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# Retrospective evaluation of risk factors and perinatal outcome of umbilical cord prolapse during labor

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**Abstract. – OBJECTIVE: Umbilical cord prolapse has a reported prevalence of 0.1-0.6%. In previous studies, risk factors for umbilical prolapse have been identified as multiparity, preterm delivery, non-vertex presentation, and obstetric manipulation for labor induction. In the present study, we aimed to investigate the risk factors for umbilical cord prolapse and to determine the factors that may relate to neonatal morbidity in these patients.**

**PATIENTS AND METHODS: This study consisted of recorded cases of umbilical cord prolapse at Dr Zekai Tahir Burak Research and Training Hospital between January 2008 and May 2013. Clinical and demographic data were obtained by reviewing the patients' medical records. Student's t test was performed for parametric variables between groups, and a Chi-square test was performed for nonparametric variables between groups. A logistic regression was performed to investigate the effects of clinical parameters such as gestational age, diagnosis to delivery interval, and fetal presentation on neonatal morbidity.**

**RESULTS: The patients with umbilical cord prolapse during labor had higher rates of preterm deliveries, low-birth-weight infants, and non-vertex presentations than the control group did. Preterm delivery, non-vertex presentation, presence of polyhydramnios, and spontaneous membrane rupture increased the risk of umbilical cord prolapse significantly. In the regression analysis, gestational age and diagnosis to delivery interval greater than 10 minutes predicted adverse neonatal outcomes independently.**

**CONCLUSIONS: Umbilical cord prolapse is more common in cases of preterm delivery, non-vertex fetal presentation, and spontaneous rupture of membranes. A diagnosis to delivery interval greater than ten minutes is independently associated with an adverse neonatal outcome.**

*Key Words:*
Umbilical cord prolapse, Breech and malpresentation, Labor management, Intrapartum fetal assessment.

## Introduction

Umbilical cord prolapse, one of the most distressing obstetrical complications, has a reported prevalence of 0.1-0.6%[1-3]. In previous studies, risk factors for umbilical prolapse have been identified as multiparity, preterm delivery, non-vertex presentation, and obstetric manipulation for labor induction[2-5]. Prompt delivery upon recognition of this condition is necessary, as it has been shown that a short diagnosis to delivery interval improves neonatal outcomes. Cesarean delivery is almost always necessary for fetal viability, except in the case of multiparous patients in whom vaginal delivery is imminent[3,6].

In the present work, we aimed to investigate the risk factors for umbilical cord prolapse and to determine the factors that may relate to neonatal morbidity in these patients.

## Patients and Methods

This study consisted of recorded cases of umbilical cord prolapse at Obstetrics Clinic of Dr Zekai Tahir Burak Research and Training Hospital between January 2008 and May 2013. Umbilical cord prolapse was defined as palpation of the umbilical cord below the presenting fetal part following amniotic membrane rupture. Fetuses with congenital malformations or women with funic presentation with intact amniotic membranes were excluded from the study. During this period, 98 cases of umbilical cord prolapse were detected The following clinical and demographic data were obtained by reviewing the patients' medical records: maternal age, obstetric history, complications in the current pregnancy, stage of labor at delivery, diagnosis to delivery interval, neonatal APGAR scores at 1st and 5th minute, neonatal umbilical cord pH and neonatal complications.



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In our labor ward 9 residents work in 12 hour shifts. Vaginal examination is performed every hour when patients are in active phase of labor. Moreover vaginal examination is also performed in cases of spontaneous membrane rupture or sustained fetal bradycardia. Once cord prolapse is recognized, manual elevation of the presenting part had been done when transporting the patient to the operating room and cesarean section was performed in all of the cases. Three controls per case were randomly selected from the remaining births by using the random table. The study was approved by the local Ethics Committee.

### Statistical Analysis

Statistical analysis was performed using SPSS version 17 (Statistical Package for the Social Sciences, Chicago, IL, USA). Student's *t* test was performed for parametric variables between groups, and a Chi-square test was performed for non-parametric variables between groups. Logistic regression is performed to investigate the effect of clinical parameters such as gestational age, diagnosis to delivery interval and fetal presentation on neonatal morbidity. A *p* value less than 0.05 was considered significant.

