

Role of ultrasonography in detection of nuchal cord in correlation with labour and neonatal outcome

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Abstract

Background: Despite that the description of nuchal cord was recorded 400 years B.C, the study of clinical implications of this prevalent condition has increased only in the past few decades. A nuchal cord occurs when the umbilical cord becomes wrapped around the foetal neck 360°. The diagnosis of a nuchal cord is made, when there is a suspicion due to the presence of variable decelerations in the fetal heart rate on the cardiotocograph (CTG) during labour. The present study is undertaken to know the prenatal diagnosis of nuchal cord and its effects on the labour and neonate.

Aims and Objectives: To Evaluate the role of ultrasound detection of nuchal cord in correlation with labour and neonatal outcome.

Material and Methods: It is a prospective comparative study done in Department of Radiodiagnosis Shri Sathya Sai Medical College and Research Institute, Ammapettai, Chengalpet, Tamil Nadu, India. Total of 200 women after 36 weeks of gestation were included and studied variation in the type of delivery and neonatal factors by calculating relative risk.

Results and Observations: In our study Nuchal cord was present in 37 (18.5%) babies after delivery. The sensitivity of ultrasound detection of nuchal cord prior to delivery is 37.8% and the specificity is 79.8%. The risk of caesarean section is high in women who had given birth to babies with nuchal cord, but difference is not significant. Nuchal cord at birth has no effect on APGAR scores of the babies at 1 minute or 5 minutes, abnormal cardiotocography, admission into neonatal intensive care unit and arterial cord pH less than 7.2.

Conclusions: Our study concludes prenatal diagnosis of nuchal cord through ultrasound after 36 weeks of gestation is of limited use as the sensitivity is low. The presence of nuchal cord at birth does not appear to increase the risk of caesarean section or of poor neonatal outcome.

Keywords: Prenatal diagnosis, nuchal cord, ultrasound, labour, neonatal outcome, caesarean section, APGAR scores

Introduction

Despite that the description of nuchal cord was recorded 400 years B.C, the study of clinical implications of this prevalent condition has increased only in the past few decades, particularly after the evolving number of studies linking it to poor perinatal outcomes^[1].

A nuchal cord occurs when the umbilical cord becomes wrapped around the foetal neck 360°^[2]. It is a common finding at delivery. The prevalence at delivery has been reported as being between 6% and 37% and the incidence may increase steeply after 38 weeks^[3,4]. Around 25-50% of nuchal cords formed at any one time will resolve prior to delivery^[5]. About 20%-60% of all foetal deaths are attributed to foetal asphyxia^[6]. However, aetiology in all cases of foetal asphyxia is not clearly established. Asphyxia is most commonly seen as a result of reduced placental circulation, but rarely, it might be secondary to umbilical cord complications. Nuchal cord accident comprises 5%-18% of all foetal asphyxia cases, and 10% of stillbirth were due to umbilical cord complications^[7]. The diagnosis of a nuchal cord is made, when there is a suspicion due to the presence of variable decelerations in the fetal heart rate on the cardiotocograph (CTG) during labour, particularly if there is 'shouldering' or if they are of a 'double variable' or 'W pattern'^[8]. Other indirect methods of diagnosis have been described by demonstrating fetal heart rate changes following application of manual compression of the fetal neck abdominally or in response to acoustic vibratory stimulation^[9,10]. Ultrasound diagnosis of a nuchal cord was first described in 1982 by Jouppila and Kirkinen^[11] and since then there have been a very few case reports in which ultrasound diagnosis has aided obstetric management. So, the present study is undertaken to know the prenatal diagnosis of nuchal cord and its effects on the labour and neonate.

Materials and Methods

It is a prospective comparative study done in Department of Radiodiagnosis Shri Sathya Sai Medical College and Research Institute, Ammapettai, Chengalpet, TamilNadu, India. A total of 205 women after 36 weeks of gestation were included in to the study among which 48 were having nuchal cord around the neck at least three of the four sides of the neck and remaining 157 were not having nuchal cord in trans abdominal ultrasound scan. All the ultrasound scans were performed by the single radiologist and the information wasn't revealed to women or clinician. After delivery of the baby, patients were grouped into Patients delivered a baby with nuchal cord and without nuchal cord and studied variation in the type of delivery and neonatal factors. Informed consent was obtained from the women for including into the study. Information was collected in predesigned questionnaire and entered into Microsoft excel. Data was analysed using SPSS statistics 21.0 version. Results were expressed in proportions and percentages and relative risk was calculated to assess the risk.

