Journal of Experimental and Clinical Medicine
https://dergipark.org.tr/omujecm

Research Article

J Exp Clin Med
2022; 39(1): 71-74
doi: 10.52142/omujecm.39.1.15

Determinants for poor perinatal outcome in term pregnancies with umbilical cord prolapse

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Received: 23.05.2021 • **Accepted/Published Online:** 01.06.2021 • **Final Version:** 01.01.2022

Abstract

Umblical cord prolapse is a very rare condition. It is an obstetric emergency that can have unfavourable consequences for the fetus. We aimed to investigate the determinants for poor perinatal outcome following emergency cesarean delivery performed due to umbilical cord prolapse in uncomplicated term pregnancies. Fifty-three term pregnants and their babies born with cesarean section due to umbilical cord prolapse were included in this retrospective study. Newborns who were taken to neonatal intensive care unit were defined as poor perinatal outcome.Eleven of fifty-three newborns needed intensive care. All of them were discharged without any problem after the treatment. The presence of fetal distress detected before or during the umbilical cord prolapse was found to be the only marker associated with poor perinatal outcome. Abnormalities detected in fetal heart rate monitoring before or during umblical cord prolapse increase poor perinatal outcome in uncomplicated term pregnancies.

Keywords: cesarean section, perinatal outcome, umblical cord, newborn

1. Introduction

Umbilical cord prolapse (UCP) is a rare condition in obstetrics practice. Its incidence is generally reported to be between 0.1%-0.6% and increases in non-cephalic presentations, multiple pregnancies, polyhydramnios, or early gestational ages (1, 2). It is classified as an obstetric emergency because it can cause poor neonatal outcomes such as hypoxic encephalopathy and death (2).

Some predictors for perinatal outcome have been identified including location where the prolapse occurred, diagnosis-to-delivery interval (DDI), gestational age/birthweight of the fetus and mode of delivery (3). While when UCP occurs outside the hospital, the mortality rate has been reported as 44% and it has been reported 3% when it occurs inside the hospital (4). Premature and low birth weight infants have less favorable outcomes, and the risk of perinatal mortality was 2-fold higher than in those without UCP (5). In some studies, it has been found that DDI less than 30 minutes is associated with higher Apgar scores (6). And emergency cesarean section (ECS) delivery reduces the risk of perinatal mortality and morbidity compared to vaginal delivery. Nevertheless, poor perinatal outcome may also occur when CS is applied promptly (7).

Umbilical cord prolapse is believed to be as an “all or non event condition’ that causes overwhelming neurological injuries and death. It may cause brain damage to fetus (2, 3). However, there is insufficient information about the factors that may be associated with poor perinatal outcome even when emergency interventions are performed. In our study, we aimed to investigate whether there are any factors that increase the probability of poor perinatal outcome in cesarean delivery which is applied urgently in uncomplicated term pregnancies due to UCP indication.

2. Materials and Methods

This retrospective study included pregnant women who were delivered by cesarean section due to UCP at Zekai Tahir Burak Woman’s Health Education and Research Hospital over a 5-year period. The detection of a segment of the umbilical cord descending through the cervix to the vagina in front of the presenting part of fetus was defined as UCP (3). In our clinics, as soon as UCP is detected, the prolapsed cord is pushed manually from the vagina and an immediate ECS is performed. Pregnant women who were included in the study had term pregnancy and all had singleton vertex presentation fetuses. Pregnant women with complications such as hypertension, diabetes mellitus, intrauterine growth restriction, polyhydramnios was excluded from the study. Multiple pregnancies were also excluded. In addition, pregnant women who had insufficient data about pregnancy follow-up, labor process and perinatal period were excluded from the study. Necessary approval was obtained from the institutional review board of the hospital for the study.

