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Umbilical Cord Blood Donation during Caesarean Section Does not Lead to Increased Maternal Blood Loss

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Abstract. *Background: Umbilical cord blood haematopoietic stem cell donation (UCBD) has increased in recent years. While performing UCBD during caesarean section, suturing the uterotomy is delayed for a few minutes. The aim of our study was to analyse if this causes an increase in maternal blood loss. Patients and Methods: In this retrospective study, we compared pre- and postpartal haemoglobin levels of 100 patients who delivered by caesarean, either with UCBD (study group) or without UCBD (control group). P-values ≤0.05 were regarded as significant. Results: The main clinical characteristics did not show any significant differences between the two groups. There was no significant difference of decrease in haemoglobin between the study group and the control group (p=0.747). Conclusion: UCBD during caesarean section does not lead to increased maternal blood loss. Objections to the safety of UCBD regarding increased maternal blood loss during caesarean section can be dispelled.*

Because of the successful use of allogeneic umbilical cord haematopoietic stem cell donation (UCBD) for therapy of paediatric leukaemia, the use of this method has increased in recent years (1). The worldwide number of cord blood units rose to 347,000 in February 2009 (2). In 2008, 398 (29.7% of all deliveries) cord blood donations were performed for allogeneic purposes at the University Medical Centre Mannheim, Germany. Donations for autologous purposes were not included in the study.

UCBD can be performed after vaginal delivery as well as during caesarean section (CS). Since the rate of CS has increased significantly in recent years, cord blood donation during this procedure has gained in importance. While the management of vaginal delivery is not modified by UCBD, the CS procedure is changed when performing UCBD: *i.e.* after delivery of the newborn, UCBD is accomplished while the placenta is still *in utero*. Therefore, suturing the uterotomy is delayed for some minutes. The aim of the present study was to analyse if this causes an increase in maternal blood loss.

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Patients and Methods

In this retrospective study, we compared pre- and postpartal haemoglobin (Hb) values of 100 patients who delivered electively by CS. The study group included 50 consecutive patients who had UCBD during CS in the Perinatal Centre at the University Medical Centre Mannheim, Germany in 2007 and 2008. Indications for the CS were breech or oblique presentation, foetal macrosomia and maternal request. Further inclusion criteria were singleton pregnancies and term deliveries (at least 37 completed weeks of gestation). Patients with prepartal anaemia (Hb <10 g/dl), haematopoietic diseases and other diseases that lead to an increased risk of bleeding (*e.g.* preeclampsia), as well as patients who had delivered by CS in a previous pregnancy, were excluded. Complications during CS were also a reason to exclude a patient from the study. For evaluation, we used a control group consisting of 50 consecutive patients of the same period who had undergone a CS without umbilical blood donation that fulfilled the same inclusion and exclusion criteria. Furthermore, there was no significant difference between these groups with regard to age, gravidity, parity, gestational age at the time of delivery, weight of the newborns, and prepartal Hb levels. The technique of the CS was a modified Misgav-Ladach method with routine preoperative urinary catheterization, blunt separation of the fascia after a small incision, and preparing the plica vesicouterina. For UCBD, donation bag systems from Fresenius HemoCare, Eugendorf, Austria (Article No.: 8001149), were used. The umbilical vein was punctured and the donation bag was either filled to two thirds of the bag volume or until the umbilical vein collapsed. The prepartal Hb measurement was to have been available within three days before delivery. Postpartal Hb was always measured on the first day after delivery. Both measurements were performed at the central laboratory of Mannheim University Hospital with a Sysmex XE-2100 by the non-cyanide SLS-haemoglobin method using sodium lauryl sulphate (3). The difference between both measurements was calculated. The Statistical Package for the Social Sciences (SPSS) version 15.0.1 (SPSS Inc., Chicago, IL, USA) was used for statistical evaluation. Non-parametric variables were analysed with the Mann-Whitney *U*-test, parametric variables were analysed with the *t*-test. A *p*-value ≤0.05 was regarded as significant.

