

Evaluation of fetal blood circulation in nuchal cord of fetus with cephalic or breech presentation by doppler Sonography

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Abstract: The effect of a nuchal cord on the outcome of delivery is controversial. This study aimed at evaluating the fetal blood circulation in nuchal cord of fetus with cephalic or breech presentation by Doppler Sonography. This cross sectional study comprised 100 normal pregnancies, which were studied prospectively. All women were examined by ultrasound at 36 ± 2 weeks' gestation by the same operator (PG). A real-time ultrasonographic device (Aloka 3500) was used. The presence or absence of a nuchal cord was documented sonographically. Of 100 fetuses with nuchal cord, 78 (78 %) had cephalic presentation and 22 (22%) had breech presentation. The mean age of all women surveyed was 28.5 ± 6.3 years. The difference between the umbilical artery PI index of cases with single and two round nuchal cord was statistically significant ($P=0.02$), whereas there was no significant difference in the thoracic aorta ($P=0.95$). The difference between the thoracic aorta and umbilical artery PI of cases with three round nuchal cord was statistically significant ($P<0.001/0$ and $P=0.05$). The difference between umbilical artery PI with 2 round and 3 round nuchal cord was statistically significant ($P=0.02$), whereas there was no significant difference in the thoracic aorta ($P=0.21$). Color Doppler sonography is a sensitive and specific method of diagnosing nuchal cord in fetus with cephalic or breech presentation.

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1. Introduction

The Circle of Willis is a circulatory anastomosis that Nuchal cords are very common, with prevalence rates of 6% to 37%. Up to half of nuchal cords resolve before delivery. How and when it ends up there will be different for individual babies. Interestingly, it is more common with boy babies perhaps because they are more likely to have longer cords.(Al-Sweedan et al. 2013; Chan and Baergen 2012) It also becomes more common with increasing gestation. If a nuchal cord does not occur in pregnancy it can occur during labour. As the baby moves through the pelvis he/she rotates and can spin the cord around their neck. Nuchal cords have been associated with an increased risk for adverse outcome. (Balki et al. 2012; Henry et al. 2013) Whether prenatal ultrasound examination should attempt to identify the presence of nuchal cords and whether identification of affected pregnancies should alter antepartum and intrapartum care are controversial. The management and diagnosis of a nuchal cord begins with anticipation of its occurrence. (Chen et al. 2011; Hasegawa et al. 2011) The fetal heart rate pattern may forewarn of a possible nuchal cord. Most pregnancies with a nuchal cord have variable decelerations with uterine contractions. However, not all patients with variable decelerations have nuchal cords because variable decelerations are seen in 40% to 50% of all labors

whereas rate of nuchal cord is lower.(Chen 2010; Duncombe et al. 2010) The degree of severity of variable decelerations is associated with the degree of cord compression's. It is common to see variable decelerations in patients with nuchal cords, particularly during descent in the second stage of labor. So, when variable decelerations occur, the accoucheur should anticipate the possibility of cord entanglement and prepare for this possibility. (Gschliesser et al. 2010; Plasencia et al. 2010) The role of sonography in the prenatal diagnosis of a nuchal cord has been validated in many previous publications. The use of color Doppler flow has increased the accuracy of this prenatal diagnosis. Nowadays, sonologists, obstetricians, and, more importantly, parents face this diagnosis more frequently since sonographic examination has become routine practice during prenatal care.(Achiron et al. 2010; Dias et al. 2010) Most of the previous publications described outcomes of pregnancies with nuchal cords detected before delivery. To our knowledge, however, not much has been said about its detection when it occurs remote from delivery.(Tantbirojn et al. 2009; Onderoglu et al. 2008) The aim of this study was to evaluate the fetal blood circulation in nuchal cord of fetus with cephalic or breech presentation by doppler Sonography.

