

Is Nuchal Cord a Perfect Scapegoat: A Retrospective Analysis from Northwest India?

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ABSTRACT

Background: Entanglement of the umbilical cord around the fetal neck (nuchal cord) is quite a common finding at delivery. It is often assumed that nuchal cord causes cord compression and thus low birth weight and intrapartum complications.

Aim: The aim of this article is to study the effect of nuchal cord on the mode of delivery, complications and fetal outcome.

Materials and Methods: A retrospective study was carried out on 386 deliveries, 60 of them with nuchal cord, during 1 year from November 2009 through October 2010. Their mode of delivery, complications and fetal outcome were studied and a comparison was established between nuchal cord group and the rest of the deliveries. Nuchal cord group was subdivided into loose nuchal cord (cord could easily be uncoiled before complete delivery of the baby) group and tight nuchal cord (cord was needed to be clamped and cut before delivery of the baby) group. Furthermore, the mode of delivery and fetal outcome were compared between these subgroups. Statistical analyses were performed using SPSS statistical soft ware version 12.0 (Chicago Illinois, USA). The results were expressed as percentages. Test for significance was done using Chi-square, and a $P<0.05$ was considered as significant. **Results:** The nuchal cord group did not have any significant difference in the mode of delivery or fetal outcome compared with the control group. However, the subgroup having tight cord around the neck had significantly higher proportion of low Apgar scores and meconium staining at birth. **Conclusions:** Nuchal cord does not increase the chances of cesarean delivery. However, tight cord around the neck may result in low Apgar scores and increased incidence of fetal distress leading to cesarean section.

KEY WORDS: Apgar score, cesarean delivery, meconium staining, north west India, nuchal cord, perinatal outcome

INTRODUCTION

Entanglement of the umbilical cord around the fetal neck (nuchal cord) is quite a common finding at delivery. It is often assumed that nuchal cord causes cord compression and thus low birth weight and intrapartum complications. The assumption that nuchal cord entanglement could cause cord compression and thus intrapartum complication is not recent. Hippocrates described in the "De OctimestriPartu" the nuchal and chest coiling of the umbilical cord and regarded it as "One of the great dangers of the 8 month."^[1]

The nuchal cord is often blamed for problems that are encountered during delivery and is often cited as a major

cause of fetal distress and perinatal mortality. However, the actual significance that a nuchal cord has on the outcome of an infant is controversial.^[2] Nuchal cords before 20 weeks of gestation is rare because the umbilical cord is shorter than the fetal body until then and thus has no opportunity to wrap around the neck or head.^[3] The pattern most commonly associated with nuchal cords (>80%) is that of wrapped right-to-left around the fetal neck. Most torsion (>70%) is counter clockwise (sinistral, left-handed) away from the fetus. This suggests that the fetus when stimulated maneuvers in the same direction most of the time.^[4,5] The fetus can develop entanglement and escape from it. It is possible for a 20 weeks fetus with a triple nuchal cord to free itself of the loops by 28 weeks.^[4,5] About 28% of all pregnancies have a nuchal cord and of these 3.7% have two or more loops. The farther along in gestation a delivery occurs, the higher probability of a nuchal cord

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being present from around 10% at 24 weeks, to around 18% at 32 weeks and around 30% at term following an almost perfectly linear distribution.^[5] Therefore, it remains appropriate to use exceedingly conservative criteria like unequivocal histopathological evidence for obstruction of blood flow in ascribing causality to nuchal cords when they are found in stillborn babies.^[5]

One of the concerns that can increase the risk of cord problems is decreased amniotic fluid. This does not allow for the free movement of the baby and the cord, on and off each other, raising the possibility of a cord accident.^[6] During labor, the only indication of the umbilical cord being wrapped around the baby may be variable fetal heart decelerations on the fetal monitor. These are generally timed with contractions as at that time the cord is stretched more tightly.^[7] The retrospective analysis was aimed at understanding the effect of nuchal cord on the mode of delivery, complications and fetal outcome.

