Nuchal Cord : A Retrospective Analysis

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Abstract

Background : 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 of nuchal cord on the outcome of an infant is controversial. A retrospective study was done to investigate the actual frequency of nuchal cords encountered in a hospital setting and to determine its effect on an infant as it passes through the birth canal and immediately after delivery.

Methods: A retrospective study was carried out in 350 deliveries (out of total 367 deliveries) including 65 cases of nuchal cord from July to December 2005. Nuchal cord group was divided into loose nuchal cord (cord could easily be uncoiled before delivery of the newborn) group and tight nuchal cord (cord was needed to be clamped and cut before delivery) group. The mode of delivery, complications and fetal outcome of nuchal cord groups was compared with rest of the deliveries. Seventeen cases (including three cases of nuchal cord) having complications as intrauterine growth retardation, oligohydramnios (AFI <5), antepartum haemorrhage, severe pregnancy induced hypertension and maternal medical complications were excluded.

Result: We found that the loose nuchal cord group did not have any significant difference in mode of delivery or fetal outcome as compared to control group however the group having tight cord around the neck had significantly higher proportion of fetal distress and low Apgar scores at one minute.

Conclusion : Loose nuchal cord doesn't increase the chances of cesarean delivery whereas tight cord around the neck may result in lower Apgar scores at one minute and increased incidence of fetal distress.

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Key Words : Nuchal cord; Apgar score; Cesarean delivery; Meconium staining

Introduction

Intrauterine life, sustained only by two small arteries and a tortuous vein coursing through a long flexible cord, hangs by a very delicate thread. The actual significance that a nuchal cord has on the outcome of an infant is controversial. But 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.

About 28% of all pregnancies have a nuchal cord (of which 3.7% have two or more loops). As the period of gestation increases, the probability of a nuchal cord becomes higher, following an almost perfectly linear distribution. Nuchal cords are rare before around 20 weeks gestation (mostly because the umbilical cord is shorter than the fetal body until around then and so has no opportunity to wrap around the neck or head) [1]. Most nuchal cords (>80%) are wrapped right to left around the fetal neck. Most torsion (>70%) is counterclockwise (sinistral, left-handed) away from the fetus. This suggests the fetus maneuvers in the same direction most of the time when stimulated. The fetus can develop entanglement and escape from it. It is

possible for a twenty week fetus with a triple nuchal cord to free itself of the loops by twenty eight weeks. Therefore, it remains appropriate to use conservative criteria (e.g. unequivocal histopathological evidence for obstruction of blood flow) in ascribing attributability of still births to nuchal cords [2].

If the umbilical cord becomes overstretched or compressed during labour, it usually leads to fetal bradycardia temporarily. These brief "variable heart rate decelerations" are not harmful. If the baby's heart rate slows to below 100 beats per minute and does not return to normal (120 to 160 for most babies) within a few minutes, measures will be taken to relieve the presumed cord compression. This includes giving oxygen and fluid to the mother or having her change position. Tocolytics may be given to slow down the contractions. If it is still not relieved, a caesarean delivery may be done.

Material and Methods

A review of 367 labor records from July 2005 to Dec 2005 was done. The gestational age, method of delivery, presence of meconium in the amniotic fluid, fetal heart rate monitoring, presence of nuchal cord, and any other complications were noted. The newborn's record was used to collect data for

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Apgar scores. Seventeen cases (including three nuchal cord cases) having complications such as intra uterine growth retardation (IUGR), oligohydramnios (AFI < 5), antepartum haemorrhage (APH), severe pregnancy induced hypertension (PIH) and maternal medical complications were excluded. Of the 350 deliveries, the study group consisted of 65 births involving nuchal cords, while remaining 285 deliveries, served as the control group.

A nuchal cord was considered to be “loose” when it could easily be uncoiled before delivery of the newborn. When the nuchal cord had to be clamped and cut before delivery, it was called “tight”. Fetal distress was recorded in the presence of bradycardia (Fetal heart rate (FHR) < 100 beats/min for > 3 min) or persistent severe variable or late decelerations (persistent recording of reduction in FHR > 15 beats/min from baseline for more than 15 sec recording with associated decreased beat to beat variability or FHR reducing to < 100 beats/min for > 1 min) in heart rate detected by an electronic fetal heart monitor. Statistical analyses were performed using chi-square test.