Results and Observations: According to the study of Ghiet *al.* the nuchal cord was detected in 32% of neonates. The chance of vaginal delivery within 24 hours from labor induction was comparable among the neonates with and without nuchal cord at birth. In our study Nuchal cord was present in 37 (18%) babies after delivery. Among which 30 (15%) babies have single loop, 6 (3%) babies have double loop and 1 (0.5%) baby have three loops of cord noticed around the neck after delivery. In table 1 and figure 1 it was shown that the sensitivity of ultrasound detection of nuchal cord prior to delivery is 37.8% and the specificity is 79.8%. In table 2 and figure 2 it was shown that, among 37 babies born with nuchal cord, 15 (40.5%) babies delivered by caesarean section, 2 (5.4%) delivered by forceps delivery due to foetal distress and 20 (54.1%) delivered by normal vaginal delivery without any assistance and among 168 babies born without nuchal cord, 61 (36.3%) babies delivered by caesarean section, 10 (6%) delivered by forceps delivery due to foetal distress and 97 (57.7%) delivered

by normal vaginal delivery without any assistance. Though the risk of caesarean section is high in women who had given birth to babies with nuchal cord, difference is not significant. In table 3 and figure 3 it was shown that, 6 (16.2%) babies born with nuchal cord and 22 (13%) babies without nuchal cord has APGAR score less than 7 at 1 minute and 1 (2.7%) baby born with nuchal cord and 3 (1.8%) babies without nuchal cord has APGAR score less than 7 at 5 minutes after birth. Abnormal cardiotocography was seen in 12 (32.4%) babies with nuchal cord and 51 (31%) babies without nuchal cord. Around 5 (13.5%) babies with nuchal cord and 16 (9.5%) babies without nuchal cord has been admitted into neonatal intensive care unit. Around 6 (16.2%) babies with nuchal cord and 30 (17.9%) babies without nuchal cord has arterial cord pH less than 7.2. Nuchal cord at birth has no effect on APGAR scores of the babies at 1 minute or 5 minutes, abnormal cardiotocography, admission into neonatal intensive care unit and arterial cord pH less than 7.2. None of the neonates born with nuchal cord has been died in the follow-up period of 1 year.

Table 1: The effectiveness of ultrasound in detecting the nuchal cord prior to the labour

Cord on ultrasound	Nuchal cord at delivery Present	Nuchal cord at delivery Absent	Total
Present	14 (37.8%) (True Positives)	34 (20.2%) (False Positives)	48 (23.4%)
Absent	23 (62.2%) (False Negatives)	134 (79.8%) (True Negatives)	157 (76.6%)
Total	37 (18%) (Total positives)	168 (82%) (Total negatives)	205 (100%)
Sensitivity		37.8%	
Specificity		79.8%	
Positive predictive value		29.8%	
Negative predictive value		85%	

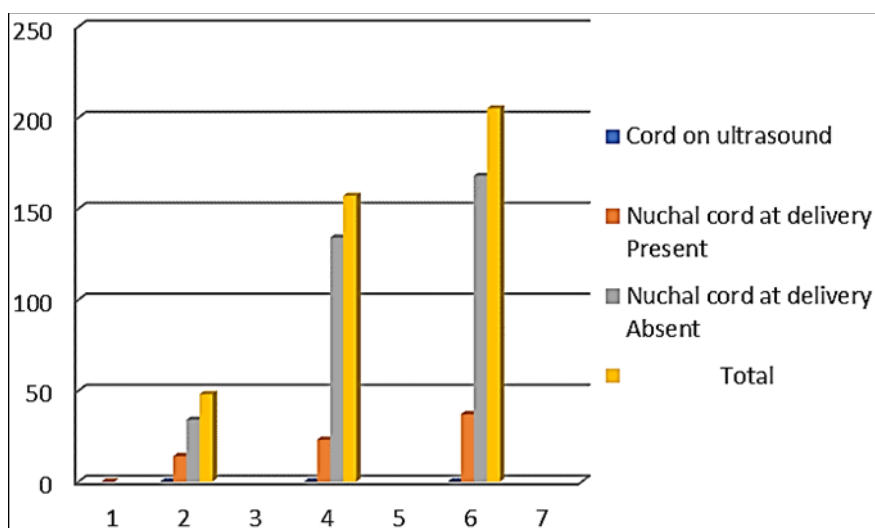


Fig1: Ultrasound detecting the nuchal cord prior to the labour

Table 2: Association of nuchal cord at delivery and mode of delivery

Mode of Delivery	Nuchal cord at delivery Present (n=37)	Nuchal cord at delivery Absent (n=168)	Relative risk (95% CI)
Caesarean section	15 (40.5%)	61 (36.3%)	1.12 (0.72-1.74)
Instrumental delivery	2 (5.4%)	10 (6%)	0.88 (0.20-3.85)
Normal vaginal delivery	20 (54.1%)	97 (57.7%)	1.94 0.68-1.30)