2. Material and Methods

This cross sectional study was conducted in department of obstetrics and gynecology of the Alzahra hospital, Tabriz from April 2012 to April 2013. This study was approved by local ethic committee. Written consent was obtained from all the patients parents. The study population comprised 100 normal pregnancies, which were studied prospectively. All pregnant women received antepartum care and subsequently delivered at the Iran. Gestational age was estimated from the first day of the last menstrual period. Women with history of previous caesarean section or uterine surgery were excluded, as well as women with medical problems in the current pregnancy, in particular diabetes mellitus, hypertension, cardiac disease, renal disease, and women under any sort of medication or drugs. All women were examined by ultrasound at 36 ± 2 weeks' gestation by the same operator (PG). A real-time ultrasonographic device (Aloka 3500) was used. The presence or absence of a nuchal cord was documented sonographically. The amniotic fluid quantity was estimated with measurement of the length of the maximum vertical pocket of amniotic fluid without limbs or umbilical cord. A maximum vertical pocket of amniotic fluid between 3 and 8 cm was considered normal, whereas for values above 8 cm and below 3 cm the amniotic fluid quantity was considered increased and decreased respectively. The presence of a nuchal cord was determined by real-time ultrasound as follows: the ultrasound transducer was placed parallel to the longitudinal axis of the fetal neck and the presence of a nuchal cord was visualised as a single or as multiple coils around the fetal neck, according to the number of cord entanglements. Ultrasound examination at 36 ± 2 weeks was preceded by history and typical clinical evaluation, including assessment of Bishop score and NST. Intrapartum routine care included electronic FHR monitoring. Women were followed-up in respect to the following parameters: mode of delivery (normal or operative vaginal or caesarean section), intrapartum CTG, and Apgar scores at 1 and 5 min. There were no neonates with congenital malformations or genetic disorders.

Statistical analysis

SPSS version 16 was used as statistical software. Data were described as mean and standard error of the mean (SEM). The ANCOVA test was used for analysis of co-variate parameters. A p value of less than 0.05 was considered statistically significant.

3. Results

Of 100 fetuses with nuchal cord, 78 (78 %) had cephalic presentation and 22 (22%) had breech

presentation. The mean age of all women surveyed was 28.5 ± 6.3 years who were in the 17-45 age range. Also separate group, the mean age of the fetus with cephalic presentation (Group A) was 28.5 ± 6.3 years (42-17) and in women with a breech presentation (Group B) was 28.4 ± 6.4 years (45-17). The age difference between the two groups was not statistically significant ($P=0.93$). In group A, 35 patients (44.9%) delivered in cesarean and 43 (55.1 %) were delivered in the normal way. In Group B, the delivery method in 20 cases (90.9%) was cesarean section and only 2 patients (9.1%) were in the normal way. The difference was statistically significant in terms of delivery ($P<0.0001$) (Table 1)

Table 1. The comparison of sonographic results in study groups

Variable	Group A N=78	Group B N=22	P value
Amniotic Fluid Index	13.3 ± 4.1 (6-27)	10.3 ± 2.9 (6-15)	$P=0.003$
Sonographic Growth of fetus	36.7 ± 0.9 (36-39)	36.4 ± 0.8 (36-39)	$P=0.15$
Heart Rate per minute	140 ± 9 (119-160)	142 ± 8 (126-160)	$P=0.33$

Mean \pm SD, Range

Color Doppler study of the umbilical artery PI and thoracic aorta which describes all fetuses were examined and compared between the two groups in Table 2. Average weight of infants in group A was 2970 ± 40 g (1250-3610) and in group B was 2775 ± 36.4 g (2110-3600). the difference of weight between the two groups was statistically significant ($P=0.04$).

Table 2. The comparison of PI index in study groups

Variable	Group A N=78	Group B N=22	P value
Umbilical Artery PI	0.93 ± 0.2 (0.55-1.95)	0.96 ± 0.3 (0.46-1.92)	$P=0.58$
Thoracic Aortic Artery PI	1.80 ± 0.1 (1.37-2.6)	1.80 ± 0.1 (1.52-2.2)	$P=0.88$

Mean \pm SD, Range

The fifth minute Apgar score, umbilical cord around the baby's neck with a curling round:

Out of 54 fetus with cephalic presentation with a round of stretching, 20 fetus had Apgar score of 10 out of 10, and 34 cases had Apgar scores of 9 out of 10. Of 11 cases with breech presentation with a twist round, 6 cases had Apgar score of 9 out of 10, and 5 cases had Apgar scores of 8 out of 10.

In the fifth minute Apgar score, umbilical cord around the baby's neck by twisting two rounds:

Out of 22 fetus of cephalic presentation with two rounds, 5 cases had Apgar scores of 10 out of 10, 15 cases had Apgar score of 9 out of 10, and only 2

cases had Apgar scores of 8 out of 10. Out of 7 fetus with breech presentation into with two curling away, 4 cases had Apgar score of 10 out of 10, and 3 cases had Apgar scores of 9 out of 10.

