

Perinatal outcome associated with nuchal umbilical cord

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Summary

Introduction: Nuchal umbilical cord (NUC) is a possible complication of pregnancy which can be associated with adverse perinatal outcome. **Materials and Methods:** A retrospective study was done at the County Emergency Hospital Timisoara, Romania, between January 2009 and December 2010 and included cases with NUC at the time of delivery. Outcome variable related to the mothers and newborns were studied. **Results:** The incidence of NUC in the studied period was 8%. Most were primiparous. There were no significant statistical differences between vaginal births and cesarean section with one minute Apgar scores higher than 8. Five percent of the studied group presented intrauterine fetal death. **Conclusions:** The presence of NUC implies more attention but are not associated with increased rate of operative vaginal or cesarean delivery. One minute Apgar scores in these cases are comparable. NUC can be a cause of IUFD.

Key words: Nuchal umbilical cord; Fetal distress; Intrauterine fetal death; Vaginal birth; Cesarean section.

Introduction

The umbilical cord (UC) has a very important role in connecting the developing fetus to the placenta. The apparition of the cord wraps - defined as a 360°, single or multiple wrap around the fetus' s neck - is considered a random event, caused by excessive fetal movement or a long UC [1]. Various factors related to the UC can influence the fetal blood flow through the umbilical cord vessels throughout pregnancy, labor, and delivery. It can have serious undesirable effects on the health of the fetus and newborn. NUC can be diagnosed antepartum using ultrasound (US) examination, but the complications are unpredictable and unpreventable. An umbilical cord accident (UCA) can conduct to intrauterine fetal death (IUFD), which is a form of sudden antenatal death syndrome (SADS). In these cases, the umbilical venous or umbilical arterial blood flow is compromised and the fetus dies. Incerpi *et al.* demonstrated that UCA may occur in 15% or more of all SADS cases [2]. The main objective of the study was to identify any correlation between maternal, fetal, and placental factors, the mode of delivery and the perinatal outcome of the cases with NUC at the time of delivery. The secondary objective was to demonstrate that NUC could be a cause of IUFD.

Materials and Methods

In the present study the recorded number of births with NUC were counted as well as the total number of deliveries in a tertiary hospital – Department of Obstetrics and Gynecology of the County Emergency Hospital Timisoara, Romania. Retrospectively the authors found 397 cases with NUC from the 5025 births recorded from January 2009 to December 2010.

Gestational age was based on the obstetrical method that uses the last menstrual cycle. In the study, term infants were defined as those born at or after 37 weeks of gestation and preterm infants were defined as those born between 28 and 36 weeks of gestation. Multipara was defined as women who had had two or more births and grand multipara was defined as women who had given birth five or more times.

Data were collected from different sources. Demographic data, including age, parity, provenance (urban/rural), obstetric history, and associated pathology were provided by patient medical records. Data related to the delivery were extracted from the delivery records and included gestational age, pregnancy type (single/multiple), fetal presentation at the time of delivery, mode of delivery, and the reasons for cesarean section (C-section), and details related to the placentas. Details about the newborns included birthweight, Apgar scores, sex, details related to NUC, associated pathologies or congenital anomalies were also extracted from the newborn's paper records.

For statistical analysis the SPSS computer application was used. More statistical tests were applied to analyze the data: chi square (χ^2), Kruskal-Wallis, Mann-Whitney, and correlation analysis.

Results

In the studied period 8% of the births were complicated with NUC. The mean maternal age was 27.7 ± 5.5 years; 11% (43) of the women were under the age of 20, 21% (238) were aged between 21-30, 28% (111) were aged between 31-40, and 1% (5) were 41 years of age or older. The urban/rural ratio showed that 54% were urban and 46% were rural. A total of 229 women (58%) were delivering their first child. NUC was present in 168 cases, (42%) in multipara, and just 13 cases (3%) of NUC in grand multipara.