The presence of admission to the neonatal intensive care unit (NICU) of the newborn following cesarean section was defined as poor perinatal outcome. Pregnant women with poor perinatal outcome were classified as case group, while the women with no poor perinatal outcome constituted the

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control group. The data were retrieved from the hospital records and each reviewed with special interest to the demographic parameters and the pregnancy status of the mothers. The gestational age (corrected by the first trimester ultrasonography) and the delivery phase at which the UCP occurred as well as intrapartum fetal well-being determinants (meconium-stained amniotic fluid and fetal heart rate monitoring record), DDI, and the perinatal outcome were also noted. The detection of any recurrent abnormal fetal heartbeat decelerations during fetal heart rate monitoring (FHRM) including prolonged decelerations, moderate-to-severe variable decelerations, late decelerations combined with absent or minimal variability, or bradycardia with a reduction in baseline FHR to less than 70 beats per minute was defined as fetal distress (8).

Statistical analyses were carried out by using the statistical packages for SPSS 17.0 for Windows (SPSS Inc., Chicago, IL, USA). Kolmogorov-Smirnov test was used to determine the data distributions. Continuous variables were expressed as mean ± standard deviation, and categorical variables were given as number (percentage). Continuous variables were analyzed using Students' t-test and categorical variables were compared using a $\chi 2$ test. Factors classified as related risk factors for poor perinatal outcome were assessed using multivariate logistic regression model. The p values less than 0.05 were considered statistically significant.

3. Results

UCP was detected in 68 (0.12%) of 56179 term pregnant women delivered in our hospital during the study period. After exclusion criteria, 53 pregnant women were determined to be eligible for the study. Eleven (20.8%) of them constituted the case group, while 42 (79.2%) of them constituted the control group. All newborns in the case group were taken to NICU due to respiratory distress and were discharged from the hospital without any problem after treatment. No perinatal mortality was detected in the newborns of the study.

Table 1. The clinical and demographic characteristics of groups

	Case group (n=11)	Control group (n=42)	p
Woman's age (year)	27.63±1.80	27.90±3.36	0.800
Gestational age (day)	275.37±6.33	275.26±4.90	0.954
Multiparity	6 (54.5)	23 (54.8)	0.990
Labor induction with oxytocin	7 (63.6)	26 (61.9)	0.916
ARMs	10 (90.9)	35 (83.3)	0.532
Early ARM (before 5 cm cervical dilatation)	4 (36.4)	14 (33.3)	0.850
Meconium-stained amniotic fluid	4 (36.4)	6 (14.3)	0.096
Cervical dilatation (cm) during UCP	6.00±1.00	5.14±1.76	0.129
Fetal head engagement	4 (36.4)	11 (26.2)	0.505
Antecedent or coincedent fetal distress	9 (81.8)	12 (28.6)	**0.001**
Diagnosis to delivery interval (min.)	21.95±3.94	20.18±4.38	0.200
Diagnosis to delivery interval >30 min.	1 (9.1)	2 (4.8)	0.580
Diagnosis to delivery interval>20 min.	7 (63.6)	30 (71.4)	0.616
Newborn birth weight (gr)	3740.00±515.93	3721.90±383.63	0.898
Newborn birth weight ≥4000 gr	6 (54.5)	12 (28.6)	**0.046**
Newborn gender ratio (male/female)	7:4	19:23	0.277

Values were presented as mean±standard deviation and number (%). UCP: Umblical cord prolapse; ARM: Artificial rupture of membranes. p<0.05 was considered as statistically significant.

Table 2. Multivariate analysis of possible risk factors for poor perinatal outcome

	Wald	S.E.	p	OR (95% CI)
Cervical dilatation during UCP	2.37	0.34	0.123	0.59 (0.31-1.15)
Antecedent or coincedent fetal distress	9.04	1.34	**0.003**	56.16 (4.07-775.61)
Meconium-stained amniotic fluid	1.33	1.36	0.249	4.81 (0.33-69.52)
Diagnosis to delivery interval	1.13	0.12	0.287	1.14 (0.90-1.44)
Newborn birth weight ≥4000 gr	0.40	1.04	0.228	1.93 (0.25-14.82)
Newborn gender ratio (male/female)	3.07	1.51	0.080	14.14 (0.73-274.38)

UCP: Umblical cord prolapse; SE: Standart error; OR: Odds ratio, CI: Confidence Interval. p<0.05 was considered as statistically significant

