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Early versus delayed umbilical cord clamping during cesarean section of pregnant women with preeclampsia: Maternal and neonatal outcome

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ABSTRACT

Background: umbilical cord serves like a conduit for fetus's gas exchange, nourishment, & endocrinal homeostasis. Clamping of umbilical cord marks watershed moment in development of foetus into independent entity.

Aim of the work: To compare effects of early versus delayed cord clamping on intraoperative blood loss during caesarean delivery in cases with severe preeclampsia. As well as to compare neonatal benefit of delayed cord clamping versus early cord clamping.

Patients and methods: This randomized prospective control study was conducted, including 60 near term pregnant women with severe preeclampsia candidate for termination by cesarean delivery and the surgery was performed by qualified staff member at the Obstetrics and Gynecology Department, Al-Azhar University Hospitals. The study duration ranged from 6-12 months.

Results: Postpartum hemorrhage was slightly more frequent in delayed group compared to early group. However, blood transfusion, and Uterotonic administration were slightly less frequent in delayed group compared to early group but without difference between 2 groups.

Conclusion: There was no difference between delayed and early cord clamping as regard maternal or fetal outcomes. Only neonatal crying/breathing established before cord clamping was significantly more frequent in delayed group compared to early group.

Keywords: *umbilical cord clamping; cesarean section; preeclampsia; neonatal outcome.*

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INTRODUCTION

The umbilical cord serves like conduit for fetus's gas exchange, nourishment, & endocrinal homeostasis. Clamping of umbilical cord marks watershed moment in development of fetus into independent entity. After birth, infants' hemoglobin concentration decreases. After birth, transformation from relatively hypoxic state in utero to relatively hyperopic state with rising tissue oxygenation causes decrease in erythropoietin concentration. [1]

Consequently timing of cord clamping, particularly early cord clamping versus delayed cord clamping, has been source of contention. [2]

Cord clamping policies vary, ranging from 1 min after birth to more than 1 min after birth & when cord pulsation has stopped. Early cord clamping is part of rate of 3rd stage of labour, which reduces 3rd stage duration & postpartum blood loss significantly. Delayed umbilical cord clamping in term neonates has been shown to enhance neonatal haemoglobin levels between 24 & 48 hours of life, iron stores between three & six months of years old, & neurodevelopmental indices up to four years of age. [3]

Late umbilical cord clamping did not increased the risk of postpartum hemorrhage or blood loss during delivery, but it had no effect on postpartum hemoglobin levels & the need for blood donation.[4]

Preeclampsia studied cases may have hem concentration because of intravascular volume depletion & increased serum uric acid levels.[5]

Delayed cord clamping helps to reduce the incidence of neonatal anemia at six & twenty four hours of life & should be considered to raise neonatal hemoglobin & hematocrit levels at birth.[6]

Purpose of research was to compare effects of early versus delayed cord clamping on intraoperative loosing blood in studied cases with severe preeclampsia during caesarean delivery. Furthermore, to compare neonatal advantage of late cord clamping versus early cord clamping & to

assess additional necessity blood transfusion actual incidence of postpartum hemorrhage with both techniques.

PATIENTS AND METHODS

The research was randomized prospective control test and will include 60 near term pregnant women with severe preeclampsia candidate for termination by cesarean delivery and the surgery was performed by qualified staff member at the Obstetrics & Gynecology Department, Al- Azhar University Hospitals.

Following have been done to all participants: After discussing nature of research, & expected value, results, & potential adverse effects, informed written consent is obtained. Comprehensive medical history, such as obstetric & pregnancy history (entailing first day of LMP). General (maternal body weight & vital signs) and comprehensive obstetric investigation. Obstetric ultrasonography: to prove gestational period & current pregnancy's eligibility to take part in this research. Preoperative clinical studies, such as duration to prothrombin and accumulation, complete blood count, & liver & kidney function researches.