## Results

The clinical and demographic characteristics of the patients are shown in Table I. Patients with umbilical cord prolapse during labor had a higher rate of preterm deliveries low birth-weight infants and non-vertex presentations than control group. Advanced maternal age was also higher among these patients than control group. Parity was similar among study patients with umbilical cord prolapse and control group.

The odd's ratio for certain risk factors in our study population are shown in Table II. Preterm delivery, non-vertex presentations, presence of polyhydramnios and spontaneous rupture of membranes increased the risk of umbilical cord prolapse significantly. Moreover mothers who gave birth infants weighing less than 2500 g had a 3.48 fold increased risk of cord prolapse. However, multiparity did not increase the risk.

Among patients there was one case of mortality. The patient admitted to our clinic with preterm labor at 25$^{th}$ gestational weeks. She had two cesarean sections previously. Cord prolapse was identified following spontaneous rupture of membranes. Cesarean section was performed and a female infant weighing 600 g was delivered. Her umbilical venous pH was 7.12 and she died 1 day after birth due to complications of prematurity.

Table III shows certain clinical features of patients with and without complications. Among patients with umbilical cord prolapse, those with complications had significantly higher rates of preterm delivery, spontaneous membrane rupture, non-vertex fetal presentation and diagnosis to delivery interval greater

**Table I.** Clinical data of the study population.

| Characteristics | Cases (n = 98) (%) | Control (n = 294) (%) | *p* |
|---|---|---|---|
| **Maternal age (years)** | | | 0.004 |
| < 19 | 4 (4.1%) | 19 (6.5%) | |
| 19-35 | 81 (82.7%) | 263 (89.5%) | |
| > 35 | 13 (13.3%) | 12 (4.1%) | |
| **Gestational age (weeks)** | | | 0.002 |
| < 37 | 73 (74.5%) | 258 (87.8%) | |
| > 37 | 25 (24.5%) | 36 (12.2%) | |
| **Parity** | | | 0.85 |
| 0 | 36 (36.7%) | 51 (38.6%) | |
| 1-3 | 60 (61.2%) | 172 (74.1%) | |
| ≥ 4 | 2 (2.0%) | 5 (1.7%) | |
| **Presentation** | | | 0.02 |
| Vertex | 84 (85.7%) | 277 (% 94.2) | |
| Breech | 10 (10.2%) | 14 (4.8%) | |
| Transverse | 4 (4.1%) | 3 (1%) | |
| **Birthweight (g)** | | | < 0.001 |
| < 2500 | 79 (80.6%) | 275 (93.5%) | |
| > 2500 | 19 (19.4%) | 19 (6.5%) | |

**Table II.** Risk factors associated with umbilical cord prolapse.

| Characteristics | Cases (n = 98) (%) | Control (n = 294) (%) | Odds ratio | CI |
|---|---|---|---|---|
| Polyhydramnios | 8 (8.2%) | 3 (1.0%) | 8.62 | 2.24-33.18 |
| Birthweight < 2500 | 19 (19.4%) | 19 (6.5%) | 3.48 | 1.76-6.89 |
| Spontaneous membrane rupture | 47 (48%) | 43 (14.6%) | 5.38 | 3.22-8.97 |
| Non-vertex presentation | 14 (14.3%) | 17 (5.8%) | 2.71 | 1.28-5.74 |
| Preterm delivery | 25 (25.5%) | 36 (12.2%) | 2.45 | 1.38-4.35 |
| Multiparity | 62 (63.3%) | 177 (60.2%) | 1.14 | 0.69-1.81 |

than 10 minutes. The rates polyhydramnios, multiparity, presence of active phase of labor and low-birth weight infants was similar among these patients.

Logistic regression was made to analyze effects of certain parameters on neonatal morbidity. In logistic regression model diagnosis to delivery interval (> 10 minutes or < 10 minutes) and fetal presentation (vertex or non-vertex) was used as a dichotomous variable and gestational age at delivery and birth weight were used as a continuous variable. The presence of polyhydramnios was not included in regression analysis since all cases with polyhydramnios had favorable neonatal outcome. Gestational age and birthweight at delivery were both included in analysis since these two variables had a moderate correlation. In regression analysis gestational age and diagnosis to delivery interval greater than 10 minutes predicted adverse neonatal outcome independently.

