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Overview of Umbilical Cord Prolapse: Evaluation of Maternal and Neonatal Outcomes

Umbilikal Kord Prolapsusunun Değerlendirilmesi: Maternal ve Neonatal Sonuçları

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Abstract

Aim: Umbilical cord prolapse(UCP) is the presence of the umbilical cord preceding ahead of the fetal presenting part with absent membranes through the cervical canal. Despite improved obstetric care and liberal use of cesarean delivery, the incidence has not been decreased dramatically. The purpose of this study was to review the literature and represent clinical experience to improve neonatal outcomes.

Material and Method: A retrospective cohort study was conducted. Patients who experienced umbilical cord prolapse between October 2016 and December 2019 were evaluated in terms of antenatal care, risk factors, labor progress, and neonatal outcomes. Maternal and neonatal outcomes of these patients were compared with the women who underwent emergent cesarean delivery due to acute fetal distress.

Results: Forty-three pregnant women experienced umbilical cord prolapses with an incidence of 11/10.000. The mean cervical dilatation of the patients was 5,4 cm. None of the fetus' presenting part station was below zero. All patients underwent emergent cesarean delivery. The mean interval between UCP and fetal delivery was 16,7 minutes. All patients delivered live newborns. The number of women who underwent emergent cesarean was 255. The APGAR scores of newborns were similar, however admission to NICU differed statistically significant. Intra-operative or postoperative complications did not differ significantly.

Conclusion: Emergent cesarean delivery could improve neonatal outcomes in patients diagnosed with UCP. Fetal wellbeing monitorization, especially in the one hour from rupture of fetal membranes, provides remarkable clues for UCP diagnosis. To improve neonatal outcomes, there should be one available operating theatre for emergent circumstances and a pediatrician for neonatal resuscitation.

Keywords: Umbilical cord prolapse, emergent cesarean, stillbirth, acute fetal distress, diagnosis delivery interval

Öz

Amaç: Umbilikal Kord Prolapsusu (UCP) ,umbilikal kordun fetüsun prezente olan kısmının yanından kayarak servikal kanalın dışında membransız şekilde bulunmasıdır. Sezaryenin liberal kullanılması ve gelişen obstetrik bakıya rağmen insidansta dramatik bir düşüş saptanmamıştır. Bu çalışmada literatürün gözden geçirilmesi, ve neonatal sonuçları iyileştirmek için klinik tecrübenin sunulması amaçlanmıştır.

Gereç ve Yöntem: Retrospektif kohort çalışma planlandı. Ekim 2016-Aralık 2019 tarihleri arsında UCP tecrübe eden hastalar antenatal bakım, UCP risk faktörleri, doğum süreci ve neonatal sonuçlar açısından değerlendirildi. Bu hastaların maternal ve neonatal sonuçları, akut fetal distress(AFD) nedeniyle acil sezaryene alınan hastalarla karşılaştırıldı.

Sonuç: Kırk üç gebe, 11/10.000 insidans oranı ile UCP yaşamıştır. Teşhis anında hastaların ortalama servikal dilatasyon 5,4 cm idi. Hiçbir fetüsun prezente olan kısmının seviyesi '0' altında saptanmadı. Tüm hastalar acil sezaryen ile doğurtuldu. Tanı ile bebeğin doğumu arasındaki süre ortalama 16,7dk. Tüm fetüsler canlı doğurtuldu. Çalışmaya dahil edilen acil sezaryen uygulanan kadın sayısı 255. UCP tanısı ile doğan bebekler ile APGAR skorları benzer olsa dahi, yenidoğan yoğun bakıma kabulde istatistiki anlamlı fark saptandı. Per-operatif ve post-operatif komplikasyonlarda istatistiki farklılık saptanmadı.