MATERIALS AND METHODS

A total of 386 infants delivered during a 1 year period from November 2009 to October 2010 were included in the study. The study was conducted in maternity center in Jammu city of Jammu and Kashmir state in northwest India. Ethical clearance was obtained from the relevant authority. The maternal delivery record provided the data for gestational age, method of delivery, presence of meconium in the amniotic fluid, fetal heart rate monitoring, presence of nuchal cord and any other complications that may have occurred at the time of delivery. The newborn's record was used to collect data for Apgar scores. Of the 386 deliveries, nuchal cord group consisted of 60 births. A nuchal cord was considered to be "loose" when it could be uncoiled before delivery of the newborn. When it needed to be clamped and cut before delivery, the nuchal cord was called tight. Fetal distress was defined as the presence of bradycardia or variable or late decelerations in heart rate detected by an electronic fetal heart monitor. Statistical analyses were performed using SPSS statistical soft ware version 12.0 (Chicago Illinois, USA). The results were expressed as percentages. Test for significance was done using Chi-square, and a $P < 0.05$ was considered as significant.

RESULTS

During the study period, 15.54% (60/386) of all deliveries had some form of nuchal cord. The incidence of one coil of the umbilical cord around the neck was 49/60 (81.67%), while two coils and three coils of the cord occurred in 6/60 (10%) and 3/60 (5%) of the deliveries, respectively. There

was 2/60 (3.33%) such cases, wherein quadruple loop was involved. Of the 60 nuchal cords, 52 (86.67%) were loose, 8 (13.33%) were tight. There were no significant differences in the maternal age, race or parity between the two groups. The mean age of the mothers in both groups was around 21 years and the majority was nulliparous (43%).

Table 1 is a summary of the timing, method and complications of labor and delivery. The mean gestational age at birth was just over 38 weeks in both groups. There was no statistical difference in frequency of primary cesarean sections or vacuum extractions between the two groups. The rate of primary cesarean section was 26.7% in the nuchal cord group compared with 28.2% in the control group. The comparative study between two subgroups with tight nuchal cord and loose nuchal cord showed statistically significant higher vacuum delivery rates, meconium stained liquor, fetal distress and low Apgar scores at 1 min in tight nuchal cord group [Table 2].

DISCUSSION

The frequency of nuchal cord in our study was 15.54%. The incidence varies from 12.6% to 33.3%, with an overall average of 20.4%.^[2,6,8-11] This study was unable to demonstrate any

Table 1: Comparison between nuchal cord group and control group

Mode of delivery	Nuchal cord % (N=60) no. (%)	Non-nuchal cord group (N=326) no. (%)	Chi-square	P value
Vaginal delivery	42 (70)	150 (46)	11.664	<0.001
Primary cesarean section	16 (26.7)	92 (28.2)	0.061	0.80
Repeat cesarean section	2 (3.3)	84 (25.8)	14.728	<0.001
Vacuum/forceps delivery	1 (1.7)	5 (1.5)	0.006	0.94
Breech delivery	2 (3.3)	25 (7.7)	1.464	0.23
Placental abruption	1 (1.7)	5 (1.5)	0.006	0.94
Meconium stained amniotic fluid	4 (6.7)	34 (10.4)	0.808	0.37
Fetal distress	8 (13.3)	40 (12.3)	0.053	0.82
Apgar at 1 min <7	5 (8.3)	32 (9.8)	0.129	0.72
Apgar at 5 min <7	2 (3.3)	4 (1.2)	1.469	0.22

Table 2: Comparison between tight and loose nuchal cord group

Mode of delivery	Tight nuchal cord % (N=8) no. (%)	Loose nuchal cord (N=52) no. (%)	Chi-square	P value
Vaginal delivery	4 (50)	38 (73.1)	1.758	0.18
Primary cesarean section	3 (37.5)	13 (25)	0.554	0.46
Repeat cesarean section	1 (12.5)	1 (1.9)	2.407	0.12
Vacuum/forceps delivery	1 (12.5)	0	6.610	0.01
Breech delivery	1 (12.5)	1 (1.9)	2.407	0.12
Placental abruption	0	1 (1.9)	0.156	0.69
Meconium stained amniotic fluid	3 (37.5)	1 (1.9)	14.104	<0.001
Fetal distress	5 (62.5)	3 (5.8)	19.310	<0.001
Apgar at 1 min <7	3 (37.5)	2 (3.8)	10.280	<0.001
Apgar at 5 min <7	1 (12.5)	1 (1.9)	2.407	0.12

