

The Incidence of Nuchal Cord at Delivery and Its Effect on Perinatal Outcome

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Abstract

Objective: The aim of this study was to determine the incidence of nuchal cord at delivery, and to investigate the effect of nuchal cord on the course of labor and perinatal outcome.

Methods: The delivery cases of 1112, sigleton, vertex presentation pregnancies undergoing spontaneous labor between January 1.2003 and November 1.2005 were included in the study. The cases with maternal and fetal complications were excluded from the study. Pregnancies with and without nuchal cord entanglement were compared with respect to labor characteristics and perinatal outcomes.

Results: The incidence of nuchal cord entanglement was found to be 16.5% in the study group. There were no statistically significant differences in the rates of neonatal intensive care requirement and 5-minute Apgar scores between pregnancies with and without nuchal cord entanglement. The rates of fetal distress during labor, cesarean section and vacuum deliveries were significantly higher in the cases with nuchal cord entanglement compared with women without nuchal cord entanglement. The rate of fetal distress during labor in pregnant women with nuchal cord entanglement complicated with oligohydramnios was significantly higher than that in cases of nuchal cord with normal amniotic fluid volume. In the absence of oligohydramnios, nuchal cord entanglement did not significantly increase fetal distress rate during labor.

Conclusion: There is no significant correlation between nuchal cord entanglement and adverse perinatal outcomes. Therefore nuchal cord entanglement alone is not an indication for cesarean section. On the otherhand, because of an incresed risk for fetal distress during labor in cases of nuchal cord entanglement associated with oligohydramnios, the labor of these pregnancies should be monitored carefully.

Keywords: Nuchal cord, labor, perinatal outcome.

Doğumda boyunda kordon dolanması sıklığı ve perinatal sonuçlar üzerine etkisi

Amaç: Doğumda kordon dolanması saptanan olgularda, kordon dolanması sıklığının, doğum eylemi ve perinatal sonuçlar üzerine etkisini araştırmak.

Yöntem: 1 Ocak 2003 - 1 Kasım 2005 tarihleri arasında tek, baş prezantasyonu ile spontan travaya girerek doğumu gerçekleştiren 1112 olgu çalışmaya dahil edildi. Maternal ve fetal komplikasyonlu olgular çalışmaya dahil edilmedi. Çalışma grubunda kordon dolanması insidansı saptandı. Kordon dolanması olan ve olmayan grupların doğum eyleminin karakteristikleri ve perinatal sonuçlar karşılaştırıldı. İstatistiksel değerlendirmede student t ve χ^2 testleri kullanıldı. p değerinin 0.05'den küçük olması anlamlı kabul edildi.

Bulgular: Çalışma grubumuzda boyunda kordon dolanması insidansı %16.5 olarak saptandı. Kordon dolanması olan ve olmayan gruplarda 5. dakika Apgar skoru ve yenidoğan yoğun bakım ünitesinde tedavi oranları arasında istatistiksel olarak anlamlı farklılık yoktu. Boyunda kordon dolanması olan olgularda travayda fetal distres gelişimi, sezaryen ve vakum ekstraksiyon oranları boyunda kordon dolanması olmayan olgulara göre istatistiksel olarak anlamlı ölçüde yüksek bulundu ($p<0.05$). Travayda fetal distres gelişiminin, boyunda kordon dolanması ve oligohidramniosu olan olgularda, boyunda kordon dolanması olup oligohidramniosu olmayan olgulara göre istatistiksel olarak anlamlı şekilde arttığı izlendi ($p=0.001$). Oligohidramniosu olmayan olgularda boyunda kordon dolanmasının travayda fetal distres gelişmesini anlamlı ölçüde arttırmadığı izlendi ($p=0.180$).