Tartışma: UCP tanısı alan hastalarda acil sezaryen ile doğum neonatal sonuçları iyileştirebilmektedir. Fetal iyilik hali monitörizasyonu, özellikle fetal membran rüptüründen sonraki ilk bir saat içinde, UCP teşhisi için önemli ipuçları sağlar.Yenidoğan sonuçlarını iyileştirmek için, doğumhane koşullarında acil durumlar için kullanılabilecek uygun bir ameliyathane ve yenidoğan resüsitasyonu için bir pediatrist her daim ulaşılabilir olmalıdır.

Anahtar Kelimeler: Umblikal kord prolapsusu,acil sezaryen , ölü doğum, akut fetal distres, teşhis doğum aralığı

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INTRODUCTION

The World Health Organization (WHO) defines normal birth as spontaneous in onset, low- risk at the start of labor, and remaining so throughout labor and delivery. The infant is born spontaneously in the vertex position between 37 and 42 completed weeks of pregnancy. After birth mother and infant are in good condition.[1] Despite the normal birth definition, obstetric practice consists of emergent and abnormal events. Umbilical cord prolapse(UCP), which is identified as the presence of the umbilical cord preceding ahead of the fetal presenting part with absent membranes through the cervical canal, is one of the life- threatening conditions of the fetus. The true incidence is hard to consider due to infrequent occurrence; nonetheless, a population-based study revealed that the incidence is 1.6 cases in 1000 births.[2] Risk factors have properly ascertained like prematurity, malpresentation, multiple gestations, polyhydramnios, multiparity, prolonged labor, artificial rupture of membranes (ARM), external cephalic version, and induction of labor.[3-5] Diagnosis can be assessed by visualization or palpation of the umbilical cord in the cervical canal or vagina. No confirmation with any diagnostic tool is needed. Prompt delivery is obligatory to prevent neonatal mortality and adverse outcomes. The prolapsed umbilical cord through the cervical canal is vulnerable to mechanical compression, and cooler temperature. These effects trigger cord vasospasm, deterioration of fetal circulation, hypoxia, and asphyxia. Total compression of the umbilical cord could lead to fetal death. Fetal bradycardia or recurrent variable decelerations especially after artificial or spontaneous rupture of membranes are the clinical findings suggestive of UCP.[5-7] Delayed diagnosis and delivery are associated with perinatal mortality which could be as high as 36%.[8] Improved obstetrical care, liberal use of cesarean, and effective neonatal resuscitation have decreased the adverse outcomes. In cases of inability to perform emergent delivery, intrauterine resuscitation is essential. Some maneuvers have been suggested to decrease the compression on the umbilical cord such as placing the pregnant women in the knee-chest position, retro-filling the bladder with 500-700 cc of saline, and tocolytic utilization.[9-11] Manual elevation of the fetal presenting part until the delivery of the fetus is crucial if an emergency cesarean would be performed.The fetus should be delivered as quickly as possible. If the time interval between diagnosis and delivery is shorter than 30 minutes, better neonatal outcomes could be achieved.[9,12,13] The purpose of this present study was to review the literature about UCP while demonstrating the single center experience. Comparison of the maternal and neonatal outcomes were achieved with the women who underwent emergent cesarean delivery due to acute fetal distress.

MATERIAL AND METHOD

A retrospective cohort study was conducted at a single university-affiliated research and training hospital. This study was approved by the local ethics committeein Bursa Yuksek Ihtisas Training and Research Hospital, University of Health Sciences with a decision number 2011-KAEK-25 2020/03-14 and it was in accordance with the Declaration of Helsinki.

Outcomes of all deliveries were identified between October 2016 and December 2019 from the hospital registry database. Patients who experienced umbilical cord prolapse were extracted using the International Classification of Diseases (ICD) codes. Patients' hospital data file folders were reviewed. Patients' characteristics, ultrasonographic evaluations (fetal presentation, amniotic fluid volume), obstetric examinations, labor progress,utilization of labor induction, cervical dilatation, fetal presented part position at the time of UCP, the time interval between UCP diagnosis and delivery of the baby, complication during cesarean delivery. Neonatal parameters were reviewed as birth weight, 1st and 5th minute APGAR scores, admission to neonatal intensive care unit (NICU), and stillbirth. Postoperative events were recorded as any of the blood component transfusion, the need for critical care admission, need for re-laparotomy, thromboembolic events, wound site infection or dehiscence, endometritis, and febrile morbidity.