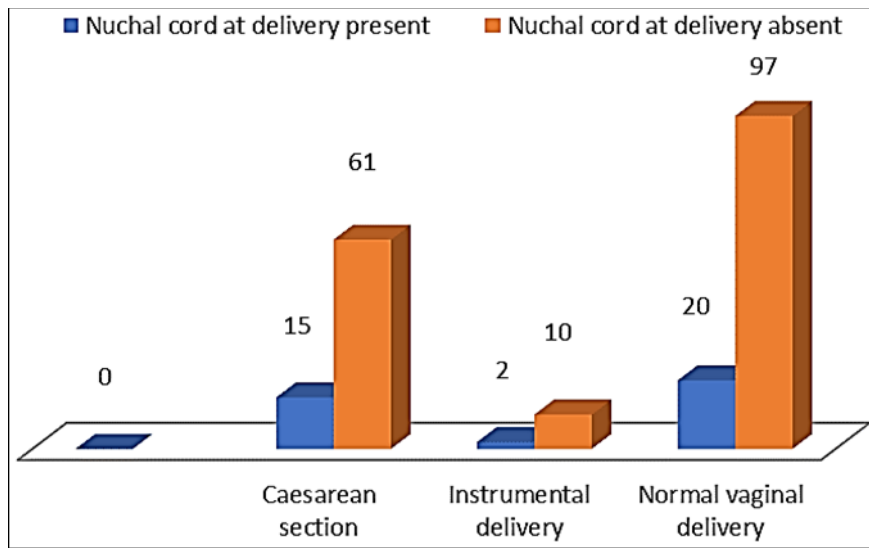


Fig2: Nuchal cord vs Mode of delivery

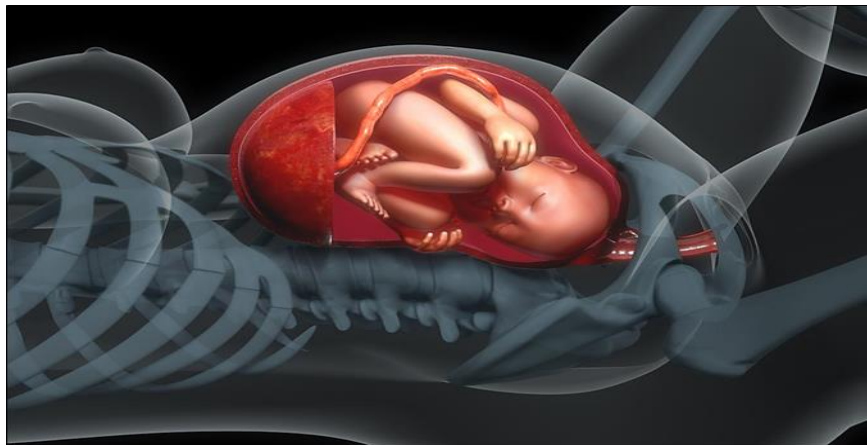


Fig3: Nuchal cord causes multiple complications as showing in the picture

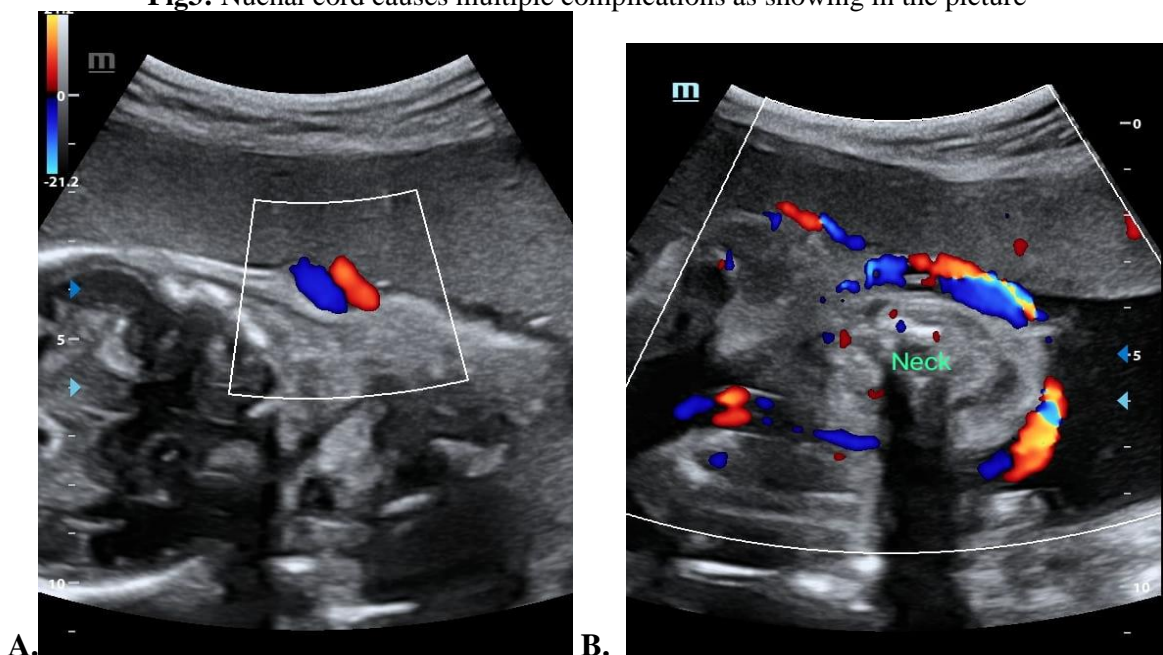


Fig 4: Sagittal(A) and Axial(B) views showing the umbilical cord wrapped around and encircling the fetal neck

Table 3: Association of nuchal cord at delivery and neonatal outcome

Neonatal outcome	Nuchal cord at delivery Present (n=37)	Nuchal cord at delivery Absent (n=168)	Relative risk (95% CI)
APGAR score <7 at 1min	6 (16.2%)	22 (13%)	1.26 (0.55-2.90)
APGAR score <7 at 5min	1 (2.7%)	3 (1.8%)	1.50 (0.16-14.1)
Abnormal cardiotocography at delivery	12 (32.4%)	52 (31%)	1.08 (0.64-1.82)
Admission into NICU	5 (13.5%)	16 (9.5%)	1.38 (0.54-3.52)
Arterial cord PH <7.2	6 (16.2%)	30 (17.9%)	0.91 (0.41-2.04)

Discussion

During the third trimester sonography, sonographic detection of the nuchal cord may be a significant finding, in particular when assessing cases of deteriorating fetal movements.

The present study was undertaken to know the effectiveness of using trans-abdominal ultrasound in detecting nuchal cord prior to the delivery after 36 weeks of gestation and found the sensitivity of 37.8% and the specificity is 79.8%, similar to the findings of Peregrine *et al.*

^[12] study. These two studies have lower sensitivity compared to other studies because the ultrasound scan was done after 36 weeks of pregnancy at which fetal crowding, low position of the fetal head or reduced amniotic fluid volume is common to create problem to visualize nuchal cord^[13]. Present study reported that there is no significant risk of having emergency caesarean section in babies born with nuchal cord at delivery. But in Jauniaux *et al.*^[14] and Rhoades *et al.