Sonuç: Boyunda kordon dolanması ile kötü perinatal sonuçlar arasında anlamlı bir korelasyon mevcut değildir. Bu nedenle boyunda kordon dolanması tek başına sezaryen endikasyonu değildir; kordon saptanan olgularda doğum yönetiminde bir değişiklik yapılmasına gerek yoktur. Bununla birlikte, boyunda kordon dolanması ve oligohidramnios ile seyreden olguların travayı sırasında fetal distres gelişme riskini önemli ölçüde arttırdığından, bu tür gebelerin travayının yakından izlenmesinde yarar vardır.

Anahtar Sözcükler: Boyunda kordon dolanması, doğum eylemi, perinatal sonuçlar.

Introduction

Cord entanglement is defined as turning 360 degree of umbilical cord around fetal neck and it is seen in 15.8%–30% of term gestations and in 6% of gestations at 20th week and it is determined as not a problem.^{1,2} Cord entangling to the fetus body and its extremities or knotting on itself is rarely seen.¹ Collins defined cord entanglement to neck as A and B types.³ Type A: Umbilical cord circle entangles to fetus neck at 360 degree and placental edge passes over umbilical edge. This entanglement can be spontaneously opened due to it is not knotted. Type B: Umbilical cord circle entangles to fetus neck at 360 degree and placental edge passes under umbilical edge. This entanglement can not be spontaneously opened due to it is knotted.

Shui and Eastman reported single cord entanglement as 20.6%, double cord entanglement as 2.5% and triple cord entanglement as 0.2% in 1007 fetus deliveries.⁴ Moreover, there are case representations reporting that the cord entangles nine times.⁵ There is a linear increase in single or multiple cord entanglement parallel to increase in gestational age and this rate increases more after 38th gestational week.⁶ Increase in movements of fetus through third trimester and turning movements towards head presentation may be effective factors for cord entanglement. It is also reported that cord entanglements found prenatally by ultrasonography can be untied spontaneously before 36th gestational week.⁷ Clinical importance of cord entanglement should be discussed. Even though no complication is observed on fetus in many studies,^{1,2} there are some publications reporting increased variable deceleration in first and second trimester of delivery, acidaemia, lowness of evidently increased first minute of Apgar score, increase in amnios fluid frequency painted with meconium, increase in urgent cesarean delivery frequency, increase in resuscitation of newborn, increase in staying and period of staying of newborn in intensive care unit and increase in newborn deaths.⁸ We researched frequency of cord entanglement, its effect on delivery and its neonatal results in cases having cord entanglement in neck at delivery in our study.

Methods

1112 cases were included to our study which were including term and postterm pregnancies that had delivery by spontaneous labor by single head presentation in between 1st January 2003 – 1st November 2005 in our clinic. Multiple gestations, cases with fetal anomaly, dead fetus cases, cases with early membrane rupture, placenta praevia, ablatio placenta, cesarean cases done by elective and repeated indication, intrauterine infection, abnormal fetal presentations were not included to study. Ages, gestational weeks at delivery, birth count, birth types, birth weights, birth Apgars', fetal distress development during labor, oligohydroamnios frequency, existence of cord entanglement at neck and entangled circle count, meconium existence in amnios fluid, staying and staying period of newborn in intensive care unit, body mass index (BMI) and length of mother at delivery were determined. While term gestation was defined as 37+0 (259 days) and 42+0 (294 days) weeks of gestation, postterm gestation was defined as gestations of 42+1 (295 days) weeks or above. CRL measurements evaluated by ultrasonography in first trimester were taken as base for properly calculating gestational age. Cord entanglement diagnosis was clinically done by doctors at delivery. Fetal distress diagnosis in labor was found as to American College of Obstetricians and Gynecologists Technical Bulletin (ACOG).⁸ Oligohydroamnios was diagnosed by founding vertical amnios pocket less than 2 cm in ultrasonography during labor. Fetal heart beats were monitored continuously in active phase of delivery routinely. Statistical determination was done by using χ^2 and student t tests.