Table I. *Main clinical characteristics of the study group and the control group. There were no significant differences between the two groups. The groups were compared using the Mann-Whitney U-test. P-values ≤0.05 were considered to be significant.*

Clinical characteristics	Study group (n=50) Median (range)	Control group (n=50) Median (range)	*P*-value
Maternal age (years)	30 (18-42)	32 (19-42)	0.828
Pregnancy (n)	1 (1-4)	1 (1-5)	0.814
Parity (n)	1 (1-4)	1 (1-5)	0.898
Gestational age at delivery (weeks+days)	38+4 (37+1 to 41+3)	38+2 (37+0 to 42+0)	0.178
Foetal birth weight (g)	3225 (1980-4650)	3205 (2060-4450)	0.430
Prepartal haemoglobin (g/dl)	11.8 (10.1-14.2)	11.7 (10.3-13.9)	0.959

Results

The main clinical characteristics of the study group and the control group are shown in Table I. In none of these characteristics could a significant difference between the two groups be found. The median (range) postpartal Hb value was 10.7 g/dl (7.8 g/dl – 12.8 g/dl) in the study group and 10.6 g/dl (7.1 g/dl – 12.5 g/dl) in the control group. The mean (SD) decrease of Hb was 1.2 g/dl (0.80) in the study group and 1.3 g/dl (0.98) in the control group. Using the *t*-test, there was no significant difference with regard to the decrease of Hb between the two groups (p=0.747).

Discussion

To the best of our knowledge, this is the first study focusing on blood loss during CS due to UCBD. We compared two groups, each of them consisting of 50 term pregnancies without any significant differences in the main clinical characteristics. The mean decrease of Hb showed no significant difference between the study group and the control group.

UCBD is an established method for the therapy of acute leukaemia in children (4). In recent years, the number of successfully accomplished umbilical cord blood transplants has increased continuously. The rate of CS has increased as well by over 40% since 1996, which is partly due to an increase in CS due to maternal request (5). Therefore, UCBD in CS has gained significantly in importance. Nowadays, most institutions use modified Misgav-Ladach technique for CS (6). This technique tends to result in minor blood loss (7). Performing UCBD in CS, the placenta stays *in utero* until UCBD is finished. The suture of the uterotomy is delayed for some minutes. However, this does not lead to increased maternal blood loss.

We consider it to be important to perform UCBD routinely in hospitals, because only with the enlargement of public cord blood banks does the possibility of finding a suitable donor for children with acute leukaemia increase. Performing a cord blood donation is simple and easy to learn.

There are limitations to our study. Only uncomplicated term pregnancies were considered. Patients with prepartal anaemia or other complications were excluded. Therefore no conclusion can be made about blood loss in anaemic patients. Furthermore, any statement about UCBD during CS in preterm deliveries cannot be made, because we took into account patients with at least 37 weeks of gestation at the time of delivery only. However, UCBD is performed mainly in term pregnancies without anaemia or other gestational complications. Our study group consists of typical patients who donate umbilical cord blood.

In summary, this study shows that UCBD during CS does not lead to a significant increase in maternal blood loss. Therefore, doubts about the safety of UCBD during CS can be dispelled.

References

1 Gluckman E and Rocha V: Indications and results of cord blood transplant in children with leukemia. Bone Marrow Transplant, *41(Suppl 2)*: S80-82, 2008.

2 Total number of cord blood units over the last 12 months [database on the Internet]. Bone marrow donors worldwide. 2009 [cited. Available from: http://www.bmdw.org/index.php?id=statistics_cordblood.

3 Inoue H: Overview of automated haematology analyzer XE-2100. Sysmex J Int *9*: 58-64, 1999.

4 Moore AS, Shaw PJ, Hallahan AR, Carter TL, Kilo T, Nivison-Smith I *et al*: Haemopoietic stem cell transplantation for children in Australia and New Zealand, 1998-2006: a report on behalf of the Australasian Bone Marrow Transplant Recipient Registry and the Australian and New Zealand Children's Haematology Oncology Group. Med J Aust *190(3)*: 121-125, 2009.

5 Menacker F, Declercq E and Macdorman MF: Cesarean delivery: background, trends, and epidemiology. Semin Perinatol *30(5)*: 235-241, 2006.

6 Li M, Zou L and Zhu J: Study on modification of the Misgav Ladach method for cesarean section. J Tongji Med Univ *21(1)*: 75-77, 2001.

7 Hofmeyr GJ, Mathai M, Shah A and Novikova N: Techniques for caesarean section. Cochrane Database Syst Rev *2008(1)*: CD004662.

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