Group allocation: On day of surgery, studied cases were randomly & equally divided into 2 categories: early clamping (n= 30) & late clamping (n= 30). (Umbilical cord to be clamped within 15 sec). Randomization was performed using computer-generated random numbers in the delayed clamping group (n= 30) (umbilical cord to be clamped at 1 minute).

Number & weight variation of operative towels (before & after LSCS) as well as amount of blood in suction unit were recorded.

Twelve hours after delivery, complete blood count was performed.

Neonatal findings (hemoglobin & hematocrit) were collected within four hours of birth, & initial serum bilirubin was collected at twelve hours of time of life, to be repeated on days 2 & 3 for follow-up.

Estimated Blood Loss was evaluated as follows: amount of surgical towels used. Distinction in operative towel weight (before & after CS) plus amount of blood in suction unit (every 1 gramme of weight variation is = 1 ml blood loss). The EBL was calculated using following formula:

EBL = EBV multiplied by Preoperative hematocrit minus Postoperative hematocrit

Hematocrit after surgery

Where EBV is the studied case's estimated blood volume in mL (= weight in kg 85).

The attending neonatologist collected neonates' clinical data, like Apgar score, blood pressure, temperature, jaundice, pallor, & respiratory distress.

Following delivery, all studied cases were monitored for presence of primary postpartum hemorrhage (within first 24 hours) & necessary for blood transfusion (within first day).

The following are eligibility criteria that patients were met to join the study:

Inclusion criteria: Pregnant females between ages of 20 & 40 who have near-term severe preeclampsia (36 weeks or more), CS under spinal anesthesia, & singleton pregnancy.

Exclusion criteria: Fetal death (IUFD), intra-partum surgical complications (uterine artery injury & lower segment extension, medical disorders like Diabetes mellitus & severe anemia, necessary for immediate resuscitation like meconium aspiration, abnormal placentation, placental abruption) are all possible. , eclampsia or HELLP syndrome, liquor abnormalities; oligo hydramnios and anomalous fetus or Rh incompatibility

Ethical considerations: Study protocol was submitted for approval by Ethical Committee of Faculty of Medicine. Informed verbal and written consent obtained from each participant sharing in the study after explanation of the purpose and procedures of study.

Statistical Analysis: SPSS 22 for Windows was used to collect, tabulate, & analyses all data (SPSS Inc., Chicago, IL, USA). Shapiro Walk research was used to check for normal distribution of data. Frequencies & relative percentages were used to represent qualitative data. To find variation between qualitative variety, Chi square research ($\chi 2$) & Fisher exact were used. For parametric data, quantitative data were expressed as mean SD & for non-parametric data as median & range. For parametric & non-parametric variables, independent T test & Mann Whitney check were used to measure the change between quantitative variables in 2 groups.

RESULTS

	Early (N=30)	Delayed (N=30)	T	P
Age (years) Mean ± SD	31.5 ± 6.29	30.17 ± 5.66	.861	.393
< 35 years	20 (66.7%)	17 (56.7%)	.635	.426
> 35 years	10 (33.3%)	13 (43.3%)		
BMI (kg/m^2) Mean ± SD	26.82 ± 1.69	27.32 ± 1.43	1.24	.221
< 25 kg/m^2	3 (10%)	2 (6.7%)	.664	.717
25 - 30 kg/m^2	14 (46.7%)	12 (40%)		
> 30 kg/m^2	13 (43.3%)	16 (53.3%)		
Parity Mean ± SD	1.22 ± 0.95	1.48 ± 0.89	1.09	.279

Table 1: Demographic data of two studied categories

There is no change between two tested categories regarding years old, BMI, and parity.

	Early (N=30)	Delayed (N=30)	T	P
Operative time (min) Mean± SD	54.82 ± 15.43	58.36 ± 12.67	.971	.336
Estimated blood loss (cc) Mean± SD	784.2 ± 273.4	832.9 ± 314.5	.640	.525

Table 2: Operative characteristics between 2 tested categories

There is no change between two tested categories regarding operative time and estimated blood loss.