## Discussion

During the study period there were 100878 births and the prevalence of cord prolapse was 0,097 %. This was consistent with previously reported prevalence[1-3]. In the present study there were more preterm deliveries in patients with umbilical cord prolapse than control group. Moreover, advanced maternal age was more frequent in patients with umbilical cord prolapse. Preterm deliveries were consistently reported to be a risk factor for umbilical cord prolapse. However, advanced maternal age has not been reported to be associated with umbilical cord prolapse previously. Risk of preterm delivery and parity increase in patients with advanced maternal age[7]. And these conditions have been previously shown to increase the risk of umbilical cord prolapse making such an association plausible.

Polyhydramnios has been linked to umbilical cord prolapse in some studies previously[2]. While some others did not examine such relationship[4,8]. In a recent study by Gabbay-Benziv et al[3] the rate of polyhydramnios among patients with umbilical cord prolapse was 5,4 %, however no control group was involved. Our data indicates that polyhydramnios significantly increases the risk of cord prolapse. We suggest increased risk of preterm deliveries and fetal malpresentation as well as spontaneous rupture of membranes in polyhydramnios might account for such association.

**Table III.** Comparision of clinical features in patients with and without neonatal complications.

| | Patients without complications (n = 72) (%) | Patients with complications (n = 26) (%) | p |
|---|---|---|---|
| Polyhydramnios | 8 (11.1%) | 0 | 0.08 |
| Birthweight < 2500 | 8 (26.7%) | 5 (31.3%) | 0.54 |
| Spontaneous membrane rupture | 30 (41.7%) | 17 (65.4%) | 0.04 |
| Preterm delivery | 10 (13.9%) | 15 (57.7%) | < 0.001 |
| Non-vertex presentation | 3 (4.2%) | 11 (42.3%) | < 0.001 |
| Multiparity | 45 (62.5%) | 17 (65.4%) | 0.79 |
| Active phase of labor | 40 (55.6%) | 10 (38.5%) | 0.14 |
| Delivery > 10 minutes | 32 (44.4%) | 18 (69.2%) | 0.03 |

It is not clear whether artificial or spontaneous rupture of membranes increases the risk of umbilical cord prolapse. It has been previously shown that artificial rupture of membranes (ARM) increases the risk of cord prolapse[3,9]. In contrast, others have not found such association[2,10]. Moreover, Dilbaz et al[2] have reported that spontaneous rupture of membranes rather than ARM may increase the risk of cord prolapse. The authors have also suggested that early amniotomy might even decrease the risk of umbilical cord prolapse since they have found that spontaneous membrane rupture in advanced staged of labor increased the risk of umbilical cord prolapse. We agree with Dilbaz et al[2], since our patients had a higher rate of spontaneous membrane rupture. We suggest that this disparity regarding the effect of spontaneous or artificial rupture of membranes on umbilical cord prolapse reflects differences in labor management between centers. In our labor ward, ARM is avoided before a cervical dilatation of 4 cm and until fetal head is engaged while some centers use ARM earlier in the context of active management of labor.

Emergency cesarean delivery is the rule following recognition of cord prolapse. In this study, diagnosis to delivery interval was an independent predictor of adverse neonatal outcome when controlled for gestational age at delivery, fetal presentation and birth weight. Gestational age was an independent predictor of adverse neonatal outcome. However, non-vertex fetal presentation or low birth weight alone did not predict neonatal morbidity independently. We believe this finding is reasonable since non-vertex fetal presentation is more common in preterm deliveries and increased morbidity is largely attributable to prematurity. Our data agree with two recent studies, in which prompt delivery is associated with favorable neonatal outcomes[2,11].

There was only a single of perinatal mortality and the perinatal mortality rate in patients with umbilical cord prolapse was 10,2 per thousand live births. The cord prolapse in this case occurred outside the hospital and the infant suffered extreme prematurity. These findings confirm recent studies which have reported good neonatal outcome[2-4]. As stated by Gabbay-Benziv et al[3], we suggest continuous fetal monitoring and low diagnosis to delivery interval might account for favorable neonatal outcome.

## Conclusions

Umbilical cord prolapse is a rare complication that is more common in preterm deliveries, non-vertex fetal presentation, and spontaneous rupture of membranes. A diagnosis to delivery interval greater than ten minutes is independently associated with adverse neonatal outcome.

### Conflict of Interest

The Authors declare that there are no conflicts of interest.

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