The clinical and demographic characteristics of the groups were listed in Table 1. Maternal and gestational age did not reveal any significant differences between the groups (p=0.800 and p=0.954; respectively). In both groups, more than half of the pregnancies were multiparous (p = 0.990) and more than half were administered oxytocin infusion for labor induction (p = 0.916). In each group, almost all of the pregnancies (90.9% vs. 83.3%) had undergone an artificial rupture of membranes (ARMs) (p=0.532), and about a third of these (36.4% vs. 33.3%) were early ARM (p= 0.850). Although the presence of meconium-stained amniotic fluid was detected more frequently in the case group, the difference between the groups was not significant (36.4% vs. 14.3%; p= 0.096). The cervical dilatation measurements when UCP occurred (p=0.129) and the state of engagement of the fetal head (p=0.505) were similar in both groups. DDI duration in the case group was 21.95 ± 3.94 min, and in the control group it was 20.18 ± 4.38 min. and these values did not reveal a

statistical difference (p=0.200). There were also no significant differences between the groups in terms of DDI >30 or >20 frequency (p=0.580 and p=0.616, respectively). Similarly, no significant difference was found between the birth weights of the newborns (3740.00±515.93 gr vs. 3721.90±383.63 gr; p=0.898). In addition, considering the neonatal gender, the male gender in case group and female gender in the control group was higher, but this difference was not statistically significant (p=0.277). On the other hand, the presence of antecedent or coincident fetal distress (81.8% vs. 28.6%) and newborns with ≥4000gr birthweight (54.5% vs. 28.6%) were significantly more frequent in the case group than in the control group (p=0.001 and p=0.046; respectively). Variable decelerations detected during FHRM in 5 (55.6%) pregnant women and absent / minimal variability in 4 (4.4%) pregnant women were defined as fetal distress. In the control group, the number of these pregnant women was 7 (58.3%) and 5 (41.7%), respectively. The multivariate analysis found that the only significant independent risk factor for poor perinatal outcome was the presence of antecedent or coincident fetal distress (Odds Ratio= 56.16 95% Confidence Interval= 4.07-775.61; p=0.003) (Table 2).

4. Discussion

UCP is an obstetric disaster, fortunately its frequency is quite rare, as found in our study. Today, although the rate of perinatal mortality has gradually decreased in the presence of UCP due to scientific and technological developments in obstetric practice, UCP still causes serious health consequences (9). In our study, we did not observe mortality in any newborn. We think that this result is important and shows that we apply the appropriate management in the presence of UCP. It has been previously reported that mechanical occlusion caused by compression of umbilical cord between the presenting part of fetus and surrounding tissues or vasospasm developing in the umbilical cord due to relatively cold environment in the vagina during UCP may disrupt fetal blood supply and the oxygenation. Also, it was shown to cause deep or total acute asphyxia or subacute hypoxia with poor neonatal outcome (10). In our clinical practice, when we detect UCP, we perform the ECS immediately. At the same time, we also elevate the fetal presenting part with digital examination. In this way, the pressure and the risk of occlusion on the umbilical cord is reduced. We also prepare optimal emergency resuscitation conditions that the newborn may need after birth. We think that these management strategies improve neonatal outcome. Indeed, in the literature, it has been reported that perinatal outcomes during UCP have improved with more liberal ECS administration and better and faster neonatal care (3,11).