The maternal and neonatal outcomes were compared with the women who underwent emergent cesarean delivery due to acute fetal distress. Patients were randomly chosen from the delivery system and recruited in the study. These patients were admitted to the delivery unit without any obstetric problem and were supposed to have a vaginal birth. Acute fetal distress was diagnosed via continuous fetal monitoring withthe Non-Stress Test (NST). Montevideo units were calculated by subtracting the resting tone of the uterus from peak uterine pressure amplitude during contractions within 10 minutes. Labor progress was determined from patients' file as cervical dilation, presented part station, time of UCP diagnosis, time of fetal delivery which were recorded by resident physicians. All patients were administered antibiotic prophylaxis(the third-generation cephalosporin concomitant metronidazole in the umbilical cord prolapse group, and the second- generation cephalosporin in the acute fetal distress group), and postpartum thromboprophylaxis due to the guidelines.[14,15]

Statistical Analysis

Statistical analysis was performed using the SPSS 24.0 software for Windows (IBM Corp, Armonk, NY). Variables are described as frequencies, mean±standard deviation of the mean. The normal distribution of continuous variables was evaluated using the Shapiro- Wilk test. Paired Student's t-test, chi-square test, and Fisher's exact test were used as appropriate. An overall p-value of less than 0, 05 was considered a statistically significant result.

RESULTS

Approximately over the 3 years of the period, 37.536 women gave birth in Bursa Yüksek İhtisas Training and Research

Hospital. The number of patients who experienced UCP was 43 with an incidence of 11 cases in 10.000 births. Median gravidity and parity of the patients were 3 and 1 respectively. In **Table 1**, patients' labor progress characteristics and neonatal outcomes were summarized.The mean UCP diagnosis delivery interval (DDI) was 16.7 minutes with a range of 7-30 minutes.

All patients underwent emergency cesarean. Five of the patients had 10 cm dilation while the head was at -3 station. Two patients experienced cesarean complications such as uterine atony and inadvertent extension of uterine incision laterally. None of the patients underwent hysterectomy. The wound site infection occurred in one patient as a postoperative complication. The need for blood transfusion, thromboembolic event, endometritis, and febrile morbidity did not occur in any of the patients. All deliveries were concluded with live newborns.Thirty newborns were male (70%). The mean birth weight was 3035±885 gr. Nine babies had an Apgar 1st minute score of ≤7, and 2 had an Apgar 5th minute score of ≤7. The number of patients admitted to NICU was 11 with a rate of 25%. Of these, the mean birth weight was 1967 grams and 9 babies were weighted below 2500 grams. The mean DDI of the patients whose babies were admitted to NICU was 19.4 min. Only 1 patient's DDI was 30 minutes that the patient had overt umbilical cord prolapses in antenatal service which was 3 floors below the delivery unit. Apart from this patient, 6 women delivered over 20 minutes after the diagnosis. Four patients diagnosed UCP out of the delivery unit and transferred to operation theatre and prompt cesarean delivery was performed. Preterm deliveries accounted for 23 % of all cases. Seven of these preterm deliveries presented with a non-vertex presentation. Four patients had polyhydramnios at the admission to the delivery unit. Two of them had UCP after the spontaneous rupture of the membrane. The other two patients were utilized artificial rupture of membranes. The UCP was detected during the follow-up of the labor within one hour, not immediately after opening the membranes. Fetal bradycardia or severe recurrent decelerations in NST were detected before UCP diagnosis.

Five patients had oligohydramnios due to spontaneous rupture of the membranes before admission to the hospital. These patients experienced UCP during the hospitalization follow-up.