The number of cases with NUC at the moment of birth increased until 40 weeks. After this term the number of cases decreased. In the cases with prematurity there were 37 pregnancies (9%) between 28-36 weeks. The gesta-

Table 1. — Mean Apgar score in different gestational age groups.

Group of gestation	N	Apgar score			
		Mean	Std. Deviation	Minimum	Maximum
28-33 weeks	14	3.9	2.5	0	10
34-36 weeks	23	7.1	3.4	0	10
37-40 weeks	337	8.8	1.7	0	10
41-42 weeks	23	9.1	0.7	8	10
Total	397	8.6	2.1	0	10

Table 2. — Results of two by two groups' comparison of the Apgar score.

Weeks of gestation by group	Weeks of gestation by group	Calculated p
28-33 weeks	34-36 weeks	< 0.001*
	37-40 weeks	< 0.001*
	41-42 weeks	< 0.001*
34-36 weeks	37-40 weeks	< 0.001*
	41-42 weeks	0.003
37-40 weeks	41-42 weeks	0.984

*significant differences.

Table 3. — Mean one-minute Apgar score of the newborns by vaginal and C-section.

Type of birth	N	Apgar score	
		Mean	Std. Deviation
Vaginal	255	8.5	2.1
C-Section	142	8.9	2.2

Table 4. — List of reasons for cesarean section.

Indication for the cesarean section	Cases
Dystocia	26 (18%)
Obstruction or severe distortion of the birth canal	5 (4%)
Previous cesarean birth	19 (13%)
Position of the fetus within the uterus	10 (7%)
Fetal distress	32 (23%)
Problems with UC	1 (1%)
Placental abruption	3 (2%)
Health of the mother	51 (36%)
Health of the baby	4 (3%)

tional age at the moment of delivery was in most cases (360) under 37 weeks (91%). NUC was frequently present in male babies (56%). The mean of the newborn weight at birth was $3,257.6 \pm 519.2$ g.

It is remarkable that the one-minute Apgar score varied between 8-10 in 92% of cases (Figure 1). It is an insignificant, direct, and very low correlation between Apgar score and NUC (Spearman coefficient = 0.04, $p = 0.428$), and was the same situation when NUC was correlated with the gestational age (coefficient Spearman = 0.032, $p = 0.519$). The mean of one minute Apgar score was related to gestational age. The largest mean one-minute Apgar score was in babies delivered post-term (Table 1). There were significant differences between the Apgar score in the described gestational age groups (test Kruskal-Wallis, $p < 0.001$). Values of the Apgar score were used to compare two by two groups using the Mann-Whitney test (Table 2).

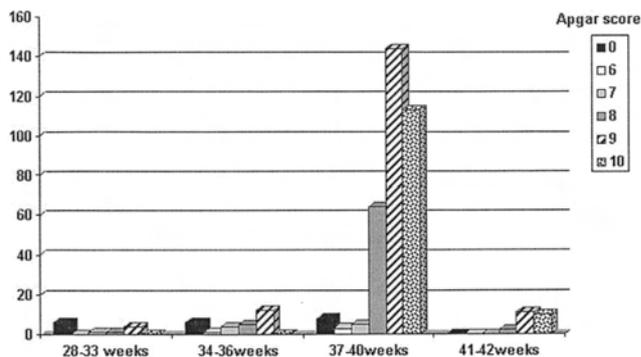


Figure 1. — One-minute Apgar scores in newborn babies according to gestational age.

There were 20 (5%) IUFDs. In these cases no other reason for fetal death were identified. An association was established between NUC and IUFD (test χ^2 , $p = 0.027$, $\alpha = 0.05$).

The number of wraps of the UC was another observation. In most cases (89%) a single loop of the cord around the neck was present at delivery. In 7% there were double loops and in 2% of cases there were triple loops.