	Early (N=30)		Delayed (N=30)		Σ^2	P
	N	%	N	%		
Postpartum hemorrhage	3	10%	4	13.3%	.162	.688
Hysterectomy	1	3.3%	1	3.3%	--	1
Blood transfusion	2	6.7%	1	3.3%	.351	.554
Uterotonic administration	3	10%	2	6.7%	.218	.640

Table 3: Maternal outcome distribution between the two studied groups

This table shows that postpartum hemorrhage was slightly more frequent in delayed group compared to early group. However, blood transfusion, and Uterotonic administration were slightly less frequent in delayed group compared to early group but without change between two groups.

	Early (N=30)	Delayed (N=30)	t	P
GA (weeks) Mean± SD	38.85 ± 1.26	38.42 ± 1.47	1.22	.229
Birth weight (kg) Mean± SD	3.320 ± .314	3.260 ± .435	.613	.543
Apgar at 1 min Mean ± SD	7.1 ± 0.805	7.06 ± 0.964	.174	.862
Apgar at 5 min Mean ± SD	9.91 ± 0.499	9.85 ± 0.521	.478	.635

Table 4: Neonatal characteristics between 2 tested categories

There is no change between two tested categories regarding GA, birth weight & Apgar at 1 min & at 5 min.

	Early (N=30)		Delayed (N=30)		Σ^2	P
	N	%	N	%		
Neonatal crying/breathing established before cord clamping	14	46.7%	28	93.3%	16	.000
Phototherapy for jaundice	1	3.3%	0	--	1.02	.315
NICU admission	1	3.3%	2	6.7%	.351	.554

Table 5: Neonatal outcome distribution between the two studied groups

This table shows that only neonatal crying/breathing established before cord clamping was significantly more frequent in delayed group compared to early group.

	Early (N=30)	Delayed (N=30)	t	P
Umbilical cord venous hemoglobin (g/dl) Mean± SD	13.88 ± 1.3	14.12 ± 1.35	.701	.486
Arterial pH Mean± SD	7.29 ± .253	7.25 ± .324	.533	.596
Venous pH Mean ± SD	7.35 ± .412	7.32 ± .463	.265	.792

Table 6: Umbilical cord measures between 2 tested categories

There is no change between two tested categories regarding umbilical cord venous hemoglobin and arterial pH and venous pH.

DISCUSSION

Placental transfusion is limited in cesarean sections, especially elective CS, & role of delaying umbilical cord clamping is less well understood. Transfusion performance may be influenced by maternal arterial blood pressure, lack of uterine contractions, & potential of newborn-to-placenta opposite flow.[7]

This randomized prospective control study was conducted, including 60 near term pregnant women with severe preeclampsia candidate for termination by cesarean delivery and the surgery was performed by qualified staff member at the Obstetrics and Gynecology Department, Al-Azhar University Hospitals. The study duration ranged from 6-12 months.

There was no change between 2 tested categories (early and late) regarding years old, BMI, & parity or clinical history.

Our findings agreed with those of Mercer et al.[8], who found no change in maternal demographics & clinical variables between DCC & immediate cord clamping groups.

Similarly, Tiemersma et al.[9] demonstrated that 183 mothers were randomly assigned to either early & delayed cord clamping. There were no variations in maternal years old or parity between groups.

Furthermore, Withanathantrige & Goonewardene, [10] found no variations in maternal years old, parity, gestational age, & BMI between groups studied. Majority of mothers were between ages of 30 & 39, & they lived in zones two, three, & four.

The present study showed that as regard maternal outcome distribution between the two studied groups; postpartum hemorrhage was slightly more frequent in delayed group compared to early group. However, blood transfusion, and Uterotonic administration were slightly less frequent in delayed group compared to early group but without variation between the 2 categories.