association between the presence of a nuchal cord and the length of the pregnancy. The average umbilical cord length is 50-58 cm. Longer cord tends to become looped around the neck. Nuchal coiling can occur in shorter cords, in which cases the cord tends to be more tightly wrapped around the infant's neck.^[12] As this study was of the retrospective nature and the length was not taken at the time of delivery, no extrapolation with respect to the length of the cord to outcome could be drawn. The presence of a nuchal cord in this study was not associated with an increased frequency of primary cesarean section and vacuum or forceps deliveries. The subgroup having tight nuchal cord didn't have a higher incidence of cesarean section in our study, which is the same as observed by many authors.^[2,4,8-11,13,14] Several studies in the past have implicated nuchal cord as a cause of fetal death. In contrast, several authors agree with the present study that nuchal cords do not increase fetal mortality.^[4,8,10,11,13] The presence of a nuchal cord is often cited as a major cause of fetal distress, as evidenced by meconium stained amniotic fluid and/or fetal bradycardia or tachycardia. In the present study, over 6.7% and 10.4% of deliveries in nuchal cord and control group respectively were complicated by thick meconium staining. Fetal bradycardia and variable decelerations were found more often in the nuchal cord group than in the control group (13.3% vs. 12.3%) in the present study. Similar increases in both moderate and severe variable decelerations in labors complicated by nuchal cords have been reported.^[11] Greater than 50% interruption of umbilical blood flow is significant for creating fetal hypoxia. Sustained or repetitive compressions eventually lead to fetal compromise. Occlusion of the uterine artery has similar effects on the fetus with specific differences on the fetal heart and brain. Combined umbilical cord occlusion and uterine artery occlusion has the effect on fetal organs and metabolism.^[14] Cord compression; whether chronic intermittent or acute, ultimately stimulates the fetus to shunt its blood flow, vasoconstrict its extremities and protect itself through a centralized circulation (heart, adrenal, brain). Baroreceptor and chemoreceptor responses occur with the release of catecholamines, cortisol, vasopressin, angiotensin and other biochemical agents to initiate a fetal response to developing hypoxia. Fetal metabolism of glucose and gluconeogenesis are induced by cord compression. Arterial lactate elevations may be a measurable result of umbilical cord compression. These protective steps over time can give way to bradycardia, vasodilatation, fetal hypotension and acidosis, depletion of glycogen stores and blunting of the cortisol response. Eventually fetal compensation fails and peripheral vasodilatation occurs with heart failure, arrhythmias and fetal death. Short term rapid biochemical defenses such as catecholamines, are replaced by the long-term endocrine and paracrine biochemistry. These agents are metabolized

at a slower rate eventually leading to devastating fetal effects. In an intermittent cord compression (one complete occlusion every 5 min), sheep model with term fetuses, fetal collapse occurs in 45 min to 1 h. In a model of 5 min complete cord compression repeated every 30 min the fetuses died after 3 or 4 occlusions. Clinical signs, which may be present, given the biochemical status of the fetus at risk of umbilical cord compression compensation, are hiccups, hyperactivity, decreased fetal movement and fetal heart rate changes.^[14] This acidosis is of a mixed (68%) or a pure respiratory (23%) type and is corrected quickly by prompt ventilation of the newborn. Thus, though the nuchal cord group did tend to have a larger percentage of infants born with a score of less than 7, nuchal cords are not a major cause of fetal asphyxia.^[8,11] In some studies, nuchal cord associated with meconium or an abnormal fetal heart rate pattern and one that has multiple loops or is extremely tight may cause a subclinical deficit in neurodevelopmental performance or unexplained spastic quadriplegia.^[15,16]

Although this study is very important, the retrospective nature did not allow us to assess the length of the cord at the time of delivery and therefore no extrapolation with respect to the length of the cord to outcome could be drawn. These short comings will be addressed in future studies.

CONCLUSION

Nuchal cord does not increase the chances of cesarean delivery. However, tight cord around the neck may result in low Apgar scores and increased incidence of fetal distress and meconium stained liquor.

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