

Nuchal Cord at Delivery and Neonatal Outcomes: A Retrospective Cohort Study

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Abstract

Objective: The present study was aimed at evaluating the outcome of pregnancies with a nuchal cord. **Methods:** A retrospective population-based study of all deliveries during the years 2011-2020 in Philippe Maguilen SENGHOR Center was conducted. Perinatal outcome of patients with and without nuchal cord was compared. **Results:** Among 44,958 deliveries during the study period, 1.8% had a nuchal cord, documented at birth (n = 807). Higher rates of labor induction (9.1% vs. 3.2%; p < 0.001) and non-reassuring fetal heart rate patterns (RR = 2.366; CI: 1.631 - 3.432) were noted among pregnancies with nuchal cord as compared with the control group. The cesarean delivery rate was significantly higher among pregnancies with a nuchal cord (39.5% vs. 21.8%; RR = 2.333; CI: 2.023 - 2.692). Although 5 min Apgar scores lower than 7 were more common in pregnancies with a nuchal cord (7.8% vs. 3.8%; RR = 2.117; CI: 1.629 - 3.363). There was no statistical significance between the two groups for the perinatal mortality. **Conclusion:** Nuchal cord is associated with prolonged labor and adverse perinatal outcome.

Keywords

Nuchal Cord, Perinatal Outcome, Philippe Senghor Health Center, Dakar

1. Introduction

Nuchal cord is a pathology of umbilical cord position that wraps completely around the fetal neck [1]-[8]. It is the most frequently observed and described funicular anomaly. The frequency varies according to the authors between 5% and 35% depending on the type of study, the sample size and the location of the

study [9] [10] [11].

The risk factors are not clearly identified but several authors favor an association with post-maturity, gemellity and amniotic fluid volume abnormalities such as excess fluid [12].

Diagnosis is most often made after fetal head delivery, but it can also be suspected antenatally by ultrasound coupled with color Doppler. However, even if ultrasound allows us to suspect it, it does not allow us to clearly evaluate the impact on the fetus, depending on the time of occurrence of the circular during the pregnancy, the degree of stricture of the cord on the fetal neck [12] [13]. The effect on the fetus can also be assessed by recording the fetal heart rate during labor.

In the case of infants born with a nuchal cord, it is hypothesized that compression of the umbilical cord during labor and delivery may decrease umbilical blood flow, causing hypoxemia, hypercapnia and acidosis in the fetus.

Several studies have evaluated the impact of this pathology on the outcome of pregnancy, delivery and the fate of the newborn with controversial results depending on the size of the cohort, the location of the study among others.

Several studies have evaluated the impact of this pathology on the outcome of pregnancy, delivery and the evolution of the newborn with controversial results depending on the size of the cohort, the location of the study among others. Several authors are in favor of a negative influence of the cord circular on pregnancy outcome and neonatal prognosis and others did not find a statistically significant impact of this anomaly on the progress of labor and delivery. As a result, to date, no clear recommendation has been made regarding the management and, above all, the delivery route in cases where the diagnosis is made antenatally. Practices vary according to the technical platform but above all according to the experiences of the different authors [11] [14].

It is in this context that we carried out this study whose objective was to evaluate the impact of the nuchal cord on labor and on the neonatal prognosis.

2. Méthods

2.1. Study Design and Period

This was a retrospective cohort study over a 9-year period between 2011 and 2020 of deliveries that took place at our facility.

2.2. Study Setting

The study was conducted at the Philippe Maguilen SENHOR which is a university reference maternity hospital in the suburbs of Dakar.

In 2019, the institution recorded 7673 deliveries, including 1261 caesarean sections.

2.3. Participants

The study included all patients who delivered a monofetal pregnancy at the hos-

pital with a newborn in longitudinal presentation (cephalic and breech) with a term of more than 33 weeks plus 6 days.

The patients were divided into two groups: the first group included patients who were diagnosed with a nuchal cord at the time of delivery, which we will refer to as the “exposed patients”; the comparison group included all patients who had delivered during the same period without a nuchal cord.

2.4. Variables

For this study, we considered maternal characteristics, labour and delivery data and neonatal prognosis for each patient. For parity, the patients were divided into two groups: primiparous (those who came for their first delivery) and the rest considered multiparous. For the term of the pregnancy there were three groups: term which was the reference, pre-term from 34 to 36 SA + 6 days and post-term beyond 41 SA + 6 days. Fetal heart sounds were assessed using the Pinard stethoscope and were considered abnormal in cases of bradycardia, tachycardia and irregularity. For the Apgar score at five minutes, patients were divided into two groups: score greater than or equal to 7 at five minutes was considered normal and a score less than 7 was considered low.

2.5. Data Sources and Statistical Methods

The parameters were collected into our computerized database. Data extracted from our database were analyzed using Microsoft Excel and Statistical Package for Social Science (SPSS) software 26.

Descriptive statistical analyses were carried out on the continuous quantitative variables to determine their position and dispersion parameters. We calculated the frequencies of the categorical or qualitative variables.

To identify the association between the outcomes and the independent variables, a bivariate analysis was performed.

The significance level was set to 5%.

3. Results

During this period 44,958 records were included in our study with 807 cases of nuchal cord diagnosed at the time of delivery, a frequency of 1.8%.

The two groups were almost identical for maternal age and parity. Post-term delivery was more frequent in patients with umbilical cord circulars (8% versus 4.3%). There was a statistically significant difference between the two groups in the presence or absence of premature rupture of membranes with 34.7% in the circular group compared to 27.1%. In addition, there was more artificial labour induction in the circular group with 9.1% compared to 3.2%. Maternal characteristics and obstetric data are presented in **Table 1**.