The number of women who were recruited in the study as a control group, underwent emergent cesarean delivery due to acute fetal distress was 255. The mean birth weight, mean APGAR 1st and 5th minute scores were 3174 gr, 8.65, and 9.65 respectively. Only the 1st min APGAR scores differed significantly comparing the groups (p:0.031). Twenty newborns with a percentage of 7% were admitted to NICU. Comparing the UCP and acute fetal distress group in terms of admission to NICU differed statistically significantly. Baby gender, complications during cesarean delivery, and post-partum complications did not differ statistically significantly. The comparison of the groups was demonstrated in **Table 2**.

Table 1. Patients who experienced umbilical cord prolapse were evaluated in terms of characteristics, labor situation before diagnosis, and postpartum features

Parity	Nulliparous N: 9 ,21%	Multiparous N: 29, 68%	Grand-Multiparous N: 5, 11%
Presentation	Vertex N: 36, 85%	Breech N:5, 11%	Transverse N:2, 4%
Gestation week	Term, n:33 77%	Preterm, n:10 23%	
Amniotic fluid index	Normal N: 34, 79%	Polyhydramnios N:4, 9%	Oligohydramnios N:5, 11%
Cervical dilation	0-6cm N: 25, 58%	6-9cm N: 13, 30%	9-10cm N: 5, 11%
Cervical effacement	0-20 % N:8, 18%	20-60 % N:9, 21%	60-100 % N: 26, 60%
Presented part Station	-3 / -2 N: 11, 26%	-1 / 0 N: 27, 63%	Above -3 N:5, 11%
Utilization of labor Induction	Yes N:16, 37%	No N:27, 63%	
Uterine Contraction Performance	> 200 Montevideo unit n:24 , 56%	< 200 Montevideo unit n:19, 44%	
Diagnose to Delivery time	<20 min n:36	20-30 min n:6	> 30 min n:1

Table 2. Comparison of the neonatal outcomes of the patients with Umbilical cord prolapse and acute fetal distress were demonstrated.

	Umbilical cord prolapse N:43	Acute Fetal Distress N:255	P value
Birth Weight (gr ±Std)	3035±896	3174±413	0.326
APGAR 1st minute	8.09 ±1.6	8.65±1.01	0.031
APGAR 5th minute	9.44±0.85	9.65±0.68	0.141
NICU admission	11 25%	20 7.8%	0.002
Complication in Cesarean (N)	2 4.6%	7 2.7%	0.623
Post-op complication	1 2.3%	11 4.3%	1.000
Baby Gender Male Female	30 (70 %) 13 (30 %)	144 (56 %) 111 (44 %)	0.102

DISCUSSION

A true obstetric emergency umbilical cord prolapse is a rare incident yet threatens the wellbeing of the fetus. The risk factors have been exposed particularly. Liberal performing of cesarean section was supposed to decrease the occurrence of UCP however the incidence is almost the same during the last decades which was about 0.1 to 0.18%.[2,16] The incidence of the UCP was 0.11% at this present study which was compatible with recent literature.Women who underwent emergent cesarean were included in the study as a control group to evaluate the maternal and neonatal outcomes. The results have depicted that maternal complications were approximately similar. The UCP was one of the crucial reasons for emergent cesarean delivery as acute fetal distress. Admission to NICU was higher in the UCP group however that could be occurred due to the high prematurity rates. The vaginal delivery could be more secure for maternal

outcomes if the delivery could occur immediately however, due to the results of that present study, women who were performed cesarean section did not have an increased risk of operational adverse outcomes comparing the women who underwent emergency cesarean for acute fetal distress. Additionally, there was no proper time for vaginal birth that could avoid adverse neonatal outcomes. Due to the results of this study, fetuses may benefit more from emergency cesarean delivery.