Results

Cord entanglement at neck was found in 184 (16.5%) of 1112 cases at delivery. Cord circle count entangled at neck was found as 1 times in 140 cases (12.6%), 2 times in 36 cases (3.2%), 3 times in 17 cases (1.5%), 4 times in 2 cases (0.2%) and 5 times in 1 case (0.08%). Age average of 184 cases having cord entanglement at neck was found as 27.15 ± 4.60 , their average gestational week at deliv-

ery was found as 276.17 ± 8.07 days, average birth weight of fetus was found as 3342.06 ± 497.83 gr and parity average was found as 1.67 ± 0.75 . Age average of 928 cases having no cord entanglement at neck was found as 27.63 ± 4.32 , their average gestational week at delivery was found as 273.81 ± 7.77 days, average birth weight of fetus was found as 3288.93 ± 499.11 gr and parity average was found as 1.47 ± 0.72 .

60.1% (558/928) of cases having no cord entanglement at neck was primipara and 39.9% (370/928) was multipara. No significant difference was found between two groups in terms of parity ($p=0.159$; OR, 0.823; 95% CI, 0.626-1.080).

There was no significant difference between maternal age, length, body mass index, parity, gestational week at delivery (as day), average weight of fetus in cases having and not having cord entanglement at neck and demographic and clinical qualities are shown in Table 1.

No perinatal mortality was observed in cases having and not having cord entanglement. Fetal distress development at labor was found in 29 (15.8%) of 184 cases having cord entanglement at neck and found in 88 (9.5%) of 928 cases not having cord entanglement. Fetal distress development was found statistically significant between cases having and not having cord entanglement at neck ($p=0.025$; OR, 1.662; 95% CI, 1.061-2063).

Rate of cesarean and vacuum deliveries which were done due to acute fetal distress (AFD) and not processing labor was found as 29.3% (54/184) in group having cord entanglement and was found as 6.6% (61/928) in group not having cord entanglement and statistically a significant difference was found between both groups ($p<0.01$; OR, 4.465; 95% CI, 2.996-6.653).

It was found that fetal distress developed at labor in 14 of 35 cases having oligohydroamnios and cord entanglement at neck. It was observed that fetal distress development at labor was significantly and statistically increased in cases having oligohydroamnios and cord entanglement at neck as to cases not having oligohydroamnios and cord entanglement at neck ($p=0.001$; OR, 3.973; 95% CI: 1.757-8986). It was seen that cord entanglement was did not increase fetal distress development at labor significantly in cases without oligohydroamnios ($p=0.180$; OR, 1.566; 95% CI: 0.809-3.028).

Distributions and indications of interfered births as to birth types of cases found and not found cord entanglement at neck are shown in Table 2. Operative birth rate (cesarean + vacuum) was found as 29.3% (54/184) in group having cord entanglement and as 6.6% (61/928) in group not having cord entanglement. Operative birth rates of group having cord entanglement were statistically and significantly higher than rates of group not having cord entanglement ($p<0.01$; OR, 4.465; 95% CI, 2.996-6.653).

Interfered birth (cesarean + vacuum) rate due to not processing labor of cases having cord entanglement was statistically and significantly difference than cases not having cord entanglement ($p<0.01$; OR, 5.516; 95% CI: 3.330-9.139).

There was no significant difference between 5th minute Apgar scores of cases having and not having cord entanglement at neck ($p=0.078$; OR, 2.207; 95% CI, 0.895-5.439).

Being with meconium of amnios fluid in group having cord entanglement was higher than group not having cord entanglement and there was sta-

Table 1. Demographic qualities of women having and not having cord entanglement in fetus.

	Cord entanglement (+)	Cord entanglement (-)	p
Maternal age	27.15 ± 4.60	27.63 ± 4.32	0.333
Maternal length (cm)	161.36 ± 5.02	162.80 ± 5.01	0.092
BMI	28.13 ± 3.66	28.23 ± 3.28	0.781
Parity	1.62 ± 0.74	1.47 ± 0.72	0.065
Gestational age (day)	276.17 ± 8.07	273.81 ± 7.77	0.103
Birth weight (gr)	3342.06 ± 497.83	3288.93 ± 499.11	0.333

Values are given as average $\pm$ standard deviation. **BMI**: body mass index.