For neonatal prognosis, in the circular umbilical cord group there was twice the risk of having a fetal heart rate defect (RR = 2.366; CI: 1.631 - 3.432), a caesarean section (RR = 2.333; CI: 2.023 - 2.692) a low Apgar score at 5 minutes

(RR: 2.117; CI: 1.629 - 2.750) and neonatal resuscitation (RR = 2.902; CI: 2.505 - 3.363). There was no association between the occurrence of intrapartum fetal death and the presence or absence of an umbilical cord circular. All these results are reported in **Table 2**.

4. Discussion

4.1. Main Results

The study found that the nuchal cord at delivery had a negative influence on neonatal prognosis with a higher frequency of caesarean section, fetal heart rate abnormalities during labour, poor Apgar score at birth and neonatal resuscitation.

4.2. Interpretation of Results

The 1.8% frequency of nuchal cord found in our study is much lower than in the literature where frequencies ranging from 5% to 37% have been found. This could be due to the large size of our sample with 44,958 records included which is an argument in favour of the reliability of the results.

Regarding maternal characteristics, no association was found between maternal age and parity in our study. The same was true for what was found in the

Table 1. Maternal and labour characteristics in patients with and without nuchal cord at delivery.

	Nuchalcord <i>n</i> (%)	No nuchalcord <i>n</i> (%)	p-value
Meanage (ans)	27.7	27.3	0.104
Multiparous	274 (33.9)	533 (36.2)	0.184
Post-term	65 (8)	1921 (4.3)	<0.001
Rupture of membranes	278 (34.7)	11,687 (27.1)	<0.001
Induction of labour	74 (9.1)	1423 (3.2)	<0.001

Table 2. Neonatal prognosis of pregnancies with and without umbilical nuchal cord.

	Nuchalcord <i>n</i> (%)	No nuchalcord <i>n</i> (%)	RR*	[CI]* 95%
Abnormal FHR*	30 (3.7)	709 (1.6)	2.366	[1.631 - 3.432]
Caesarean section	319 (39.5)	9662 (21.8)	2.333	[2.023 - 2.692]
Neonatal condition (stillbirth)	11 (1.3)	379 (0.8)	1.596	[0.873 - 2.918]
Apgar M5 < 7	63 (7.8)	1654 (3.8)	2.117	[1.629 - 2.750]
Newbornresuscitation	294 (37.8)	7407 (17.3)	2.902	[2.505 - 3.363]

*FHR: Fetal Heart Rate; *RR: Relative Risk; *CI: Confidence Interval.

literature [9] [13] [14] [15].

As reported by several authors, post-term is more frequent in case of cord circularity. This pathology could explain post-maturity by acting on the fetal head responsible of a bad descent which could delay the entry in labour. This same mechanism could also explain the fact that we find more premature rupture of the membranes and artificial induction of labour in this group [1] [14] [15].

Caesarean section was more frequent in the exposed group of patients (39.5% vs. 21.8%). This is explained by the impact of this pathology on the labour but especially on the foetus. On the neonatal aspect, there was a two times greater risk of having abnormalities of the fetal heart sounds and at the same time a poor Apgar score at birth. This is probably due to the fact that there may be compression and stricture of the fetal neck by the cord in this condition. It follows, as in our study, that more use was made of resuscitation measures for the newborn in this group (37% compared to 17%). These results are similar to those found by Abdo *et al.* who in a study assessing risk factors for neonatal asphyxia found three times more acute fetal distress in the presence of a nuchal cord (RR: 3.1 95; CI: 1.2 - 9.3) [16]. But these results are controversial, and for some authors the presence of nuchal cord is not necessarily associated with a poor neonatal prognosis [14] [17]. The difference in our study could be due to differences in the study design, the setting which is a referral health unit whose geographical location makes it a preferred location for obstetric evacuations. Also, there is the large sample size with 44,958 patients included which is an argument for reliability. The assessment of the fetal status at birth allowed us to find a quasi-similar rate of intrapartum fetal death in the two groups. This does not necessarily depend on the presence of the circular but above all on the quality and speed of management in the event of a fetal heart rhythm anomaly.

4.3. Implication of Results

For clinical practice, it seems important to try to search for the presence of an umbilical cord circular at the 3rd trimester ultrasound or in early labour given the impact of this condition on neonatal prognosis. A study by Peregrine in 2005 evaluating ultrasound detection of cord circulars and the rate of caesarean section, found a circular in 34% with a high false negative rate (58%) [13]. This is relevant to the obstetrical attitude in cases where this condition is suspected antenatally. But as this author states, ultrasound diagnosis will only be useful if we can refine the technique to be able to diagnose nuchal cord reliably and predict cases where it may have an impact on the course of labour and neonatal prognosis. Should a caesarean section be used routinely or should a vaginal delivery be attempted with more rigorous monitoring of the fetal heart rate [13] [18]?

This has two implications: firstly, there may be an increase in the rate of caesarean section in cases of antenatal suspicion; secondly, there may be an ethical problem in attempting vaginal delivery given the proven impact of this condi-

tion on neonatal prognosis.

This opens up possibilities for research, with the importance of carrying out studies on the evaluation of risk factors for neonatal asphyxia and also prospective studies on prenatal ultrasound diagnosis.

Only then can clear recommendations be made on the management of pregnancies complicated by umbilical cord anomalies.

4.4. Strengths and Limitations of the Study

The fact that it was a retrospective study limited the use of data with incomplete records and missing information.

The strengths of our study were the large sample size and the location of the study, which was a reference health center.

5. Conclusion

The results of our study confirm the impact of the umbilical cord circular on the neonatal prognosis with a negative impact on this pathology. This leads us to question the interest in prenatal diagnosis of circulars but also the route of delivery when it is suspected in antenatal.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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