Considering the risk factors for poor perinatal outcome related to UCP, the only determined factor was the presence of fetal distress identified before or during UCP. In our study, most of the newborns with poor perinatal outcome (81.8%) had signs of distress in their FHR tracing before delivery. On the other hand, in most of the newborns with no poor outcome (71.4%), signs of fetal distress were not identified. Huang et al. reported that fetal distress to be a strong determinant for low apgar score and poor perinatal outcome, and even severe fetal distress accompanying UCP may be associated with fetal death (10). In contrast, Koonings et al. did not observe any fetal death in the presence of variable deceleration or prolonged deceleration that they detected during fetal monitoring in UCP cases (4). In another study, Nizard et al showed that the incidence of adverse neonatal outcomes was low in the presence of normal findings in FHR monitoring, which lasted at least 20 minutes after the diagnosis of UCP (12). All these studies support our study, albeit partially. As a result of our study and the findings of the above studies, it can be said that the severity and duration of the fetal distress are as important as the presence of fetal distress. However, fetal monitoring alone may be insufficient to show the perinatal outcome. Fetuses with low reserves against distress can experience worse outcomes in the presence of UCP. The fact that fetal death was not observed in the UCP cases accompanied by the findings of variable deceleration and variability loss in our study similar to the findings in the study of Koonings et al. suggest that fetuses with these monitoring findings may have relatively sufficient reserves against UCP. However, additional studies are needed regarding which monitoring finding makes UCP more dangerous for the fetus.

UCP can quickly lead to a dangerous condition for the fetus, resulting in long-term disability or death. Therefore, if the fetus is alive when UCP is diagnosed, it is necessary to deliver it quickly. This type of prompt intervention can positively affect the fetal outcome (6). The generally accepted approach is to deliver UCP cases by ECS delivery. For UCP, which occurs in the first stage of the labor, where there is no full dilatation in the cervix, delivery by ECS is inevitable. In the second stage of the labor, when the cervix is completely dilated, an instrumental delivery can be applied, but even in this case, there are studies reporting that perinatal outcomes are better with ECS (3,6). As we have already mentioned, when we diagnose UCP, we perform ECS delivery in our clinical approach. Therefore, no case in our study was delivered vaginally, which led to the inability to compare the effect of vaginal delivery and cesarean delivery on perinatal outcome.

Although DDI is reported as a determining factor for fetal outcome, there is no full consensus on optimal value for this period. While the German Society of Gynecologists and Obstetricians recommends a maximum of 20 minutes for favorable fetal outcome (13), the Royal College of Obstetricians and Gynecologists (14) and the American College of Obstetricians and Gynecologists and the American Academy of Pediatrics (15) emphasize that this period should not exceed 30 minutes. On the other hand, poor outcomes can be observed in those born with DDIs that are less than 20 minutes, while it has not always been shown that adverse

outcomes are always present for babies born much longer than 30 minutes (16,17). Such contradictions suggest that other factors besides DDI may also be effective. In our study, the mean DDI values (approximately 20 minutes for both) and >20 and >30 minutes DDI frequency of the groups were similar. The number of newborns delivered within 30 minutes was 3, but 1 of them was in the poor outcome group. All babies were discharged without any problem. Our hospital is a refereed center that is active 24 hours a day and has sufficient equipment regarding all kinds of staff and tools in the obstetric field. Therefore, UCP diagnosis can be made easily during labor follow-up and delivery via ECS can be performed quickly, ensuring that the DDI process is short for patients. Perhaps that we have such equipment and ability to intervene quickly leads to good perinatal results. Thus, DDI has moved away from being a factor that may lead to poor perinatal outcome for our study.

The retrospective character of our study may have caused limitations on the variety and reliability of the data. However, it should be remembered that conducting a controlled prospective study on UCP can be very difficult and force ethical rules. In addition, there are no long-term follow-up results for newborns in our study. As a result of this, the morbidity / mortality assessment of the future periods that UCP may cause could not be investigated completely. Unfortunately, the current literature is still insufficient in this regard. On the other hand, since UCP is a very rare condition, there are limited number of studies on UCP and we think that the studies on this subject are important and valuable for the literature.

In conclusion, although UCP is a rare condition during the labor of uncomplicated term pregnant women, it may cause poor results for the newborn. In particular, abnormalities in FHR monitoring detected before or during UCP increase the need of NICU for newborn. Whereas, when the diagnosis of UCP is made, vaginal elevation of the presented part, performing immediate cesarean delivery in a short time and providing optimal care conditions for the newborn increase the expectation of the specialist and parents about good perinatal outcomes. Therefore, providing adequate medical facilities and staffing is very important to improve perinatal outcome during UCP.

Conflict of interest

None to declare.

Acknowledgments

None to declare.

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