The point that should be paid attention to the high percentage of preterm deliveries which was not only the main determinant of neonatal morbidity and mortality[17] but also one of the major risk factorsfor UCP.[18] The emphasized issue for these patientscould be the examination with transvaginal ultrasound for funic presentation at the hospital admission, and speculum examination soon after ruptures of membranes.Fifteen percent of the cases were non-vertex presentation in our study. In a contemporary study, it was depicted that the incidence of UCP was 9.6% and 3.5% for transverse and breech presentations respectively.[19]

The most catastrophic event for the patient and the physician is the experience of intrapartum still birth. Most of the articles have referred to stillbirth related to UCP.[6,7,20] In the present study, stillbirth did not occur due to UCP. The major reason of this success was the immediate delivery of the fetuses. The mean diagnosis delivery interval (DDI) was 16 minutes which was quite shorter than similar studies.[7,9,21,22] The foremost determinant of this interval was the diagnose. Approximately 30 babies are born in a day in the hospital that the study presented. Intrapartum continuous fetal heart rate monitoring has been routinely performed on patients admitted to the delivery unit. If UCP occurs, an emergency cesarean is performed and the fetal presented part is elevated manually until the baby is born. A pediatrician attends to emergent cesareans, and also the cases if the obstetrician anticipates any possible neonatal adverse outcome. These managements and the interventions might be related to the success of neonatal outcomes.In some studies, about 50 percent of UCP was caused by iatrogenic interventions.[22,23] Murphy et al. declared that UCP occurred within 5 minutes after the ARM.[24] No UCP had occurred within 5 minutes after ARM at the present study. The physicians should be aware that opening the amniotic membrane should be performed after the engagement has occurred. Overlooking some factors may increase the risk of UCP, such as ARM which was performed by inexperienced resident trainees. It is also important that multiparity and utilization of labor induction would cause a late engagement.[25] Thus, we recommend that ARM ought to be performed by an experienced physicianafter the engagement had occurred. Before opening the membranes, the patient should have an active uterine contraction, minimal fundal pressure could be applied or the patient could push the baby. Patients should be monitored with NST for at least one hour after amniotomy due to the crucial findings of that study which was the occurrence of UCP during the labor fallow up occurred within one hour after spontaneous rupture of membranes. If the NST has not been utilized during labor continuously, patients ought to be monitored for at least one hour along after the spontaneous or artificial rupture of membranes.

Prompt cesarean delivery was performed at the present study even patient hasa 9-10 cm dilated cervix because each attempt for vaginal delivery would increase the compression on the umbilical cord and could increase the possibility of fetal morbidity or mortality. There is always one operating theatre at our delivery unit which can be used for emergency cesareans. Pediatricians are always informed before emergency cesarean delivery, and the pediatrician is ready for neonatal resuscitation in the operating room. The lack of these two conditions was inevitable to increase perinatal mortality.[2,8,9] Behbehani et al achieved a precious population-based study evaluating UCP.[2] They determined that vaginal birth causes less birth injury without increasing mortality. In our study, the birth injury did not occur in any patient even the cesarean had performed in the fully dilated cervix. They also determined that placental abruption, postpartum hemorrhage (PPH), meconium-stained amniotic fluid, and law APGAR scores had occurred more in emergency cesarean of UCP.[2] In the present study, only one patient experienced PPH treated with Bakri Balloon and one patient experienced inadvertent extension of uterine incision which was repaired without the need for any extra intervention. None of the patients needed blood component, transfusion. These low complications could be related to high experienced obstetricians. Simulation scenario programs have recommended for emergency cesarean to decrease complications and decrease perinatal comorbidities.[26,27] These programs are definitely useful,especially for the clinics performing the small number of emergency cesarean cases. If the emergency delivery was not possible, the aforementioned maneuvers could be utilized for intrauterine resuscitation.[9-11] Esau et al described that the knee-to-chest position is effective in reducing neonatal mortality for patients who experienced UCP outside the hospital.[9] We prefer to elevate the presenting part manually by a physician from vagina forumbilical cord decompression until the fetus was delivered.