*^[15] studies, it was shown that the risk of having caesarean section is more in babies born with nuchal cord. The difference was missed in the present study may be due to less sample size. Present study also reported presence of nuchal cord at birth has no effect on APGAR scores of the babies at 1 minute or 5 minutes, abnormal cardiotocography, admission into neonatal intensive care unit and arterial cord pH less than 7.2. Similarly, studies done by Jauniaux *et al.* and Carey *et al.*^[16] also reported no increase in the risk of stillbirth, especially if risk factors such as hypertension, abruption, diabetes, premature rupture of the membranes, oligohydramnios and major fetal anomalies are controlled. Irrespective of this some retrospective studies have been reported poor neonatal outcome and an increase in perinatal mortality^[17,18]. Collins JH has suggested that the nuchal cords which are 'locked', where the placental end passes under the umbilical end rather than 'unlocked' are more often associated with a poor outcome^[19], but this has not been demonstrated on ultrasound. It may be that the presence of other associated features such as reduced fetal movements or other markers of concern about fetal wellbeing will identify fetuses at risk.

Conclusions

Prenatal diagnosis of nuchal cord through ultrasound after 36 weeks of gestation is of limited use as the sensitivity is low. The presence of nuchal cord at birth does not appear to increase the risk of caesarean section or of poor neonatal outcome. However, the presence of two or more nuchal loops may affect the mode of delivery and early neonatal outcome. Once nuchal cord is highly suspected either antenatal or intrapartum, patients should be closely monitored or shifted to a special ward offering close monitoring to fetal heart rate, CTG changes and progress of labor. Further, the study is recommending that further research should be directed towards improving the diagnostic techniques available for identifying nuchal cords in order to detect maximum number of cases with nuchal cord to limit the false negatives to minimum level.

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