Table 2. Birth types and indications of cases having and not having cord entanglement at neck.

Birth type	Indication	Cord (+)		Cord (-)		p
		n	%	n	%	
Cesarean	AFD	16	8.7	22	2.4	<0.001 (a)
	Not processing labor	35	19	32	3.4	<0.001 (a)
Vacuum	AFD	2	1.1	5	0.5	0.329 (ad)
	Not processing labor	1	0.5	2	0.2	0.420 (ad)
SVB	AFD	11	6	61	6.6	0.778 (ad)

AFD: acute fetal distress, SVB: spontaneous vaginal birth, n: case number, a: statistically significant, ns: statistically not significant.

tistically a significant increase ($p=0.001$; OR, 3.519; 95% CI: 2.151-5.757). But it was found that amniotic fluid with meconium did not affect perinatal mortality.

Statistically, no significant difference was found between two groups in terms of staying rates of newborns in newborn care unit ($p=0.074$; OR, 1.538; 95% CI: 0.956-2.472).

There was an increase in favor of male sexuality in fetal sexuality rates in group having cord entanglement (56%). But this increase was not significant when compared with the group not having cord entanglement ($p=0.450$; OR, 1.108; 95% CI: 0.956-2.472). Qualities of fetus between both groups are shown in Table 3.

It was found that placenta settlement in group having cord entanglement occurred mostly in anterior (47%, 86/184); but when it was compared with the group not having cord entanglement, it was not statistically significant ($p=0.340$; OR, 1.147; 95% CI: 0.865-1.522).

Discussion

It is reported that cord entanglement at neck takes place about 5-18% in reasons of fatal perinatal asphyxia together with other cord complica-

tions such as real knot at cord and cord prolapsus.¹⁰ It is claimed that cord entanglement does not affect the labor negatively.^{11,12} On the other hand, it is reported that the cord entanglement is the reason of antepartum and intrapartum variable deceleration and intrapartum fetal distress may occur due to increase of cord tightening in next phases of birth.^{1,13,14} It is reported that complications such as cord entanglement at neck, real not at cord and cord prolapsus are seen in 48% of asphyxiated newborns reached up to the term, it is observed that fetal asphyxia frequency increases parallel to the increase of entangled cord circle count and these complications are fatal in 5-18% of them.¹³ We found a significant difference in fetal distress development between groups having and not having cord entanglement in our study.

Researching cord entanglement at neck is not done routinely before birth but existence of variable deceleration at fetal heart beats in cardiotocography during labor reminds us cord entanglement.¹² Cord entanglement was first defined by ultrasonography by Joupila and Kirkinen¹⁵ in 1982 and there are obstetric works done by using ultrasonography since then.^{1,12} There are studies done by colored Doppler in recent years.^{17,18} Generally,

Table 3. Qualities of fetuses having and not having cord entanglement at delivery.

	Cord entanglement (+)		Cord entanglement (-)		p
	n	%	n	%	
Male fetus	103	56	469	50.5	0.450 (ad)
Meconium	30	16.3	43	4.6	>0.001 (a)
Staying at ICU	25	13.6	82	8.8	0.074 (ad)
Apgar (5th Apgar > 7)	7	3.8	16	1.7	0.078 (ad)

ICU: Intensive care unit, s: statistically significant, ns: statistically not significant, n: case number.

colored Doppler examination has diagnostic value for rupture of fetal membrane. Three dimensioned ultrasonography was used in works related with cord entanglement and it is claimed that it is more advantageous than colored Doppler study.¹⁸