WHO defines normal birth without any intervention.[1] Understanding labor progress is fundamental of obstetrics. Traditionally Friedman's curve has been used by health care providers to define the normal length of labor. Zhang et al have assessed the curve with larger sample participants.[28] Evaluating labor progress decreases maternal and neonatal adverse outcomes. The fact that every intervention could also cause more intervention. Multiparity and labor induction could increase UCP due to the cause of late engagement. We evaluated the cervical dilatation and station before UCP. About 60% of the patients were not in the active labor phase. Our findings were similar to Kawakita et al. They stated that any fetal position before 6 cm cervical dilation and fetal station

above station -3 at 6-10 cm cervical dilation was associated with UCP. It is obvious that if the fetal head is not engaged particularly; there is always a risk of UCP. The engagement of the presented part of the fetus is crucial for the artificial rupture of membranes however, the fact is that there is no possibility to predict the time of spontaneous rupture of membranes, and the relation with the engagement. Fetal gender was also defined as an independent risk factor of UCP.[2,7,29] Seventy percent of the newborn babies were male in our study which was compatible with literature.

Murphy and colleagues conducted a very remarkable definition that knowledge of UCP did not decrease the occurrence.[24] Thus, obstetricians should concentrate on the interventions to deliver the fetus with the minimum adverse consequences when the UCP occurred. The most crucial point is the prompt delivery and adequate neonatal resuscitation. There is always one operating theatre for the emergency cesarean section. These approaches ensured that there was no neonatal mortality in patients with umbilical cord prolapse.

The limitations of the present study were being a retrospective nature, small patient population (due to low incidence) and not having a proper control group and the data was obtained from patients' files which were filled by different resident physicians. The strengths of the study were unique literature investigating, presenting adequate suggestions for neonatal and maternal outcomes, and the study was carried out in a high- volume hospital with more than 13000 births each year.

CONCLUSION

As a true emergency, umbilical cord prolapse threatens neonates well being. Although approaches that reduce risk factors are important, the most precious intervention is prompt delivery. Each woman ought to be monitored continuously with NST for at least one hour after spontaneous or artificial rupture of membranes. There should be always a suitable operating theatre for emergency cesarean sections, and a pediatrician who can perform adequate neonatal resuscitation.

ETHICAL DECLARATIONS

Ethics Committee Approval: This study was approved by the local ethics committeein Bursa Yuksek Ihtisas Training and Research Hospital, University of Health Sciences with a decision number 2011-KAEK-25 2020/03-14.

Informed Consent: Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Referee Evaluation Process: Externally peer-reviewed.

