen de la Arrixaca" Clinic University Hospital (Murcia, Spain) which was first approved by the local ethics committee and registered on www.controlled-trials.com (ISRCTN49161976).

Patients were randomized to either ECC or DCC at a ratio of 1:1. To assign patients to these two groups, a computer-generated random-number list was created; the probability of assignment was half (0.5). Each patient was identified by a unique assignment code, and no stratification was used in the randomization.

Pregnant women were informed about the study on admission to the labour ward. A total of 100 healthy full-term pregnant women gave written informed consent and were randomized to the ECC group (<10 s post-delivery, n = 50) or the DCC group (2 min post-delivery, n = 50) as previously described. Inclusion criteria were singleton pregnancy, healthy mother, no pregnancy complications, no fetal abnormalities, spontaneous cephalic vaginal delivery at 37–42 weeks, and Apgar score >7. In the DCC group, 5 cases were excluded due to technical problems with analysing the cord blood sample.

Neonates were held at 20 cm below the introitus in all cases [10]. For the acid–base and cord blood gas analysis, a segment of umbilical cord was double-clamped in the ECC group. In the DCC group, however, umbilical artery and vein blood was obtained from the unclamped cord connected to the placenta after cord clamping. Separate venous and arterial samples were analysed within 15 min using a Radiometer ABL 800 flex Analyzer (Radiometer A/S, Copenhagen, Denmark) [8]. Each fetus had been monitored by continuous cardiotocography (CTG) during both the first and the second stages of labour, and all CTG traces were normal according to International Federation of Obstetrics and Gynecology guidelines [11]. No oxytocin or other uterotonic drugs were administered until the cord had been clamped, and no cord traction was performed in any cases in either group.

The duration of the third stage of labour was measured with a stopwatch and stopped after the delivery of the placenta.

At 48 h post-delivery, a blood test was taken from the mother to check for any haematological differences between the early versus delayed group.

Statistical analysis

Sample size was calculated based on the detection of a 2-min difference in the third stage of labour between the two groups: if a variance of 9 min is assumed for $\alpha = 0.05$ and $\beta = 0.9$, 39 women would be needed for each group. We rounded this to 50 patients per group to adjust for any losses.

Continuous variables were tested for normal distribution using the Kolmogorov–Smirnov test; all normally distributed data are shown as mean ± standard deviation (SD). Categorical variables are expressed as percentages, and any differences between groups were evaluated using the *t* test for continuous variables and the chi-square test for categorical variables. The significance level was set at $P < 0.05$. All statistical analyses were performed using the SPSS® 16.0 software package (SPSS, Chicago, IL).

Results

No significant differences in the maternal or neonatal demographic variables studied were found between the ECC and DCC groups (Table 1). The duration of the third stage of labour did not differ significantly between the two groups ($P = 0.353$), as shown in Table 1 and Fig. 1.

Acid–base and gas analyses were performed in both study arms, but no statistically significant differences were found between the ECC and DCC groups in the umbilical artery (Table 2) or vein (Table 3).

Furthermore, there were no significant differences between the haematological parameters before and 48 h post-delivery in the mother (Table 4).

After birth, all newborns from the two groups made good progress and required no admission to the neonatal care unit.

Table 1
Demographic and obstetric characteristics of the sample.

Characteristics	ECC (n = 50)	DCC (n = 45)	*P*
Maternal age (years)	31.46 ± 5.7	30.18 ± 5.7	0.272
BMI (kg/m^2)	27.4 ± 4.5	28.8 ± 4.8	0.150
Gestational age (weeks)	39.6 ± 1.1	39.5 ± 1.2	0.519
Smoking, n (%)	6 (11.8)	2 (4.4)	0.276
Spontaneous conception, n (%)	49 (96.1)	45 (100)	0.497
Nulliparous, n (%)	19 (36.5)	17 (37.8)	0.900
Spontaneous labour onset, n (%)	38 (73.1)	34 (75.6)	0.781
Epidural anaesthesia, n (%)	40 (78.4)	35 (79.5)	0.894
Meconium-stained amniotic fluid, n (%)	3(5.9)	3(6.8)	1.000
Spontaneous placenta delivery, n (%)	51(98.1)	44(97.8)	1.000
Use of drugs in bearing, n (%)	6(11.5)	5(11.1)	0.947
Oral iron treatment during 3rd T, n (%)	26(52.0)	23(57.5)	0.603
Sex of the neonate			
Male, n (%)	27 (51.9)	16 (35.6)	0.106
Female, n (%)	25 (48.1)	29 (64.4)	
Duration of the second stage of labour (min)	61.1 ± 65.2	59.5 ± 64.1	0.908
Duration of the third stage of labour (min)	8.2 ± 3.3	9.0 ± 5.1	0.353
Birth weight (g)	3181.4 ± 422.7	3293.0 ± 449.7	0.211

Mean ± SD. t-test was used to assess differences among the groups ($P < 0.05$).