Results

During the study period, 18.57 % of all deliveries had some form of nuchal cord. The incidence of one coil of the umbilical cord around the neck was 61 (17.43%), while two coils and three coils of the cord occurred in five (1.43%) and two (0.57%) of the deliveries, respectively. Sixty five nuchal cords were studied after excluding three nuchal cords present in 17 excluded cases. Out of 65 nuchal cords, 48 (73.85%) were loose and 17 (26.15%) 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 slightly over 21 years and majority (48%) were nulliparous.

Table 1 gives 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 7.35 % in the nuchal cord group as compared with 12.09 % in the control group. Primary cesarean section is a better parameter than total number of cesareans as previous cesarean itself is a significant

factor for repeat cesarean.

The control group had more breech presentations and placental abruptions than the nuchal cord group; however, the difference was not statistically significant. Meconium staining of the amniotic fluid was equally present in both groups. Fetal bradycardia and variable decelerations occurred almost equally in both groups. There was no significant difference found between the two groups in respect of low one and five-minute Apgar scores.

The comparative study between two subgroups (Table 2) with tight nuchal cord and loose nuchal cord showed statistically significant higher primary cesarean rate ($p \leq 0.025$) and low Apgar scores at one minute ($p \leq 0.01$) in patients with tight nuchal cords. Apgar score at five minutes did not show any significant difference as fetal compromise in utero is usually reversible and fetus recovers rapidly after delivery. Only in cases of prolonged fetal compromise or neglected labours this will result in low Apgar scores at five and ten minutes and poor outcome. Table 3 shows comparison between loose cord group and control (no nuchal cord) group. There was no significant difference in primary cesarean rates, fetal distress, Apgar scores or other parameters. Hence finding of nuchal cord in ultrasound in absence of fetal compromise is not contributory in decision of mode of delivery.

The comparative study between tight nuchal cord group versus control group (Table 4) showed significant difference in incidence of fetal distress ($p \leq 0.05$) and Apgar scores at one minute ($p \leq 0.01$). Though the incidence of primary cesarean section, meconium staining, vacuum delivery was higher in tight cord group, it was not found statistically significant.

Discussion

The frequency of nuchal cords found in this study was 18.57 %, the incidence of which varies from 12.6 - 33.3 %, with an overall average of 20.4 % [4-7]. The average umbilical cord length is 50 to 58 cm. Longer cords tend 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 [8].

Table 1
Comparison between nuchal cords group and control group

	Nuchal cord group n=65 (%)	Control group n=285 (%)	Chi square value	p value
Vaginal delivery	58 (89.23)	215 (75.44)	5.8673	$\leq 0.025^{**}$
Primary cesarean	6 (9.23)	34 (11.93)	0.3809	≤ 1
Repeat cesarean	1 (1.53)	36 (12.63)	6.8894	$\leq 0.01^{**}$
Vacuum	1 (1.53)	3 (1.05)	0.1105	≤ 1
Breech	1 (1.53)	10 (3.51)	0.6749	≤ 1
Abruptio	0	1 (0.35)	0.2287	≤ 1
Meconium stained	4 (6.15)	20 (7.02)	0.0618	≤ 1
Fetal distress*	8 (12.31)	25 (8.77)	0.7748	≤ 1
Apgar 1' < 7	5 (7.69)	15 (5.26)	0.5796	≤ 1
Apgar 5' < 7	2 (3.07)	4 (1.40)	0.8796	≤ 1

(*) As manifested by fetal bradycardia, variable or late decelerations. (**) denotes statistically significant.

Table 2**Comparison between nuchal cords loose subgroup and nuchal cord tight subgroup**

	Nuchal cord loose group n=48 (%)	Nuchal cord tight group n=17 (%)	Chi square value	p value
Vaginal delivery	45 (93.75)	13 (76.47)	3.9006	≤ 0.05**
Primary cesarean	2 (4.17)	4 (23.52)	5.6173	≤ 0.025**
Repeat cesarean	1 (2.08)	0	0.3597	≤ 1
Vacuum	0	1 (5.88)	2.8676	≤ 0.1
Breech	1 (2.08)	0	0.3597	≤ 1
Abruptio	0	0	0	
Mec stained	2 (4.16)	2 (11.76)	1.2549	≤ 1
Fetal distress*	4 (8.33)	4 (23.53)	2.6859	≤ 0.2
Apgar 1' <7	1 (2.08)	4 (23.53)	8.1316	≤ 0.01**
Apgar 5' <7	0	1 (5.88)	2.8676	≤ 0.1

(*) As manifested by fetal bradycardia, variable or late decelerations. (**) denotes statistically significant.