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REFERENCES

1. Technical Working Group WHO. Short Communication: Care in Normal Birth: A Practical Guide. Birth 1997;24(2):121-3.
2. Behbehani S, Patenaude V, Abenhaim HA. Maternal risk factors and outcomes of umbilical cord prolapse: a population-based study. J Obstet Gynaecol Can 2016;38(1):23-8.
3. Ahmed WAS, Hamdy MA. Optimal management of umbilical cord prolapse. Int J Women's Health. 2018;10:459.
4. Boyle JJ, Katz VL. Umbilical cord prolapse in current obstetric practice. J Reprod Med. 2005;50(5):303-306.
5. Holbrook BD, Phelan ST. Umbilical cord prolapse. Obstet Gynecol Clin North Am 2013;40(1):1-14.
6. Siassakos D, Hasafa Z, Sibanda T, et al. Retrospective cohort study of diagnosis–delivery interval with umbilical cord prolapse: the effect of team training. BJOG 2009;116(8):1089-96.
7. Huang J-P, Chen C-P, Chen C-P, Wang K-G, Wang K-L. Term pregnancy with umbilical cord prolapse. Taiwan J Obstet Gynecol 2012;51(3):375-80.
8. Enakpene C, Omigbodun A, Arowojolu A. Perinatal mortality following umbilical cord prolapse. Int J Gynecol Obstet 2006;95(1):44-5.
9. Wasswa EW, Nakubulwa S, Mutyaba T. Fetal demise and associated factors following umbilical cord prolapse in Mulago hospital, Uganda: a retrospective study. Reprod Health. 2014;11(1):12.
10. Kumar A, George N. Cord Prolapse and Transverse Lie. Labour Room Emergencies: Springer; 2020. p. 317-26.
11. Vago T. Prolopse of the umbilical cord: A method of management. Am J Obstet Gynecol 1970;107(6):967-9.
12. Pediatrics AAo, Obstetricians ACo, Gynecologists. Guidelines for perinatal care: Am Acad Pediatr 2002.
13. Schauberger CW, Chauhan SP. Emergency cesarean section and the 30-minute rule: definitions. Am J Perinatol 2009;26(03):221-6.
14. Obstetricians ACo, Gynecologists. ACOG Practice Bulletin No. 120: Use of prophylactic antibiotics in labor and delivery. Obstet Gynecol 2011;117(6):1472.
15. Wu P, Poole TC, Pickett JA, Bhat A, Lees CC. Current obstetric guidelines on thromboprophylaxis in the United Kingdom: evidence based medicine? Eur J Obstet Gynecol Reprod Biol 2013;168(1):7-11.
16. Bush M, Eddleman K, Belogolovkin V. Umbilical cord prolapse. Uptodate. 2016;16(3):10-4.
17. Barros FC, del Pilar Vélez M. Temporal trends of preterm birth subtypes and neonatal outcomes. Obstet Gynecol 2006;107(5):1035-41.
18. Demol S, Bashiri A, Furman B, Maymon E, Shoham-Vardi I, Mazor M. Breech presentation is a risk factor for intrapartum and neonatal death in preterm delivery. Eur J Obstet Gynecol Reprod Biol 2000;93(1):47-51.
19. Barclay M. Umbilical cord prolapse and other cord accidents. Gynecol Obstet 1989;2:1-7.
20. Gabbay-Benziv R, Maman M, Wiznitzer A, Linder N, Yogev Y. Umbilical cord prolapse during delivery–risk factors and pregnancy outcome: a single center experience. J Matern Fetal Neonatal Med 2014;27(1):14-7.
21. Prabulos AM, Philipson EH. Umbilical cord prolapse. Is the time from diagnosis to delivery critical?. J Reprod Med. 1998;43(2):129-32.
22. Alouini S, Mesnard L, Megier P, Lemaire B, Coly S, Desroches A. Procidence du cordon: prise en charge obstétricale et conséquences néonatales. Journal de gynécologie obstétrique et biologie de la reproduction. 2010;39(6):471-7.
23. Usta IM, Mercer BM, Sibai BM. Current obstetrical practice and umbilical cord prolapse. Am J Perinatol 1999;16(09):0479-84.

24. Murphy D, MacKenzie I. The mortality and morbidity associated with umbilical cord prolapse. BJOG 1995;102(10):826-30
25. Hamilton EF, Simoneau G, Ciampi A, Warrick P, Collins K, Smith S, et al. Descent of the fetal head (station) during the first stage of labor. Am J Obstet Gynecol 2016;214(3):360. e1-. e6.
26. Rajakumar C, Garber A, Rao PM, Rousseau G, Dumitrascu GA, Posner GD. Umbilical cord prolapse in a labouring patient: a multidisciplinary and interprofessional simulation scenario. Cureus. 2017;9(9).
27. Flentje M, Schott M, Woltemate A-L, Jantzen J-P. Interdisciplinary Simulation of Emergency Caesarean Section to Improve Subjective Competence. Zeitschrift fur Geburtshilfe und Neonatologie. 2017;221(5):226-34.
28. Zhang J, Troendle JF, Yancey MK. Reassessing the labor curve in nulliparous women. Am J Obstet Gynecol 2002;187(4):824-8.
29. Boushra M, Stone A, Rathbun KM. Umbilical Cord Prolapse. StatPearls [Internet]: StatPearls Publishing; 2019.