In the fifth minute Apgar score, fetal umbilical cord around the neck with three twists:

Two fetuses of cephalic presentation with three far-twisting had Apgar score of 9 out of 10. Out of 4 cases of breech presentation with three twists away from, 2 cases had Apgar scores of 10 out of 10 and 2 cases had Apgar scores of 9 out of 10. The difference between the umbilical artery PI index of cases with single and two round nuchal cord was statistically significant ($P=0.02$), whereas there was no significant difference in the thoracic aorta ($P=0.95$). The difference between the thoracic aorta and umbilical artery PI of cases with three round nuchal cord was statistically significant ($P<0.00010$ and $P=0.05$). The difference between umbilical artery PI with 2 round and 3 round nuchal cord was statistically significant ($P=0.02$), whereas there was no significant difference in the thoracic aorta ($P=0.21$).

4. Discussions

Sonographic detection of a nuchal cord was firstly reported in 1982 . With two-dimensional ultrasound a high degree of suspicion is required in order not to miss the presence of a nuchal cord, even with the application of highresolution sonographic imaging. This is due to the sonolucent nature of the umbilical vessels. All the women recruited had an ultrasound scan performed by one operator in one center and outcomes were obtained for all deliveries.(Onan et al. 2009; Hoffman et al. 2008) Given that a nuchal cord is defined as an umbilical cord that passes 360° around the neck, we feel it is unlikely to resolve during labor, when the head is in the pelvis. Therefore we assume that if there is a nuchal cord at the onset of labor then it is very unlikely to correct itself, and if there is no nuchal cord prelabor then one is unlikely to occur during labor. Overall we found that the sensitivity of the ultrasound diagnosis of a nuchal cord is low prior to induction of labor at term. We found that fetuses with a nuchal cord were more likely to be delivered with caesarean section rather than normal vaginal delivery. Jauniaux et al. examined the antenatal, intrapartum, and neonatal records of 2650 neonates and found a significantly higher incidence of emergency caesarean section in the nuchal cord group compared to controls.(Jauniaux et al. 1995) Larson et al. examined the records of 8565 deliveries and found that the presence of multiple nuchal cord entanglements was associated with a greater need for operative vaginal delivery but not for caesarean

section.(Larson et al. 1995) It should be noted, that women in these two studies were not stratified, according to parity, the presence of nuchal cords was diagnosed postnatally, and that both studies were retrospective, while our study was conducted prospectively. The incidence of a nuchal cord at delivery after induction of labor in the present study is similar to the well-documented incidence in all deliveries at term. The presence of a nuchal cord has been associated with many different factors in the mother, fetus, cord, placenta and labor and with a less favorable fetal outcome; however, the majority of these studies are case reports or small series.(Romero et al. 2000; Qin et al. 2000) There are reports of associations with breech presentation, right-sided fetal position, a male fetus, increased fetal activity, reduced fetal movements, a long length and less vascular coiling of the cord, abnormal umbilical artery Doppler findings, abnormal ductus venosus velocity waveforms, a posterior placenta, induction of labor, variable decelerations of the fetal heart rate, meconium-stained amniotic fluid, shoulder dystocia, operative vaginal delivery, emergency lower segment Cesarean section, IUGR, low Apgar scores, increased neonatal unit admission, need for resuscitation, umbilical artery acidemia, neonatal hypovolemic shock, neonatal anemia, dural sinus dilatation, stillbirth, poor neurodevelopmental performance at 1 year and cerebral palsy.(Hosoda et al. 2001; Miller et al. 2001) Despite these reports, a nuchal cord is usually associated with a normal neonatal and maternal outcome. This study found that the difference between the umbilical artery PI index of cases with single and two round nuchal cord was statistically significant ($P=0.02$), whereas there was no significant difference in the thoracic aorta ($P=0.95$). The difference between the thoracic aorta and umbilical artery PI of cases with three round nuchal cord was statistically significant ($P<0.0001$ and $P=0.05$). The difference between umbilical artery PI with 2 round and 3 round nuchal cord was statistically significant ($P=0.02$), whereas there was no significant difference in the thoracic aorta ($P=0.21$). Our results are generally in agreement with those of the previous studies. Rhoades et al. found a significantly higher incidence of low Apgar score at 5 min in the nuchal cord group. Both Jauniaux et al. and Larson et al. found a significantly higher incidence of low Apgar score at 1 min but not at 5 min in the nuchal cord groups compared with controls. In the former study, a higher incidence of need for neonatal resuscitation, and admission to the neonatal intensive care unit was found in the nuchal cord group, while in the latter higher incidence of low umbilical artery pH was reported in the presence of multiple cord entanglements.

Conclusion

Color Doppler sonography is a sensitive and specific method of diagnosing nuchal cord in fetus with cephalic or breech presentation.

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