Table 3**Comparison between nuchal cords loose subgroup and control group**

	Nuchal cord loose group n=48 (%)	Control group n=285 (%)	Chi square value	p value
Vaginal delivery	45 (93.75)	215 (75.44)	8.0478	≤ 0.01**
Primary cesarean	2 (4.17)	34 (11.93)	2.5677	≤ 0.2
Repeat cesarean	1 (2.08)	36 (12.63)	4.6280	≤ 0.05**
Vacuum	0	3 (1.05)	0.5098	≤ 1
Breech	1 (2.08)	10 (3.51)	0.2613	≤ 1
Abruptio	0	1 (0.35)	0.1689	≤ 1
Mec stained	2 (4.16)	20 (7.02)	0.5411	≤ 1
Fetal distress*	4 (8.33)	25 (8.77)	0.0099	≤ 1
Apgar 1' <7	1 (2.08)	15 (5.26)	0.9081	≤ 1
Apgar 5' <7	0	4 (1.40)	0.6818	≤ 1

(*) As manifested by fetal bradycardia, variable or late decelerations. (**) denotes statistically significant.

Table 4**Comparison between nuchal cords tight subgroup and control group**

	Nuchal cord tight group n=17 (%)	Control group n=285 (%)	Chi square value	p value
Vaginal delivery	13 (76.47)	215 (75.44)	0.0092	≤ 1
Primary cesarean	4 (23.52)	34 (11.93)	1.9624	≤ 0.2
Repeat cesarean	0	36 (12.63)	2.4379	≤ 0.2
Vacuum	1 (5.88)	3 (1.05)	2.8633	≤ 0.1
Breech	0	10 (3.51)	0.6169	≤ 1
Abruptio	0	1 (0.35)	0.0598	≤ 1
Mec stained	2 (11.76)	20 (7.02)	0.5352	≤ 1
Fetal distress*	4 (23.53)	25 (8.77)	4.0249	≤ 0.05**
Apgar 1' <7	4 (23.53)	15 (5.26)	9.0794	≤ 0.01**
Apgar 5' <7	1 (5.88)	4 (1.40)	1.9765	≤ 0.2

(*) As manifested by fetal bradycardia, variable or late decelerations. (**) denotes statistically significant.

The presence of a nuchal cord in this study was not associated with an increased frequency of primary cesarean, vacuum, or forceps deliveries. Though the group having tight nuchal cords had higher incidence of cesarean in this study, this is controversial in the literature [3-7,9,10].

Greater than 50% interruption of umbilical blood flow is significant in 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 effects on fetal organs and metabolism [10]. 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 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, fetal hypotension and acidosis, depletion of glycogen stores and blunting of the cortisol response. Eventually fetal compensation will fail, peripheral vasodilation will occur with heart failure, arrhythmias and fetal death. Short term rapid biochemical defenses such as catecholamines, are replaced by long-term endocrine and paracrine biochemistry. These agents are metabolized at a slower rate eventually leading to devastating fetal effects. Clinical signs which may be present in the foetus at risk of umbilical cord compression are hiccups, hyperactivity, decreased fetal movement and fetal heart rate changes. This acidosis is of a "mixed" (68%) or a pure respiratory (23%) type and is corrected quickly by prompt ventilation of the newborn.

Although the nuchal cord group had a larger percentage of infants born with Apgar score of less than 7, nuchal cords are not a major cause of fetal asphyxia [4,7]. Similarly in this study, fetal bradycardia and variable/ late decelerations were found more often in the group with tight nuchal cords (23.53% as compared with 8.77%) and it was statistically significant ($p \leq 0.05$). Apgar scores at one minute were significantly lower in tight nuchal cord subgroup ($p \leq 0.01$). But nuchal cords did not increase fetal mortality nor had significant effect at Apgar scores at five minutes as shown in many other studies [4,6,7,9]. Increase in meconium staining and fetal compromise in labors complicated by nuchal cords have been reported by other authors also [7].

We conclude that nuchal cord does not increase the chances of cesarean delivery. However tight cord around the neck may result in low Apgar scores at one minute and increased incidence of fetal distress.

Conflicts of Interest

None identified

Intellectual Contribution of Authors

Study Concept : Lt Col G Singh

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