As cord entanglement is related with very different factor, most of performed studies are done with case representations or little series. There are publications which show the relationship of cord entanglement with shoulder presentation, fetal right side position, male fetus, increased fetal activity, decreased fetal movement, abnormal umbilical artery Doppler diagnoses,^{18,19} abnormal ductus venous flows,²⁰ posterior settled placenta,²¹ birth induction,²² variable decelerations in fetal heart beatings,^{13,22} amnios fluid painted with meconium,^{13,22,23} shoulder dystocia,²³ operative vaginal birth,¹³ birth by urgent cesarean,²³ intrauterine growth retardation,^{25,26} lower apgar score,^{13,14,22} increased staying in newborn unit,²³ increased newborn resuscitation,²² umbilical artery acidemia,¹³ hypovolemic shock of newborn,¹² dural sinus dilatation,²⁷ dead birth,^{28,29} cerebral paralysis.^{30,31} Despite these reports, it is reported in some studies that cord entanglement is together with normal neonatal and maternal outcomes.^{1,2,11,12} We found in our study that amnios fluid painted with meconium rate in group having cord entanglement was increased significantly as to group not having cord entanglement but there was no significant increase in staying at ICU, lower Apgar score and lower birth weight.

While there are publications reporting that cord entanglement causes urgent cesarean rates to increase due to fetal distress,^{13,22,32} there are also publications reporting that it does not cause urgent cesarean rates to increase. We found an increase in rates of interfered birth (cesarean + vacuum) in cases having cord entanglement. There are also publications reporting that cord entanglement increases the perinatal mortality.³¹ But these publications are retrospective. In many works, it is reported that dead birth rates do not increase if there is no especially hypertension, ablatio placenta, diabetes, premature rupture of membranes, oligohydroamnios and major fetal anomalies.^{1,3,25} It

was mentioned in these publications that cord entanglement in cases without oligohydroamnios did not affect fetal distress development at labor significantly but it affected fetal distress risk at labor in cases with oligohydroamnios.³² We observed in our study that cord entanglement and fetal distress development increased significantly in cases with oligohydroamnios as to cases without oligohydroamnios. Cord tightening during contractions may be the reason of fetal distress development at labor and cord entanglement in cases having oligohydroamnios. Fetal distress frequency will increase due to the fact that cord tightening will be easier and frequently in cases with oligohydroamnios.

Cord entanglements are generally not affects fetus weight and prognoses of fetus and mother negatively.³¹ Single entanglement of cord at neck is described as a natural diagnosis and it is emphasized in repeated studies that entangled cord may be untied.⁷ But it is possible to meet with interesting examples about malign prognosis in case representations.^{5,33} We observed in our study that cord entanglement did not affect fetus weight and prognoses of fetus and mother negatively.

When fetus presentation is examined, it is found that cord entanglement is frequently met in rump presentation.³⁴ We did not researched a relationship between fetus presentation and cord entanglement due to the fact that we included cases with vertex presentation into our study.

Cord entanglement was found slightly high in male fetuses.^{21,31} We found that male fetus count was higher in group having cord entanglement but it was statically not significant.

We observed increase in the rates of interfered birth due to hardly processing labor in cases having cord entanglement at neck in our study. Not processing of labor in cases having cord entanglement at neck can be explained that cord prevents engagement of head to pelvis. In this case, cord at neck can be deemed within reasons of surmaturation. Researching existence of cord at neck by ultrasonography becomes important for inspecting third trimester of gestations in case of surmaturation.

tion. As in our study, if there are cord entanglement and oligohydroamnios, interfered birth rate increases.

Conclusion

Cord entanglement at neck in the existence of oligohydroamnios significantly increases fetal distress development risk at labor and this condition increases the interfered birth rates. Rates of amnios fluid painted with meconium significantly increase in cases with cord entanglement; but this result does not affect perinatal mortality and staying of newborn in intensive care unit.

As a result of our study, it is found that perinatal outcomes are not different between groups having and not having cord entanglement at neck and there is no need to change birth administration of cases found cord, but labor should be observed closely due to the fact that fetal distress risk is increased in cases with oligohydroamnios.

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