Vaginal delivery was carried out in 64% of the pregnancies and vidextraction was used in 5% of these cases. The decision for cesarean birth was made by balancing the risks and benefits to mother and baby. The Apgar scores of the newborns by vaginal delivery and by C-section are presented in Table 3. The differences are statistically insignificant (test Mann-Whitney, $p = 0.096$). The percentage of patients with vaginal deliveries with the one-minute Apgar score from 8-10 was not significantly different in comparison with the C-sections (test χ^2 , $p = 0.308$, $\alpha = 0.05$).

The reasons for the cesarean births were grouped into eight categories (Table 4). The dystocia group included all cases in which the fetus was not able to progress down the birth canal and the size of the baby compared to the size of the mother's pelvis implied a difficult vaginal delivery. This category represents 11% of all cesarean sections. Cases with uterine fibroma and with placental previa were included in obstruction or severe distortion of the birth canal and represented 4%. Previous C-sections were described in 13% of cases. In the studied group, the fetuses were in normal position before the delivery – head downward in most cases (97%). There were 7% of C-sections performed due to abnormal position of the fetus in the uterus. Fetal distress represented 23% – as a single or associated reason for the C-section. It was the single reason for the Cesarean section, or was associated with other reasons. Placental abruption was present in three cases. Two of these were associated with pregnancy-induced hypertension which could be the reason for the C-section. The C-section was performed in case of fetal anomaly or IUFD (3% of cases).

Discussion

The study identified one NUC of every 13 deliveries (8%). Studies have described approximately 20-33% of pregnancies with NUC at term [3]. Other studies have reported a frequency between 18-25% of deliveries [4, 5]. Some studies suggest that NUC at delivery is not associated with perinatal outcomes [6]. Still other studies demonstrate that NUC has been associated with an increased risk for adverse outcome [7, 8]. The wrap of the UC was associated with higher birth weights and a fewer C-sections [9-11]. In the present group 60% of newborns weighed more than 3,500 g and just 36% were born by C-section.

Although the observation that NUC is present more often in primiparas, other studies identified the presence of NUC mostly in multiparas and still others did not find any relation between multiparity and NUC [12]. Moreover more male fetuses than female born with NUC has also been described in other studies [13].

In the third trimester of gestation, the most common cause of fetal demise is the complication of UC [14]. In UC accidents, the UC is constricted. This results in periods of hypoxia for the fetus which are described as unusually long periods of kicking or struggling. Therefore it is important to educate pregnant women to pay attention to these movements, especially when there is a large increase in kicking. It is not known how much time is needed for a fetus to die in cases when the UC is constricted. Unfortunately a common time of fetal death is during maternal sleep. Studies suggest that the event could be related to circadian rhythms [15-17]. In these cases various placental changes can appear with blood flow disruption or increased resistance [18, 19]. In the studied period, 37% of all IUFDs were attributed to an UC accident, which is a previously unrecognized complication in pregnancies after assisted reproductive techniques [20]. In the studied group, 4% of the pregnancies were obtained after sterility or infertility treatment; no IUFD occurred.

Ghosh demonstrated that in post-term pregnancies where NUC is present, there is an increased risk of fetal distress and operative intervention during labor, and thus delivery should be performed [21]. In the present study in the post-term pregnancies, 6% of the cases presented NUC and no IUFD.

In the studied group the mode of delivery was predominantly vaginal (64%). Other studies described a higher incidence of natural birth (84.21%) [13]. Because of the blood flow changes in cases with NUC, it has been hypothesized that it could be the reason for reduced fetal weight at birth [4, 22, 23]. In the studied group, the average fetal weight was under 3,200 g.

Conclusions

The presence of NUC does not result in slightly lower Apgar scores at one minute, mainly as a consequence of higher operative delivery rates. A good perinatal outcome resulted in the cases with natural birth so C-section deliv-

ery was not necessary – just in cases that presented documented fetal distress. NUC can complicate the result of birth, therefore in these cases the delivery requires more attention. Monitorization during labor is very important in all these cases. If any signs of fetal distress appear, C-section is recommended. The study concludes that the presence of NUC implies a possible fetal risk and NUC could be a reason for IUFD.

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