Consonni et al.[11] demonstrated that Post-partum hemorrhage, characterized as bleeding greater than 1000 mL, was more common in elective CS (19percent vs zero cases in UCM vs 3percent in dUCC, P =.01).

ECC was recommended to decrease postpartum hemorrhage & necessity for mother's blood transfusions.[12] However, De Paco et al.[13] found no link among DCC in term & preterm infants & maternal danger of postpartum haemorrhage, bleeding during delivery, & necessity for blood transfusion. Bleeding measurement (visual estimation versus measuring jar), method of delivering (vaginal versus caesarean section), DCC duration (from thirty seconds to three minutes), & single vs multifetal gestation were all different in these trials.

A number of randomised controlled trials [14] investigated the effect of DCC on maternal bleeding in term infants. According to study of 358 mother-infant pairs from Mexico, DCC for two minutes in normal weight & full-term infants was not associated with increased estimated maternal bleeding at delivery.[15] There were no variations in midwives' assessments of maternal bleeding & hemoglobin on average sixteen hours postpartum between DCC & ECC. 16 2 studies, Chaparro et al.[15], van Rheenen et al.[16], had limitation of not being able to quantify maternal blood loss.

Also, Qian et al.[17] stated that DCC was not linked to increased risk of postpartum hemorrhage & maternal blood transfusion in either caesarean & vaginal delivery.

Our results showed that as regard neonatal characteristics between 2 tested categories; there was no variation between two tested categories regarding GA, birth weight & Apgar at one min and at 5 min. Only neonatal crying/breathing established before cord clamping was significantly more frequent in delayed group compared to early group. There was no variation between 2 tested categories regarding umbilical cord venous hemoglobin and arterial pH and venous pH.

However, in the study of Ranjit et al., [18], on follow-up at six weeks, the DCC group had significantly higher hematocrit (Hct 2) & ferritin levels than ECC group. 1 of infants in ECC group was anaemic. DCC group had higher mean hematocrit on day one of life (Hct 1) than ECC category. Table 2 finds that ECC group had higher number of neonates with anaemia on day 1. Neonates in DCC category needed more phototherapy. There was no statistically variation in need for blood products & other neonatal morbidities.

In addition, Qian et al., [17] late cord clamping in term & preterm infants was associated with higher haemoglobin levels & iron storage, improved infant & child neurodevelopment, less anaemia, rusing blood pressure, & fewer transfusions, & also decreasing levels of intraventricular haemorrhage , Chronic lung illness, necrotizing enterocolitis, & late-onset sepsis are all possibilities. Reducing Apgar scores, neonatal hypothermia, respiratory distress, & serious jaundice were rarely associated with DCC.

Andersson et al.[19] revealed that at twelve months, there was no difference in iron status (mean ferritin grade, 35.40 versus 33.60 ng/mL, P =0.40) or neurodevelopment (mean ASQ total score, 229.60 versus 233.10, P =0.42). Infant gender & ferritin in umbilical cord blood were used to forecast ferritin rates.

In met analysis conducted by Zhao et al.[20] this research identifies & included total of twenty RCTs. For final meta-analysis, all data from 20 researches were combined (3733 infants). Between preterm deliveries, delayed cord clamping raised hematocrit (6–10 weeks) & serum ferritin (6–10 weeks). Delaying cord clamping decreased prevalence of anemia after 6 months of years old (≥6 months), iron deficiency (< 6 months, ≥6 months), & iron deficiency anemia (4-12 months) in term infants, while increasing mean corpuscular volume before 6 months old (< 6 months), hemoglobin after 6 months old (≥6 months), serum iron (2-4 months), total body iron (4-6 months),

serum ferritin (< 6 months, ≥6 months), & transferrin saturation (2-12 months). Other variables revealed no variations between early and late cord clamping categories

CONCLUSION

There was no variations between delayed & early cord clamping as regard maternal or fetal outcomes. Only neonatal crying/breathing established before cord clamping was significantly more frequent in delayed group compared to early group.

Conflict of interest : none

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